

**“WHAT’S A HEAVEN FOR?”
NATIONAL PUBLIC CULTURE’S ROLE IN SHAPING US SPACE POLICY,
AEROSPACE DOCTRINE, AND THE FUTURE OF THE DYNA-SOAR, 1957-61**

By

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Dr Adrian Lewis (Chair)

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ABSTRACT

While cultural tenets exert strong impact on defense policy and doctrine, these ideas are crucially distilled and adjusted by people and institutions, and other opinion seek to influence the minds and actions of these bodies. Culture can be seen as the aggregate attitudes, practices, and values of a particular group of people. These, and perceived circumstances, determine the tenets or ideas which will resonate with a society. Culture is both learned and taught, so it adapts and is continuously contested.

Dwight Eisenhower's employment of airpower and nuclear weapon technology complemented dominant tenets in US culture up to Sputnik. But Soviet space accomplishments prompted elites amongst the media and the Air Force to promote the idea of "aerospace" as a continuous realm to be explored and protected through technological advance and armed Air Force presence, and the Eisenhower Administration struggled for the remainder of his administration to control space policy and the contours of the culturally induced faith in technology.

The Dynamic Soarer, the Air Force's flagship project envisioning a space-to-earth bomber, represents an essential part of the history of US space development. From the Air Force preparation for "Dyna-Soar" spun off the first iconic element of the US space program – the Mercury ballistic capsule. Dyna-Soar was seen as a rival to Apollo in 1961, and afterward as a precursor to the shuttle. Understanding its history and place in this critical period helps provide a more complete understanding of the US space program.

Eisenhower officials sought to impede Dyna-Soar development and the President sought to calm the nation so that it would again ratify his employment of technology for massive retaliation (and secret reconnaissance) without leading to an arms race in space. Candidate, and ultimately President John Kennedy, aimed to galvanize political support by embracing noisy calls for a space adventure. He then gradually shifted the emphasis and direction of the adventure on which the nation embarked.

ACKNOWLEDGEMENTS

I knew I loved history since I was four years old, but I found the Dyna-Soar almost by accident. Preparing to write a paper in Roger Spiller's class on theories of warfare, I noticed the glider during the first semester of my Doctoral program here at the University of Kansas. It seemed intriguing, and with Ted Wilson's guidance the following semester, I scratched a bit deeper into the program's history during the Kennedy years.

Previous works such as Walter McDougall's ...*The Heavens and the Earth* mentioned the Dyna-Soar, and recent works by Air Force officers Roy Houchin and Mark Erickson focused on the program. McDougall deemed the program an interesting example of how truly ridiculous programs could sometimes be ended even during a generally technology-happy era. Houchin studied the vehicle's development history and rued its cancellation. Erickson studied the efforts of the military and of the civilian NASA from Eisenhower's tenure through Lyndon Johnson's. To each of these scholars I owe respect for the light they bring to the Dyna-Soar.

Still, something about the story seemed as yet untold, and the program's early history in particular seemed worthy of further attention; my committee at the University of Kansas offered valuable help in exploring the Dyna-Soar in a new way to more fully appreciate its historical significance. My advisor Adrian Lewis's own research guided my attention toward the role of culture. And indeed, the archival evidence I unearthed agreed: the dominant tenets upheld to the nation's public and enunciated by contingents of opinion leaders played a decisive role affecting the course of the Dyna-Soar and the larger direction of space policy. A fuller understanding of space policy and programs depends on accounting for the interaction of policymakers and military leaders. Many of these figures kept an eye on how society seemed to perceive trends in space. In different ways, these players sought to frame their plans in so as to appeal to the society's presumed cultural tenets, as they were understood by public figures. Such initiatives dramatically impacted space policy and space programs. Throughout my research and while drafting a manuscript, Sheyda Jahanbani's and Ted Wilson's advice and consultation continued to be invaluable. Their collegiate guidance has helped make for a productive and engaging trek from the

drawing board to the archival room to the dissertation office I set up in my apartment. Jeff Moran and Tom Heilke too have been generous in lending an eye and offering comments on this last leg of a student journey. Adrian and the rest of my committee offered profoundly important insights and perspectives that help me grow as a researcher and as a writer, and to them I owe a debt of sincere gratitude and admiration.

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Several classmates' encouragement and advice deserve recognition too. Greg Ball, Marion Mealey, John Clune, and Ray Finch provided valuable comment along the path, and Neil Oatsvall reviewed a chapter to provide helpful insights in preparing to present elements of my research. Gates Brown, Chris Rein, Frank Cai, and Mark Calhoun provided notable encouragement too. Angelina Long and Kevin Lee offered tremendous assistance in locating materials which I needed but had packed while preparing to teach overseas. Their intellectual companionship helped enrich this final stage.

Acknowledgements could not be complete without thanking my parents, Nick and Rose, and my brother Eric for an upbringing and an environment that fostered wonder, that encouraged learning, and that valued history. It made a happy childhood, and I discovered my career passion before my first day of first grade came some twenty-two years ago. Preparing for that first day of school meant buying a lunchbox, and I still remember what struck me as an uninspiring assortment of cartoon superheroes emblazoned on the sides of the boxes at the store. None interested me. I remember the patience that my parents showed during this extended process. And I remember the happy solution my parents devised: finding a camping box and marking it with the decals my godmom Carolyn gave me of the first Apollo missions. I was delighted.

It was a perfect fit for a young historian, and good reason to give thanks.

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Introduction: HOW GENERALS, PRESIDENTS, AND CULTURAL TENETS
DECIDE WHAT THE HEAVENS ARE FOR

Ah, but a man's reach should exceed his grasp, or what's a heaven for? - Robert Browning,
quoted as preface in a 1960 Air Force history of its space program¹

Sputnik did reveal a space gap, but the real space gap was quite different from the apparent one. -
Herbert York, 1970²

Thesis

Culturally induced beliefs or tenets exert inexact, but often pivotal, influences on policy in both war and peace. In the United States during the late 1950s, national public culture lent important support to US Air Force efforts to weaponize space through the development of a "Dynamic Soarer" space bomber. Civilian policymakers generally opposed this, but they did so in the face of determined spacepower advocates in the military - and insistent voices from amongst those representing and informing the public. In the last years of Dwight Eisenhower's Presidency, this militarization was most manifested by the Air Force intention to build a space bomber. Launched to orbit by rocket boosters, it would conduct reconnaissance and strike missions against the Soviet Union in time of general war. Afterward, the vehicle's pilot would steer the craft back through the atmosphere to a conventional airstrip. High-temperature materials would radiate heat away from the craft, whose shape would allow the boosted vehicle to glide back to earth. Unlike a simple capsule shot into space only to fall earthward, the glider would dynamically soar through the heavens. It would be called the "Dyna-Soar."

Fervent about the vast potential of technology, startled by sequential and spectacular Soviet feats in space, the national public's outlook prompted its acceptance of technological solutions to address presumed existential crises. Perceived crises in space loomed, in the eyes of many, all the more menacingly because technological power was harnessed by a potential adversary. Representative systems reflect their peoples and a distilled version of that populace's ideas. Dwight Eisenhower, abruptly out of step with the expectations of many constituents, found it impossible to entirely resist the tide demanding

¹ Bowen, Lee. *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA.

² York, Herbert, *Race to Oblivion: A Participant's View of the Arms Race* (New York: Simon and Schuster, 1970), 112.

increased space efforts. This environment proved conducive to space programs, and although Administration officials struggled to constrain the Air Force's space bomber, it grudgingly yielded greater ground on less offensive projects. John Kennedy, assuming office after castigating his predecessor's policies, began his presidency by supporting space initiatives both of military and civilian character. The culturally established environment which welcomed space technology did not disappear; instead public attention began to shift increasingly toward specific civilian space initiatives. Policymakers could not abrogate the values upheld by the national public culture, but they eventually redirected its attentions.

Competing Views of the Dyna-Soar

The Dyna-Soar's historical significance lies in the competing interpretations which military leaders, policymakers, and segments of the public had of the Cold War and the role of technology. Never completed, let alone flown, the Dyna-Soar did not participate in combat as other strategic bombers (such as the B-29 Superfortress or the B-52 Stratofortress) did during parts of the long Cold War. As a result, the Dyna-Soar program has been relegated to obscurity, and when mentioned it has usually received peripheral or somewhat simplified attention. At first glance, the historical obscurity of the Dyna-Soar might seem to be understandable. But the interaction of these competing forces shaped the course of the Dyna-Soar program, which underwent dramatic upheaval during the period from 1957 through the end of 1961. To date, characterizations of the Dyna-Soar have generally fit into two competing schools.

The first school might be referred to as tangential or dismissive, because its authors focus on other, macro issues to which the Dyna-Soar program seems only tangentially relevant. These authors therefore quickly dismissed the program as a shortsighted, wasteful dead-end. Walter McDougall's impressive work, ...*The Heavens and the Earth* is a strong example. McDougall aimed to show that "the unending race to keep up with foreign military and economic competition threatens to erode the very values that make one's society worth defending in the first place," and the rise of a space-driven technocratic elite introduced dangerous centralizing trends to US culture. Addressing a broad topic, McDougall described the Dyna-Soar as one of several "big ticket items of dubious promise but durable political backing," and

he gave a page and a half rendition of the program history. Dyna-Soar appeared in passing, mentioned because its cancellation in 1963 demonstrated that although “more money was being spend on R & D than ever before, [...] there were still ‘ceilings.’”³ A subsequently published Air University Press book from the service’s command and staff college agreed that “the lack of a clear mission, along with competition for funds, led to the [Dyna-soar’s] eventual demise.”⁴ The program period from organization in 1957 until the close of 1961, studied in this manuscript, existed for this school of thought simply as contextual prehistory, as authors deemed the Dyna-Soar as anecdotal evidence that unfocused research projects would eventually be cancelled even during time of zealous technological pursuit.

Herbert York, an actor in the Dyna-Soar’s history, had helped set the stage for the first school when he remembered the defunct program in his 1970 book, *Race to Oblivion*. “In retrospect,” he offered, “I think we should have recognized at the beginning that it was a nonsensical program.” York continued that he rued having “played an important part in allowing it to get started and I regard it as one of my major errors.” In contrast to this statement, his work during the Eisenhower Administration permitted flight research while severely hobbling pursuit of the service vision of a weapon system. But York, like other authors addressing the Dyna-Soar, explained that because the program’s costs outpaced early estimates, “the program was [...] cut back in 1960 and finally cancelled completely in 1963.” In general, military efforts “to carve out a space mission” for one particular service “wasted large sums of the public’s money, but also diverted money and attention from other [...] programs where there was serious need for them.”⁵ These explanations did less than they might have to indicate the degree to which projects like the Dyna-Soar actively endangered important elements of the President’s approach to national security.

A second school, one of sympathetic advocacy, emerged more recently and was partly sparked by the existence of the first school. In his introduction to *Hypersonic Research*, Air Force Lieutenant Colonel

³ McDougall, Walter A, *...the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985), 13, 190, 339-41.

⁴ Muolo, Major Michael J, *Space Handbook: A War Fighter’s Guide to Space, Volume One* (Maxwell AFB: Air University Press, 1993), 14.

⁵ York, *Race to Oblivion*, 130, 142.

Roy Houchin pointed to the work of Clarence Geiger and of McDougall, the latter having written that the Dyna-Soar history “deserves a telling.” An instructor of air and space power employment at the service’s college at Maxwell Air Force Base, Houchin asserted that “the Air Force lost DynaSoar, and the opportunity to inhabit the ‘high ground’ of space” because of doctrinal friction with Defense Department officials and because of the “increasing operational capabilities” of reconnaissance satellites under the National Reconnaissance Office. Houchin judged his own work “contextual and interpretive,” but the final product is valuable in a rather different way. Houchin’s extensive use of interviews conducted with program officials transforms *Hypersonic Research* into a history of the program’s technological development; contextual factors enter the scene to facilitate or (more often) impinge on that development. The result is a work with a tone of advocacy. This is made explicit by references to an Air Force general’s retrospective comments that Dyna-Soar ““would have been Mark I [for NASA’s] shuttle if we had gone ahead, and we would have saved ourselves several billion bucks.”” The dissertation manuscript of Houchin’s book introduced the topic by describing a critical (and hypothetical) Dyna-Soar reconnaissance mission during the 1973 Arab-Israeli War. Houchin’s book is a work of well-researched advocacy history.

Clarence Geiger anticipated the birth of the advocacy school in a 1987 chapter within an anthology about hypersonic research. Of Dyna-Soar, Geiger remarked that “no project was ever undertaken with more enthusiasm by its advocates, and no program was ever more callously treated by bureaucratic forces beyond the research and development community.”⁶ Air Force Lieutenant Colonel Mark Erickson, who also taught at Maxwell Air Force Base, wrote about the military and civilian space projects going “into the unknown together.” Erickson’s topic spans the presidencies of Eisenhower, John Kennedy, and Lyndon Johnson; Mercury, Gemini, Apollo, and Dyna-Soar figure prominently in his study. Erickson asserted that “the multifaceted relationship between NASA and the DOD involving support, coordination, and rivalry formed an important component of America’s first decade in space and its Cold War

⁶ Geiger, Clarence, “Strangled Infant: The Boeing X-20 Dyna-Soar,” *The Hypersonic Revolution: Eight Case Studies in the History of Hypersonic Technology*, ed. Richard P Hallion (Wright-Patterson AFB: Aeronautical Systems Division, 1987), II-ii.

strategy.”⁷ However, this relationship was a consciously established dynamic of bureaucratic tension. NASA’s predecessor organization NACA had held a distinctly different relationship with military aviation, built on technical assistance and advice.

This work seeks to describe and explain the course of the Dyna-Soar program from its program organization at the time of the Sputnik launches through the remainder of the Eisenhower administration and into the early portion of the Kennedy administration, after Kennedy’s call for a civilian human landing on the moon. Earlier works by Geiger, Erickson, and Houchin noted the institutional challenges; this work explains the factors which prompted policymakers to impose these obstacles in the path of the Dyna-Soar. Houchin correctly refuted popular claims that the program suffered from a lack of focus. The Dyna-Soar’s planners and supporters, in fact, had rather clear ideas of the ultimate purpose of the vehicle: a space-travelling bomber capable of further diversifying the US deterrent force and thereby maintaining future national security in the 1970s and beyond.

The Dyna-Soar represented the dream of top Air Force generals and the nightmare of the highest civilian policymakers. In a contest between a subordinate but ongoing institution and a temporarily supreme executive branch, the long-term deciding force would be a third body entirely.

How Doctrine, Policy, and Cultural Values Interact

Military and political leaders do not always agree in their perceptions of security problems or of their solutions. In such cases, the resolution suggests the character of the political system. In militarist systems, the military’s vision might be expected to run roughshod over objections of civilian officials. In civilian-dominated systems, officials would give orders and military personnel would dutifully obey despite their reservations and concerns. The United States has been accused of flaunting militaristic traits on one hand and its formal institution of civilian control by the President can be seen on the other. This, however, does not yet explain the changing landscape of national actions in the security realm. The United States does possess armed forces, and the country is presided over by a President.

⁷ Erickson, Lieutenant Colonel Mark, *Into the Unknown Together: The DOD, NASA, and Early Spaceflight* (Maxwell AFB: Air University Press, 2005), 538.

Fundamentally, the United States is a representative system in which large swaths of the population are able to (though they do not always) participate. Formal participation includes measures of obedience such as paying taxes and abiding by laws, but a far more active formal means of participation is voting. In collectively determining their leaders, the public in a representative system helps shape the future policy of the political community. A field of candidates is self-selecting and may not include individuals apparently embodying the essence of an ideal statesperson. Nonetheless, the US public at large has a regular, scheduled opportunity to select from a list of potential leaders. Different candidates carry different attitudes, ideas, and visions – and these will impact the policy which they would mold as a chief executive. Candidates have to and do seek to appeal to voters by seeming to be in tune with the national character and mood, while also commanding enough visionary talent and expertise to plan for the future and prepare for it.

This does not translate into policymakers' actions standing as a perfect enactment of the public's desires or representation of its views. Two crucial factors prompt this dynamic. One is that "the public" is not a monolithic entity with a single unified mind. It is, instead, a complex amalgam of myriad peoples, many of whom may not possess definite or consistent ideas about a given issue, while other people may sympathize with differing or even opposing factions of opinion leaders or policymakers. The other vital factor is that the leaders whose decisions shape policy do not refer to popular sentiment (however it might be interpreted) as an infinitely authoritative oracle. It may serve a guide, and political pragmatism dictates should it should, but it is not usually mistaken for a roadmap by the people setting policy. This said, cultural tenets nonetheless wield important influence because they cumulatively constitute a force more enduring than the tenure of individual policymakers.

Such tenets are set by the culture. Culture – the product of the attitudes and practices and values of a society of people – matters. By lending frameworks through which to interpret the world, its inhabitants, and events, historian Adrian Lewis has noted that "culture makes the objective world comprehensible by

inculcating structures and constructs.”⁸ These constructs need not be wholly accurate, but to be retained they must at least seem to work. People do not usually deliberately court failure, and as a result, cultural lessons and values which appear to have been inaccurate or to have become outmoded are liable to be discarded. In keeping with this dynamic, new cultural views which do not conform to the world or its needs – as people perceive them – are unlikely to be long embraced in the first place.

These ideas presuppose that culture changes, and indeed it does. Thomas J Jackson Lears explained that “a dominant culture is a continuous process, not a static ‘superstructure’; it contains innumerable tensions and idiosyncrasies; it can generate dissent as well as accommodation.”⁹ Cultural tenets are learned, and as such they are also taught. Members of a society both display and teach culture through their words and actions, and they learn culture through interactions with other people. “Culture” is therefore a generalization. What can be described as a “culture” is therefore an aggregate, a communal product which is shaped in slight degrees by its individual constituents. No single person can individually determine the course which a culture will follow. People’s individual views are, in turn, influenced rather than determined by the precepts of the culture in which they live. Cultures exist wherever people do, and cultures, like societies, are more enduring than their individual members.

Because culture is dynamic and because its trends depend on circumstances and on contemporary people’s ideas about them, culture is a constantly moving target. Rather than shifting uniformly and abruptly in quantum leaps, changes in culture tend to be natural (if sometimes fast-paced) developments among the individuals constituting the society. TJ Jackson Lears recognized that these individuals often work in conflicting directions as they attempt to move a society’s laws or customs or more broadly its culture in one direction or another. Successfully steering adjustments to culturally held tenets embodies a profound challenge. While culture is learned and undergoes change over time and across spaces, its changes tend to be more contiguous than abrupt. Although culture is a plastic entity, *deliberate changes*

⁸ Lewis, Major Adrian, *The American Culture of War: The History of US Military Force from World War II to Operation Iraqi Freedom* (New York: Routledge, 2007), 5.

⁹ Lears, Thomas J Jackson, *No Place of Grace: Antimodernism and the Transformation of American Culture, 1880-1920* (Chicago: University of Chicago Press, 1994), xvii-xviii.

to a culture can be made most effectively when the alterations can be interpreted by a society's members as necessary, beneficial, and as unobtrusive as possible with respect to the other aspects of a culture which do not appear to be in critical need of reform.

Like the culture, military services can stand as relatively permanent entities in a society. The services develop and inculcate ideas, expressed as doctrine, and the process of doctrinal thought can therefore endure and outlast any one individual's tenure of service and direct personal influence. Intellectual inquiry demands a certain degree of space in which to maneuver without obstruction, but organized efforts require a degree of uniformity in purpose and method. Military services cannot safely allow their doctrine to remain in constant flux in the same way that a free society's culture necessarily can and does. The solution is to develop doctrinal thinking which is ultimately translated into an official set of formal precepts. Doctrinal manuals, such as Air Force Manual 1-2 released to define "aerospace," serve this purpose of placing personnel on literally the same page, after allowing an earlier intellectual space for the development of competing thought.

While a military service is bound to abide by civilian instruction from above, the President is pragmatically obligated to bear in mind the views of the public who he has historically represented. This is too diffuse to be a line of authority in the strictest sense, and indeed past Presidents have at times chosen policies which contradict cultural tenets and even alienate large portions of the populace. It should be remembered, against the intellectual dangers of generalizations about "the people" or demands to "do the right thing," that the culture is in fact the aggregate product of the ideas and practices of large numbers of people whose interests, circumstances, and outlooks do not wholly align. Just as one cannot fool all the people all of the time, it can prove nearly impossible to satisfy all of the people any of the time. "Culture" is a generalization born somewhat of necessity, and cannot be substituted as an automatic analog for the views of any particular constituent of a society. Identifying dominant cultural perspectives can therefore be a daunting task, although people setting policy do well to keep this task in their minds, if not using it as a substitute for their own ideas and judgments.

Culture does not deterministically dictate thought or action, because people make choices. “Counterculture” often carries connotations of the *opposite* of prevailing culture; as a rejection, countercultural efforts risk interpreting culture in a polar simplicity of alignment or opposition. A policymaker such as a President has a responsibility to recognize more nuance than is denoted by the idea of “counterculture.” Within a representative system, a policymaker can help shape an *alternative*, not merely a presumed *opposite*, of a contemporary value or opinion. Policymakers have a platform from which to try to realign culture, because their position offers a chance to try to reshape cultural outlooks. In representative systems, leaders are temporarily empowered to challenge attitudes and ideas cherished by contemporary culture. Opportunity does not equate to wisdom. For any leader, threatening to alter culturally upheld outlooks means risking harm to one’s own political career. In the bigger picture, efforts to radically realign cultural values can jerk a society violently into directions which are out of step with long-term cultural inclinations. In such cases, the public may in aggregate reject the proposed alternative path, or it may adopt the alternative (as it is interpreted), either entirely or more likely in part.

These dynamics shaped the course of the Dyna-Soar program and influenced the direction of US space policy during a critical juncture in the Cold War.

Doctrinal Thought, Policymaking, and National Public Culture Intersect on the Dyna-Soar

In describing contrasting models of military technological innovation in the United States and the Soviet Union, Matthew Evangelista recognized that a bottom-upward route of ideas present in US innovation was absent in its Soviet counterpart. In the United States, scientists could and did promote ideas to military and civilian officials to form a consensus and promote development of a technology. Perceived external threats help provide an environment conducive to development and finally top level military and civilian officials approve mass production of a new weapon technology.¹⁰ Contemporary society was relatively open to new ideas and prepared to encounter revolutionary ideas in technology, permitted this dynamic to occur.

¹⁰ Evangelista, Matthew, *Innovation and the Arms Race: How the United States and the Soviet Union Develop New Military Technologies* (Ithica, NY: Cornell University Press, 1988), 52.

The Evangelista model is useful as a preliminary illustration of the Dyna-Soar's process of development. The Dyna-Soar's "technocratic initiative" started with Eugene Sänger's hypersonic concept in the 1930s and continued into the 1950s with ex-Nazi Walter Dornberger's attracting the attention of Bell Aircraft in 1952. The second step of "consensus building" occurred during the 1950s while the Air Force and the National Advisory Committee on Aeronautics (NACA) pursued limited studies into the technological challenges involved in hypersonic flight. The third stage, "promotion," started with the launch of Sputnik in October 1957, concurrent to the "open window" Evangelista identified as a fourth step, when an external threat provided an opportunity for further support. However, where the Air Force insisted that a Soviet aerospace threat existed, civilian policymakers' support (step five) was not forthcoming. The program did not neatly fit the pattern of weapon technology development.

The Dyna-Soar, as envisioned by its advocates in the US Air Force, ran contradictory to fundamental elements of Eisenhower's policymaking. Eisenhower believed that national security demanded the simultaneous maintenance of an adequate level of defense strength and a robust economic vitality. As confirmed by recently unearthed drafts of his first national addresses in the wake of the Soviet Sputnik I and II orbits, Eisenhower deemed adequacy primarily in terms of producing a deterrent effect in the posture of his Soviet counterparts. US military potential which prevented Soviet leaders from seriously *considering* major aggression therefore equated to an "adequate" defense. Further spending beyond this point was not only unnecessary, it would be harmful, since every dollar invested in implements of war could not then be spent on civilian needs and had ultimately to be taken from the private sector and private citizens.

Eisenhower's election in 1952 occurred because "it was both appropriate to the situation and in harmony with the outlook of a majority of his countrymen," and William Pickett concluded that the General's concern about the country's national security posture in an alternative administration under Isolationist Republican Robert Taft led Eisenhower to seek the office. In general, reliance on Air Force and Naval power projection, on nuclear weapons, and on fostering reliable allies overseas sought to

achieve affordable adequacy in national defense.¹¹ The “New Look” in defense dovetailed with the President’s outlook enunciated by his “Cross of Iron” speech just months into his tenure. The United States military wielded nuclear arms on Air Force and Navy planes, but also on Army rockets, and eventually in Navy submarines as well. A more diverse deterrent force stymied an anticipated Soviet surprise attack, because diversified deterrent forces complicated the Soviet task of neutralizing US forces before launching the second phase of its aggression. US nuclear forces grew and diversified with the years of the Eisenhower Presidency. Meanwhile, the Air Force, which enjoyed conspicuously disproportionate shares of contemporary defense budgets, sought to diversify its deterrent forces further. This entailed the extension of airpower beyond the atmosphere, into space.

Air Force space advocates included officers at the very top of the service, such as Chief of Staff General Thomas White. In 1958, White coined a term to describe this extension of airpower thought into the realm above the atmosphere. The realm of “aerospace” would encompass, without serious practical limits, the sky in its entirety, from the breathable air into the reaches of space. In time of war, airspace is a battleground, and high-ranking Air Force officers of the late 1950s had battled in the skies over Occupied Europe and the Pacific during World War II. In Korea, warplanes had attained new altitudes topping 40,000 feet. Airmen expected altitudes to extend farther as technology progressed; a future general war might see combat above the atmosphere. After all, defeated Nazi scientists had studied the possibility of specialized bomber vehicles. Eugene Sänger had theorized about a vehicle which would “skip along the atmosphere like a stone on a pond.” By ricocheting on the top of the atmosphere, vehicle range could be fabulously extended. Cooling the vehicle and aiming a weapon each posed a mammoth challenge, and scarcity of resources caused his work to stall in the middle of the war. Nonetheless, some Nazi scientists remembered Sänger’s dream of an *Amerikabomber* capable of reaching and striking another continent.

¹¹ Pickett, William B, *Eisenhower Decides to Run: Presidential Politics and Cold War Strategy* (Chicago: Ivan R Dee, 2000), xvii, 193, 215. Leighton, Richard M, *Strategy, History of the Office of the Secretary of Defense, Volume III: Money, and the New Look, 1953-1956* (Washington, DC: History Office, Office of the Secretary of Defense, 2001), 25-48.

These notions captured the attention of some in the United States (such as Bell Aircraft and eventually the Air Force) and in the Soviet Union (reputedly dictator Joseph Stalin). The Air Force translated its interest, during the mid-1950s, into a series of research programs studying the problem of hypersonic flight. The National Advisory Committee on Aeronautics, established in 1915 to make pilots' dreams into technological realities, cooperated with the Air Force on these small scale studies. Physicist Theodore von Karman fostered Air Force interest in scientific research and expressed in 1945 that "only a constant inquisitive attitude toward science and a ceaseless and swift adaptation to new developments can maintain the security of the nation," and top officers in the service agreed with the spirit of this dictum.¹²

Max Boot's recent work, *War Made New*, offers insight about the new uses of new military technologies. Boot pointed to five themes as crucial, and these are relevant to this study. The essence of them are:

1. "technology alone rarely confers an insurmountable military edge"
2. agile powers availing of shifts have profited in warfare
3. powers still need "the wisdom to know the capabilities and limitations of its war machine"
4. "no military revolution has ever conferred an indefinite advantage upon its early innovators"
5. the technological innovation spiral is accelerating.¹³

Air Force officers might not have identified these factors in the same way, but they were acutely aware of some, although they seem to have been nearly oblivious to others.

The development of aerospace doctrine indicates a definite service awareness of the first theme, and the Air Force's interest in ever-improving technologies in order to continually keep ahead of Soviet reactions (and maintain a consistent posture of deterrence) indicates a service awareness of the second, fourth, and fifth themes as well. If the Air Force suffered from a lack of awareness, in view of Boot's themes, it would be the capabilities and limitations of the technology. On one hand, enormous technological challenges interposed themselves between Dyna-Soar advocates and the promise of a further diversified deterrent. However, at least as important a limitation, in the short run, was the fact that the Dyna-Soar contradicted the intentions and outlook of the Eisenhower Administration. The service's

¹² Gorn, Michael H, *Harnessing the Genie: Science and Technology Forecasting for the Air Force, 1944-1986* (Washington, DC: Office of Air Force History, 1988), 37.

¹³ Boot, Max, *War Made New: Technology, Warfare, and the Course of History, 1500 to Today* (New York: Gotham Books, 2006), 15-6.

solution was in effect to proceed with research on a relatively small scale, to rely on events or discovery to promote more ardent support of space work by the public, and anticipate that public support would bring a change in policy or the introduction of a more sympathetic set of policymakers.

The Soviet orbit of the first earth satellite on October 4, 1957, and of a far larger satellite carrying the first organism to orbit a month later, explicitly introduced the realm of space to the dynamic of the Cold War. Within the Eisenhower Administration, earnest discussion ensued about the portent of space exploration. Administration officials quickly recognized that if space were interpreted as an international realm like the high seas, then passive transit of nonmilitary vehicles could occur without challenge. Some of these vehicles might carry cameras or electronic equipment able to survey the rival's lands and offer vital clues about enemy capabilities and technologies. For a President dependent on dangerous, infrequent, and finite missions by the extremely high-altitude U-2 reconnaissance jet, the notion of reconnaissance satellites carried inestimable cache. To officers in the Air Force, however, relying on the Soviet antagonist (whose political system was ostensibly bent on world revolution) to concede and respect a "freedom of space" was a fool's errand. The service's in-house scientific advisory board urgently cautioned against "spectacular, but technically superficial demonstration[s]" in response to Sputnik; technology was seen to offer valuable solutions, but only if it were taken on in earnest.¹⁴ A later Air Force history specifically noted that officers in the Air Force Research and Development Command during the 1950s "would have been shocked to know that in a few years time, satellite-based reconnaissance, communications, weather, and navigation would be considered peaceful uses of space!"¹⁵ The Air Force vision of "aerospace" dominance and the Eisenhower Administration set to promote the "freedom of space" were at loggerheads.

Kenneth Osgood's study of Eisenhower's "total cold war" touched importantly on this topic. Presidential rhetoric, including the Cross of Iron speech three months into his first term, subtly "elevated the cause of waging Cold War over that of making peace," and Osgood deemed Eisenhower a skilled

¹⁴ Sturm, Thomas A, *The USAF Scientific Advisory Board: Its First Twenty Years, 1944-1964* (Washington, DC: Office of Air Force History, 1986), 81.

¹⁵ Gorn, *Harnessing the Genie*, 72.

deployer of propaganda. “Propaganda” was deliberate communication, but was not necessarily untrue communication, and it could succeed when in accordance with public attitudes. For example, Atoms for Peace “struck a responsive chord in target audiences,” and Administration enthusiasm for Open Skies (allowing US overflight of the USSR and Soviet overflight of the United States for reconnaissance purposes) owed much to perceptions of Atoms for Peace. As with Atoms for Peace, “Open Skies was both a serious proposal and a political warfare move,” and when it failed, the need for reconnaissance information continued. Osgood rightly noted officials’ emphasis before Sputnik that the precedent for satellites stress the peaceful (defined as nonweaponized) nature of the first satellite.¹⁶ Where Open Skies had failed, a Freedom of Space could promise another opportunity – which Eisenhower wanted to utilize. An operational Dyna-Soar would ruin this, and concerted development might endanger it.

Fred Greenstein’s interpretation of Eisenhower, enunciated most conspicuously in *The Hidden Hand Presidency*, was of a Chief Executive whose true actions flew beneath the radar, undetected but effectual in real terms. Osgood’s awareness of the propaganda activities of the administration stands in keeping with the notion of a political style new to electoral politics but hardly unacquainted with strategy. A byproduct, as Greenstein noted, of this style was that much of the public then and afterward underestimated the degree to which Eisenhower was an active force as President.¹⁷ This study of the Dyna-Soar’s history acknowledges that the office of the Presidency entails far too much work for a single person but affirms that Eisenhower stood at the center of actual decision making on space policy. His civilian subordinates loyally acted in keeping with the President’s priorities.

When space policymaking entailed Eisenhower yielding ground, *he yielded to his perception of the public’s demands* rather than to opposing voices among the elites in the Air Force or among his deputies in the Administration. His private remarks of reluctance to cancel space projects that boasted public support suggest that the President believed in a potent force of public opinion. Furthermore, his key addresses to the citizenry implied a faith that the public’s latent capacity to take a more deliberate hand in

¹⁶ Osgood, Kenneth, *Total Cold War: Eisenhower’s Secret Propaganda Battle at Home and Abroad* (Lawrence, KS: University of Kansas, 2006), 64, 7, 179, 190-4, 330-1.

¹⁷ Greenstein, Fred I, *The Hidden-Hand Presidency: Eisenhower as Leader* (New York: Basic Books, 1982).

determining its own mind – or, rather, minds. Eisenhower sought to reshape the framework through which the public viewed space and other topics, but Greenstein aptly recognized that “of all Eisenhower’s qualities, his political communication style has least to commend it to future chief executives.”¹⁸ This may have been a price of the so-called hidden-hand approach. While his final address encountered some approving and supportive ears, it fell on many unhearing ones as well. Eisenhower’s recognition of this latent power reflected his respect and interpretation of what democracy meant, but even in its warning about military-industrial complexes and scientific-technological elites, it underestimated the power of these elites and in some ways apparently overestimated the determination of the public to turn potential into reality.

The US Constitutional system arranges the three entities which determine policymaking, doctrine, and culture, so that the populace’s input selects the policymaker. This person then stands for four to eight years over the military figures who write and fulfill military doctrine. Policymakers therefore wield significant authority in relation to the country and directly over the military. At first glance, policymakers possess striking powers. However, the policymaking element is significantly unlike both the culture and the military. Because the populace selects presidents, the potential for continuity among policymakers is far less than the degree of continuity within the populace’s culture or the military’s doctrine. Successive presidents can, and have, dramatically disagreed with one another and enacted substantially conflicting policies as a result. Furthermore, wise policymakers recognize both that they represent the least permanent element in this triad and that as the elected member their responsibility includes the job of keeping the cultural values, the doctrinal precepts, and the policies in some degree of alignment.

Events up to the middle of the twentieth century appeared to many to validate belief in technological potency. In the United States, more than in other contemporary countries and even during harsh times like the Depression, people worked and lived with technologies like automobiles which made life more comfortable, profitable, and efficient. Access to technologies was not uniform, and technologies had

¹⁸ Greenstein, Fred I, *The Presidential Difference: Leadership Style from FDR to George W Bush* (Princeton: Princeton University Press, 2004), 54.

eliminated some jobs while opening others. But technology seemed to work wonders. Visionaries foresaw technology allowing the country to escape the dirt, blood, and toil of ground combat in a future war; cursory considerations of the Second World War seemed to bear this out. Although increasing scrutiny would actually permit a very different conclusion, the promise of airpower and firepower proved enticing. A society which saw atomic attacks coincident with Japanese final surrender was willing to invest in bigger, better, faster, further-flying technologies which might achieve miracles. After the war, technologies meant conveniences every day for greater numbers of people. With the vaccine developed by Jonas Salk in the early 1950s, polio ceased to be the leading killer among childrens' communicative diseases.¹⁹ Technology saved lives in peacetime and in war; as Lizbeth Cohen recognized, postwar prosperity offered the chance for people in the United States to celebrate materialism.²⁰

The Dyna-Soar program languished, rather than died, during the Eisenhower years because of the President's reluctance to completely shut down space projects. Waging what amounted to a rearguard action in defiance of voices from the public's elected representatives in Congress and media voices, Eisenhower officials learned the propaganda value of spectacular space programs but for two reasons resisted the temptation to foster them. First, ambitious space programs cost money which would deny funds to other elements of the government or the economy. Second, rather than calm international tensions by allowing intelligence data to be collected through passive transit through space, programs such as a weaponized Dyna-Soar promised instead to extend the arms race. Both of these only weakened the nation's real level of security, as interpreted by Eisenhower. Administration officials responded to the small but growing Dyna-Soar in the spring of 1959 by confining it to prioritize suborbital flight research over the testing of military subsystems. At the end of 1959, officials then introduced a four-month top-to-bottom review of the program to slow it down further.

Progress on the Mercury program, and the limited-scale continuance of the Air Force's Dyna-Soar and of the NASA's idea of a multi-crew Apollo ballistic capsule, indicated the degree to which the

¹⁹ O'Neill, William L, *American High: The Years of Confidence, 1945-1960* (New York: Free Press, 1986), 136.

²⁰ Cohen, Lizbeth, *Consumer's Republic: The Politics of Mass Consumption in Postwar America* (Vintage, 2003).

Eisenhower administration was unhappily conceding ground on space programs. Eisenhower viewed each of these crewed vehicles unfavorably, but felt unable to order their outright cancellation because of the insistent tones from the Congress and the media which represented the nation's public and helped inform it. Democrat gains in Congress in 1958 and John Kennedy's Presidential victory in 1960 suggested a public repudiation of Eisenhower's approach to many issues, including the space and defense realms as well as attaining economic health after recession in 1958. In the last weeks of his Presidency, Eisenhower wrestled with how he might short-circuit the crewed space vehicle projects he saw as expensive and unproductive distractions. Instead of ordering an eleventh-hour cancellation of the initiatives, he recrafted his Farewell Address to call upon the nation to maintain an informed vigilance as citizens; Eisenhower also cautioned listeners to resist the temptation to allow the continuing establishment of intimate ties between the military and defense companies, and to beware the emergence of a "scientific-technocratic elite." One of his principle defense technology officials, Herbert York (who had instituted the first of the 1959 complications for the Dyna-Soar), strongly believed that the Dyna-Soar was among the programs weighing on Eisenhower's mind as he prepared his Farewell warning message.²¹

The early months of the Kennedy Administration showed that the new President sought, in space as elsewhere, to pursue both military strength and initiatives beyond the military realm. By year's end, Kennedy's approach would bring expedited work on the Dyna-Soar (now revised away from overt focus on the orbital bomber which the Air Force had first wanted) and on a more powerful Titan-based booster rocket to carry the Dyna-Soar and other cargos into space. This would set the Dyna-Soar on a course toward more concerted development work during the early 1960s, but shorn of its controversial role the Dyna-Soar would continue until its cancellation to be plagued by skeptical civilian officials questioning the value of military personnel working in space. The nation's cultural tenets reinforced interest in technology had helped preserve the Dyna-Soar during Eisenhower's tenure. This inclination did not disappear in the 1960s, but its attention drifted to the other, more famous, track of Kennedy's dual approach in space: the announcement in May 1961 of a human lunar landing, which would be conducted

²¹ York, *Road to Oblivion*.

by the civilian space administration. The first steps on the moon would in fact be taken by a man who had once been slated to fly the Air Force's Dyna-Soar.

Chapters

This manuscript encompasses nine chapters. Chapter 1 follows the interest in hypersonic flight up to the time of the Soviets' Sputnik I and II orbits. These satellites, particularly the second, posed serious propaganda challenges to President Eisenhower, who sought to reassure the public at home (and hopefully the world beyond) that a satellite launch did not prove Soviet mastery of the guidance and reentry requirements involved with fielding an intercontinental ballistic missile (ICBM). Eisenhower also set about, in the wake of the Sputnik II launch, calling for what amounted to an increased citizens' attention not merely to trusting in the power of science but to actually raising new scientists. The President and his scientific advisors saw a threat of Soviet scientific superiority as an eventual possibility *if the United States did not reply with increased public engagement in scientific learning*, while the Air Force interpreted the Soviet challenge as far more imminently threatening. Simultaneous with the first Soviet satellites, Air Force planners consolidated various hypersonic flight research projects into the Dynamic Soarer program.

Chapters 2 and 3 explore the Air Force's pursuit of Dyna-Soar technology during the Eisenhower years. Developing the Dyna-Soar vehicle required first the establishment of an intellectual landscape conducive to development of military craft traversing both air and space, and while the service looked for contractors capable of building the Dyna-Soar craft, the service's highest ranking officers and authors in its service university journal worked to develop doctrinal thinking which would incorporate the Dyna-Soar and its presumed successors. Chapter 2 studies the development of this doctrinal thought, while Chapter 3 follows Dyna-Soar development as this thinking became codified in the service's official doctrine at the end of 1959. During this time, the Dyna-Soar faced challenges from the administration which seemed to impede the program's development, and although this tarnished some of the service expectations about deploying an operational Dyna-Soar in the foreseeable future, it did not bring an end

to the Dyna-Soar or to Air Force belief in the importance of the aerospace realm which the Dyna-Soar would pioneer.

Chapters 4 and 5 examine the Eisenhower Administration's decision making about space policy and the implications for the Dyna-Soar program. Chapter 4 pays attention to the unease which gestational Air Force thought on "aerospace" prompted within the Administration. York conceded that there was "much justification" for viewing the heavens as a continuum and Air Force personnel could not imagine a continuum not coinciding with uniform rules about usage.²² Nonetheless, the Administration felt a pressing need to prevent, for fiscal and for security reasons, spiraling growth in the arms race; furthermore, internationally accepted passive transit by satellites in space raised the prospect of US reconnaissance satellites someday providing the intelligence information that the failed Open Skies initiative could not. Administration officials became more specifically aware of the Dyna-Soar from late 1958 onward, and Chapter 5 studies the ways in which officials worked during 1959 to pursue national policy objectives and stymie the troublesome program which threatened to upset these.

Media outlets both appealed to the public and informed it, and as such their reporting provides relevant information about the US public's cultural tenets. Chapter 6 considers the awareness and perception of space issues - and of the Dyna-Soar in particular - in the period between the Sputnik I orbit and the 1960 campaign season. Examination of the *Washington Post*, *New York Times*, and *Aviation Week* help illuminate these factors. Major newspapers like the *Post* and the *Times* attracted general readership from across the country, and both papers did report occasionally on topics related to the Dyna-Soar. As might be expected, the popular trade journal *Aviation Week* spent decidedly more time on air and space issues than did general readership newspapers. Readership for such journals was far smaller than for major newspapers, but the self-selected cadre of readers was also more likely to be compelled by aviation issues and to voice its opinions about them. *Aviation Week's* editorial page provides a valuable gauge of the journal's generally critical view of Eisenhower's perceived confusion and sloth in

²² York, *Road to Oblivion*, 126. Gorn, *Harnessing the Genie*, 72.

addressing Soviet advances in space. Likeminded readers would embrace candidates advocating more assertive activity in space.

While the 1960 campaign season proceeded, Air Force officers and Administration officials worked in respective, divergent, directions. Chapter 7 considers events during the twelve months preceding the presidential election. Many voices directed at the voting public decried Eisenhower's space initiatives as dangerously inadequate, and the outcome of the election appeared to be a repudiation of the President's handling of key issues; significantly, the Democrat President-elect John Kennedy rode to a narrowly won victory while coupling economic and defense issues in a way different from that done by Eisenhower. While Eisenhower's frugal Republican administration had presumed that government spending (including on the military or in space) detracted from the strength of the national economy, Kennedy asserted that defense spending could help boost the economy out of the recession which had confronted the country since 1958.

Chapter 8 begins to explore the contrasting outlooks of Eisenhower and Kennedy. It examines recently uncovered drafts of Eisenhower's last major speeches, his January 12 State of the Union Address and his January 17 Farewell Address. The evolution of these speeches show the depth of his concern about the dangers of intimately intertwining business and military interests and of placing excessive faith in a technocratic elite insulated from the larger public. Again, Eisenhower called upon the public to commit to being "an alert and knowledgeable citizenry" able to avoid the docile dependence on distant elites which could undermine the republic's democratic character. Technology would, he hoped, remain a vital tool – but one kept within the strictures of informed public vigilance.

Chapter 9 relates the surge in attention to space which coincided with Kennedy's first months in office. Kennedy moved along both the military and the civilian tracks in space. His March 28 speech on the defense budget included a line urging increased spending on the Dyna-Soar program over the level set by Eisenhower, and on May 25 Kennedy called for an implicitly nonmilitary human lunar landing. Between these two speeches, the Soviets orbited a human in space, and Boeing (the Dyna-Soar contractor), presented a plan to expedite vehicle development. In the waning months of 1961, *Aviation*

Week poured further attention on the need for assertive advances in space, and the Administration approved a modification of the Boeing proposal. Alterations by Kennedy officials established the elimination of the intermediate suborbital stage of testing, and this simultaneously lowered the projected cost of Dyna-Soar development and increased the need for big booster development. Concurrently, the Dyna-Soar was redirected away from anticipating an aerospace bomber.

Chapter 1: HYPERSONIC PLANS, AND A BASKETBALL IN SPACE

These aircraft skip along the atmosphere; they dive down only after they have flown across the ocean in order to slice their way into New York! What an impressive idea! – Soviet aviation design chief Aleksey Isayev, 1945, commenting on Eugene Sanger’s *Amerikabomber* concept²³

It’s easier to make rockets than that airplane. – Moscow Aviation Institute professor Genrikh Abramovich, 1945, commenting on Eugene Sanger’s *Amerikabomber* concept²⁴

Dr [Hugh] Dryden opened the meeting by stating his belief that no vehicle [was] as important as the boost-glide research vehicle which the Air Force was considering [...] - NACA Memo, February 6, 1957²⁵

Now is the right time to start thinking about a hypersonic glideweapons system. - General Thomas Power, Air Research and Development Command, June 10, 1957

In the eyes of the nation’s policymakers and of its Air Force commanders, American security depended on its deterrent power, and that power rested on the Strategic Air Command’s ability to strike the Soviet Union. Eisenhower’s continuing commitment to massive retaliation was “based on both fiscal and strategic reasoning,” since a different strategy would have required a different and expanded force structure which would also entail substantial added defense costs and might hypothetically lead to a “garrison state” entirely contrary to democratic ideals.²⁶ Air Force commanders believed that maintaining a deterrent position necessitated continual advances in weapons systems technology.²⁷ Loud and influential voices therefore called for continuous quantitative and qualitative improvements to the deterrent force.²⁸ But projecting the existing massive retaliation strategy into new realms, for example by

²³ Chertok, Boris, *Rockets and People, Volume I* (Washington, DC: NASA History Division, 2005), 263.

²⁴ Chertok, *Rockets and People*, 265.

²⁵ Memo for Record, “Meeting of NACA Personnel at NACA Headquarters February 6, 1957 to Discuss Possible Hypersonic Research Airplane,” February 6, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

²⁶ Secretary of Defense Document # TS-0128, March 2, 1956, Fldr Missiles January 1956-January 1960. Box 18, Staff Sec ser, DDEL; Roman, Peter J. *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 122.

²⁷ Memo from Twining to Sec Def Wilson, “Need for Multimegaton Thermonuclear Tests,” April 23, 1956. Fldr Wilson, Chas. E. (defense) 1956 (2), Box 41, Papers of the President, Ann Whitman Diary ser (hereafter PP AWD), DDEL; Roman, Peter J. *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 64.

²⁸ “Closing Statement by Senator Stuart Symington at conclusion of hearing of Secretary Wilson, Senate Armed Services Subcommittee on the Air Force,” July 3, 1956. Fldr Twining Report July 1956 (2), Box 24, Staff Sec Alpha ser, DDEL; “Preliminary Report of Visit of the United States Air Force Delegation to the Soviet Union, 23 June – 1 July 1956,” July 1956. Fldr Twining Report July 1956 (2), Box 24, Staff Sec Alpha ser, DDEL.

a weaponization of space, would have produced added defense burdens and impacted intelligence strategies, although not necessarily defense strategies.

Massive retaliation bore an all-or-nothing aura difficult for some people to pallet. It also seemed to leave many probable cold war scenarios (involving local aggression or tension) without a plausible US response. Despite some calls within and outside the administration urging greater ability to prosecute limited war, Eisenhower demurred from such notions. Boosting US limited war capability meant either that deterrent power would be sapped or that economic health would be drained. Additionally, a limited war potential might prove counterproductive, leading the USSR to discount US will and thereby inadvertently *encourage* Communist aggression.²⁹ Limited war capabilities combined risks Eisenhower distained with costs he scorned. During his second term in the White House, critiques of his vision grew. But there was a time in which massive retaliation represented a means of addressing national needs in a balanced way.

The Cold War can be now, and was then, viewed in many prisms, as a military, economic, political, psychological, even spiritual competition. While quantitative strength came from factories, some voices – including scientists who would join the President’s Science Advisory Council (PSAC) at the dawn of the “space race” – considered that qualitative strength came from laboratories.³⁰ Research - and development - therefore appeared to many Americans to be vital components in preserving national security.

But where does this process end? Policy choices determine which strategies are appropriate, and although the public selects the president, the president commands the authority to shape national policy. President Eisenhower’s priorities pointed to protecting an American *way of life*. In Eisenhower’s conception, this entailed individual liberties as well as physical security from aggression. Eisenhower said plainly that protecting lives was not sufficient to protect the nation, and that establishing a garrison state to save lives from Soviet aggression would undercut the freedoms which Americans sought to

²⁹ Notes taken at NSC Meeting, May 1 1958, document #0433 declassified 2000, DDRS. Roman, Peter J. *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 87.

³⁰ Draft for discussion, “Research and the Department of Defense,” May 7, 1957. Fldr Research—PSAC, Box 5, PSAC Committee (1) ser, DDEL; letter from ODM Science Advisory Committee chair II Rabi to Gordon Gray, July 29, 1957. Fldr Science Advisory Committee (2), Box 23, Staff Sec Alpha ser, DDEL.

protect.³¹ Additionally, the President believed that the emergence of vast new internal industrial or research empires married to the defense establishment threatened the nation's democratic fabric – a point he would make explicit in his farewell address. Endless military buildup and endless military spending would threaten to construct the garrison state and erode the country's economic health. During the middle Cold War years, about half of the nation's tax dollars went to the Defense Department. Throughout his presidency, Eisenhower therefore pursued policies intended to preserve sufficient American deterrent strength so as to provide national security from Soviet attack, while funding the military (and the rest of the government, which cumulatively shared about the other half of a tax dollar) skimpily enough to preserve ample economic freedom.

Sputnik I made the time suddenly seem ripe indeed for bold new advances in defense technology and doctrine. The Air Force had not been asleep to space issues, but it had faced understandable contemporary resistance. In the waning days of the Second World War, General "Hap" Arnold had directed Hungarian scientist Theodore von Karman to consider trends of future technology, and in 1946 the newly minted Research and Development (RAND) Corporation had been tasked with analyzing the feasibility of a reconnaissance satellite. Tight peacetime budgets, interrupted by the urgent demands of the Korean War, had helped prevent progress from being made in the ten years after the Second World War. Furthermore, influential figures such as Roosevelt and Truman-era science advisor Vannevar Bush had judged such projects to be hopelessly futuristic, and therefore potential wastes rather than potential investments. As precocious as the Nazis' V-2 rocket technology had been, its range had been short, its speed insufficient to boost anything into orbit, and its accuracy had left much to be desired. Powerful and accurately guided ballistic missiles did not exist in the wake of the war, nor could anyone seriously be certain, in the 1940s, that they would appear in the near future. Extensive planning about what such non-existent rockets would carry into space seemed, in Bush's eyes, unjustifiable. Visionaries can usually see

³¹ "Memorandum of Discussion at the 384th Meeting of the National Security Council," Oct 30, 1958. *Foreign Relations of the United States (FRUS) 1958-1960 Volume III*, doc 36, pp139-145.

farther than critics can – but critics might well point out that such apparitions often turn out, upon closer scrutiny, to be mirages.

Walter Dornberger, the ex-Nazi General who had directed their Peenemunde research program, had tried since the end of the war to sell a modified version of a wartime idea of a vehicle capable of lifting into the high atmosphere and gliding to a target and back. Bell Aircraft first gave the idea attention in 1952, and “in 1954 the Air Force contracted Bell for a limited study of the boost-glide system.” This was to be known as Hywards. On May 12, 1955, the Air Force added a general operational requirement (GOR) for a “piloted very high altitude reconnaissance weapon system.” Bell began work on this too, dubbing the project “Brass Bell.” Finally, the Air Force on June 12, 1956, ordered another project, whose exact title was classified. Bell started work on this last concept as well, and its designations confirm that project’s purpose. Bell initially called it “Bomi,” for “bomber missile,” but soon adjusted the name to “Robo,” for “rocket bomber.”³²

The Air Force’s interest in boost-glide technology in the mid-1950s was low key but its curiosity in the subject was at that time also sometimes challenged and derided. Walter C. Williams was an Air Force lieutenant and a masters degree student in aeronautical engineering at the Air Force’s Institute of Technology at Wright-Patterson Air Force Base in Dayton, Ohio, when he first learned of Bell’s work with boost-glide technology. Interested, he attended a presentation at the Heyden Planetarium in New York City on May 4, 1954. “A bunch of old guys in civilian clothes” were already seated waiting for the talk to begin. An Air Force colonel noticed Williams there, dressed in his service uniform, and was furious. Personnel were supposed to attend the talk *out* of uniform. Williams explained that his attendance was prompted by curiosity, and that he had not been ordered to hear the presentation.

Pointing to the assembled audience, the colonel explained that the other attendees constituted ““most of the highest ranking officers in the Pentagon from all the military services.”” The colonel continued that, “we don’t want the god dam [*sic*] press making a big thing out of this so we all came in civilian

³² Bowen, Lee. *Threshold of Space: An Air Force History of Space Activities, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p45; “Abbreviated System Development Plan,” 23 August 1957.

clothes except that one general sitting in the front row. He's a plant. The newspaper and magazine reporters will be let loose in here shortly, and they're all going to rush down to interview that general. He's going to tell the same story you told me, that he's just here out of personal interest. Then they're all going to rush back up here to interview you – you get the picture?" Williams said he understood, and he would insist (genuinely) that he had attended from personal interest, just as the planted general would less sincerely claim.³³

Williams noted, forty years afterward, that "*what the military of all the services was most vitally interested in at this point in time was long range liquid rocket missiles – not space flight!*" The presenters, chiefly company head Larry Bell and Walter Dornberger, aimed to sell the audience on what Williams described as "a new hypersonic, winged, boost-glide weapon system." Unlike the "skip-glide" pattern envisioned in the Sänger Project, mentioned in the previous chapter, the revised concept would glide smoothly in and through the atmosphere. This change was connected to the enormous heat burden which a skipping method of flight would have entailed.

"The reaction of the DOD and Air Force audience" to the boost-glide concept "that day was not only abusive, it was downright insulting." Dornberger, irritated, eventually made an outburst. Williams, somewhat charitably, believed that Dornberger had intended to say that his listeners would have taken him more seriously if the science had been demonstrated more fully during World War II. What Dornberger ended up saying was more inflammatory: "'I wish we had shot down more of your bombers in WWII!' Then he sat down. The silence was deafening. It took a long time for Old Man Bell to mend the fences trampled down that day!"³⁴ Boost-glide advocates were not alone in encountering derisive resistance to their proposed technologies. New ideas, because they are as yet unproven and therefore entail a leap of faith as a reply to more tangible challenges, often meet resistance.

³³ Walter C. Williams, "Project Dyna-Soar: the Roots of the Shuttle – a Memoir," 43rd Congress of the International Astronautical Federation, August 28-September 5, 1992, Washington, DC, K146.3-7 AFHRA.

³⁴ Williams, "Project Dyna-Soar: the Roots of the Shuttle – a Memoir," K146.3-7, AFHRA.

The Union of Soviet Socialist Republics (USSR) announced in April 1955 its intention to launch an earth satellite during the International Geophysical Year (IGY). Hypersonic research followed a separate thread of development, but the Air Force quietly developed its GOR for a “piloted very high altitude reconnaissance weapon system” soon after this announcement. After prompting by the influential American Rocket Society (ARS), in July 1955 Eisenhower publicly announced the intention of the United States to launch a satellite during the IGY. The IGY would extend from July 1, 1957 to December 31, 1958. Its purpose was to promote scientific study in various realms, and although the IGY encompassed almost a dozen fields of Earth science, the prospect of an artificial satellite stood out as a particularly noticeable potential accomplishment. The committee overseeing IGY activities agreed that such a project should broadcast a radio signal of 108 MHz frequency so that science enthusiasts could detect its orbit, furthering even greater interest in scientific discovery.³⁵

For its part, the American Rocket Society proved a sturdy rallying point for advocates of US space science. As noted, their push for a US counterpart to the Soviet IGY satellite had influenced the President’s decision. The ARS grew steadily in the 1950s, expanding more than three-fold between 1954 and 1959, by which time it would boast 13,000 members.³⁶ This obviously did not encompass a large proportion of the US public, but the organization did possess a powerful voice. In the coming months and years, the organization would continue to promote its vision of space development and to serve as a publicly visible institution upholding space science. While its interest in space investment outstripped the President’s own preferences, the ARS did not simply serve as a cheerleader to anything pointed toward

³⁵ RUSSIAN JOURNAL OF EARTH SCIENCES VOL. 10, ES1003, doi:10.2205/2007ES000249, 2008. <http://elpub.wdcb.ru/journals/rjes/v10/2007ES000249/6.shtml> (accessed November 26, 2011). NSC 5520: “US Scientific Satellite Program,” <http://www.marshall.org/pdf/materials/805.pdf> (accessed November 23, 2011). IGY World Data Center A, *IGY Satellite Report* (Washington, DC: National Research Council, 1958) http://books.google.com/books?id=8jwrAAAAYAAJ&pg=RA2-PA47&lpg=RA2-PA47&dq=igy+satellite+frequency&source=bl&ots=PPTK11vMga&sig=5_SEExL5Dqe7AXW60EQzLvVr60M&hl=en&ei=gpvfTomdOoe9twec9en0BQ&sa=X&oi=book_result&ct=result&resnum=1&ved=0CDQQ6AEwAA#v=onepage&q=igy%20satellite%20frequency&f=false (accessed December 7, 2011).

³⁶ Winter, Frank H. “The American Rocket Society Story – 1930-1962.” *Journal of the British Interplanetary Society*, Vol. 33, pp.303-311. 1980. <http://www.gravityassist.com/IAF1/Ref.%201-49.pdf>. Accessed January 11, 2011.

space. The ARS's stance against space weaponization coincided with coming Administration decisions about the future of space policy.

In May 1955, after the Soviet announcement and as the small Air Force hypersonic initiative proceeded, the National Security Council (NSC) collected its thoughts about satellites. NSC 5520 noted the “considerable prestige and psychological benefits [that] will accrue to the nation which first is successful in launching a satellite.” An inferential relationship between satellite launch capacity and ballistic missile strength was identified. “Furthermore, a small scientific satellite will provide a test of the principle of ‘Freedom of Space.’ [...] It should be emphasized that a satellite would constitute no active military offensive threat to any country over which it might pass. Although a large satellite might conceivably serve to launch a guided missile at a ground target, it will always be a poor choice for the purpose” because “anything dropped from a satellite would simply continue alongside in the orbit.” The NSC predicted that the scientific satellite (which would be known as Vanguard), tracking instrumentation, and logistics costs would total \$20 million.³⁷ Given the strategically framed benefits of a satellite and its apparently finite cost, the NSC considered a scientific satellite to be a valuable Cold War instrument.

But the satellite's cost steadily outpaced the initial estimate. In April 1956, special assistant for scientific liaison David Beckler told NSC member William Elliot that “it is not clear that this program would have been approved” had the contemporary cost estimates (\$60 million for six satellite attempts or \$90 million for twelve attempts) been known in 1955. Beckler accused “potential contractors and military organizations” of “underestimate[ing costs] in an effort to make the project attractive.” He further believed that military nonchalance about the scientific satellite was “because of an unwillingness to provide funds,” since in fact satellites held promise for “the anti-ICBM program and” development of “a reconnaissance satellite.” These suspicions of course gave credence to similar brands of suspicion in the future. Despite the suspicions and despite the stupendously rising cost, Beckler argued against cancellation, since “to slow down or cancel the program would involve a loss of prestige, would let down

³⁷ NSC 5520: “US Scientific Satellite Program,” <http://www.marshall.org/pdf/materials/805.pdf> (accessed November 23, 2011).

the scientific community and would invite a Soviet propaganda coup if she were able to come through with a satellite during the IGY time period.” Beckler reiterated in the same letter that “more than a scientific program is at stake. The satellite launching has been made a matter of national prestige and symbol of technological strength.” Beckler repeated this before month’s end noting that “there is currently no emphasis in the US program on the timing of the first satellite shot” but rather focus is “to assure a successful satellite launching.”³⁸

Vanguard’s costs did not prompt endorsement of an Army alternative using the Redstone rocket built with the help of ex-Nazi scientists. The Army Ballistic Missile Agency (ABMA) boss, Major General John Medaris, foresaw a possible satellite launch using a Redstone rocket in January 1957. One advisor informed the Assistant Secretary of Defense for Research and Development that a one-shot Army attempt would have “doubtless [...] less than 50 per cent” chance of success and that “in any case, such a single flight would not fulfill the Nation’s commitment for the International Geophysical Year because it would have to be made before the beginning of that period.” If the sole purpose of lifting a satellite were to demonstrate missile technology, then a January 1957 Redstone launch could hardly be counterproductive simply because it preceded the start of the IGY. DOD was informed, more credibly, that scientist Clifford Furnas believed that using a military missile as a booster “may have the effect of disrupting our relations with the non-military scientific community and international elements of the IGY group.”³⁹ Though Furnas had the Navy’s Jupiter missile in mind, the issue at hand (whether boosters carried military, and militarized, association) was even more pertinent regarding the Army’s Redstone descendant of the Nazi V-2.

The uses of space remained matters of speculation, already a contested ground between those advocating establishment of a “freedom of space” and those arguing for study of the realm’s presumed military potentials. Scientific- and fiscal-minded skeptics informally constituted another group as

³⁸Beckler, David, to William Elliot, “Earth Satellite Program,” April 18, 1956. 11130 “DOD in Space,” NASA HQ. Beckler to Arthur Flemming, “The Earth Satellite Program,” April 30, 1956. 1956 11130 “DOD in Space,” NASA HQ.

³⁹Stewart, Homer J, “Vanguard and Redstone,” June 22, 1956. 11130 “DOD in Space, NASA HQ. Murphree, EV, “US of the Jupiter Reentry Test Vehicle as a Satellite,” July 5, 1956. 11130 “DOD in Space,” NASA HQ.

different voices promoted their visions. The nonprofit Research and Development Corporation (RAND) associated with the Air Force advocated three discrete space-located projects as militarily valuable and as technically feasible. One was an advanced reconnaissance system, another was a man-in-space project, and a third was a ballistic weapons research project. Nobel physics laureate I Rabi urged Office of Defense Management (ODM) director Arthur S Flemming on October 10 1956 to bolster the Vanguard program. US and Soviet efforts appeared to be causally linked, and “failure by the US to launch satellites successfully during the IGY in the light of this commitment would result in loss of US scientific prestige that would be compounded by successful Soviet launching.” Confident of a satellite’s importance but uncertain of its chance of success, Rabi advised that additional money be invested to expand the satellite program from six attempts to twelve, and that “official announcements” refer “to a ‘satellite’ only after it has been placed in orbit.”⁴⁰

While the Administration and its advisors deliberated about an unmanned scientific satellite launch in the upcoming IGY, the Air Force and the National Advisory Committee for Aeronautics (NACA) continued on a path established forty years earlier, in which the aviation service dreamt of new possibilities in flight and NACA engineers strove to transform those dreams into reality. A far higher, faster flying craft appealed to the Air Force, and at the end of 1956 the two organizations believed that “the hypersonic boost glide concept offers a major technological breakthrough in performance capabilities which should be exploited by future reconnaissance and bombardment aircraft weapons systems.” While contemporary Air Force planes and the planned X-15 rocketplane would help pave the way in preparatory research, “a research aircraft system is required with performance characteristics and capability significantly beyond those of the X-15,” because “the flight phenomena confronting hypersonic

⁴⁰ Memo from Scientific Advisory Committee President Rabi to ODM Director Arthur S. Flemming, Oct 10 1956, included as an attachment by David Beckler to Andrew Goodpaster, Oct 9, 1957. Fldr Science Advisory Committee (1), Box 23, Staff Sec Alpha ser, DDEL.

intercontinental weapon systems would not be encountered” by speeds approaching the Mach 7 anticipated limit of the X-15.⁴¹

A December 1956 report on hypersonic research held that “the hypersonic glide rocket concept offers a breakthrough in weapon system capability in terms of obtaining speed, range, and altitude simultaneously.” For Air Force advocates of progressively capable systems which would fly faster, farther, and higher, such research promised a revolution in technology while retaining fidelity to what seemed a war-tested tenet that technical superiority helped win (and hopefully deter) major wars. A secret section confided that “this research system should be able to generally support the Air Force research and development effort in the development of superior weapon systems for many years to come without having to plan and develop additional research systems with the consequent delay in progress.” BOMI and Brass Bell were specifically identified as related efforts.⁴² Hypersonic research, its advocates asserted, would pioneer a new age of flight and a new realm in which the military could help preserve national security. And the two roles most identified, fittingly, were bombardment and reconnaissance.

Admittedly, opening the door to hypersonic flight meant encountering and mastering technical hurdles. NACA observed that “Brass Bell developed to the point when somebody sold the idea that there should be a reconnaissance vehicle to impact damage done by the ICBM.” Since the ICBM had not yet been built in February 1957, the idea of a plane to assess its effects in battle might indeed have been easy to sell. NACA officials noted that “although there are no basic obstacles to the realization of such a research airplane, there are many detail design problems – particularly those involving the high-performance structures and its cooling systems.” However, Brass Bell had recently been revised to produce a Mach 20 reconnaissance plane by 1959, which the agency deemed “not realistic.” Furthermore, the Air Force had run out of money for the ROBO/BOMI bomber and Brass Bell bore

⁴¹ “Project Research System: Hypersonic Glide Rocket Research System; Hypersonic Weapons Research & Development Supporting System,” December 28, 1956. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

⁴² “Project Research System: Hypersonic Glide Rocket Research System; Hypersonic Weapons Research & Development Supporting System,” December 28, 1956. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

similarities to the Hywards research project and seemed redundant. NACA sensed that the Air Force was “looking ahead to this as [a] bombing system for 1965-1970, but with no real expectation that it will meet these dates.”⁴³ If the Air Force aimed at retaining a deterrent edge, then the pace of its technology needed to continually step ahead of rival Soviet offensive systems and of Soviet defensive developments. Timelines remained fairly theoretical until Soviet advances appeared to suddenly impose urgency. The “bomber gap” at mid-decade had seemed to do just that. Vigilance, for Air Force planners, therefore required study of fundamentally new technologies.

Government officials in the late winter looked skyward, but in different directions. NACA Director Hugh Dryden told his employees that he considered “no vehicle as important as the boost-glide research vehicle which the Air Force was considering could proceed without the active participation and cooperation of the NACA.” While the Air Force seemed content to move independently, NACA leaders would have preferred to cooperate along the lines planned for the X-15; the extensive requirements for the vehicle’s tracking range proved to them, however, that NACA “would require Air Force assistance.” Meanwhile, research pilot Neil Armstrong (who would find future renown a decade later) noted preliminary engineering considerations to modify a B-58 “as a first-stage launcher for research vehicles (X-15 and subsequent).” While NACA sought to assist Air Force aspirations in the hypersonic realm, Beckler followed up on Rabi’s letter to ODM chief Flemming by advocating expansion of the number of Vanguard satellite attempts.⁴⁴

Physicist Nate Gerson, working to keep the IGY in liaison with the American Geophysical Union, worried about the encroachment of DOD power in scientific exploration. He pointed specifically to a

⁴³ Becker, John V, “Hypersonic research airplane study,” January 17, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ. Memo for NACA Director, “Meeting of NACA Personnel Held at NACA Headquarters February 6, 1957, to Discuss Possible Hypersonic Research Airplane,” February 6, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ. Memo for Record, “Meeting of NACA Personnel at NACA Headquarters February 6, 1957 to Discuss Possible Hypersonic Research Airplane,” February 6, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

⁴⁴ Memo for Record, “Meeting of NACA Personnel at NACA Headquarters February 6, 1957 to Discuss Possible Hypersonic Research Airplane,” February 6, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ. Beckler to Flemming, “Scientific Satellites,” January 23, 1957. 11130 “DOD in Space,” NASA HQ. Armstrong, NA, “Visit to Convair, Fort Worth, on January 22, 1957, to discuss possible utilization of a B-58 airplane as a research vehicle launcher,” January 31, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

summary the previous month of joint military and civil government discussions on rocketry. The summary had explained that “upper air rocket research became established in DOD historically because facilities for doing such research were (the) property of DOD.” Gerson objected to implications “that since it is now imbedded in DOD, rocket research should remain there.” He reminded the Technical Panel chairman for the US National Commission for the IGY that “the primary function of DOD is the immediate preparedness of the nation for defensive, offensive or strategic type warfare,” and suggested the bad precedent set by the National Science Foundation financing scientific study under the arm of the DOD.⁴⁵ Gerson’s letter would be the harbinger of ongoing contention about the proper division of responsibility between military and civilian elements of government in space, and in how space ought to be utilized.

NACA officials prepared to support the Dyna-Soar, though it still as yet lacked that name. In fact, confusion about the still separate, but interrelated, research projects posed enough complication that NACA designated a uniform, if uninspired, nomenclature for the project: “In order that correspondence dealing with the consideration of a new research airplane might be recognized and properly routed in the Laboratories, it was suggested that the study of the new airplane be called Round Three.”⁴⁶ Rounds One and Two had been earlier research programs about high altitude, high speed flight, which Round Three research would advance further. Within NACA, the engineers at Ames Laboratory and at Langley Laboratory disagreed about the actual practicality of the Round Three concept; Alfred Eggers of the Ames group questioned estimates by Becker’s Langley team that the increasing vehicle temperatures could be kept at controllable levels during atmospheric hypersonic flight.⁴⁷ The project as yet lacked an inspiring name and still raised doubts in some NACA engineers’ minds, but study would proceed and these difficulties would be overcome.

⁴⁵ Gerson, MC, to Fred Whipple, memo, February 15, 1957. 11130 “DOD in Space,” NASA HQ.

⁴⁶ Wood, Clotaire, to Dryden, “Round Three – Areas of Agreement of New Research Airplane Steering Committee at Initial Meeting,” February 26, 1957. 11924 “Round Three’ Background Correspondence,” NASA HQ.

⁴⁷ Memo for Record, “Meeting of NACA Personnel at NACA Headquarters February 6, 1957 to Discuss Possible Hypersonic Research Airplane,” February 6, 1957. 11924 “Round Three’ Background Correspondence,” NASA HQ. Soule, Hartley, to JW Crowley, “NACA Let to Langley, Ames, and Lewis, Feb 14, 1957,” March 5, 1957. 11924 “Round Three’ Background Correspondence,” NASA HQ.

The boost-glide projects' supporters increasingly concluded that continued division of boost-glide research into three discrete segments was inefficient and unnecessary. The science involved in making a boost-glide journey to the edge of the atmosphere remained consistent even if the details of a mission varied. The Air Force directed its Air Research and Development Command (ARDC), on April 30, 1957, to consolidate the projects. Williams, after many frustrations that some in the Air Force had resisted the boost-glide vision in the years since the Second World War, mixed pride and confidence that he was part of a project which would ultimately prove dominant in the military realm. Williams thought he had the perfect name for the project, whose dynamic shape would allow it to soar at the top of the atmosphere. It was something big, an idea whose time had finally come, and which would inevitably rule over the earth. It would be called "Dyna-Soar."⁴⁸ It didn't seem to occur to Williams that its namesake dinosaur might one day evoke, in other minds, the image of a lumbering beast whose ultimate fate was that of oblivion. In 1957, there was reason to think that the Dyna-Soar might indeed enjoy a day in the sun.

Air Force and NACA leaders met in June to discuss hypersonic objectives. General Thomas Power, leading the Air Research and Development Command but heading to the Strategic Air Command (SAC) in less than two months to fill LeMay's vacancy as the latter became service Vice Chief of Staff, represented the Air Force. Dryden spoke for NACA. Power indicated that a vehicle with global range enjoyed greater security against surprise attack, and Dryden said that development of an operational weapon system might lag behind the technological capability of global flight by 15 to 20 years. Power, reminiscing about the B-52 Stratofortress at the forefront of the contemporary SAC, noted that "we started thinking about the B-52 about 10 years ago. So now is the right time to start thinking about a hypersonic glideweapons system." But Power demurred from the possibility of designating the vehicle a "prototype," suggesting that "the way to start is as a research vehicle." In contrast to his apparent enthusiasm in February, Dryden in his June meeting with Power indicated that "we would not want to

⁴⁸ Williams, "Project Dyna-Soar: the Roots of the Shuttle – a Memoir," K146.3-7, AFHRA.

start this project soon.”⁴⁹ Dryden’s dampened enthusiasm, though seemingly surprising, might be understood in the context of NACA’s traditional function: assisting the air service overcome technological hurdles. When the Air Force seemed interested in pushing ahead alone during February, NACA needed to keep pace or risk being left out. Power’s comparatively patient stance in June allowed a more paced approach to hypersonic flight in the summer.

A month later, project consolidation melded into the ongoing dynamic dictating a measured but deliberate pace on hypersonic research. Statements by Deputy Chief of Staff for Development Lieutenant General Donald Putt led NACA to reach four conclusions about the Air Force’s position on Round Three: “(1) It is not yet time to start a project directed at a hypersonic boost-glide weapons system, (2) in any event such a project should be preceded by a hypersonic research airplane, (3) the hypersonic research airplane should be a joint project with NACA, (4) the Air Force should take some step to make the hypersonic research project a project in being, but should not apply any significant funds” to it at the expense of the X-15 because the concepts press the state of the art and also potentially conflict with one another.⁵⁰ Dryden too described to Ames Lab Director Dr Smith DeFrance that “the X-15 project is not out of the financial woods yet.”⁵¹ Pursuing both the bold X-15 and its even bolder Round Three successor seemed to risk the future of both. Technological progress was deemed essential, but only acute emergency could warrant pursuit of programs at a pace that recklessly left them vulnerable to fiscally or scientifically founded skepticism. External events could – and in fact would – alter this pace again almost imminently.

By the summer of 1957, figures in government recognized the propaganda value for the nation to build the first satellite, and they also saw that a reconnaissance satellite could offer significant political

⁴⁹ “Round III Presentation at ARDC Headquarters, Md,” June 10, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

⁵⁰ Wood to Dryden, “Presentation to Air Force Headquarters on Round III,” July 11, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

⁵¹ Dryden to Smith J DeFrance, memo, July 11, 1957. 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

utility.⁵² Space admittedly held unknown possibilities, and while for some this implied horizonless vistas of opportunity, it denoted in the minds of others an aura of impracticality – an aura which might be disproven, but whose potential would have to be demonstrated. In keeping with the President’s interest in placing limits on the increasing dimensions of the arms race between the Western and Soviet blocs, the State Department worked on the nation’s position regarding potential disarmament. Although no satellite yet existed, space too was addressed: “The parties will agree that within three months after the effective date of the agreement they will cooperate in the establishment of a technical committee to study the design of an inspection system which would make it possible to assure that the sending of objects through outer space should be exclusively for peaceful and scientific purposes.”⁵³

Eisenhower wanted to maintain national security without damaging the national economy, and in the late summer of 1957 Richard Leghorn aimed to balance these priorities. Leghorn wrote to Beckler on July 31 to describe the benefits of a reconnaissance satellite.⁵⁴ Keeping faith both with national security demands and with economic needs posed difficult questions, and such questions lead different people to differing answers. Less than two months later, Beckler wrote to Eisenhower’s assistant Gordon Gray, objecting to “the ordered five per cent reduction in the level of basic research support, as part of a general reduction in obligations.” This reduction, Beckler protested, “is inconsistent with with [sic] the spirit” of numerous reports to the President, “all of which vigorously endorse the need for strong support of the relatively inexpensive basic research in the face of budgetary restrictions.”⁵⁵ The potential range of missiles sparked interservice frictions which Eisenhower had to rule on in August, and while he “reemphasized his desire that the Army not feel it is forbidden to develop a good missile which has the capacity for firing 500 miles,” his Chief of Staff General Andrew Goodpaster noted that “again the

⁵² “Discussion at the 322nd Meeting of the National Security Council, Friday, May 10, 1957,” document # 2769, May 11, 1957, declassified 2001, DDRS; document # 1919, May 24, 1957, declassified 2000, DDRS.

⁵³ “Department of State Paper: US Position on First Phase of Disarmament,” June 11, 1957. *FRUS*, 1955-1957 Volume XX, doc 237, pp620-625.

⁵⁴ Letter from Leghorn to PSAC Beckler, “The Reconnaissance Satellite and ‘Space-for-Peace’ Political Action,” July 31, 1957. Fldr Space – Satellites July 1956-February 1960, Box 3, Special Asst Sci & Tech ser, DDEL.

⁵⁵ Memo by David Beckler to Gordon Gray, “Basic Research Policy,” Sept 19, 1957. Fldr Science Advisory Committee (2), Box 23, Staff Sec Alpha ser, DDEL.

President reiterated his statement of 12 August *that the technical angles, which include cost and procurement, are not matters for the President*” [italics added].⁵⁶ However, as would become increasingly clear in the course of space projects and the Dyna-Soar in particular, the “technical angles” carried potent policy implications and would thus creep into Presidential responsibilities.

Hypersonic study gained some traction in September. RAND’s “missile-space” wish list grew apace, calling for “reconnaissance satellites; cislunar systems; interplanetary systems; navigation satellites; and communication satellites.” In early September, NACA informed top Air Force military and civilian personnel, including Lieutenant General Putt, of NACA’s engineering options in confronting challenges of hypersonic flight. Heat remained a stupendous problem. One alternative solution involved use of high-temperature metals and ceramics, another called for a complicated internal cooling system, and a third would use an external insulation. NACA preferred the latter two choices, whose advantages were seen to counterbalance their complications and the weight of the ceramic option. ARDC in turn informed NACA of its development program for a “hypersonic glide rocket weapon system (embracing Hywards, Brass Bell, and ROBO).” On September 26, NACA sent comments on the project, now identified as “Dyna Soar,” to ARDC. NACA agreed “that flight research with a vehicle having performance capability similar to that of the ‘conceptual test vehicle’ (Dyna Soar I), is indispensable prior to the development of an effective long-range reconnaissance or weapon system based on the hypersonic boost-glide concept.” NACA forwarded its conclusions about the technical feasibility to the Air Force’s Assistant Secretary for Research and Development with the notation that it was “not being distributed beyond the military services at this time.”⁵⁷ Indeed, little in the way of press reporting - yet - mentioned such possibilities as hypersonic flight to a civilian public.

⁵⁶ “Memorandum of Conference with the President, August 16, 1957,” Aug 20 1957. Fldr Department of Defense Vol. II (1) August 1957, Box 1, Staff Secretary Subject ser, DDEL.

⁵⁷ Bowen, Lee. *Threshold of Space: The Air Force in the National Space Program, 1945-1959* (USAF Historical Division Liaison Office, September 1960), K168.01-6, AFHRA, pp6-7. NACA to Asst Sec USAF for R&D, ARDC Commander, “Study of the Feasibility of a Hypersonic Research Airplane,” September 3, 1957. 11924 “Round Three Background Correspondence,” NASA HQ. NACA to SJ DeFrance, memo, September 13, 1957. 11924 “Round Three Background Correspondence,” NASA HQ. NACA to Asst Sec USAF for R&D, “NACA Study of the Feasibility of a Hypersonic Research Airplane,” September 26, 1957. 11924 “Round Three Background

Sputnik I entered orbit on October 4. At a conference in the Oval Office on October 7, “the President decided not to shift from the present orderly procedure to produce an Earth Satellite.”⁵⁸ Historian Robert Divine noted that Eisenhower “appeared to be the calmest person in the White House” in the wake of Sputnik I, the Soviets’ October 1957 launching of the first satellite. However, according to Divine, the President’s “low-key response to *Sputnik* completely failed to defuse the growing sense of public alarm.” CIA Director Robert Bissell admitted that Sputnik I “created an atmosphere of crisis in the government, as well as in the country at large.” Reasons supported Eisenhower’s calm, but these reasons remained hidden from the public: secretly, US reconnaissance planes had been overflying specific portions of the USSR. Eisenhower briefly considered, and then decided against, disclosing the U-2 program’s existence as a means to assuage public concern.⁵⁹

Beckler did not share Eisenhower’s calm, but Beckler did share his views with others. To the ODM, Beckler wrote on October 8 that “there is widespread belief among the scientists that our scarce scientific resources are not being husbanded in the most effective way; that there is lack of balance between long-term and short-term goals and inadequate focusing on important national objectives.”⁶⁰ To sharpen his point, Beckler on October 9 forwarded a copy of Rabi’s year-old letter, sending it to Eisenhower’s Staff Secretary General Andrew Goodpaster.⁶¹ Outgoing Defense Secretary Charles Wilson conferred with Eisenhower October 8, explaining that the Sputnik would catalyze greater emphasis on missiles. Eisenhower conceded that minor revisions could be made on the limits set earlier on cost-cutting

Correspondence,” NASA HQ. NACA to ARDC Commander, “NACA Comments on ARDC Development Plan 133/LA (Dyna Soar),” September 26, 1957. 11924 “Round Three Background Correspondence,” NASA HQ.

⁵⁸ “Memorandum for the President, Subject: Earth Satellite,” Oct 7, 1957. #0745, declassified 1999 DOD, DDRS.

⁵⁹ Divine, Robert. *The Sputnik Challenge: Eisenhower’s Response to the Soviet Satellite* (Oxford University Press, 1993), 3-8; Bissell, Richard M., with Jonathan E. Lewis and Frances T. Pudlo. *Reflections of a Cold Warrior: From Yalta to the Bay of Pigs* (Yale University Press, 1996), 134-5.

⁶⁰ Special Assistant for Scientific Liaison Beckler to Acting Director ODM Victor Cooley, “Satellites and Missiles,” Oct 8, 1957. Fldr Space – Oct 1957–Oct 1959, Box 3, Special Asst Sci & Tech ser, DDEL.

⁶¹ Memo from Scientific Advisory Committee President Rabi to ODM Director Arthur S. Flemming, Oct 10 1956, included as an attachment by David Beckler to Andrew Goodpaster, Oct 9, 1957. Fldr Science Advisory Committee (1), Box 23, Staff Sec Alpha ser, DDEL.

measures to reduce overtime work on US missile development.⁶² But Eisenhower preferred that reliable subordinates take such steps; the President's desk was cluttered even without added issues which could be entrusted elsewhere. And the Sputnik did not prompt the President's alarm. A functional ICBM needed long range and lifting capacity, which the USSR had proven; but it also required the intact reentry of ballistic warheads and of their accurate guidance to specific points on earth, neither of which the Soviets had yet demonstrated.

In the October 7 meeting with Eisenhower, Deputy Secretary for Defense Donald Quarles had pointed out "that the Russians having been the first with their Satellite to overfly all countries [...] have thereby established the international characteristic of orbital space. We believe that we can get a great deal more information out of free use of orbital space than they can."⁶³ A respected and experienced scientist in the private sector, Quarles had also served as Secretary of the Air Force, and his voice carried weight. Now again at the National Security Council on October 10, Quarles repeated that the precedent set by Sputnik in fact supported "our objective in the earth satellite program [...] to establish the principle of the freedom of space," and Quarles continued to say that satellites "were of very great significance, especially in relation to the development of reconnaissance satellites." He also "pointed out that the US program had used separate rockets from the rockets employed in the program to achieve military ballistic missiles," in contrast to Soviet practices in which space efforts and ballistic missile efforts seemed to be closely meshed.⁶⁴

Ambiguous situations gave rise to conflicting messages by officials. Following Charles Wilson's planned retirement, Neil McElroy became Secretary of Defense on October 9. McElroy quickly held a press conference which "compet[ed] in effect with the President's press conference," and "while the President said that the Russian success with the satellite would not cause us to speed up our missile

⁶² "Memorandum of Conference with the President," Oct 8 1957 DDE. Fldr Department of Defense, Vol. II (2) Sept-Oct 1957, Box 1, Staff Secretary Subject ser, DDEL.

⁶³ "Memorandum for the President, Subject: Earth Satellite," Oct 7, 1957. #0745, declassified 1999 DOD, DDRS.

⁶⁴ "Discussion at the 339th Meeting of the National Security Council, Thursday, October 10, 1957," Oct 11, 1957. #0850, declassified 1987 NSC, DDRS.

program, Mr McElroy in effect said the program would be speeded up.”⁶⁵ Some rumors had spread that Sputnik was itself a reconnaissance satellite, but the DOD had assured Eisenhower that this was not the case.⁶⁶ Contemporary US satellite plans envisioned a US reconnaissance satellite weighing three hundred pounds and carrying a 100-foot resolution tv camera to “begin test flights in two years” and be “in service in three years.”⁶⁷ Producing an effective satellite proved to be a major challenge; producing an effective *reconnaissance* satellite represented an even more daunting one, since images would have to be taken in a useful resolution and then sent earthward either by a broadcast signal or by some method of physical recovery.

In the days after Sputnik I, Dyna-Soar’s designers completed an abbreviated system development plan. The Dyna-Soar I was to be a “conceptual test vehicle.” In contrast, the X-15, under development but not yet flown, was a “research system [...] designed to research [an] area [of flight] not test solutions to problems.” Also distinct was a “prototype vehicle” such as the X-10 Navaho missile, which was “designed to test solutions to problems, not research areas – used in development of operational subsystems.” As a “conceptual test vehicle,” the Dyna Soar I would “obtain flight data in an environment which has not been sufficiently well defined” because it was pioneering a new realm in flight. Dyna Soar was “intended for use in development of weapon systems utilizing a specific concept,” boost-glide hypersonic flight. The focus would be on “research[ing] and test[ing] solutions to problems” and to serve as a test bed for subsystems. Potently, the development plan asked, “Can the entire strategic mission in the post-1970 period be entrusted to [the] ICBM?” It noted that “the question is further complicated by the possibility of improved or advanced ICBM’s,” because “if ICBM’s with CEP’s [circle of equal probability] of 500 feet can be operational by 1970, *there may be no requirement for a boost-glide bomber, but we cannot at this time safely assume that the 1970’s will find us in a position to destroy all*

⁶⁵ Diary, Oct 9 1957. Fldr October 57 – ACW Diary (2), Box 9, PP (AWD), DDEL.

⁶⁶ “Discussion at the 339th Meeting of the National Security Council, Thursday, October 10, 1957,” Oct 11, 1957. #0850, declassified 1987 NSC, DDRS.

⁶⁷ Goodpaster, memo for the record, Oct 15, 1957. Fldr Satellites October 1957 – February 1960 (1), Box 23, Staff Sec Alpha ser, DDEL. An optimistic appraisal anticipated a possible “limited reconnaissance capability” as early as the second quarter of 1959. #2541, declassified 1997 DOD, DDRS.

necessary targets with an ICBM” [italics added].⁶⁸ Although designers conceded a week after Sputnik that the future need for a boost-glide bomber was unknown, they felt certain that its absence could gravely weaken the future of the US deterrent and thereby undermine the security of the United States.

Mid-month, Eisenhower met with the Office of Defense Management’s Science Advisory Committee to discuss the country’s contemporary security. The President noted a call to shift money from applied research toward basic research, but Eisenhower asked “how much is enough?” He also questioned, despite the Soviet satellite, whether the United States was truly outdistanced in science. He commented that he had “recently been aboard the nuclear submarine and felt it is as important from a scientific point of view as the satellite.” Rabi, who had urged expansion of the Vanguard program a year before Sputnik’s launch, worried about “the quality and breadth of [the Soviet] educational system in scientific fields,” and Dr Edwin Land said that the Soviets “are teaching their whole country.” Eisenhower thought this might characterize the experience of the Soviet scientific elite, but that the USSR cared “little about [educating] the common laborer.” Land also told the President that “the Committee, as scientists, feels that our country doesn’t understand the spiritual rewards of scientific life. Is there a way to tell the country that we should set out on a scientific adventure in which all can participate?” Rabi chimed in of a need for more continuous scientific representation in deliberations with the President, rather than “being called in after the fact.”⁶⁹

Eisenhower agreed. The Office of the President was “crammed and inadequate,” and the answer might involve “someone who can see the scientific problems and bring in more specific ideas – a special assistant trained as a scientist.” Dr James Killian suggested that the Scientific Advisory Board “could provide proper back-up for such an individual,” and Eisenhower “said that he had felt a need for such assistance time and again.” By late November, this would be accomplished, as the Committee moved from ODM to the White House and Killian became the first head of the now renamed President’s

⁶⁸ “Abbreviated System Development Plan, System 464L: Hypersonic Strategic Weapon System,” October 10, 1957. 11325 “X-20 Dyna-Soar Documentation,” NASA HQ.

⁶⁹ ODM Science Advisory Committee meeting with President, October 15, 1957. 11130 “DOD in Space,” NASA HQ.

Scientific Advisory Committee. During the October 15 meeting, Dr Jerome Wiesner urged that US missile programs be bolstered, noting that the problem in the missile realm was “that we got a late start.” The previous administration, under Harry Truman, had established containment policy and established the North Atlantic Alliance, but investment in missile development suffered from efforts to drastically economize military spending. Meeting notes show that Eisenhower remembered this to the scientists but explained that “because of the political aspects [...] he had had avoided placing blame for this.” The President pondered altering laws on sharing nuclear technology with selected European allies.⁷⁰ Eisenhower, in public and in his private conferences, did not exhibit panic over Sputnik I. His meeting with the Scientific Advisory Committee, and its subsequent move into the White House fold, indicate that the President’s equanimity were not signs of apathy or lack of understanding.

At the same time that Eisenhower met with his scientists, the Administration sought to assure the public, and members of the press and the public sought to guide the President’s hand. On October 15, Vice President Nixon told an audience in San Francisco, California, that “the Soviet Union is not one bit stronger today that it was before the satellite was launched,” and that Sputnik’s orbit simply demonstrated the old news of Soviet rocket and industrial power and the regime’s confidence in its “slave economy.” Republican Senator Charles Potter of Michigan proffered his advice to Eisenhower the following day, suggesting establishment of a new federal agency on science. The White House answered by alluding to Eisenhower’s moves toward establishing a PSAC. “My scientific friends identified,” the reply read, “as probably the most serious and difficult phase of our situation, not the proved current competence and advances of Soviet scientists, but rather the difficulties we in the United States in [...] attracting to this pursuit of science an increasing number of individuals of quality and promise.”⁷¹

⁷⁰ ODM Science Advisory Committee meeting with President, October 15, 1957. 11130 “DOD in Space,” NASA HQ.

⁷¹ “Address of the Vice President of the United States before the International Industrial Development Conference, San Francisco, California,” October 15, 1957. Fldr Vice President Nixon, Box 2, Moos Papers, DDEL. Eisenhower to Senator Charles Potter (R-MI), October 21, 1957. Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (3), Box 3, Moos Papers, DDEL.

The United States Information Agency (USIA), a Cold War institution engaging in white propaganda, reported international reaction to the Sputnik as well. Director Arthur Larson noted to Atomic Energy Commission Director Lewis Strauss that “reports from our overseas posts indicate that the launching of the Soviet earth satellite has caused a greater psychological impact than any prior Soviet cold war action.”⁷² In mid-October, Larson wrote Eisenhower, suggesting

the undertaking of several possible projects, such as manned satellites, hitting the moon, or a space platform. Apart from the inherent scientific value of these achievements, they would also in part be motivated by the conscious intention to enhance America’s prestige abroad.⁷³

A human in space would doubtless have propaganda value. Larson suggested space undertakings not for “the value of scientific preeminence for its own sake, but the disproportionate impact that real or apparent scientific preeminence now seems to have on our military position and our diplomatic bargaining power.”⁷⁴

Also in the middle of October, the American Institute of Consulting Engineers bestowed its Award of Merit upon Deputy Defense Secretary Donald Quarles. Accepting the award, Quarles had declared that “to be effective from now on, our forces must be continually improved and modernized, calling for full assistance and support from our very best scientific and engineering talent as well as a substantial draft on our other national resources. [...] This concept of continuing cold war is new to Americans,” he continued. “If we are to get full grass roots acceptance of this as a continuing need all of us must do everything within our power to see that people across the country understand and believe in it, to the point where they will in peacetime behave with the same courage, determination, and single-mindedness that has always characterized them in wartime.”⁷⁵ Bernard Baruch met with Eisenhower in New York on October 22. Baruch had dabbled in advising presidents Wilson, Franklin Roosevelt, and Truman, and had in 1946 attempted to bring atomic energy under international control. “Whatever the reason, the public is worried now and in a condition to see the needs on defense and our economy. I think they are in a frame

⁷² Memo from Larson to Eisenhower, Oct 15, 1957. #2098, declassified 1990 USIA, DDRS.

⁷³ Memo from Larson to Eisenhower, Oct 15, 1957. #2098, declassified 1990 USIA, DDRS.

⁷⁴ Memo from Larson to Eisenhower, Oct 15, 1957. #2098, declassified 1990 USIA, DDRS.

⁷⁵ “Acceptance Remarks by Deputy Secretary of Defense Donald Quarles upon Presentation of Award of Merit, American Institute of Consulting Engineers, New York,” Oct 15, 1957. Fldr Department of Defense Vol II (2) Sept-Oct 1957, Box 1, Staff Sec Subject ser, DDEL.

of mind to give you the support and even the sacrifice to put both our defense and economy on a sound footing.”⁷⁶

An editorial in the *New York World-Telegram and Sun* asserted a need for a national, and assumedly lunar, crusade. It called upon Eisenhower to “summon the industrial power of our country” and “give purpose, direction and determination to a program to get into outer space ‘fustest with the mostest.’” Anything else would be to “falter” and cede valuable Cold War ground (whether literal or rhetorical, the essay did not explicitly explain) to Soviet ruler Nikita Khrushchev. Presciently, the editorial anticipated a current in national opinion. “If in your speeches on this crisis you give soothing reassurances instead of stern calls to sacrifice and effort...If that’s the drift...Your last three years in the White House, Mr President, will not be pleasant for you, or for us, or for anyone in the free world. Shoot the moon, Ike.”⁷⁷ Immediate initiation of bold space projects did not necessarily constitute wise or useful policy, but the demand did mesh with the impulse of some in the country bothered by the Soviet accomplishment and its presumed implications of US technological and strategic inferiority, despite the assurances of the Administration. Keeping in step with the mood of the public and a phalanx of its opinion leaders demanded space projects, with little immediate regard to their exact character or their impact on a long term space *policy*.

October ended with the Administration seeking to place Sputnik I in perspective – but struggling to determine what that perspective would be. Efforts to deflect criticism by Missouri Democrat Senator (and Truman era Air Force Secretary) Stuart Symington led Eisenhower officials to explain that “the US has not exploited ballistic missile programs for propaganda purposes,” in implied contrast to the Soviets. Furthermore, the US “has leaned over backwards [...] in order to avoid intensifying the armament race.” Deputy Defense Secretary Donald Quarles emphasized this too. Quarles added that “the problem is one of the long pull,” a need to continue a contemporaneously strong military position into the future years. The United States’ offer to prohibit weapons from space had been brushed off by Soviet refusal as the

⁷⁶ “Subjects discussed with the President by Bernard Baruch, New York, October 22 1957.” Fldr October ’57 – ACW Diary (1), Box 9, PP AWD, DDEL.

⁷⁷ “Shoot the Moon, Ike,” October 29, 1957, *New York World-Telegram*.

Soviets had “advertise[d] their ICBM” by lifting a satellite and “have in effect served notice of their intention to exploit outer space for military purposes.”⁷⁸ This position conflicted with and detracted startlingly from Quarles’ first post-Sputnik argument to Eisenhower, that the satellite had paved the way for a precedent on freedom of passive transit in space.

Indeed, at month’s end, Quarles seemed to sense the ominous specter of Soviet weaponized space power. Notes describe Quarles’s proposed response: “We can play this game, too. We have other programs along these lines. The scientists have many ideas about what can be done in outer space. Some of these are actually being done. We will ask for any authority that may be required to do the things necessary to do in the national interest.” The statement did not identify the Dyna-Soar by name or suggest that any one program stood as a flagship for US military space potential. However, the spirit of the assertion could be seen as a clear manifesto for the advocacy of what would soon be called “aerospace power.” Just as significantly, a pencil notation on the notes read beside this statement the succinct comment, “*Don’t say this*” [italics added].⁷⁹

November began with the Operations Coordinating Board (OCB) estimating the damage done so far, and the President’s team drafting speeches to focus the nation. The OCB found Sputnik I distressing for several reasons. First, “Soviet claims on scientific and technological superiority over the West and especially the US have won greatly widened acceptance.” Furthermore, public perceptions of US military superiority seemed shaken, and Soviet propaganda had “been greatly enhanced.” Last, the OCB asserted that “American prestige is viewed as having sustained a severe blow,” sparking “concern, discomfiture

⁷⁸ “Facts from Secretary McElroy’s Memorandum to the President ref the Symington Inquiry,” October 31, 1957. Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (4), Box 3, Moos Papers, DDEL. Notes on Interview with Deputy Secretary of Defense Quarles Regarding the President’s Speech, October 31, 1957. Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (4), Box 3, Moos Papers, DDEL.

⁷⁹ Notes on Interview with Deputy Secretary of Defense Quarles Regarding the President’s Speech, October 31, 1957. Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (4), Box 3, Moos Papers, DDEL.

and intense interest” in the United States, which further unsettled the nation’s allies.⁸⁰ Presidential speeches were hoped to productively refocus the public and alleviate fearful distraction.

The November 1 draft of the first speech, dubbed “Science and Security,” outlined facts in order to understand “facts” and “not to defend or accuse, [...] apologize or boast.” The speech conceded that the Sputnik I accomplishment was impressive, but it contested the notion that the USSR necessarily stood ahead even in missile technology, since US ballistic missiles had had recently been test fired thousands of miles into the sky, and since “the standard of accuracy necessary to [place a satellite in orbit] is of a much lower order than that which would be needed to hit a particular target on earth.” The draft quickly emphasized that the US Bomarc and Snark missiles (which were cruise, not ballistic) already had that capability. The draft challenged the idea that Soviet citizens were all being trained as scientific geniuses, answering public parallels to the concerns Land had privately raised two weeks earlier. Another misconception effectively magnified the Sputnik feat. “Some people, including some of our friends abroad, seem to start from the assumption that the United States has always been first with every scientific breakthrough, and that therefore this recent episode is somehow a unique and unprecedented tragedy.” Indeed, some important advances had occurred in the United States, and several were listed: “nuclear energy, the cyclotron, the transistor, and the Salk vaccine” which finally banished polio. But Germany gave X-rays and Sulfa drugs, Italy gave wireless telegraphy, Japan advanced magnetism, myriad countries’ scientists advanced atomic theory, and Britain developed the turboprop engine. The November 1 draft followed by stating, “We have said, in all sincerity, that we did not consider the earth satellite project a race. But we may as well come right out and say that, so far as preeminence in the field of science is concerned, we are in a race, and a mighty important race it is.” An honest appraisal of the situation “should give us confidence that, with hard work and self-denial, we must surely win.”⁸¹

⁸⁰ OCB draft memo, “Guide Lines for Public Information on the US and Soviet Scientific Earth Satellite Program,” Nov 1, 1957. Fldr National Aeronautics and Space Administration – National Aeronautics and Space Council (3), Box 4, PSAC ser, DDEL.

⁸¹ Draft “Science and National Security” speech, November 1, 1957. Fldr President’s Speeches: Sciences in National Security – Drafts Nov 7, 1957, Box 2, Moos Papers, DDEL.

Important modifications quickly followed. Eisenhower and his staff decided to add a vital element: the “most important thing on earth is still a start toward disarmament. It would be tragic if, just as we seem to get getting [sic] near a first step in curbing the armaments race, the whole emphasis should now change to a race in missiles and satellites for military purposes.” Very succinctly, the President’s enunciated vision displayed extreme difference from the ideas Quarles had recently voiced about the United States answering in kind any expected future hostile Soviet space developments.⁸² The Eisenhower Administration was not going to leap to opportunities toward weaponization of space. Doing so would risk fiscal catastrophe and would deeply threaten chances of disarmament.

Then a second Sputnik entered orbit on November 3. This vehicle, far larger and heavier, carried a living dog, the first creature in orbital space; this conical capsule also prompted far bigger concern in the United States than Sputnik I had done. Robert Divine described unambiguously that “the launch of *Sputnik II* did more than anything else to bring the issue of presidential leadership to a climax,” and the polls indicated the public unrest, as Eisenhower’s popularity steadily fell, from a high of 79% at the year’s start to just 57% eleven months later.⁸³ Steering the nation’s efforts remained the job of the president. Historian Robert Aliano noted that the “missile gap” and Sputnik opened the door to overt challenge of the Eisenhower defense strategy. Major publications publicly pronounced the Soviet achievement to constitute a US defeat: *Newsweek* called it a defeat “in pure science, in practical know-how, and in psychological warfare,” and *Life* cautioned readers against “pretend[ing] that Sputnik is anything other than a defeat for the United States.” Despite the challenges culminating with the Sputnik launchings, Dwight Eisenhower’s conception of the presidential role remained fairly consistent. Historian Peter Roman asserted that “Eisenhower’s style of managing nuclear crises changed little after Sputnik.”⁸⁴

⁸² Draft “Science and National Security” speech, n.d. (between Nov 1 and Nov 5). Fldr President’s Speeches: Sciences in National Security – Drafts Nov 7, 1957, Box 2, Moos Papers, DDEL.

⁸³ Eisenhower’s approval rating would slip further, to 52%, by March 1958, although Divine acknowledges that the contemporary economic recession contributed to this trend. Divine, Robert. *The Sputnik Challenge: Eisenhower’s Response to the Soviet Satellite* (Oxford University Press, 1993), 44-5, 119.

⁸⁴ Richard A. Aliano, *American Defense Policy from Eisenhower to Kennedy: The Politics of Changing Military Requirements, 1957-1961* (Athens, OH: Ohio University Press, 1975), 1. Osgood, *Total Cold War*, 336. Roman, Peter J. *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 28-9.

A somewhat similar point might be made regarding Eisenhower's approach as president to the intersection of space and military issues: he did not abruptly alter his conception of the President's role in decision-making.

But temptation grew for bold actions and proclamations. USIA director Larson received a memo on November 4, just a day after the second satellite's achieving orbit, which warned that "reaction of bewilderment is shifting to anger." The President's speech "has to have some simply understandable idea that something has been changed." In the meantime, "DDE's prestige in his special area is slipping." It was felt critical that "reassurance in concrete terms" be provided to the country, assuring it "that this setback can be overcome"⁸⁵ and that Soviet earth satellites would cause neutral nations to fall into the USSR's geopolitical orbit. As the first Sputnik had prompted editorial calls for Eisenhower to "shoot the moon," the next Sputnik coinciding with the President beginning to draw some political fire. "You Needn't Be a Scientist to Understand Sputnik [sic], Mr President, But You Must Be a Leader," chided Erik Bergaust, the executive editor of the magazine *Rockets and Missiles*, in an open letter to Eisenhower. "Until recently many of your toplevel officials have considered space flight trivial and irrelevant," but the Soviets' accomplishment showed this judgment to be a dangerous mistake. The *New York Times* reprinted the letter on November 7.⁸⁶

ARS president Robert C. Truax wrote to Rabi explaining his organization's concern that "in recent scurrying for a plan of action to offset the demonstrated Russian lead in the space flight field, there has been considerable consultation by the administration with scientists and the armed services, but we have seen very little effort to solicit advice from those who will have to develop those space vehicles."⁸⁷ As revision progressed on Eisenhower's speech, the White House received one letter from an aircraft

⁸⁵ Note to Larson, November 4, 1957. Fldr President's Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (3), Box 3, Moos Papers, DDEL.

⁸⁶ News clipping, "An open letter to President Eisenhower," Nov 7 1957. Fldr October 1957 – February 1960 (1), Box 23, Staff Sec alpha, DDEL.

⁸⁷ Letter from ARS president Robert C. Truax to II Rabi, Nov 6, 1957. Fldr Space November 1957 (2), Special Asst Sci & Tech, Box 15, DDEL. Winter, Frank H. "The American Rocket Society Story – 1930-1962." *Journal of the British Interplanetary Society*, Vol. 33, pp.303-311. 1980. <http://www.gravityassist.com/IAF1/Ref.%201-49.pdf>. Accessed January 11, 2011.

engineer urging the President to take advantage of “a real opportunity for the scientific and engineering community to present judgments on vital aspects of our national security without political or military interservice bias.” Concise explanations, without divulging sensitive material, “would be most welcomed by the general public,” he exhorted, suggesting even that Eisenhower himself make these presentations as film-shorts. The President would speak to the nation about science and would mention some items in the US arsenal, but he politely declined the idea of speaking in film shorts, saying he did not wish to play the part of an “actor.”⁸⁸

Revisions immediately after the second satellite aimed to answer these needs. The ambling statements that the country was indeed in a race but had not realized it beforehand ran counter to the nation’s and the President’s needed message; it was eliminated. One point Eisenhower wanted inserted stressed that “we can have both a sound economy and a sound defense – in fact, the two must go together. The secret is determination to make the hard choices needed to find savings in other less essential areas. It can be done, and it must be done.”⁸⁹ The President still as yet intended to address the Sputnik issue in a single speech, to be delivered in Oklahoma City. Both the revisions prior to and just after Sputnik II’s launch fit snugly into Eisenhower’s outlook. Disarmament continued to carry vital currency in policy and opinion realms, and the President cherished the message that a sound defense did not conflict with national economic health because national security required that preconditions for both be guaranteed simultaneously.

The final version of the address made certain to note the potent capacity of “a different kind of missile, the air-breathing Snark” bound for US arsenals and capable of accurately hitting targets at 5,000 miles’ distance, and of “three [US] rockets [fired] to heights between 2,000 and 4,000 miles” which collected “much valuable information on outer space.” Speaking from the Oval Office, Eisenhower also

⁸⁸ Letter by Eisenhower to United Aircraft Corporation chief research engineer Wesley A. Kuhrt, Nov 12 1957; letter by Kuhrt to Eisenhower, Nov 8 1957. Fldr President-Goodpaster-Whitman (General) (2), Box 5, Pres. Subseries, Special Asst Natl Sec Affairs Special Asst ser, DDEL

⁸⁹ Draft “Science and National Security” speech, n.d. (between Nov 4 and Nov 5). Fldr President’s Speeches: Sciences in National Security – Drafts Nov 7, 1957, Box 2, Moos Papers, DDEL.

showed the audience a missile nose cone retrieved from suborbital ballistic spaceflight. Since the Soviets had not yet demonstrated mastery of this, their spacedog was necessarily doomed, and, more strategically significant, their implied ICBM capability was silently deflated. In his November 7 speech, the President called for greater national attention to science and announced the formation of the PSAC.⁹⁰ The nation's security was not in doubt. Action was being taken. The priorities were to remain within the President's grasp.

The National Science Foundation supported the President as Eisenhower set to work on the Oklahoma City address, which was now to be a second speech on science. NSF Director Alan Waterman told listeners in San Antonio, Texas, that the Soviet satellite had been "a major disappointment to American scientists," but not a surprise in the light of the "magnitude of the effort and cost" involved and the competing defense, health, and other needs which likewise required funding. Waterman acknowledged the fact that although "scientists were not taken wholly by surprise [...], the American public was," and the result was "the usual hue and cry to do something." Like the President, Waterman counseled wisdom and action. "If the net effect is to shake us out of our complacency a bit [...], all well and good. But it will serve no useful purpose to turn things upside down in a hasty and ill-considered effort to right the situation." Future projects could include sequentially placing a satellite in orbit, achieving satellite recovery, developing a true scientific observatory satellite, and "the fourth logical development is obviously an attempt to send the rocket onto the moon, or to send it around the moon and bring it back." Waterman emphasized that domestic lack of understanding posed a greater real problem than did Soviet accomplishment. "The real truth of our present dilemma is the sobering fact that our people have neither fully understood nor appreciated the need for science and scientists in world affairs

⁹⁰ Draft, "Sciences in National Security," November 7, 1957. Fldr President's Speeches: Sciences in National Security – Final Nov 7 1957, Box 3, Moos Papers, DDEL.

today.”⁹¹ Significantly, Waterman’s four possible objectives entirely skirted the topic of military or reconnaissance use of space, and none of the objectives mentioned the possibility of a human traveler.

At the White House, successive drafts of the President’s November 13 speech appeared, underwent changes, and were overtaken by new versions. The theme remained consistent: to give substance to the November 7 speech; “to demonstrate that, whatever the cost, the economy can manage it without damage to either the soundness of the economy or the essentials of American life”; to show that new expenditures cannot “merely pile up [...] without cutting somewhere.” On November 8, drafters explained the challenge of maintaining deterrence and balanced defense. “In a game, it is enough to win by one point. [...] But in the grim business of survival, we must be ahead, not just by one point, but by such an unmistakable margin that no dictator can possibly make a miscalculation. At the same, when we have that margin, we certainly do not have to pile up additional expensive armaments ad infinitum – for this would only drain our resources and not add importantly to the deterrent effect.”⁹² The question of diversified deterrent, and particularly of the degree of diversification which might be sufficient, bore imperative significance on later Administration judgments about the Dyna-Soar.

The next draft rid the document of distracting allusions to game outcomes.⁹³ It more concisely noted that “we must maintain an atomic retaliatory power of such power and strength and alertness as to convince the Soviets that any attack on us would result in their own destruction.” Further refinements included changes in the title from “New Dimensions of Effort” to “Our Future Scientists” and finally “Our Future Security.” Education retained a position in the series of drafts. Eisenhower considered explaining that “man lives not by bread alone, and we will not maintain our position in the world by weapons alone. [...] My call to youth and to their parents is not just a call to arms, but a call to a high and noble endeavor.” Pointed criticism that classes in “social living, how to drive a car, or how to behave

⁹¹ “Southwest Research Institute Conference San Antonio, Texas, November 7-8, 1957.” Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (3), Box 3, Moos Papers, DDEL.

⁹² Draft, “Our Future Security,” November 8, 1957, first draft. Fldr President’s Speeches: Our Future Security – Oklahoma – Nov 13 1957 – Drafts, Box 3, Moos Papers, DDEL.

⁹³ Somewhat ironically, within a few years, “game theory” would come into vogue as a means of testing potential outcomes in superpower brinkmanship encounters.

on a date [...] clutter up our curricula” got cut. “We shall do exactly what sensible, rather than rattled, people should do” about Soviet satellites was massaged into “the Sputniks have inspired a wide variety of suggestions.”⁹⁴ The fact that some suggestions seemed inane or dangerous might have remained thought, but it would not be spoken here. In the long term, Eisenhower believed that education allowed the long term maintenance of the US strategic superiority it had not really lost.

One of the last drafts, crafted on November 12, included in its closing, “Our defense effort, large as it is, goes only far enough to deter and defeat attack. We want adequate security. We want no more than adequacy. We will accept nothing less.”⁹⁵ The first of these sentences would be replaced by a refusal to be an aggressor. The President and his staff had revised the Oklahoma City speech several times; while the form had seen notable alterations, the spirit of this theme of adequacy in defense had endured. President Eisenhower did not want to encourage programs which represented avoidable waste. Partly for this reason, he wanted to prevent the expansion of an arms race into the space realm. But top Air Force leaders did not share the opinion that such a prevention could be secured other than by friendly military presence. And the public, its representatives, and the media grew restive at the prospect of repeated and ominous Soviet advances into space. In the next four years, a reckoning was due.

Into this world the Dyna-Soar space bomber was born.

⁹⁴ Draft, “Our Future Security,” November 9, 1957, second draft. Fldr President’s Speeches: Our Future Security – Oklahoma – Nov 13 1957 – Drafts, Box 3, Moos Papers, DDEL. Draft, Quarles’s changes to “Our Future Scientists,” n.d. (about nov 10, 1957). Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (2), Box 2, Moos Papers, DDEL. Draft, Killian’s changes to “Our Future Scientists,” n.d. (about nov 10, 1957). Fldr President’s Speeches: Science and Security Background Material used for Nov 7 and Nov 13 1957 (2), Box 2, Moos Papers, DDEL. Draft, “Our Future Security,” n.d. (about Nov 10 or Nov 11). Fldr President’s Speeches: Our Future Security – Oklahoma – Nov 13 1957 – Drafts, Box 3, Moos Papers, DDEL.

⁹⁵ Draft, “Our Future Security,” November 12, 1957, pm draft. Fldr “President’s Speeches: Our Future Security – Oklahoma – Nov 13, 1957 – Drafts,” Box 3, Moos Papers, DDEL.

Chapter 2: “THE FIRST OF A NEW GENERATION”:
DYNA-SOAR AND BUILDING THE AIR FORCE’S VISION OF ITS FUTURE, 1957-58

Technical supremacy is clearly essential to our freedom, progress, and survival. - Chief of Staff General Nate Twining, November 25, 1957⁹⁶

Looking further into the future, the Air Force has under development, the Dyna-Soar, the first ‘space bomber’ which will be capable of circumnavigating the earth at extreme altitudes and attacking its target with space-to-surface missiles. - Vice Chief of Staff General Curtis LeMay, May 7, 1958⁹⁷

This program represents the first of a new generation of strategic weapons systems. - Chief of Staff General Thomas White, October 3, 1958⁹⁸

When Air Force leaders looked skyward, they saw potential - and limitlessness. To them, the enticing potentials for travel and national defense did not seem to end, abruptly and arbitrarily, with the edge of the atmosphere. But although seemingly endless frontiers carry inviting potential, potential itself has a darker side as well. If harnessed by a hostile power, the sky’s potential transformed into something far more sinister. American Airmen determined to harness the potential of the heavens for the United States, and their vision showed in their programs and their rhetoric.

Crucial to the expression of this Air Force vision was the idea that the sky consisted of an “aerospace,” in which various altitudes within – and beyond – the atmosphere comprised a continuous space. It would follow, thought airmen, that an independent air force responsible for military matters within the atmosphere also constituted the military service logically responsible for realms beyond the atmosphere. Furthermore, since control of the air had been contested during the wars of the twentieth century, many Air Force figures considered it obvious that extra-atmospheric realms would eventually witness military struggles if future wars occurred. Some voices, impractically futurist and optimistic, would ultimately claim that such struggles in space might spare the Earth from the experience of general warfare. In short, the Air Force line of thinking identified the development of aerospace forces as a

⁹⁶ Twining, Thomas Dresser (Gen), letter to the Advisory Group for Aeronautical Research & Development (NATO), Nov 25, 1957, Box 129, Twining Papers, Library of Congress.

⁹⁷ LeMay, article for the American Ordnance Association’s *Ordnance*, May 7, 1958. Fldr Cleared Copies Oct 1957-Sept 1958 (General LeMay, Box B171, LeMay Papers, Library of Congress.

⁹⁸ Memo from White to AF Sec Douglas, “Priority Program Augmentations to Basic 1959 Budget Estimate,” White Oct 3 1958. Fldr Secretary of the Air Force #2, Box 18, White Papers, Library of Congress.

necessity and an inevitability. For a time, starting in the Eisenhower era, Air Force thinkers envisioned the Dyna-Soar as an integral component of that aerospace force.

The term “aerospace” was coined in the wake of the first Soviet Sputnik, and the Dyna-Soar program itself gathered steam simultaneously. But the origins of the Air Force’s aerospace outlook, and the boost-glide components of the Dyna-Soar program as well, predated the world’s first satellite. In February 1957, nearly eight months before Sputnik’s launch, General Bernard Schriever addressed an astronautics symposium in San Diego, California. A tireless advocate of the ballistic missile, Schriever told his audience, “in the long run our safety as a nation may depend upon our having space superiority.” He continued, explaining that manifold reasons forced this conclusion: “Besides the direct military importance of space, our prestige as world leader might well dictate that we undertake lunar expeditions and even interplanetary flight when the appropriate technological advances have been made and the time is ripe.”⁹⁹

The Air Research and Defense Command presented its consolidation plan for Dyna-Soar to the Air Staff on October 17, 1957. Hywards, now redesignated Dyna-Soar I, was to focus on a first flight in 1963 to test the project’s overall feasibility. The ARDC hoped that the reconnaissance vehicle Brass Bell, renamed Dyna-Soar II, would make its first flight in 1966 and would have an initial operational capability set for 1969. Dyna-Soar II was to have a range of 5,000 miles. The considerably more complicated task of perfecting the strategic bombardment vehicle Robo, now called Dyna-Soar III, aimed at a first flight in 1970. Planners intended Dyna-Soar III to fly faster than its predecessors and almost twice as high as the operational Dyna-Soar II; furthermore, the ARDC noted that the Dyna-Soar III was to have a earth-circumnavigation capability. The ARDC aimed at an initial operational capability date of 1974 for the Dyna-Soar III bomber.¹⁰⁰

⁹⁹ Bernard A. Schriever, speech “ICBM – A Step Toward Space Conquest, San Diego, California, 19 Feb 57.” Schriever, B.A., Public Statements on Important Military Issues, Roll 35253, IRIS 1040169. Air Force Historical Research Agency, Maxwell AFB (Hereafter referred to as AFHRA).

¹⁰⁰ Bowen, Lee. *Threshold of Space: An Air Force History of Space Activities, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p46. “Abbreviated System Development Plan,” 23

“It is believed that the boost-glide concept is feasible, and that the classic sustained flight air breathing engine approach to strategic mission accomplishment is very limited and has very little growth potential.” Writing the “Abbreviated System Development Plan” for the Dyna-Soar program, the ARDC reported that the Dyna-Soar offered “tremendous capability and potential [...] in the accomplishment of Air Force missions of the 1967 through 1980 time period and beyond.” The Dyna-Soar I was to provide technical information required before operational extensions could be built. “A Dyna-Soar II type vehicle [for reconnaissance] appears to be a very realistic design goal for the first weapon system” because “there is a very great need to provide ‘eyes’ for the ballistic missile and the boost-glide weapon systems,” the latter of which would be manifested by the Dyna-Soar III.¹⁰¹ At the ARDC, the Dyna-Soar’s developers saw their program as future successor to the still new B-52.

Reeling from the news, still less than two weeks old, of *Spuntik I*, the Air Staff directed that the ARDC compress the Dyna-Soar’s development schedule. The Dyna-Soar I’s first flight was to be accelerated a year, from 1963 to 1962. The Air Staff wanted the Dyna-Soar II’s first flight in 1964 and an initial operational capability three years later. These goals were bold enough. Even more staggeringly optimistic, the Air Staff wanted the final bombardment version, the Dyna-Soar III, to fly in 1965 and to be operational starting in 1968.¹⁰²

To date, the United States had successfully sent and recovered no living thing larger than a mouse into space, and even then it had traveled on a simple ballistic, nonorbital trajectory – up and then down in a parabola. To design, fabricate, and make operational a manned, maneuverable vehicle, capable not only of multiorbital flight but of accurately hurling space-to-earth weapons toward their targets, sounds horrendously impractical. To attempt to accomplish this in barely a decade’s time seems to indicate people with an outlook out of touch with reality.

August 1957, *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003).

¹⁰¹ “Abbreviated System Development Plan,” 23 August 1957, *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003).

¹⁰² Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p46.

Yet it should be noted that the manned lunar landing was accomplished in essentially the same timeframe. Reaching the moon and exploring it, and providing a means of return, certainly represented an enormous challenge, and the nine-year deadline which the nation would set itself definitely left little time to spare. Admittedly, the Apollo and the Dyna-Soar were far from identical; to compare the two is to place an apple beside an orange. Apollo was not intended to be an operationally regular means of traversing space, and the Dyna-Soar's planners expected their boost-glide vehicle to incorporate that capability among others. Ironically, beyond the Eisenhower years, the Dyna-Soar would be, inappropriately, compared by policymakers to the successive generations of ballistic reentry space vehicles. For the present study's purposes, Apollo stands as an example that stupendous, and seemingly impossible, scientific feats can be achieved. In short, although feasibility is an important issue, more is an issue than the technical feasibility alone. Also important is the impetus, the reasons for which programs are pursued, and the purposes which they are intended to achieve.

For Air Force leaders during 1957, technical supremacy was not an end in itself; rather, it was seen as a sacrosanct prerequisite toward national security. General Nate Twining, the Chairman of the Joint Chiefs of Staff, expressed exactly this view when he spoke to the North Atlantic Treaty Organization's (NATO) Advisory Group for Aeronautical Research and Development on November 25. "Technical supremacy," he told them, "is clearly essential to our freedom, progress, *and survival*" [italics added].¹⁰³ Defense-issue publications echoed this sentiment. *Rockets and Missiles* even anticipated its spirit, criticizing in December 1956 Air Force missile projects as being insufficient and expressing "shock and surprise" at Defense Secretary Charles Wilson's limitations on Army missile capabilities.¹⁰⁴

Voices, both in the Air Force and in the National Advisory Committee on Aeronautics (NACA), pressed urgently for technological progress. General Curtis LeMay, then Strategic Air Command (SAC) and soon to become Air Force Vice Chief of Staff, emphasized to the Air Force Scientific Advisory Board

¹⁰³ Twining, Thomas Dresser (Gen), letter to the Advisory Group for Aeronautical Research & Development (NATO), Nov 25, 1957, Box 129, Twining Papers, Library of Congress.

¹⁰⁴ Clipping from *Rockets and Missiles*, December 14, 1956, fldr NACA, Box 7, White Papers, Library of Congress.

(USAF SAB) in May 1957 that “the objective of our national defense policy is deterrence,” a word that he admitted carried different meanings in the ears of the public than in those of the military. Where the former imagined that deterrence was “rooted in the fear of nuclear devastation of populations centers,” the latter understood deterrence as “measured in terms of ability to destroy the enemy’s means of long-range combat-ready capability.” The margin of deterrence “cannot be precisely measured,” but depends on technical superiority and, implicitly, on innovation. New weapons would constantly be needed to maintain a margin of deterrence, and LeMay reminded his listeners that “any operational commander [...] must expect that any new weapon system will have very low reliability.” This was a factor to keep in mind, and a reason to retain caution, but it was not to be deemed a reason to spurn innovation.¹⁰⁵

Twining visited this issue six months later. Speaking after the first two Sputnik successes had given the Soviets the first orbit and then the first organism in orbit, Twining addressed the subject of missiles to the American Ordnance Association in Cleveland, Ohio. The missile “is the latest weapon which is having a tremendous impact on military thinking. Our defense planning must develop concepts based on the use of this weapon.” But Twining was careful not to suggest that every fad be followed haphazardly.

On the other hand, we cannot be hasty in discarding systems of known reliability for those not yet proven. [...] In developing these new concepts we must not be deluded into thinking that the machine will replace the man. [...] We cannot afford to have forces specifically designed to meet every possible contingency.¹⁰⁶
An element of caution, which many in the Air Force interpreted as a need to maintain current systems while exploring new ones, is evident. So is the belief that human beings possess inherent advantages over machines, particularly in terms of on-the-spot judgment and “flexibility.” Twining’s other point, that building forces to answer every *possible* contingency represented an unbearable burden to the nation and economy, would prove during the coming years more difficult for some minds to remember.

The USAF SAB declared in December that “Sputnik and the Russian ICBM [intercontinental ballistic missile] capacity have created a national emergency.” The Board insisted that “in the rocket field the Air

¹⁰⁵ LeMay, Curtis E. (Gen), “Remarks By Curtis E. LeMay to the USAF Scientific Advisory Board at Patrick Air Force Base, Florida, 21 May 1957,” Box B206 & B207, LeMay Papers, Library of Congress.

¹⁰⁶ Twining, speech to the American Ordnance Association in Cleveland, OH, November 12, 1957, Box 129, Twining Papers, Library of Congress.

Force should make a maximum contribution to a proper national response,” and that this response include several enumerated items. First, “obtain a massive first generation IRBM and ICBM capability as soon as possible.” Second would be to set up “a vigorous program to develop second generation IRBM’s and ICBM’s.” Reconnaissance satellite programs should be accelerated. Fourth, the nation, and presumably the Air Force, should “establish a vigorous space program with an immediate goal of landings on the moon.” Other priorities were to develop a system for ICBM detection and warning, and then also a system by which to counter incoming ICBMs.¹⁰⁷ Edward Teller, already renowned for his contribution to the hydrogen bomb and a notable exponent of high technology, was a member of the USAF SAB, and the Board’s proposals were not only technically ambitious but accepted that massive expenditures would be necessary and accepted.

In broad terms, the proposals would come to be fulfilled: the United States would develop successive generations of ballistic missiles (though not with quite the degree of urgency hoped for); reconnaissance satellites were indeed a priority, and in fact their importance would come to impact the course of the nation’s larger space program; work on an ICBM warning system would yield the Missile Defense Warning System (MIDAS) in the coming decade; an anti-ICBM system would remain an elusive and controversial goal, and like an Air Force space program it would conflict with reconnaissance needs. These issues would come to impact the Dyna-Soar program, and their relevance in policymaking will be addressed in coming chapters.

A week following the Sputnik I launch, the NACA lent its endorsement to the boost-glide brand of high technology. Its Committee on Aircraft Construction unanimously endorsed a “manned hypersonic boost-glide rocket-propelled research aircraft and recommend[ed] that this program be continued by the NACA at the maximum possible rate.” Although the NACA, and its successor the National Aeronautics and Space Agency (NASA), would never control the Dyna-Soar program, this statement speaks to the interest and involvement of the civilian flight research agencies in the Dyna-Soar work. Indeed, the

¹⁰⁷ “Report of the Scientific Advisory Board Ad Hoc Committee on Space Technology,” Dec 6, 1957. Fldr Scientific Advisory Board, Box 7, White Papers, Library of Congress.

NACA and the NASA would contribute scientific personnel to the Dyna-Soar's development effort. In terms pertinent but less specific to Dyna-Soar, NACA Director Hugh Dryden wrote to Twining expressing that "new technology and changing defense requirements result in a need for continual reappraisal of flight propulsion systems." Dryden specifically identified "high energy chemical fuels, new energy sources and new propulsion cycles."¹⁰⁸

In this atmosphere, White addressed a memorandum for Defense Secretary Wilson, rejecting Navy attempts to separate space exploration from Air Force control. "The Air Force does not agree," White wrote, with the Navy idea that "a new organization is required for any space flight program either for the development responsibilities or for the operational employment responsibilities. Operational employment should definitely be vested within the appropriate service or services."¹⁰⁹ Presumably, the "appropriate service" was the Air Force – indeed Air Force leaders believed this to be the case. And before long they would develop a term to help promote that perspective.

New organizations appeared to be useful tools as well. On November 20, 1957, the new Defense Secretary Neil McElroy told Congressmen his idea to establish an agency for advanced research projects. The organization, which would become known as ARPA, seemed likely to conflict with the Air Force's vision of its own role in space, and two days later the Air Force's Assistant Director of the Office of Legislative Liaison offered a solution to the potential problem. The President's "space for peace" initiative already bode ill for the services' utilization of space, and the establishment of a major new technology agency – conspicuously outside and above the authority of the respective military branches – unsettled Air Force officers interested in space. Reflecting discomfiture with this kind of trend, Schriever told the Senate Armed Services Committee that, "if you ever separate research and development of military weapons from the users," the development of weapons systems is unnecessarily delayed. The Air Force should "jump the gun on the problem of astronautics by appointing either a Director or

¹⁰⁸ "National Advisory Committee for Aeronautics, minutes of meeting, October 10, 1957." Fldr NACA, Box 7, White Papers, Library of Congress.

¹⁰⁹ "Memorandum for Secretary of Defense, Attention: Special Assistant Armed Forces Policy Council," undated, sometime after November 21, 1957. Fldr Secretary of Defense, Box 7, White Papers, Library of Congress.

Assistant Chief of Staff for Astronautics.”¹¹⁰ Unwelcome edifices such as an ARPA might be headed off.

While Air Force leaders considered a possible astronautics agency, they simultaneously sought to bring national policy into alignment with their own ideas. Deputy Chief of Staff for Development Lieutenant General Donald Putt sent White “a policy statement that affirmed the loyalty of the Air Force to national objectives and asserted that the control of space was essential to national security.” The latter point fit the thinking of Air Force leaders far more closely than it really aligned with the “space for peace” for which Eisenhower hoped. Furthermore, Putt’s statement identified, not surprisingly, the Air Force as the appropriate organization through which space-related national security could be guaranteed. The reason, Putt asserted, was that “there could be ‘no division, per se, between air and space; [there is] only one indivisible field of operations above the surface of the Earth.”¹¹¹

Putt’s assertion, which he framed as an explanation, about the indivisibility of air and space would imminently become a mantra in the service, ardently touted by Chief of Staff White. The Air Force had worked on this issue before Putt’s message to White in December and before Sputnik’s orbits. The service’s General Council started a study in the spring of 1957 focused on the definition of the terms “air space” and “outer space” and on the related subjects of “the legality of satellites in transterritorial flight, and the legal complications of space defense.”¹¹² The perceived need for space-oriented defense projects and the presumption that this should be an Air Force responsibility reinforced the conviction that the establishment of an astronautics office would be necessary.

The suggested astronautics office would need a home. Irritation in Air Force Headquarters with the proliferation of assistant chiefs of staff precluded the creation of a new astronautics office at that level. White decided to place the office under the Deputy Chief of Staff for Development, although an Air Force

¹¹⁰ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p 109; Schriever quotes, Senate Armed Services, Dec 57-Jan 58.

¹¹¹ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p 183-4.

¹¹² Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p 184 footnote.

history suggested that the office might alternatively have been fit under the umbrella of the Office of Assistant Chief of Staff for Guided Missiles. On December 10, General Putt named his Deputy Director for Research and Development, Brigadier General Homer A. Boushey, to head the new Air Force Directorate of Astronautics. The civilian bosses quickly snuffed out the Air Force's initiative. The Air Force continued to insist that it needed an agency ready to liaison with the pending ARPA; the civilians relented in July, after months of negotiation, and on the condition that the word "astronautics" not appear in the office's title. The agency, which would be established on July 29, 1958, would be called the Directorate of Advanced Technology.¹¹³ Boushey would move into the new agency, but in the meantime spent the spring as Deputy Director for Research and Development.

Civilian authorities had unambiguously shown that "astronautics" was too offensive a term to be used in an Air Force agency's title. But Boushey's Directorate of Research and Development, standing remarkably undeterred, continued to think in aeronautical terms. It drew up a statement on the service's space program, dated January 24, 1958. Appearing above a list of missions it deemed "essential to the maintenance of our nation and prestige" was the phrase "Air Force Aeronautical Program." The programs listed were even more telling.

The Air Force subdivided the five space programs into twenty-one discrete categories responsible for fulfilling a variety of missions. The first program was "Ballistic Test & Related Systems," aimed at space research; the second was a "manned hypersonic research system," to start with the X-15 rocket-powered research plane. Dyna-Soar, third on the list, accounted for fully one third of the USAF space subdivisions. Interestingly, its first subdivision was a "manned capsule test" to demonstrate manned space flight. The remaining subdivisions turned more specifically to the ambitious winged vehicle: a "conceptual test" to build on the capsule; a "boost glide tactical" system for "weapon delivery"; a "boost glide interceptor" for "countermeasures"; a "satellite interceptor" similarly denoted; a "global

¹¹³ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p109-11.

reconnaissance” system for “reconnaissance”; and finally a “global bomber,” although this too was puzzlingly identified as having a “reconnaissance” mission.¹¹⁴

The Air Force’s ambitions showed in their last two programs as well. The fourth item on the Air Force list was the WS117 reconnaissance satellite, which would come to be broken into different component missions, some of which would eventually orbit as the Discoverer satellites, upon which the secret CORONA reconnaissance satellites would travel under Central Intelligence Agency rather than Air Force auspices. As the Air Force had envisioned the satellite, however, it would eventually incorporate a “manned strategic station” for “weapon delivery reconnaissance.” Finally, the Air Force wanted a “lunar system,” culminating in a “manned lunar base,” which would also be tasked with “weapon delivery reconnaissance.”¹¹⁵

The Air Force’s astronautical program underlines a number of important issues. First, the service obviously retained strong interest in space, and confidence in what would come to be called “aerospace”: the idea that the sky is a continuum and that its appropriate uses do not change with altitude. The Air Force did not shy away from declaring its interest in developing space vehicles for reconnaissance *and for combat, both offensive and defensive*. The fact that the “global bomber” version of the Dyna-Soar met a proposed mission of “reconnaissance” seems surprising. Three of the twenty-one subdivisions (the Dyna-Soar “boost glide tactical” vehicle, the WS117 satellite “manned strategic station,” and the Lunar System “manned lunar base,”) identified a “weapon delivery” mission, and in this light the Dyna-Soar III’s “reconnaissance” mission seems surprising as well as less than candid. Additionally, the concept of a manned, weaponized lunar base indicates the extent to which some Air Force thinkers in the late 1950s were willing to focus on expensive space projects. Would defense issues closer to earth suffer if the nation pursued these outlined space projects? The costs of ambitious space projects would be literally astronomical.

¹¹⁴ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p131-2.

¹¹⁵ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p132.

The development requirement for Dyna-Soar as a “hypersonic conceptual test vehicle system” emerged simultaneous to the service’s Astronautics Program. “The ultimate objective [of Dyna-Soar] is to have a manned or unmanned global recoverable bombardment/reconnaissance system available at the earliest possible date.” An eye would be kept on development of “future boost-glide systems,” on controllable reentry, on orbital test flights, and potential mating with a future nuclear rocket. The Air Force, in its development requirement, was unambiguous, however. Spin-off applications were welcome, but “*these will not, however, be allowed to comprise its prime purpose of most rapid accumulation of data for boost-glide weapon system development*” [italics added]. Less than two weeks before the development requirement’s writing, Boeing representatives had spoken with NACA personnel and learned “about the NACA’s desires in a research vehicle apart from the requirements that the Air Force might establish for Dyna Soar I. [...] They were told that the NACA is now looking at the effect on the design of trying for higher speeds, and that NACA is very much interested in having prospective designers examine this same question. The Boeing visitors agreed.”¹¹⁶ The Air Force and NACA were beginning to march in diverging directions with respect to the Dyna-Soar, and this came at the same time that some in and outside the Administration were considering the transformation of NACA away from serving as an aviation research assistant to the Air Force and instead standing as its civilian rival in space.

The Astronautics Program, the Dyna-Soar Development Requirement, and the record of the NACA-Boeing discussion bring significant points into sharp relief. Although the idea of manned, weaponized lunar bases indicated that the Dyna-Soar was not the most ambitious of the Air Force space concepts at this time, the Dyna-Soar clearly was to inhabit a strikingly important niche. The Astronautics Program’s first two projects focused on research. The last two programs focused on reconnaissance and lunar activity. The Dyna-Soar was to fill the very wide gaps: complementing the weapons delivery and reconnaissance functions, and carrying the responsibility for countermeasures against hostile space

¹¹⁶ “Development Requirement: Hypersonic Conceptual Test Vehicle System 464L Project Dyna-Soar,” January 24, 1958. Fldr 11924 “‘Round Three’ Background Correspondence,” NASA HQ. Clotaire Wood, memo for files, “Visit of Boeing Personnel to NACA Headquarters to Discuss Advanced Research Airplanes (Dyna Soar I),” January 21, 1958. Fldr 11324 “X-20 Correspondence Martin 1962-64,” NASA HQ.

activity. The fate of the Air Force's space aspirations would play crucially in the fate of the Dyna-Soar program. And yet the Air Force and NACA teams working on the Dyna-Soar looked toward different goals.

Air Force and NACA representatives sought to square this circle, drafting successive memoranda of understanding on the Dyna-Soar. NACA continued to seek a role in the project, asserting that the Air Force's team "cannot adequately handle such a project" and pointing to ARDC interest in NACA involvement. Still, NACA intended to split authority (where the advisory committee would oversee applied research and the Air Force would be responsible for weapons aspects) and Air Force financing and administration of the program. Air Force representatives were intent on seeing the program first and foremost as a weapon system and only afterward as a flight research project.¹¹⁷ As noted earlier, the definition of a "conceptual test vehicle" straddled somewhat conspicuously between the NACA preference for research vehicles and the Air Force desire for something short of a prototype system leading toward an operational weapons system.

An internal NACA memo explained that "the Air Force could not stretch Research and Development funds to support another research airplane," so the Air Force "invented the conceptual test vehicle and had the DynaSoar project put together to tie Hywards to a weapon system and to assure that the requirements of both bombing and reconnaissance would be considered. Since the initiation of the DynaSoar project, the account has been continually shifting toward the weapon system and away from the exploratory aspects."¹¹⁸ The palpable concern within the NACA memo spoke to the NACA's distinct and characteristic emphasis on the aerodynamic research elements of Hywards rather than on the weaponizing applications manifested by Brass Bell and ROBO, now essentially seen as Steps II and III of Dyna-Soar.

¹¹⁷ Soule, Harley, memo, "Suggested Memorandum of Understanding Between Air Force and NACA for Conduct of Dyna Soar I Project," February 13, 1958. 11924 "'Round Three' Background Correspondence," NASA HQ. Untitled notes, February 13, 1958. 11924 "'Round Three' Background Correspondence," NASA HQ. Wood, Clotaire to NASA Director Glennan, "Need for Clarification of Role of NACA in Development of Dyna Soar I," February 25, 1958. 11924 "'Round Three' Background Correspondence, NASA HQ. Draft memo of understanding, March 19, 1958. 11924 "'Round Three' Background Correspondence, NASA HQ.

¹¹⁸ Memo to Dryden and JW Crowley, "Recommendations for changes in DynaSoar I memorandum of understanding," March 24, 1958. 11327 "Dyna Soar Proposals & Eval," NASA HQ.

Accord came in May, when Air Force Chief of Staff White and NACA Director Dryden signed a joint memorandum. In keeping with Air Force priorities, the Dyna-Soar existed to “develop the military potential of hypersonic boost glide” flight and pave the way for future usable refinements. “Overall technical control,” as well as financing of the vehicle’s design, construction, and testing would be Air Force responsibilities. NACA would provide its “advice and assistance” to the Air Force.¹¹⁹ A month after the agreement, Air Force personnel worried that the pending National Aeronautics and Astronautics Act establishing a civilian space agency would muddy the waters. “The lack of clear cut distinctions” in authority between military and civilian institutions “may well inhibit sound planning, programming and operations of NASA, DOD, or both,” and some in the Air Force saw NASA encroachment as an unwelcome possibility. Parties worked to ensure that, with respect to the Dyna-Soar, responsibilities were not to be altered. The May 20 agreement was revised on November 14, and the sole alteration was the replacement of the acronym “NACA” with that of “NASA.”¹²⁰

Parallel to this ongoing dance about authority over the Dyna-Soar and its direction were larger discussions about overall military-civilian boundaries in space and about the prospect of launching a human into space. In December 1957, the Army’s missile team ABMA proposed “consolidation of military and scientific space objectives,” with Army rockets predictably playing important roles as satellite boosters. Putt recognized that the Dyna-Soar “will be able to orbit as a satellite” but in January 1958 he considered that “it may be feasible to demonstrate an orbital flight appreciably earlier with a vehicle designed only for the satellite mission than would be possible with a vehicle capable of executing

¹¹⁹ “Memorandum of Understanding: Principles for Participation of NACA in Development and Testing of the ‘Air Force System 464L Hypersonic Boost Glide Vehicle (Dyna Soar I),” May 20, 1958. 11327 “Dyna Soar Proposals & Eval,” NASA HQ.

¹²⁰ “Memorandum of Understanding: Principles for Participation of NACA in Development and Testing of the ‘Air Force System 464L Hypersonic Boost Glide Vehicle (Dyna Soar I),” May 20, 1958. 11327 “Dyna Soar Proposals & Eval,” NASA HQ. “NACA memo for clarification of NACA role,” *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003), p89. “Memorandum of Understanding,” fldr NASA, Box 18, White Papers, Library of Congress.

the boost-glide mission as well.”¹²¹ Study would be taken to determine whether enough time could be bought by simply putting a human inside a canister bound for a short ballistic journey.

NACA representatives discussed the situation in March, agreeing that “a recoverable manned vehicle in orbit is of primary national importance and that the ballistic type of vehicle [...] offers the most promise for an early solution to the problem.” Consistent with NACA’s earlier interest in the Dyna-Soar, Soule and his associates noted a glider’s long term advantages: “the use of lift offers a possible means for reducing the severity of the heating and deceleration problems” as well as operational flexibility. However, a simpler system using a ballistic trajectory (lifting from a rocket booster and simply falling back earthward) could be more expeditiously produced. NACA representatives favored work on this additional project, though explicitly *not* at the expense of work on the Dyna-Soar. NACA and Air Force representatives met to discuss this expedited ballistic manned capsule. “The NACA group got the impression that project overstressed the human factors elements to the detriment of the operational and engineering aspects.”¹²² Air Force representatives, mindful of their goal of a man in space not only existing but performing duties to diversify the nuclear deterrent, stood at cross purposes with their erstwhile engineering partners.

This project would spin off into Mercury, whose moot military utility led to its ultimate cancellation in the Air Force and the start of a ballistic capsule within the new civilian space arm. In essence, this was transferal away from the Air Force to the emerging NASA. The NACA’s frustration with the overemphasis on the human’s role in the capsule fit well into the context of the NACA’s past legacy of working engineering solutions. The genesis of the Mercury capsule, recognizable in the Air Force’s January 1958 Astronautics Program, was a capsule preceding the Dyna-Soar intended to demonstrate human capacity to survive in space. The Air Force’s interest in the program and use for it were therefore confined to the aspect which least impressed the NACA personnel. Though astronauts would be the face

¹²¹ “Part of Chron[ology] for Bruce Byers, re: Red Socks,” 1957. 11130 “DOD in Space,” NASA HQ. Putt, Lt Gen, memo, January 31, 1958. 11130 “DOD in Space,” NASA HQ.

¹²² Soule, Harley, “Meeting of the Steering Committee For a New Research Vehicle System at Ames Laboratory on March 11, 1958.” 11924 “‘Round Three’ Background Correspondence,” NASA HQ.

of NACA's successor agency, engineering remained the NACA's concentration. The Air Force would quickly lose Mercury, but the Air Force's space interest remained fixed on what actions could be undertaken to strengthen the nation's deterrent posture. It was presumed by many space advocates that humans would probably have a role to play, in person, in securing the nation's defense.

Influential service voices strove, as 1958 marched onward, to describe the Air Force they envisioned.

“Soon we may have missiles launching space vehicles and space vehicles launching missiles,”

Twining told an audience at the National War College in March.¹²³ Twining's prediction did not identify Dyna-Soar by name, but the image fit that which the Dyna-Soar's advocates pursued. And if the Chairman of the Joint Chiefs did not identify the Dyna-Soar by name, the Air Force's Vice Chief of Staff LeMay did. In an article for the journal “Ordnance,” a bi-monthly published for the American Ordnance Association, LeMay placed the Dyna-Soar in the context of the Air Force's vision of the present and future.

The present came first. LeMay noted contradictions in Soviet leader Nikita Khrushchev's recent statements. Khrushchev had claimed that “fighter and bomber planes can now be put into museums” but the USSR had unveiled a new jet bomber plane just two months later. “There is an obvious inconsistency,” LeMay pointed out. “Before manned bombers can be completely replaced with unpiloted systems, unpiloted systems must possess” several crucial abilities: to react to enemy action, to deliver firepower, to penetrate enemy defenses, and to be selective in finding and striking targets; he also identified precision as an important factor. “The speed and range of manned bombers and the wide range of tactics which can be employed permit great flexibility of operations.” Manned aircraft would not be obsolete until unmanned systems could match such capabilities. “Until they do, manned bombers cannot be replaced,” LeMay wrote, pointing to the B-70 chemical-fuel bomber as something to further increase the capability of manned systems. LeMay then lifted his outlook to the horizon.

¹²³ Twining, speech to the Industrial College of the Armed Forces & the National War College, Washington, DC,” March 18, 1958. Box 129, Twining Papers, Library of Congress.

“Looking further into the future, the Air Force has under development, *the Dyna-Soar, the first ‘space bomber’ which will be capable of circumnavigating the earth at extreme altitudes and attacking its target with space-to-surface missiles*” [italics added].¹²⁴ The Dyna-Soar, and its role, were now clearly and publicly identified. The image of the Dyna-Soar offered LeMay a chance to explain his perspective on weapons systems. LeMay’s view, stereotyped as a grimly obstinate preference for the old bomber over the new missile, was less simple than that. In coming years, LeMay would return to the subject of manned versus unmanned systems, and for a time he used the Dyna-Soar to illustrate nuance in his outlook. He certainly set on this path with his article for “Ordnance”:

We already have fighter and bomber planes in museums. But the day you stroll into a museum to see a B-52 or a B-70 or even a nuclear [powered] bomber, it will not be because man has been eliminated as a direct participant. It will be because new equipment has been perfected to propel him higher, drive him faster, keep him in motion longer and so enable him to perform more tasks better.¹²⁵

The Dyna-Soar seemed to promise a continuing, productive role for man in an age at risk of being wrongly handed solely to the missile.

LeMay did not stand alone in aiming to contextualize the ballistic missile. In that spring edition of the *Air University Quarterly Review*, Colonel Claude E. Putnam cautioned readers that, “we must agree that missiles are welcome and compatible additions to the Air Force family of weapons, but it is incumbent on all airmen to keep them in perspective.” Another article in the same issue considered the service’s future missile men. The latter essay placed more optimistic hope on the missile, while conceding that “boredom and monotony will be a constant companion [of missile base crews] except for the times when missiles are actually being fired.”¹²⁶ Neither of these essays identified the Dyna-Soar, as LeMay had, as promising to extend man’s role in weapon systems. Schriever addressed the National Geographic Society in November, and while he predicted “for the foreseeable future a missile and bomber

¹²⁴ LeMay, article for the American Ordnance Association’s *Ordnance*, May 7, 1958. Fldr Cleared Copies Oct 1957-Sept 1958 (General LeMay, Box B171, LeMay Papers, Library of Congress).

¹²⁵ LeMay, article for the American Ordnance Association’s *Ordnance*, May 7, 1958. Fldr Cleared Copies Oct 1957-Sept 1958 (General LeMay, Box B171, LeMay Papers, Library of Congress).

¹²⁶ Colonel Claude E. Putnam, “Missiles in Perspective,” *Air University Quarterly Review* Vol X No 1 (Washington, DC: Government Printing Office, Spring 1958), pp3-10. Colonel Allen W. Stephens, “Missilemen – Present and Future,” *Air University Quarterly Review* Vol X No 1 (Washington, DC: GPO, Spring 1958), pp11-19.

‘mix,’” he meant not a combination in which a missile propelled a manned weapons system but rather a force which included both missiles and aircraft.¹²⁷ LeMay, among others, would vocally support an appropriate “mix” rather than the abrogation of missile development or the wholesale abandonment of aircraft.

If the notion of an “aerospace” realm failed, then visions of the Air Force of the future might hinge on definitions of “air” and “space,” and these definitions entered the conversation as well. Air Force thought on this subject was not monolithic. The Spring 1958 of *Air University Quarterly* issue’s “In My Opinion...” column, standing in the role of an editorial essay, advocated for the creation of an international body to control of space. Its author, Colonel Martin B. Schofield, recalled that

an early-day monopoly in the field of aviation inspired the French to advocate “freedom of the air space” regardless of territorial sovereignty. A comparable feeling of leadership in the air today has inspired the United States to advocate strongly the policy of “open skies” in which to employ aviation to its greatest advantage. This position, presently held by the United States, when translated into the free use of space might not be wise under the assumption above that a true balance of power may exist sometime in the future.¹²⁸

To avoid danger, Schofield urged that the United States, “while it is an early contender in the exploration of space, [...] use its position to influence to the best advantage by strongly advocating a form of international control over the use of space.”¹²⁹ Schofield’s essay indicates two relevant items.

First, his characterization of “open skies” entirely misses the Administration’s reason for that policy: Eisenhower sought intelligence on the Soviet Union, which could be gained *only* by technological means, whereas the Soviet Union could already learn much about the United States before resorting to reconnaissance overflight. Second, Schofield’s advocacy for an international control on space use demonstrates that, although many in the Air Force expected space to become militarized and therefore wanted the United States to guard its security by developing space weapons systems, this attitude was not unanimous.

¹²⁷ Schriever, speech to the National Geographic Society, Washington, DC, 21 Nov 1958. Schriever, B.A., Public Statements on Important Military Issues, Roll 35253, IRIS 1040169, AFHRA.

¹²⁸ Colonel Martin B. Schofield, “In My Opinion... Control of Outer Space,” *Air University Quarterly Review* Vol X No 1 (Washington, DC: GPO, Spring 1958), pp93-112.

¹²⁹ Colonel Martin B. Schofield, “In My Opinion... Control of Outer Space,” *Air University Quarterly Review* Vol X No 1 (Washington, DC: GPO, Spring 1958), pp93-112.

Intriguingly, Schofield offered “definitions of space strata.” “Obviously the observing or enforcing of boundary lines in space is difficult up through the 50-mile zone, impossible 2000 miles up, and ridiculous to the stars and galaxies,” and for this reason he suggested that “national air space” and legal sovereignty extend to 50 miles; sovereignty would not apply to “international space,” lying between 50 and 2000 miles up, or to “outer space” extending infinitely beyond that.¹³⁰

Schofield’s article encountered, and perhaps catalyzed refutations. Major General Lloyd Hopwood contributed to the Summer 1958 issue to say that “one of the lessons history should teach us is the futility of differentiating between ‘territorial’ and ‘open’ space.” Another article differentiated space travel by phases, effectively loosening the parameters suggested by Schofield.¹³¹ Another article, by Major General Dan C. Ogle, enunciated a recurring undercurrent, that “we cannot afford to be second-best in the conquest of space. To be second is to invite the bonds of subjugation, the humiliation of inferiority, or the oblivion of destruction.”¹³² Ogle continued that

If space is to continue as a symbol of freedom, then its use for the purposes of war must be neutralized. General Thomas D. White, Chief of Staff of the United States Air Force, has repeatedly affirmed the truism that the nation which controls the air and space above controls the ground under it as well. The control of ‘high ground’ has long been a major factor in determining military advantage. In our time this vantage point may become the surface of the moon itself.¹³³ High level Air Force brass did indeed argue that the “high ground” should *and would* some time soon refer to a lunar base.

Boushey, on January 28, 1958, had described to the Aero Club in Washington, DC, the military potential he saw in the moon. He drove his point home further a week later in the *Army-Navy-Air Force Register*, under the less-than-ambiguous heading, “Lunar Base Vital”:

¹³⁰ Colonel Martin B. Schofield, “In My Opinion... Control of Outer Space,” *Air University Quarterly Review* Vol X No 1 (Washington, DC: GPO, Spring 1958), pp93-112.

¹³¹ Major General Lloyd P. Hopwood, “The Military Impact of Space Operations,” *Air University Quarterly Review* Vol X No 2 (Summer 1958), pp142-146. Dr. Hubertus Strughold, “Basic Factors in Manned Space Operations,” *Air University Quarterly* (Summer 1958), pp29-46. Strughold divided human flight into four phases: 1. of atmospheric flight; 2. “space equivalent flight” by the “X-class” aircraft; 3. orbital flight, which lay in the nearer future; 4. interplanetary travel farther in the future.

¹³² Major General Dan C. Ogle, “The Threshold of Space,” *Air University Quarterly Review* Vol X No 2 (Summer 1958), pp2-6.

¹³³ Major General Dan C. Ogle, “The Threshold of Space,” *Air University Quarterly Review* Vol X No 2 (Summer 1958), pp2-6.

The moon provides a retaliation base of unequalled advantage. If we had a base on the moon, either the Soviets must launch an overwhelming nuclear attack towards the moon from Russia two to two-and-one-half days prior to attacking the continental US (and such launchings could not escape detection) or Russia could attack the continental US first, only and inevitably to receive, from the moon – some 48 hours later, sure and massive destruction.¹³⁴ Boushey's statements came very shortly on the heels of his Directorate of Research and Development's "Air Force Astronautical Program," and in fact the lunar base represented the boldest set of interrelated items on the Air Force's space agenda. It will be remembered that the Dyna-Soar appeared prominently in that report as well.

He repeated this view in April, speaking at congressional hearings. "He claimed that the moon could be used as a launching site for deeper penetration of space, as a supply base for earth satellites, as an astronomical and meteorological observatory, and as a means of world-wide surveillance that could be a deterrence to aggression."¹³⁵

Boushey's claim would encounter detractors from some contemporary corners. But the idea of a moon missile base, *lunacy* as it literally seems to be, found its defenders too. Suggestions favoring a militarized moon base could not be ignored as entirely isolated. But before the moon could be used, there needed to be a way to get there, and furthermore there needed to be a lot of other infrastructure in place as well. Lunar ambitions and Dyna-Soar plans fit into the larger context of using and defending the continuum of air and space.

After Research and Development unveiled the "Air Force Astronautical Program" in January, the Air Research and Development Command spent the following seven months developing a cluster of study requirements for space defense. Six of these seven projects fell within three overall systems: a "strategic orbital system," a "strategic lunar system," and a "strategic interplanetary system." An Air Force history noted that the seventh study requirement was a reconnaissance satellite which "was regarded as a possible support system – along with the photographic satellite of WS-117L, the meteorological satellite, man-in-

¹³⁴ Brigadier General Homer A. Boushey, "Lunar Base Vital," *Army-Navy-Air Force Register*, 79 (8 Feb 1958), p. 11.

¹³⁵ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, 159.

space, and Dyna Soar – for the strategic orbital system.”¹³⁶ This presumed application for the Dyna-Soar helps indicate the divergent directions in which the program was heading in the late 1950s. In keeping with the ARDC’s study requirements, the Dyna-Soar would be a multifaceted vehicle capable of helping support a more permanent orbital system.

Yet Air Force approaches to its funding issues simultaneously pulled the Dyna-Soar in another direction. In February 1958, Air Force and NACA representatives worked to draft a memorandum of understanding about the Dyna-Soar I project. Dyna-Soar I was the test bed, providing a foundation from which development of the Dyna-Soar II (reconnaissance) and III (bomber) would follow. A February draft noted that “the conceptual test vehicle [Dyna-Soar I] has to be related to a weapon system to expend weapon system funds. [...] It would be extremely desirable for NACA to be made an active partner in D.S. I project because the Air Force organization cannot adequately handle such a project. The alternat[iv]e is an equivalent to B[allistic] M[issile] D[ev]elopment] who could hire someone like R[amo]-W[oolridge] to play the NACA role.”¹³⁷

The NACA’s staff clarified their point days later in a February 25 memo to their director, Hugh Dryden:

We believe that the best way to develop the conceptual test vehicle is to establish a joint Air Force-NACA program along the lines of the X-15 project. Because the Dyna Soar I must be more closely related to the Weapons Systems which will follow it, than were the X-15 and the preceding research airplanes, it appears that technical direction of the project should be the responsibility of the Air Force.¹³⁸

The memorandum of understanding the following month confirmed this relationship: “overall technical control of the project will rest with the Air Force, acting with the advice and assistance of the NACA.”

¹³⁶ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, 158-9.

¹³⁷ “Proposal for Memo of Understanding between NACA & USAF,” *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003), p87.

¹³⁸ “NACA memo for clarification of NACA role,” *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003), p88.

This memorandum would be revised in mid-November, but the only alteration would be the change of “NACA” to “NASA” to reflect the provisions of the Space Act of 1958.¹³⁹

Air Force control of the Dyna-Soar was understandably important to its exponents. In the course of 1958, the ARPA emerged and the NACA transformed into the NASA. Authority for a number of military service space projects began shifting toward the ARPA and eventually to the NASA. Not all of these transfers were permanent, and a contemporary Air Force history noted that “the Air Force was pleased to have” authority over its research on nuclear propulsion in space, on high-energy fuels, effects of weapons on electronics, the 117L satellite, and Project Score (orbit of an Atlas missile fuselage). “Nevertheless, the Air Force was seriously disturbed,” the history explained, “by ARPA’s persistent splintering of projects into components.”¹⁴⁰ When the Air Force’s distaste for “splintering” and its concern that its projects not be lost to new, expansive civilian research agencies is taken into contextual account, its stance on the Dyna-Soar that fall makes greater sense.

Dyna-Soar’s money needed to be secured for it. On September 8, White wrote to his Deputy for Development, General Putt; White said he had been informed “that ARPA would be open to suggestion that \$10 million of ARPA money could be transferred from ‘Man in Space’ programs to the Air Force Dyna-Soar program, this in light of the probability that scientific man in space efforts will be taken over completely by NASA.”¹⁴¹ The Air Force had identified the “manned capsule test” as a subdivision of the Dyna-Soar program, according to its January 24, 1958, Astronautical Program. Recovering a human being from space travel would demonstrate his ability to survive in the new environment. Through “Man in Space,” the Air Force aimed to demonstrate a human’s ability to *survive* in the new environment as a precondition for his *working* in it. In the NASA’s hands, “Man in Space” would receive a new name: Mercury.

¹³⁹ “Memorandum of understanding between NACA & USAF,” *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003), p89. “Principles for Participation of NASA in Development and Testing the ‘Air Force System 464L Hypersonic Boost Glide Conceptual Test Vehicle (Dyna Soar I).” NASA folder, box 18, General White papers, Library of Congress.

¹⁴⁰ *Dyna-Soar: Hypersonic Strategic Weapons System* (Burlington, Ontario, Canada: Apogee Books, 2003), 141-2.

¹⁴¹ White, “Memorandum for DCS/Development,” Sept 8, 1958. Fldr Chief of Staff Signed Memos Jan 58-Dec 58, Box 15, White Papers, Library of Congress.

White sent Air Force Secretary James Douglas, on October 3, his list of priority programs for augmentation in the coming budget. Several systems, including the solid-fuel Minuteman ICBM, the KC-135 tanker, the B-52/GAR-77 bomber/missile combination, and strategic airlift resources each got prominent attention in turn. Then White turned to the Dyna-Soar:

*This program represents the first of a new generation of strategic weapons systems. It will enable the United States to maintain its military posture of major war deterrence by having in-being a known capacity to nullify air defense systems designed to combat air-breathing manned vehicles and predictable ICBM trajectories.*¹⁴² [italics added]

Nothing in the Air Force Chief of Staff's description would indicate that the service, from the highest levels, supported the Dyna-Soar program and that they held a remarkably clear and bold vision of what the Dyna-Soar was to do. It would serve as the successor of the modern manned bomber planes, and it would mark a jumping-off point from which a new era in military aerospace would be inaugurated.

And yet the Dyna-Soar's envisioned technological potential was deliberately obscured from the view of US civilian authorities. The Air Force did not hide its intention to ultimately make the Dyna-Soar a weapon system – far from it. In fact, the Air Force was so intent on preserving this mission that it sought to marry the Dyna-Soar I conceptual test craft to the Dyna-Soar II and III weapon systems.

The Air Force did this because it wanted to keep the work on Dyna-Soar in-house: the Air Force in 1958 did not want to lose its space glider to the ARPA or the NASA.

Ten days after White had written Douglas, Douglas wrote back. "In recent discussion with managing personnel of the Advanced Research Projects Agency," he cautioned, "it has become apparent that the interests of that Agency, insofar as aeronautic programs are concerned, include in the classification of vehicles only those bodies which are designed to attain or exceed velocities necessary for stabilized orbits." Douglas aimed to capitalize on this ARPA position.

This might, in effect, constitute an arbitrary but clearly defined boundary on one side of which development projects are clearly the responsibility of the Air Force whereas, on the other side, the policy and program direction responsibility becomes the responsibility of the ARPA.

In view of this definition, it becomes clearly advantageous to clarify the development objectives of the Dyna-Soar Program. Since the purpose of the Phase I is to obtain hypersonic

¹⁴² Memo from White to AF Sec Douglas, "Priority Program Augmentations to Basic 1959 Budget Estimate," White Oct 3 1958. Fldr Secretary of the Air Force #2, Box 18, White Papers, Library of Congress.

research data and accumulate research and development experience in this kind of vehicle, it should clearly be designated a military research vehicle programmed for sub-orbital velocities. This would not be a handicap to the project, and modest growth could at some future date meet any military purpose requiring continuous orbiting flight.¹⁴³

Douglas's proposal would prove to be, in retrospect, a spectacular miscalculation. Marrying the Dyna-Soar I to its intended II and III successors did succeed in preventing the project's being "splintered" and it did succeed in preventing major portions of the program from being claimed by the acquisitive ARPA and NASA.

Some justification might be made for Air Force interest in averting these fates. Splintering was bringing the 117L satellite to grief, as components (DISCOVERER and the secret CORONA) were being pursued, but beyond Air Force control, or even access. It is, after all, important to remember that the Mercury program had started as a simple demonstration of man's ability to survive space travel and that the Air Force had considered this demonstration to be a first step toward the creation of the Dyna-Soar. Man in Space had been splintered away from the Dyna-Soar program and it had then been gobbled up by the NASA.

However, this "safety" had been bought at an extremely high price. First, the intimate linkage of the Dyna-Soar I to its weaponized successors meant that any national policy precluding space weapons systems would pose an existential threat to the *entire* program. This risk might have seemed minimal at a time in which a potent Soviet Union seemed capable of surprise "spectaculars" in space and might be secretly at work on more sinister capabilities in space. Certainly, President Eisenhower had expressed hope that space might be preserved for peace. But in cold war, as in war itself, policy is not like painting on an inert canvas, but rather is a product of interaction.

The second part of the "price" for keeping the Dyna-Soar I under Air Force auspices was that the Air Force declared it to focus on research of hypersonic *suborbital* travel. Douglas's letter to White assures the Chief of Staff that this definition "would not be a handicap" because it could easily be reversed at a future date. But it was important: the purpose of the Dyna-Soar I seemed abruptly less ambitious. The

¹⁴³ Memo from AF Sec Douglas to Chief of Staff White, Oct 13, 1958. Fldr Secretary of the Air Force #2, Box 18, White Papers, Library of Congress.

Dyna-Soar I suddenly seemed less distinctly different from the pending X-15 project. The program's purpose included unnecessary ambiguity, a definite handicap when facing skeptical or penurious inquisition. In short, the Dyna-Soar's wings were clipped in 1958; they were clipped by the Air Force itself, an inadvertent result of the service's bid to protect their program from abduction by new civilian space research agencies.

Air Force rhetoric emphasized an expansive continuity not only between air and space but also in the vehicles designed to traverse them. LeMay, speaking at a public information seminar banquet in November 1958, described "the X-15 rocket research plane" as "our first 'spacecraft.'" Noting that it was a continuing joint effort with the Navy and the NACA (now the NASA), he added that "the experience of the United States Air Force in working with science and industry for the development of faster, higher-flying aircraft with longer range gives us confidence in the future of our equipment in space."¹⁴⁴

He expounded further on NBC television three months later.

We refer to the X-15 as an aerospace vehicle. Space is actually just a continuation of the air in which we now operate. Since there is no definite boundary between the two, it is very difficult to determine where the functions of an aircraft stop and those of a spacecraft begin. We use the term aerospace to cover that whole operational area.¹⁴⁵ LeMay did take pains to indicate the role and purpose of the X-15, as seen by the Air Force. "The X-15 is a research vehicle and was never intended to have a combat capability. However," he continued, "the data gathered from its flights will be the basis not only for further flight research, but also for the design of our future combat aerospace vehicles."¹⁴⁶

This continuity sometimes blurred the image of the Dyna-Soar, throwing the service's commitment to that program into a degree of shadow despite the continuing importance which the service's top leaders attached to an expanding aerospace mission. But the sticky question of continuity bedeviled civilians too.

¹⁴⁴ LeMay, speech at the Public Information Seminar Banquet at the Manhattan Hotel, New York City, Nov 7, 1958. Fldr Cleared Copies Oct 1958-1960, Box B171, LeMay Papers, Library of Congress.

¹⁴⁵ LeMay, approved draft remarks on NBC Monitor Program in Washington, DC, Feb 17, 1959. Fldr Cleared Copies Oct 1958-1960, Box B171, LeMay Papers, Library of Congress.

¹⁴⁶ LeMay, approved draft remarks on NBC Monitor Program in Washington, DC, Feb 17, 1959. Fldr Cleared Copies Oct 1958-1960, Box B171, LeMay Papers, Library of Congress.

NASA's Assistant Director of Research, Ira Abbott, attempted to explain to a House subcommittee the fuzzy line separating "air" from "space." Abbott told them:

Beginning immediately after the end of the war, advancing technology combined with intensive international competition for faster and longer range aircraft and for missiles to cause revolutionary developments in aeronautics. [...] Gradually the 'frontiers of aeronautics' became the 'threshold of space.' From the point of view of research no clear cut distinction can be drawn between aeronautics and space as may be illustrated by the experimental X-15.¹⁴⁷

In ironic parallel, a review conducted by the *Air University Quarterly Review* and published in their Fall 1958 issue focused on the X-15 as it explored "the spiral toward space." Its closing section, titled "the future," focused exclusively on the Dyna-Soar:

The project which is perhaps closest to the continuation of the X-15 program is the development of a boost-glide aircraft called Dyna-Soar [...] The Air Force and the NACA [*sic*] are now engaged in developing this advanced test vehicle, thus continuing the productive partnership that resulted in the earlier research aircraft and the forthcoming X-15.¹⁴⁸

The staff review did allow the Dyna-Soar to escape beyond the X-15's shadow as well, however.

Noting that "preliminary investigations indicate that it will be possible to vary the original thrust and thus the velocity of the Dyna-Soar, enabling the pilot to complete one or more orbits around the earth and make a normal landing. [...] It will utilize both centrifugal effect and aerodynamic lift."¹⁴⁹ This orbital potential lay far beyond anything to which the fast (but far slower) X-15 might aspire. Significantly, the essay's statement about an orbital potential suggested the disingenuous nature of the Air Force's dubbing Dyna-Soar I "suborbital" to prevent its loss to civilian authority. The staff review noted, with greater honesty, that the Air Force saw the vehicle's capability as a function of its booster rocket.

The review also looked to the Dyna-Soar's future, declaring that "possible operational craft following the test version of Dyna-Soar will be capable of various missions, including bombing and reconnaissance. As a weapon this vehicle promises to have some of the best features of both guided missiles and aircraft." Specifically, the authors pointed to "long range and great destructive capability, especially with nuclear

¹⁴⁷ Abbott, Ira, "Statement of Ira H Abbott, Assistant Director of Research, National Aeronautics and Space Administration before Subcommittee on Manpower Utilization of the Committee on Post Office and Civil Service, US House of Representatives," December 5, 1958. 7 "Abbott: Congressional Testimony (Commtes)," NASA HQ.

¹⁴⁸ Staff Study, "The Spiral Toward Space," *Air University Quarterly Review* Vol X No 3 (Washington, DC: GPO, Fall 1958), pp10-21.

¹⁴⁹ Staff Study, "The Spiral Toward Space," *Air University Quarterly Review* Vol X No 3 (Washington, DC: GPO, Fall 1958), pp10-21.

payloads,” galvanized by the pilot’s human judgment. “Such a weapon would be particularly useful in case of loss of our overseas bases.” The essay finished by acknowledging that the future is an unknowable realm, but “we can say with some assurance, however, that the information gained from the flights of the X-15 and similar aircraft will be extremely valuable. In fact, *later craft in this same line of development may well play the predominant role in the conquest of space*” [italics added].¹⁵⁰

Some signs already indicated, however, that the mission’s importance might not translate to the Dyna-Soar’s success. Notes from a Research and Development (RAND) Advisory Group meeting in December 1958 outline myriad programs discussed during a three-day conference. “Cost Implications of Manned Circumnavigation Weapon Systems,” slated for the second day, considered “the costs of developing, procuring, and operating manned boost-glide circumnavigation weapon systems.” This description seems intensely focused on the Dyna-Soar’s role. However, the outline explicitly noted that “findings are applicable to, *but not limited to*, the Dyna Soar program” [italics added].¹⁵¹ When discussing some sixty budget items “which have changed significantly either as a result of our own doing or higher authority,” General White listed three examples to his executive assistant; the three examples were “DYNA SOAR, BOMARC, and B-58.”¹⁵²

Meanwhile, space issues remained significant to Air Force leaders. In February, White asserted to the House Committee on Science and Astronautics that, “Since there is no dividing line, no natural barrier separating these two areas [air and space], there can be no operational boundary between them. Thus air and space comprise a single continuous operational field in which the Air Force must continue to function. The area is aerospace.”¹⁵³ In March, White was pleased by indications from the ARPA director Roy Johnson that that agency desired “to farm out military space programs to the services as soon as

¹⁵⁰ Staff Study, “The Spiral Toward Space,” *Air University Quarterly Review* Vol X No 3 (Washington, DC: GPO, Fall 1958), pp10-21.

¹⁵¹ White, “Project RAND Military Advisory Group Meeting,” Dec 4, 1958. Fldr AFCCS Reading File – December 1958, Box 12, White Papers, Library of Congress.

¹⁵² Memo from Exec to Chief of Staff Col George S. Brown, “Memorandum for Director of Budget,” Jan 22, 1959. Fldr Chief of Staff Memos, Box 26, White Papers, Library of Congress.

¹⁵³ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, p188.

feasible in order to reduce the budgetary impact on ARPA. [...] I want to make certain that the Air Force is in these programs to the full extent that its missions demand.”¹⁵⁴

White recognized that ARPA’s motivation meant “transferring the [financial] impact to the services,” and in this light he thought “it might be wise to sacrifice in some areas in order to be able to take on space projects.”¹⁵⁵ At the end of May, contemplating the “military use of space” in the context of the Fiscal Year 1960 budget and, White reiterated that, “We consider that space is contiguous and an undivided medium with the atmosphere. The requirement to operate above the earth’s surface is indistinguishable in our eyes, whether it be in the atmosphere or above the atmosphere. It is one medium as far as we see it from a military point of view.”¹⁵⁶ White’s statements show a definite consistency in their allegiance to the idea of “aerospace” and of the Air Force’s expanding defense responsibility as simply a “continuing” one.

LeMay’s statements that fall struck a similar chord. He told an Air Force Association convention that “aerospace power by its very nature is global” and that “the speed, range, mobility and flexibility of aerospace power – which are constantly being improved by modern technology – allows us to take full advantage of this worldwide medium and to expand the scope of Air Force operations.” Early the following week, LeMay stood for a radio interview from the Pentagon. Responding to a question about aircraft, the Vice Chief of Staff reminded the interviewer and listeners that “rather than manned aircraft, I think we should refer to them as manned vehicles. Our advanced aerospace vehicles don’t look much like aircraft as we now know them. But whatever these machines are called, I feel that their future is unlimited.”¹⁵⁷ LeMay did not name the Dyna-Soar, but in both cases his rhetoric not only identified but specifically emphasized the importance of space-located aerospace power.

¹⁵⁴ Memo from White to Deputy Chief of Staff for Development, Mar 30, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁵⁵ Memo from White to Deputy Chief of Staff for Development, Mar 30, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁵⁶ Issues Relevant to 1960 Budget Items, May 28, 1959. Fldr Chief of Staff Memos, Box 26, White Papers, Library of Congress.

¹⁵⁷ LeMay, “approved draft speech at SUAF Symposium at the Air Force Association Convention in Miami Beach, FL, 5 Sept 1959,” Sept 2, 1959. Fldr Cleared Copies Oct 1958-1960, Box B171, LeMay Papers, Library of

LeMay's overt references to Dyna-Soar could flow and ebb; White's rhetoric bore a greater consistency. Notably absent from White's statements explored here are explicit rhetorical references to particular systems with which aerospace is to be defended and used. Dyna-Soar does not appear, in this context, as an exception. But White did support the Dyna-Soar program in 1959, and he acted in the second half of that year to help make the Dyna-Soar fulfill the promise which he and others saw in it.

The same September days that LeMay continued to speak about aerospace power, White moved to accelerate progress on the Dyna-Soar. But at just this point, the Dyna-Soar faced another round of challenges. "We have a contract pending on Dynasoar," White noted, and "industry is anxious to get settled" whether Martin would work in combination with Bell or with Boeing on the project. "Let's get [the] Sec[retary of the] A[ir] F[orce] to get on with it." White's assistant executive informed the Deputy Chief of Staff for Development that "General White desires that the pending contract on Dyna Soar be expedited," a point which the Chief of Staff reiterated again on September 5.¹⁵⁸

The Dyna-Soar rested securely in General White's mind, but it was not the only program vying for the service chief's attention – it was not even the only space project on the horizon. Schriever rushed separate letters to White that he was "deeply concerned" about the "severe administrative and funding restrictions on the MIDAS development program" and "the events which are besetting the SAMOS Program."¹⁵⁹ The former was meant to detect incoming Soviet ballistic missiles, while the later was a planned reconnaissance satellite. Such calls did not preclude White from returning his attention to the Dyna-Soar's progress the following month, however.

Congress. LeMay, radio interview on "Capitol Assignment" at the Pentagon on Sept 8, 1959, Sept 4, 1959. Fldr Cleared Copies Oct 1958-1960, Box B171, LeMay Papers, Library of Congress.

¹⁵⁸ White, handwritten notation on a memo from Asst Exec to Chief of Staff Lt Col Robert N. Ginsburgh to White, Sept 2, 1959. Fldr Chief of Staff Memos, Box 26, White Papers, Library of Congress. Lt Col Benjamin H. Ferer, "Actions on Dyna-Soar – 5 Sept 59 thru 6 Nov 59," Nov 10, 1959, K140.8636-4 AFHRA. Lt Colonel Robert N. Ginsburgh, asst exec to C/S USAF, "Memorandum for Deputy Chief of Staff, Development," Chief of Staff Memos folder, box 26, White papers, Library of Congress.

¹⁵⁹ Letter from Schriever to White, Sept 15 1959. Fldr Command ARDC, Box 26, White Papers, Library of Congress.

At a time when rocket technology still encountered significant growing pains, vehicle weight embodied a vital issue. The Dyna-Soar generally was expected to weigh about 10,000 pounds, which was then a fantastically enormous mass to place into orbital altitude. What if the Dyna-Soar could be sliced into two pieces: a test vehicle weighing 5,000 pounds, which would be less impracticable to lift; and then the full-weight vehicle along the lines the Air Force envisioned? Victor Charyk, the Air Force's Assistant Secretary for Research and Development, declared on September 25 that the Titan C booster would not be developed, and he "suggested a 'two-phase' program, but with a different glider."¹⁶⁰

Major General Victor Haugen, Deputy Chief of Staff for Development, met with several colonels in early October to discuss the possibility, and he was told emphatically "that the two airplane approach (i.e. 5,000-6,000 lbs design weight and ICBM [booster] followed by over 10,000 lbs design weight and Saturn [booster]) was a wasteful and very undesirable one." Waste was one problem, and dead-ends were another: civilian bosses had already indicated hesitancy when York minimized the military subsystems' testing that April, and the officers may well have recognized that the larger operational vehicle would be in danger if not married to the test vehicle. The colonels urged that the Dyna-Soar remain at its envisioned size, and Haugen agreed, also noting that he "did not believe that management would be changed sufficiently to require a new competition," since this too would slow the program and risked offering another opportunity to stymie it altogether. It was noted that "General Wilson said he had given ARDC and AMC [Air Materiel Command] ten days to get together on a management plan for Dyna Soar."¹⁶¹

Despite the hopes of the men meeting early that month, within two weeks a memo announced "guidance [...] that Dyna Soar must proceed as a two-phase program with the first phase using an ICBM booster and a 5000-6000 lb. airplane. This vehicle-booster combination could attain the primary objectives set out by DDR&E," although tests on military equipment and manned lift would not be possible, and "the vehicle would not be suitable for later orbit tests." The memo identified "an

¹⁶⁰ Lt Col Benjamin H. Ferer, "Actions on Dyna-Soar – 5 Sept 59 thru 6 Nov 59," Nov 10, 1959, K140.8636-4 AFHRA.

¹⁶¹ "Cancellation of Dyna Soar Selection," Oct 9, 1959. K140.8636-4 AFHRA.

alternative,” which would be to start with “a 9000-10,000 lb. design vehicle off loaded to weigh 5000-6000 lbs at launch and boosted by a modified ICBM. This combination could attain the primary objectives set out by DDR&E. At design weight, but with a different booster, the vehicle could attain both primary and secondary objectives.” Another memo with the same date explained that, by this process, “the test phase of this step could evolve into an initial operational capacity” as Dyna-Soar II and ultimately “a military system based on Dyna Soar technology,” Step III.¹⁶²

Even if necessity demanded that the full-scale, full-weight Dyna-Soar could not be lifted imminently, the Air Force determined to hollow out its vehicle rather than construct a smaller test variant. Charyk wanted to authorize a contract for the fiscal year 1960 part of only the Dyna Soar I, and this action would certainly serve to corroborate Air Force suspicions.¹⁶³ In the eyes of its key thinkers, Air Force planning - and US sovereignty - depended on the development of operational aerospace systems. According to this perspective, the Air Force had to operate across the aerospace realm. Vehicles needed to be operational weapon systems rather than to end simply as test platforms. The Dyna-Soar stood crucially to be the first in a line of new aerospace defense systems.

¹⁶² “Dyna Soar Source Selection” and “Required Action on Dyna Soar,” Oct 29, 1959. K140.8636-4 AFHRA.

¹⁶³ “Status of Action on Dyna Soar,” Nov 19, 1959. K140.8636-4 AFHRA.

Chapter 3: “THE AIR FORCE MUST NOT LOSE DYNASOAR”:
THE DYNA-SOAR AND AEROSPACE POWER, 1958-61

The aerospace is an operationally indivisible medium consisting of the total expanse beyond the earth’s surface. – AFM 1-2, December 1, 1959¹⁶⁴

Just as the Wright Brothers in their time could not imagine planes like the B-70 or modern jet transports, so it seems that man today cannot imagine the extent to which space flight will be used. [...] Dyna-Soar is one of the steps toward that future. - Air Force Booklet on Dyna-Soar, April 1960¹⁶⁵

“The A[ir] F[orce] must not lose Dynasoar,” White unambiguously fired off to the Charyk, in a two-sentence memo on October 27. White concluded the brief note with, “Will you please put all of this in context for me.”¹⁶⁶ The “Phase Alpha” study ordered by Charyk would follow, perhaps justifiably maligned by contemporary Air Force Dyna-Soar advocates and by the Dyna-Soar’s program biographer Roy Houchin in 2006.¹⁶⁷ From the perspective of the Dyna-Soar’s advocates, Charyk can credibly be characterized as a serious adversary. This did not mean, however, that Charyk’s vantage point did not give him genuine reasons for skepticism about the feasibility or need of the Dyna-Soar.

More immediate still, coming just a day after White’s memo to Charyk, White wrote to the Deputy Chief of Staff for Development (as of July 1, 1958, this was Lieutenant General Roscoe Wilson), indicating that inefficient work on the Dyna-Soar might yield long-lasting ill effects:

I am exceedingly dissatisfied with the progress made on Dynasoar. If the Air Force expects to get into the space business we have got to get over these internal hassles which have already delayed this program an unconscionable amount. I want immediate action, and if there are impediments that can’t be settled at your level let me know.¹⁶⁸

The “internal hassles” to which White referred may have been the authority squabble between the Space Systems Division and the Ballistic Missile Division which Houchin describes and which he too considered a hideously inefficient waste of effort which endangered the Dyna-Soar. But the “hassles” may alternatively be other issues.

¹⁶⁴ “United States Air Force Basic Doctrine AFM 1-2AFM 1-2,” (December 1, 1959).

¹⁶⁵ Booklet on Dyna-Soar, about April 1960. K140.8636-4 AFHRA.

¹⁶⁶ Memo from White to Charyk, Oct 27, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁶⁷ Houchin, Roy F. II (Lt Col), *US Hypersonic Research and Development: The Rise and Fall of Dyna-Soar, 1944-1963* (New York: Routledge, 2006), 119-21.

¹⁶⁸ Memo from White to Deputy to the Chief of Staff for Development, Oct 28, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

As his letter indicates, White himself agonized that such pettiness might cost the Air Force what he considered its rightful role in space and might by extension cost the United States the security which he believed only bold aerospace leadership could guarantee. General Wilson replied immediately, explaining that “the immediate hurdle in the Dyna Soar Program is the formulation and presentation of the Development Plan. All details of the plan are complete except for the proposed management structure of the program.” Indeed, Wilson had earlier given the ARDC and the AMC a short deadline to conclude the management plan for the Dyna-Soar.¹⁶⁹

White’s answer back to Wilson was immediate and emphatic:

Much as I would like to go into this in this detail I simply cannot unless everybody else on the staff can’t handle.

I want:

Dynasoar expeditiously settled on a realistic basis. Beyond that I expect the staff and the commanders to get the thing settled and implemented.¹⁷⁰

White’s statement seems ready to stand, in historical terms, without needing much further commentary.

Presumably, his lieutenants at the Air Force got the point, because serious analysis of the Dyna-Soar soon proceeded.

By October 30 planners concluded that “management responsibility for the Dyna Soar Program will be bested [sic] in a joint AMC/ARDC weapon system subject office organizationally located with inter AMC Aeronautical Systems Center and the Wright Air Development Division at Wright-Patterson Air Force Base.” The Air Force moved energetically in early November to present its refinements to Air Force Secretary Douglas, but his schedule prevented a meeting until the afternoon of November 6. At that point, “Mr Douglas approved the Dyna Soar plan substantially as presented. However, he allowed that he wasn’t committed by that approval to the exact sum of \$96.0 in FY [19]61” which the Air Force planners thought necessary.¹⁷¹

¹⁶⁹ Memo from Wilson to White, “Dyna Soar Development Plan,” Oct 29, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress. “Cancellation of Dyna Soar Selection,” Oct 9, 1959. K140.8636-4 AFHRA.

¹⁷⁰ Memo from White to Wilson, Oct 30, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁷¹ Memo from ARDC Arnold Air Force Station in Tennessee to Chief of Staff White, Oct 30, 1959. K140-8636.4 AFHRA. Lt Col Benjamin H. Ferer, “Actions on the Dyna Soar – 5 Sep 59 thru 6 Nov 59.” K140.8636-4 AFHRA.

White had insisted that the Air Force “must not lose Dynasoar,” but events concurrent to the intra-Air Force quibbling seemed to show the risk of just that happening. “The loss of the Dyna Soar project to NASA appears imminent,” a report explained. Titled “Statement of Critical Problem Concerning SATURN, DYNA SOAR, and Air Force Space Responsibilities,” it listed causes for serious concern. Among the reasons cited were a Defense Department budget review on October 11 during which “all FY ’61 money [was removed] from Dyna Soar ‘contemplating its elimination.’” Furthermore, Eisenhower’s scientific advisor Dr George Kistiakowsky and DDR&E head Dr Herbert York “discussed (and may have decided upon) cancellation of the Dyna Soar, with NASA to pick up the pieces as experimental in-house work.” The NASA, it was believed, was considering a “winged Dyna Soar-like vehicle” as part of their Mercury program.¹⁷²

As noted earlier, space vehicles *weren’t* space vehicles without a means of reaching beyond the atmosphere, so booster capability represented a significant issue. Perhaps the most ominous points therefore hinged on booster development. “In a 29 October 1959 high level O[ffice of the] S[ecretary of] D[efense]-NASA presentation on the SATURN (now scheduled for transfer to NASA) Dr Von Braun justified the choice of 220” as the diameter of the second stage SATURN booster (rather than 160”) entirely on the basis of assumed DYNA SOAR requirements.”¹⁷³ The report also pointed to contemporary OSD-NASA discussions which might transfer the sole responsibility for large booster development to the NASA. As will be mentioned subsequently, this discussion was not a mirage. The OSD and the NASA did reach agreement on October 30 that there was “a definite need for super boosters for civilian space exploration purposes, both manned and unmanned,” and President Eisenhower signed this agreement on November 2.¹⁷⁴ “This agreement,” the existence of which the Air Force authors

¹⁷² “Statement of Critical Problem Concerning SATURN, DYNA SOAR, and Air Force Space Responsibilities.” about Nov 2, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁷³ “Statement of Critical Problem Concerning SATURN, DYNA SOAR, and Air Force Space Responsibilities.” about Nov 2, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁷⁴ Glennan and Gates, “Memo for the President: Responsibility and Organization for Certain Space Activities,” Oct 21, 1959. Fldr McElroy, Neil H. Secy. of Defense, 1959 (1), Box 23, PP AWD, DDEL. Notes from Oct 1, 1959 meeting, Oct 2, 1959. Fldr Space January- June 1959 (6), Box 15, Special Asst Sci & Tech ser, DDEL.

suspected but did not know, “taken in context with the above mentioned situation, would limit the 18 September Secretary of Defense memorandum assigned to the Air Force of space booster development and launching responsibilities to military space projects which utilize the present ICBM’s as boosters.”¹⁷⁵

Air Force planners toyed with the idea of potentially employing the service’s solid-fuel Minuteman missile as a booster for the Dyna-Soar. Given the importance attached to developing a credible ballistic missile force and the overall advantages offered there by the solid-fuel Minuteman over its liquid-fuel predecessors, the notion of using Minuteman as a space booster seems initially puzzling. But an Air Force belief that the Saturn rocket would be unavailable for the Dyna-Soar might help explain such consideration.

The implications of losing big boosters would be staggering for the Dyna-Soar. To prevent the Dyna-Soar I’s loss to the ARPA, the Air Force had emphasized its suborbital characteristics to prevent its being stolen away as a “space research vehicle” instead of being a test platform for weapons systems. As authors for *Air Force Quarterly Review* had recognized, the power of the booster would do much to determine the range, altitude, and capability of a Dyna-Soar vehicle. Now an agreement for the NASA to monopolize big booster development threatened to prevent the Air Force from being able to develop a booster capable of lifting the Dyna-Soar to the heights for which it had always been intended.

Relations between the Air Force and the NASA had in fact been deteriorating for some time. The NACA had served for four decades, assisting in aerodynamics and flight research. The NACA had been an extremely useful instrument for the Air Force, and for aviation at large. The Air Force quickly came to view the NASA in a very different light. The NASA fast appeared to stand as a competitor rather than as a helpmate. In the words of a contemporary Air Force history, “a background of unhappy incidents in NASA-USAF relations built up.”¹⁷⁶

¹⁷⁵ “Statement of Critical Problem Concerning SATURN, DYNA SOAR, and Air Force Space Responsibilities.” about Nov 2, 1959. Fldr Chief of Staff ‘Signed’ Memos, Box 26, White Papers, Library of Congress.

¹⁷⁶ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, 160.

The moon was a serious locus of contention. The Air Force had, in 1958, developed a series of study requirements envisioning a strategic orbital system, a strategic lunar system, and a strategic interplanetary system; prior to this, the Air Force's Astronautics Program had envisioned five major categories, of which the Dyna-Soar had been one and a Lunar System had been another. Throughout that year, Deputy Director of Research and Development Boushey had publicly advocated for military bases on the moon. In March 1959, the ARDC had invited the NASA "to participate in contractor midpoint briefings" related to the study requirement for a lunar observatory within the context of the Air Force strategic lunar system. The NASA sent a single staffer and the "response was markedly unenthusiastic." A month later the NASA created its own Lunar Exploration Group, and although the Army and Navy had been part, the Air Force had not. The Air Force was surprised by the NASA's abrupt announcement, on April 17, 1959, of "plans for long-range scientific exploration of the moon."¹⁷⁷

The Air University Quarterly Review fired back with space-oriented articles. In the Summer 1959 issue, Lieutenant Colonel S.E. Singer's "The Military Potential of the Moon" lauded Boushey's vision, which Boushey had himself reiterated in the previous issue. In his article, "Blueprints for Space," Boushey had declared that, "in twenty years, I believe both the moon and Mars will have permanent, manned outposts." Describing, if not naming, the Dyna-Soar and its principle planned role, Boushey also argued that

Satellite vehicles can prove immensely useful to mankind. Appropriately utilized, they could provide a manned space patrol for peaceful purposes. *Another use would be purely military – bombardment – and accomplished by space vehicles. I use the term vehicles rather than satellites because I believe these weapon systems will be manned. [...] Obviously they would serve as a deterrent to armed aggression, just as our Strategic Air Command bombers safeguard the peace of the free world today.*¹⁷⁸ [italics added]

Boushey conceded a few points to his critics while downplaying the significance of these objections.

Aiming a bomb delivered from orbit would indeed be complicated. And, "It is true that today we have very little excess payload capacity in a satellite vehicle to allocate to fuel for the deceleration of a

¹⁷⁷ Bowen, *Threshold of Space, 1945-1959* (USAF Historical Division Liaison Office, August 1964), K168.01-7, AFHRA, 160.

¹⁷⁸ Brigadier General Homer A. Boushey, "Blueprints for Space," *Air University Quarterly Review* Vol XI No 1 (Washington, DC: GPO, Spring 1959), pp30-37.

warhead. *But, I think such arguments are much like those faced by Wilbur and Orville Wright*” [italics added].¹⁷⁹

Boushey’s statement implicitly makes an arresting, and ahistorical, point. Implicitly, one is brought to imagine the Wright brothers overcoming cynicism about their contraption. And indeed they did encounter scoffs. But as they strove to invent the airplane, the brothers hoped - and believed - that the human capacity to fly might banish warfare from the human experience. In view of this, one can hardly imagine the Wright brothers scratching their heads before a drawing board, pondering better ways to hurl a bomb from the air or from space.

Boushey exhibited greater honesty when writing, “I believe space will be used effectively for both military and civilian purposes,” and “our very security depends upon our military capabilities.” He added that “unless these men can do something useful, there is no reason for landing them on the moon in the first place. So we must give them a goal, a job to do. And it must be a job that will contribute to scientific and military colonization of the moon.” He acknowledged the financial cost, noting that “to make this trip possible the effort will tax a good segment of American industrial capacity and will cost a vast sum of money. [...] But there is one thing that would cost even more. That would be the failure to be first on the moon.”¹⁸⁰ Many of these ideas may seem profoundly unrealistic. But Boushey’s efforts indicate his genuine belief in the outlook he espoused.

Writing as Boushey’s paladin, Singer rued that “the American public” had, in the two years since Sputnik, “settled back into a complacency only somewhat less rigid than that of the pre-Sputnik era.” Singer quoted Boushey extensively, raising the specter of his critics only to dispel their objections. “It is hard to escape the conclusion that there is military sense to General Boushey’s concept of a lunar-based missile force,” Singer asserted.¹⁸¹

¹⁷⁹ Brigadier General Homer A. Boushey, “Blueprints for Space,” *Air University Quarterly Review* Vol XI No 1 (Washington, DC: GPO, Spring 1959), pp30-37.

¹⁸⁰ Brigadier General Homer A. Boushey, “Blueprints for Space,” *Air University Quarterly Review* Vol XI No 1 (Washington, DC: GPO, Spring 1959), pp30-37.

¹⁸¹ Lt Colonel S.E. Singer, “The Military Potential of the Moon,” *Air University Quarterly Review* Vol XI No 2 (Washington, DC: GPO, Summer 1959), pp31-53.

A particular brand of optimism, juxtaposed with pessimism, saturates both of these essays and is evident in the Air Force's approach to space during this era. On one hand, fulfillment of the tasks necessary for space exploration – and exploitation – were deemed solvable, and often were presumed to be potentially *simple*. This may seem unbelievable to ears for which “rocket science,” which the Dyna-Soar, lunar, and other projects indisputably were about, is taken to denote the *opposite* of simplicity. Yet Boushey, for instance, wrote that “it is hoped that free oxygen in the Martian air will be available, and *perhaps the atmosphere will be of such composition that one only needs to compress it for use by man. Water is probably present in sufficient quantity*” [italics added]. Singer acknowledged that the moon lacked air or atmosphere, but in a strikingly similar optimistic note, he suggested that the lack of an atmosphere would reduce the damage wrought by an enemy nuclear strike on a lunar base.¹⁸² Singer soon even went further:

It is possible that the topographic features of the moon, its many craters and clefts, would provide a very large number of potential [missile launch] sites requiring little or no additional construction [...]. The moon is not nearly so barren as it seems. [...] It then becomes possible to consider the cost of earth-to-moon hauling as a capital investment that could yield rich profits and therefore could be amortized over a long period of time. In economic terms, a lunar autarky is thus conceivable.¹⁸³

The biological needs of interplanetary Aerospace Force personnel, the positioning and use of lunar ballistic missiles, even the cost of such a project (Singer argued that “cost is a relative and elusive yardstick”) – all of these factors seemed not only solvable, but *potentially self-solving!*

“There must be a somewhat visionary or even fanciful approach to the future as well as a conventional one,” Singer wrote, aiming to justify some of these rather wild anticipations. The optimism in each of these assertions is striking, and their cumulative effect is almost overpowering. These authors, and their audiences to whom they repeatedly spoke and wrote, imbibed a fantastic degree of optimism about how effectively space exploitation might be achieved.

¹⁸² Brigadier General Homer A. Boushey, “Blueprints for Space,” *Air University Quarterly Review* Vol XI No 1 (Washington, DC: GPO, Spring 1959), pp30-37. Lt Colonel S.E. Singer, “The Military Potential of the Moon,” *Air University Quarterly Review* Vol XI No 2 (Washington, DC: GPO, Summer 1959), pp31-53.

¹⁸³ Lt Colonel S.E. Singer, “The Military Potential of the Moon,” *Air University Quarterly Review* Vol XI No 2 (Washington, DC: GPO, Summer 1959), pp31-53.

And yet an intensely real pessimism was very present too. Singer argued that the case for lunar missile forces as almost inescapable. Boushey dubbed the military exploitation of space an “overwhelming urgency.” This pessimism was the other side of the same coin. Boushey wrote that “one thing is certain: for each new offensive weapon, a military opponent will attempt to provide a defensive or counterweapon. [...] Each new fantastic space weapon will probably generate a requirement for an equally fantastic defensive weapon.”¹⁸⁴

The race would not find an ultimate, end, point. The present day was one moment within a spiral. LeMay would make similar points in addresses during which he indicated that he did not expect nuclear weapons to be “ultimate” – the process was not a finite one, because while the security needs continued the threat transformed. War is interaction. So is cold war.

Aerospace proponents also added a note to the emerging debate about limited warfare.

Critics of President Eisenhower’s New Look and its reliance on nuclear retaliatory power had voiced concerns throughout his tenure, but these criticisms gained traction in his second term. Critics from the services, such as the freshly retired former Army Chief of Staff General Maxwell Taylor, advocated a “flexible response” as an alternative to the rigidity implicit in Eisenhower’s policy of massive retaliation. Eisenhower’s policy emphasis on nuclear weapons and deterrence, combined with his awareness of the dangers connected with federal deficits, had bitten deeply into conventional forces’ budgets in general and the Army’s notably. By preparing for a range of conflicts, Taylor argued, the United States could more effectively counter aggression; revitalizing the conventional forces stood prominently in this outlook. Taylor retired in July 1959 and published *The Uncertain Trumpet* outlining this plan in January 1960.

Taylor’s perspective proved influential, but his was not the only significant voice advocating an increased limited war capability, and advocates of “limited war” hypothesized that war in different terms. In *Nuclear Weapons and Foreign Policy*, academic and think-tanker Henry Kissinger had reminded

¹⁸⁴ Brigadier General Homer A. Boushey, “Blueprints for Space,” *Air University Quarterly Review* Vol XI No 1 (Washington, DC: GPO, Spring 1959), pp30-37.

readers immediately before Sputnik that, although “the renunciation of total victory is repugnant to our military thought,” general war “constitutes a special case” and is “far from being the ‘normal’ form of conflict.” Adherence to general war would in the long run inhibit US policymaking.¹⁸⁵ The alternative which Kissinger urged was the willingness to engage in limited war. “Limited war has become the form of conflict which enables us to derive the greatest strategic advantage from our industrial potential. [...] Thus the argument that limited war may turn into a contest of attrition is in fact an argument in favor of a strategy of limited war. A war of attrition is the one war the Soviet bloc could not win.”¹⁸⁶

For his part, Eisenhower agreed that the Soviet Union could not bear a long-term competition, and this assumption stood at the heart of the President’s Long Haul approach to the Cold War. Containment policy in general had presumed that a determined non-Communist world could outlast the Soviet bloc, provided that Communist aggressions could be successfully parried. In short, Kissinger’s belief that the United States could outlast the Soviet Union lacked originality. Kissinger’s claim that the United States could outlast the USSR through attritional warfare would remain technically an untested thesis, though the national frustration in Vietnam would later throw enormous doubt on such a presumption. Also significant was that Kissinger joined the ranks of those who envisioned a potential for limited nuclear war, and his 1957 book includes consideration of how a nuclear battlefield and war might be geographically and politically contained. Some in the Air Force similarly sought to find ways in which “nominal-yield nuclear weapons” might be profitably employed, since “we must not deprive ourselves of the unique advantages offered by imaginative employment of nuclear weapons.”¹⁸⁷

A very different, but still fantastic, vision of limited war appeared from some corners in the Air Force. Singer’s Summer 1959 article had proclaimed that, “since Korea the term ‘limited war’ has enjoyed great popularity.” Like Kissinger, Singer explained that limited wars had in fact been a mainstay in history. “David and Goliath fought a limited war, though larger forces were available to settle the issue

¹⁸⁵ Kissinger, Henry, *Nuclear Weapons and Foreign Policy* (New York: Harper & Brothers, 1957), 86, 130.

¹⁸⁶ Kissinger, Henry, *Nuclear Weapons and Foreign Policy* (New York: Harper & Brothers, 1957), 156.

¹⁸⁷ General Frederic H. Smith, “Nuclear Weapons and Limited War,” *Air University Quarterly Review* Vol XII No 1 (Washington, DC: GPO, Spring 1960), pp3-27.

at stake. [...] The history of warfare is a history of limited wars. Whether this has owed more to man's inability to wage truly total war than to his desire not to is surely debatable. Modern nuclear warfare makes this issue irrelevant," since nuclear weapons introduced that capacity. This, and "the possibility of miscalculation make limitation a doubtful and dangerous concept."¹⁸⁸

But Singer did not banish the thought – indeed, he aimed to salvage it! He explained:

Space warfare as a form of limited warfare is a possible solution to this dilemma, and the moon and its environs are close enough to the prospective combatants to be convenient but far enough from the inhabitants of earth to ensure their safety.

At first blush the use of the moon as a locale for conducting limited war is surely somewhat fantastic. The possible annihilation of mankind in a total nuclear war is also fantastic. Perhaps a fantastic problem requires a fantastic solution.¹⁸⁹

A contemporary Air Force history of its space efforts quickly echoed Singer's enunciation that space might provide a realm in which a cold war could become hot without leading to catastrophe on Earth. The history, written by Max Rosenberg, explained that "an ideal deterrent" would be "a self-contained, manned military space force with multimission capabilities, dispersed in the cislunar and translunar regions." It continued that "elimination of this force by the enemy would be prerequisite to attacking the nation, and the outcome of the aerospace battle could well be decisive without involving surface forces."¹⁹⁰

First, it should be noted that the history's claim about a decisive aerospace conflict making the potential of surface forces moot is a page torn directly from the earliest and most ardent airpower advocates, dating to Giulio Douhet before the First World War. Second, in spite of the parallel outlook between Singer's article and Rosenberg's history, the locus of battle is different. Singer looked to the moon, as Boushey had. Rosenberg described a manned space force equipped with multimission (and presumably multiorbital) military (and potentially weaponized) systems. Rosenberg's depiction sounds much more like the realm and role intended for the Dyna-Soar.

¹⁸⁸ Lt Colonel S.E. Singer, "The Military Potential of the Moon," *Air University Quarterly Review* Vol XI No 2 (Washington, DC: GPO, Summer 1959), pp31-53.

¹⁸⁹ Lt Colonel S.E. Singer, "The Military Potential of the Moon," *Air University Quarterly Review* Vol XI No 2 (Washington, DC: GPO, Summer 1959), pp31-53.

¹⁹⁰ Rosenberg, Max. *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 21-2.

Lunar goals captured attention, but the Dyna-Soar and other projects had not escaped the frictions between the Air Force and the civilian agencies which the service identified as rivals in the space realm.

The satellite programs provided examples. In June, 1959, the ARPA informed the Air Force that some funds previously slated for SAMOS and MIDAS would be lost to other space projects instead. Simultaneously, the ARPA “directed a major technical reorientation of Samos” and rejected an Air Force plan for MIDAS’s second phase of development. The Air Force regained managerial control over these projects as well as of Discoverer,¹⁹¹ the continually resliced satellite project which was secretly to carry CORONA reconnaissance capability, though this was not information to which the Air Force was to be privy.

Eisenhower’s reorganization of the defense structure in 1958 prompted the creation of a Directory for Defense Research and Engineering (DDR&E), to be headed by Herbert York. The “DDR&E claimed that it was not logical to formulate a long-range military space program separate and distinct from the overall defense program,” since in its eyes the military’s use of space depending on space offering a more effective way to accomplish objectives. This decision, however, prevented the Air Force from presenting its space projects (and their proposed budgets) to Congress as a unified space program; it will be remembered, however, that Air Force work throughout 1958 indicated that the service did think in just such terms of a space program.¹⁹²

The Air Force chafed at the way in which the reorganization had introduced new layers of civilian authority, such as the DDR&E, and civilian rivals such as the NASA (created from the NACA by the space act of the same year), and the ARPA which stood ominously in a position both as an authority and as a sort of rival. Rosenberg explained that “the Air Force retained responsibility for determining requirements to satisfy its assigned mission but had to persuade higher echelons to approve, fund, and

¹⁹¹ Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 31.

¹⁹² Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 8.

assign the projects necessary to meet these requirements.” General Roscoe Wilson, Deputy Chief of Staff for Development, feared that ““all services will bog down in red tape.””¹⁹³

With respect to the Dyna-Soar, Air Force planners had sought late in 1958 to prevent the outright seizure of the program. To the space-hungry ARPA, they characterized the Dyna-Soar I as a hypersonic high-altitude sub-orbital research vehicle preceding the Dyna-Soar II and Dyna-Soar III weapons systems. As mentioned earlier, the Dyna-Soar I was not lost as the Man in Space (Mercury) had been. But the Air Force had perhaps been too clever by half. In mid-April 1959, York directed what Rosenberg correctly described as “certain fundamental changes.” The Dyna-Soar I would now focus on hypersonic flight at a velocity up to 22,000 feet per second (15,000 miles per hour). The testing of an orbital capability and progress on military subsystems could occur *only* if these activities did not interfere with its redefined focus on manned, hypersonic, maneuverable research.¹⁹⁴ The Air Force could keep the Dyna-Soar. But York’s directive had transformed the Air Force’s *raison d’etre* for the Dyna-Soar into an incidental goal.

Air Force Magazine editor Claude Witze encouraged top Air Force generals when he forwarded the NASA’s December 8 answers to several of his questions. “There is no desire, or intention, on the part of NASA management to expand the civilian space agency’s role” to the extreme detriment of the military, the NASA assured readers. “It is necessary for NASA to demonstrate [...] and for the Military Services to recognize [...] that the civilian agency is not competing with the Military Services. There needs to be the same interchange of information, the same harmony, between DOD and NASA, as existed between DOD and NACA.”¹⁹⁵

And yet, despite the bold claims and the urgent calls, despite the NASA’s assurance of respect for the military, and despite the Air Force’s regaining remnants of its envisioned space program, little tangible progress toward military use of space – according to how the Air Force intended that use to be –

¹⁹³ Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 27.

¹⁹⁴ Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 46-7.

¹⁹⁵ Memo from White to AFCCS, “Relations with NASA,” Dec 15, 1959. Fldr NASA, Box 28, White Papers, Library of Congress.

manifested itself during this period. Many bold claims rested more on hope than on evidence, and optimistic visions of panacea aerospace programs could make the service's aerospace vision seem hazy, ill-defined, and impractical. Influential forces in that service aimed to address these issues. They believed that the answer lay in refining the goals and the methods by which the potentials of U.S. aerospace power might be realized.

Lack of technical progress certainly had characterized the Dyna-Soar's history in 1959. Rosenberg noted that "the Air Force accomplished little in the way of developing Dyna-Soar I" because "most of 1959-60 was spent in resolving technical and managerial questions." Furthermore, the Air Force's attempt to save its boost-glider from ARPA acquisition had not entirely succeeded: "ARPA took over direction of the small study effort on an orbital Dyna-Soar weapon system."¹⁹⁶ While a functioning boost-glider obviously stood as a prerequisite for a weapon system, the Air Force's real interest had been in the latter, and for this the ARPA had introduced its authority.

Charyk, having been directed by White the previous month to "put all of this in context" about the Dyna-Soar, established a new study of the boost-glider in mid-November 1959. This study, Project Alpha, emphasized "the identification and solutions of technical problems" and saw the Dyna-Soar I's objective as answering technical questions. Ordered on November 23, it "prohibited the obligation of more than three or four million dollars for Dyna Soar until [Charyk] had approved detailed financial plans and work statements," starting with the Phase Alpha study.¹⁹⁷

Within the USAF SAB's Aero and Space Vehicles Panel, the Dyna-Soar encountered criticism from Alfred J. Eggers, who argued that wing weight detracted from payload capacity and that therefore a semi-ballistic model offered more efficient means of placing payloads into orbit. The Panel wanted Phase Alpha to address the aerodynamic concerns (to vanquish the proposed ballistic and lifting-body alternative concepts) which threatened the Dyna-Soar. Panel Chairman Courtland D. Perkins (who was also chairman of Princeton University Aeronautical Engineering Department) confided to the Panel "that

¹⁹⁶ Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 46.

¹⁹⁷ Houchin, *US Hypersonic Research*, 122-4; Apr-60 K140.8636-4

‘Dyna-Soar at this point was easily killable,’ but, because Air Force leaders wanted Dyna-Soar, ‘the [USAF] SAB should help [the] USAF [retain it].’¹⁹⁸

As demonstrated by White’s memos in October, top Air Force leaders did indeed want the Dyna-Soar. The service included those who saw Charyk’s insertion of a Phase Alpha study as an annoyance and a burden. Less than a month after the study’s creation, an Air Force report on the “Status of Dyna Soar” rued that program funding had been held up until Alpha’s completion, and that “results of Phase Alpha will not be available before 15 March 1960 [...] Phase Alpha will delay the Dyna Soar development by not less than three months.” This prospect prompted White to scrawl a note beneath the report, “Gen LeMay: Please follow up on this & give me a run down on what we must do. Talk to Charyk.”¹⁹⁹

Dyna-Soar maintained its prominent place in the minds of Air Force planners while work on Phase Alpha proceeded. An “Importance Category List” outlined the service’s highest priority advanced development projects: an advanced ballistic missile, the 117L satellite, the X-15, the Dyna-Soar, the 638A ALBM (Skybolt Air Launched Ballistic Missile), and SPAD (Space Patrol and Defense). The report noted that Category I projects such as those above constituted “those operational systems which are vital to the survival of the nation and those advanced systems which provide technological capabilities vital to the development of future Air Force systems.”²⁰⁰

Air Force determination to combine air and space extended not just among the contemporary Air Force leaders but also among their former colleagues. In March 1960, retired Lieutenant General Ennis Whitehead wrote a personal letter to Chief of Staff White. “There will be much argument over the term AEROSPACE. It may end up AIR*SPACE as the aeroplane ended up the airplane in common usage. *I believe that I shall live to see the time when Strategic Air Command is renamed Strategic Air-Space*

¹⁹⁸ Houchin, *US Hypersonic Research*, 122-4

¹⁹⁹ “Status of Dyna Soar,” Dec 15, 1959. Fldr 4-5 Missiles/Space/Nuclear, Box 36, White Papers, Library of Congress.

²⁰⁰ Memo to White, “Importance Category List,” Feb 5, 1960. Fldr 5-1 Air Force Council (Folder #1) Jan-June 1960 correspondence, Box 36, White Papers, Library of Congress.

Command. A name is important if one is to identify his service and its mission clearly to laymen” [italics added].²⁰¹

New “aerospace” doctrine rolled out on December 1, 1959. In a real sense, this edition of the basic Air Force doctrinal manual (AFM 1-2) enshrined the term with fanfare rather than in true elucidative detail for contemporary personnel. Aerospace was decreed to constitute “an operationally indivisible medium consisting of the total expanse beyond the earth’s surface.” Air Force forces were deemed to “comprise a family of operating systems,” utilizing the six features of flight in this extended realm (range, mobility, flexibility, speed, penetrative ability, and firepower delivery). The manual emphasized the linkage between the continuity of aerospace and the flexibility offered by the extended realm, and the importance of maintaining the initiative which enabled that flexibility to be brought to bear to preserve national security. The manual closed by asserting that the “nation, or group of nations, which maintains predominance in the aerospace – not only in its military forces but also in its sciences and technologies – will have the means to prevail in conflict.”²⁰²

Earlier studies have aptly noted that the 1959 version AFM 1-2 that, apart from a definition of “aerospace” as “the total expanse beyond the earth’s surface[,] [n]o further mention of space operations was included.”²⁰³ However, while the new manual presented one extremely overt change in terminology, it also sought to place this change as an accomplished fact. The employment of past tense, as in, “aerospace vehicles and new weapons have provided these forces with the ability to concentrate decisive striking power upon selected targets,” demonstrated this [italics added].²⁰⁴ By using “aerospace” to encompass the *entire* realm of flight, the Air Force had as already mentioned sought to preclude the arbitrary establishment of “space” as a realm in which US defense requirements might be radically redefined and Air Force expansion prohibited. However, the broad definition of aerospace followed a

²⁰¹ Letter from Ennis C. Whitehead to White, March 6, 1960. Fldr 4-5 Missiles/Space/Nuclear, Box 36, White Papers, Library of Congress.

²⁰² “United States Air Force Basic Doctrine AFM 1-2AFM 1-2,” (December 1, 1959), 6-8, 13.

²⁰³ Newberry, Major Robert D., “Space Doctrine for the 21st Century,” <http://www.au.af.mil/au/awc/awcgate/acsc/97-0427.pdf> (accessed November 26, 2011).

²⁰⁴ “United States Air Force Basic Doctrine AFM 1-2AFM 1-2,” (December 1, 1959), 8.

second purpose as well. Embracing atmospheric flight meant that, in rhetorical terms, every plane in the military arsenal had already demonstrated the value of aerospace power. Given this premise, aerospace power could be described in past tense terms as an accomplished fact, and not as a revolutionary assertion or a service power grab. Air Force leaders, bent on preserving national security - in the face of existential Soviet challenge - through the potency of their military branch, would not have interpreted their efforts as craven bids to extend service interests anyway.

The Dyna-Soar lay, during this time, at the core of Air Force leaders' aspirations and plans for the nation's defense through aerospace. It is certainly tempting to read such references to aerospace, and to space in particular, and to the Dyna-Soar program, and conclude that it lay at the core of the Air Force's aerospace aspirations. Did other programs compete for planners' affinities? The answer is that some programs did command significant attention and inspire real hope and effort. Pivotal Air Force leaders, in the closing years of the Eisenhower administration, believed that the Dyna-Soar would hold the key to US security by establishing aerospace defense and by maintaining and extending the deterrent power which seemed crucial in preventing Soviet aggression and general war.

Documents from March 1960, just as Phase Alpha promised to give way to renewed work on the Dyna-Soar, substantiate the idea that the Dyna-Soar figured centrally in the minds of top Air Force generals contemplating the future. Lieutenant General Dean Strother, acting chairman of the Air Force Council, reported to White about the satellite interceptor project known as "SAINT." "An orbital based tracking capability, and probably an offensive capability, are prerequisites to Air Force achievement of an effective active ballistic missile defense capability. The Satellite Intercept and Inspection (SAINT) demonstration is an advanced research exploration that would furnish considerable information to assist in making future space decisions," Strother wrote. He indicated that the Air Force should present its views as cooperative with the ARPA so that the Air Force might be confirmed "as the agency to conduct the demonstration" of the project. SAINT would be orbital, able to inspect and rendezvous with satellites and was to possess a "kill-on-command capability." Even so, Strother recommended to White that "the

SAINT program should be placed in Category II of the Advanced Systems Importance Category List in order to provide technical capabilities which will be required for future operational capability.”²⁰⁵ The Air Force deemed its Category II priorities as “essential,” but time was a less pressing factor than for Category I projects.²⁰⁶ SAINT was important, and valued. But Air Force leaders considered the Dyna-Soar more important.

Strother confirmed this in another memo, anticipating the future cold war threat. “The offensive aerospace threat in the 1960-63 period will include a mixed force of ICBM’s (250 in mid-1961), and bombers (1250), some armed with air-to-surface missiles.” This expectation, like other Air Force predictions of Soviet strategic strength, was overblown, especially with respect to the idea of an enormous Soviet bomber force. “It is expected during the 1964-70 period that Soviet reconnaissance and warning satellites will be fully operational, as well as manned maneuverable space vehicles, manned lunar satellites *and possibly boost-glide vehicles*” [italics added].²⁰⁷

In short, the US Air Force needed a Dyna-Soar because the Soviets were feared to be at work on one of their own. It would not be the only time that a defense project was propelled by fears, even false fears, that the enemy had stealthily stolen a march on developing some new weapon. Since the “bomber gap” in 1954, the Air Force overestimated Soviet advanced bomber development and strength fairly consistently. The Spring 1959 issue of *Air Force Quarterly Review* had voiced concern of Soviet interest in a Dyna-Soar-type weapons system. Dr. Kenneth R. Whiting explored “Past and Present Soviet Military

²⁰⁵ Memo for White, “SAINT Program,” Mar 25, 1960. Fldr 5-1 Air Force Council (Folder #1) Jan-June 1960 correspondence, Box 36, White Papers, Library of Congress.

²⁰⁶ “Importance Category I includes operational systems vital to national survival, and advanced systems required to provide technical capabilities vital to the development of future Air Force systems. Resources are applied to insure attainment of operational or technical capability on the date specified insofar as program approval by higher authority permits. Importance Category II includes operational systems considered an essential element of the nation’s strength and advanced systems required to provide technical capabilities essential to the development of future Air Force systems, the lack of which will result in critical degradation of a future operational capability. Resources are applied to insure the attainment of an operational or technical capability but not necessarily on the date specified.” “Importance Category Lists,” August 1, 1960, Air Force Council (Folder #2) Jul-Dec 1960 Correspondence, box 36, White papers, Library of Congress.

²⁰⁷ Memo for White, “The Threat,” Mar 27, 1960. Fldr 5-1 Air Force Council (Folder #1) Jan-June 1960 correspondence, Box 36, White Papers, Library of Congress.

Doctrine.” He pointed to a second-hand, but chilling, story by the Soviet aeronautical engineer Lieutenant Colonel Grigori Alexandrovich Tokaev.

Tokaev abandoned the Soviet Union for the West in 1947, telling his hosts that he had been put in control of the Soviet counterpart to Operation Paperclip, the effort to capture, collect, and utilize Nazi rocket scientists. Shortly before his defection, “Stalin interrogated him very closely on the Sanger Project. This concerned a German engineer’s plan for an aircraft with better than intercontinental range,” Whiting explained. It will be remembered that Dornberger’s advocacy for boost-glide vehicles had found inspiration in the “Sanger Project,” and that Bell had adopted Dornberger’s idea and its work led directly to the Dyna-Soar. In his article, Whiting quoted Tokaev, who in turn claimed to be quoting Stalin: “We need aircraft of the Sanger type and, if this project can be realized in practice, we must do it. If we have such an aircraft, it will be easier to talk to Truman. We may be able to quiet him down.”²⁰⁸

Phase Alpha concluded, and in the spring of 1960 work on the American Dyna-Soar could begin to engage as authorities gave their stamps of approval, allowing use of the program’s funds. This progress came as welcome news, in stark contrast to the uncertainty which had characterized the period of Phase Alpha scrutiny. One program status report in mid-December 1959 had identified Dyna-Soar as “an experimental prototype for follow-on operational exploitation of [...] boost glide flight or orbital space flight. System vehicles could be manned or unmanned.” This description fit poorly with the Air Force’s preferred vision of the program! Status reports from subsequent months show that the program recovered its footing, even if time was lost. A “full scale, but lightened” and unmanned vehicle would be tested first, and then progressively larger boosters would be employed to lift the Dyna-Soar to orbital altitudes and allow piloted, maneuverable return.²⁰⁹ The Air Staff reviewed Phase Alpha in early April, then

²⁰⁸ Dr Kenneth R. Whiting, “The Past and Present of Soviet Military Doctrine,” *Air University Quarterly Review* Vol XI No 1 (Washington, DC: GPO, Spring 1959), pp38-60.

²⁰⁹ “Current Status Report: System 464L – Dyna Soar,” Dec 18, 1959. K140.8636-4 AFHRA. “Current Status Report: 620A Dyna Soar,” Feb 1960. K140.8636-4 AFHRA. “Current Status Report: 620A Dyna Soar,” April 1960. K140.8636-4 AFHRA. “Dyna Soar Study Phase Completed: Funds Released for Development,” April 27, 1960. K140.8636-4 AFHRA.

passed it forward to the Under Secretary of the Air Force and then on to DDR&E York, who approved the program on April 22.²¹⁰ 1960 was shaping up to be an eventful year.

Strother synthesized the Phase Alpha results for White. First, the study had “provided a better understanding of the re-entry vehicle spectrum in relation to Dyna-Soar.” This alluded to the work done to answer Eggers’ questioning of the efficiency of the boost-glide concept. Second, the study had “confirmed that all of the vehicles involved will require additional development effort.” The technical challenges involved indeed could only be described as profoundly formidable, and even the comparatively simple (and non-maneuverable) manned ballistic re-entry technique would not be accomplished *by anyone* for another year.²¹¹ Third, Phase Alpha had “validated that the winged glider approach will satisfy Dyna Soar objectives and is compatible with the Scientific Advisory Board recommendations.” Last, the study “lends additional confidence to the initiation of the development effort.”²¹²

Strother, in some ways, reported a glass half full. Phase Alpha had dominated the Dyna-Soar’s calendar since November 17, 1959. Now on April 7, 1960, the readjusted cost estimate for the Dyna-Soar I stood higher than the optimistic estimates from before Alpha. Dyna-Soar I was set to cost \$493.6 million, a nearly 25% increase from the earlier estimate of \$397 million. Strother noted that the cost estimate for Dyna-Soar II had remained steady.²¹³ But the Dyna-Soar program head engineer and program director, Bill Lamar and Colonel Walter Moore respectively, had also altered the development plan. Step II would be split into two portions. Houchin explained that IIA “would be to gather data on orbital velocities with an upgraded or new booster,” while IIB “would provide an interim military system capable of operational reconnaissance and satellite inspection.” Step III remained the operational

²¹⁰ “Abbreviated System Development Plan,” May 5, 1960, *Dyna-Soar: Hypersonic Strategic Weapons System*, ed. Godwin (Burlington, Ontario, Canada: Apogee Books, 2003), p117-9.

²¹¹ This was Alan Shepard’s non-orbital ride and return from a ballistic path to space on May 5, 1961. Cosmonaut Yuri Gagarin had undergone a multiorbital trip in space on April 12, but the Soviet system could not support a manned re-entry, so he was obliged to evacuate the craft and parachute separately from his craft, *Vostok I*.

²¹² Memo to White, “Dyna Soar – Phase Alpha Study.” Fldr 5-1 Air Force Council (Folder #1) Jan-June 1960 correspondence, Box 36, White Papers, Library of Congress.

²¹³ Memo to White, “Dyna Soar – Phase Alpha Study.” Fldr 5-1 Air Force Council (Folder #1) Jan-June 1960 correspondence, Box 36, White Papers, Library of Congress.

weapons system, to be capable of orbital bombardment missions. Moore “only outlined the last two steps,” Houchin explained, because he was “sensitive to the concerns of Charyk and York.”²¹⁴

Moore was likely right to be sensitive. Weeks later, in mid-June, DDR&E York gave his formal approval of feasibility work on the SAINT program, which Strother’s memo indicated was important to the Air Force but less urgent than the Dyna-Soar. In mid-July, Charyk “directed that all references to a ‘kill’ capability in the system be eliminated, restricting technical effort to inspection functions only.” Contemporary Air Force historian Max Rosenberg recognized this as being “related to the President’s ‘Space for Peace’ program.” Still referred to as the SAINT, the project was now the “Satellite *Inspector*,” – not the “Satellite *Interceptor*.”²¹⁵

The limited thrust of contemporary boosters also posed a challenge. Weight estimates for the Dyna-Soar tended to stand around 10,000 pounds, and talks between the OSD and the NASA threatened to preclude the Air Force’s developing big boosters capable of lifting such heavy loads with the force necessary to achieve orbital speed. Air Force leaders recognized the booster problem, not only in terms of insufficient thrust but also in terms of daunting cost; they noted that “there should be increased effort to reduce booster costs, since those costs will be a large item of expense in any active space defense system.”²¹⁶

Defense Department officials officially endorsed the Dyna-Soar’s new development plan in late April. But York, not convinced of a military need for a boost-glide weapon system, reiterated his now year-old guidance that the Dyna-Soar I focus on hypersonic flight research and that military subsystems testing not be allowed to hamper the priorities which he had set for it.²¹⁷

The Air Force noted York’s disposition regarding space policy. In mid-1960, Chief of Staff White received a “Brief on NASA,” prepared by NASA historian Eugene M. Emme. Emme, who was also a

²¹⁴ Houchin, *US Hypersonic Research and Development*, 127.

²¹⁵ Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 42.

²¹⁶ Memo for White, “Space Defense, FY 1961-1970.” Fldr 5-1 Air Force Council (Folder #1) Jan-June 1960 correspondence, Box 36, White Papers, Library of Congress.

²¹⁷ Houchin, *US Hypersonic Research and Development*, 128.

Major in the Air Force Reserve, could provide an important perspective; he paid attention to explaining York's outlook. York had elucidated this outlook to a Senate hearing, and Emme briefed White on the trajectory of York's thinking:

Considering the nature of our space objectives, it is not logical to formulate a long range military space program which is separate and distinct from the over-all defense program. [...] He [York] emphasized that, at the present time, the Department of Defense space was concentrating on those space oriented weapon systems which were capable of reconnaissance and of securing information rather than on system developments in the Defense and Offense area. He explained that there were no Offense or Defense space systems presently contemplated which could accomplish military objectives more efficiently than ICBMs. [...] Dr York stated that the Department of Defense does not have a ten year space program similar to the one presented to the Committee by NASA.²¹⁸

Several important points appear in York's summarized statements. First, it discounted the Dyna-Soar – something entirely in keeping with what one might expect of York, given his attempts to tolerate it as a scientific vehicle while clipping its weapon-related wings. Second, York's statements about reconnaissance and information, while possibly not obvious to the contemporary public, indicated the government's belief that space offered more in terms of information-gathering than of war-fighting. While members of the Air Force were increasingly being shut out from awareness of the very existence of reconnaissance projects, York's statement spoke greater truth than was then necessarily apparent.

Third, crucially, York asserted that space-based weapons could accomplish nothing more efficiently than ICBMs could. In objective contemporary terms, this was unassailably correct. But it carried less water from the Air Force's vantage point: that overwhelming retaliatory capacity provided national security, and that a diverse deterrent force was a vital element in guaranteeing that the enemy could not feel comfortable with the concept of aggression. Faith in technology means expecting that technology will solve problems, and technological enthusiasts will readily recognize that the high-tech problem they point at the antagonist may well be answered with a high-tech solution developed in reply. The ICBM was the high-tech problem of the day, but the catapult, the cannon, and myriad other weapons had risen before, and each had been answered. Technology-minded airmen did not feel comfortable trusting national security to an "ultimate weapon," and indeed LeMay publicly rejected the idea that such a

²¹⁸ Maj Eugene M. Emme, "Brief on NASA," Spring 1960. K140.8636-5 AFHRA.

weapon even existed. Circumstantial evidence seemed to suggest that the development of the sword would inspire the invention of the shield; this was not a new idea in 1960, and it did not disappear afterward.

Emme noted that Schriever, too, had spoken. Schriever told Senators that Defense and NASA needs diverged, and for important reasons they were bound to diverge dramatically as space exploration went forward. To provide defense, the military would need large numbers of vehicles, whose operational lives would need to be relatively long. Systems would need to be simple (and rugged), and frequency of missions would demand that launch costs be kept down. Time was a vital element in defense, so military vehicles needed to be available with little warning. Scientists, Schriever noted, faced different challenges: vehicles would carry differing payloads from one mission to another, but fewer vehicles would be needed, their systems could afford to be more complicated, vehicle life did not need to be very long if one-use capsules were used (as Mercury and the nascent Apollo programs indeed envisioned). And of course the time element in science answered to completely different imperatives than it did in war.²¹⁹

The loquacious Boushey enunciated some of this in 1960 as well, and Boushey had connected his points specifically to the Dyna-Soar. “An essential ingredient of these systems will be some device that can return man from orbital flight in a routine, nonadventurous manner that can be supported operationally. [...] It is this essential capability that is sought in Dyna-Soar.” The “Dyna-Soar must be maneuverable not only for providing flexibility of operation but also as a corollary to its data acquisition of capability. Dyna-Soar must be able to test military equipment and the machine relationship. Dyna-Soar must achieve orbital capability.”²²⁰ Boushey spoke directly to the Air Force’s idea for the Dyna-Soar, and his description stood conspicuously distinct from the profile which York had outlined since April 1959.

²¹⁹ Maj Eugene M. Emme, “Brief on NASA,” Spring 1960. K140.8636-5 AFHRA.

²²⁰ Booklet on Dyna-Soar, about April 1960. K140.8636-4 AFHRA.

Boushey continued, drawing an overt link between the Dyna-Soar pioneering aerospace and the first flight to pioneer airspace:

Just as the Wright Brothers in their time could not imagine planes like the B-70 or modern jet transports, so it seems that man today cannot imagine the extent to which space flight will be used. The things that can be done now are rigidly restricted by the trust and the large cost of the boosters that are available. Dyna-Soar is one of the steps toward that future.²²¹ Despite Air Force rhetoric, vision, and dreams, that concept depended on several uncertain and interconnected elements: principally technological capacity, policy support, and the financial support. The future is not fate. Events closer to earth would take a hand in shaping the future as well.

An “omen” is easier to spot (with accuracy) when seen in retrospect.

Defeating stunning scientific and technological challenges were prerequisites before the Dyna-Soar could successfully fulfill its intended operational role. But its supporters generally seemed confident that these hurdles could be met. In the middle of 1960, one significant lapse in confidence appeared. Program Review Exercise 62-E aimed to determine the Air Force’s fiscal year 1961 and 1962 budget needs, and to identify specific programs meriting emphasis. Three months of work went into the Review, and the Air Force Council deliberated the findings on May 23 and 24, at which point Vice Chief of Staff LeMay reported to Chief of Staff White.

Deterrent capacity retained priority, but in the Review LeMay did acknowledge funds to be finite and specific priorities to be necessary. The Review emphasized “1965 as the key year when it can be anticipated that heavy funding will begin for those operational systems such as Dyna-Soar, Space Counter Weapon System, SAINT, B-70, and control systems which are initiated in the early sixties.” As such, programs expected to offer operational capability by 1965 would receive priority. The Exercise 62E paperwork explores a wide variety of systems, ranging from strategic bombers to missiles, air-refuel craft to nuclear capable fighters, radars to weather planes. Projections for the Dyna-Soar are included as well, but the study expects the Dyna-Soar to have no operational system by fiscal year 1967; the same was the

²²¹ Booklet on Dyna-Soar, about April 1960. K140.8636-4 AFHRA.

case for projections of the ANP (Aircraft, Nuclear Powered). The study anticipated some operational capacity for B-70, SAINT, and MIDAS by that time, however.²²²

LeMay is popularly known as a staunch advocate of the manned bomber plane, although this text has already explored his support for the Dyna-Soar and he himself suggested that he would be more accurately seen as a *manned aerospace system* advocate. LeMay's statements repeatedly acknowledged the need for a mixed force of manned systems and missiles, and his report on Exercise 62E stood in keeping with this. "For the foreseeable future, a mixed force of missiles and manned aircraft is required. There must be a follow-on capability to the B-52 for finding and eliminating residual targets. However, the Air Force cannot afford a package of B-70, ANP, Phase III Dyna Soar, and a Long Endurance Boundary Layer Control aircraft, all as follow-on systems to the B-52." It was time to prioritize:

It follows that (1) The B-70 appears to be the only weapon system that offers the capability at the time required. Therefore, the B-70 should be reinstated on a Weapon System basis. (2) At this time, manned orbital flight within a weapon system, as represented by Dyna Soar III, must be considered of lesser priority than the B-70 as a manned strategic weapon system. (3) All efforts on a military nuclear powered aircraft should be directed toward a significant improvement of the B-70. This, therefore, means a concentrated, reoriented ANP development effort phased toward a weapon system at a date not later than 1970.²²³

LeMay's system for prioritization followed three major strands of logic: first, resources spread in all directions would constitute waste which civilian bosses would disallow; second, systems incapable of operational status by 1965 claimed less priority; third, hope could be preserved for elements which might be folded into existing systems. As a result, the wish for the ANP could be preserved on the notion that the nuclear engine might someday be dropped into the back of a then-existing B-70 aircraft.

Dyna-Soar's priority slipped behind the B-70, but the author hastens to note that the program was *not* ended, nor was its high priority for research. Indeed, the Dyna-Soar retained its status as a Category I priority for *development* – a different list than the priority list for operational systems. The Dyna-Soar's place in LeMay's mid-1960 report then comes into clearer focus, as the Vice Chief of Staff recognized the program's slow progress as hindering its near-term operational future but the service did not discount the

²²² Memo to White, "Program Review Exercise 62-E," n.d. Fldr 5-1 Air Force Council (Folder #2) correspondence, Box 36, White Papers, Library of Congress.

²²³ Memo to White, "Program Review Exercise 62-E," n.d. Fldr 5-1 Air Force Council (Folder #2) correspondence, Box 36, White Papers, Library of Congress.

Dyna-Soar's future significance. Research continued, in fact, for years. And two other points should be remembered as well. First, Air Force planners felt certain that Charyk's ordering of Phase Alpha had thrown the Dyna-Soar irrevocably behind schedule by three to six months. Second, LeMay prioritized the B-70 in the middle of an election year in which the B-70 program was resuscitated by Eisenhower in an effort to deflect candidate John Kennedy's criticism of Eisenhower and attacks on Vice President Richard Nixon. Even if the Dyna-Soar's footing could be seen as shaky in terms of finance, policy, and technology, the B-70's could hardly be seen as truly secure either.

On May 1, 1960, a former Air Force pilot entered an unusual airplane and flew from Turkey. A Soviet Surface to Air missile cut his mission short, destroyed his plane, and led to Francis Gary Powers's capture by the Soviets.²²⁴ As with other moments significant in space history, military history, and national policymaking, Powers's shootdown and its aftermath made up part of a chain of reactions which would come to impact the Dyna-Soar as well.

In the wake of the U-2 affair, satellites got a boost. Congress pressed for more rapid development of the MIDAS and SAINT satellite systems, even voting sums for the programs in excess of the amounts which the administration had requested.²²⁵ Contrary to contemporary opinion, Eisenhower had not been ignoring the strategic value promised by satellites. Far from it, the administration had been at work to achieve a low-profile satellite reconnaissance capability. The highly secret CORONA program relied on the publicly known DISCOVERER program as a means of hiding, at least from the general public, in plain sight. DISCOVERER satellites had been launched as early as February 1959 to work toward attaining that reconnaissance capability.

By the time of Powers's flight, ten such launchings had been conducted. Events in 1959 had been promising, as the majority of those launched had successfully achieved orbit. The task of recovery introduced new and daunting complications – and complications which would have to be met before

²²⁴ Peebles, Curtis. *Shadow Flights: America's Secret Air War Against the Soviet Union* (Novato CA: Presidio, 2002).

²²⁵ Rosenberg, *The Air Force in Space, 1959-1960* (USAF Historical Division Liaison Office, June 1962), K168.01-7 AFHRA, 33.

DISCOVERER could be a useful platform for CORONA, since any satellite images needed to be recovered before they could be used by policymakers. In this respect, 1960 was going poorly. Early in the year, recovery efforts for a satellite launched in November 1959 failed; DISCOVERER IX was launched on February 4 but failed to orbit, and DISCOVERER X was destroyed seconds after its launch on February 19. Attempts after Powers's interception also proved disappointing: DISCOVERER XI in May could not be recovered, and DISCOVERER XII in June failed to orbit.²²⁶

This trend was happily reversed on August 10-11, 1960. DISCOVERER XIII launched, orbited, and was successfully recovered at sea. The Air Force's Public Affairs fact sheet from day of the launch characterized it as "the most completely instrumented satellite vehicle of this series yet launched into orbit by the US Air Force. The shot has been termed a 'Diagnostic' test." Although acknowledging the recovery objective, the sheet shows a hesitance to anticipate success: The additional telemetering instrumentation placed aboard DISCOVERER XIII may lead the way to solving this very difficult undertaking and should bring us much closer to recovery than we have ever been before," and although recovery attempts would be made, "emphasis during the separation and re-entry sequence [...] will be on diagnosing, through telemetry, exactly what is happening to the capsule."²²⁷

In his own remarks after the satellite's successful recovery, White's description carried a more boastful note. "All of us vividly recall speculation with which the free world met the news of the Russian Sputnik overhead less than three years ago. Let me assure you that the tremendous and complex test successfully made by DISCOVERER XIII is by far a greater single achievement in the technical realm than that of the relatively crude early satellites."²²⁸ The United States now had a clear, spectacular first. The DISCOVERER XIII capsule's retrieval from the waters off Hawaii were "the first time a man made

²²⁶ Memo for White, "Air Force Exploration of Space Capsule," Aug 12, 1960. Fldr 4-6 Information Services Correspondence, Box 36, White Papers, Library of Congress.

²²⁷ "DOD Office of Public Affairs Fact Sheet: Discoverer Program," Aug 10, 1960. Fldr 4-6 Information Services Correspondence, Box 36, White Papers, Library of Congress.

²²⁸ "Remarks by General Thomas D. White, Chief of Staff, USAF," about Aug 12 1960. Fldr 4-6 Information Services Correspondence, Box 36, White Papers, Library of Congress.

object has been retrieved from orbit.”²²⁹ The success of DISCOVERER XIII had not permanently banished setbacks. XIV later that month succeeded in capturing the first photographic intelligence from space, but the next three DISCOVERER missions failed for various reasons.

The Air Force expected space accomplishments to feed one another, building on the corporate knowledge and extending the service’s capability and the nation’s security. The Air Force’s space advocates saw this realm as a frontier without a horizon.

The service greeted the DISCOVERER XIII success with enthusiasm, as indicated by the tone of White’s public announcement. An information memo for White dated August 12, 1960, noted significantly that “the DISCOVERER program is providing vital technical and scientific advances to the whole of aerospace technology.” Elaborating on this point, the memo explained that, “while many of the results of the DISCOVERER program are directed primarily toward applications in the SAMOS and MIDAS programs, the long term benefits of DISCOVERER are serving to increase significantly man’s knowledge of the spatial environment, to enhance his skills and techniques in space operations, and to provide experience in the development and operation of a reliable space vehicle.”²³⁰

The DISCOVERER, in the eyes of Air Force leaders, was as a stepping stone toward greater accomplishments and operations. This opinion was in keeping with the larger approach to technology to which Air Force leaders were committed. The memo to White indicated that “many difficulties, some self-imposed due to the nature of the experiment,” had been overcome, and that,

in general, most of these problems are common to both SAMOS and MIDAS. Problems have been found and solved in a relatively inexpensive system prior to their occurrence in the latter vastly more complex and expensive program. From this viewpoint DISCOVERER is a ‘test bed’ for space programs. [...] The precision components and techniques developed in this aspect of DISCOVERER are directly applicable to SAMOS, MIDAS, and programs with a man-in-space application.²³¹

²²⁹ “Remarks by General Thomas D. White, Chief of Staff, USAF,” about Aug 12 1960. Fldr 4-6 Information Services Correspondence, Box 36, White Papers, Library of Congress.

²³⁰ Memo for White, “Air Force Exploration of Space Capsule,” Aug 12, 1960. Fldr 4-6 Information Services Correspondence, Box 36, White Papers, Library of Congress.

²³¹ Memo for White, “Air Force Exploration of Space Capsule,” Aug 12, 1960. Fldr 4-6 Information Services Correspondence, Box 36, White Papers, Library of Congress.

DISCOVERER accomplishments would not only pave the way for developments in the Air Forces planned reconnaissance and missile detection satellite systems, but also in pioneering human space flight. It will be remembered that the Air Force two years earlier had identified its man-in-space project as a demonstration in preparation for the development of the Dyna-Soar.

But the Air Force's perspective, that technological feats complement further developments, would hit a building wall of secrecy. In a special National Security Council meeting on August 25, 1960, Eisenhower's scientific advisor George Kistiakowsky discussed the freshly successful CORONA (DISCOVERER) and the Air Force's contemporary SAMOS with the President. Six days later, the Office of Missile and Satellite Systems (SAFMS) was created. The SAFMS quickly cut the Air Force out from knowledge of the national reconnaissance projects. "Effective immediately, the satellite reconnaissance program will be managed within the above structure," Air Force Secretary Dudley Sharp directed White on September 13. The Secretary of the Air Force held authority over the Air Force's SAMOS project. The Satellite Reconnaissance Technical Advisory Group and the Satellite Reconnaissance Advisory Council provided their input.²³²

The organizational charts attached to Sharp's September 13 memo indicated that the SAFMS was to be linked directly to the Secretary of the Air Force, thereby looming over the process. Sharp's memo confirmed this, declaring that "there will be no review or approval channels between the Director of the SAMOS Project and the Secretary of the Air Force." This meant more direct civilian control, and it also threatened to exclude Air Force personnel from awareness of their own service's satellite work. Provision was made for information:

²³² "Organization and Functions of the Office of Missile and Satellite Systems," NRO, <http://www.nro.gov/foia/declass/NROStaffRecords/736.PDF> (accessed May 2, 2011). A similar, but more complete, organizational chart is held by the Library of Congress. "Organization and Functions of the Office of Missile and Satellite Systems," attachment, 4-5 Missiles/Space/Nuclear, box 36, White papers, Library of Congress. Strangely, sources cannot agree on who first headed the SAFMS. Houchin, writing about the Dyna-Soar in 2006, identifies Charyk as the first head. The NRO's website identifies Charyk and Richard Bissell as co-directors, but the NRO's website begins its chronology only in September 1961, when SAFMS had become the National Reconnaissance Office (NRO). Meanwhile, the organization chart cited earlier in this footnote points to Brigadier General Richard D. Curtin and is dated September 12, 1960. "NRO Directors," NRO. <http://www.nro.gov/history/directors/dir1.html> (accessed May 2, 2011). This author therefore concludes that SAFMS was headed by Brigadier General Curtin until Charyk and Bissell were handed the organization when it was redubbed NRO.

However, in order to maintain general project knowledge within those command and staff offices where such knowledge is necessary for program support or coordination of related matters, need-to-know briefings will be given by the program management staff. These briefings will be given on a periodic basis, without request, and not as part of Project management actions. All requests for briefings will be directed to the Secretary of the Air Force, and will be approved only on a strict need-to-know basis.²³³

Of course, establishing a “need-to-know” basis for information sharing risks that relevant people and projects may not be deemed to be so. By being kept uninformed, their thoughts and actions will run separate from - and potentially even contradictory to - the policies which they aim to serve.²³⁴

This policy of information exclusion was not accidental. President Eisenhower believed that awareness within the Air Force of the secret CORONA program could well lead to a leak to the public and the world stage. The Air Force’s own satellite reconnaissance program SAMOS might lead to similar effects. As has already been explored, the Air Force had demonstrated a propensity for open and frank discussion of its technological futurism. Published essays expounding the benefits of lunar observation and missile bases were one example. Speeches and statements by top Air Force generals describing the role of projected orbital systems, including the Dyna-Soar, offered another example. Such announcements could yield benefits in terms of public attention and support for funding.

Perhaps, given Eisenhower’s perception of his needs as a policymaker and the Air Force’s track record, the establishment of the SAFMS was unavoidable. At first, Air Force Brigadier General Richard D. Curtin directed the SAFMS; Curtin had worked for the Deputy Chief of Staff for Research and Development in the months prior to the establishment of the SAFMS.²³⁵ The SAFMS would be rechristened the National Reconnaissance Organization (NRO). By that time, its co-directors would be Victor Charyk - the man who in the fall of 1959 had ordered the time-consuming Phase Alpha study of the Dyna-Soar and in the summer of 1960 had transformed the Air Force’s Satellite *Interceptor* into a

²³³ Dudley Sharp, “Memorandum for the Chief of Staff, USAF,” Sept 13, 1960. Fldr 4-5 Missiles/Space/Nuclear, Box 36, White Papers, Library of Congress.

²³⁴ Houchin pointed to a specific exchange in October 1963 between Dyna-Soar program engineer Lamar and Defense Secretary McNamara which underscored this exact point: when kept out of the loop, personnel could not effectively respond to the needs or questions of policymakers. Houchin, *US Hypersonic Research and Development*, 176.

²³⁵ “Major General Richard D. Curtin.” US Air Force Biographies. <http://www.af.mil/information/bios/bio.asp?bioID=5139> (accessed June 16, 2011).

Satellite *Inspector* – and Richard Bissell who had run the U-2 for the Central Intelligence Agency. Charyk in the meantime retained his position as Assistant Secretary for Research and Development.²³⁶ It was an ominous development from the perspective of Air Force aerospace development.

Fences were coming to space. But those fences were not clearly perceived by the Air Force's aerospace advocates. In the late summer of 1960, the Air Force again identified six projects as "Category I for development," and again space-related projects dominated. An advanced ballistic missile, the 117L DISCOVERER satellite, and the X-15 constituted half of the list. Making up the other half were the Dyna-Soar, the 649E Space Counter Weapons System, and the now elevated 649F SAINT. In October, a development directive outlined work on Step I and Step II vehicles and stated that "a concurrent aggressive study effort is directed in the area of military application of the Dyna Soar concept as a basis for possible future Step III weapon system development programs."²³⁷

Lieutenant General Roscoe Wilson, the Deputy Chief of Staff for Development, noted in late September 1960 that "Dyna-Soar...offers an enormous potential for future maneuverable capability in space and the atmosphere." Wilson hinted more clearly at the Air Force's intentions that same day, however: "*The Air Force considers Dyna-Soar the most important research and development project it has...The Dyna-Soar will open a new era...It is the first step towards practical man-in-space flights*"²³⁸ [italics added].

Schriever agreed, proclaiming, simultaneously, in *Air Force Magazine*, "So far, Dyna-Soar has been programmed solely as an experimental craft for research purposes. However, as the first piloted military space system planned by the United States, Dyna-Soar has important operational potentialities."²³⁹

Exploring that potential would depend on overcoming significant engineering challenges, and on convincing policymakers in an elected system of government that the Dyna-Soar's day had indeed come.

²³⁶ Houchin, *Hypersonic Research and Development*, 132.

²³⁷ Memo to White, "Important Category Lists," Aug 1, 1960. Fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Library of Congress. "Development Directive for 620A DYNA SOAR (Step I) Hypersonic Glider System," Oct 12, 1960. K140.8636-4 AFHRA.

²³⁸ Boeing Company, "This is Dyna-Soar," 168.7127-38 AFHRA.

²³⁹ Boeing Company, "This is Dyna-Soar," 168.7127-38 AFHRA.

In the words of Brigadier General Homer Boushey that election year, “The Air Force believes that the Dyna-Soar development can now be begun with ample confidence.”²⁴⁰

²⁴⁰ Booklet on Dyna-Soar, about April 1960. K140.8636-4 AFHRA.

Chapter 4: NO TIME FOR WILDCATTING:
POLICYMAKING, 1957-1958

Actually nothing can be ‘dropped’ from a satellite. [...] The earth itself is the best and most effective weapons carrier. – President’s Scientific Advisory Committee, March 12, 1958²⁴¹

No reasons have been advanced which indicate that this research and development activity is ‘necessary to make effective provision for the defense of the US’ other than the ‘feeling’ that the military ultimately will require manned satellites or other space vehicles. – Robert Piland, July 23, 1958²⁴²

By the end of 1957, the United States already possessed large numbers of nuclear-capable aircraft.

Some Army projects involved nuclear weapons, work was underway on developing reliable ballistic missiles, and by the end of 1957 the Navy had ordered a submarine capable of launching nuclear weapons, too. How far should the country’s nuclear deterrent extend to be sufficient – should the United States pursue the aerospace option as well?

One briefing on the Army’s satellite program declared that Sputnik II “has materially increased the threat to our national security posed by Sputnik-I.” Answering this technological challenge, it alleged, required bold technological advances. “As we stand on the threshold of space travel we must truly visualize applications heretofore relegated to the ‘Buck Rogers’ category.”²⁴³ Such assertions presumed that technological progress had achieved such a pace that conservative approaches – and even normal standards of credulity – had become outmoded and obsolete, and perhaps even dangerous to the nation’s security. High-technology advocates would accuse their critics with charges ranging from lack of vision to dangerous incompetence.

Eisenhower’s difficulty was not born of a lack of leadership or of a lack of vision. Rather, it was the product of a contradiction between the vision which he possessed (and which the public had, in aggregate, endorsed in his 1952 and 1956 election campaigns) on one hand, and increasingly numerous and vocal cries that a new direction be chosen. Coherent policies depend on consistency between overarching

²⁴¹ “Draft No. 2. ‘The Scientific Exploration of Outer Space,’” Mar 12, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (3), Box 4, PSAC, DDEL.

²⁴² Notes, “Responsibility for Activities Directed Toward the Developmnet of a Manned Satellite,” July 23, 1958. Fldr Space Notebook Killian 1958-59 (3), Box 15, Special Asst Sci & Tech ser, DDEL.

²⁴³ “Briefing on Army Satellite Program,” Nov 1957. Fldr Space November 1957 (2), Box 15, Special Asst Sci & Tech, DDEL.

philosophical outlooks and specific policy decisions. Eisenhower's outlook defined US security in terms of balance between sufficient national security (personified by its strategic deterrent forces) and internal strength and freedom (for which economic health and stability was seen as crucial). Eisenhower was not in a position simply to embrace "applications heretofore relegated to the 'Buck Rogers' category" because such a move would have thrown into question the larger context of his outlook and therefore of the nation's posture in the world. But, at the same time, some alterations would have to be made regarding space issues. Whatever space projects advanced to development and use, an organizational structure would be needed for their coordination. Understandably, different corners voiced different concepts about what that organization should do and be.

"We must be selective or we will be broke," Dwight Eisenhower would succinctly remark.²⁴⁴

National strength, during his presidency, entailed the combination of sufficient military power and ample economic health. This perspective lay at the core of Eisenhower's "New Look." Despite the turmoil in the wake of the first Sputniks during the start of the "space race," Eisenhower generally held true to this approach. The Air Force's vision of a boost-glide weapon system, called the "Dyna-Soar," clashed with this outlook yet proceeded throughout the last years of Eisenhower's presidency. The Dyna-Soar conflicted with national policy in several ways: policymakers deemed it of "no military value"; perhaps this led to Eisenhower's judgment that the program was needlessly expensive; furthermore, the Dyna-Soar potentially compounded the problems standing between the administration and the collection of vital strategic intelligence. And yet, work on the Dyna-Soar space glider continued unabated – and projections foresaw a program which would ultimately claim almost 10% of the total US space budget by 1964.

The ARS claimed that "the strictly military aspects of space flight are probably receiving adequate support at the present time" but that "many scientific, commercial, and politico-military applications of even greater long-range importance" were "in the opinion of the committee, [...] being neglected." The ARS recommended in the fall of 1957 that "a national space-flight program be initiated": an agency with

²⁴⁴ Notes taken at NSC Meeting, May 1 1958, document #0433 declassified 2000 NSC, Declassified Document Retrieval System (afterward referred to as DDRS).

“independent status similar to that of the Atomic Energy Commission or the National Advisory Committee for Aeronautics.”²⁴⁵ Indeed, some consideration was made of granting responsibility for space projects to the AEC, or to the NACA, or to a planned Defense Department arm overseeing military research and development.²⁴⁶

Alan Waterman of the National Science Foundation (NSF) agreed with the ARS, writing to Eisenhower’s science advisor Dr James Killian that “the American Rocket Society has [...] proposed an independent organization” for space exploration, and “an organization for this purpose really deserves, ultimately, to be independent of existing agencies.”²⁴⁷ A confidential NSF position paper emphasized the value, “particularly in terms of US and world public opinion, in favor of a strictly scientific, civilian-managed program which could not be suspected of military purposes. [...] A US scientific program of space exploration and research should be initiated without delay.”²⁴⁸ J Sterling Livingston’s article for the *Harvard Business Review* asserted that “the most critical question facing the United States today is how it can regain undisputed technological leadership and weapons superiority.” Livingston argued that the military’s ponderous system had caused it to be incapable of effective research and development work, and that “A new weapons planning system must be established under civilian control to assure a scientifically directed, long-range weapons research program such as will permit the prompt and wise selection of weapon systems for development and production.”²⁴⁹ The journal shortly later voiced continuing concern about Soviet achievements, but it professed confidence in American research and development *capacity*.²⁵⁰

²⁴⁵ “Space Flight Program: Report by the Space Flight Technical Committee of the American Rocket Society,” revised Oct 10, 1957. Fldr Space October 1957 (1), Box 15, Special Asst Sci & Tech, DDEL.

²⁴⁶ This would be dubbed “ARPA,” for “Advanced Projects Research Agency,” when the DoD would be reorganized in 1958. The addition of “Defense” to the title would prompt its renaming to “DARPA” decades later, a decision which has since been reversed and then, in the 1990s, reversed again back to DARPA.

²⁴⁷ Confidential NSF position paper, Dec 6, 1957. Fldr Space December 1957 (3), Box 15, Special Asst Sci & Tech, DDEL.

²⁴⁸ Letter from Alan Waterman to James Killian, Dec 6, 1957. Fldr Space December 1957 (3), Box 15, Special Asst Sci & Tech, DDEL.

²⁴⁹ Letter and attachments from Bursk to Cutler, Dec 2, 1957. Fldr Department of Defense Vol. II (3) November-December 1957, Box 1, Department of Defense subseries, Staff Secretary Subject ser, DDEL.

²⁵⁰ Letter from Edward C. Bursk to Robert Cutler, Dec 2, 1957. Fldr Department of Defense, Vol. II (3) November-December 1957, Box 1, Department of Defense subseries, Staff Sec Subject ser, DDEL.

One memo by Killian at the end of December stated flatly, “there are many scientists and others, however, who are opposed to the centralization of all space R & D under DOD. There are deeply-felt convictions that the more purely scientific and non-military aspects of space research should not be under the control of the military.” Toward the end, Killian declared that “we must have far more than a program which appeals to the ‘space cadets.’ It must invoke, in the deepest sense, the attention of our best scientific minds if we as a nation are to become a leader in this field. [...] If we do not achieve this,” he closed soberly, “then other nations will continue to hold the leadership.”²⁵¹ The fate of programs including the Dyna-Soar, and of the trajectory of future space policy, lay closely interconnected with the organizational structures which policymakers established or approved in the wake of the first satellite.

It was at this unfortunate juncture, in December 1957, that Air Force officers unveiled their intention to establish a “Directorate of Astronautics.” The Air Force’s Deputy Chief of Staff for Development, Lieutenant General Donald L. Putt, announced the Directorate of Astronautics on December 12. Putt named Brigadier General Homer A. Boushey as director, and empowered him “to ‘plan, organize, and manage the air programs in astronautics.’” Putt’s memo announcing the directorate indicated that “Boushey’s office would include ballistic missile defense, ‘additional research satellites,’ boost-glide vehicles, special reconnaissance aircraft, and a project identified only as ‘WS-117L,’” which was learned to refer to “a program aimed at developing an earth satellite as a space platform.”²⁵² The WS-117L was ultimately to undergo a circuitous development leading to the DISCOVERER program, through which the secret CORONA surveillance satellites would be developed and operated. WS-117L is today probably the most widely recognized of the Air Force space projects referred to above. But it was not alone, and it was not necessarily the most potentially significant of them.

The Dynamic Soarer program was one of the Air Force’s research projects that would have found a welcoming home in such an Air Force organization as the Directorate of Astronautics. Dyna-Soar, as a

²⁵¹ “Memorandum on Organizational Alternatives for Space Research and Development,” Dec 30, 1957. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council, Box 4, PSAC, DDEL.

²⁵² Telegram, Dec 12, 1957. Fldr Department of Defense Vol. (3) November-December 1957, Box 1, Department of Defense subseries, Staff Secretary Subject ser, DDEL.

“boost-glide vehicle,” was to be lifted into space by a rocket booster and would re-enter the atmosphere as a glider, harnessing a lift-to-drag ratio that would provide maneuverability during re-entry. An alternative, ballistic, method for re-entry from space involves a vehicle returning in a capsule literally falling through the atmosphere with minimal maneuverability during its decent. The “splashdowns” which would become iconic in the coming years were features of ballistic reentry. The Air Force exhibited interest in using space, and although it conducted some work on ballistic re-entry, the Air Force greatly preferred the maneuverability – both literal and figurative – which the boost-glide concept promised with Dyna-Soar.

An Air Force program organized in late-October in the wake of the Sputnik I orbit, Dyna-Soar was a consolidation of three boost-glide research concepts whose earliest origins hail from Nazi vengeance weapons. Scientists captured during Operation Paperclip (the US collecting of Nazi scientists at war’s end) remembered their notions of a craft which would fly high enough to skip along the atmosphere like a stone on a pond and thereby attain extremely long range. First Bell Laboratory, and then the Air Force, were introduced to these ideas, and three different projects - Hywards, Brass Bell, and Bomi – were established to explore different applications of the boost-glide concept. Air Force planners proposed consolidating these into Dyna-Soar in August 1957, and the Chief of Staff approved the move in November. Dyna-Soar envisioned a hypersonic research program that would ultimately yield an operational weapons system capable of bombarding the Soviet Union from space. Roy Houchin’s *Hypersonic Research: The Rise and Fall of the Dyna-Soar, 1944-1963* provides a valuable study of the Dyna-Soar from an engineering-historical perspective. The Dyna-Soar program itself was just six weeks old when Putt formed the Air Force Directorate.

Eisenhower was not aware of the Dyna-Soar in the fall of 1957. It was at that time a minor program in a sea of other programs and issues, within the context of national security and technological concerns; these in turn were important parts, but parts only, of the myriad challenges vying for presidential attention, even during the years at the middle of the Cold War. This was in keeping with Eisenhower’s

belief that the president's responsibilities lay with overseeing bigger pictures and trusting more specific matters to loyal and competent lieutenants.

If Eisenhower was not aware of the Dyna-Soar in the fall of 1957, Secretary of the Air Force Jim Douglas was taken aback by the announcement of the Directorate of Astronautics that winter. “Similar staff offices are frequently and properly created without my knowing about it,” he explained to Eisenhower’s assistant Sherman Adams. Douglas had in fact been “presented with a proposed press release” announcing the Directorate; Douglas had disapproved the release in such a way that he “thought I had made it clear that no action would be taken to establish any office of astronautics.” Douglas reproached Air Force Chief of Staff General Thomas D. White and ordered “that the Directorate of Astronautics referred to above be dissolved.”²⁵³

Defense Secretary Neil McElroy had announced in November that he “intended to establish an overall agency to direct work on missile defenses and other space projects. This office is expected to be called the ‘Advanced Research Projects Agency,’” or “ARPA.” The creation of the ARPA, favored by Eisenhower as part of a larger reorganization of the Defense Department, would serve to remove the individual services’ prerogatives in technical development, particularly regarding space projects. The Air Force claimed that it had understood McElroy’s announced intention “only as being opposed to any formal announcement about the new Air Force office.”²⁵⁴ The Air Force’s space advocates seemed naïve to the idea that policy might interrupt their vision – a vision which they believed included the only practical road to continued national security.

The Air Force’s ill-fated Directorate of Astronautics pointed to the service’s vision of “aerospace,” a term which itself was only first coming into use. Air Force thinking had long accepted that advantages could be gained by flying higher and faster than one’s adversary. Space travel promised to be very high and very fast – an “ultimate high ground.” The Senate Majority Leader, Democrat Lyndon Johnson, also

²⁵³ Message and attachment from James Douglas to Sherman Adams, Dec 15, 1957. Fldr Department of Defense Vol. II (3) November-December 1957, Box 1, Department of Defense subseries, Staff Secretary ser, DDEL.

²⁵⁴ Telegram, Dec 12, 1957. Fldr Department of Defense Vol. (3) November-December 1957, Box 1, Department of Defense subseries, Staff Secretary Subject ser, DDEL.

spoke of an ultimate “high ground” while calling for boldness in space exploration.²⁵⁵ But according to this Air Force conception, “air” and “space” were parts of a grand continuum rather than strictly separate realms. The issue of defining “air” and “space” was semantic, but it held very real – and very significant - implications for the future.

When the ARS released its Space Flight Technical Committee’s Space Flight Program Report in the fall of 1957, it had declared that “Astronautics can no longer be considered as an appendage of the Science of Aeronautics.” In so doing, the ARS enunciated a position that confronted the Air Force in the coming months. The ARS had reported that “leading military powers can ill afford to neglect the potential of hypersonic flight and satellite operations. Chemospheric superiority implies the successful operation of hypersonic gliders for bombing and reconnaissance.”²⁵⁶ The image of a hypersonic glider capable of bombing and reconnaissance is a portrait, in all but name, of the Dyna-Soar. Although the ARS report (dated August 23 and revised October 10) *preceded* the consolidation of the Dyna-Soar, it clearly speaks to the role which Air Force advocates of Hywards, Brass Bell, and Bomi, aimed to achieve when these projects became combined days after the Sputnik I launch.

The ARS looked even higher than the chemospheric realm. It also delineated “ionospheric superiority” as the “capability of operating satelloids and satellites for reconnaissance” and stated, “exosphereic and free-space operations, up to altitudes of several thousand miles, are of potential politico-military usefulness.” This did not equate into an endorsement of military employment of space. “Politically,” they wrote, “space flight can not but make still more apparent the impracticality of war as a means of solving differences between nations.” The committee looked to “freedom of the seas” as a

²⁵⁵ DeGroot, Gerard J. *Dark Side of the Moon: The Magnificent Madness of the American Lunar Quest* (New York University, 2006), 69.

²⁵⁶ “Space Flight Program: Report by the Space Flight Technical Committee of the American Rocket Society,” revised Oct 10, 1957. Fldr Space October 1957 (1), Box 15, Special Asst Sci & Tech, DDEL.

precedent for a “freedom of space” and to the “establishment of this condition in international law [as] a prerequisite to any national space flight program.”²⁵⁷

Arranging agreement of an international law would prove a challenging task. With so much about space still unknown, different ideas competed about what should constitute the US position about those laws, and even whether deriving formal laws and definitions about space would be beneficial. Although Dyna-Soar did not appear by name in these debates during the majority of 1958, the role that Dyna-Soar might fulfill did impact the discussions, and the debate certainly impacted the fate of Dyna-Soar.

The Gaither Report on “Deterrence and Survival in the Nuclear Age” had been prepared during 1957 and was presented to Eisenhower that fall as the second Sputnik was launched. The report did not address space issues, but leaks of the report’s existence and stories of its purported contents wove into the public’s restive concern that winter. The report’s text was largely the work of the hawkish Paul Nitze, who had earlier authored NSC-68, and Colonel George Lincoln, a believer in the value of technology and research who had served under General George Marshall during World War II.²⁵⁸ Early in January 1958, Robert Sprague, who had chaired the committee since Rowan Gaither’s illness, urged Secretary of State John Foster Dulles to have the President form a study group to consider “possibilities for fruitful use of the near-term future during which the US will have a margin of strategic bombardment capability over the Soviet Union.” Sprague outlined four alternatives: continuing the present policy; waging preventive nuclear war against the USSR; threatening the USSR with preventive nuclear war if it did not disarm itself; and “plac[ing a] reliance in God to find a solution.” Sprague made clear that he favored preventive war or the threat of it as the most viable options of the four. A few weeks later, Dulles confided to his disarmament advisor General Alfred M. Gruenther that Dulles “was a little bit concerned [about Sprague]

²⁵⁷ “Space Flight Program: Report by the Space Flight Technical Committee of the American Rocket Society,” revised Oct 10, 1957. Fldr Space October 1957 (1), Box 15, Special Asst Sci & Tech, DDEL.

²⁵⁸ Divine, Robert. *The Sputnik Challenge: Eisenhower’s Response to the Soviet Satellite* (Oxford University Press, 1993), 36-7; Snead, David L. *The Gaither Committee, Eisenhower, and the Cold War* (Columbus: Ohio State University Press, 1999), 64-71.

because he seemed to be emotional about certain aspects.”²⁵⁹ The Soviets’ space accomplishments, despite not demonstrating a true military superiority, carried a capacity to greatly jar the confidence of individuals and societies. In this context, rumors might be accepted as credible; in a January 6 NSC meeting, Vice President Richard Nixon and Eisenhower’s assistant Gordon Gray suggested that the government release the report by the committee which Sprague had chaired. Nixon “emphasized that what had been published about the contents of the Gaither report was fantastically worse than what the Gaither report actually said.”²⁶⁰

During that same meeting, Eisenhower had noted that the Air Force seemed to visualize “a long period of time in the future in which our main reliance would still be placed on manned aircraft.” If this was the case, he noted that “money expended on improving the early warning system and the dispersal of SAC bases would be money well spent.”²⁶¹ The following week, Defense Secretary McElroy told the House Armed Services Committee that the Soviet satellites had demonstrated “that the Russians are farther advanced scientifically than many had realized and are in fact challenging the scientific supremacy of the United States ,” and that “the weapons of the future may be a great deal closer upon us than we had thought, and therefore, the ultimate survival of the nation depends more on the speed and skill with which we can pursue the development of advanced weapons [...] than ever before.” One part of the solution, he told the House members, should be “increased effort behind space programs,” including anti-missile missiles and satellites.²⁶²

With resources necessarily finite and technical superiority considered vital, potential weapons systems had to measure up to needs and to outpace rival proposals. The Army, with cooperation from the Air Force, Navy, and other organizations including the Research and Development (RAND) Corporation,

²⁵⁹ “Memorandum of Conversation, Washington,” Jan 3, 1958. *FRUS*, 1958-1960 Volume III doc 1, pp1-3.

²⁶⁰ “Memorandum of Discussion at the 350th Meeting of the National Security Council,” Jan 6, 1958. *FRUS*, 1958-1960 Volume III, doc 2, pp4-7.

²⁶¹ “Memorandum of Discussion at the 350th Meeting of the National Security Council,” Jan 6, 1958. *FRUS*, 1958-1960 Volume III, doc 2, pp4-7.

²⁶² “Statement of Secretary of Defense Neil McElroy before the Committee on Armed Services House of Representatives, 13 January 1958.” Fldr Preparedness Investigation December 1957, Box 22, Staff Sec Alpha ser, DDEL.

examined issues relating to lead time in weapons development and defense organization, concluding that “it is possible to develop standard criteria for comparing alternative and competing weapon systems,” although “the evaluation must [...] be done outside the context of an individual proponent service or organization.”²⁶³

The paper delineated a ten-step test to consider a potential weapon system along several criteria: operational, technical, lead time, economic, and political. “All of these tests must be met if we are to have useful future weapons. [...] Because of the wide range of choices offered by today’s technology, uncertainty can be reduced by adopting a policy of flexibility; that is, no weapon system for use in the post-1960 period should be considered unless it has the growth potential to incorporate future advances in technology.”²⁶⁴ Dyna-Soar’s Air Force advocates could meet similar attitudes by indicating the flexibility latent in the potential applications for their space glider. But the Air Force’s ultimate vision of the Dyna-Soar proved to be inflexible because it stood at the core of Air Force doctrinal thinking. Dyna-Soar advocates intended to bring Dyna-Soar eventually into the fold of manned bomber systems, to further diversify the US deterrent force and thereby strengthen the nation’s strategic position.

In the meantime, purported Air Force claims found their way into newspapers, as when the *New York Times* released a story citing public statements by Air Force General Bernard Schriever in his testimony to the Senate Preparedness Subcommittee, claiming “that the Air Force hopes to launch a ‘military reconnaissance satellite’ by the spring of 1959.”²⁶⁵ This intention was in line with an optimistic appraisal which had anticipated a possible “limited reconnaissance capability” as early as the second quarter of 1959.²⁶⁶ Schriever did tell Senators Bush and Symington that “I think that we could have a

²⁶³ “Background Paper: ‘The Lead Time Race’ Pertinent to Defense Organization,” Feb 4, 1958. Fldr Missiles January 1958-January 1960, Box 18, Staff Sec Alpha ser, DDEL.

²⁶⁴ “Background Paper: ‘The Lead Time Race’ Pertinent to Defense Organization,” Feb 4, 1958. Fldr Missiles January 1958-January 1960, Box 18, Staff Sec Alpha ser, DDEL.

²⁶⁵ “Scientific and Reconnaissance Satellites,” memo from Robert Cutler to James Killian, Jan 20, 1958. Fldr Space – Satellites July 1956-February 1960, Box 3, Special Asst Sci & Tech, DDEL.

²⁶⁶ n.d. #2547, declassified 1997, DDRS.

reconnaissance capacity, using the Thor booster, by the spring of next year [1959], with a recoverable capsule.”²⁶⁷ It would take longer than that.

A series of would-be satellites disintegrated in embarrassing, spectacular, and public, launchings during the winter of 1957-8 and were mirrored by sober estimates about missiles and space. One general speaking at a meeting of the Atomic Energy Working Group of the Disarmament Panel expressed a desire for a more capable, solid-fuel, missile. He described then-current US ICBM development: “We will have an ICBM which is a plain out and out bastard. You cannot even tell where these things are going to go after you push the button, apparently. At least they can’t at Canaveral [space rocket launch site].”²⁶⁸ As unfortunate as the problems were, and as embarrassing as the rocket explosions continued to be, the problems were in the technical engineering realm – the scientific problems with first-generation missiles essentially has been worked out.²⁶⁹

But with respect to the Dyna-Soar, missile development problems introduced an added challenge. At a time when lifting a satellite of *any* size proved vexingly difficult to accomplish, and when the nation’s first satellite entered orbit in January weighing about 30 pounds, the various design concepts for Dyna-Soar seemed outlandishly heavy. Yet as a boost-glide vehicle, Dyna-Soar depended on boosters possessing tremendous power and reliability. Each remained elusive. Dyna-Soar required both.

If the sky was posing a limit in short-term technological terms, organizational considerations posed even graver problems for Dyna-Soar’s long-term future. Conferring with scientists Killian, George Kistiakowsky, and Herbert York on February 4, 1958, Eisenhower remarked “that he has come to regret deeply that the missile program was not set up in OSD [Office of the Secretary of Defense] rather than in any of the services.”²⁷⁰ Killian and York spoke again afterward, this time joined by other scientists and officials who had not been present with the President earlier in the week. And on February 7, Killian told

²⁶⁷ Hearing notes, Feb 25 1958. Fldr National Aeronautics and Space Administration September 1958 – January 1961 (3), Box 18, Staff Sec Alpha ser, DDEL.

²⁶⁸ “Meeting of the Atomic Energy Working Group of the Disarmament Panel,” Feb 5, 1958. Fldr President’s Science Advisory Committee October 1957-March 1958 (2), Box 3, Special Asst Sci & Tech, DDEL.

²⁶⁹ “Memorandum of Conference with the President, Feb 4, 1958,” Feb 6, 1958. Document #Ret 914C, DDRS.

²⁷⁰ “Memorandum of Conference with the President, Feb 4, 1958,” Feb 6 1958. Document #Ret 914C, DDRS.

the President that “mil[itary] uses of outer space” were “extraordinarily limited.” Killian identified early warning against strategic attack, reconnaissance, and missile travel as worthwhile.²⁷¹ Since ballistic missiles traversed space, some consideration was given to whether ICBMs might potentially be defined as “space weapons,” and this potential definition explains Killian’s including missiles in his list.

The PSAC prepared to address organizational issues directly in a February 21 memo. It differentiated between space “exploration” done by civilians and “control” conducted by the military. Although conceding that “certainly, ICBM’s will transit portions of outer space in performing their missions, [...] for the moment the chief military interest lies in better methods of surveillance, communications and long-range weather forecasting.” Significantly, however, “the control of outer space, basically a military matter, involves many troublesome questions of international law.” The PSAC’s preliminary observations emphatically declared that US space efforts should be civilian-managed “both at the policy and at the operating levels.”²⁷² The main remaining question, then, was to determine which civilian organization ought to oversee US space projects.

Three candidates emerged. The paper considered the Atomic Energy Commission first, which was described as “organizationally competent,” although the report noted that the AEC had no experience in flight technology. The National Advisory Committee for Aeronautics (NACA) was considered more favorably, since it “has been in the space exploration field for a long time.” The newly established ARPA appeared to be able to “take on the job with a minimum of additional legislation.” The report noted that “it has been suggested that whatever form of organization is agreed upon to initiate the space exploration program it should be attached temporarily to ARPA.” Indeed, ultimately a number of space projects, held by various military services, would be transferred to the ARPA and subsequently to the NACA’s successor agency. But an attachment to the preliminary observations report contended that “it would seem highly probably [probable], however, that even if a temporary arrangement of this sort were made it

²⁷¹ Notes of conversation, Feb 7 1958. Fldr Meeting Notes February 1958, Box 1, PSAC, DDEL.

²⁷² “Preliminary Observations on the Organization for the Exploitation of Outer Space,” memo from SP Johnson to Killian, Feb 21, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (3), Box 4, PSAC, DDEL.

would be extremely difficult, if not impossible, to detach and to reassign the space exploitation project at a future date.”²⁷³ In the eyes of PSAC members, even the temporary collection of space projects, and even under the civilian-controlled ARPA, seemed too close to military control.

Revised March 12, the PSAC’s report honed the message of its earlier draft more than it changed it. The NACA remained its suggestion as the proper “basic organization, on which to build an agency” implementing US space projects. PSAC predicted that a “civilian-oriented, civilian-managed organization for space” would be better able to engage with scientists and non-governmental organizations than would an organization connected to the military.²⁷⁴

The PSAC, in its March 12 draft, disparaged Dyna-Soar’s planned role. Even if the committee was not familiar with the Dyna-Soar program specifically, the writers did address the issue of orbital strategic forces:

Consider, for example, the concept of the satellite as a bomb carrier. Actually nothing can be ‘dropped’ from a satellite. All objects aboard are travelling at the same speed, and if pushed overboard will simply continue in orbit. A bomb would have to be “fired” back toward the earth. The problem then becomes the same as launching a full scale ICBM from earth. [...] A very easy calculation will show that launching a weapon from a rapidly moving platform half way round the world yields much less chance of successful strike on a given target than if the same weapon were launched from a fixed missile base on earth. So far, after analyzing all the schemes that have been presented, the consensus is that the earth itself is the best and most effective weapons carrier.²⁷⁵

The PSAC’s conclusion regarding this issue tremendously undercut the argument for building orbital weapons systems in general, a task for which the Air Force envisioned Dyna-Soar.

Although its findings threw a shadow over the Dyna-Soar, the PSAC wrote its paper, “The Scientific Exploration of Outer Space” concentrating on broad issues rather than on particular, and contemporarily obscure, research projects. A March 7 draft had conceded that “as space technology develops new uses for manned and unmanned military space vehicles may well be found,” but “facts lead us to the conclusion that for the foreseeable future the military uses of satellites will be restricted mainly to

²⁷³ "Preliminary Observations on the Organization for the Exploitation of Outer Space," Feb 21, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (3), Box 4, PSAC, DDEL.

²⁷⁴ "Draft No. 2. 'The Scientific Exploration of Outer Space,'" Mar 12, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (3), Box 4, PSAC, DDEL.

²⁷⁵ "Draft No. 2. 'The Scientific Exploration of Outer Space,'" Mar 12, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (3), Box 4, PSAC, DDEL.

reconnaissance and communications.”²⁷⁶ The March 12 draft’s rejection of orbital bombing sharpened this point. The committee determined that “the proper relationship between military objectives in space technology and scientific and civilian objectives” as “a two-way street,” in which achievement in the one would advance the capabilities of the other, and vice versa. “In contrast to the somewhat limited practical military use of its outer space currently envisioned, there are many important civilian and scientific uses.”²⁷⁷

The PSAC alerted Eisenhower to its views. Killian prepared a much shorter condensation on March 24, and understandably many of these details disappeared while the overall sweep generally remained: the NACA remained the implicit choice, over the ARPA, and the AEC, and the creation of a new agency using the AEC as an organizational model.²⁷⁸ In a separate memo to Eisenhower, written March 8 by PSAC members including Killian, the committee urged that “because of the importance of civilian interest in space exploration, the long term organization of Federal programs in this area should be under civilian control.” The letter to Eisenhower carried, almost verbatim, the March 7 draft’s assertion that space exploration should be done under civilian auspices because space “has a relatively limited military significance, at least for the foreseeable future.”²⁷⁹

The PSAC deemed space a poor realm for weaponized activities, but space would still serve as a medium through which ballistic missiles would travel if general war were to come. The same day that he had written of the limited military significance of space, Killian notified Eisenhower that the Ballistic Missiles Panel had reported that “technological progress to date indicates the feasibility of greatly improved programs for a second generation of ballistic missiles.”²⁸⁰

²⁷⁶ Draft of “The Scientific Exploration of Outer Space,” March 7, 1958. Fldr Space January-May 1958 (4), Box 15, Special Asst Sci & Tech, DDEL.

²⁷⁷ “Draft No. 2. ‘The Scientific Exploration of Outer Space,’” Mar 12, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (3), Box 4, PSAC, DDEL.

²⁷⁸ “Organization for Scientific Exploration of Outer Space,” Mar 24, 1958. Fldr National Aeronautics and Space Administration-National Aeronautics and Space Council (2), Box 4, PSAC, DDEL.

²⁷⁹ Draft of “The Scientific Exploration of Outer Space,” Mar 7, 1958. Fldr Space January-May 1958 (4), Box 15, Special Asst Sci & Tech, DDEL.

²⁸⁰ Letter from Killian to Eisenhower, Mar 8, 1958. Fldr Killian James R. 1957 (1), Box 23, PP (AWD), DDEL.

Eisenhower showed reluctance regarding the poor reliability and staggering expenses of first generation missiles, so the feasibility of more efficient second generation weapons came as welcome news. Work with the present rockets could safely be kept within limits while scientists crafted more predictable systems to replace them. The costs of second-generation missiles in turn sapped the degree of his enthusiasm for them as well.²⁸¹ At a National Security Council meeting on April 24, Eisenhower commented about missile spending allocations that “it seemed to him, in the light of these figures, every time we fire off a Titan missile we are shooting away \$15 million.” Eisenhower continued “that he still had more faith in the delivery capabilities of the aircraft than he had in all these missiles at the present time.” Defense Secretary McElroy concurred.²⁸²

Nineteen fifty-eight saw the transformation of the NACA into the National Aeronautics and Space Administration. During the spring and summer, while his scientists urged that space activities be organized under civilian-controlled auspices, Eisenhower likewise expressed that he wanted space responsibilities centralized. Speaking to Killian and York in early March, “he pointed out [...] the need for central direction of our space activities.”²⁸³ Three weeks later, press secretary Jim Hagerty discussed speech subjects with the President. Eisenhower told him “that he thought he should not spend his time on a speech that did not deal with peace, disarmament, mutual aid, freer trade, or the like. Other things he considers other people can do.” The press secretary suggested a speech addressing outer space, “but the President insists that his immediate job is peace and the things that go into the making of peace.”²⁸⁴ Killian was part of a larger group of scientists conferring with Eisenhower in mid-June. Both Killian and the President agreed that “the great problem is to achieve a public understanding of the basic considerations [regarding space policy], since otherwise they [the public] are expected to take positions

²⁸¹ Roman, Peter J. *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 186.

²⁸² When Eisenhower had made the \$15 million missile comment, Deputy Secretary of Defense Quarles answered that the Titan missile itself cost between \$1-2 million. Basing cost a further \$5 million per missile. The total allocation of \$454 million also took into account “years of active development still lying ahead of the Titan missiles.” “Memorandum of Discussion at the 363d Meeting of the National Security Council,” April 28, 1958. *FRUS* 1958-1960 Volume III, doc 21, pp70-78.

²⁸³ “Memorandum of Conference with the President,” Mar 6 1958. Document #Ret904B, DDRS.

²⁸⁴ “Diary, Mar 26 1958.” Fldr ACW Diary March 1958 (1), Box 9, PP (AWD), DDEL.

on policies which they cannot understand.”²⁸⁵ Although Eisenhower preferred for himself to focus on “the things that go into the making of peace,” he recognized space as significant and he further recognized that communicating to the public about it would be important as well.

Issues of space and issues of peace intersected. This intersection occurred at a boundary – the division between “space” and “air.” The term “aerospace” denotes a specific concept – that above the earth lies an atmosphere of breathable gasses which grow less dense as one travels higher and higher. Eventually, one travels beyond the earth’s atmosphere entirely, but this travel from the air through the atmosphere and beyond to interplanetary space is, in essence, a continuum. Air Force Chief of Staff, General Thomas White, would consciously promote the term “aerospace” in an article that August.²⁸⁶ The Air Force’s perspective was understandable, and some case could be made for considering air and space as “operationally indivisible,” as the Air Force would formally contend in its doctrine the following year. Definitions had interservice and policy implications as well as scientific meaning.

A year prior to the first satellite orbit, Eric Burgess had published a work looking forward to an era of space exploration. Burgess had noted that “that old question, ‘how high is the sky?’ is still not answered.” Furthermore, various scientists had delineated convincing – and competing – definitions by focusing on various scientific aspects of the atmosphere. Edmund Halley had, in the early 18th century, estimated the atmosphere as existing up to 45 miles in altitude. By the 1950s, scientists measured an “air envelope extend[ing] much more than the odd 200 miles” cited in earlier works. Some contemporary estimates extended to 700 or even 1000 miles. Furthermore, “If the atmosphere rotated as a body with the Earth it would be easy to obtain the maximum height. It would be that at which centrifugal force would balance gravitational force. In the case of the Earth this comes to a height of about 21,000 miles (34,000

²⁸⁵ “Memorandum of Conference with the President, June 18 1958, 11:45.” Document #Ret914A, DDRS.

²⁸⁶ Futrell, Robert Frank. *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1960, Volume I* (Maxwell AFB, AL: Air University Press, December 1989), 553-4.

km.) above sea level at the equator.”²⁸⁷ Suffice to say that profoundly differing estimates, many with defensible scientific premises, existed in the era of Sputnik.

The question of the sky’s edge carried significant strategic and political implications. As sovereign political entities, nation-states controlled their own air space and had internationally respected rights to do so. Violating these rights constituted serious offenses and implied hostility. Both the United States and the Soviet Union had been dragged into the last world war through surprise attack and were understandably anxious and suspicious of any seeming preparation for a future surprise. Careful secrecy characterized Eisenhower’s use of U-2 spyplanes in undertaking vital reconnaissance missions between 1956 and 1960. Despite airspace sovereignty issues, intelligence information was desperately needed, and the extremely high-altitude U-2 had been built as a stop-gap to provide that information. As an airplane, its overflights *did* violate Soviet airspace, but it was hoped that its extreme altitude would protect it from Soviet interception. Even during the first flights along the Soviet border in the summer of 1956, the Soviets saw the plane on radar scopes but proved unable to bring the craft down. Secretary Dulles believed that their inability to do so might preclude the Soviets’ publicizing US overflights.

The Soviets did send word of their knowledge of, and displeasure with, the U-2 flights. One Soviet message to the State Department points to a US overflight of the USSR by a U-2 on March 2, 1958. The State Department had denied this to the USSR three days earlier, but Soviet diplomats replied on April 21 to state that

the Soviet Government expects that the Government of the United States of America will undertake further investigation of this act of violation of the airspace of the USSR by an American military aircraft and will punish severely those guilty of this violation. The Soviet Government also expects that the Government of the United States of America will take the necessary steps to prevent violations of Soviet airspace by American aircraft in the future and states that in the event of new violations full responsibility for their consequences will rest with the Government of the United States.²⁸⁸

²⁸⁷ Burgess, Eric. *Frontier to Space* (New York: Macmillan, 1956), 47.

²⁸⁸ “LS No. 10662,” April 21 1958. Document #0300, declassified 2001, DDRS.

CIA Director Richard Bissell felt that Eisenhower took such protests seriously, as after one event the President slowed the project down for “quite a few months” before approving another flight.²⁸⁹ In total, twenty-five U-2 flights passed over the USSR between July 1, 1956 and May 1, 1960.²⁹⁰ Each was soberly considered and carefully approved by Eisenhower, and each was a violation of Soviet airspace. Determining the boundary between “air” and “space” meant determining how future intelligence might be gathered. While the U-2 was indisputably an airplane (capable of extremely high altitude) and thus a violator of Soviet *airspace*, defining the threshold of space would impact whether a reconnaissance-equipped Dyna-Soar might one day be considered in similar violation.

Deputy Defense Secretary Quarles had recognized this to Eisenhower on October 8, 1957, citing a memo written the previous day. He noted that, in the three days since the Soviets’ launching of Sputnik, no wave of international diplomatic protest had emerged, despite the fact that the Soviets’ metal sphere had already overflowed many foreign countries.²⁹¹ This lack of uproar implicitly established in international minds a concept on which Eisenhower was happy to capitalize on: a freedom of space akin to the freedom of the seas, along the lines called for by the ARS. If a freedom of space for peaceful purposes could be agreed upon, then perhaps the United States ultimately could develop and launch reconnaissance satellites that would provide the intelligence the country desperately needed and the U-2 was currently, tenuously, providing.²⁹²

²⁸⁹ Bissell, Richard M., with Jonathan E. Lewis and Frances T. Pudlo. *Reflections of a Cold Warrior: From Yalta to the Bay of Pigs* (Yale University Press, 1996), 113-4.

²⁹⁰ The first U-2 flight over the Soviet bloc occurred on June 20, 1956, when a plane overflew Poland, East Germany, and Czechoslovakia in order to test the Soviet detection ability and air defense reaction. From the start, the Soviets were able to detect the flights, though until Gary Francis Powers’s May 1 mission the Soviets were unable to bring one of these planes down. A Central Intelligence Agency document following the shutdown lists all of the U-2 missions over the Soviet bloc. A total of fifty missions were completed during this period. Fourteen were directed solely toward the USSR, and eleven overflew the USSR as well as at least one other Communist state. The other twenty-five overflew Communist China, other portions of Southeast Asia, or Communist states in Eastern Europe without passing over the USSR itself. “U-2 Overflights of Soviet Bloc,” Aug 18 1960. Document #0022, declassified 2000, DDRS.

²⁹¹ “Conference in the President’s Office, 8:30 a.m., Oct 8, 1957.” Document #3444, declassified 1993, DDRS. DoD memo for the President, “Earth Satellite,” Oct 7, 1957. #0745, declassified 1999 DOD, DDRS.

²⁹² Killian believed that even an unlimited amount of aerial surveillance – by itself – would be insufficient to guarantee national security, asserting that such flights would not be able to extend US warning of an incoming attack to more than the time taken by attacking missiles to make their journey. Letter from Killian to JD Dulles, July 10, 1958. #2944, declassified 1993 WH, DDRS.

Not surprisingly, the Air Force was inimical to such views. American security rested on its deterrent power. Air Force personnel would have been ill-disposed to the idea of trusting national security solely to international agreements and Soviet sincerity. In addition, with the respect to the Dyna-Soar project, such international agreements could be completely devastating. Conceding to a defined boundary between “air” and “space” would wreck the aerospace concept and the foundation for extending future doctrine into space. The role of Air Force vehicles such as Dyna-Soar would be thrown into question. Conceivably, the role of the Air Force at large might be stunted. And in the eyes of its personnel, whose lives were marked by devotion to their nation exerted through service in their military branch, a stunted Air Force meant an unnecessarily vulnerably nation and society.

Any internationally recognized air-space boundary would have meant that nations continued to possess sovereignty in airspace up to an altitude, but none above that stratum. Because of the number of defensible methods and thresholds to potentially differentiate between “air” and “space,” such a boundary would also necessarily be an arbitrary one in many respects. In contrast, extending airspace endlessly would also extend national sovereignty endlessly into the sky. Before the United States could achieve a preferable status quo in defining “air” and “space,” American policymakers would have to determine what definitions would be in the national interests as they understood them.

The National Security Council confronted these issues in the summer of 1958. Historian Robert Watson wrote that “the wording of NSC 5814/1 reflected a compromise between JCS [the Joint Chiefs of Staff] and BOB [Bureau of the Budget]” because the Joint Chiefs urged for “stronger statements on the importance of US primacy in outer space,” while the Bureau of the Budget wearily eyed the enormous costs which such ventures would entail. The document called for the United States to become a “recognized leader” in space.²⁹³ The NSC noted that “reconnaissance satellites are of critical importance to US national security,” but “political implications” from the possible use of such satellites prompted the need for studies “to determine the most favorable political framework in which such

²⁹³ Watson, Robert J. *History of the Office of the Secretary of Defense, Volume IV: Into the Missile Age, 1956-1960*. (Washington, DC: Historical Office, Office of the Secretary of Defense, 1997), 391.

satellites would operate.” It decided that “space is divided into two regions: ‘air space’ and ‘outer space’ . ‘Outer space’ is considered as contiguous to ‘air space’, with the lower limit of ‘outer space’ being the upper limit of ‘air space’.” It outlined the uses for outer space as being for “vehicles or other objects that achieve their primary purpose in outer space”; “transmission of electromagnetic energy for [...] communications”; and last for “vehicles which traverse outer space, but which achieve their primary purpose upon their return to air space or earth.”²⁹⁴

The last use, traversing space, remained partly classified. However, it seems reasonable, given other records, to presume that this referred to ballistic weapons, which were seen as using space as a brief means of transit but not as a base. A concept of this distinction would allow the issue of weapons in space to be decoupled from that of ballistic missiles. The NSC declared also that “any use of outer space, however, whatever purpose it is intended to serve, may have some degree of military or other non-peaceful application.”²⁹⁵

NSC 5814 aimed to preserve space for peace while simultaneously securing an opportunity to use “space for security” through the development of reconnaissance satellites. Divine later judged these objectives to be “contradictory.”²⁹⁶ The two would not *necessarily* have to stand in opposition, however. International respect for reconnaissance satellites, as a means of verifying the developments of rival nations, would certainly have depended on an atmosphere of lessened tension. It would also have required more or less universal distinction of something “military” as relating to a defense (or security) institution from something “weaponized” as a tool for destruction. Many questions remained contested in 1958, “military” satellites and “weapon” satellites might still have sounded like synonyms, and cold war rivalries make poor fields in which to grow trust. But security and peace were nonetheless not strictly “contradictory.”

²⁹⁴ “National Security Council: US Policy on Outer Space, NSC 5814,” June 20, 1958. #345, declassified 1992 NSC, DDRS.

²⁹⁵ “National Security Council: US Policy on Outer Space, NSC 5814,” June 20, 1958. #345, declassified 1992 NSC, DDRS.

²⁹⁶ Divine, Robert. *The Sputnik Challenge: Eisenhower’s Response to the Soviet Satellite*. Oxford University Press, 1993), 154.

The NSC debated these points on July 3. Two issues provoked significant discussion at the meeting: whether ballistic missiles constituted “space vehicles” and what being a “recognized leader” in space entailed.

Quarles claimed not to have chosen a side about whether ballistic missiles ought to be included in US policy on outer space, but later in the meeting he pointed out that some practicable ballistic paths did not exceed 100 miles altitude and that “accordingly, we must not let ourselves be trapped into the feeling that all ballistic missiles must necessarily traverse outer space.” Special assistant for national security affairs Robert Cutler argued that “military and peaceful outer space vehicles were inextricably involved with each other.” To McElroy’s relief, Killian clarified his own views by asserting that he did not advocate necessarily limiting DoD’s involvement in space solely to ballistic missiles. Eisenhower agreed with Quarles and expressed a will to draw a “distinction between ballistic missiles and other outer space vehicles. [...] The President thought we could and should differentiate policy guidance on these two classes of outer space vehicles.”²⁹⁷

Two powerful figures, Secretary of State Dulles and Budget Director Maurice Stans, questioned the wisdom of the nation’s proposed status in space. Dulles pointed to part of 5814/1 calling for the US to achieve “either superiority over or parity with the USSR in all outer space activities.” He explained that this policy would require “expenditures and efforts [...] almost without limit” to produce “a capacity in outer space adequate for our own US purposes, but not necessarily superior or equal to the capability of any other nation.” Waterman countered that the national interest demanded bold commitments to research and development in areas in which “the success or ultimate utility [...] could not be definitely foreseen. [...] A really determined effort” would be required to achieve parity with the Soviet Union, which “had such a long head-start in outer space activities.”²⁹⁸

²⁹⁷ “Discussion at the 371st NSC Meeting on Thursday, July 3, 1958,” July 5, 1958. #2801, declassified 1996 NSC, DDRS.

²⁹⁸ “Discussion at the 371st NSC Meeting on Thursday, July 3, 1958,” July 5, 1958. #2801, declassified 1996 NSC, DDRS.

Stans supported Dulles, partly by turning Waterman's argument on its head. Dulles had doubted "the wisdom of a policy which committed the United States to ape whatever we imagine any other nation is doing or is going to do." Stans echoed that US policymakers had traditionally set policy according to "our own national objectives rather than the objectives of some other country." Furthermore, he added, US efforts *couldn't* mirror Soviet efforts unless their objectives were somehow discovered. Stans continued that the Soviet head start guarantees that they "will maintain their lead over the United States in outer space activities for at least two years [and] accordingly, we could not possibly achieve parity with them within this time limit [...] no matter what we do." Stans concluded that a focus on competition with the USSR and on the military aspects of space would undercut "all the programs for the peaceful use of outer space."²⁹⁹

NSC 5814/1's text had included potentially promising notes for space projects. It had acknowledged the necessity for reconnaissance satellites, and it identified an "undoubted" eventual need for manned space exploration, partly because "to the layman, manned exploration will represent the true conquest of outer space."³⁰⁰ Nonetheless, beyond reconnaissance satellites and ballistic missiles, the possibility of military exploitation of space met with disapproval and criticism, stridently illustrated both by the Secretary of State and the Director of the Budget.

In several important ways, the July 3 NSC discussion placed darker shadows on Dyna-Soar's fate. Identifying a difference between "air space" and "outer space" threatened to pulverize the still-forming "aerospace" concept on which Air Force thinking rested – and which provided the groundwork for Dyna-Soar's *raison d'être*. Eisenhower showed determination to distinguish missiles' travel *through* space distinctly from vehicles' travel *in* space; missile programs (as an overall category) were safely ensconced in national policymaking, but compartmentalizing airspace away from outer space prevented such guarantees for the Dyna-Soar project. Dulles and Stans had made two arguments whose implications

²⁹⁹ "Discussion at the 371st NSC Meeting on Thursday, July 3, 1958," July 5, 1958. #2801, declassified 1996 NSC, DDRS.

³⁰⁰ "National Security Council: US Policy on Outer Space, NSC 5814," June 20, 1958. #345, declassified 1992 NSC, DDRS.

impinged on the Dyna-Soar. These men reminded an alert Eisenhower of the need to defend national security not only from external antagonists but also from economic dangers. Furthermore, they pointed out that little was known of Soviet space objectives and that knowledge of these objectives did not necessarily provide reasons for the United States to create projects to mirror accomplishments. A project like Dyna-Soar would ultimately have to stand on its own merits, as measured by national policymakers.

Discussion outside the NSC indirectly impacted these measurements, and Dyna-Soar first *overtly* appears in the Eisenhower archival record at this point. A June 10 conversation, including General Schriever, ARPA representatives, Nobel-winning physicist Edward Purcell, and NASA's acting administrator Hugh Dryden, had drawn several conclusions. This conclave considered whether national sovereignty could skyward endlessly:

It is absurd to try to apply national sovereignty to an ascending cone of outer space, to stay within which it is necessary at sufficient altitude to travel faster than the speed of light. Rather deal with outer space in terms of function, use, [and] vehicle.³⁰¹

In practical terms, national airspace sovereignty would have to end somewhere, or space exploration would not be possible. Purcell suggested that a freedom of space travel should be secured for vehicles making "passive transit" in space; he indicated "satellites which take photos and are recoverable or telemeter them [the images] back to home territory" as one example of passive transit. This description neatly aligns with the two alternatives under consideration for performing satellite reconnaissance.

Purcell also suggested a "delineation of responsibilities," and he would grant ARPA "manned maneuverable space flight" and "manned maneuverable orbital flight." The group listed several reasons to send humans into space, among them that "man can do some things better than a machine in an unknown environment." The notes show an interest that space vehicles "should have [a] circular orbit at 300 mi[les] – 7 times a day covers the whole Soviet bloc in 8 days." Four projects appeared as ways to

³⁰¹ "Outer Space Notes (Talks with Schriever, ARPA, [illegible], Purcell, Dryden," June 10 1958. Fldr June 1958 (1), Box 5, Special Asst National Security Affairs Special Asst ser, DDEL.

launch humans into orbit: first listed was a “collapsible boost glide vehicle,” then an “ejectable capsule,” next X-15 was placed in parentheses, and the last line read “Dyna-Soar (1963) – maneuverable.”³⁰²

Killian’s assistant, Robert O. Piland, warned him that the Defense Department was gaining control of the nation’s space program. “Man-in-space and communications projects have tentatively been assigned to ARPA,” and Piland feared that DOD authority would not retreat. “The placing of this initial manned space project under the direction of the military cannot help but set a precedent for future, more extensive manned projects.”³⁰³ Meanwhile, York informed Killian that although “consideration of space weapon systems, such as bombardment satellites, would be limited to studies in the 1959 budget, [...] that ARPA had an obligation to conduct the studies to insure that military opportunities were not overlooked.” Predictably, York’s position drew fire from Stans, who pointed to a \$10 billion deficit in 1959 “and the prospect of deficits continuing into the 1960s.” Stans deemed the \$500-600 million range for space budgets to be “out of order,” preferring a sum half as large.³⁰⁴

Deputy Defense Secretary Quarles and future Director of Defense Research & Engineering York agreed that the “man-in-space program” was neither “primarily” military nor “primarily” civilian, and that long-range objectives in space would determine its ultimate position.³⁰⁵ But Piland insisted to Killian that since man-in-space efforts were no longer on a “crash” basis, that “responsibility should be assigned on more basic grounds than ‘who has’ or ‘can do what’ at the moment.”³⁰⁶ This perspective boded poorly for the military’s space projects, and the remainder of Eisenhower’s presidency saw the transfer of military space assets and researchers to the ARPA.

³⁰² “Outer Space Notes (Talks with Schriever, ARPA, [illegible], Purcell, Dryden,” June 10 1958. Fldr June 1958 (1), Box 5, Special Asst National Security Affairs Special Asst ser, DDEL.

³⁰³ Memo from Piland to Killian, July 7, 1958. Fldr Space Notebook Killian, 1958059 (1), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁰⁴ Memo for Killian, notes of the Space Panel Meeting of July 2, 1958. Fldr Space Notebook Killian, 1958-59 (2), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁰⁵ York explained that “if manned exploration to Mars, for instance, was a national objective, then it would be reasonable to put ‘man-in-space’ in the civil category.” “NASA-ARPA Combined Budget for Space Activities Exclusive of Military Reconnaissance (117L): Fiscal Year 1959,” July 10, 1958. Fldr Space Notebook Killian, 1958-59 (3), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁰⁶ Memo from Piland to Killian, “notes of Space Budget and Responsibility Meeting of July 10, 1958,” July 11, 1958. Fldr Space Notebook Killian 1958-59 (3), Box 15, Special Asst Sci & Tech ser, DDEL.

From the ARPA, space projects were passed on to the NASA. But this transfer was not inevitable, and it was not taken for granted. “For all intents and purposes, ARPA has, of necessity, become the Nation’s first space agency. [...] Its proposed 1959 budget has only one major item which ARPA considers non-space.” This was the anti-ICBM.³⁰⁷ In general, control of the nation’s space-related projects shifted to the ARPA.

The Army Ballistic Missile Agency is a notable example. So is the Air Force’s Man in Space Soonest program, dubbed “Mercury.” Piland explained that the

Man-in-space project would still be the responsibility of the NASA since the military operational system is not yet defined. [...] The DOD would be permitted to not only develop and operate systems of a military nature and conduct research necessary to develop or determine feasibility of a particular system but would also be permitted to conduct any space activities that might have military application.³⁰⁸

In late July, Piland reported to Killian, in even more emphatic tones, of a necessity to curtail military involvement in space:

At the present time there is no seriously proposed weapon system, or military operation, which requires the development of a manned satellite. In addition, no reasons have been advanced which indicate that this research and development activity is ‘necessary to make effective provision for the defense of the US’ other than the ‘feeling’ that the military ultimately will require manned satellites or other space vehicles.³⁰⁹

Piland again repeated his message to Killian that Defense authority in a man in space project threatened to “set a precedent” regarding future projects, whether or not they involve any military application.³¹⁰

While authority for other military space projects would transfer to the ARPA and then onward to the civilian-controlled national space agency, the Dyna-Soar remained an exception. The Air Force retained authority for its space glider. But the very concepts of space bombardment were under attack and the role of the military in space exploration faced criticism.

³⁰⁷ Space Notebook, approximately July 28, 1958. Fldr Space Notebook Killian, 1958-59 (1), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁰⁸ Memo from Piland to Killian, notes of “Possible DOD-NASA Responsibility Relationships,” July 16, 1958. Fldr Space Notebook Killian, 1958-59 (3), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁰⁹ Notes, “Responsibility for Activities Directed Toward the Developmnet of a Manned Satellite,” July 23, 1958. Fldr Space Notebook Killian 1958-59 (3), Box 15, Special Asst Sci & Tech ser, DDEL.

³¹⁰ Notes, “Responsibility for Activities Directed Toward the Developmnet of a Manned Satellite,” July 23, 1958. Fldr Space Notebook Killian 1958-59 (3), Box 15, Special Asst Sci & Tech ser, DDEL.

July became August as Eisenhower's advisors continued to consider the role and needs of reconnaissance satellites.

Richard Leghorn sent Beckler revisions of a 1955 memo about unauthorized overflight of the USSR. Leghorn had written in July 1957 proposing a reconnaissance satellite. Now in July 1958 he reminded the PSAC member that "we should not plan on conducting unauthorized overflights indefinitely." He predicted that current unauthorized overflight capability would diminish in about 1959 or 1960 and suggested various "supplementary systems" including reconnaissance satellites, very high altitude jets, and ram-jet missiles, but not mentioning a boost-glide concept. Mirroring Killian's earlier assessment, Leghorn questioned the real utility of aerial inspection, because the Soviet Union (and therefore potential Soviet attack) lay just 10 hours away by air; fortunately, he expected reconnaissance satellites to provide "fully operational capabilities in 1960."³¹¹

Another report the following month indicated that "repeated overflights of USSR test ranges with high resolution cameras" would yield valuable information on Soviet missile development, but that the high altitude of satellites would probably preclude the discovery of ballistic or air-breathing missiles which were already built, installed, and camouflaged. Reconnaissance satellites, it predicted, provided more about Soviet developments in progress than about finished achievements. Envisioning a "substantial number of satellites" equipped with infrared detectors, "a detection of the launching of ICBM's may be possible by 1963."³¹²

Leghorn's work noted, however, that improved technical overflight capabilities needed to be complemented by political initiative to protect US intelligence gathering. He wanted "to minimize tension with the Soviet Union resulting from the unauthorized overflight program [and] to establish our legal right to be, when unarmed, anywhere in free space, e.g., outside the earth's air spaces, which run

³¹¹ Memo from Leghorn to PSAC Beckler, "Political Action and Unauthorized Overflight of the USSR Field: Space-Satellite," July 26, 1958. Fldr Space – Satellites July 1956-February 1960, Box 3, Special Asst Sci & Tech ser, DDEL.

³¹² "Some Aspects of the Problem of Surprise Attack," Aug 12, 1958. Fldr Surprise Attack August-September 1958 (2), Box 24, Staff Sec Alpha ser, DDEL.

usably to about 120,000 feet.”³¹³ Quarles voiced similar ideas to Eisenhower at an NSC meeting on July 31. Recalling that the US satellite project predated the IGY, he explained that from the start it had been “motivated by the desire to have a vantage point from which to view what goes on behind the Iron Curtain. In order to operate reconnaissance satellites for this purpose, however,” he continued, “it would be necessary to establish the doctrine of freedom of outer space.”³¹⁴

The Sputniks had helped set a precedent of acquiescence to satellites in space, but it was still not guaranteed. Furthermore, it had done nothing to completely ensure continued acceptance of satellites once technology progressed to allow reconnaissance data to be garnered and recovered, or that satellites would not be transformed into weaponized platforms. Vociferous voices, such as that of Missouri Democrat Senator Stewart Symington, cried for ever greater US military capabilities. Symington had served as Harry Truman’s Air Force Secretary in the previous administration, and Symington continued to work as a paladin of the Air Force. He had spearheaded Congressional angst about the supposed “bomber gap” during Eisenhower’s first administration and participated in the unrest about an equally specious “missile gap” during the President’s second term. Symington leveled caustic statements against the administration, questioned intelligence estimates of Soviet strength, and demanded that Eisenhower do and spend spectacularly more on defense.³¹⁵ Even if Symington’s outrage were genuine, his noises in Congress became popular among other Democrats who were, like him, interested in claiming the Presidential mantle in 1960. Perceived military weakness carried political dangers. The potential of military vulnerability carried existential risk, and it could not easily be discounted.

The power to deny space to the enemy, or the capacity to control it one’s self, might prove useful if a general war were to come. Officials considered the technical possibility of denying the use of space. “It

³¹³ Memo from Leghorn to PSAC Beckler, “Political Action and Unauthorized Overflight of the USSR Field: Space-Satellite,” July 26, 1958. Fldr Space – Satellites July 1956-February 1960, Box 3, Special Asst Sci & Tech ser, DDEL.

³¹⁴ “Discussion at the 374th Meeting of the National Security Council, Thursday, July 31, 1958,” Aug 1 1958. #1026, declassified 1997 NSC, DDRS.

³¹⁵ “Diary, August 25 1958.” Fldr August ACW Diary – 1958 (1), Box 10, PP (AWD), DDEL. Letter attachment from Symington to Eisenhower, Aug 29 1958. Fldr Symington Letter, Box 24, Staff Sec Alpha ser, DDEL.

is believed that a small number of megatons exploded at a suitably high altitude can make manned space flight impossible for a period of time.” Although a July 1958 status report noted that the length of time was not yet known, the Argus tests, a series of nuclear explosions triggered in space, were calculated to find answers.³¹⁶

The Dyna-Soar represented a more active alternative for controlling space than a denial technique of in-space detonations outlined in Argus. Air Force General Nate Twining, Chairman of the Joint Chiefs of Staff, told the President and the National Security Council that US “scientists were not really in sympathy with the military objectives in the exploration and exploitation of outer space.” Science dollars thrown into the sky might be gone forever – they would not necessarily land back on earth.

Eisenhower remained unmoved; Killian noted, “fifty percent of our American scientists were now working in one way or another for the military services.” Earlier in the meeting, Eisenhower had explained his outlook on space.

The President felt that we should put, so far as possible, all space projects under the space agency. Clearly, not all of these space projects were going to turn out to have military implications, at least at the outset. The space agency must prove the military practicability or feasibility of a given space project or activity before the Defense Department takes over [...]. Secretary McElroy expressed doubt that the agencies of the Defense Department would be willing to wait until the space agency proved that [...]. The President replied that he couldn't at this time help but look upon these initial activities in outer space as we used to look at wildcatting in oil in a former day.³¹⁷

Had the Dyna-Soar been mentioned by name during this meeting, the President would almost certainly have identified it as a “wildcat” project. Indeed, the time would come when he would do that.

³¹⁶ “Effects of Nuclear Weapon Explosions in the Outer Atmosphere: A Brief Status Report,” July 24 1958. #0285, declassified 2000, DDRS.

³¹⁷ “Discussion at the 376th Meeting of the National Security Council, Thursday, August 14, 1958,” Aug 15 1958. #2771, declassified 1997, DDRS.

Chapter 5: "SATELLITES ARE OUR LAST CHANCE"

Ok says P[resident Eisenhower], but still thinks it should be out of Defense. Pres[ident] wants satellite orbiting and working before Defense takes it. McElroy defends recon satellite. Pres[ident] - have we proved we have the satellite we want - lets [sic] get what we want and then give Def[ense] application. - notes, meeting in Augusta, November 28, 1958³¹⁸

November 1958 marked greater administration awareness of the Dyna-Soar program, but it remained a small ship in a busy sea of major issues. The year's recession earned public attention and brought political repercussions. The midterm election season claimed much of Eisenhower's attention, and his diary describes the period from mid-October through early November as one of so much "intense political activity [...] that it was impossible to make daily notes." Eisenhower had emphasized fiscal restraint in the face of public discomfit and in contrast to Democrats' calls for bold increases in spending, arguing that such funds would provide both an answer to Soviet strategic challenges and a solution to economic recession at home. Republicans took a drubbing. In the Senate, defeat unseated ten incumbent Republicans and Lyndon Johnson's narrow majority grew to a formidable 65 seats; in the House another Texas Democrat, Sam Rayburn, oversaw the dramatic widening of his party's majority. On Sputnik I's first anniversary, only a single Soviet satellite remained in orbit, and also in orbit were three US satellites. Nevertheless, as White House personnel recognized, US space accomplishments had remained less spectacular even if they were more scientifically useful. Space was not the only issue. But the midterm election unambiguously indicated that the public's confidence in the President and in his policies was shaken.³¹⁹

As already shown, Piland counseled against military interests in space. On November 3, 1958, he authored a memo to Killian about the Dyna-Soar. It was a scathing criticism. "The question of the need for a satellite vehicle capable of maneuvering and landing upon re-entry appears to be confused with the need for a glide missile," he expressed. Explaining that "the Dyna-Soar concept has been studied for five

³¹⁸ Gordon Gray, "handwritten notes of meeting at Augusta, Georgia, Nov. 28, 1958 re defense expenditures," Nov 28, 1958. Fldr Meetings with the President 1958 (4), Box 3, Special Assistant for National Security Affairs, Special Assistant ser, DDEL.

³¹⁹ "Diary: October 13, November 2 period [1958]." Fldr ACW Diary - Nov., 1958, Box 10, PP AWD, DDEL. Divine, Robert. *The Sputnik Challenge: Eisenhower's Response to the Soviet Satellite* (Oxford University Press, 1993), 185, 196-7.

to ten years,” Piland implied that the Dyna-Soar was synonymous with boost-glide bombardment research.³²⁰ Accepting this assertion, one could see the continuity between several previous, related, efforts: late Nazi research on Eugene Sänger’s *Amerikabomber*; Walter Dornberger’s proposal to Bell Laboratory of an atmosphere-skipping aerospace craft; the Air Force projects Hywards, Brass Bell, and Bomi; and finally the consolidation of its earlier research projects into the Dynamic Soarer. The boost-glide concept had been considered for a decade, and some of these manifestations had shared an objective of creating a bomber. But it is equally clear that boost-glide work had undergone too many alterations to be neatly characterized as *synonymous* with the Dyna-Soar program. By describing the one-year-old program in such terms, however, Piland reinforced his message that work on the Dyna-Soar had been marked by confusion.

Piland also labeled the program as ill-conceived. Reaching back to World War II-era boost-glide considerations, Piland said that the Dyna-Soar had been studied because of an impression that boost-glide methods would allow longer strike ranges than could have been achieved using contemporary ballistic missiles. The glide phase, however, introduced heating problems distinct from those being confronted with missile nose cones during reentry. Piland depicted a program which the Air Force wanted to continue, despite the technology having been preempted by other, superior systems. The potential for satellites, for example, disintegrated the need to *extend* vehicle ranges. The Air Force intended to use the Dyna-Soar for reconnaissance and bombardment, but Piland reminded his boss that work on satellites threw the Dyna-Soar’s reconnaissance value into question, and that as a bombardment vehicle the Dyna-Soar would have to be “compared with the ballistic missiles, including Minuteman.”³²¹ Although Killian himself had informed the President that second-generation missiles would be feasible, this comparison in 1958 between Dyna-Soar and Minuteman remained speculative, to say the least, about each of the respective systems.

³²⁰ Memo from Piland to Killian, “Dyna-Soar,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

³²¹ Memo from Piland to Killian, “Dyna-Soar,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

Piland dryly declared to Killian that “if the Air Force has a definite requirement for a bomber in the 5-10,000 mile range, then the concept may be desirable. If it is to be used only as an orbital vehicle, the approach should be altered.”³²² Of course, Air Force thinking was predicated on the need for intercontinental weapons systems as the pillars upholding deterrent strategy and ultimately national policy during the Cold War. The Air Force *did* want more numerous and progressively improved long-range weapons systems. Since the Air Force’s attitude was no secret, Piland certainly intended his statement to question the Air Force’s outlook.

Piland’s memo painted the portrait of the Dyna-Soar as a misfit. “The conceptual test vehicle,” Piland continued, “is something short of a weapons system but decidedly different from the X-15 research airplane concept.”³²³ Perhaps anticipating a query as to the opinion of the newly established civilian agency overseeing the civilian space program, Piland noted that:

The NACA/NASA position is that a glide vehicle capable of speeds of 20,000 feet or thereabouts is a reasonable extension of the research airplane concept. As such it would be valuable in studying and evaluating problems of flight at high altitudes. The NASA maintains its usual position of not commenting on the military utility of the vehicles. The NASA has also not commented on the relative priority of this project.³²⁴

Reinforcing his already clear message, Piland bluntly added that the Dyna-Soar’s “desirability as a weapon system has not been clearly established in comparison with reconnaissance satellites and ballistic missiles.”³²⁵

Piland’s excoriating memo included an attachment, titled “Air Force Dyna-Soar Project Justification.” Consisting of a single fourteen-line paragraph, it summated the Air Force’s interest in and purpose for the Dyna-Soar, explaining:

DYNASOAR will represent the first of a whole new generation of manned weapon systems that will succeed present day turbo-jet powered weapon systems and may eventually supplant unmanned ballistic weapon systems. The introduction of this new family of weapon systems will

³²² Memo from Piland to Killian, “Dyna- Soar,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

³²³ Memo from Piland to Killian, “Dyna- Soar,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

³²⁴ Memo from Piland to Killian, “Dyna- Soar,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

³²⁵ Memo from Piland to Killian, “Dyna- Soar,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

enable the Air Force to nullify air defenses designed to combat air-breathing manned vehicles and predictable ICBM trajectories.³²⁶

The Air Force saw the Dyna-Soar as a means toward creating a more diverse, and therefore more formidable, deterrent.

It is impossible to know the future. For his part, Killian professed an open mind to future possibilities when he said that R and D regarding weapons development “should [be] predicated on an over-all grand strategy [...] which includes as an inherent concept the recognition that the strategy must be modified as new technological opportunities arise.”³²⁷

A contemporary summary of space activities prepared for the National Aeronautics and Space Council identified “four areas which obviously represent potential operational systems that have military application.” Reconnaissance, communications, meteorology, and navigation comprised these areas. The report also noted that the payload capacity for boosters expected in calendar years 1958-1960 ranged between 22 and 2700 pounds. Future systems “will eventually allow a satellite payload capability of 6000 to 8000 pounds.”³²⁸ Since the various conceptions of the Dyna-Soar each weighted several thousands of pounds, finding powerful enough boosters would alone prove a significant hurdle – and one which Piland in his memo to Killian had not failed to mention.

Perhaps in keeping with these challenges, Killian received a memo on November 15 exploring the needs of “an adequate successor to the presently operational special reconnaissance aircraft [U-2].” For his part, Bissell had been working on a successor to the U-2 ever since August 1956, just one month after its first mission over the USSR. The requirements read: first, a “substantial increase in operational ceiling and probably also in speed to avoid interception;” second, a low radar profile; third, “no sacrifice in operational range;” and last “minimum size and weight.” The advisory group preferred “a new, small

³²⁶ Memo attachment from Piland to Killian, “Air Force DYNA-SOAR PROJECT Justification,” Nov 3, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

³²⁷ Killian, speech script, Sept 26, 1958. Fldr Space – Speeches September 1958, Box 3, Special Asst Sci & Tech ser, DDEL.

³²⁸ “National Space Activities: A Brief Summary Prepared for the National Aeronautics and Space Council,” Sept 12, 1958. #0974, declassified 1998 NASA, DDRS.

and reasonably lightweight aircraft carried aloft to supersonic speed by the B-58 as a mother aircraft.”³²⁹ Such ideas would eventually yield the plane designated as the SR-71 Blackbird and a variant carrying a piggyback drone.³³⁰ Significantly, the group seems to have presumed, from the outset, that the successor to the U-2 was to be an aircraft. Obviously, this precluded real consideration of the Dyna-Soar or a similar boost-glide concept. But the panel’s thinking also indicates that, although the U-2 was a stop-gap means of collecting photographic surveillance data about the USSR, the principle of illicit overflight was not necessarily believed to be a similarly transient expedient.

Eisenhower’s first question about the Dyna-Soar came on November 28, 1958, and it was a simple one. The President’s assistant, Gordon Gray, kept notes during this conference in Augusta Georgia. Sometime during the second half of the meeting, two “exotic programs” were mentioned. One was a “ANP,” an acronym for “aircraft, nuclear powered”; the other was the Dyna-Soar. Eisenhower asked what this latter program was, and Gray’s notes indicate that the answer: it “follows on [the] X-15” as a “high altitude & high speed [vehicle] moving to an [sic] 4, 5, 6, 100 miles altitude.”

According to Gray’s notes, Dyna-Soar did not reappear during the discussion, but the nuclear powered aircraft (another Air Force answer to potential future needs) did. Eisenhower asked why the NASA and the AEC did not get control over nuclear propulsion research; Quarles attempted to defend the ANP’s position under the DoD, but “P[resident] still thinks it should be out of Defense.” Furthermore, Eisenhower “want[ed a] satellite orbiting and working before Defense gets it.” McElroy defended the reconnaissance satellite’s position too, but Eisenhower responded, asking whether “we [have] proved we have the satellite we want” and explaining, “lets [sic] get what we want and then give Def[ense] application” of it.³³¹

³²⁹ Memo by Edwin H. Land, Courtland D. Perkins, Edward M. Purcell, Allen F. Donovan, and H. Guyford Stever to James R. Killian, Nov 15, 1958. #2366, declassified 2000 WH, DDRS.

³³⁰ The D-21 drone and sole remaining M-21 modified SR-71 are on display at the Museum of Flight in Seattle, Washington.

³³¹ Gordon Gray, “handwritten notes of meeting at Augusta, Georgia, Nov. 28, 1958 re defense expenditures,” Nov 28, 1958. Fldr Meetings with the President 1958 (4), Box 3, Special Assistant for National Security Affairs, Special Assistant ser, DDEL.

Two December launches testified at best to a mixed answer to Eisenhower's question whether the United States was getting what the President wanted regarding space advances and satellite successes.

Organizational and rhetorical developments showed progress, from the President's perspective. Transfer of space projects and authority continued from the services to the ARPA and from the ARPA toward the NASA. Consistent with this policy, Goodpaster informed press secretary Hagerty that "accomplishments [by the United States in space] should be announced as US accomplishments, not as accomplishments of particular agencies or organizations such as the Army, the Air Force, etc." Eisenhower had reminded the National Security Council in late summer that "we are struggling for a psychological victory."³³² A "psychological victory" had to be in keeping with national policy, aligning with the President's hope to ensure and expand the freedom of space. The transfer of space projects away from the military had been in line with this intention. But truly dramatic technical accomplishments in space – the vital ingredients for a "psychological victory" – had laid beyond reach throughout so much of 1958. In the year's final month, two launches would attempt to provide that psychological victory.

The first launch illustrated the dangers of space. A US launch at 4 a.m. on December 13, aimed to mark the first time that a primate entered space and the first time that a creature be recovered alive from space. The squirrel monkey, alternately called "Gordo" and "Little Old Reliable," placed inside the Jupiter rocket's nose cone, succeeded on the first point but a parachute failure prevented his survival and the capsule's recovery. Days before the launch, the government had prepared for various contingencies, including a failure to recover the animal; "nothing will be said about the animal experiment unless queried," and in that case only minimal information and no photographs were to be released. Months before Gordo's death, Assistant Secretary of State William M. Roundtree had warned the Defense Department that "publicized use of monkeys in space satellites" could damage US relations with "the

³³² Letter from Quarles to NASA administrator Glennan, Nov 28, 1958. Fldr Space Council (10), Box 24, Staff Sec Alpha ser, DDEL. Letter from NASA Administrator Glennan to Sec Def McElroy," Dec 1, 1958. Fldr Space Council (10), Box 24, Staff Sec Alpha ser, DDEL. Memo by Goodpaster to Hagerty, Nov 26, 1958. Fldr National Aeronautics and Space Administration September 1958 – January 1961 (3), Box 18, Staff Sec Alpha ser, DDEL. "Memorandum of Discussion at the 375th Meeting of the National Security Council," Aug 7, 1958. *FRUS* 1958-1960 Volume III, doc 32, pp132-135.

peoples of several Asian nations where monkeys are treated with great respect and, in some cases, veneration.” The December 9 memo outlining Army perspectives for handling publicity about the imminent launch took care to note that “The type of animal will be included, specifically noting the primate type, i.e. squirrel monkey. NOTE: This is not the Rhesus Monkey which is particularly sensitive to the Indians.” In view of the December 13 failure and its potential diplomatic implications, the government had been wise to replace the Indian rhesus monkey it had trained for a space experiment with an untrained American squirrel monkey. In future, efforts would be made to “avoid personalization of the monkeys,” and while the OCB suggested referring to the creatures only by lab names, the NASA preferred that, “lest the press originate fanciful names for the monkeys,” they “call them Able and Baker.”³³³ When successful recovery of a small monkey from a short ballistic space trip seemed so doubtful, the prospect of manned aerospace bombers in any reasonably foreseeable timeframe could easily have seemed to many to be sheer fantasy.

The second of the December launches represented a more visible success but it demonstrated relatively little in the way of scientific achievement. Somewhat ironically, Quarles had reported virtually the opposite to Eisenhower on August 7, asserting that the launching of a “stripped-down ATLAS” would place a 9,000 pound satellite with a 100 pound payload “into orbit by late 1958.” Quarles noted that such a large object would be visible with the naked eye and “would provide important engineering data of use to the planned ‘Man-in-Space’ program in terms of guidance and control.” Quarles acknowledged perils: “while there is a high risk of failure of this project because it contemplates only one launching and would use hardware that is now in early prototype stage of development, it is considered worth the risk involved.” He also mentioned that the estimated cost for the payload development and booster

³³³ Memo from Colonel Seedlock to Mr Murry Snyder, “Jupiter Shot on 12 December,” Dec 9, 1958. Fldr National Aeronautics and Space Administration September 1958-January 1961 (5), Box 18, Staff Sec Alpha ser, DDEL. Undated letter by Asst Sec of Near Eastern, South Asian and African Affairs William M. Roundtree to Asst Sec of Defense for International Security Affairs Mansfield D. Sprague. Reply letter by JN Irwin to Roundtree, May 19, 1958. Fldr National Aeronautics and Space Administration September 1958-January 1961 (5), Box 18, Staff Sec Alpha ser, DDEL. “Public Information Handling of Biomedical Experiments for Jupiter IRBM Test Vehicle No. 18,” May 27, 1959. Fldr National Aeronautics and Space Administration September 1958-January 1961 (5), Box 18, Staff Sec Alpha ser, DDEL. “Notes on pre-press briefing, June 3, 1959.” Fldr ACW Diary – June 1959 (2), Box 10, PP AWD, DDEL.

modification amounted to \$600,000, to be provided by the ARPA.³³⁴ Quarles identified this project as something capable of fulfilling the “psychological victory” which Eisenhower had that same day told the National Security Council he needed. The action was dubbed “Project Score.”

Project Score encountered detractors. Piland described it to Killian as the “Atlas ‘Carcass’ Satellite.” Predictably, Piland found it too potentially close to military presence in space. Although the warhead was to be replaced by a package not containing any weapon, the vast bulk of the satellite would be its 9,000 pound fuselage rather than its 100 pound payload. And Atlas was then the country’s intercontinental ballistic missile. “I believe the possible reaction to the US putting a missile in orbit to pass over other countries might case adverse reaction,” he wrote.³³⁵

Quarles’ perspective won the day, and Project Score closed 1958 with a dramatic and visible success. One significant item in its payload was equipment to allow the relay of a message from earth to the satellite and back down to earth. It consisted of fifty-eight words, spoken by the President, proclaiming the scientific marvel and “convey[ing] to [...] all mankind America’s wish for peace on earth and good will toward men everywhere.”

Project Score was an encouraging psychological coup – it was not a knockout blow. Nor did the Eisenhower administration see psychological space achievements as being capable of offering opportunity for such a blow in the Cold War. An OCB report at the start of 1959 illustrated the administration’s perception on this point. “There is less tendency – particularly in the responsible press – to treat each latest triumph as indicating final ‘victory’ in the space race, or as giving proof of a commanding lead.” This perspective complements Eisenhower’s “long haul” vision of the Cold War as much as it conflicts with the proposals made by his successor at the start of the coming decade.

The OCB report cheerfully continued that “another sign of sophistication is the apparent increase in attention to the launchings as ‘propaganda’ triumphs; there is less immediate disposition to accept them as

³³⁴ Letter from Quarles to Eisenhower, Aug 7, 1958. Fldr McElroy, Neil 1957-8 (1), Box 23, P AWD, DDEL.

³³⁵ Memo from Piland to Killian, “Atlas ‘Carcass’ Satellite,” Nov 6, 1958. Fldr Missiles April-December 1958 (3), Box 12, Special Asst Sci & Tech ser, DDEL.

purely scientific, technological, or military triumphs.” Although the report identified a “consensus [...] that the US is behind at the moment in rocketry, [...] but Atlas had sufficient impact to make comment more cautious in describing the lead as decisive.”³³⁶

Improved intelligence – in terms of amounts and regularity – would be welcome and real accomplishments. A year earlier, the Air Force had predicted that US reconnaissance satellites could be ready by the coming spring. Now that spring had come. And, although some figures pondered the implications of these satellites, the first successful recovery from a reconnaissance satellite still lay another year and a half in the future.

At the close of 1958, the ARPA director Roy Johnson had answered press inquiries about WS-117L by describing it as an “open ended” project but adding that “the series as now planned does not include a man in it.” He noted frankly that WS-117L “early was an all-inclusive thing that covered satellite work of any kind for the Air Force,” and since then it had been reconfigured. Reporters asked what military value the program entailed, “what distinguishes this experiment from the civilian type experiment of NASA?” Johnson replied that “there are military missions where you would like to get back the data that you acquired and examine it visually,” and when a follow-up question suggested that this referred to photographs, Johnson insisted “I am not referring to anything specifically.” As he had told reporters, DISCOVERER had been separated from WS-117L.³³⁷ Johnson did not of course mention that the CORONA reconnaissance program secretly piggybacked on the unclassified Discoverer, which effectively served as something of a blind.

How long do open societies successfully keep secrets? One letter from an influential scientist spoke to concerns that such a ruse might be contemplated, and feared that the time would be limited. C.G. Villard, a member of the Space Science Board of the National Academy of Sciences’ National Research Council, referred to an article he had read in *Aviation Week* magazine. Villard cautioned that the government must resist the “considerable temptation to pass off what was in fact a military

³³⁶ “Intelligence Notes,” Jan 9, 1959. #2095, declassified 1985 WH, DDRS.

³³⁷ “DOD minutes of press conference held by Mr Roy Johnson, Director, ARPA,” Dec 3, 1958. Fldr National Aeronautics and Space Administration September 1958-January 1961 (3), Box 18, Staff Sec Alpha ser, DDEL.

reconnaissance satellite, as just another scientific test. [...] Speaking as a scientist, I would hate to be a party to such a deception, however desirable it might seem at the time.” In open societies, Villard emphasized, truth has a way of leaking out, and the emergence of a deception would tarnish what Villard considered “one of the greatest psychological assets of the Western powers, [that] the circumstance that in general their public announcements are truthful.”³³⁸

Two days before Project Score, the Director of Central Intelligence briefed the vociferous Senator Symington with what the intelligence apparatus knew of Soviet missile development. In the fall, Symington, relying on information illicitly received by a former assistant then working at the Convair aircraft company and then passed forward to the Senator, accused the administration of incompetence. Now presented with CIA figures on Soviet missile testing, or rather a lull in their missile firing, Symington’s assumption that the USSR would have 500 ICBMs by 1962 began to seem somewhat silly. Relying on his own experience in industry and dealings with corporations, Symington reflected that it was difficult to imagine the USSR having many missiles without testing them. And yet the CIA was not finding evidence of tests. “Considering the estimated cutback in bomber production in conjunction with our figures on ICBM firings, it sounded [to Symington] as if Khrushchev was violating Teddy Roosevelt’s principle of speaking softly but carrying a big stick.” Yet later during that briefing, Symington expressed his continuing belief that the Soviets were flying a nuclear-powered aircraft; he explained that his foundation for this belief was a 1953 statement by the former Defense Secretary Charles Wilson that although Wilson had found the ANP to be useless that the Soviets were then working on it. Administration personnel conceded to being “puzzled” by some of the intelligence information, but Symington refused to seriously believe any of the intelligence information which conflicted with his

³³⁸ Letter from CG Villard to VL Berkner, Jan 22, 1959. Fldr Space January-June 1959 (6), Box 15, Special Asst Sci & Tech ser, DDEL.

presumptions of massive Soviet military buildup.³³⁹ Eisenhower “called Symington ‘neurotic’ and a ‘demagogue’ who ‘leaked security information that ‘mislead’ the public.’”³⁴⁰

In separate context, the NASA Administrator Keith Glennan noted during a January 1959 National Aeronautics and Space Council meeting that “estimates of future Soviet progress were based on utilizing to the fullest, their science and technology without concern for budgetary limitations,” whereas the same was not the case for US development.³⁴¹ This juxtaposition illustrates the difficulty involved in determining what the Soviets *were* doing and the seductive alternative of imagining what possibilities they might follow and then presuming that the Soviets were marching forward in all directions, ten feet tall.

Even the best intelligence estimates about the Soviets were in fact necessarily based on guesswork. Intelligence gathering – and digestion – is always a messy task, and an intelligence picture can never be available in a complete, clear, and simultaneously timely form.³⁴² The CIA estimated that the Soviets were building ballistic missiles and might possess about 130 by 1962. The Air Force and Senator Symington each insisted that Soviet strengths were growing at geometrically faster rates than believed by the CIA. In fact, Soviet missile buildup during the latter years of Eisenhower’s administration was fairly scant. With sporadic U-2 flights overflying the USSR’s enormous landmass in small strips, US intelligence personnel could develop a picture of Soviet strength and development, but it remained a picture with gaps. A bare fraction of the USSR could be studied, even during the cumulative four years in which lone U-2 aircraft photographed narrow strips of the country that intelligence indicated might be

³³⁹ “Memorandum of Conversation: Subject: DCI Briefing of Senator Stuart Symington on the Soviet Ballistic Missile Programs and Capabilities,” Dec 16, 1958. Fldr Symington Letter, Box 24, Staff Sec Alpha ser, DDEL.

³⁴⁰ Roman, Peter J. *Eisenhower and the Missile Gap* (Ithaca, NY: Cornell University Press, 1995), 131.

³⁴¹ National Aeronautics and Space Council, “Informal Meeting of 28 January 1959.” #3454, declassified 1996 NASA, DDRS.

³⁴² Keegan, John. *Intelligence in War: Knowledge of the Enemy from Napoleon to Al-Qaeda* (New York: Alfred A. Knopf, 2003).

potentially significant. Herbert York, the first Defense Director for Research & Engineering, later described the task as “trying to prove a negative on the basis of a very small sample.”³⁴³

In discussion with science advisor George Kistiakowsky in January 1959, Eisenhower conceded the scientist’s belief that the USSR might possibly possess “an operational long-range missile force.” As Kistiakowsky had mentioned, long-range ballistic missiles seemed “in fact [to be] a focal point in their whole defense concept.” But Eisenhower posed vital questions for which the nation’s policymakers needed to know answers: What were the numbers of these missiles? What was their degree of accuracy? And, implicitly, what did the USSR expect to happen afterward? The President pointed out that, even if the USSR had such missiles and used them, “they [the Soviets] would still be exposed to destruction” from the rump of the US deterrent forces.³⁴⁴ Eisenhower did not evince anxiety that the nation needed a revolutionary new generation of weapons systems to preserve its deterrent posture.

The prospect of further Soviet space progress, and US alternatives, loomed in the minds of policymakers in the early months of 1959.

Notes from a February 17 conference may seem to suggest that the President was not in the driver’s seat with respect to US space policy. Eisenhower confided to close advisors that he was “not disposed to challenge the space program conception, or to try to put a stop to a major program.” The President explained, “the psychological build-up would be untenable.” While he would be able to stand the pressure himself, “he was sure that the Congress would break loose under the pressure. He stated that world psychology on this matter has proven to be tremendously important – even if it is not too well informed.” Killian added, “we may have a recurrence of the Sputnik hysteria if the Soviets get a ‘man in space’ first.”³⁴⁵

³⁴³ York, Herbert. *Making Weapons, Talking Peace: A Physicist’s Odyssey from Hiroshima to Geneva*. (New York: Basic Books, 1987), 123.

³⁴⁴ “Editorial Note,” for Jan 12, 1959. *FRUS* 1958-1960 Volume III, pp172-173.

³⁴⁵ “Memorandum of Conference with the President, February 17, 1959,” Feb 24, 1959. Fldr National Aeronautics and Space Administration [September 1958-January 1961] (5), Box 18, Alpha subser, Staff Sec Subject ser, DDEL.

The February 17 meeting indicates that strong, and strongly different, aggregate public opinion could potentially give the President pause in his space programming. Eisenhower expressed unwillingness to dramatically alter space projects which enjoyed substantial public support. Because the Dyna-Soar remained obscure in the waning years of the 1950s, this could not guarantee the program's safety in the face of administration misgivings. Nonetheless, Eisenhower's confidential statements indicated a concession that he might bend in this wind rather than break in it.

On the other hand, because of the priority Eisenhower placed on adequate defense combined with economic health, his willingness to bow to public opinion strongly suggests that he did not sense the prospect of an existential threat emerging from any imminent Soviet successes. Eisenhower regretted feeling compelled for domestic political reasons to bow somewhat to public hysteria. He felt able to do so because he did *not* share that hysteria.

The following month, the Operations Coordinating Board compared its predictions of Soviet and US future capabilities. The OCB's task was to coordinate various policies and report to the NSC. The report anticipated that a Soviet manned circumlunar mission "with reasonable chance for success" as early as 1961 and judged that the Soviets would not be able to contemplate a manned lunar launching until "sometime after 1965." In the event, the USSR never accomplished either of these tasks. But the OCB's predictions certainly show a sober respect for Soviet technical capability, and arguably these forecasts also indicate an underestimation of the challenges involved with manned space travel.³⁴⁶

When the OCB listed "earliest possible capability dates" for "planned and possible US space program objectives," it predicted that a "maneuverable type" manned satellite might be ready as early as 1962-3 and that a prototype "strategic weapons delivery" project could be achieved as early as 1961. Although the Dyna-Soar is not referred to by name, these two items sound strikingly like the role envisioned by the Air Force for its Dynamic Soarer. While a case might be made that these items fit the Air Force's contemporary "SAINT," or *Satellite Interceptor* concept (which is also not mentioned in the OCB's

³⁴⁶ "Operations Coordinating Board: Operating Plan for Outer Space," Mar 18, 1959. #3540, declassified 2000 WH, DDRS.

report), other items described dispel that impression. The OCB lists five projects not expected to be possible prior to 1965: a 25,000 pound satellite, a manned circumlunar flight, a manned lunar landing, a military space platform, and a satellite interceptor.³⁴⁷

The OCB proved itself optimistic about manned spaceflight capabilities again when returning to estimates of Soviet capabilities. It considered a Soviet manned capsule possible between 1959 and 1960, “glide-type vehicles” as early as 1960 or 1961, and 25,000 pound satellites between 1961 and 1962. The “glide-type vehicle” would have used the boost-glide concept which the Dyna-Soar embodied for the Air Force, and the OCB anticipated the Soviet lead in space to continue unabated for some time.³⁴⁸

However, in keeping with Eisenhower’s own thinking, the OCB did not see a continuing Soviet lead in space as necessarily constituting an existential security threat to Americans on earth. “Soviet space exploration programs and military programs are complementary,” the report noted, citing specifically the use of ICBMs as space boosters. Soviet military applications of space remained a possibility:

Future Soviet programs probably will be established for fairly specific scientific and/or military purposes in accordance with a planned, step-by-step progression from one achievement to the next. [...] While the Soviet space program was undoubtedly initiated to serve scientific purposes, an immediate aim was to achieve political and propaganda gain. [...] In recent months, several Soviet sources have stated that a manned space vehicle is feasible and is one of the USSR’s prime objectives. [...] We believe that the Soviets intend to pursue an active space flight program designed to put men into space for scientific and/or military purposes. We also believe they intend to undertake further scientific research utilizing unmanned earth satellites, lunar rockets, and probes to Mars and Venus. [...] Immediate or known military considerations may have no bearing on the decision to develop certain types of space vehicles, although the successful development of these vehicles could result in military applications.³⁴⁹

The foundation for this attitude had been laid down in January. A joint paper by the NASA and the DOD, unclassified in April 1959, recounted information which had been provided to policymakers three months earlier. The central figures included Mercury and Discoverer. The Dyna-Soar did not figure prominently in the briefing notes, but it did appear once, and very inauspiciously. “The requirements of

³⁴⁷ “Operations Coordinating Board: Operating Plan for Outer Space,” Mar 18, 1959. #3540, declassified 2000 WH, DDRS.

³⁴⁸ “Operations Coordinating Board: Operating Plan for Outer Space,” Mar 18, 1959. #3540, declassified 2000 WH, DDRS.

³⁴⁹ “Operations Coordinating Board: Operating Plan for Outer Space,” Mar 18, 1959. #3540, declassified 2000 WH, DDRS.

the DYNASOAR Program have not yet been thoroughly defined,” began the single-sentence paragraph, “but will be reviewed in order not to duplicate the Mercury Program equipment.”³⁵⁰ The Dyna-Soar would not be allowed to “duplicate” the work of the Mercury, and implicitly its development would not be allowed to impede that of the manned capsule. Yet, as has been pointed out, the Dyna-Soar would have to compete against such programs in order to secure its existence.

“Satellites are our last chance,” warned Richard Leghorn. Consistent with his earlier messages, Leghorn believed that “the problem is not a problem of technology. It is not a problem of vulnerability to Soviet military measures. The problem is one of the political vulnerability of current reconnaissance satellite programs.” He had predicted previously that the U-2’s capabilities would decline between 1959 and 1960, and by April 1959 the United States found itself already in that window. “Should reconnaissance satellites be ‘politically shot-down’, no scientific or technological opportunity can be foreseen to obtain this security information during the forthcoming years.” The solution would be to negotiate the freedom of space, to establish a satellite detection capacity of nuclear tests, and perhaps to offer satellite surveillance to the United Nations.³⁵¹

Killian had considered complementary issues in March, when he had written to Eisenhower about a possible agreement banning nuclear tests in the atmosphere. Killian had emphasized to the President the importance of establishing a “formal agreement (rather than [...] unilateral action)” and that this include “some system of monitoring” compliance. The scientific advisor hoped that “such an agreement might include specific provisions for a phased, evolutionary extension of the test ban to include coverage of testing underground and at high altitudes when controls adequate to detect such tests became technically feasible.” A formidable hurdle in contemporary discussions with the USSR was the lack of feasibility

³⁵⁰ NASA and DOD, “A National Program to Meet Satellite and Space Vehicle Tracking and Surveillance Requirements for FY 1959 and 1960,” unclassified April 1959. #2759, declassified 2001 DOS, DDRS.

³⁵¹ “Political Action and Satellite Reconnaissance,” April 24, 1959. Fldr Space January-June 1959 (6), Box 15, Special Asst Sci & Tech ser, DDEL.

and dependability of test detection. But in his memo, Killian identified another challenge: “the limit of the ‘atmosphere’ will probably be difficult to establish.”³⁵²

The NASC meeting of April 27 witnessed two vital statements in determining the course of the Dyna-Soar. Eisenhower noted “that any space program, whether it be military or civilian, should come before this Council for recommendation with final determination by the President.”³⁵³ Two months earlier, Eisenhower had described “world psychology” about space as “tremendously important,” although this did not necessarily denote that Eisenhower had conceded power over the trajectory of US space exploration. Now with his April 27 statement he reinforced the point that as President he would chart the final course of the nation’s space policy for the duration of his presidency.

Shortly after the President reemphasized his authority over space policy, Deputy Defense Secretary Quarles moved to bring military space projects more closely into the DoD fold. Speaking for the DoD, Quarles argued that “space is a place in which old missions may be more effectively carried out with new tools. Therefore he proposed that in the case of DOD projects, whether or not in space, reprogramming of Defense funds should be based upon their competitive position on a scale of Defense values rather than on their relationship to the rest of the space program.”³⁵⁴ Extending Quarles’s statement, the Dyna-Soar would be seen in its military role, and it would be compared to other deterrent alternatives such as manned bombers and ballistic missiles.

Ironically, Piland had suggested just as much when he had written to Killian the previous fall –but Piland had been castigating the program! Piland had been confident that the Dyna-Soar could not withstand such a comparison, while the Air Force interest in a diversified deterrent did not see the Dyna-Soar as subject to competitive comparison with programs it was meant (in the short run) to complement rather than to replace. Since Piland’s November 1958 memo, however, the Dyna-Soar had increasingly been seen by policymakers as a research vehicle, and as such it was not only subject to comparison but to

³⁵² Memo from Killian to Eisenhower, “Memorandum on Some Technical Factors Involved in Policy Decisions on Arms Limitations and Specifically on the Limitation of Nuclear Testing,” Mar 11, 1959. Fldr Killian, James R. 1957 (1), Box 23, PP AWD, DDEL.

³⁵³ National Aeronautics and Space Council, “Meeting of 27 April 1959.” #0390, declassified 2000 NASA, DDRS.

³⁵⁴ NASC, “Meeting of 27 April 1959.” #0390, declassified 2000 NASA, DDRS.

comparison with other research vehicle proposals and to comparison on their essentially alien field. Thus, in the six months which separated Piland's memo from Quarles's statement, the Dyna-Soar had suffered ominous setbacks.

In such circumstances, it would be tempting to declare that the Dyna-Soar was effectively a doomed program. Thoughtful minds are leery of leaping to such statements, however, because history is a product of contingencies more than it is a child of fate. The government ultimately would cancel the Dyna-Soar program – but it was not Eisenhower's government which did so, and it did not happen in the 1950s, and it was not inevitable. As can be seen, many circumstances combined to make the program's chances for survival seem bleak, but work on the Dyna-Soar would continue. The course of the program - in the context of its time and of the perspectives and judgments of leaders, policymakers, and the populace – demonstrate the significance of studying the dynamics between these factors.

That summer, Eisenhower strove to confirm that the US space program focused on crucial items whose costs could be justified.

Eisenhower described the Congress's apparent fickleness on June 30. "The President commented that the Congress is showing some tendency toward cutting the space budget." Glennan observed that "the cuts are being made without the exercise of much real discretion," and Eisenhower remembered "that the Senate Majority Leader [Lyndon Johnson, Texas Democrat] had made great speeches when the country was stirred up on this matter, calling for going all-out on crash programs. Now the opposition in the Congress seems to be cutting the program back." The President's response kept faith with his general outlook; he "told Dr Glennan that we must be very sure that we can justify every program. He said he had no idea of cutting any particular item at the present time himself. He felt it was necessary, however, to have a range of projects," from a short list comprising projects "wholly justified for operational or scientific purposes," and a longer list "including some that are planned for psychological reasons."³⁵⁵

Justifiable, manageable costs remained on the President's mind that afternoon, when he noted that basic

³⁵⁵ "Memorandum of Conference with the President, June 30, 1959," July 2 1959. Fldr National Aeronautics and Space Administration September 1958-January 1961 (6), Box 18, Staff Sec Alpha ser, DDEL.

research absorbed 40% of the ARPA's budget and he told a NASC meeting that basic research "is the area in which unnecessary duplication of effort should be particularly guarded against."³⁵⁶ Preventing overspending would go hand in hand with safeguarding important projects.

Centralization constituted a cornerstone of that effort. In mid-July, Eisenhower emphasized his agreement with Killian "that ARPA should take control of space research throughout the Department of Defense." At that same meeting, former Chairman of the Joint Chiefs Admiral Arthur Radford speculated that the Air Force "is making such efforts to get into missiles [and] outer space" because that service had more "grounds for concern over [its] combat roles than does the Army and the Navy" in the long run.³⁵⁷ Radford's comment carries truth, in that the Air Force's perception of "aerospace" faced severe challenges which threatened to place a cap on the Air Force's operational realm and to place that cap just where the Air Force envisioned its future and *the* future ultimately to lie. A day later, Eisenhower cautioned NASA officials Dryden and Glennan against "'stunts' such as firing a vehicle into interplanetary space with no real purpose in mind." He assured the men that he "has always been to favor pushing out beyond what is now known, but only where there is reasonably something to be learned through the effort."³⁵⁸

Eisenhower explicitly combined fiscal and organizational issues at an NSC meeting in August. Eisenhower expressed that "he was interested in saving money. Some people say that the country can afford anything," but the President knew better. With his New Look in mind, he explained, "our whole economy was as important as continental defense." However, "the question was, how do you do the job best but cheapest?" Eisenhower lamented more work had gone into making missiles than into determining their organization. McElroy reminded Eisenhower that his work as President had proven

³⁵⁶ "Meeting of 30 June 1959: the sixth meeting of the National Aeronautics and Space Council," July 8, 1959. Fldr Space Council (9), Box 24, Staff Sec Alpha ser, DDEL.

³⁵⁷ "Memorandum of Conference with President Eisenhower," July 14, 1959. *FRUS* 1958-1960 Volume III, doc 65, pp253-355.

³⁵⁸ For their own part, the NASA leaders abided by the President's wishes. Glennan recalled that he had decided against sending a probe to Venus the previous June because the technological difficulties made the project "an unwise gamble." "Memorandum of Conference with the President, July 15, 1959, 12:15 PM," July 15, 1959. Fldr National Aeronautics and Space Administration September 1958-January 1961 (6), Box 18, Staff Sec Alpha ser, DDEL.

valuable in preventing the Congress from overspending which would have burdened the country with a glut of unreliable first-generation missiles.³⁵⁹

The ARPA kept aware of all the space projects conducted by the military, but the ARPA was not in the business of micromanagement. As Eisenhower learned from McElroy, the ARPA consented to let the military “undertake, without prior approval, studies of feasibility investigations by contract up to \$500,000 each.” The military departments each sent the ARPA regular reports of the “progress, results, and conclusions” of its studies. Major projects, costing over \$500,000, had to be submitted to the DDR&E for approval and then had to be coordinated with the ARPA director. A listing of military space-related contracts “under ARPA cognizance” included modestly sized contracts with Convair, North American, Goodyear, and Northrup to consider “inter-relationships of potential offensive, defensive, recon[naissance], deterrence, neutralization and support aspects within earth orbital space,” titled “Strategic Orbital System Study.” The Dyna-Soar, costing whose studies ran to a \$3 million cost in 1958, exceeded the limit for military projects excused from the ARPA’s verdict-making. But the smaller studies about strategic orbital systems indicate service interest in learning what military purposes might be served in space, and what threats might need to be countered in it. Despite the ARPA’s oversight of military space spending, Eisenhower told Killian that “the space program in the Department of Defense may be too ambitious and too costly. I have not seen evidence that it has had the hard-boiled technical review to determine what is realistically possible that has been taking place in the civilian Space program.”³⁶⁰

When Eisenhower discussed surveillance and required vehicles that summer, aircraft retained center stage. With Secretary of State Chris Herter and CIA Director Bissell, Eisenhower weighed the risks of

³⁵⁹ “Memorandum of Discussion at the 417th Meeting of the National Security Council,” Aug 18, 1959. *FRUS* 1958-1960 Volume III, doc 72, pp319-323.

³⁶⁰ Memo from Thomas Gates to Andrew Goodpaster, “Military Department Contracts for Space Activities,” July 27, 1959. Fldr Department of Defense, Vol. III (7) July-August 1959, Box 1, Secretary Subject Series Department of Defense, DDEL. “Notes of Matters Discussed with the President at Meeting on July 14, 1959,” July 15, 1959. Fldr Science Advisory Committee (6), Box 23, Staff Sec Alpha ser, DDEL. “Consolidated List of Military Department Contracts for Space Activities Under ARPA Cognizance within \$500,000,” July 2, 1959. Fldr Department of Defense, Vol. III (7) July-August 1959, Box 1, Secretary Subject Series Department of Defense, DDEL.

conducting another U-2 mission over the USSR. Bissell expressed worry “that the Soviets have a fighter which could probably zoom to the altitude of” the U-2, and Eisenhower responded by remarking “that Khrushchev seems almost to be looking for excuses to be belligerent.”³⁶¹ Events would bear out these speculations in just ten months’ time. But when Eisenhower met with Bissell and others barely a week later to discuss successors to the U-2, the contenders were a “Super Hustler” reconnaissance plane based on the B-58 manned bomber and “a very advanced turbojet.”³⁶² Satellites would offer the long-term solution. But while the many bugs in satellite reconnaissance were being addressed, the short-term answer would be the creation of a new spy airplane. A reconnaissance application of the Dyna-Soar never came up during the discussion, perhaps because entities such as the OCB had outlined that a “maneuverable type” US manned satellite could not appear before 1962, by which time the reconnaissance satellites would hopefully have already been in operation. This relied on hope of success – despite the fact that the second quarter of 1959 had come and gone, and a primitive reconnaissance satellite capacity predicted by that time had failed to materialize.

In late summer and into the fall, the President further clarified his views to advisors, encountering resistance from some corners, civilian and military.

Differences surfaced at the NSC meeting on July 30, 1959. As J.F. Dulles and Stans had done the previous summer, Eisenhower told the National Security Council that the national space program ought not be based on competition with the USSR “when we did not know exactly what the USSR was doing in outer space.” It was not yet clear “whether we were in a 100-yard dash or a mile run,” either. The NSC had called for the United States to become a “recognized leader” in space, and BOB officials hoped “to hold to the ‘a leader’ language.” NASA Deputy Administrator Hugh Dryden responded to the President

³⁶¹ “Memorandum of Conference with the President, July 8, 1959.” #1774, declassified 2001 WH, DDRS.

³⁶² “Memorandum of Conference with the President, July 20, 1959.” #2941, declassified 2000 WH, DDRS.

by agreeing “that it was not necessary for our policy to be stated in terms of what other countries were doing,” but Eisenhower answered that the majority proposal had nonetheless done exactly that.³⁶³

Later during the meeting, Defense Secretary McElroy suggested that, because “we were approaching the point of operational capability for such military programs as surveillance satellites, communications satellites, etc., [...] it was time to effect a clear separation between military space projects and other space projects.” Eisenhower answered that, with an operational capacity, “the Defense Department could stop buying reconnaissance planes and buy reconnaissance satellites instead.” But Eisenhower rejected McElroy’s point that military space programs should be separated from non-military programs. The President was trying to avoid duplicating basic research; “any purely research activity should be conducted by the Space Agency while applied research looking toward a military capability should be conducted by the military.”³⁶⁴

Eisenhower interrogated the NSC regarding its thinking about the psychological aspects of space programs. Planners agreed on the need “to establish the US as a recognized leader in this field” of space.³⁶⁵ More contentious was the issue of where US space achievements needed to stand, relative to the USSR’s, in order for the nation to be “a recognized leader.” The NSC had split on the issue, and the President registered disapproval with both majority and minority positions. In particular, Eisenhower questioned the NSC whether “comparable” US accomplishments implied “equal” US feats to Soviet ones. The majority had included in paragraph 62 of NSC 5906, “In formulating and implementing [space] programs, due consideration should be given to the psychological potential of solid scientific and

³⁶³ WH Shapley to Dr Reid, “Comments on revision of Outer Space policy,” July 16, 1959. 12456 BOB, NASA HQ. “Discussion at the 415th Meeting of the National Security Council, Thursday, July 30, 1959.” #2275, declassified 1999 NSC, DDRS.

³⁶⁴ “Discussion at the 415th Meeting of the National Security Council, Thursday, July 30, 1959.” #2275, declassified 1999 NSC, DDRS.

³⁶⁵ “Operations Coordinating Board, Operating Plan for Outer Space,” March 18, 1959. #3540, declassified 2000 WH, DDRS.

technical achievement.” The State Department and others pressed to interject the phrase “where there are projects of comparable scientific and technical value.”³⁶⁶

If “comparable” implied “equality,” Eisenhower asked, then “who would determine which [...] projects had the greater psychological value? For example,” did “flying to the moon or visiting Venus [have] the greater psychological value.” Eisenhower concluded that “the discussion was turning toward hypothetical situations,” and this emphasis he said was counterproductive. Perhaps the psychological issues “pertain only to NASA, whose whole program was based on psychological values.”³⁶⁷

Dryden disagreed with Eisenhower’s premise. The NASA, Dryden insisted, “rendered very important support to the military.” The President would not be swayed. He “said that nevertheless the furor produced by Sputnik was really the reason for the creation of NASA.” He again repeated his challenge to explain how programs could be compared or considered “comparable.” Dryden then answered that “the psychological value of a project really depended on whether or not it was successful. What is done must be successful or it will have no psychological or scientific value.” It was decided to pursue “scientific, military, and political purposes,” and an asterisk explained that “the term ‘political’ includes consideration of psychological factors.” Within this context, “a military space program” would be “designed to extend US military capabilities through application of advancing space technology, *without invading the responsibilities of the National Aeronautics and Space Administration*” [italics added].³⁶⁸ Eisenhower’s statements strongly indicated that he viewed NASA’s budget as a psychological investment rather than a scientific one.

Essentially, the July 30 notes show Eisenhower struggling to avoid the waste, either of unnecessary or counterproductive programs or of duplicated efforts. Faithful to the President’s ideas, one discussion paper that fall deliberating the merits of a space race advocated “a vigorous national space program of our

³⁶⁶ “Discussion at the 415th Meeting of the National Security Council, Thursday, July 30, 1959.” #2275, declassified 1999 NSC, DDRS.

³⁶⁷ “Discussion at the 415th Meeting of the National Security Council, Thursday, July 30, 1959.” #2275, declassified 1999 NSC, DDRS.

³⁶⁸ “Discussion at the 415th Meeting of the National Security Council, Thursday, July 30, 1959.” #2275, declassified 1999 NSC, DDRS.

own design which emphasizes scientific achievements. [...] More effort should be put into the refinement of smaller payloads and the earliest acquisition of scientific data [...] Ambitious ‘one-of-a-kind’ shots, like circumnavigation of the moon, should be planned cautiously, because they open us to unfavorable comparisons with the Soviets.”³⁶⁹

Service rivalry represented another species of waste. Kistiakowsky reported to Goodpaster that military space projects led “to strong competition among the Services to stake out the largest possible claims ‘in space.’” At the end of September, Kistiakowsky suggested to Eisenhower that it might “be preferable to aim at fewer weapon systems projects, especially those with such ambitious requirements, [...] that operational availability is many years off.” Such constraints would allow “more effort [to] be directed to projects whose military usefulness is around the corner” so that “an effective modern force-in-being could be assured for the immediate future.”³⁷⁰ The trajectory of Kistiakowsky’s advice clearly boded poorly for futuristic concepts like the Dyna-Soar, which could in no way be considered “around the corner.” The scientists’ advice against the military services could draw wrath from each of the branches. When Army Major General John Medaris deemed York as “second rate,” however, Eisenhower’s principle scientific advisors rallied to the DDR&E’s aid.³⁷¹

The first technical challenge in utilizing space is simply getting there. The development and possession of powerful rocket boosters therefore influenced the direction of space exploration. Representing the NASA and the DoD, Administrator Glennan and Deputy Defense Secretary Thomas Gates reported to Eisenhower on October 30 of a need for “at least one super booster” and for responsibility to “be vested in one agency,” in keeping with Eisenhower’s own outlook. Glennan and Gates continued that “there is, *at present, no clear military requirement for super boosters, although there is a real possibility that the future will bring military weapons systems requirements.* However,

³⁶⁹ “To Race or Not to Race? (A Discussion Paper),” Oct 16, 1959. Fldr Space January-June 1959 (6), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁷⁰ “Memorandum for the Chairman, Joint Chiefs of Staff: Subject: Coordination of Satellite and Study Vehicle Operations,” Sept 15, 1959. Fldr Kistiakowsky, Dr G.B. (2), Box 23, PP AWD, DDEL.

³⁷¹ Gordon Gray, “Memorandum for the President,” Sept 21, 1959. Fldr 1960 – Meetings with President – Volume 2 (6), Box 5, Presidential subser, Special Asst National Security Affairs Special Asst ser, DDEL.

there is a definite need for super boosters for civilian space exploration purposes, both manned and unmanned” [italics added]. From the vantage at the top of NASA and at DOD, a potential need for weaponization of space simply could not be dismissed. Several figures, including Glennan and Kistiakowsky, had earlier that month recommended the Nova booster as necessary “as insurance against failure of the Saturn.” Eisenhower approved the joint memo by Glennan and Gates on November 2.³⁷²

The Glennan-Gates memo, in the wake of Eisenhower’s discussions with advisors, aptly describes the administration’s perceptions of the space program. The Dyna-Soar did not attract overt attention at this level because of its nascent stage of development – it was manifestly *not* an imminent technology. As has been discussed, the deployment of a Dyna-Soar type weapons system would have posed significant problems relating to satellite reconnaissance, which enjoyed the President’s attention and priority. But, despite all this, US officials could not definitely rule out the possible future need for weaponized military utilization of space. As long as this possibility remained, programs including the Dyna-Soar could not be entirely cancelled.

Glennan eagerly used the latter part of 1959 to press for greater NASA control in space issues. Saying that “it would be desirable to delineate, publicly, a program of non-military space research, development and exploration,” Glennan urged that the President move to amend the year-old Space Act to “make NASA responsible for the nation’s space program including the development of all new space vehicle systems whether for use by NASA or the military services.”³⁷³ Clearly, any such adjustment would have brought the Dyna-Soar under NASA rather than Air Force control. Such a move would certainly have prompted redirection of the program, transforming it into solely a research vehicle, a follow-on to the X-15.

³⁷² “Memo for the President: Responsibility and Organization for Certain Space Activities,” Oct 21, 1959. Fldr McElroy, Neil H. Secy. of Defense, 1959 (1), Box 23, PP AWD, DDEL. Notes from Oct 1, 1959 meeting by Kistiakowsky, Glennan, Horner, Silverstein, Purcell, and Hornig. Oct 2, 1959. Fldr Space January-June 1959 (6), Box 15, Special Asst Sci & Tech ser, DDEL.

³⁷³ Letter from Glennan to Eisenhower, Nov 16, 1959. Fldr Space Council (11), Box 24, Staff Sec Alpha ser, DDEL.

Glennan also urged Eisenhower to follow his upcoming 1960 State of the Union address with a request for more than a billion dollars in space spending. “No development in modern times,” Glennan declared, “has so stirred the imagination of the peoples of the world as the beginning of the exploration of space.” Regardless of the major mission envisioned, the NASA administrator wrote that “we find that our capabilities are determined in the first instance by the available thrust of the first stage rocket booster.” Eisenhower shared part of this view, that “the key to our space program was the Saturn or the big booster.”³⁷⁴ But Eisenhower was not ready to sign on wholly to Glennan’s outline.

For his part, Eisenhower remained most focused on – and concerned about – fiscal aspects and related implications. Repeating himself about the need for fiscal stability, he declared on November 17 that “Sputnik gave a surge to defense spending from which we have not recovered.” A scant week later, however, Eisenhower told the National Security Council that the Soviets’ first satellite “induced a Sputnik psychology in this country. One had only to say ‘moon’ or ‘missile’ and everyone went berserk. Sputnik was followed by a recession resulting in tremendous pressure to spend additional money. The peak of our anxiety is now past and people are taking things into their stride.” Goodpaster’s notes showed that, back on November 17, Eisenhower had ruminated “that if he has to approve another unbalanced budget he would be obliged to regard his Administration as discredited.”³⁷⁵ Unnecessary programs were expensive. American solvency and security were too precious.

In mid-November, the final draft of the US Policy on Outer Space addressed, among other issues, the potential military uses of space. The document acknowledged that military applications aimed to “enhance military capabilities” and were “being developed for use as operational systems.” The paper identified a list of military applications “that are expected to be available earliest,” consisting of meteorology, communications, navigation, mapping, reconnaissance, early warning, and inspection.

³⁷⁴ Letter from Glennan to Eisenhower, Dec 3, 1959. Fldr Space Council (11), Box 24, Staff Sec Alpha ser, DDEL. Goodpaster, “Memorandum of Conference with the President, November 17, 1959,” Dec 1, 1959. Fldr Space Council (11), Box 24, Staff Sec Alpha ser, DDEL.

³⁷⁵ Goodpaster, “Memorandum of Conference with the President, November 17, 1959,” Dec 1, 1959. Fldr Space Council (11), Box 24, Staff Sec Alpha ser, DDEL. “Memorandum of Discussion at the 425th Meeting of the National Security Council,” Nov 25, 1959. *FRUS* 1958-1960 Volume III, doc 79, pp339-352.

Afterward, it noted that, additionally, “future military possibilities under study include: passive and active defense systems to detect and to destroy enemy missiles or space vehicles; *space to earth weapons systems to diversify further our strategic deterrent posture*; electronic countermeasures” [italics added] and potential lunar military bases.³⁷⁶

Although listing the policy paper identified space-to-earth weapons systems – a role which other documents confirm encompasses the role envisioned for the Dyna-Soar – the paper carefully separated this possibility from the upcoming applications such as communications and reconnaissance. This separation was accomplished in manifold ways: whereas the paper described each of the upcoming applications independently, it simply listed the other “future military possibilities” in a single brief paragraph. The notion of lunar military bases, also appearing in this paragraph, must surely have seemed so outlandish to skeptics as to tarnish the concepts appearing beside it.

NSC executive secretary James Lay penned a memo outlining the Dyna-Soar less than two weeks later. Lay wrote to Eisenhower’s assistant Gordon Gray, describing a recent briefing of the Space Council. The Dyna-Soar program “was said to combine the operating capabilities in both air and space” and to lengthen flight duration and range. The Air Force divided the Dyna-Soar program into three phases, which Lay described. The first phase, cited as costing an anticipated \$397 million and extending from 1960 through 1964, consisted of drop-tests from airborne bombers, in the way in which the X-15 was then being tested. Then flights would be boosted by Titan missiles; unmanned versions were to be boosted in 1962 and the first manned boost-glide flight was scheduled for mid-1963. “The first-step test objectives include an effort to determine the military value of this project.”³⁷⁷

A second phase, lasting from 1963 to 1966, would cost \$241 million and would see the use of Saturn as a booster, with the objective of bringing the Dyna-Soar into orbital flight. “The final step which is not yet programmed will be the development of an operational military system.” Dyna-Soar’s advocates

³⁷⁶ “Final Draft, US Policy on Outer Space,” Nov 12, 1959. #1141, declassified 1997 WH, DDRS.

³⁷⁷ Memo from James Lay to Gordon Gray, “Dynasoar,” Nov 25, 1959. #2953, declassified 1998 WH, DDRS.

expected the vehicle to “have mission adaptability because additional weight can be added onto the tail of the vehicle.” Lay listed six potential future uses:

- Satelloid reconnaissance.
- Reconnaissance.
- Satellite inspector, interceptor.
- Orbital bomber.
- Multi-purpose space station.
- Logistics maintenance and rescue functions.³⁷⁸

Although the list included several items, the orbital bomber function won the primary attention. The Dyna-Soar would “provide ‘three-dimensional dispersal’ of weapons and continuous alert through orbital flight.” The memo further explained, “it is contemplated that the vehicle might carry three [nuclear] bombs into orbit. Then, each vehicle and crew could be rotated once a month, while leaving the three bombs in orbit.” To preempt potential Soviet objections that orbiting US nuclear weapons intruded on their aerospace sovereignty, “these bomb loads might be carried in an equatorial orbit which would not go over the Soviet Union.” Expanding beyond the bombardment role, “it was also suggested that if a system of space stations were established, the Dynasoar vehicle could be used as a taxi between earth and each of these stations.”³⁷⁹

Remembering the four military space possibilities mentioned in the November 12 policy paper, detection and destruction of enemy satellites, deterrent diversity through space-to-earth weapons, electronic countermeasures satellites, and lunar military bases, the advocates’ envisioned role for and significance of the Dyna-Soar becomes clear. Had it continued on this trajectory, the Dyna-Soar would have been at least a first-generation orbital weapons system, and its advocates already scoped out the possibility of its serving as a “taxi” to space bases and as a satellite interceptor – three of the four potential uses of space which the policy paper had identified as being studied.

For two years, space policy had impacted the fate of the Dyna-Soar program. As can clearly be seen from Lay’s memo to Gray, the future of the Dyna-Soar could in turn have dramatic impact on future US

³⁷⁸ Memo from James Lay to Gordon Gray, “Dynasoar,” Nov 25, 1959. #2953, declassified 1998 WH, DDRS.

³⁷⁹ Memo from James Lay to Gordon Gray, “Dynasoar,” Nov 25, 1959. #2953, declassified 1998 WH, DDRS.

space policy. The Dyna-Soar remained obscure in the last days of the 1950s, and space policy earned widespread attention. But the course of space policy and the status of the Dyna-Soar were intertwined.

At precisely this point, as the top officers of the Air Force directed that the Dyna-Soar program be expedited, civilian authorities ordered a major review of the program – a reconsideration of the program that delayed its development and threatened to derail it entirely. Assistant Secretary of the Air Force for Research and Development Victor Charyk, skeptical of the Dyna-Soar’s concept and design feasibility, established the new reappraisal. Dubbed Phase Alpha, the study would freeze the Dyna-Soar project until April 1960. The Dyna-Soar program would survive the challenge posed by Phase Alpha, and the program even survived the Eisenhower Administration. The program survived this by the skin of its teeth, to greet a new administration under John Kennedy, whose campaign had suggested dramatic new policy directions regarding the military and space fields.

From 1957 through the end of his Presidency, Dwight Eisenhower moved to block reckless space spending and to control the direction of space projects. Satellite reconnaissance remained his priority in space, and this did much to preclude technologies like the Dyna-Soar and true embrace of the “aerospace” doctrinal thought which the Air Force developed concurrently to justify it. The aerospace option could not be pursued except at the cost of “space for peace,” whose political and strategic implications the President was entirely unwilling to lose. But the aerospace option, and its manifestation in the Dyna-Soar, could not be entirely abandoned unless the US public could be brought to understand that no Soviet equivalent existed. Paradoxically, no such proof could possibly be presented without developing – and then revealing – dramatic secret surveillance methods. These surveillance methods, when they came online, would depend on a tacit international “space for peace” policy which the aerospace option would have thrown into doubt.

Chapter 6: SIGHT AND MIND:
PUBLIC INFORMATION AND THE NATIONAL PUBLIC CULTURE

Hypersonic bombers, fighters, rocket transport planes, etc., will all become possible as soon as these [technological] problems are solved. Any air force that has sole possession of such craft would border on the invincible, hence the scientific opinion that the hypersonic glider should receive a maximum engineering effort. – the *New York Times*, November 11, 1957³⁸⁰

The Air Force ‘Dyna-Soar’ is being developed as the first space bomber. [Chief of Staff General Curtis] LeMay said the plane would be able to circumnavigate the earth and attack targets with ‘space-to-surface’ missiles. – the *Washington Post*, August 24, 1958³⁸¹

The Soviets are known to be working on a Dyna-Soar type manned vehicle. Little is known about the progress [...] - *Aviation Week*, March 9, 1959³⁸²

The Dyna-Soar program was no secret – in a free society with an active press, information was available for public consumption. Given the Dyna-Soar’s modern obscurity and the complicated technological issues involved in hypersonic flight and the novel idea of controlled reentry from space, much of the contemporary information offered a fairly accurate picture of the program’s character and progress. Of course, sometimes contemporary media reporting overlooked or lacked access to significant nuances. These factors, in combination with the tug-of-war surrounding the project’s focus (as tested for a weapons system or as research platform), set the stage for points of confusion. It should also be acknowledged that the availability of information does not necessarily translate to detailed public awareness.

Steve Call’s recent *Selling Air Power* convincingly illuminated the rise to prominence of the American public’s post-World War II culturally validated faith in airpower. This was particularly enunciated in the early Eisenhower years, when the New Look emphasized bomber-delivered massive retaliation and when moviegoers flocked to watch films like *Strategic Air Command* set in the contemporary day and *The Court-Martial of Billy Mitchell* lauding purportedly visionary aviation prophets. Offensive airpower (strategic bombing) won special distinction, but Call noted that airpower

³⁸⁰ Butz, JS, “Sphere, Glider Feasible for Re-Entry,” December 16, 1957, *Aviation Week* (microform).

³⁸¹ Hotz, Robert, “Editorial, August 18, 1958, *Aviation Week* (microform). Dryden, Hugh, “Civil Space Role Defined,” September 29, 1958, *Aviation Week* (microform). “LeMay Warns Red Might Rises,” pA12, August 24, 1958, *Washington Post*.

³⁸² “Soviets Study Military Aspects of Space,” March 9, 1959, *Aviation Week* (microform).

advocates ran the gamut and included diversity of thought across their ranks – which included many civilians in addition to military airmen. The power to inspire the public depended, however, on airpower seeming intrinsically revolutionary. First, flight was bold and impressive, but then as flying became more routine it grew to be seen as commonplace rather than revolutionary. Concern about nuclear weapons and nuclear war also tarnished the glint on airpower’s reputation. And with Sputnik, “public fascination in aviation became eclipsed by the relatively new interest in space travel, [as] people feared the rocket had trumped the airplane.”³⁸³

Much in Call’s argument proceeds smoothly, but coinciding with the decline in faith in airpower stood an unfortunate silence in the narrative. Call acknowledged that missiles were “the biggest addition to SAC during the fifties,” despite misgivings about them. Recapitulating his thesis, Call asserted that

It seems no coincidence that air power’s era of domination in the US military structure began during a period of enchantment with aviation and in an atmosphere of grave international danger. The wondrous new invention was going to save the nation. Likewise, the erosion of faith in salvation through air power seemed to coincide with the fading cultural fixation with the airplane as flying became commonplace, and new wonders, like space travel, captured the public’s imagination.³⁸⁴

In retrospect, this narrative appears seamless: people bored with airpower and frightened of holocaust turned their attention to space, and the Air Force, stuck in the paradigm of *aircraft*, was caught unprepared because it couldn’t compete in this realm.

The problem with this story is that – as this study of the Dyna-Soar demonstrates – the Air Force had *not* bound itself intransigently to the air, it was *not* caught unprepared by the new popular interest in space. Not only the team working directly on the Dyna-Soar, but even the service’s highest-ranking officers, identified the Dyna-Soar as a bold step pioneering a new era in flight, extending the traversable realm from the atmosphere to include extra-atmospheric and ultimately perhaps interplanetary realms. General White introduced the term “aerospace” to promote this concept of space flight as an *extension*, not a revolution, of flight. Humans do not make history precisely as they mean to, but history is not a

³⁸³ Call, Steve, *Selling Air Power: Military Aviation and American Popular Culture after World War II* (College Station: Texas A&M, 2009).

³⁸⁴ Call, Steve, *Selling Air Power: Military Aviation and American Popular Culture after World War II* (College Station: Texas A&M, 2009).

matter of inalterable fate. No fate decreed that human spaceflight would happen, nor that it would be so long dominated by the use of ballistic re-entry capsules, nor that their crews would be unarmed.

Nothing is guaranteed, but galvanizing popular or influential support can provide useful insurance when working to transform a treasured vision into a tangible reality. Aircraft could be glorified through extensive feature stories and through film; the Strategic Air Command's public relations work reinforced the popular conception of strategic bombers and nuclear weapons having brought the Second World War to a final end. Familiarity and mystique had fused, regarding aircraft, enough for the Air Force's public relations pitch to enjoy an effective heyday. Space systems were in many ways another category altogether. Despite the emerging Air Force concept of "aerospace" as combining all elements of the Heavens, space vehicles were from a popular vantage point something associated with "Buck Rogers" fiction. Fiction in aviation could, at midcentury, get a message across. Space fiction might be entertaining, but in the 1950s it would be less effective at promoting the aerospace vision than would reports with more ostensible sober credibility.

Public awareness of events outpaced understanding *about* them. Contemporary researchers found Sputnik exemplified this dynamic. Nonchalance characterized satellite-related surveying prior to Sputnik. *Public Opinion Quarterly* commented that "the most striking finding concerned the apparent difficulty of the interviewers to treat the survey as something other than a joke or temporary derangement of the sponsor's mentality."³⁸⁵ As will be seen, public opinion surveys following Sputnik demonstrated widespread awareness of the satellite feat and that this was accomplished by the Soviets rather than the United States; however, many in the public did not claim to know what purposes satellites might serve, and large segments exhibited false understanding of the use or significance of space satellites. In short, headlines could help foster awareness of events or projects, but they provided little guarantee that readers attributed particular importance to such things or that the importance attributed might be accurate.

³⁸⁵ Round Table Sessions: Lebaron R. Foster, Alexander L. George, Sidney Hollander, Jr., and Stephen Withey. RESEARCH ON PUBLIC REACTIONS TO NEW ADVANCES IN SCIENCE *Public Opin Q* (1958) 22(2): 210-211 doi:10.1093/poq/22.2.210

Public awareness and support for the Dyna-Soar depended therefore on the program appearing as a realistic eventuality toward which the service was hard at work. Two avenues in print media could assist this image. One would be the specialized press focused on aviation technology, the industry, and other related issues. *Aviation Week* was a leading periodical in this realm; its growing readership in the late 1950s numbered a bit over 70,000 subscribers.³⁸⁶ Specialized publications, even the larger ones like *Aviation Week*, would not have been read in every American home. But growth in the industry suggests an increase in public interest in aviation issues, and the Dyna-Soar was one of the aerospace projects to which *Aviation Week* dedicated some of its pages and attention. Despite Eisenhower's generous treatment of the Air Force in his early defense budgets, *Aviation Week* proved harshly critical of the President in the post-Sputnik era when it commented on space issues. Its editor, Robert Hotz, took evident relish in scathing Eisenhower for complacency in space technology and its purported security implications.³⁸⁷ Publications such as *Aviation Week* focused attention on aviation issues and particularly appealed to people with business interests or enthusiasm pertaining to flight. Occasional letters to the editor appeared decrying the magazine's advocacy of "more of everything" approach to civil and military aerospace investment. However, such letters appear to have represented a vocal exception rather than a rule; *Aviation Week* commanded strong readership and attracted more advertising than competing trade journals like *Rockets and Missiles*. Still, trade journals were specialized and their readers were finite in number.

Widespread public awareness depended on larger media institutions with a more general readership. Newspapers such as the *New York Times* and the *Washington Post* enjoyed circulations which dwarfed publications such as *Aviation Week*. Readers were unlikely to zero in on aviation and space articles, and such stories could frequently find themselves buried deep in the pages of these newspapers. But such stories were necessary, if not sufficient, toward establishing a public awareness of something like the Dyna-Soar. Since the business of journalism is both the public service of news dissemination and of

³⁸⁶ Martin, Robert W, "Outlook for 1959," January 19, 1959, *Aviation Week* (microform).

³⁸⁷ Martin, Robert W, "Message from the Publisher," August 31, 1959, *Aviation Week* (microform). Martin, Robert W, "Outlook for 1959," January 19, 1959, *Aviation Week* (microform).

simultaneously deriving profit, media will ideally report on issues which are both important and of readers' interest. The appearances of these articles thus promote public awareness and imply the newspapers' belief of the public's interest. A cardinal rule of traditional journalism is the premium put on time and print space, and this rule certainly carries forward to advertising as well. The identification of the Dyna-Soar in sales and employment advertisements indicates businesses' trust that the public had heard of the Air Force's boost-glide program and that the vehicle had captured not only attention but imagination.

The word "hypersonic," a threshold defined by newspapers as approximately 3500 miles per hour or faster, appeared only rarely in the public eye prior to Sputnik. For example, a *New York Times* article in early 1954 mentioned intense heat in US hypersonic wind tunnels. A year and a half later, officials at NACA's Ames Laboratory predicted "war missiles that will hurtle from continent to continent across oceans at speeds twenty times that of sound." Ames personnel, such as Alfred Eggers, hastened to inform reporters "that such missiles were 'not just around the corner.' Their development was considered a matter of some years." Significantly, "the greatest obstacle to their production was viewed as the problem of heat" missiles encountered by the friction of reentering the atmosphere at extreme speeds.³⁸⁸

Missile issues achieved increasing prominence and urgency in the next two years. In the spring of 1957, reporters noted that the Air Force's Deputy Chief of Staff for Materiel warned that the nation had to speed up work related to hypersonic flight or "otherwise the nation will find itself trailing the Soviet Union in missile and aircraft development. [...] in the future scientists, engineers and production men must accomplish a job with tools and materials that were thought yesterday to have been impossible."³⁸⁹ Such talk potentially struck a chord similar to the Buck Rogers visions (or illusions) which turned off some people, including President Eisenhower. But in the second half of the year, events made the impossible appear to be reality. In August, the Soviet Union successfully demonstrated a long-range

³⁸⁸ "Test Winds Speed at 10 Times Sound," p29, January 30, 1954, *New York Times*. "Scientists Seek Faster Rockets," p15, *New York Times*.

³⁸⁹ "Nation is Warned on Air Research," p9, April 3, 1957, *New York Times*.

ballistic rocket. Segregationist efforts in Arkansas demanded Eisenhower's attention simultaneously, as the President reluctantly contemplated use of federal power to overcome segregationist intransigence at Little Rock's high school system. Simultaneous and urgent issues in both domestic and foreign affairs was nothing new, but it was demanding. Soviet success prompted American concerns with its apparently languishing rocket development, and *Aviation Week's* editor Robert Hotz lambasted perceived misleadership on missiles throughout September. The publication, whose length varied but which regularly extended well beyond a hundred pages of aviation reporting and trade journal ads, was prefaced by a page-long essay by the editor, which provided a platform on which Hotz could hold forth about various contemporary aviation issues.

“Many Americans will wonder how a technically undeveloped country such as the Soviet Union can even be in a position to seriously challenge the US in such a technologically sophisticated field as ballistic missiles. The fault lies not with the quality or industry of US technology but rather with the lack of imagination, courage and candor in our political leaders.” In this September 2 editorial, Hotz was still content to blame the lag on the stoppages prompted by Truman in his effort to economize government spending immediately after World War II. Hotz called on the testimony of Soviet Colonel GA Tokaev, who had used a mission to the West to kidnap scientific personnel as means of his own escape, to demonstrate Stalin's giving “top priority from the very start of the Soviet's post war armament program” to ballistic missiles.³⁹⁰

By September 9, Hotz had laid blame on Eisenhower, for misinformation and false secrecy to conceal incompetent leadership.

These policies are based on the philosophy that the American citizen whose vote elects the government and whose hard earned tax dollars finance its activities has no ‘need to know’ how wisely or well his money is being spent to provide him with an adequate defense [...] official statements by President Eisenhower, Secretary of State Dulles and Deputy Defense Secretary

³⁹⁰ Hotz, Robert, “Editorial: Facts and Fiction on the ICBM,” September 2, 1957, *Aviation Week* (microform). It will be remembered from a previous chapter that Tokaev also declared that Stalin had expressed specific interest in developing a Saenger bomber, from which the Dyna-Soar was derived, as a weapon to intimidate President Truman in the late 1940s.

Quarles have been manipulated solely for political effect with a technique that we expect from the Kremlin but not from the White House.³⁹¹ A week later, Hotz decried the Army's attempts to define a "missile industry" as its service fiefdom because "there is in fact no separate 'missile industry' or missile science nor is there likely to be in the future. [...] Missile development today is based primarily on the research and development of aviation industry, the National Advisory Committee for Aeronautics, the Air Force and Navy research agencies during the past 15 years." Hotz fired again at the Army the following week, characterizing the Army as producing a "fever pitch of propaganda" stemming from an inferiority complex by "the most technically naïve group in the three military services and the last to realize the vital necessity of harnessing the galloping new technologies of nuclear fission and aerodynamics to its functions."³⁹² As an aviation technology supporter, Hotz insisted that like-minded figures control development of planes and missiles. News that the Air Force had to curtail research and development efforts, juxtaposed to Army General John Medaris's assertions, angered the journal's editor intensely.

And then came Sputnik.

It was not quite as if space failed to appear in the minds of Americans until the Soviets orbited a satellite. For instance, one of *Aviation Week's* advertisements on September 30 asked, "How to do you control temperature on space ships?" and used an illustration from Viking Press's recent book *The Exploration of Mars* by Willey Ley, Wernher von Braun.³⁹³ But such books and advertisements of optimistic space science fiction hardly prepared the public – or the press – to encounter a space science fact.

The initial *New York Times* coverage of the Soviet accomplishment seemed grounded, anticipating likely questions and addressing them with factual reassurance. An implicit first question was whether Sputnik was specifically hostile:

³⁹¹ Hotz, Robert, "Editorial: Missile Misinformation," September 9, 1957, *Aviation Week* (microform).

³⁹² Hotz, Robert, "Editorial: The 'Missile Industry' Myth," September 16, 1957, *Aviation Week* (microform).

³⁹³ The illustration borrowed by the Fenwal Company for the ad was the work of Chesney Bonestell. Advertisement, Fenwal Company, September 30, 1957, *Aviation Week* (microform).

*Military experts have said that the satellites would have no practicable military application in the foreseeable future. They said, however, that study of such satellites could provide valuable information that might be applied to flight studies for intercontinental ballistic missiles. The satellites could not be used to drop atomic or hydrogen bomber or anything else on the earth, scientists have said. Nor could they be used in connection with the proposed plan for aerial inspection of military forces around the world.*³⁹⁴ [italics included]

William Jordan's page 1 story did not engage in wanton fear-mongering, and regarding surveillance it addresses questions which were simultaneously being considering and similarly addressed by the President's advisors. Jordan noted that the "real significance" of Sputnik lay in "providing scientists with important new information" about the sun, radiation, and global magnetism. Jordan noted the "modesty and caution" in the Soviet claim, as "generally Soviet scientists consistently refused to boast about their project or to give the public or other scientists much information about their progress." The text of the Soviet's official announcement appeared two pages later.³⁹⁵

The note rapidly changed to one of near-panic. An October 6 story identified Sputnik as "a propaganda triumph," and the next day while page 16 noted that Sputnik broadcast on two frequencies (slightly above 20 megacycles and about 40 megacycles, far under the frequency agreed by the IGY to allow widespread radio operators to tune in), page 17 declared that "US experts disagree on whether the satellite sends secret code in beeps." Another story argued that "the accuracy of the United States Government's intelligence information regarding Soviet capabilities is called into question again by the news of the Soviet space satellite achievement," since the White House in mid-July had suggested that the Soviets' missile efforts were focused on vehicles of far shorter range. Even Jordan, in two stories, undercut the mood of his previous account. The Soviets had already moved forward to "an artificial satellite able to return to earth undamaged" – a feat which in fact would take them longer than the Americans to achieve. And a Soviet claim of having successfully launched Sputnik on the first try was

³⁹⁴ Jordan, William J, "560 Miles High: Visible With Simple Binoculars, Moscow Statement Says," p1, October 5, 1957, *New York Times*.

³⁹⁵ Jordan, William J, "560 Miles High: Visible With Simple Binoculars, Moscow Statement Says," p1, October 5, 1957, *New York Times*. "Text of Satellite Report," p3, October 5, 1957, *New York Times*.

accepted at face value, juxtaposed to how “American satellite scientists have said they plan to send up several satellite rockets next spring in the hope that a few will stay up.”³⁹⁶

The notion of consensus makes for clean generalizations, but complete consensus is not often to be found in the world. “The public” is a sum of its parts – conflicting, disjointed, disagreeing – not a solid mass moving in lockstep and thinking in unison. The University of Michigan’s Survey Research Center found that, immediately after Sputnik, 54% of respondents had not heard of satellites prior to the Soviets’ orbiting one. More than half of those who had heard of satellites “had only vague or distorted knowledge about them.” The *Washington Post* explained to readers that Sputnik raised “3 confusing questions”: whether the satellite was collecting scientific data, whether it was relaying this back to the USSR, and whether the USSR would share its new knowledge with other nations. Other stories, marking Air Force preparation for Project Farside and of a fifth US nuclear-powered submarine being readied for launch, implied a lesser degree of panic than evinced in the *New York Times*.³⁹⁷

Aviation Week displayed a degree of confusion too, without aiming to. Despite Hotz’s ultimately emerging pattern of derision against leaders who lacked the leadership to foresee the menacing Soviet potential in space, his editorial essays in October focused not on space but on the topic of the nation’s commercial air traffic. An October 7 article summarized Lieutenant General Irvine’s dismissal of ballistic missiles compared to aircraft. After exploring the Air Force perspective, the arguments are familiar: unmanned missiles cannot evade enemy countermeasures, they cannot completely destroy

³⁹⁶ Schwartz, Harry, “A Propaganda Triumph,” October 6, 1957, *New York Times*. Schmeck, Harold M, “Amateur Communications-Type Short Wave Sets Can Receive Satellite Signals,” p16, October 7, 1957, *New York Times*. - “Scientists Split on Soviet Signals,” p17, October 7, 1957, *New York Times*. Schwartz, Harry, “Intelligence and ‘Moon,’” p16, October 7, 1957, *New York Times*. Jordon, William J, “Launching Held First Soviet Try,” p16, October 7, 1957, *New York Times*. Jordan, William J, “Moscow Revising Design,” p1, October 7, 1957, *New York Times*.

³⁹⁷ Blakeslee, Alton L, “Russian ‘Moon’ Creates 3 Confusing Questions,” pA4, October 8, 1957, *Washington Post*. Diamond, Edwin, “AF Ready to Send Rocket to Moon,” pA2, October 8, 1957, *Washington Post*. “New A-Powered US Submarine to be Launched,” pA4, *Washington Post*. DONALD N. MICHAEL. THE BEGINNING OF THE SPACE AGE AND AMERICAN PUBLIC OPINION *Public Opin Q* (1960) 24(4): 573-582 doi:10.1086/266973

targets, and they cannot report damage assessments. In contrast, nuclear powered aircraft escape the limitations of missiles and the weight limitations faced by conventionally-powered jet aircraft.³⁹⁸

The following week's issue, coming on the tenth anniversary of the Bell X-1's breaking the sound barrier, hardly acknowledged the anniversary. A Bell advertisement sang the company's praises and touted "the famous series of X-airplanes," which were "never intended for tactical operation" but "made invaluable contributions to aerodynamics design and the art of supersonic flight." Reports that day focused more on the Air Force's interest in its Pied Piper satellite concept, on how "basic research [...] has been given a boost by the Russian satellite launching," on a contrasting pattern of cutbacks ordered on Air Force research, and on Senator Symington's call for a Senate investigation of satellite progress.³⁹⁹

In the remainder of the month, reports noted that Presidential Assistant Sherman Adams told supporters at a fundraiser dinner in San Francisco to avoid undue concern at "Soviet satellites that sail over our heads and land on the front page of every American newspaper," rejecting disparaging conclusions about domestic missile work as "wild exaggerations." Symington meanwhile continued to hammer at the supposed delays in missile work prompted by the administration's ban on overtime pay and policy of self-financing for defense contracting.⁴⁰⁰

The orbit of Sputnik II ushered in November, and by midmonth an exponentially more sinister concept appeared to be an impending reality:

A bomber that skips along the fringe of the upper atmosphere as a flat stone skips the surface of water may have been tested by the Soviet Union, the publication *Missile Week* has reported. The trade journal said in its Nov 17 issue that the bomber was designed for a 10000-mile range and employed a 'recently announced, 820000-pound-thrust rocket engine' to drive it to hypersonic speeds well above the atmosphere. Hypersonic usually refers to speeds of 3500 miles an hour or more. The bomber could drop bombs or fire rockets on North America on a flight from the Soviet Union, it was said.⁴⁰¹

³⁹⁸ Hawkes, Russell, "Missiles Won't Alter USAF Role – Irvine," October 7, 1957, *Aviation Week* (microform).

³⁹⁹ Advertisement for Bell Aircraft, October 14, 1957, *Aviation Week* (microform). "USAF Pushes Pied Piper Space Vehicle: Success of Soviet Satellite will give new impetus to Lockheed project for reconnaissance satellite," October 14, 1957, *Aviation Week* (microform). Clark, Evert, "Impact of Russian Satellite to Boost US Research Effort," October 14, 1957, *Aviation Week* (microform). "USAF Cutback Rundown," October 14, 1957, *Aviation Week* (microform). Johnsen, Katherine, "Senate Group Probes Satellite Progress," October 14, 1957, *Aviation Week* (microform).

⁴⁰⁰ "Adams Asks US to Close Ranks," p21, October 15, 1957, *New York Times*. Johnsen, Katherine, "Early Missile Hearings Planned," October 21, 1957, *Aviation Week* (microform).

⁴⁰¹ "Skip-Rocket Bomber is Reported in Soviet," p12, November 11, 1957, *New York Times*.

Thus the *New York Times* introduced to the wider public the notion of the hypersonic glide bomber which the Air Force sought in the Dyna-Soar. And it was presented as already being a Soviet reality, rather than a US Air Force hypothetical. A possibility so instinctively frightening appearing in mainstream print would bring calls for action.

Aviation Week in December announced the formation – and administration “disfavor” – of the Air Force Astronautics Directorate, which the story noted would oversee missile defense, air staff management, the WS-117L, other research satellites, boost glide vehicles, and special reconnaissance aircraft. Another report focused more specifically on space gliders, although the Dyna-Soar name still did not yet appear. Reporter JS Butz predicted that “manned space flight will probably begin in a winged hypersonic glider [...] or in a non-lifting, modified spherical craft.” Furthermore, the American Rocket Society was told that the “soundness of [the] US space flight efforts for years to come may depend on the choice of a vehicle to win the second round in the struggle to control space.” Although spherical craft “would take a much shorter time to develop than the hypersonic glider - one or two years - against five for the glider by the most optimistic estimate - and put the US in a better position to send the first man into space.” The timeframes envisioned proved hopelessly optimistic.⁴⁰²

“Many astronomical and aeronautical experts” supported work on both methods, “very anxious to repair the damage US prestige has suffered in the last two months.” They concluded that “spherical craft should have second priority and that nothing should interfere with the development of the hypersonic glider [since] *the spherical, non lifting craft would be a stopgap measure if developed alone* and should occupy only a small part of our total development capacity” [italics added]. The report called for “great effort [...] to answer the aerodynamic problems of winged vehicles (heating, stability, control, drag, etc.) up to about 18,000 mph,” but the comparative safety and controllability of glider showed their superiority to alternative vehicle concepts.⁴⁰³

⁴⁰² Witze, Claude, “USAF Forms Astronautics Directorate: New unit to monitor space plans, missile defense; may conflict with McElroy’s single manager,” December 16, 1957, *Aviation Week* (microform). Butz, JS, “Sphere, Glider Feasible for Re-Entry,” December 16, 1957, *Aviation Week* (microform).

⁴⁰³ Butz, JS, “Sphere, Glider Feasible for Re-Entry,” December 16, 1957, *Aviation Week* (microform).

Space was not just to be explored and traversed, it was to be exploited and controlled:

*Hypersonic bombers, fighters, rocket transport planes, etc., will all become possible as soon as these problems are solved. Any air force that has sole possession of such craft would border on the invincible, hence the scientific opinion that the hypersonic glider should receive a maximum engineering effort.*⁴⁰⁴ [italics added]

Such rhetoric may not identify the Dyna-Soar by name, but it could hardly have described the Dyna-Soar's envisioned role in more explicit detail to an audience interested in aviation at a time rife with seemingly ominous Soviet achievements. In the ears of a concerned public, such promises of protection could well seem the best guarantor of safety.

At the same time, it must be remembered that Sputnik competed for attention with other stories which also commanded public attention. One, certainly of historic significance, was the federally enforced integration of the Little Rock high school system. Another of more fleeting impact was the World Series between the Milwaukee Braves and the New York Yankees. In the minds of many at the time, these events brushed aside the Soviets' orbiting ball. Sputnik undeniably caused a stir, and President Eisenhower sought to address public concern with his speeches on November 7 and November 13. But, surprisingly, public awareness of Sputnik and concern about its portents did not necessarily prompt Americans to look skyward to see to Soviet accomplishment drift overhead. By December 1957, when both of the first two Soviet satellites remained in orbit and visible even to urbanites in the early evening and early morning skies, only 4% of polled Americans reported having seen *either* Sputnik.⁴⁰⁵ Analysts declared that the evidence "is rather spotty" whether awareness of Sputnik truly indicated interest in it. But while awareness might be cursory, demands for action could still be insistent.

Before year's end, *Aviation Week* noted the closure of the Directorate of Astronautics, but with the die seemingly cast on inevitable work on new space technology, the journal said the establishment "has [been] *temporarily* withdrawn" [italics added]. Meanwhile, air experts marked the 54th anniversary of the Wright Brothers' flight with expectations of "rocket-powered gliders." NACA's chief high-speed researcher was H Julian Allen delivered the Twenty-first annual Wright Brothers lecture at the

⁴⁰⁴ Butz, JS, "Sphere, Glider Feasible for Re-Entry," December 16, 1957, *Aviation Week* (microform).

⁴⁰⁵ DONALD N. MICHAEL. THE BEGINNING OF THE SPACE AGE AND AMERICAN PUBLIC OPINION *Public Opin Q* (1960) 24(4): 573-582 doi:10.1086/266973

Smithsonian Institution: “The present situation is certainly analogous to that which the Wright brothers faced at the turn of the century. If we give the same painstaking and intelligent treatment to our problems as they gave to theirs a half-century ago, our success seems assured.” He described a glider traveling between 5,500 and 13,500 miles per hour at altitudes of 275,000 feet.⁴⁰⁶ Even when Dyna-Soar style technology was not overtly associated with weapons, it was presented – by the experts to the interested – as a future development inevitable if pursued with sufficient zeal.

Aviation Week acknowledged Eisenhower’s work on Defense Department reorganization and the Rockefeller Group’s simultaneous “admonition that new ‘upstream’ projects should not originate with the services as requirements but should result from technological possibilities and will be assigned to the service according to their strategic utility.” But the dawn of 1958 also showed continuity with the end of its predecessor. Hotz blamed “complacent hope” exhibited by the Administration, and urged that key projects “be pushed boldly” rather than be allowed to “grow moldy in advisory committee meetings and be budgeted and audited to death.” The key weapons projects were a missile defense system, manned space vehicles, and “the hypersonic glide bomber.”⁴⁰⁷

A subsequent article declared that the “X-15 rocket research aircraft [is] forerunner of manned orbital bombers”; it would not be the last time journalists drew a straight line between the X-15 and the Dyna-Soar. But the article also noted Ames Laboratory’s discomfort with the skip-glide approach, while another described Aveo Research Lab’s “firm stand for the non-lifting type of manned re-entry vehicle in preference to the hypersonic glider or lifting configurations.” The public concurrently learned that the NACA, comprising civilian authorities and military leaders, unanimously endorsed the idea of “a

⁴⁰⁶ Witze, Claude, “Pentagon Girds for New Research Feud,” December 23, 1957, *Aviation Week* (microform).
Finney, John W, “Air Experts Note Wrights’ Flight,” p10, December 18, 1957, *New York Times*.

⁴⁰⁷ Hotz, Robert, “Editorial: Aviation’s 1958 Scoreboard,” January 13, 1958, *Aviation Week* (microform). Witze, Claude, “Eisenhower, Rockefeller Group Back Advanced Research Agency,” January 18, 1958, *Aviation Week* (microform).

comprehensive national space flight program.”⁴⁰⁸ Of course, the nature of this national space program would continue as an issue of contention.

In February and March, *Aviation Week* acknowledged the variety of Air Force space programs and the presence of Navy and Army plans for space as well. In these weeks between the establishment of the ARPA and Eisenhower’s formal recommendation to transform the NACA into a NASA, Hotz dramatically illustrated his allegiance to the technological zealotry so mistrusted by the President. Eisenhower had resisted reckless spending on unreliable first generation ballistic missiles. Now Hotz proclaimed missiles obsolete in the face of even newer prospective weapons – including the Dyna-Soar. For Hotz, “the spectacular pace of this galloping technology is demonstrated by the fact that ballistic missiles, which only a few months ago were being hailed as the ‘ultimate’ weapons, are now clearly just a transitory phase of new weapons development, with much more sophisticated and effective weapons such as air launched missiles, the hypersonic glide bomber, the manned space vehicle and a military outpost on the Moon already in the research and development mill.”⁴⁰⁹

Air Force Deputy Chief of Staff for Material Lieutenant General CS Irvine, another space power paladin, added further to the techno-advocacy to the Western Space Conference in Los Angeles. “The Air Force today is the space force of tomorrow,” he announced, while *Aviation Week* noted that Irvine also

⁴⁰⁸ “How X-15 Will Double Man’s Mach Number,” February 3, 1958, *Aviation Week* (microform). “Space is Booming, Meeting Crowds Show,” February 3, 1958, *Aviation Week* (microform). Clark, Evert, “NACA Urges National Space Program,” February 3, 1958, *Aviation Week* (microform). A number of notables collectively comprised the NACA leadership: Dr James H Doolittle, chairman of NACA and the USAF SAB and vice president of Shell Oil; Dr Leonard Carmichael, NACA vice chairman and secretary of the Smithsonian; Preston R Battett, former vice president at Sperry Rand; Dr Detley W Bronk, president of the National Academy of Sciences and member of President’s Committee on Scientists and Engineers; Vice Admiral William V Davis, Deputy Vice Chief of Naval Operations for Air; Dr Paul D Foote, Assistant Secretary of Defense for Research and Engineering; Rear Admiral Willington T Hines, Assistant Chief of Bureau for Aeronautics for Procurement; Dr Jerome C Hunsaker, aeronautics professor at MIT and former chairman of NACA; Charles J McCarthy, chairman of the board Chance Vought; Lt Gen Donald Putt, USAF Deputy Chief of Staff for Development and military director of USAF SAB; James T Pyle, civil aeronautics administrator; Louis S Rothschild, Undersecretary of Commerce for Transportation; Dr Allen V Astin, director of the National Bureau of Standards; Frederick C Crawford, chairman of the board Thompson Products; Dr Francis W Reichhelderter, chief of US Weather Bureau; Edward Rickenbacker, chairman of the board Eastern Air Lines; and Gen Thomas D White, USAF chief of staff.

⁴⁰⁹ Clark, Evert, “USAF Studies High-Thrust Space Engine,” February 24, 1958, *Aviation Week* (microform). “USAF Plans to Study Moon Surface,” February 24, 1958, *Aviation Week* (microform). Butz, JS, “Radical Configurations May Find Role in Push Toward Space Flight,” February 24, 1958, *Aviation Week* (microform). Brownlow, Cecil, “Navy Details Needs for Space Mission,” March 24, 1958, *Aviation Week* (microform). “USAF, Army Get Moon Roles,” March 31, 1958, *Aviation Week* (microform). Hotz, Robert, “Defense Contracts Sput 1958 Sales,” March 3, 1958, *Aviation Week* (microform).

“pointed out that no one could have foreseen all the military applications of the airplane at the time of the Wright brothers’ first flights.” His was not the only voice on the issue, however. Lee A DuBridge was then president of the California Institute of Technology, and as the conference’s keynote speaker, he cautioned his audience “against ‘wild programs of Buck Rogers stunts and insane pseudo-military expeditions.’” He characterized the military’s notion of lunar missile bases as “utter nonsense.” DuBridge’s opposition would be noted in Air Force journals, and in Los Angeles he also enjoyed the support of Caltech’s Jet Propulsion Laboratory, Dr William H Pickering, who explained the impracticality of space weapon sites relative to less expensive and more accurate land-based alternatives.⁴¹⁰

Interested readers had the opportunity to discern the conflicting visions held by the Administration and the Air Force; the Dyna-Soar began appearing increasingly, sometimes by name, in major press outlets at this moment. *Aviation Week* recorded in April that the President advocated “a civilian setting for the administration of the space function [to] emphasize the concern of our nation that outer space be devoted to peaceful and scientific purposes,” while in the Air Force General LeMay sought funds for a military man-in-space program and press conveyed General Boushey’s prediction that the “US could land a man on the moon within eight years after receiving a go-ahead.”⁴¹¹ Presumably, Boushey’s lunar astronaut would be in an Air Force uniform beneath his spacesuit.

May saw reports of Brigadier General HF Gregory, commander of the Air Force Office of Scientific Research, echoing General White’s ideas about aerospace; “air and space are convenient ways of describing several parts of what really is a unified phenomenon.” Defense officials meanwhile emphasized to Congressional committees a need for “greater participation or complete control of space projects that have or may have military application.” In April, *Aviation Week* reported optimistically that, although “the first hypersonic re-entry gliders may have structural safety factors which later prove to be unnecessary, the vehicles probably will not be heavily constructed in comparison to current supersonic

⁴¹⁰ Hawkes, Russell, “Military Space Goals Stir Controversy,” March 31, 1958, *Aviation Week* (microform).

⁴¹¹ “President Details NACA Space Mission,” April 14, 1958, *Aviation Week* (microform). “Air Force Plans Manned Orbit for 1959: Gen LeMay seeks funds to support ARDC program that would put primary emphasis on human factors,” April 7, 1958, *Aviation Week* (microform). “Washington Roundup,” Apr 28, 1958, *Aviation Week* (microform).

combat aircraft.” This would apply specifically to “an orbital bomber, the Dyna-Soar.” The following month, the *New York Times* told readers that the “Dyna-Soar contract is one of the most coveted for which aircraft firms are battling.” In June, another article informed readers that the Dyna-Soar would use “the centrifugal force given by the rocket boosters and the dynamic lift of its wings” to orbit at supersonic speeds; “as a military weapon, the Dyna-Soar probably could be used first for reconnaissance and later for strategic bombing.”⁴¹² True, the stories lay only on pages 41 and 58, respectively, but the Dyna-Soar had begun to gain a foothold from which it might garner public attention – and potential support.

In its June 16, 1958 edition, *Aviation Week* dedicated its focus on space issues. Although its official title would embrace “Space” in 1960, the journal began flirting with applying the term to its title banners. Several of the numerous articles in that issue mentioned the Dyna-Soar, and one had it even share a headline. But the contradictions appeared in reporters’ conclusions about the Air Force’s role in space. Reporter Irving Stone commented on the “still debated” timetables and alternative reentry methods for space vehicles; he explained that Air Force planners “probably are pushing for relatively early manned satellite trials” for reasons of prestige, propaganda, because “man will never be ‘fully’ ready to cope” with space travel anyway (delay thus being unbeneficial), but also because “manned space vehicles, regardless of type, will not achieve the operational reliability of present-day aircraft for a long time to come.” Stone noted that, in initial manned missions using ballistic reentry capsules, the pilot “will go along mainly ‘for the ride’” rather than do significant piloting work.⁴¹³

Yet, in the same issue, Richard Sweeney depicted the Dyna-Soar as the direct successor to the still-unflown X-15 research plane. “Dyna-Soar probably will be built on sound technical data derived very largely from X-15 flight test work.” Sweeney conceded that technical problems remained that “boosters

⁴¹² Hotz, Robert, “Editorial: Toward a National Space Policy,” May 5, 1958, *Aviation Week* (microform). Eastman, Ford, “Administration to Clarify Civil Space Role,” May 19, 1958, *Aviation Week* (microform). Butz, JS, “Orbital Re-Entry Will Intensify Demands On Structures,” April 21, 1958, *Aviation Week* (microform). “2 Teams Bidding on Space Glider; Air Force Likely to Narrow Dyna-Soar Race to Boeing and Bell-Martin Groups,” p41, May 11, 1958, *New York Times*. “Air Force Orders Glider for Space; Craft Would Circle World at Near-Satellite Speed – Manned Flight Intended,” p58, June 17, 1958, *New York Times*.

⁴¹³ Stone, Irving, “Man-In-Space Timetable Still Debated,” June 16, 1958, *Aviation Week* (microform).

for [a] hypersonic glider present enough problems in themselves.”⁴¹⁴ This concession was, if anything, a considerable understatement. Nonetheless, technical problems implicitly posed no permanent hindrance, and besides:

Combining an orbital bomber and hypersonic boost-glide type vehicle would offer several advantages, such as dual mission capability [reconnaissance and bombing], flexibility. [...] A wide variety of weapons will be available for use with hypersonic glide bombers. Missiles, both guided and unguided and ordinary trajectory bombs could become part of the weapon system, all with high yield thermonuclear warheads.⁴¹⁵

Conspicuously, these particularly sweeping statements refer to the Dyna-Soar by role but not by name.

A contemporary article described the ARPA’s (perhaps temporary) seizure of military space research projects; the Air Force had kept the Dyna-Soar. The “Air Force has retained direct control of this family of manned, orbiting, boost-glide space vehicles primarily because it is based on stated military requirements.”⁴¹⁶ At a stroke, this separate article implicitly explains the emphasized reference to the role over the program. The Dyna-Soar was to pioneer the extension of airpower into the extra-atmospheric realm. As such, its significance lay largely in the directions in which it pointed. That summer, the esteemed émigré-scientist Theodore von Karman contributed another two cents empathizing with the Air Force’s aerospace concept: “I do not see any point in these developments which would indicate that [...] the military services should not consider the new activities as a natural extension of their missions and carry out the operations within the framework of their command system.”⁴¹⁷ One might alternatively say that von Karman’s comments reflect the parochialisms of a figure whose work had led the Air Force in this direction, or more charitably suggest that his work had been the product of a dedication to these beliefs. But the ideas of this respected figure could not be considered surprising.

The initial Soviet spectaculars had shaken many in the country, and the fall of 1957 hardly saw the end of Soviet accomplishments. The USSR had not advertised the failure of moon-bound Luna E-1 in September, but it did bask in its May success in sending the 3,000-pound Sputnik III into orbit.

Ironically, concurrent with the Luna failure, *Aviation Week* commented on the concern and response to

⁴¹⁴ Sweeney, Richard, “X-15, Dyna-Soar Will Put Man Into Space,” June 16, 1958, *Aviation Week* (microform).

⁴¹⁵ Sweeney, Richard, “X-15, Dyna-Soar Will Put Man Into Space,” June 16, 1958, *Aviation Week* (microform).

⁴¹⁶ “USAF Space Effort Based on Research,” June 16, 1958, *Aviation Week* (microform).

⁴¹⁷ Von Karman, Theodore, “Von Karman on Space,” July 28, 1958, *Aviation Week* (microform).

the prospect of a Soviet “tank-type vehicle” being landed on the moon to scout a future site for a lunar base. Even so, late summer saw the Senate carve heavily into the NASA’s proposed budget of \$343.1 million, planned as a combination of three generally equal amounts from three sources: new funds, transfer from military accounts, transfer from the NACA. *Aviation Week* praised the relative equanimity with which the public accepted a US lunar probe setback that in mid-August, in “contrast to the hysteria that accompanied the first Vanguard abortive missions.” Hotz attributed this to “a higher degree of understanding of the problem of experimental development.”⁴¹⁸

Commenting on the nomination of Case Institute of Technology president T Keith Glennan to oversee the NASA, Hotz did not feel inhibited in mixing his praise with criticism for not having advanced the NACA’s deputy, Hugh Dryden, to the position. Dryden, in keeping with administration policy, staked out a role for civilian space activity while explaining that the NASA was a new creature distinct from its predecessor. Dryden reminded readers that “it is factually incorrect to state that the only proper justification for supporting work in space is military. Plainly, it is a perversion of facts to suggest that all non-military space activity should be considered mere ‘fun in space.’” Air Force Deputy Chief of Staff General LeMay was reading from a different sheet of music when he spoke to American Veterans in St Louis. The *Washington Post* observed LeMay’s prediction of future bombers maintaining a constant patrol, “prepared to hurl missiles ‘on a moment’s notice anywhere in the world.’ The Air Force ‘Dyna-Soar’ is being developed as the first space bomber. LeMay said the plane would be able to circumnavigate the earth and attack targets with ‘space-to-surface’ missiles.”⁴¹⁹

On the cusp of Sputnik I’s anniversary, Hotz observed in the October 6 issue that “the democratic processes of government do respond to public opinion, but they grind relatively slowly toward policy

⁴¹⁸ “Military May Accelerate Lunar Base Plan,” September 29, 1958, *Aviation Week* (microform). Hotz, Robert, “Editorial: First Shot at the Moon,” August 25, 1958, *Aviation Week* (microform). \$125 million was to come from new funds, \$117 million was to come from the DOD, and \$101.1 million from the NACA. Eastman, Ford, “NASA Details Plans for Space Challenge,” August 11, 1958, *Aviation Week* (microform).

⁴¹⁹ Hotz, Robert, “Editorial: Space Team Leaders,” August 18, 1958, *Aviation Week* (microform). Dryden, Hugh, “Civil Space Role Defined,” September 29, 1958, *Aviation Week* (microform); “LeMay Warns Red Might Rises,” pA12, August 24, 1958, *New York Times*.

shifts.” But the essay inadvertently showed how fickle the press, as reflection and instigator of that public voice, could be. Establishment of a PSAC was praised – although the previous week’s issue had criticized that, “while President Eisenhower has been following a ‘second-hand’ approach in the handling of scientific problems, Russia’s Nikita Khrushchev apparently has adopted the ‘direct’ approach advocated by many US scientists as the only real way heads of state can acquire an understanding of the potential of modern science.” On September 29, Killian was “distilling the primary facts” to inform Eisenhower “in the ‘second-hand’ method.” A week later, Hotz wrote that “President Eisenhower at long last saw the need for a scientific adviser with direct access to the highest White House circles, and Dr James Killian [...] has been playing an active role in shaping Administration policy.” One note remained consistent: “We still have a long way to go to regain our significant superiority in new weapons development and scientific leadership.”⁴²⁰

October 6 also saw an announcement spanning two pages, reading “Dyna-Soar...” The journal illustrated a Dyna-Soar zooming toward the moon, with a caption acknowledging competing Martin and Boeing efforts to win the contract. *Aviation Week* identified the vehicle as using “a series of skips” to travel, although this notion, dating to World War II, in fact faced serious technical criticism among designers. The journal also claimed to have anticipated the vehicle in its March 18, 1957 issue. Crucially for this study, it noted that “Dyna-Soar, even though not scheduled to fly until the 1960’s, will affect thousands of buying decisions tomorrow, next week, next month. [...] The most authoritative source on Space Technology, AVIATION WEEK is also your most effective advertising medium to the entire Aviation industry including the multi-billion dollar Space Technology market.”⁴²¹

The bombast of the advertisement should not surprise the reader, but the use of Dyna-Soar as the “vehicle” for its claim is definitely significant. The Dyna-Soar, in the minds of aviation-interested members of the public, was exotic enough to be exciting and familiar enough to be of use for an advertisement. Otherwise, *Aviation Week* would have used one of any number of other contemporary

⁴²⁰ “‘Direct Approach’ Need,” September 29, 1958, *Aviation Week* (microform). Hotz, Robert, “Editorial: The Year Since Sputnik,” October 6, 1958, *Aviation Week* (microform).

⁴²¹ “Dyna-Soar...,” October 6, 1958, *Aviation Week* (microform).

aviation projects for the announcement. The Dyna-Soar represented the American future in space enough for an aviation journal to decide to sell *itself* through association with the Air Force's plan for a boost-glide bomber.

Companies like Chance Vought also incorporated their work on the Dyna-Soar into their advertisements. On October 12, the company ran simultaneous ads in the *Washington Post* and the *New York Times*, boasting of its work including “weapons for spacemen...and defenses for the ocean floor: both are active areas at Chance Vought today.” Half of the ad's text discusses “military astronautics” and Vought is identified as “a member of Boeing's Dyna Soar space glider development team.” The advertisements weren't just about getting the company name out – they were also about getting new employees in. The Dyna-Soar seemed an exciting project capable of enticing young talent to work at companies like Vought.⁴²² Advertisements in the *Washington Post* and *New York Times* referring to the Dyna-Soar escalated in the second half of 1958 and slumped a year later. Significantly, they would spike spectacularly higher in the second half of 1960, coinciding with the President's increasing discomfort with the program. With the exception of only three months, the papers accumulated *multiple* advertisements using the Dyna-Soar's name from July 1958 through July 1959 – a total of 51 ads in these two major newspapers.⁴²³

This did not imply that the Dyna-Soar would fly imminently - or cheaply. A *Washington Post* report describing the X-15 as resembling a missile more than a plane, noted that “the best features will be used in the manned outer-atmosphere bomber, the Dyna-soar, which is not [sic – now] in the development stage. But they must be proven before used in the bomber program, which may cost \$1 billion.” *Aviation Week* meanwhile catalogued for the public the totals scheduled for investment in the X-15; as the senior military partner, the Air Force had spent or was slated to outspend the Navy between 9-to-1 and 36-to-1

⁴²² Vought advertisement, “Ocean floor to Deep Space,” October 12, 1958, *Washington Post*. Chance Vought ad for employment, “Weapons for Spacemen...and defenses for the ocean floor,” October 12, 1958, *New York Times*.

⁴²³ The three exceptions were December 1958 and June 1959, in which no ads appeared, and May 1959 in which there was only a single ad in the *New York Times*.

on the program between fiscal year 1956 and 1959.⁴²⁴ These outlays could seem understandable, however, if they led to a vehicle which would help transform warfare.

General Tommy Power, LeMay's successor as commander of the Strategic Air Command, thought the Dyna-Soar would help do just that. *Aviation Week* noted explained the general's predictions "'a new regime of strategic operations in which utilization of the space medium will place a fantastic premium on action and reaction times.' [...] Current studies concerning development of a manned missile could possibly lead to *a vehicle that might exceed ballistic missile performance*, General Power said, citing the *Dyna-Soar project as an example*" [italics added].⁴²⁵

High-profile military affairs journalist Hanson W Baldwin informed the public, though, that "space conquest is clouded by unknowns." He described competing space vehicle concepts, including "the Dynasoar program which is intended to put man into a kind of skipping orbit around the earth." Readers learned of a gulf in thought about the military in space. "Many scientists, like many nuclear physicists when atomic energy was young, are opposed to military exploitation of the new medium. Most scientists however are moderate conservatives, like Dr Lee A Dubridge of the California Institute of Technology, who favors reasonable military space development but who wants to avoids useless spending." Killian, Baldwin noted, was of essentially like mind. "This attitude differs fundamentally from some of the military extremists," the writer continued, pointing to General Boushey by name. Most in the military, Baldwin continued, tend "to feel that General Boushey's objective is unnecessary (it is far easier and more accurate to launch rockets from the earth against Russia than from the moon) and indeed far-fetched, nevertheless feel that numerous military applications of space – some of them as yet undreamed of – will be developed as our knowledge increases, and that imagination, energy and relatively free rein

⁴²⁴ Toth, Robert C, "US to Roll Out Its Space Plane Tuesday," pA11, October 12, 1958, *Washington Post*. "X-15 Development History," October 27, 1958, *Aviation Week* (microform).

⁴²⁵ "Space Strategy Hinges on Time Factors," October 20, 1958, *Aviation Week* (microform).

are necessary.” The emergence of the NASA threatens this, in their outlook. But in the meantime, real and important scientific problems stand in the way of truly getting into space in the first place.⁴²⁶

Such cautions did little to dissuade the dedicated technologists from demanding ever further work. An *Aviation Week* story in August had showed “that, in actual purchasing power, the research and development effort of the three military services had declined” from its peak in fiscal year 1952. Editor Hotz sharpened the point in November, declaring that “for the next century, the American economy must depend on the expansion of basic knowledge to new frontiers and the development of the resulting technologies.”⁴²⁷ From the perspectives of military space advocates, the civilian elements of these ventures seemed to grow alarmingly. Early November saw coverage of the NASA inviting bids on a capsule, and stories midmonth noted that “the man in space program is a joint effort between the civilian National Aeronautics and Space Administration and York’s agency, which is part of the military establishment.” A front-page *New York Times* article explained Pentagon resentment of the NASA’s having “‘proselytized’” and poached personnel from the DOD to fill its own ranks.⁴²⁸

Exotic military technology may have seemed urgently necessary in the last weeks of 1958. While US scientists were preparing the ill-fated monkey Gordo for his mission into space and the more successful Project Score for its launch, US journalists were rushing disturbing reports to the American public. Hotz dismissed the successful Project Score as “propaganda antics [...] belong[ing] to the era of frantic circus stunts aimed at quick and dirty substitutes for well-planned scientific programs” anyway.⁴²⁹ The *Washington Post* declared that “Russia is developing an intercontinental rocket glider with a range up to 12,500 miles,” according to Bell Aircraft space scientist Everett R Wellmers, who spoke to the Air Force’s School of Aviation Medicine. The vehicle would have retractable wings and a landing capability

⁴²⁶ Baldwin, Hanson, “Space Conquest is Clouded by Unknowns; Yesterday’s Second Attempt to Hit the Moon Point Up Problems,” October 12, 1958, *New York Times*.

⁴²⁷ “Research and Development Decline,” August 11, 1958, *Aviation Week* (microform). Hotz, Robert, “Editorial: How Research Investments Pay Tremendous Dividends,” November 17, 1958, *Aviation Week* (microform).

⁴²⁸ “NASA Invites Bids on Capsule,” November 3, 1958, *Aviation Week* (microform). “ARPA Gives Details on Man-in-Space Program,” November 17, 1958, *Aviation Week* (microform). Raymond, Jack, “Pentagon Resentment Mounts at ‘Raiding’ by Space Agency; Pentagon Scores Loss of Experts,” p1, November 17, 1958, *New York Times*.

⁴²⁹ Hotz, Robert, “Editorial: Orbital Atlas – Preview of Future,” December 29, 1958, *Aviation Week* (microform).

on Mars or Venus – but not the moon – because of the lack of an atmosphere.⁴³⁰ It is possible that this confused report incorporated nascent fears of a Soviet Dyna-Soar (the story did state that “America also is working on such a glider. The Air Force last June awarded contracts for the Dyna-Soar”), an inkling of the Soviet Vostok program, and other rumors. Indeed, Gagarin’s Vostok would be incorrectly identified in initial US reporting as something resembling a Dyna-Soar vehicle – a highly inaccurate assertion, given the Dyna-Soar’s projected ability to undergo maneuverable reentry, in contrast to Gagarin having to bail out of his capsule and parachute from high altitude!

Familiarity did not automatically confer accuracy. The *New York Times*, despite having already reported on the envisioned Dyna-Soar, referred intermittently to the program in inadvertently misleading or inaccurate ways, as on November 27 when identifying the “Dyna-Soar missiles.” Typically, such misappraisals appeared where the Dyna-Soar was tangentially related to the main topic (in this case, missile contracts).⁴³¹ Like the monsters conjured in the 19th century from dinosaur bones, the Dyna-Soars concocted by 20th century journalists could be as intimidating as they were inaccurate.

And on December 1 came an even more frightening apparition: an imminently operational Soviet nuclear-powered bomber plane. A US project had tinkered with the idea, in September 1955 beginning tests to confirm that crew could be shielded from a small airborne reactor’s radiation; shielding was successful, but staggering technical problems remained and the test reactor was a carried weight rather than a flight propulsion source. A reactor had to be small to fit in a plane, powerful to allow its flight, and shielded to protect the crew – and these requirements conflicted with one another. *Aviation Week* broke the (incorrect) story of the USSR having presumably mastered these challenges and built the fearsome vehicle.

As he frequently did, Hotz wrote his editorial essay to complement and sharpen the effect of a particularly vital story of the week, writing scathingly that

⁴³⁰ “Red Rocket Glide Reported in Works,” pB6, November 12, 1958, *Washington Post*.

⁴³¹ “Missile Work Awarded,” November 27, 1958, *New York Times*.

While this Soviet achievement is a truly remarkable feat, it is not beyond the technical state of the art in our own nuclear aircraft propulsion program. The difference lies rather in the top priority and steadfast support accorded the Soviet program by its top political leadership and the technical timidity, penny-pinching and lack of vision that have characterized our own political leaders' attitude toward the goal of nuclear-powered aircraft for both military and civil purposes. [...] During the past few years, we have heard much from our political leaders on how much we can or cannot 'afford' for the defense of this country. [...] How much longer can we 'afford' this kind of leadership and still survive as a free nation?⁴³²

Whereas the editorial derided the Eisenhower administration for ossified and penurious lack of vision, the news story focused on the plane, identified as the “prototype of a design to perform a military mission as a continuous airborne alert warning system and missile launching platform similar to the USAF CAMAL.” A nearby text box provided a rundown of the US’s ANP project, including Defense Secretary Wilson’s spring 1953 cancellation of the Convair-GE work on a direct-cycle engine and the August 1957 cancellation of the Pratt & Whitney closed cycle research.⁴³³

Hotz’s editorial the next week indicates a frenetically panicked mood. “There is no real over-all strategic policy and definite tactical requirements developed for the defense problem as a whole,” he argued, pointing to the “primary reliance on the Air Force as a ‘dynamic deterrent’ to scare any potential enemy from major aggression.” A case might be made about the particular reliance on airpower and massive destruction – indeed, politicians would increasingly strike that note in their criticisms of Eisenhower. But Hotz also wrote of “an increasing tendency on the part of newcomers to the Defense Department [...] to become increasingly enamored by the glitter of radically new weapons that are little more than a gleam in the engineer’s eye at the sacrifice of proven reliability.” Again, a strong case could be made criticizing contemporary techno-zealotry. However, it was the paladins of aerospace power in the military and in the civilian press who most exhibited these tendencies – not figures such as Herbert York who had been brought into the ARPA and imminently the DDR&E. Hotz closed, ironically, with a plausible statement, but one which sounded more in keeping with the aerospace techno-zealots: “In the long range megaton delivery system business, *it is again foolish to search for an ‘ultimate weapon’ and rely on a single delivery method.* Flexibility and variety are still the keys to this problem” [italics

⁴³² Hotz, Robert, “Editorial: The Soviet Nuclear-Powered Bomber,” December 1, 1958, *Aviation Week* (microform).

⁴³³ “Soviets Flight Testing Nuclear Bomber,” December 1, 1958, *Aviation Week* (microform). “US Nuclear Powered Aircraft Program,” December 1, 1958, *Aviation Week* (microform).

added].⁴³⁴ Hotz had in essence argued the case for a diversified deterrent – but this vision was most distinctly evident in the Air Force’s aerospace vision then manifested in the Dyna-Soar program!

In the first month of 1959, Americans learned of important developments in US space efforts. The NASA decided on McDonnell’s bid to make a space capsule (Mercury), reported to focus on sustaining a 100-150 mile nearly circular 24-hour orbit. The *New York Times* identified a “contract rush” spurred by the space race. And, significant to the Dyna-Soar program, as part of his revamping the Department of Defense, Eisenhower installed Herbert York as the Director of Defense Research and Engineering.⁴³⁵

DDR&E was a new – and potent – position, overseeing the months-old ARPA while absorbing the positions of the Assistant Secretary of Defense for Research and Engineering (held by former NACA member Paul D Foote) and the Director of Guided Missiles (formerly William Holaday). In the *Washington Post*, Jack Anderson criticized the presence of “too many czars in space work.” Each service’s parochial space-related projects had to be guarded against “raids on their bureaucratic empires.” Anderson continued, “for instance, the Air Force is designing a satellite plane, the Dyna-Soar, which will be capable of orbiting around the earth with a pilot aboard. To keep it out of Glennan’s or Johnson’s clutches, the generals will call it a ‘satelloid,’ and will carefully keep it out of orbit.”⁴³⁶ Anderson’s prediction largely proved accurate; the Air Force indeed sought to avoid NASA or ARPA takeover, and their solution was indeed to cling to the Dyna-Soar as a vehicle in preparation for developing a weapon system, defined as being hypersonic but *suborbital* – and therefore beyond the reach of the space organizations Eisenhower was menacingly creating to stymie military control. Such efforts still could not inoculate the Dyna-Soar against York’s power in the coming months.

In February and into March, *Aviation Week* continued to report on moves to push the air and space envelope. *Aviation Week* completed its series of three articles “describing the optical problems affecting

⁴³⁴ Hotz, Robert, “Editorial: Today and Tomorrow,” December 8, 1958, *Aviation Week* (microform).

⁴³⁵ “McDonnell Wins NASA Capsule Award,” January 19, 1959, *Aviation Week* (microform). Witkin, Richard, “Space Race Spurs a Contract Rush; Young Engineers Seeking Share of New Business With Own Concerns,” p92, January 12, 1959, *Aviation Week* (microform). Clark, Evert, “York Named Defense Director Of Research and Engineering,” January 5, 1959, *Aviation Week* (microform).

⁴³⁶ Anderson, Jack, “Too Many Czars In Space Work,” pD7, January 3, 1959, *Washington Post*.

earth reconnaissance from a satellite,” reported on Wright Air Development Center research on heat-resistant materials “for the development of a 2500 F leading edge for hypersonic boost glide vehicles such as the Dyna-Soar.” Hotz argued the case for nuclear-powered aircraft, reporter Ford Eastman noted ARPA interest in a “Maneuverable, Recoverable Space Vehicle” known as “MRS V,” and the journal provided successive pages of charts comparing stats on US and Soviet satellites and space probes.⁴³⁷

The *New York Times* recounted General White’s efforts to connect the two realms of air and space. He reiterated his talking points that, “since there is no dividing line, no natural barrier, separating these two areas, there can be no operational boundary between them. [...] Thus, air and space comprise a single continuous operation field in which the Air Force must continue to function. This area is aerospace.” Representative John W McCormack, a Massachusetts Democrat, noted that other services might contest this claim, and more whimsically asked about the origin of the term, ““why not call it spaceaero, anyhow?”” The general answered, ““It’s a little more euphonic this way.””⁴³⁸ Implicitly, a reader might conclude that the Air Force not only wished to extend into space, but that the top billing retained by the “air” element owed more to the sound of the words than to the weight of their priority.

Aviation Week proclaimed the vital importance of the public role in space policy. One critical element was the public’s access to information. Under Project Argus, US nuclear devices were detonated in orbit on August 27 and September 6, to determine the impact of radiation in space; as mentioned earlier, some considered the utility as a means of denying space as a medium from which the enemy could undertake hostile operations. But the public learned of these tests several months after they had occurred, prompting Hotz to decry the thickening “secrecy fog” with which the Administration had stymied *New York Times* reporting efforts. A “fog of secrecy [...] separates the American people from the vital policies and decisions of its government,” and although an element of secrecy is necessary, “it has

⁴³⁷ Fusca, James, “Improving Image Aids Reconnaissance,” February 2, 1959, *Aviation Week* (microform). Yaffee, Michael, “Navy, USAF, High Heat Metals Tests,” February 2, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: The Case for Nuclear Powered Aircraft,” March 2, 1959, *Aviation Week* (microform). Eastman, Ford, “ARPA Plans Maneuverable Satellite Unit,” February 23, 1959, *Aviation Week* (microform). Clark, Evert, “US Plan for Rocket Vehicles Included Manned Flight to Mars,” March 2, 1959, *Aviation Week* (microform). “US-USSR Satellites and Space Probes,” March 9, 1959, *Aviation Week* (microform).

⁴³⁸ “Atmosphere and Space Joined as ‘Aerospace,” p3, February 4, 1959, *New York Times*.

become particularly acute during the last three years as the tremendous impact of new technologies hit the traditional methods of operating the government.”⁴³⁹

Access to information was not deemed sufficient, however, because the public must be galvanized. George S Trimble, the head of Martin Company’s space division, told Congress that ““the hero of this age will not be the space traveler, but rather the man or men who successfully figure out how to motivate 170 million American people actively to do battle with a part of their environment that they just began to hear about, that they really did not know was important – Space.”” Information could be of true value only if employed as a tool of inspiration. Space was *prima facie* important, but the public in democracies had to be brought to see that importance. That implicit lesson might have sounded odd enough, but the reporter paraphrased one more: “Russia, not being a democracy, does not have a parallel problem.”⁴⁴⁰ The implication that the Soviets possessed a strategic advantage in their undemocratic form of government was chilling, but it was not unique to the Cold War or even to a modern era. Within weeks, Hotz chimed in that “the regimentation characteristic of the potential enemy enables them to take much more effective passive defensive measures in the dispersal and under ground protection of personnel and facilities.”⁴⁴¹

Voices in Congress sometimes cried loudly for greater space spending. The Senate had sliced \$50 million off of the \$125 million new dollars requested by the NASA the previous year, but in March Democrat Senate Majority Leader Lyndon Johnson of Texas spoke on the subject of military space spending. ““We must determine whether the military policies of our country are being written by military officers through the judgment of our Joint Chiefs of a budget officer.””⁴⁴² A month earlier, when Eisenhower rued the public’s noisy but incompletely informed impact on space policy, he specifically

⁴³⁹ “Atomic Blasts Create Radiation Belts,” March 23, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: Secrecy Fog Thickens,” March 30, 1959, *Aviation Week* (microform).

⁴⁴⁰ “Soviets Capitalize on Space Leadership,” March 9, 1959, *Aviation Week* (microform).

⁴⁴¹ Hotz, Robert, “Editorial: Mixed Force Concept,” May 11, 1959, *Aviation Week* (microform).

⁴⁴² Eastman, Ford, “Military Objections Spot Budget Probe,” March 16, 1959, *Aviation Week* (microform).

noted “that Senator Lyndon Johnson has asserted he will add substantially to the Administration’s program, whatever it is.”⁴⁴³

Complementary to these perspectives, *Aviation Week* reported on the “considerable evidence that the Soviets are” rapidly equipping themselves with “the latest model missiles and manned aircraft for both offensive and defensive purposes.” Contrary to Khrushchev’s noises that missiles have displaced aircraft, the report explained, the USSR is building both. And the report asserted that missiles and planes were not all that Soviet designers were up to:

Beyond Bounder [a medium bomber], *the Soviets are known to be working on a Dyna-Soar type manned vehicle. Little is known about the progress of this work except that the basic launching booster yielding close to a million lb thrust has reached the static test stage. This project has had a high Soviet priority from the end of World War II when the Russians acquired the German research data on hypersonic boost-glide vehicles.* [italics added]⁴⁴⁴

In April of 1959, while York clipped the wings of the proposed suborbital round of Dyna-Soar tests, the Air Force campaigned hard for funding and authority. SAC’s General Power testified before Congress and urged augmentations in his command’s capabilities, involving anti-sabotage measures, hardening of missile bases, and force dispersal. But presumably the Air Force was bothered by questions of “how much is enough?” Hotz praised Power as “better qualified in modern military technology and the fast changing factors of the strategic deterrent equation than any other general [...] in this country today,” and the editor condemned the notion of “‘minimum deterrent’ [as] completely false.” “No one,” Power indicated, “except Khrushchev perhaps, knows that minimum amount of deterrent required to prevent Russia from attacking the US.”⁴⁴⁵

These Air Force efforts included moves which conflicted with the Administration’s space policy. John W Finney of the *New York Times* wrote that Air Development and Research Command’s General Bernard Schriever spoke to senators and “staked out a major claim for the Air Force in the new military

⁴⁴³ “Memorandum of Conference with the President, February 17, 1959,” Feb 24, 1959. Fldr National Aeronautics and Space Administration [September 1958-January 1961] (5), Box 18, Alpha subser, Staff Sec Subject ser, DDEL.

⁴⁴⁴ “Soviets Study Military Aspects of Space,” March 9, 1959, *Aviation Week* (microform).

⁴⁴⁵ Hotz, Robert, “Editorial: General Power’s Blunt Warning,” April 13, 1959, *Aviation Week* (microform). Eastman, Ford, “Power Warns SAC Ability ‘Deteriorating,’” April 13, 1959, *Aviation Week* (microform).

frontier of space – a frontier that he deliberately called ‘aerospace’ to indicate that it was merely an extension of the Air Force’s present realm. [...] General Schriever said that development of space projects had been ‘very definitely’ hampered by lack of Defense Department decisions on which service would be the eventual user of a space weapon.” Eisenhower’s officials, rather than dithering about *which* service would use space weapons, was attempting to if possible prevent the introduction of space weapons. In almost farcical dissonance, *Aviation Week* reported at the end of April that the Air Force was “considering [a] moon base by 1968” and “anticipated that a base probably could be established by 1965 if sufficient support were available.” Soon thereafter, General Schriever identified “a clear military role firmly attached to space weapon systems now under development,” and “it will be the Air Force’s primary combat mission that will be the most vitally affected.” He thus proposed the abolition of the ARPA, a suggestion that was obviously a non-starter with respect to the Administration.⁴⁴⁶

The ARPA was not exactly an entity moving cravenly away from military employment of space – indeed its officials proved capable of contributing to the chorus urging bold space projects. One ARPA official recommended, in an address to an ARS conference, studies into “the feasibility of deterrent satellite weapon carriers [and] armed orbiting satellites.” Continuing, he suggested the possibility of “manned space stations equipped with maneuverable missiles as an active defense against enemy ballistic missile attack.” Days later, *Aviation Week* reported that the Air Force’s chief scientist, Dr Joseph V Charyk, had told the Aviation Writers Association that “development of an effective defense against enemy ballistic missiles that won’t bankrupt the country will require fundamentally new approaches, probably involving systems designed to operate in space.” Although reporting now cast doubt on the military usefulness of Argus, support for the Air Force’s “WS-117 advanced reconnaissance system” appeared likely. Deeper into space, a Lockheed design engineer identified the “propaganda value” of a

⁴⁴⁶ Finney, John W, “Pentagon’s Role on Space Scored; End of Its Research Agency and Air Force Priority Urged by Schriever,” p10, April 24, 1959, *New York Times*. “USAF Considering Moon Base by 1968,” April 27, 1959, *Aviation Week* (microform). Eastman, Ford, “Gen Schriever Asks ARPA Abolishment,” May 7, 1959, *Aviation Week* (microform).

lunar landing project suspected of the Soviets, but “placing a man on the moon is more than a propaganda stunt; it is an expression of the destiny of a nation.”⁴⁴⁷

An *Aviation Week* issue in mid-May announced an upcoming issue to focus on “the next decade in space...Blueprint for US space exploration.” Accompanying illustrations showed a wheel-and-spokes space station and half a dozen vehicles, two of which appeared to be boost-glide sketches.⁴⁴⁸ Just a week later, the journal ran included the first full-page advertisement dedicated solely to the Dyna-Soar. Radio Corporation of America crowed of its responsibility for electronics in the Boeing contract bid. The description spoke powerfully, both in what it included and in what it did not say. “Studies show that by varying the original rocket boost, and thus the velocity, and with the control available to the pilot, the Dyna-Soar aircraft can circumnavigate the earth, followed by a normal landing.”⁴⁴⁹ The program’s orbital potential certainly sounded exciting. But the ad predictably did not mention the fresh news that the vehicle’s suborbital goals were reprioritized by DDR&E York, intent on preventing the Dyna-Soar from growing in the direction of an operational weapon system. Nor did the ad explain that “varying the original rocket boost” was as yet quite impossible, since no existing US rocket could lift the behemoth (but still unbuilt) Dyna-Soar with sufficient speed.

June issues mixed greater candor with exhibitions of technological zeal. *Aviation Week* correspondent Katherine Johnson identified York’s “tight control of R&D funds,” and the June 22 issue focused on space explained a great deal more to an interested public. Space timetables stood at the mercy of booster development, of which Rocketdyne’s 1.5-million-pound thrust booster was expected in mid-1963. The NASA was nonetheless considering its own “major goal [...] to land men on the planets of the solar system and return them to earth.” Toward this end, it had developed “an orderly evolution of manned US space craft” in successive (and extremely ambitious) phases: first, “Mercury type drag

⁴⁴⁷ Klass, Phillip J, “Official Asks Study of Deterrent Satellites,” May 11, 1959, *Aviation Week* (microform). “New Approach to Missile Defense Urged by USAF Chief Scientist,” May 18, 1959, *Aviation Week* (microform). “New Space Tempo May Increase Support for WS-117,” May 25, 1959, *Aviation Week* (microform).

⁴⁴⁸ “Announcing June 22, 1959: The next decade in space...Blueprint for US space exploration,” May 18, 1959, *Aviation Week* (microform).

⁴⁴⁹ *Aviation Week* advertisement, “Dyna-Soar,” May 25, 1959, *Aviation Week* (microform).

capsules and Dyna-Soar type lifting vehicles”]; then 5- to 7-man space labs; then lunar vehicles; finally, interplanetary vehicles. The story, seeking vainly Dyna-Soar “probably will not fly for three or four years.”⁴⁵⁰

JS Butz offered a more sober opinion of the Dyna-Soar in his *Aviation Week* article, titled, “Hypersonic Aircraft Will Face Technical, Cost Problems.” The cost of flights “will be astronomical” unless ICBM-patterned boosters could be discarded in favor of some reliable system of reusable boosters. The Dyna-Soar vehicle itself, to be constructed of exotic refractory materials added to the prospective expense of \$100 million for each of the envisioned hand-built Dyna-Soar I craft. “These obvious high costs have brought a reconsideration of the entire Dyna-Soar program. There is considerable opinion both within the government and in industry that a very high cost program should be avoided until the last possible moment.” Heat offered a boggling technological problem. Questions about landing, maneuvering, and the pilot’s value lingered as well. The value of a hypersonic vehicle for attack roles “is believed to be feasible by most engineers, but the extent of this capability is far from established.” Potential capability to conduct reconnaissance, another role boasted by Air Force advocates, “is another question that cannot be clearly answered at present.” Others had compared the Dyna-Soar to other pioneers in flight, but in mid-1959 Butz’s comparison was far from praising: “*Probably no aerial weapon since the Wright biplane has come into the military planning picture with as little understanding and agreement about its optimum mode of operation, its attack and reconnaissance potential and its limitations*” [italics added]⁴⁵¹

As June gave way to July and then August, Hotz worried about Soviets’ misinterpreting domestic debate about defense spending the way that they had “misinterpreted the inexcusable political, executive and administrative bungling in our defense program as a lack of genuine technical and industrial ability in the critical new fields of weapons technology such as missiles and space.” The answer to defense budget

⁴⁵⁰ Johnsen, Katherine, “York Gains Tight Control of R&D Funds,” June 1, 1959, *Aviation Week* (microform).

⁴⁵¹ Butz, JS, “Hypersonic Aircraft Will Face Technical,” June 22, 1959, *Aviation Week* (microform).

problems was not more money but rather “more effective use of the billions already provided.” Hotz found Khrushchev’s bombast during the premier’s visit to the United States the product of “overconfidence,” but Hotz did not sense that it might have been at least partly bluff. RCA reran its full-page ad about work on the Dyna-Soar, but during these months, the program appeared far less in the pages of the *Washington Post* and the *New York Times* than it had in autumn 1958 or spring 1959 months.⁴⁵²

Late August saw NASA administrator Glennan warn of sluggish advances in US space technology as DDR&E director York predicted that Dyna-Soar specifications would be finalized ““within the next few months.”” York told the National Press Club that “there is ‘no doubt that we want to’ carry through the Dyna-Soar program but added that the Air Force is ‘having some difficulties in regards to coming up with precisely what it wants.’” Previous chapters have demonstrated that, on the contrary, Air Force leaders had a fairly exact vision of the Dyna-Soar’s role: an aerospace bomber diversifying the US strategic deterrent, capable of reconnaissance and possibly other peripheral space utility roles as well. The difficulty was *not* confusion within the Air Force but rather dissonance between the Air Force vision and solidifying national space policy. York in fact pointed, obscurely, to his role in limiting the Dyna-Soar, describing “the Dyna-Soar as a ‘strictly exploratory vehicle, not a weapon system,” to build on the X-15’s research.⁴⁵³ This “strict” parameter was York’s own doing, an effort to hinder the Air Force’s efforts to weaponize space.

Reconfiguration of space exploration seemed potentially in the offing. The *New York Times* described a NASA effort to use an atomic clock on earth and in space to test Albert Einstein’s theory of relativity, and NASA deputy Dryden predicted that the demands of space exploration would outstrip the capacity of single nations and require what *Aviation Week* characterized as “an unprecedented degree of international cooperation.” Scientists debated the potential usefulness of a telescope set in orbit.

⁴⁵² Hotz, Robert, “Editorial: Possibilities for Gross Error,” July 27, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: Defense Trends,” August 17, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: Mr Khrushchev’s Visit,” August 24, 1959, *Aviation Week* (microform). Hotz, Robert, “Dyna-Soar,” July 20, 1959, *Aviation Week* (microform).

⁴⁵³ Text Box, August 31, 1959, *Aviation Week* (microform).

Journalists described the evolution of the Mercury capsule, which had begun with the work of Max Faget and other NASA employees on “the general notion that the US would soon need an efficient design for a manned capsule.” Because “there was no official program,” Faget and his colleagues AB Kehlet and WS Blanchard considered the capsule in addition to their regular workload.⁴⁵⁴ Here with Mercury appeared to be an example of how small-scale design work, without, might prove useful when administration officials came around to calling for just such an effort.

Reporting on military involvement in space presented a somewhat confused picture. The House of Representatives’ Government Operations Committee recommended a re-merger of the Army and Air Force, barely a decade after the two had been separated. Karman, who had written a year earlier to propound the aerospace vision, now wrote to urge greater flexibility in US warfighting capability. Hotz credited York with the transfer of space weapon systems from the ARPA back to their original services. The Air Force was reported as interested in interplanetary programs and in the return of “MRS V,” which had been reported in March as being parallel to the Mercury capsule program. Now MRS V was “a logical *extension* of the USAF-NASA Dyna-Soar program and will probably become part of that project in later stages” [italics added].⁴⁵⁵

Dust appeared to settle in the following weeks, as *Aviation Week* explained that “the recent transfer of projects [from the ARPA to the military, especially the Air Force] generally is being interpreted by the services as a green light for the USAF to expand its efforts even beyond the scope of the transfers.” The ARPA’s director Roy Johnson contemplated retirement and the Dyna-Soar settled into the pantheon of first-tier US space projects. Westinghouse advertised the nation’s spacecraft in the September 28 issue, illustrating seventeen vehicles including the “Mercury capsule for manned satellite” and the “Dyna-Soar

⁴⁵⁴ Clark, Evert, “Dryden Foresees World Cooperation on Space,” September 7, 1959, *Aviation Week* (microform). Sweeney, Richard, “Scientist Doubts Space Telescope Value,” September 14, 1959, *Aviation Week* (microform). “How Mercury Capsule Design Evolved,” September 21, 1959, *Aviation Week* (microform).

⁴⁵⁵ Butz, JS, “ARPA Official Raps US Space Pace,” March 30, 1959, *Aviation Week* (microform). Johnsen, Katherine, “House Unit Urges USAF-Army Merger,” September 14, 1959, *Aviation Week* (microform). Butz, JS, “Von Karman Urges Flexible War Posture,” September 21, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: Space Programs Changing,” September 28, 1959, *Aviation Week* (microform). Clark, Evert, “US Gears Space Plan to Cut Soviet Gap,” September 28, 1959, *Aviation Week* (microform).

glider bomber,” accurately identified in keeping with the Air Force’s intentions. The following month, a report focusing on “man’s space role” divided its attention between the Mercury and the Dyna-Soar.⁴⁵⁶

Boeing and Martin won their contracts in early November 1959, although technical challenges remained daunting, especially with regard to resisting intense reentry heats; “the current development program [...] is more in the nature of a research aircraft project than a weapon system.” The *Washington Post* commented that “if carried through to the logical conclusion of a military space ship, it could cost billions. [...] It might be used as a bomber [...] able to make its own before-and-after reconnaissance, or as a ‘fighter’ to shoot down ICBMs or an enemy’s military satellites.”⁴⁵⁷ Such a range of potential uses, coupled with the ongoing technical hurdles, risked allowing the Dyna-Soar to seem as unfocused as York had earlier characterized it - and as other influential officials would crucially do in the future.

Hotz urged a steady hand at the helm – and accused Eisenhower of charting the wrong course. In November he praised Glennan for seeking a balance between “grow[ing] hysterical every time the Russians score” in space, “rush[ing] pell mell into makeshift space spectacles” on the one hand, and “run[ning] second in any phase of space exploration” in the long run on the other. Although chiding Eisenhower for setting a “snail’s pace in space,” the President in fact had been fairly amenable to the perspective Glennan had voiced and Hotz had praised. The editor condemned any notion of unilateral disarmament as “sheer folly” before returning near the month’s end returning to attack the President with the rhetorical question, “Do we have a space program?”⁴⁵⁸

The answer, which would probably have met Hotz’s chagrin, was that in fact the Administration had since before Sputnik I been considering space *policy*. That policy revolved around the peaceful use of space and its interpretation to include surveillance satellite development. As Hotz continued his

⁴⁵⁶ Clark, Evert, “Defense Plans to Clarify Space Missions,” October 5, 1959, *Aviation Week* (microform). Westinghouse ad, “Spacecraft USA,” September 28, 1959, *Aviation Week* (microform). Lewis, Craig, “Johnson Retires, Outlines ARPA Future,” October 26, 1959, *Aviation Week* (microform). “Test Pilots Stress Man’s Space Role,” October 26, 1959, *Aviation Week* (microform).

⁴⁵⁷ Norris, John G, “Space Ship is Ordered by Air Force,” pA1, November 10, 1959, *Washington Post*. Clark, Evert, “USAF Drafts Dyna-Soar Contract Terms,” November 16, 1959, *Aviation Week* (microform).

⁴⁵⁸ Hotz, Robert, “Editorial: Snail’s Pace in Space,” November 2, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: Thoughts on Disarmament,” November 16, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: Do We Have a Space Program,” November 23, 1959, *Aviation Week* (microform).

vociferations on the eve of the election year, Charyk ordered the reevaluation of the Dyna-Soar under Phase Alpha, stalling a space project which conflicted with the President's space policy. In fact, the Administration had in all had little use for things which the technological zealots like Hotz, uninitiated as to the truly secret work on spy satellites, would identify as a "space program." But as the wearying Eisenhower Administration was reluctantly learning, and as its successor too would learn, there could be a political utility in answering the public and press demand for a "space program" with something that looked like one. The former had established the NASA toward this end. The latter would assign it a quest.

Chapter 7: TO HARNESS THE WIND:
NATIONAL CULTURE AND THE 1960 CAMPAIGN SEASON

Public opinion pressure frequently reveals a problem but rarely a solution. --*Public Opinion Quarterly*, fall 1960⁴⁵⁹

“We should frankly admit that we are indeed in a race with the USSR,” Dr William H Pickering told the assembled members of the ARS at their 14th annual conference, held in Washington, DC. Pickering, born in New Zealand and serving as head of the California Institute of Technology’s Jet Propulsion Lab, was working primarily with the NASA when he spoke in early November, 1959. He had touched an issue important to many in the United States on the cusp of an election year. The existence of a space race left US policymakers two alternatives: “either pursue our space developments actively and successfully, or [...] declare ourselves completely out of the space race.”⁴⁶⁰ The answer, from the podium as in the hall, seemed obvious.

Aviation Week noted Pickering’s professed view that, if a space program involved “clear national goals, management and funds to support them on a long-term basis and public understanding of the importance of the program and the time and effort required to conduct it,” then the country lacked a space program. General Boushey also spoke, calling a “a military space capability [...] a matter of urgency for our national survival” and decrying Eisenhower’s year-old answer to reporters distinguishing missiles (as rockets fitting military use) from rockets (as space exploration tools). Boushey recalled for the audience that the President had said, “I cannot for the life of me see any reason why we should be using or misusing military talent to explore the moon. [...] You have given to the military only what is their problem and not anything else. The rest stays under civilian control and that is the reason for having this agency.”⁴⁶¹ From the general’s perspective, this seemed nonsensical, as he was convinced of a definite need for the military to pioneer the high ground in space.

⁴⁵⁹ PUBLIC OPINION PRESSURES ON EDUCATION TODAY: Philip Coombs. PUBLIC OPINION PRESSURES ON EDUCATION TODAY *Public Opin Q* (1960) 24(3): 470-473 doi:10.1093/poq/24.3.470

⁴⁶⁰ Clark, Evert, “US Space Officials Rap Lack of Urgency,” November 23, 1959, *Aviation Week* (microform).

⁴⁶¹ Clark, Evert, “US Space Officials Rap Lack of Urgency,” November 23, 1959, *Aviation Week* (microform).

Boushey identified a ray of light, however, and reporter Evert Clark described it. “*The first break in this pattern was the decision to leave the Dyna-Soar boost-glide vehicle with the military and some military observers hoped it meant the beginning of a better appreciation of the need for a military space program*” [italics added].⁴⁶² The ARS had urged the President in late 1957 to organize a civilian space agency but in the closing weeks of 1959 it also proved willing to invite the Air Force’s director of advanced technology to make the case for vastly greater military involvement in space.

Candidates dedicated major attentions to issues of defense, space, missiles, technology, and research as party primaries and then the general campaign proceeded in the close-fought campaign of 1960. Contemporaries expected the Dyna-Soar program and the course of aerospace development to be profoundly affected by the outcome of the election. Some specific weapons systems, like the B-70 manned bomber system, got strong overt attention during the campaign.⁴⁶³ Space, with an ostensible national component interwoven, received attention as well. Candidates, such as the Massachusetts senator John Kennedy who would ultimately prevail, used the space issue to insist that the United States must not fall behind in a crucial race.

Fears abounded of a US lag or gap and of the specter of the Soviet system’s superiority – because it did not require the unwieldy mechanism of open debate conveying confusion or indecision to the world, as US domestic debate did. Such were the fears. But this fit into a pattern of mistaken beliefs that various non-democratic systems possessed efficiency in bypassing the democratic process. Hitler’s regime in Germany received pre-war praise for being an efficient, centralized system – notions which have been profoundly refuted in retrospect. The China Consensus prompts envy in more recent times.

During the Cold War, some outsiders saw Russia’s secretive non-democratic governance and the hands-on approach of propaganda-hungry Nikita Khrushchev as more efficient than the US model. Strangely, such voices did not quite seem to understand that the assertion of Soviet efficiency, and

⁴⁶² Clark, Evert, “US Space Officials Rap Lack of Urgency,” November 23, 1959, *Aviation Week* (microform).

⁴⁶³ “Memorandum of Conference with President Eisenhower,” November 16, 1959, *FRUS 1958-1960 III*, doc. 78, pp333-339.

implicitly of Soviet superiority, manifested an anti-democratic assertion – a rejection of the Western tradition laid down by the likes of James Madison or John Stuart Mill that dissenting and conflicting voices can balance each other or potentially strengthen society. Furthermore, the fears were inaccurate, because the supposed consensus did not exist. *Aviation Week* noted the conflicting statements by Dryden's Soviet counterpart and the head of the Soviet aerospace medical program about whether there was a need for a man in space or a Soviet program to put one there.⁴⁶⁴ While readers could plausibly conclude in their own minds that such contradictions were products of Soviet disinformation, there was the potential that they reflected a lack of lock-step consensus and coordination in the supposedly ultra-efficient Soviet system.

Hotz disdained the way he saw Eisenhower acting hands-on, in contrast, declaring that “current space policy is actually made in the White House and Budget Bureau.” The editor was incensed at cuts that reduced the B-70 “development program to a bare skeleton,” considering it one of Eisenhower's worst decisions as president since the plane was “the spearhead of the research effort” toward cutting-edge aircraft. “The ultimate price of this economy may be our existence as a free and independent nation,” Hotz pontificated. *Aviation Week's* readers included dissenters, such as one man from Los Angeles who argued that “our star chasers” forget that a zooming bomber posed more obvious deterrence and propaganda value than “an abstract picture of the moon's far side.” He urged balance in defense spending, “lest we become so sophisticated that we succumb to a row boat invasion.”⁴⁶⁵

The President and his advisors foresaw the costs of a blank check. The Dyna-Soar was set to require astronomical funding well before it could explore the heavens or exploit the “high ground” of space. In fiscal year 1960, the program, referred to as the “Aerospace Test Vehicle (Dynasoar),” was set to spend \$35 million; this represented about 7.2% of the total military space budget and less than 3.3% of the

⁴⁶⁴ Scientist Andrei Blagonravov told the ARS there was no need for a man in space program, while aerospace medical czar Andrei Kuznetsov had announced in the summer of 1958 that the USSR had selected four astronauts for a manned space capsule program. “Soviets View Man-in-Space Need,” November 23, 1959, *Aviation Week* (microform).

⁴⁶⁵ Hotz, Robert, “Editorial: Military Space Problems,” November 30, 1959, *Aviation Week* (microform). Hotz, Robert, “Editorial: A Dangerous Decision,” December 7, 1959, *Aviation Week* (microform).

nation's total space budget. However, the projection anticipated massive increases in space programs' funding overall – *but particularly dramatic increases for the growing Dyna-Soar program*. By FY 1964, the military space budget was expected to increase by half, and the NASA's budget was expected to increase more than 150%. Even so, with total US space spending standing at an anticipated \$2.1 *billion* dollars, analysts expected the Dyna-Soar to absorb more than a quarter of DOD space moneys and a staggering 9.1% of the *total national space budget*.⁴⁶⁶ At the close of 1959, the Dyna-Soar was set to be the largest single item on the nation's space agenda.

Important factors help explain the Dyna-Soar's extraordinary projected growth. At the moment of the projection, December 22, 1959, Kennedy had not yet won the coming year's election. No national gambit, setting the nation on a lunar course with a self-imposed deadline, yet existed. The costs of Apollo – even the decision to move forward with Apollo – were not yet evident, and therefore could not appear in the projections and thereby dampen the Dyna-Soar's growth in proportion to the rest of the nation's space programs. Also, work on the Dyna-Soar remained, in 1959, in very early stages. The major program costs still lay ahead.

Mercury had begun as an unsolicited gleam in designers' eyes, adopted by policymakers when they concluded it had political use. Similar conditions existed for Apollo and for Dyna-Soar at their outset. They were concepts waiting in the wings, and while it might be tempting to infer parochial opportunism on the part of their advocates, an important factor should be kept in mind. In addition to acute minds and capable advisors, policymakers need options, and early research on various programs did offer a measure of latitude to policymakers. No leader could dynamically declare a project into being and oversee its instantaneous fulfillment. This was rocket science – but it is a dynamic that applies much farther.

Embryonic study allowed a speedier transition from the *decision* to put man into space to actually *putting* one there. And, if policymakers had so decided, it would have hastened the pace at which the country could have worked to put warfighters and nuclear weapons into space. Such early work made it

⁴⁶⁶ Phillips, Franklyn W, "Estimated Funding Requirements of Military Programs Using Space Sub-Systems," December 22, 1959. Fldr Space Council (11), Box 24, Staff Sec Alpha, DDEL.

possible for the government to be more responsive to public demands and for the military to be more responsive to potential directives by policymakers. This did not guarantee that the public demands or the policy directives would be wise or even logical, but it did help answer the need for a government responsive to its public and its representatives.

“Future military possibilities” of space remained on the Administration’s radar. The revised final draft of the US Policy on Outer Space identified such realms as including systems that the Administration certainly did not *want* to have to build: systems “to detect and destroy enemy missiles or space vehicles; *space to earth weapons systems to diversify further our strategic deterrent posture,*” countermeasures satellites, and lunar logistics bases [italics added]. Also eligible for consideration was development of an “international system designed to assure that outer space be used for peaceful* purposes only.” The asterisk led to a telling notation: “This does not necessarily exclude military applications.” Eisenhower’s advisers did not reject the use of space for military purposes (such as reconnaissance) which might stave off general war; toward that end, these advisors recognized a need to keep studies about the weapons-related potentials of space on a low, very back burner. Commenting on the revision process, Vice President Richard Nixon predicted “a great deal of discussion on Outer Space soon after Congress convenes.”⁴⁶⁷

Answering press questions about an overall transition from planes to missiles, Eisenhower recalled an old aphorism, “Be not the first by which the new is tried, nor the last to lay the old aside,” explaining that some aircraft research (presumably the reduced work on the B-70) complemented work to get “these missiles perfected to the point where we think that the deterrent itself needs nothing more.” *Aviation Week* recorded York’s contemporary declaration that, ““some people have lingering doubts’ about the capability and accuracy of missiles, but ‘I don’t have any doubts myself.’” For its part, the journal published a subsequent letter to the editor sarcastically castigating York’s implications. And some in Congress demanded to know whether “vital military projects [were] being transferred to NASA for

⁴⁶⁷ “US Policy on Outer Space,” December 16, 1959. Fldr Space Council (11), Box 24, Staff Sec Alpha, DDEL.; National Security Council, “US Policy on Outer Space,” December 17, 1959, #0347 declass. 1992 NSC, DDRS.

development because of defense budget restrictions,” and Air Force generals sought to reinvigorate interest in the B-70 by presenting it as capable of an increasing range of roles.⁴⁶⁸

“Extensive studies of the aircraft’s multi-mission capability [...] concluded that *the aircraft could serve as a: Recoverable first stage booster for satellites and Dyna-Soar-type boost glide vehicles*” [italics added] as well as a transport plane, an all-weather interceptor, a carrier for cruise missiles or air-launched ballistic missiles or parasite bomber planes, and that the “great size of the B-70 would allow it to be converted to nuclear power once the US develops this type of aircraft powerplant.”⁴⁶⁹ Indeed, Air Force documents in the coming months would corroborate this story about Air Force thinking on the varied possible uses of the B-70, including as a Dyna-Soar booster. Given the problems posed by the lack of powerful and dependable boosters, selling this vision was hoped to help bolster both the B-70 and the Dyna-Soar, which similarly acquired a vast array of projected operational uses.

Aviation Week greeted the 1960s as the “Decade of Decision,” as Hotz characterized the preceding decade as being “dominated by the steady growth of the Communist challenge” from Korea to Berlin and criticizing “the elderly conservatism of the current Administration.” Hotz cautioned against hopes of changed policies by Eisenhower, but he looked toward “fundamental revision” regarding defense issues. Zeroing in on space, he explained that, “while the space issue may not be the most important issue of the 1960s, how this country tackles it may well be symptomatic of how well it will handle the many other and perhaps more significant problems in the technical-economic-political trinity that is involved in our development of a successful formula to repel and dissolve the challenge of international communism.”⁴⁷⁰

⁴⁶⁸ “President’s Advanced Planning Views,” December 7, 1959, *Aviation Week* (microform). Eastman, Ford, “Congress Plans Space Program Probes,” December 14, 1959, *Aviation Week* (microform). Butz, JS, “Budget Cuts Force Stretchout of B-70,” December 7, 1959, *Aviation Week* (microform). O Pruszanowki wrote to *Aviation Week* to say the DDR&E “implies that [he] knows accurately the coordinates of all enemy targets, both fixed and mobile. This is heartening news, and we can all rest more easily.” Hawkins, Scott F, letter to the editor, December 28, 1959, *Aviation Week* (microform).

⁴⁶⁹ Butz, JS, “Budget Cuts Force Stretchout of B-70,” December 7, 1959, *Aviation Week* (microform).

⁴⁷⁰ Hotz, Robert, “Editorial: Beginning a New Decade,” January 4, 1960 Butz, JS, “Budget Cuts Force Stretchout of B-70,” December 7, 1959, *Aviation Week* (microform).

For Hotz's more enthusiastic readers, space would not only carry inherent importance in terms of technology, defense, prestige and propaganda, it would be emblematic of the era.

But it seemed at that moment cause for concern. *Aviation Week* reported on Mercury's unexpectedly rising costs. The NASA had underestimated the costs, and nearly twice as many Mercury capsules were now on order from McDonnell; the global tracking network added more costs, and launching operations and R&D costs were outgrowing estimates. To help allow progress in Mercury, money was reportedly being diverted from other R&D projects. Cutbacks prompted a "darken[ed] scene in Seattle," too, where journalists identified Boeing's major projects as the Bomarc missile, the KC-135 airtanker, the 707 airliner variant, Minuteman missile, and the "Dyna-Soar rocket orbital bomber," which journalist Dwight Schears identified in keeping with the Air Force vision of the project.⁴⁷¹

Ominously, reports indicated the Soviets proceeding steadily. The *New York Times* spotlighted a *Missiles and Rockets* story claiming that the Soviets had a semi-ballistic space bomber "in the advanced testing stage." Though not thought operational, it "could mean that they are seven to eight years ahead of the United States in developing a Dyna-Soar type manned boost-glide space vehicle." The *Washington Post*'s Edward Gamarekian noted concern among some in the US that Soviet Premier Khrushchev's recent references to "a new space weapon that was 'more incredible' and 'more formidable' than any developed so far" could be a veiled reference to "a manned orbital bomber of the type being developed in the United States in the Dyna-Soar program."⁴⁷² Advertisements and news stories showcasing the Dyna-Soar and its apparently inevitable capabilities gave the public a chance to see and recognize the Dyna-Soar. This encouraged ambitious but inaccurate assumptions about state-of-the-art technology. Another sinister byproduct could be seen in the recurrent suspicions that Soviet space technologies were signs of the Soviets' own Dyna-Soar bomber program.

⁴⁷¹ Clark, Evert, "Costs Crimp Nation's Top Space Project," December 28, 1959 Butz, JS, "Budget Cuts Force Stretchout of B-70," December 7, 1959, *Aviation Week* (microform). Schears, Dwight B, "Cutbacks Darken Scene in Seattle," p150, January 11, 1960, *New York Times*.

⁴⁷² "Russians Credited with Space Bomber," p3, January 9, 1960, *New York Times*. Gamarekian, Edward, "Reds Raise Specter of Space Arm," pA8, *Washington Post*.

Eisenhower maintained work on the vital CORONA program while continuing to fight a political rear guard against critics stirring popular disapproval. Kistiakowsky confided to the President that, although CORONA had not yet worked, “each successive launch has resulted in some progress, one difficulty after another being eliminated.” Perhaps complete success would meet a launch next month. Eisenhower began a mid-January meeting with his space officials “by saying he felt we are going to be impelled to put an additional \$100 million into Saturn, [...] the most important project before the Space Agency at the present time,” because “if we do not take the initiative on this, the funds will be pushed on him, and this is an area in which he does not wish to be on the defensive.”⁴⁷³

But he was on the defense. Hotz belittled the increased NASA budget, pointing out that much of its apparently increased funds had already been earmarked for space – thus the editor wrote that moving the Saturn project from the Army’s control to the NASA’s gave the mere illusion of a redoubled space program. General White told the Press Club that the reduction ordered for the B-70 was a budgetary decision which virtually canceled the program, whereas the *Post* quoted Eisenhower arguing that “the B-70, as an operational weapon, is going to take a long time to produce, and we certainly ought to be in a pretty strong position in many other ways before those years elapse.” Privately, Kistiakowsky concurred. “Putting it crudely,” he told the President, “it is not clear what the B-70 can do that ballistic missiles can’t – and cheaper and sooner at that.”⁴⁷⁴ The deterrent, he judged, was diverse enough without exploring exotic and uncertain deterrent projects.

The President’s own statement about the B-70, as an Air Force successor to the B-52, might resemble his attitude toward the Dyna-Soar, but with an important difference: the Dyna-Soar not only required a fortune in money and time, but it also threatened to upset the space for peace policy. *Aviation Week* informed its readers at this juncture that the Dyna-Soar faced a major review in Phase Alpha, ordered by

⁴⁷³ “Briefing Note,” January 14, 1960, *FRUS 1958-1960 III*, doc. 83, pp360-1. “Memorandum of Conference with the President,” January 14, 1960. Fldr National Aeronautics and Space Administration September 1958 – January 1961 (7), Box 18, Staff Sec Alpha, DDEL.

⁴⁷⁴ Hotz, Robert, “Editorial: Small Steps Taken Slowly,” January 25, 1960, *Aviation Week* (microform). “B-70 Rescue Operations,” January 18, 1960, *Aviation Week* (microform). Kistiakowsky to Eisenhower, “Problems of the B-70 Project,” February 12, 1960, *Aviation Week* (microform).

Assistant Secretary for Research and Development Charyk, and that North American Aviation had proposed a modified X-15 as a replacement for the Dyna-Soar.⁴⁷⁵ Philip Farley, Assistant to the Secretary of State, endorsed work to ban space weapons, sensing that two opportunities (the anti-nuclear Baruch Plan and the moment at the outset of ICBM development) had already been missed. A prohibition on space weapons would certainly preclude an operational Dyna-Soar, but it would *not* imply a ban on missiles, because Farley argued for a prohibition on vehicles making *sustained* travel in space. On the subject of arms control, *Aviation Week* insisted that any agreement which extended further than technology could confirm and verify was “patently ridiculous.”⁴⁷⁶ Again, although the journal’s editor did not know it, this pointed to the importance of preserving space for reconnaissance purposes.

Significantly, Eisenhower did not ignore space as his critics insisted. Hotz announced divisions within the Administration over the value of space, and General White called “the Soviet [...] increasingly pressing, diversified, sophisticated and ominous.” At this time, Eisenhower agreed with Kistiakowsky’s suggestion to “create a capability to incapacitate satellites.” Effort should be kept secret. Eisenhower said “we should simply state we are investigating outer space.” But since these inclinations, like the vital CORONA program, remained shrouded in secrecy, defense issues proved fertile ground for political opponents, who seized on opportunities identified by the press. The usual critics, such as Senators Symington and Johnson, were joined other powerful Democrats like House Speaker Sam Rayburn and House Armed Services committee chair Carl Vinson and by influential scientists like William Pickering, ARS president Howard S Seifert, and MIT professor H Guyford Stever.⁴⁷⁷ Hotz gleefully noted in March that five Republicans openly opposed Eisenhower’s defense position. These included former Gaither

⁴⁷⁵ “Dyna-Soar Design Under Review; New X-15 Proposed as Substitute,” January 18, 1960, *Aviation Week* (microform).

⁴⁷⁶ Special Asst to Sec of State Philip J Farley to Kistiakowsky, “Proposed Prohibition of Weapons in Space Vehicles,” Feb 2, 1960, # 1934 declass. 1983 DOS, DDRS. Hotz, Robert, “Editorial: Changing the Mixture,” April 4, 1960, *Aviation Week* (microform).

⁴⁷⁷ Hotz, Robert, “Editorial: The Space Debate,” February 1, 1960, *Aviation Week* (microform). “Soviet Bomber Threat,” February 1, 1960, *Aviation Week* (microform). Goodpaster, memo, February 8, 1960. Fldr Missiles January 1956-January 1960 (8), Box 18, Staff Sec Alpha, DDEL. Eastman, Ford, “Attacks Increase on US Defense Policy,” February 15, 1960, *Aviation Week* (microform). “Washington Roundup,” February 22, 1960, *Aviation Week* (microform). Eastman, Ford, “Space Lag Blamed on Conservative Effort,” February 29, 1960, *Aviation Week* (microform).

Committee director Robert C Sprague and former Defense Secretary Robert Lovett. Rumor held that Republicans loyal to Eisenhower were beseeching him to release classified materials which would buttress Administration policy in the public's eyes.⁴⁷⁸

As Secretary Gates revised the estimate of Soviet missile superiority and Hotz's journal declared missiles as ascendant weapons and political issues, Phase Alpha continued. Bell aircraft ran an advertisement with an illustration appearing to show an enlarged Dyna-Soar style vehicle flying as a passenger airliner. *Aviation Week* defined the program's "ultimate fate" as "unsettled." But while York had redirected it and Charyk had challenged it 1959, Kistiakowsky aimed in 1960 to kill the Dyna-Soar. The science advisor noted that the PSAC had deemed the Dyna-Soar "very costly" but without a known "potential military use," and that "orderly follow-ons of the Mercury and X-15 projects" would be cheaper and as beneficial. Kistiakowsky drew his conclusion still more starkly: "*We recommend that the Dyna-Soar project either be cancelled or limited to paper studies at this time*" [italics added]. He noted the extreme contrast between his recommendation and the Dyna-Soar's scheduled budget increase from \$25 million to \$58 million for fiscal year 1961 – and upward long thereafter.⁴⁷⁹

But the Dyna-Soar did not die.

Phase Alpha concluded and by April 1960, Boeing began moving ahead again on the program. Oddly, when Burton Crane of the *New York Times* mentioned a boost in Boeing stock prompted by the Dyna-Soar's emerging from Phase Alpha, the stories reflected part of the ongoing pattern of familiarity of the Dyna-Soar but hazier understanding of its job. The *Times* referred to a "Dyna-Soar missile" on April 23 but correctly identified the "Dynasoar space glider program" on April 28.⁴⁸⁰ The difference in spelling the program name may indicate editorial input, which may account also for the altering ostensible role of

⁴⁷⁸ Three others rounded out the list: IBM president Thomas Watson, General Dynamics vice president Thomas Lanphier, and former Gaither committee member James P Baxter III. Eastman, Ford, "Space Lag Blamed on Conservative Effort," February 29, 1960, *Aviation Week* (microform). "Washington Roundup," March 21, 1960, *Aviation Week* (microform).

⁴⁷⁹ Eastman, Ford, "Gates Downgrades Soviet Missile Lead," January 25, 1960, *Aviation Week* (microform). Hawkes, Russell, "Missile Grows as Weapon, Political Issue," March 7, 1960, *Aviation Week* (microform). Bell Aircraft advertisement, "Bell Studies Airframe Cooling Structures," March 28, 1960, *Aviation Week* (microform). Kistiakowsky to General Persons, memo, March, 12, 1960, #1155 declass. 2000 WH, DDRS.

⁴⁸⁰ Crane, Burton, "Stocks End Week in Retreat Again," p27, April 23, 1960, *New York Times*. Crane, Burton, "Market Set Back as Rally Expires," p49, April 28, 1960, *New York Times*.

the program. The end product was a pair of reports which would help reinforce public awareness that a Dyna-Soar program existed without really clarifying what the Dyna-Soar was meant to do. In fairness, the *Times* did get something right which Killian's deputy Robert Piland had tried to obscure in 1958: "the idea began six years ago when the Air Force and the aviation industry began studies of 'hypersonic' flight."⁴⁸¹ Despite Piland's generalizing the program as the exact manifestation of all boost-glide thought, the Dyna-Soar itself was the product more of mid-50s NACA-Air Force considerations than of mid-40s Nazi weapon gurus.

Aviation Week recognized the importance of surviving Phase Alpha. Contracts for major subsystems could not be awarded until completion because "it is impossible to begin the design of these systems until it is decided whether the vehicle will have a semi-ballistic, high-lift, high-drag shape or will have substantial wing area and resemble current high-speed aircraft." Subsequently, the journal, charitably, identified the twin purposes of Phase Alpha as being to examine a variety of reentry concepts and to determine methods of solving anticipated "structural, materials, heating, etc" technical challenges. "While there is no military requirement for a Dyna-Soar vehicle at the moment, USAF feels that this glider will meet the general military needs for a hypersonic vehicle as they are now conceived."⁴⁸²

Although spared Charyk's destruction, the program had been stalled, and the Dyna-Soar was not out of the woods yet. The Air Force planned a conference at Maxwell Air Force Base for mid-April "to develop a realistic budget evaluation of the complete spectrum of USAF weapon systems from the research and development phase to the end of operational life," and the conference would "decide what programs will form the hard core of the Air Force weapon structure over the next ten years." This conference was pushed back to May 18 to 20, which had the effect of allowing the Dyna-Soar to be included in the review post-Alpha. *Aviation Week* predicted that by about 1966, over \$600 million would

⁴⁸¹ "Work Will Start on New Space Ship," April 28, 1960, *New York Times*.

⁴⁸² "Washington Roundup," April 25, 1960, *Aviation Week* (microform). "Dyna-Soar Flight Test Schedule Detailed," May 9, 1960, *Aviation Week* (microform).

be invested in the Dyna-Soar's research and development and another \$300 in procurement if the program met success.⁴⁸³

An ominous blow was now dealt from a very unexpected corner – Vice Chief of Staff General Curtis LeMay. His conclusion must have been pained, and certainly was damning: “There must be a follow-on capability to the B-52 for finding and eliminating residual targets. However, *the Air Force cannot afford a package of B-70, ANP, Phase III Dyna Soar, and a Long Endurance Boundary Layer Control aircraft, all as follow-on systems to the B-52*” [italics added]. LeMay, who had been among the Dyna-Soar's advocates, explained his reasoning. “For the foreseeable future, a mixed force of missiles and manned aircraft is required.” But the best candidate as the B-52's successor would be the vehicle which could be developed in the near future and incorporate technological improvements in the foreseeable time beyond that. Whereas the ANP and the Dyna-Soar could have no operational capability through fiscal year 1967, the B-70 was expected to have a slight operational capability.⁴⁸⁴ Thus, quoting report:

1. The B-70 appears to be the only weapon system that offers the capability at the time required. Therefore, the B-70 should be reinstated on a Weapon System basis.
2. *At this time, manned orbital flight within a weapon system, as represented by Dyna Soar III, must be considered of lesser priority than the B-70 as a manned strategic weapon system.*
3. All efforts on a military nuclear powered aircraft should be directed toward a significant improvement of the B-70. This, therefore, means a concentrated, reoriented ANP development effort phased toward a weapon system at a date not later than 1970. [italics added]⁴⁸⁵

In a sense, Charyk's effort had succeeded in crippling the Dyna-Soar. The Air Force had spent years dreaming of an orbital aerospace bomber in the Dyna-Soar III. The sheer ambition of the concept invited a host of technological challenges, as well as daunting costs and potential conflicts with national policy. These problems had cumulatively led to delays in the program's progress, and Charyk's Phase Alpha had stalled the program for several further months. Those months, lost from the perspective of the

⁴⁸³ “Washington Roundup,” April 11, 1960, *Aviation Week* (microform). “Washington Roundup,” May 16, 1960, *Aviation Week* (microform). “Industry Observer,” May 2, 1960, *Aviation Week* (microform).

⁴⁸⁴ “Program Review Exercise 62-E,” n.d. (1960). Fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Maxwell AFB.

⁴⁸⁵ “Program Review Exercise 62-E,” n.d. (1960). Fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Maxwell AFB.

Dyna-Soar's advocates, would seem crucial. As a result, the Dyna-Soar of 1958 which had seemed futuristic but inevitable began in the eyes of its Air Force sponsors to seem less imminently promising by 1960. As LeMay's report indicates, this led to the Dyna-Soar being reprioritized behind a seemingly more practical project (ironic in retrospect), the B-70 Valkyrie. Reassessment was *not* repudiation, however. LeMay had not given up the dream of the Air Force coming one day to fulfill the Dyna-Soar's envisioned role.

The Dyna-Soar would need a powerful boost to get into space – not only from policymakers but from a large rocket as well. Air Force Secretary Douglas had commented to Eisenhower on the progress of the Saturn back in January, and in March the rocket came under the NASA's control. In April, Douglas wrote Eisenhower again, this time that the Saturn “has potential military application and the Department of Defense will continue to follow the project with considerable interest.” Just before Phase Alpha began, the NSC's executive secretary informed Eisenhower's assistant that the Air Force considered using the Saturn as a booster for the Dyna-Soar.⁴⁸⁶ With the Dyna-Soar emerging from Phase Alpha by late April, perhaps it could employ the big booster under development. Glennan “clear[ed] the air” in a meeting days later with the Space Science Panel; one of the items was “complete agreement” that there is a “lack of a payload for Saturn” and speculation that “the decision to go ahead with Saturn [was] a politically motivated decision in attempting to compete with the USSR.”⁴⁸⁷ If the Dyna-Soar was a vehicle lacking a sufficiently powerful booster, and the Saturn was a prestige rocket lacking a purpose, it seemed logical (to the Air Force) that the Saturn be given a purpose and the Dyna-Soar be given a booster.

Study continued on the powerful booster, Saturn. Its payload, although now iconic as the Apollo lunar capsule, was not yet set. Eisenhower had not committed the country to any lunar venture. In fact, Eisenhower first learned of the NASA's lunar intentions in May. But organizations' early work can provide details about what may be possible, so that policymakers can then decide from such options which contribute to preferable directions in policy. Upon learning of the NASA aspiration, the President

⁴⁸⁶ Memo from James Lay to Gordon Gray, “Dynasoar,” Nov 25, 1959. #2953, declassified 1998 WH, DDRS.

⁴⁸⁷ Notes, May 11, 1960. Fldr Space January-June 1959 (6), Box 15, Special Asst Sci & Tech, DDEL.

directed his science advisor to examine “the goals, the missions and the costs” which NASA hopes entailed. Dr Donald Hornig, a veteran of the Manhattan Project, was to direct a committee of six to discover answers for the President. They would report their findings to Eisenhower weeks after the fall election.⁴⁸⁸

A more immediately explosive story fell from the sky, when Soviet missiles vectored against an intruder succeeded in downing an intruding sailplane and (inadvertently) also a Soviet fighter vectored to the purpose. The offending pilot, Francis Gary Powers, had survived, and the enough of the broken plane had survived to feed Soviet suspicions. Twenty-four similar surveillance missions had been flown in the previous five years, rarely but deliberately; Soviet defenses had detected these flights but had not proven able to intercept during that time. Ironically, *Aviation Week* published pictures of a U-2 based in Japan just prior to Powers’ downing, noting its extreme high altitude in level flight as useful to “government agencies for high-altitude weather research, photo reconnaissance and radiation sampling,” but not explicitly suggesting that the reconnaissance involved violations of Soviet airspace. In the initial wake of Powers’ capture, *Aviation Week* accepted the official declarations that the pilot had been flying for the NASA and trouble with his oxygen system over eastern Turkey had caused him to lose consciousness and drift into Soviet airspace.⁴⁸⁹ This was not the case.

The journal, accustomed to Soviet lies and perceived US lethargy, was incensed to learn of US fabrications. Hotz condemned “the welter of official lies pouring from Moscow and Washington,” and he pointed to apparent contradictions in the Soviet account while declaring that “the need for a congressional or some other ‘watchdog’ operation over CIA was never more apparent.” The State Department had performed “a complete slow motion somersault” from initially denying ever attempting to violate Soviet

⁴⁸⁸ Editorial note, “The President’s Science Advisory Committee, “Report of the Ad Hoc Panel on Man-in-Space,” December 16, 1960, NASA Historical Reference Collection, History Office, NASA Headquarters, Washington DC. (accessed October 3, 2011) <http://www.hq.nasa.gov/office/pao/History/report60.html>

Hornig’s associates on the panel were nuclear scientist and PSAC member Dr Malcolm Hebb, PSAC consultant Lawrence Hyland, Dr Donald Ling, Bell Telephone director of military research Dr Brockway McMillan, and astronomer Dr Martin Schwarzschild. Douglas Lord served as technical assistant.

⁴⁸⁹ “Lockheed U-2 Research Aircraft Based in Japan,” May 2, 1960, *Aviation Week* (microform). “U-2 Missing; Soviets Say US Plane Down,” May 9, 1960, *Aviation Week* (microform).

airspace, to acknowledging flights but “that they ‘were not authorized by Washington,’ to a final complete admission that the U-2 penetrations were in fact an integral part of US national policy.” Articles mid-month added that the flights had been “conducted on a sporadic basis” and that Eisenhower had given his tacit approval. His prepared statement asserted that “no one wants another Pearl Harbor,” that Soviet secrecy made flights necessary, and that these operations were too sensitive to be conducted under military auspices: “We do not use our Army, Navy or Air Force for this purpose, first to avoid any possibility of the use of force in connection with these activities and, second, because our military forces, for obvious reasons, cannot be given latitude under broad directives but must be kept under strict control in every detail.” The fact that Eisenhower approved specific airspace violations under strictly civilian auspices threw a shadow over the notion that he would have approved military reconnaissance from a space-going Dyna-Soar. At a point this was moot, given the Dyna-Soar’s early development and the President’s tenure drawing to an end. It could portend significantly to the program’s fate during the coming months, however. U-2 flights in the meantime would continue “despite Russian retaliation threats until an effective surveillance satellite system becomes operational and/or an arms inspection agreement is reached.”⁴⁹⁰

To Hotz, the solution seemed obvious: to intertwine civilian and military space projects and rapidly produce a surveillance satellite. In late May he wrote that the U-2 had reached “diplomatic obsolescence.” Satellites presented the future path:

Midas, with its infrared detection system, the Samos, with a capability for photographic and electromagnetic reconnaissance, and the Courier communications satellite together offer a solid technical hope for the creation of a military space system that will provide the best warning yet of a potential enemy’s aggressive operations.⁴⁹¹

The Administration’s “pontifications [...] that there was no foreseeable military value in space” was simply “technically naïve bilge.” The following week, Hotz condemned the administration’s separation

⁴⁹⁰ Hotz, Robert, “Editorial: Lockheed U-2 Over Sverdlovsk: A Study in Fabrication,” May 16, 1960, *Aviation Week* (microform). “U-2 Missions Approved by Eisenhower,” May 16, 1960, *Aviation Week* (microform).

⁴⁹¹ Hotz, Robert, “Editorial: Top Priority for Military Space Systems,” May 30, 1960, *Aviation Week* (microform).

of military from civilian applications because it meant “not recognizing the full military potential to be realized in the immediate future from space technology.”⁴⁹²

By midyear, the U-2’s handling and utility had become political issues, and Eisenhower sought to keep a tighter lid on space programs from repeating an ugly scene. The Soviet defense minister boasted on the power of his air defense system. Democrat Senator William Fulbright of Arkansas, chairing the Foreign Affairs Committee, criticized the use of the NASA as a “cover” for the flights as “a rather dangerous undertaking.” Afterward, *Aviation Week* quoted him again, “short of the madness of preventive war, I can think of nothing more dangerous than to resume overflights of the Soviet Union,” Fulbright said. “These overflights were useful while they lasted, but they have now obviously become [...] compromised.” Censored testimony did not make clear whether NASA officials understood their role as a cover, but Dryden said that 200 weather flights had been conducted using the U-2 at high altitude, and Gates asserted publicly that the U-2 had provided useful information on strategic planning. Eisenhower had approved statements dealing with the U-2 since a May 24 conversation with his assistant Gordon Gray about the ongoing public controversy.⁴⁹³

Secrets and control were not to be abandoned, however. The President demanded to know how SAMOS had “slip[ped] out of control.” His Chief of Staff, General Andrew Goodpaster explained that the transition from development to operational status had been the cause. McElroy as Defense Secretary had been more sympathetic to aerospace ideas than the President, and he “took the action of dispersing operational use of satellites to the Departments rather than keeping them under centralized direction.”

⁴⁹² Hotz, Robert, “Editorial: Top Priority for Military Space Systems,” May 30, 1960, *Aviation Week* (microform). Hotz, Robert, “Editorial: Military vs. Civil Space Requirements,” June 6, 1960 Hotz, Robert, “Editorial: Top Priority for Military Space Systems,” May 30, 1960, *Aviation Week* (microform).

⁴⁹³ “Soviets Boast of Impregnable Defenses,” June 6, 1960 Hotz, Robert, “Editorial: Top Priority for Military Space Systems,” May 30, 1960, *Aviation Week* (microform). Johnsen, Katherine, “President Blamed for Loss of U-2 Program,” July 4, 1960 Hotz, Robert, “Editorial: Top Priority for Military Space Systems,” May 30, 1960, *Aviation Week* (microform). Clark, Evert, “U-2 Data Aided US Military Planning,” June 6, 1960, *Aviation Week* (microform). Gray, “Memorandum of Conversation with the President, Tuesday May 24, 1960 at 8:40am,” May 25, 1960, *Aviation Week* (microform).

DDR&E York, Goodpaster told the President, could oversee and corral projects during their development stage but “*the sky is the limit so far as the operational use is concerned*” [italics added].⁴⁹⁴

The distinction between the ease with which potentially problematic projects could be controlled during the development stage and the way in which operational systems escaped many of these fetters suggests strongly that, even if the technology *had* provided for the rapid construction of the Dyna-Soar, Eisenhower would probably have moved to keep the knotty problem of space weaponization in check by constraining the glider in the development stage as long as possible. The President told Defense Secretary Gates that “SAMOS and related projects [...] should be brought before the National Security Council for careful consideration and review,” especially with respect to intelligence requirements and technical feasibility. The State Department suggested that summer that the SAMOS lacked direction and that “a major effort within the SAMOS program should be a recovery development program.” Given the efforts with CORONA, recovery indeed represented an important goal.⁴⁹⁵

Aviation Week focused its June 20 issue on the Strategic Air Command’s capabilities and technologies, and throughout the summer kept tabs on other issues including those connected to Dyna-Soar: plans to select Air Force space pilots (from the service’s Experimental Test Pilot School and among Mercury applicants), preliminary design contracts for Dyna-Soar, efforts to directly impact boost-glide technical development through use of study contracts, and work on the Hyper-Environmental Test System (HETS) 609A as a supporting system.⁴⁹⁶

The value of orbital bombardment, a manifestation of the Dyna-Soar’s original concept, faced debate among planners, however. Termed “nuclear-armed bombardment satellites” or NABS, adherents argued that the extreme speed of orbital travel reduced its vulnerability to interception; yet interception was

⁴⁹⁴ Goodpaster, "Memorandum of Conference with the President, May 26, 1960," #2973 declass. 1999 WH, DDRS.

⁴⁹⁵ Eisenhower to Gates, memo, June 10, 1960, #1269 declass 1997 DOD, DDRS. "The Samos Program," July 29, 1960, #0308 declass 2000 DOS, DDRS.

⁴⁹⁶ Series of stories on the Strategic Air Command, June 20, 1960, *Aviation Week* (microform). "USAF Space Pilots," June 13, 1960, *Aviation Week* (microform). "Dyna-Sora Research," July 11, 1960, *Aviation Week* (microform). Butz, JS, "USAF Builds Capability for Hypersonic Development," July 25, 1960, *Aviation Week* (microform). Hawkes Russell, "Scout Variant to Have Dyna-Soar Role," July 1, 1960, *Aviation Week* (microform).

precisely what the Air Force's SAINT aimed to accomplish, an answer underway to a Soviet NABS which techno-zealots suspected Khrushchev possessed when he had claimed to have a "fantastic new weapon" six months earlier. Skeptics argued that deorbited NABS warheads would never be as accurate as earth-based ICBM warheads, that "a bombardment satellite could not be given a complete operational checkout while in orbit to assure that it would perform as planned," and that by about 1970 a sufficiently dependable anti-satellite (ASAT) weapon would make this more expensive, less reliable alternative to the ICBM as vulnerable as land-based missiles anyway.⁴⁹⁷ Techno-zealots could in turn argue that manned satellites could counter this by traveling in varying, unpredictable orbits to avoid interception. Simultaneous statements by an official at General Electric supported aerodynamic reentry vehicles as superior to alternatives because they "add less weight than rocket maneuvering systems if payloads are heavy or the amount of maneuvering required is large," as might be the case for evading interceptors.⁴⁹⁸ Phase Alpha's challenges had touched on the wisdom of designing a winged glider, and in the years to come the Dyna-Soar would continue to encounter queries as to the effectiveness and efficiency of a winged vehicle in relation to a capsule alternative.

The reports and the advertisements in the *New York Times* and *Washington Post* which mentioned the Dyna-Soar provided a generally clear barometer of the program's apparent outlook. In the second half of 1958, an uptick began in advertisements employing the Dyna-Soar in some capacity – at the time when Eisenhower felt compelled to use Project Score to assure the public anxious about various issues (economic, but also security and space) during the election season. Ad emphasis tapered off toward the summer of 1959, as York redirected the program into something much more technically oriented and much less sexy. Ads and reporting remained at a fairly low level for the next year. Then, the summer of 1960 saw Dyna-Soar reporting, but especially advertising, ramp up dramatically in these two major papers. Particularly in the *Times*, the Dyna-Soar became a relatively regular presence. Frequently it was

⁴⁹⁷ Klass, Philip J, "Value of Bombardment Satellites Debated," July 11, 1960, *Aviation Week* (microform).

⁴⁹⁸ "Control Systems for Maneuverable Space Vehicles Are Investigated," July 11, 1960, *Aviation Week* (microform).

mentioned in a seemingly marginal way, such as being an exotic *example* of a company's advertisement or jobs announcement. Such examples provide valuable evidence, however, that interested people were aware of the program: print space is valuable to newspapers and does not come free to advertisers, so every word must count. "Dyna-Soar" seemed to many companies, advertising in trade journals like *Aviation Week* or in national papers like the *New York Times*, to be a word worth its space. The peak that started in June 1960 dwarfed the comparative "bump" in reporting and advertising in late 1958 and early 1959. Months varied, but the spike generally carried on through the end of the scope of this study in December 1961.

In this atmosphere, Eisenhower considered his options regarding reconnaissance. He recalled that he had spoken with the late John Foster Dulles about the possibility of a U-2 being shot down. As a hypothetical, it had not seemed likely to cause a crisis, and indeed the Soviets had shown pragmatic discretion about overflights during the time they could see but not destroy intruders. But crisis had come with Powers' capture, and the President realized that a resumption of overflights could bring another shoot down, which he described as "a disaster." Such an event, he said, could not be handled as Woodrow Wilson had handled repeated submarine German attacks in the First World War, remaining neutral and sending stern diplomatic notes. An undeclared war between the US and the USSR could emerge, vaguely like the undeclared border fighting between the USSR and Japan in the 1930s.⁴⁹⁹ This, however, was the nuclear age, and there was no guarantee that even a "low-intensity" conflict could be kept small. Until reconnaissance satellites could function, the US had no alternatives between the risks borne by a U-2 flight and the alternative risks involved in making no flight at all.

News on August 18 that the Discoverer XIII reentry capsule, after its reentry from orbit, had successfully been recovered was certainly welcome. As the news arrived, Discoverer XIV was launched. This satellite orbited for twenty-six hours and was snagged by an Air Force C-119 as it parachuted

⁴⁹⁹ Norstad to Herter, memo, August 9, 1960, #1239 declass 2002 DOD, DDRS.

earthward after reentry.⁵⁰⁰ The public was free to learn about the Discoverer feat, but the government did not divulge the portents regarding CORONA and the solution to the nagging reconnaissance crisis.

The public was simultaneously treated to news of Soviet claims of recovering animals from orbit, of speculation that this was a prelude to a Soviet man in space, and reports that the Air Force planned to launch and recover a monkey. Stories also mentioned the Mercury capsule, the Dyna-Soar vehicle, and distinguished between the two by describing reentry techniques. ARDC Commander General Schriever said he doubted the Soviet claim to have recovered animals from space, and he insisted to reporters that “although the successful recovery of smaller animals would aid in the eventual man-in-space plans, there was ‘more valuable military application’ in the Dynasoar program than might be expected from the Mercury program.”⁵⁰¹

Meanwhile, presidential campaigns incorporated defense and space issues in bids to garner enthusiasm and support. The presidential contenders, Republican Vice President Richard Nixon and Democrat Senator John Kennedy of Massachusetts, initially left Hotz underwhelmed. He commented that “both Senator [Lyndon] Johnson [Democrat of Texas] and Henry Cabot Lodge [Republican, Ambassador to the United Nations] have had considerably more day-to-day practical experience with the realities of the Soviet threat and methods of combating it than their superiors on the party tickets.” Perhaps to assist Nixon, Eisenhower had seemed to have “left the door open for a bigger defense effort” when he addressed the Republican convention. Nixon soon called for strong defense efforts, telling the Veterans of Foreign Wars that higher taxes, though not necessary presently, would be an acceptable price for security. To boost his credentials as a candidate, Kennedy began accumulating defense advisors like Roswell Gilpatric from the nonprofit Aerospace Corporation and Paul Nitze, vice chair of the US Strategic Bombing Survey, Truman advisor, and author of NSC-68 which had laid the groundwork for containment policy.

⁵⁰⁰ Gates to Eisenhower, memo, August 18, 1960, #0195 declass 1983 DOD, DDRS. “Summary: June, July, August 1960: Discoverer Project (Research and Development Satellite),” October 24, 1960. Fldr Gates Thomas S Jr 1959-61 (2), Box 15, AWD, DDEL.

⁵⁰¹ Witkin, Richard, “Russian Expected as First Orbit; US Scientists Call Retrieval of Animals Major Stride Toward Human Trip,” p32, August 21, 1960, *New York Times*. Booda, Larry, “First Capsule Recovered From Satellite,” August 22, 1960, *Aviation Week* (microform). “US Plans to Put Monkey in Space,” August 27, 1960, *Aviation Week* (microform).

Symington, already at work examining defense management, agreed to help oversee another panel to review defense policy for Kennedy.⁵⁰²

Apollo remained an idea without a mandate, on an as yet less firm footing than the Dyna-Soar. Even so, the leap from the unflown one-man Mercury capsule to more ambitious projects like an Apollo or a Dyna-Soar seemed perhaps too far. Mercury designers had tinkered with a Mercury Phase II craft as a transition project, and by August 1960 *Aviation Week* noted that “progress of Mercury and the NASA-USAF Dyna-Soar program will determine whether a Mercury follow-on precedes the more ambitious Apollo.”⁵⁰³ Whenever technological comparisons appeared between the Mercury capsule and the Dyna-Soar glider, the former suffered in comparison. From the perspective available to the public, Mercury seemed a certainty and Dyna-Soar and Apollo definite possibilities, while the Mercury II stood to be made redundant by advancing technology.

Hotz offered a rare concession in September that “the US space technology program has progressed faster and on a broader front than anybody might have hoped in the gloomy months after Sputnik.” He managed to beat a more familiar drum as well: now is the “time to make a major re-evaluation of both our military and civil space programs aimed at taking bolder, longer steps into the future in areas where the technological foundation has been laid and at hastening the day when we can reap the rewards in operational space system from the sizable investments we are making in space technology.”⁵⁰⁴

Although delays had tarnished the Air Force hopes regarding Dyna-Soar, the aerospace vision overall still shone brightly. A memo for Chief of Staff General White listed the service’s required capabilities in mid-September. It stated that “the capabilities are not to be associated with individual systems,” likely

⁵⁰² Hotz, Robert, “Editorial: Defense is Now a Key Issue,” August 1, 1960, *Aviation Week* (microform). “Washington Roundup,” August 8, 1960, *Aviation Week* (microform). “Washington Roundup,” August 29, 1960, *Aviation Week* (microform). Eastman, Ford, “Democrats Study Defense Reorganization,” August 15, 1960, *Aviation Week* (microform). Former Ambassador to France David KE Bruce and Gaither committee member James Perkins would also help advise Kennedy. Gilpatric was to do double duty as a defense reviewer, accompanied by former Air Force Secretary Thomas Finletter, Truman’s special council Clark Clifford, and former counsel to the Secretary of Defense Marx Leva. Eastman Ford, “Kennedy Creates Defense Planning Group,” September 5, 1960, *Aviation Week* (microform). “Kennedy Names Defense Reviewers,” September 19, 1960, *Aviation Week* (microform).

⁵⁰³ Text box, August 15, 1960, *Aviation Week* (microform).

⁵⁰⁴ Hotz, Robert, “Editorial: Space Technology Comes of Age,” September 5, 1960, *Aviation Week* (microform).

explaining that a tarnished Dyna-Soar did not imply a damaged aerospace role. In keeping with the pattern of assigning dream vehicles like the Dyna-Soar (or the more conventional B-70) additional roles, the memo explained that “the trend is toward the merging of the offensive and defensive and the development of multi-mission space forces.”⁵⁰⁵ Six categories appeared. Paraphrased, they were:

1. Targeting
2. Surveillance
3. Surveillance, inspection and neutralization of space vehicles
4. Interception of enemy missiles *and space vehicles* during boost and mid-course phases
5. “Earth target strikes – An ability to strike surface targets from vehicles deployed into space for protection against surprise attack.”
6. Earth target strikes, “in anticipation of improved enemy warning and reaction time, an ability is required to shorten weapons flight time from launch to target by taking advantage of the shorter distance to target afforded by orbital overflight.”⁵⁰⁶

Another notion, more than ambitious, was for “space alternative command posts” because “earth based survival techniques and assured earth-to-space communications” were expected to become increasingly difficult during combat. Research and development objectives included lowering the cost of launching objects into orbit, developing defensive systems and of “weapons most suitable for space-to-space and space-to-surface applications,” support systems allowing manned space operations to be “routine,” and “the development of weapon system concepts” and related production capabilities.⁵⁰⁷ The Air Force certainly saw the aerospace realm as anything but dead. They knew a reason why.

The reason was Kennedy. Major Abbott C Greenleaf of the Long Range Objective Group reported to White favorably on the Senator’s “views on key defenses policy issue[s].” Greenleaf conceded that Kennedy “has not outlined explicitly the strategic concept he endorses,” or on reorganization of the Joint Chiefs, establishing unified strategic and tactical commands, “or any other internal change.” He instead repeatedly pointed to Symington’s committee conducting studies for him; nonetheless, Greenleaf was encouraged. “Senator Symington’s views and the public announcements outlining the proposals his

⁵⁰⁵ “USAF Space Required Operational Capabilities,” September 16, 1960. Fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Library of Congress.

⁵⁰⁶ “USAF Space Required Operational Capabilities,” September 16, 1960. Fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Library of Congress.

⁵⁰⁷ “USAF Space Required Operational Capabilities,” September 16, 1960. Fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Library of Congress.

committee is studying appear to be very close – if not identical in most respects – to the USAF position on DOD reorganization.”⁵⁰⁸

Greenleaf arranged a chart for the Chief of Staff, comparing Kennedy’s views with those of the Air Force. The Air Force and Kennedy had the “same view” on the Space Race: “that the US must surpass Russians.” Regarding the military’s role, Kennedy thinks “freedom of space must be assured, preferably by the UN. The US must have pre-eminence in security. Must have centralized direction and coordination of missile and space programs. Must accelerate Saturn Program.” The Air Force identified space as “a vital military area in which the Air Force has a major responsibility.” Significantly, the memo identifies the Saturn booster in connection with *military* use of space – as a booster for weighty vehicles (such as the Dyna-Soar). Kennedy had expressed support for the B-70, but cooler support than the Air Force itself had, and the Senator had not yet commented on issues like counter-force deterrence or “pre-emptive strategic strikes,” which the Air Force endorsed and thought “a necessary option,” respectively. The most salient point on which daylight separated the service from the senator was on limited war, since Kennedy thought the “US must be capable of containing limited war” and the “most likely form of military struggle,” whereas the Air Force “resists massive conventional war buildup” while “accept[ing] increased likelihood” of limited warfare.⁵⁰⁹ To the techno-zealots gazing skyward, Kennedy’s stated and implicit views seemed sympathetic and in keeping with the Air Force’s own position. A Kennedy presidency, it was thought in the fall of 1960, would allow the Air Force to proceed with extending national defense upward into aerospace through both defense and deterrent forces.

White addressed the Air Force Association in San Francisco in late September, warning against the assumption of indefinite stalemate “as a warranty of peace. A stalemate, he said, ‘is not a long-continuing probability.’” White, armed with memos outlining future space weapon requirements – and likely suspecting that his Soviet counterparts held similar memos and the power to proceed from that basis –

⁵⁰⁸ Greenleaf, Maj Abbott C to White, memo, n.d. (late 1960). Fldr 7-3 Congressional, Box 39, White Papers, Library of Congress.

⁵⁰⁹ Greenleaf, Maj Abbott C to White, memo, n.d. (late 1960). Fldr 7-3 Congressional, Box 39, White Papers, Library of Congress.

anticipated revolutions in military technology. His deputy for development, Lieutenant General Roscoe Wilson told a news conference at the same convention that the B-70 ““admirably meets our needs for high-performance strategic aircraft during this decade and beyond.”” Then “he unveiled a model of the Dyna-Soar, a manned boost-glide vehicle destined eventually for orbital flight.”⁵¹⁰

Dr George W Rathjens, the staff assistant to the Missile Panel, hoped to stop that “destiny,” if he could. The Missile Panel report on Dyna-Soar stated that hypersonic manned technology would ordinarily be a NASA responsibility, but that since the Dyna-Soar already resided under Air Force auspices, it should be left there. Despite the lack of sufficient boosters, hypersonic research should continue, perhaps with an unmanned, lighter, expedited version of the Dyna-Soar. The panel recommended, however, that the program be reoriented away from an operational capacity – an action which DDR&E York had tried to enforce the previous year.⁵¹¹ Rathjens wrote to Eisenhower’s science advisor Kistiakowsky two days after making the report, expressing the sharper opposition he held for the Dyna-Soar. He explained to Kistiakowsky that the panel’s report was “essentially a compromise between my own views and what I believe is the view of the Panel.” Although seeing “a good case [...] for a research program on the properties of materials under conditions that might be encountered by DINOSAUR [sic], [...] I see no reason for the present emphasis on manned flight nor for the Panel’s insistence that this be part of the present program.”⁵¹²

Four days after writing Kistiakowsky, Rathjens wrote to the Strategic Systems Panel. He now added that the Dyna-Soar’s “operational capability, politico-psychological advantages, and biomedical experience” could be discounted because the Mercury underway and the possible Apollo programs already fulfill these objectives. Manning space vehicles, he noted, slowed their development and dramatically increased their cost. Rathjens expressed concern that the Air Force might attempt to manipulate the Missile Panel’s views into sounding like an endorsement of the program. Having

⁵¹⁰ Davies, Lawrence E, “Air Chief Terms Space Lead Vital,” September 23, 1960, *Aviation Week* microform).

⁵¹¹ “Comments on Dynasoar,” September 17, 1960. Fldr Missiles July-September 1960 (6), Box 12, Special Asst Sci & Tech, DDEL.

⁵¹² Rathjens to Kistiakowsky, “Dinosaur,” September 19, 1960. Fldr Missiles July-September 1960 (6), Box 12, Special Asst Sci & Tech, DDEL.

compared notes with the President's science advisor, he also wrote that Kistiakowsky "*is concerned that it may develop into another gigantic program with emphasis on a poorly-defined or nonsensical strategic operation requirement, when we are already confronted with what might be an unreasonably large proliferation of strategic systems*" [italics added].⁵¹³

Throughout its existence, civilian critics accused the Dyna-Soar of being "poorly defined." This study, like Houchin's study of the program's engineering history, shows these accusations to be in fact baseless. The Air Force had a definite role conceived for the ultimate manifestation of the Dyna-Soar: an orbital space bomber, with potential to do other yeoman work as a space pioneer, logistical or reconnaissance vehicle. Potential missions were heaped on the Dyna-Soar in efforts to demonstrate its extreme utility. Its need, as the Air Force envisioned it, was as an orbital bomber. This point, despite civilian claims from York to Rathjens to Defense Secretary Robert McNamara in the years ahead, ought not be in doubt. A big problem was that technological challenges demanded both time and money; while time eroded the degree to which the program seemed inevitable, its passage did not bring a world in which policymakers accepted the need for weaponized control of aerospace. This study, in focusing on the policymaking, doctrinal, and the public's dominant cultural allegiance to the presumably boundless potential of technology, explores the pivotal intersection of these elements.

Indeed, in September Eisenhower and his advisors pondered the best way to word the President's idea that "all launchings of space craft should be verified in advance by the UN." The thorn was Samos, which the Joint Chiefs would likely insist ought to be protected from Soviet inspection. "After discussion, it was concluded that Samos activities apply to exploration of our own earth and therefore are not subject to verification and disapproval. This prohibition would apply only to weapons of mass destruction placed in space." With the press simultaneously reporting on the Air Force moving to expedite further work on Samos, the President's concern was well-justified.⁵¹⁴

⁵¹³ Rathjens to Strategic Systems Panel, memo, September 23, 1960, #1143 declass 1988 WH, DDRS.

⁵¹⁴ "Memorandum of Conference with President Eisenhower," September 19, 1960, *FRUS 1958-1960 III*, doc. 263, pp909-910. Booda, Larry, "New Capsule to Be Developed for Samos," September 19, 1960, *Aviation Week* (microform).

In the face of Eisenhower's surveillance need, civilian projects stood somewhat as appurtenances while various Air Force dreams presented outright obstacles. The PSAC emphasized the "essential" importance of the manned element of the Mercury program. "The original objective of Project Mercury was to enhance the prestige of the United States" through scientific demonstration and "the second, but no less important objective was to obtain initial information on the effects of the space environment on man and his behavior." The NASA also offered to launch privately built satellites, "stimulat[ing] [...] intense commercial interest in communications satellites."⁵¹⁵

Gray noted that "it seems impossible to 'get away' with the statement that the contents of the package of the SAMOS is classified in view of open testimony given earlier this year in Congressional hearings by Secretary Sharp, Under Secretary Charyk and General Ritland, all indicating that there would be photographic equipment in the SAMOS" and further published records about equipment, orbit, and image resolution. Keeping CORONA's secret meant less if a separate program appeared to be just what CORONA actually was. "The President decided that any public statements should be in as low key as possible but that it must be acknowledged that there was involved photographic and related equipment for research and development purposes." *Aviation Week* outlined still more ambitious plans for the Dyna-Soar, as Larry Booda reiterated that the "Air Force is pinning its hopes for development of a true space weapon system" on the Dyna-Soar and that "long-range thinking on the Dyna-Soar contemplates flight to the moon and re-entry into the earth's atmosphere."⁵¹⁶

Commenting on the subject of education, *Public Opinion Quarterly* observed that "Sputnik fever" had declined from initial its "endemic proportions," but that the public pressure on education was largely "unrelated to Sputnik fever." The country witnessed "the increasing demand that every child, whether

⁵¹⁵ Hartgering, James B to David Beckler, memo, September 26, 1960. Fldr Space July-December 1960 (9), Box 15, Special Asst Sci & Tech, DDEL. "NASA Will Launch Commercial Satellites," October 17, 1960, *Aviation Week* (microform).

⁵¹⁶ Gray, "Memorandum of Meeting with the President (Thursday, 6 October 1960 at 8:45am)," October 6, 1960. Fldr 1960 – Meetings with President – Volume 2 (4), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Series, DDEL. Booda, Larry, "Hardware, Training, Operation Plan Takes Shape in Dyna-Soar Project," September 26, 1960, *Aviation Week* (microform).

fully capable of it or not, shall go to college.” This was not quite in keeping with the message Eisenhower had attempted to relate to the country after the first satellite’s launch. Nor was it in keeping with the President’s ongoing ideas about the interconnection between scientific research and education with defense. The journal noted that “public opinion pressure frequently reveals a problem but rarely a solution.”⁵¹⁷ This sentiment certainly applied with respect to the broad issues of space programs and space policy. Enough of the public and been enough concerned by the novelty and inferred hostile potency of Soviet space successes to establish a political issue. In a representative system, these calls could not simply be bypassed and ignored. From the start, Eisenhower had sought to address these concerns with reminders that strategic situation had not altered – in military terms the US defense retained its strong deterrent posture. To many, this had never signified a sufficient answer.

The *New York Times* described the warm, even exuberant reception for Kennedy upstate, where “the enthusiasm and noise were greater than at any Democratic rallies since the days of Franklin D Roosevelt” and a woman broke through police lines to kiss the candidate on the cheek. The Senator criticized Nixon on a variety of issues, ranging from Cuba and Congo to layoffs in the steel industry and medical aid need for the elderly. *Aviation Week* focused on industry issues, noting Kennedy’s support for New York’s fight for more military contracts. “He said contracts should be equitably distributed across the nation, especially where costs are lower or where there is substantial unemployment.”⁵¹⁸ In contrast, *Aviation Week* was unimpressed by Administration efforts to bolster Nixon’s position. Hotz noted that, a month out from the election, “neither candidate [...] has seen fit to expound his proposed policy” on aerospace and national defense. “Now in the waning weeks of September and the early days of October this same Administration has been thawing out these frozen funds and quietly trickling them into the vary programs that the critics have been howling about since last January as requiring more funding and higher priority.

⁵¹⁷ PUBLIC OPINION PRESSURES ON EDUCATION TODAY: Philip Coombs. PUBLIC OPINION PRESSURES ON EDUCATION TODAY *Public Opin Q* (1960) 24(3): 470-473 doi:10.1093/poq/24.3.470

⁵¹⁸ Egan, Leo, “Upstate Crowds Cheer Kennedy,” September 29, 1960, *New York Times*. “Washington Roundup,” October 3, 1960, *Aviation Week* (microform).

[...] Polaris, Minuteman, Samos, Midas, B-70, MATS modernization, modernized Army equipment, anti-submarine warfare, Dyna-Soar, Skybolt and other key research areas.”⁵¹⁹

Nixon quickly presented specifics, including reevaluation of the aviation industry and possible elevation of the Federal Aviation Administration to cabinet status, government assistance in developing a supersonic transport, and emphasis on AICBM development, on manned combat aircraft, and on small war capability. Kennedy answered, again bracing his proposals on others’ reports. Hotz noted Kennedy’s stance that “crash programs should be accelerated on the ‘ultimate weapon’ – the Polaris and Minuteman – ‘which will eventually close the missile gap.’” Senator Fulbright announced surveys indicating European expectations that the USSR would surpass the US by 1970, and Kennedy accused the Eisenhower administration of working to keep these secret and avoid damage to Nixon’s campaign.⁵²⁰

In the final days, Nixon rejoined that US prestige had never been higher. Furthermore, the US had surpassed the Soviet Union in all aspects of the space race other than boosters, despite starting “‘some paces behind’ [...] because the Truman Administration discarded and ignored the implications of the long-range rocket.” Acknowledging that space efforts would entail expenses, the Vice President insisted that dollars would be well spent, that “‘America will be second to none in the long stride into space,’” and predicting that “‘we will launch in the period from 1966 to 1968, manned circumlunar flights. By the early 1970s we will launch manned space ships to land and return from the moon.’”⁵²¹

As voters moved to register their say on the nation’s future, *Public Opinion Quarterly* pondered impending reaction to upcoming military developments in space. Yale political scientist Gabriel Almond identified two uses in particular: reconnaissance satellites and bomb delivery satellites. Unbeknownst to Almond, satellite reconnaissance had already just been conducted. The article identified reconnaissance as “so near to reality, without unusual public response, as to suggest that we will move into the age of

⁵¹⁹ Hotz, Robert, “Editorial: Where Do They Stand?” October 10, 1960, *Aviation Week* (microform).

⁵²⁰ Hotz, Robert, “Editorial: Nixon Takes a Stand,” October 17, 1960, *Aviation Week* (microform). Hotz, Robert, “Kennedy on National Defense,” October 24, 1960, *Aviation Week* (microform). “Washington Roundup,” October 31, 1960, *Aviation Week* (microform).

⁵²¹ “Washington Roundup,” October 31, 1960, *Aviation Week* (microform). “Nixon Claims US Dominates Space Race,” October 31, 1960, *Aviation Week* (microform).

satellite reconnaissance without a notable opinion reaction.” Indeed, the low key element of reaction about reconnaissance satellites was hardly accidental; as has been shown, the Administration had been struggling to establish an environment in which such satellites could operate. Almond noted that “the development of satellite reconnaissance will be construed as being to the advantage of the United States,” and obviously the USSR would be especially prone to derailing reconnaissance publicly known to occur and disproportionately assist the West.⁵²² Unwelcome notoriety to US satellite surveillance work threatened to upset this situation. Eisenhower had shown concern that the Air Force’s efforts regarding SAMOS – and media conjectures about the project – similarly posed an inadvertent danger to the development and deployment of US satellite reconnaissance. With respect to the Dyna-Soar and aerospace doctrinal though, the weaponization of space certainly promised to shatter any hopes of a “space for peace” precedent being maintained.

And yet Almond considered precisely the question of the weaponization of space. More exactly, he considered the question of public reaction to what appeared to be a relatively certain ultimate development. “It is less easy to appraise the consequences of the complication of the deterrent picture by the development of bomb-carrying satellites,” he wrote mildly. Some had already suggested that either power’s stationing deliverable nuclear warheads in orbit could “represent a step which neither side could tolerate, or which might raise anxiety to panic levels and trigger military action.” In fact, the two issues of the surveillance satellite and the weaponized space system intertwined – in that deployment of the latter would preclude any implicit or explicit “space for peace” agreement. At a stroke, weaponization would establish an Air Force-style definition of aerospace as an operational continuum. CORONA would then have no more diplomatic safety than that possessed by the U-2 in the wake of Powers’ fatal flight - none at all. In a Cold War environment, opening the door a crack to a space arms race could easily lead to a door wide open. Eisenhower took this possibility seriously and would register horror at this thought.

⁵²² GABRIEL A. ALMOND. PUBLIC OPINION AND THE DEVELOPMENT OF SPACE TECHNOLOGY
Public Opin Q (1960) 24(4): 553-572 doi:10.1086/266972

The Dyna-Soar vision represented a particular danger to the legacy of peace, security, and solvency which Eisenhower had striven for eight years to establish.

Almond worked to take the long view of the situation, and he suggested that space weaponization might fit, albeit uncomfortably, into the larger Cold War context of ominous weapons deployment and extended, armed tension. “The question here is whether the development of a satellite-bombing capability would differ in any striking way from the development of other delivery systems such as the ICBM or the Polaris.” He explained that, “from a psychological point of view the constant passage through one's air space of a fleet of bomb-carrying satellites capable of being fired from an enemy country may have more of an anxiety-producing effect than knowledge of a launching capability from enemy land or submarine bases. Similar predictions were made of the development of hydrogen weapons and of the ICBM itself,” that some thing or other represented an ultimate weapon which would fundamentally alter the equation. The truly “ultimate” weapon had as yet not developed, although destructive yield and weapons’ reach had expanded by revolutionary proportions. “Hence it might be argued that the development of bomb-carrying satellites would be greeted at first with anxiety and attention, and then gradually would be assimilated into the monstrous family of threats and deterrents among which it is the fate of modern man to live.”

He conceded near the end of his essay that it is “impossible to judge these matters in advance,” but Almond appeared ready to carry at least a palpable hope and perhaps a real belief that space weaponization would present another onerous psychological burden (especially in the short run) but that it would not prove to be the fatal step catalyzing oblivion. The President did not relish the prospect of adding this further burden to the nation and its people. Significantly, Almond’s article left little room for the possibility that space might not become weaponized. In the environment of global armed tension, he seemed to expect that surveillance satellites “so near to reality” would enter operational status more or less imminently, and that more sophisticated space weapons systems would take longer in arriving but would eventually enter reality as well. Fatalism might be a coping mechanism people can use if they lack power over their circumstances. But what seems likely is not necessarily inevitable. Policymakers, by

definition, have a responsibility not to be simple inert passengers. Furthermore, citizens in a representative system of government have a complementary, though more diminutive, responsibility. Facing the last weeks of his presidency, Dwight Eisenhower conceded the finite span of his remaining authority. He also recognized the ongoing responsibility of citizenship. If it was too late to cancel or derail any ill-conceived projects, it was not too late to finish preparations on a message to remind and advise an anxious nation.

Secretary of Defense Gates added his perspective to the mix on October 25, addressing the Postmasters of America. Comparing satellite progress, he showed the lie to fears of Soviet space superiority. The US had sent 25 satellites to orbit, of which 13 remained in space and 7 continued to send radio signals. Soviet satellites had weighed considerably more, but their figures could not match up – 8 sent to orbit, 2 remaining there, none still operating.⁵²³

Gates assured his audience that the Administration was far from complacent, and that the present “period of scientific and military transition involv[es] profound change.” Gates continued on the topic of change. “*It takes courage to change, to cancel an expensive program that has been overtaken by events, to close an installation employing trusted competent people, or to abandon a proven military mission of the past in exchange for a better way. Sometimes it takes more courage to do this than to cross a new threshold. [...] Finally, there must be decision, and those who carry the burden of the responsibility must answer ‘yes’ or ‘no,’ supervised and guided by the great check-and-balance system implicit in the Constitution*” [italics added]. He described national defense as “the burden of everyone – every citizen, every member of the press, and every member of Congress.” He also reminded listeners that “defense [policy] is not made in isolation.”

We don’t sit down in all of our wisdom in the Pentagon and produce a program. Defense is part of national policy. Today the world is ever changing, and *policy has become very complicated. It is military; it is political; it is economic; and it is psychological. None of these elements can be*

⁵²³ “Excerpts of Remarks by Secretary of Defense Thomas S Gates to the Annual Convention of the US Postmasters of America in Miami, Florida, at about 10:30am, EST, 25 October 1960.” Fldr Gates Thomas S Jr 1959-61 (2), Box 15, AWD, DDEL.

*separated from the whole. There is no longer such a thing as a purely military decision except in combat. [italics added]*⁵²⁴

Gates urged composed vigilance. “The struggle with Communism will be long and costly,” he reminded the postmasters. “Our national strategy and policy gathers our resources for a prolonged test of endurance. We must run our defense on a balanced, sensible, and timely basis for the long pull.”⁵²⁵

Eisenhower was at work on a farewell speech addressing many similar points.

⁵²⁴ “Excerpts of Remarks by Secretary of Defense Thomas S Gates to the Annual Convention of the US Postmasters of America in Miami, Florida, at about 10:30am, EST, 25 October 1960.” Fldr Gates Thomas S Jr 1959-61 (2), Box 15, AWD, DDEL.

⁵²⁵ “Excerpts of Remarks by Secretary of Defense Thomas S Gates to the Annual Convention of the US Postmasters of America in Miami, Florida, at about 10:30am, EST, 25 October 1960.” Fldr Gates Thomas S Jr 1959-61 (2), Box 15, AWD, DDEL.

Chapter 8: "A THOUSAND DRAWING BOARDS":
EISENHOWER'S FINAL MESSAGES

The military services feel trapped by the lack of a definitive, approved space program. - *Aviation Week*, November 28, 1960⁵²⁶

General White expressed the view that the Dynasoar program was vital in order to keep the US in the technological race. The President said that his comments on Dynasoar had been based on his view of the national security rather than the technological race. - National Security Council meeting notes, December 8, 1960⁵²⁷

In the waning days of the Eisenhower administration, with the presidential election imminent, military claims to space seemed incorrigible. They would continue to appear to be so. LeMay had recommended the reprioritizing of the B-70 ahead of the Dyna-Soar some months earlier – technical challenges inherent to the glider's ambitious concept and the extensive reevaluation of the program the previous winter had contributed to delays, whereas the B-70 had seemed less impossibly ambitious within the foreseeable future. Furthermore, the B-70 appeared potentially capable of housing a nuclear jet engine, when that would be developed. Given public support for national defense and affinity for technology, this was assumed to be an eventuality rather than a contingency. Despite LeMay's pessimism in 1960 about the delays which the Dyna-Soar had thus far encountered, the aerospace vision would not simply die imminently and with a whimper, forgotten by its paladins. It was, after all, in their opinion, a vital realm of future national defense, ignored only at the peril of the country and the cause of freedom.

In fact, the Air Force was in the process of considering a vastly *more* ambitious project than the Dyna-Soar! *Aviation Week* reported on October 31, 1960, to describe Air Force plans for a "radical new space plane." Referred to as the Space Plane, it would weigh an extraordinary half a million pounds. It should be remembered that the Dyna-Soar was planned to weigh between two and four percent as much, and that one of the principle obstacles faced by the Dyna-Soar's advocates was the lack of a sufficiently powerful booster. The Space Plane could not possibly be lifted by a conventional rocket. An alternative

⁵²⁶ Edward H Kolcum, "Services Challenge NASA's Dominant Role," Nov 28, 1960, *Aviation Week* (microform).

⁵²⁷ "Memorandum of Discussion of the 469th National Security Council, *FRUS, 1958-1960, Volume III*, doc 129, pp 494-508.

method would allow it to require “no large rocket booster such as Mercury, Apollo and Dyna-Soar do.”⁵²⁸

The use of present tense is notable, since Mercury had launched two macaques in separate suborbital flights, whereas Apollo and Dyna-Soar existed only in paper drawings. Already, however, some aerospace thinkers had vaulted over booster-lifted space vehicles entirely.

Indeed, planners envisioned in the Space Plane a craft lifting like a conventional aircraft, using jet engines and collecting oxygen and gaining even more weight as it flew higher, to altitudes of 285,000 to 380,000 feet. The collected oxygen would then be used in combination with stored liquid hydrogen to produce chemical rocket fuel for space travel. *Aviation Week* predicted that the “Space Plane probably would be the last chemically powered spacecraft because it is believed that nonchemical systems in the nuclear and nuclear-electric fields will be sufficiently developed in the mid-1970s to power a follow-on craft.” Although advocates conceded that “the concept will be subject to many changes in the study phase and the research and development phases,” they insisted that “the system is based on studies already completed” and indicating its feasibility.⁵²⁹ The Dyna-Soar concept had defied civilian policy priorities, but despite added possible missions and critical program studies, its ultimate mission (an operational Dyna-Soar III bomber) had thus far remained survived and could be identified in some reports available to the public; in contrast, the purpose of the Space Plane was not altogether explicitly evident. The Dyna-Soar suffered tremendously from a host of technological problems. But it seemed not only practical but positively pedestrian when compared to the fantasy of the Space Plane. Aerospace visionaries were not fettered by reality.

Within the Administration, the NSC Planning Board briefed officials on the DOD’s space activities on November 3. “Gordon Gray was concerned with the impression given that prior to Sputnik I we were doing nothing in space, whereas immediately thereafter we have projects across the board.” The major DOD space programs, with the exception of the Dyna-Soar and Saint, were addressed. Douglas Lord, a technical assistant on the Ad Hoc Panel on Man-in-Space, told Kistiakowsky that the briefing did little to

⁵²⁸ Larry Booda, “USAF Plans Radical New Space Plane,” Oct 31, 1960, *Aviation Week* (microform).

⁵²⁹ Larry Booda, “USAF Plans Radical New Space Plane,” Oct 31, 1960, *Aviation Week* (microform).

explain “where there is duplication in the DOD and NASA programs or in which projects DOD is invading NASA territory.” However, “as the discussion went on the DOD representatives began to get into trouble. They repeatedly expressed concern that the responsibilities were not clearly defined between NASA and DOD and indicated their refusal to accept orders and stay out of the space exploration business. Their defense was that they must be doing conceptual thinking of new systems and this involves extensive study programs.” Lord explained that “our worry here is that these studies are getting out of hand and are monopolizing an inordinate amount of technical manpower.” Beckler wrote separately to the science advisor Rubel’s presentation of DOD space activities had “listed such clearly NASA responsibilities as Man-in-Space.”⁵³⁰

Aviation Week’s readers were treated to a distinctly contrasting perspective. Hotz declared in the November 7 issue that “it is now apparent that the original concept of NASA as handling the total US space effort was a rather shortsighted outlook, although understandably so in 1958.” He presumed that civilian control had been a mistake more than a deliberate (or defensible) policy decision. Hotz criticized the NASA’s “abrasive approach to its military and industrial cohorts” and recommended a restricted research-focused role in keeping with that practiced by the NACA. A week earlier, the journal had printed a discrete text box stating that “Marshal Mitrofan Nedelin, supreme commander of Soviet Russia’s rocket command and a deputy defend minister, was killed on duty Oct 24 in an air crash,” according to the Soviet Tass news agency. “No details were given.” In fact, even this Tass-fed detail was wrong: Nedelin had burnt to a crisp with over one hundred Soviet rocket personnel while during a horrific launch pad rocket disaster. A November 7 story cited potential for “a ‘revolutionary’ third-generation nuclear weapon” able to contain a nuclear war within more strictly military parameters. AEC Commissioner Thomas Murray predicted that international moral condemnation of such weapons would be less than of second generation (hydrogen) weapons as a result. Thus, “the third-generation weapon”

⁵³⁰ DR Lord to Kistiakowsky, “NSC Planning Board briefing on DOD Space Activities,” Nov 3, 1960. Fldr Space July-December 1960 (9), Box 15, Special Asst Sci & Tech Ser, DDEL. DZ Beckler to Kistiakowsky, “Comments on Lord’s memorandum re NSC Planning Board Briefing on DOD Space Activities,” Nov 4, 1960. Fldr Space July-December 1960 (9), Box 15, Special Asst Sci & Tech Ser, DDEL.

would become “a new symbol of strength and the massive weapons a symbol of weakness,” according to Murray. “The Soviet Union probably has actively developed nuclear technology along the lines of the new weapon,” *Aviation Week* speculated, contrasting this with the voluntary testing ban practiced by the United States.⁵³¹ Both the false explanation of the rocket commander’s death and the conjured expectation of advanced Soviet superweapon research indicate the selective nature of US press suspicions regarding Soviet deceit.

John Kennedy won the election held on November 8. His campaign had linked defense spending with economic recovery from the lingering effects of recession, and Kennedy had furthermore joined the voices interpreting space issues within the larger realm of defense concerns. In his hands would be the future of US policymaking, and thus its future in space for the coming years, and of the Air Force’s bid to harness aerospace. For the intervening ten weeks, Eisenhower would oversee a country without realistically being able to determine its upcoming policy. Despite the severely constrained authority involved, it was not a responsibility to be shirked.

Eisenhower’s meetings on Election Day reflected his efforts to prevent strange, expensive, and unnecessary new projects in space. That morning he met with his National Security Advisor Gordon Gray. At the close of their meeting, the President said he “felt that the only place we ought to be even in a clandestine way contesting with the Soviet Union is the development of the big engine. He repeated his often expressed view that little would be accomplished by putting a man into space.” Separately, he told advisors that, while programs offering real potential should be supported, “in the case of others, we should stay closer to basic research.” Budget Director Stans noted recent reporting on a “space plane” and asked to know specifically what relationship this had to the Dyna-Soar and why the project was in DOD rather than under NASA. John Rubel, York’s deputy, answered that the Space Plane had not received approval as a project or as a program. As such, it represented a vocalized Air Force wish rather

⁵³¹ Robert Hotz, “Editorial: Gathering Storm Over Space,” Nov 7, 1960, *Aviation Week* (microform); text box within Larry Booda, “USAF Plans Radical New Space Plane,” Oct 31, 1960, *Aviation Week* (microform); “Washington Roundup,” Nov 7, 1960, *Aviation Week* (microform).

than anything more concrete or officially sanctioned. Gray told the group that DDR&E York and NASA Administrator Glennan were on top of the task of keeping bogus projects corked, and Eisenhower “said that he was delighted with the mechanism that had been created.”⁵³²

Aviation Week continued to press for expanded military roles in space. Glennan’s impending departure meant that Kennedy’s selection of a new NASA administrator would “to a large degree” determine “the results of this NASA-Air Force battle” over control of US activity in space. In late November, the journal declared that “the present official attitude that there is no demonstrable military need for man in space” brought “confusion.” The Space Plane was identified as the most recent victim of this conflict. *Aviation Week* reported NASA moves to gain control over the Space Plane. Separately, Edward H Kolcum reported for the journal on expectations of major changes to be made by the Kennedy administration. “Defense has been unable to convince President Eisenhower on its space role,” Kolcum said with some understatement. Aerospace advocates believed that the military space role was “restricted primarily not by finances, but by a national philosophy which virtually excludes identification of military with space.” NASA meanwhile was reported to consider expanded military space roles as heralding reductions in its own efforts.⁵³³ These characterizations proved accurate, in light of Eisenhower administration deliberations and of the President's own earlier assertion to Glennan that NASA existed because of Sputnik.

The quest for economic vitality demanded sufficiency in place of extravagance, not only in space but with respect to more earth-bound defense items as well. In fact, notes from a December 5 meeting about possible adjustments to the proposed Fiscal Year 1962 budget display this transparently. Various potential cuts listed could bring a total of nearly \$2.5 billion in saved defense investment. Several projects stood to be reduced: Titan could be capped at 10 squadrons to yield a \$500 million saving; limiting Minuteman to 400 missiles until it was a proven system could save \$400 million more; confining

⁵³² “Memorandum of Meeting with the President (Thursday, November 8, 1960 at 9:15am),” Nov 8, 1960. Fldr 1960 – Meetings with President – Volume 2 (4), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL. "Discussion at the 466th Meeting of the National Security Council, Monday, November 7, 1960," November 8, 1960, #1031 declass 1999 NSC, DDRS.

⁵³³ “Sharp Defense, Space Challenges Expected,” Nov 14, 1960, *Aviation Week* (microform).

SAC airborne alert to its current level, reducing B-58 strength, and addressing overhead at arsenals could save further money. Moneys could be saved by retentions and substitutions: by keeping the Hound Dog standoff missile instead of introducing the Skybolt; by using the F4H jet instead of a new Short Take-Off and Landing plane; using long-range interceptors instead of the exotic F-108. Obviously, cancellations could save money too. Ending the B-70 was believed capable of saving \$400 million; eliminating one of the two ANP programs could save between \$20 and 50 million too. Canceling Atlas would yield nearly \$200 million.⁵³⁴

The most arresting comment in the list addressed the Dyna-Soar. The notes announced that ending the Dyna-Soar would save \$146 million dollars, a significant but by no means gargantuan sum when compared to the average contemporary annual defense budget of about \$40 billion.⁵³⁵ This document indicates Eisenhower's considering, in his last weeks as President, putting the boost-glider on the chopping block. But even more telling was the notation typed beside the program's name, "Eliminate – no military value." Other projects had been listed as eligible for cuts or elimination, but none were saddled with such damning criticism. In part, civilian space projects served as an instrument by which to help short-circuit popular insistence on support for the military's ambitious and weaponized space projects. The Dyna-Soar was a prime example of the Air Force's intention to weaponize space.

That did not mean that the civilian agency's actions necessarily aligned in full with the role which the President had envisioned it to serve, as the NASA did not always appear to be on the same page. Kolcum reported that NASA had identified Dyna-Soar as an aeronautical program "so that it can be funded without violating the national policy prohibiting manned military aerospace vehicles." Both NASA and the Air Force wanted a piloted orbital craft, but NASA was reported to feel unable to "support Dyna-Soar as a true space program until the Air Force gives the vehicle a mission and the mission gets the approval

⁵³⁴ "Possible Further Adjustments – FY 1962 Budget," Dec 5 1960. Fldr Gates, Thomas S Jr 1959-61 (2), Box 15, AWD, DDEL.

⁵³⁵ The meeting notes did not clarify how the totals had been calculated, but this was the figure requested by the Air Force for Fiscal Year 1962.

of the Air Force, Defense Department and White House,” and, in keeping with York’s strictures, DOD had approved only a suborbital research craft.⁵³⁶

Obviously, White House approval would not come before Eisenhower’s departure. Presumably, it might occur with Kennedy’s accession. Kolcum noted that, the Air Force “conceivably could try to skip the suborbital vehicle [...] and go directly to an orbital craft.” Kolcum expected that such a maneuver would encounter objections from NASA. Presumably, he expected NASA’s disquiet to be connected with the civilian agency’s contention that its Saturn was “the only booster capable of orbiting a Dyna-Soar weapon system.” A contemporary memo suggests a different concern, originating from Air Force thinkers. Although vehicles and boosters required “a high degree of reliability,” NASA’s projects “are still research tools, or extensions of research programs, upon which the DOD and the US depend.” National defense, and therefore the DOD, could not afford time that would be wasted “if the NASA does not push and strain the state-of-the-art with its research programs.”⁵³⁷

Press reporting sometimes obscured Air Force visions, and aerospace advocates pondered the extent and borders of the term and the realm it had been developed to describe, now also referred to as “military space.” On November 21, *Aviation Week* argued that “when [the] Air Force adopted the term ‘aerospace’ shortly after Sputnik I was launched, the implication was that it included everything from the ground up. With missiles going into underground silos and seaborne launching platforms under active Air Force consideration, a still more inclusive term may be needed.” Deputy Chief of Staff for Development Lieutenant General Roscoe Wilson pointed to this issue of *Aviation Week* reporting that Air Force defined the military space realm as extending ten earth diameters skyward. Wilson considered this definition “misleading and [...] not in accord with over-all Air Force policy,” but on December 5 *Aviation Week*

⁵³⁶ Edward H Kolcum, “Services Challenge NASA’s Dominant Role,” Nov 28, 1960, *Aviation Week* (microform).

⁵³⁷ Edward H Kolcum, “Services Challenge NASA’s Dominant Role,” Nov 28, 1960, *Aviation Week* (microform); memo, technical asst to director of Launch Vehicle Programs col USAF Daniel D McKee to Mr Hyatt, “Pursuing the Space Program,” Nov 25, 1960, Fldr 11130: DOD in Space, NASA HQ Archives.

again referred to the ten earth diameters figure. For its part, the *New York Times* in its business financial reporting again incorrectly referred to “the Dynasoar *missile*” [italics added].⁵³⁸

Journalists did accurately identify the Air Force’s “publicity offensive.” John W Finney of the *Times* noted the Air Force’s enthusiastic appraisals of Kennedy and pointed to a recent information policy letter which “said that President-elect John F Kennedy had indicated a realization that military supremacy in space as [sic] essential to our security as military supremacy at altitudes near earth. As evidence, the letter quoted Senator Kennedy: ‘Control of space will be decided in the next decade. If the Soviets control space, they can control the earth.’” Kennedy’s own statement was little more than an echoed rehash of the assertions which others, prominently his running mate Lyndon Johnson, had been saying since Sputnik about the “high ground” offered by space. Finney recognized that the Air Force had prepared its publicity campaign for some time and that “in some ways the Air Force offensive is a direct challenge to the law of 1958” which had empowered the new civilian space agency. *Aviation Week* expected this campaign to yield success: “an expanded military space program is almost certain to result from the combination of legislative and executive department changes expected during the early days of the Kennedy Administration.”⁵³⁹

Key technology questions awaited decision by the impending administration. In the intervening weeks, Eisenhower refused to reverse the policies he had formulated and held in place over the past years.

The NSC meeting on December 8 included a heated debate between President Eisenhower and Chief of Staff White about the Dyna-Soar program. In the course of discussing defense projects, Eisenhower had inquired about the final objective of the Dyna-Soar. Crucially, DDR&E York rather than an Air

⁵³⁸ “Washington Roundup,” Nov 21, 1960, *Aviation Week* (microform); letter from D/CS Devt Lt Gen Roscoe C Wilson to CS Gen White, “Briefing of Industry on Definition of Military Space,” Dec 1, 1960, Fldr 4-5 Missiles/Space/Nuclear, Box 36, White Papers, Library of Congress. Larry Booda, “Air Force Outlines Broad Space Plans,” Dec 5, 1960, *Aviation Week* (microform). Burton Crane, “MARKET DECLINES; AVERAGE OFF 0.16; Stocks Reverse Early Climb to Close at Day’s Lows -- Volume Shows Rise 524 DROPS, 494 GAINS Most Major Groups Down -- Many Issues Said to Rebound From Tax Sales MARKET DECLINES; AVERAGE OFF 0.16,” Dec 15, 1960, *New York Times*, Business Financial, p69.

⁵³⁹ John W Finney, “Air Force Seeks Top Role in Space; Drafts Publicity Offensive Keyed to the Change in Administrations,” Dec 11, 1960, *New York Times*, p68. “Washington Roundup,” Dec 5, 1960, *Aviation Week* (microform).

Force representative, offered the reply; York described it as a military man in space program and a follow-on to the X-15 and the Mercury. The President would soon vocalize his lack of commitment to Mercury, so investment in a purported successor project would seem like a complete waste. Eisenhower said that “Dynasoar would be a desirable project to play around with if unlimited fund were available.”⁵⁴⁰ But Eisenhower was a budget-conscious chief executive and in 1960 the effects of recession lingered. York, whose opinions Eisenhower trusted, said that Dyna-Soar had less promise than did Samos, which was less promising than Midas.

When White insisted that the Dyna-Soar was a crucial program, Eisenhower flatly disagreed and replied that “insufficient discrimination had been used in establishing priorities” for research. White tried to present the Dyna-Soar as one of several important “building blocks” for future national defense, but the President answered that monetary health, national defense, and economic strength were interrelated issues. Military safety was vital, but in a Cold War framework the President doubted that an “absolute assurance” could be guaranteed, and the “principle objective must [therefore] be to convince the Soviets that they cannot attack us with impunity.”⁵⁴¹ It was strikingly similar to the outlook which Eisenhower had sought to explain to the nation in the immediate aftermath of the initial Soviet space successes. In real measure, this parallel demonstrated the degree to which the President had not lost sight of the priorities of the long pull. But the fact that he felt compelled, three years afterward, to remind his chief air officer of these principles indicated that the service had not agreed with this reasoning. And the coming inauguration of John Kennedy suggested that the public had dismissed it as well.

Aviation Week commented on December 19 that the “Space Plane has become a controversy before it has become a project,” and it reported Killian’s cautioning “against excessive stress on [the] man-in-space program.” Reiterating his position consistent with earlier speeches from years past, he supported space exploration and contented that “we must never be content to be second best, but I do not believe that this

⁵⁴⁰ “Memorandum of Discussion of the 469th National Security Council, *FRUS, 1958-1960, Volume III*, doc 129, pp 494-508.

⁵⁴¹ “Memorandum of Discussion of the 469th National Security Council, *FRUS, 1958-1960, Volume III*, doc 129, pp 494-508.

requires us to engage in a prestige race with the Soviets.” As Eisenhower’s advisors had told the President two years earlier, Killian reminded the public: “we should pursue our own objectives in space science and exploration and not let the Soviets choose them for us by our copying what they do.” He noted that Soviet accomplishments had focused on “spectacular accomplishments in space technology as an index of national strength, and too often the press and the public at large” bought the image that the Soviets sold. But Eisenhower’s imminent departure meant a corresponding downgrade in his own influence; prior to the Democratic National Convention, Kennedy had chosen MIT electrical engineering professor Jerome Wiesner to replace him as head of the PSAC. By year’s end, reports noted Wiesner’s criticism that the Scientific Advisory Committee had been too controlling of defense science projects.⁵⁴²

The B-70’s role continued to figure in Air Force thought, and that, too, encountered some contention. The B-70 enjoyed strong supporters, but even within the top echelons of the Air Force, its support was not unanimous. A memo to White in mid-December repeated that its primary goals were “to conduct initial strikes with high yield weapons against priority military targets of both known and uncertain locations, while concurrently observing and reporting the progress of the aerospace battle” and “to provide a residual capacity which can seek out and destroy any remaining enemy capability and convince the enemy that further resistance is futile.”⁵⁴³ Eisenhower, it will be remembered, had earlier scoffed at White’s justification in a meeting with the Air Force boss when White had described the B-70’s role. Air Force General Lawrence Kuter, commanding the North American Air Defense Command (NORAD), would carry responsibility for defeating a Soviet strike on the US, and he argued in the wake of the 1960 studies of projected future needs and capabilities that “in order to pay for the F-108” Mach 3 interceptor

⁵⁴² “Washington Roundup,” Dec 19, 1960, *Aviation Week* (microform). “Killian Cautions Against Excessive Stress on Man-in-Space Program,” Dec 19, 1960, *Aviation Week* (microform). “Washington Roundup,” Dec 26, 1960, *Aviation Week* (microform).

⁵⁴³ Memo to CS General White, “Concept for the B-70 Weapon System,” Dec 19, 1960, fldr 5-1 Air Force Council (Folder #2) Jul-Dec 1960 correspondence, Box 36, White Papers, Library of Congress.

project, that “the B-70 be deleted from the program.” Budgeting prompted some thought about thinking in terms of *either* the exotic fighter *or* the exotic bomber.⁵⁴⁴

Hanson Baldwin had indirectly provided another reason for such talk when he wrote that manned bombers would in future be stand-off launching platforms of nuclear-armed missiles. This implied that bombers no longer needed capability to penetrate hostile airspace. As such, Stuart Symington, once Truman’s Air Force Secretary and now a powerful Democrat Senator from Missouri, had commented that the F-108 interceptor was unnecessary, since a B-70 might be rigged to do interceptor work with anti-aircraft missiles. Between April and December 1960, Symington and White exchanged several letters in the course of 1960 on this topic. From the start, White explained that “we do not now envision that the requirement for a manned system to penetrate enemy defenses will be eliminated,” and he contended that manned systems with stand-off weapons capability “would provide a much greater degree of ‘invulnerable deterrent’ than does the [nuclear missile-armed] submarine” because there is more sky than there is sea. White was empathic that, “although the B-70 has many unprecedented capabilities, [...] it cannot do the ‘same job’ as the F-108.” Overseeing air defense, Kuter agreed that the two planes were not interchangeable, and the longtime bomber advocate of World War II vintage insisted this time that the fighter was more important. Kuter also said that “defense leads to space, and in space the offense and the defense merge.” Yet contemporary emphasis heavily favored offensive air power over its defensive counterpart. He noted concern that possibly “the Air Force would be left with no space mission.”⁵⁴⁵ The supposed missions of the Dyna-Soar moved somewhat in parallel to these arguments, as the concept collected numerous roles including interception to stand beside the primary objective of an operational bomber.

⁵⁴⁴ Memo to CS General White, “Commanders’ Reaction to Exercise 62-E,” 1960 (n.d.), fldr 5 Conferences/Boards/Exercises, Box 36, White Papers, Library of Congress.

⁵⁴⁵ Letters between Senator Stuard Symington and CS General White: White to Symington, April 19, 1960; Symington to White, May 6, 1960; White to Symington, Dec 20, 1960, fldr 7-3 Congressional, Box 39, White Papers, Library of Congress. Memo to CS General White, “Commanders’ Reaction to Exercise 62-E,” 1960 (n.d.), fldr 5 Conferences/Boards/Exercises, Box 36, White Papers, Library of Congress.

In fact, the Administration was disinclined to drive deeper into the manned space field, regardless of whether the pilot wore a uniform or the vehicle carried a weapon. In late December, Eisenhower and his advisors reached increasing consensus, as shown by notes from NSC meetings of December 20 and 21. The President approved findings that “there appeared at this time to be no psychological or scientific reason for carrying on the ‘Man in Space’ program beyond the completion of Project MERCURY, and that ways might be sought publicly to disclose this administration's views on this subject.” Not only was the State Department’s accession to this position asserted, but so was that of the National Science Foundation, the NASA, and the Joint Chiefs of Staff.⁵⁴⁶ The promotion of Apollo, or of a Mercury II, or certainly of a Dyna-Soar, contradicted the outlook of President Eisenhower and his administration. President-elect Kennedy’s tone had indicated far more strident support for such projects across the board, and while Eisenhower did not intend to set last-minute formal policies which would simply be undone and create confusion, Eisenhower meant to leave a lasting mark as Chief Executive by delivering a potent message to his countrymen from the bully pulpit.

As important as first impressions are, conclusions carry potential weight as well; as early as May 1959, Dwight Eisenhower was thinking about his own concluding remarks as president eighteen months in advance. He told his speechwriter Malcolm Moos that he hoped “that the Congress might invite him to make a 10 minute farewell address to the Congress and the American people.” Moos deemed his boss’s idea “brilliant [...] if it can be carried off with a minimum of fanfare and emotionalism.” Work began by collecting ideas from which to hone successive drafts as the term’s end approached. Special Assistant Frederic Fox advised eleven months later that Moos closely examine George Washington’s own Farewell Address, noting “its relevance to our day” by commenting specifically on “Constitutional obedience; the warnings about sectionalism; the dangers of ‘overgrown military establishments’ but the necessity of maintaining ‘a respectable defensive posture,’” the dangers and temptations of using and bestowing

⁵⁴⁶ “Draft Record of Actions, 470th NSC Meeting,” Dec 20, 1960, fldr 1960 – Meetings with President – Volume 2 (1), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL. “Draft Record of Actions, 471st NSC Meeting,” Dec 22, 1960, fldr 1960 – Meetings with President – Volume 2 (1), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL.

power, and “the ungenerous habit of one generation to spend beyond its means and to throw ‘upon posterity the burden which we ourselves ought to bear.’” Fox suggested that Washington’s Farewell Address might “perhaps serve as a guide for [Eisenhower’s] final statement in January 1961.”⁵⁴⁷ Recently discovered sources include a succession of Farewell Address drafts. These shed light on the process by which Eisenhower and his writers crafted his most famous speech, and indeed one of the most famous presidential speeches in US history.

From the start, Eisenhower intently aimed to warn the public about the “military-industrial complex.” His writers dutifully built this into the core of the message. It cited the legacy since the Founders “to make sure that no military group arose to challenge the civil authority, and that no segment be allowed to develop which was permanently and exclusively concerned with building the weapons of war.” Formation of “a large and permanent military establishment” was a regrettable and potentially dangerous necessity – imposed by the tense state of world affairs and the possibility of a future war.⁵⁴⁸ The speech initially described the challenge in somewhat different terms than he used in the speech’s final form:

We shall need all the organizing genius we possess to mesh the huge machinery of our defenses with our peace-oriented economy so that liberty and security are both well served. It requires constant vigilance, and a jealous precaution against any move which would weaken the control of civil authority over the military establishment. We must be especially careful to avoid measures which would enable any segment of this vast military-industrial complex to sharpen the focus on its own power at the expense of the sound balance which now prevails. The potential for disastrous abuse of power in this area is great. Let us watch it carefully.⁵⁴⁹

This original draft, titled simply “Commencement,” spanned a scant three pages, but an attached memo informed Moos that this was a “start” and explained the “plan to go from here to the Scientific Revolution and the twin dangers of government dominating scientific research through purse power, and of the generalists becoming captives of the technical specialists.” This outline stood strikingly in keeping with the spirit of the speech’s final form.

But the “last point” indicated a powerful inclination toward addressing foreign affairs, identifying “the new concept of equality among nations, which only came into existence in the Eisenhower half-

⁵⁴⁷ Memo for record, May 20, 1959. Fldr Farewell Address (1) Box 16, Moos Papers, DDEL. Fox, Frederic, to Malcolm Moos, April 5, 1960. Fldr Farewell Address (1) Box 16, Moos Papers, DDEL.

⁵⁴⁸ “Commencement,” n.d., fldr Farewell Address (2), Box 16, Moos Papers, DDEL.

⁵⁴⁹ “Commencement,” n.d., fldr Farewell Address (2), Box 16, Moos Papers, DDEL.

century” and exploring “its implications for world order and our support of nations holding these ideals.”⁵⁵⁰ As drafting proceeded during Eisenhower’s final weeks in office, the international strain in the Farewell Address would ultimately evaporate, as the State of the Union also scheduled for January 1961 provided opportunities to comment on foreign policy. The record shows, in all, fifteen preserved drafts of this final address. Alterations in phrasing of the military-industrial complex and scientific elements of the speech honed rather than upset Eisenhower’s original message. But the numerous drafts contained more than simply insignificant cosmetic variations. For his advice and his warnings to be properly heard and received, the message had to be concise and clear; phrases which promised to sound unreflective, cantankerous, or overly suspicious had to be cut or altered. Edits strongly indicate care having been taken to show Eisenhower’s concluding remarks as the reasoned conclusions of a circumspect mind.

On December 16, “technological transformation” joined the military-industrial complex as “closely akin to the sweeping changes in our concept of military readiness.” The draft identified the “highly formalized, complex, and costly” nature of scientific work, and the increasing Federal role in its direction. The result, identified from the first draft (but eventually to be cut), was that “formula has replaced empiricism.”⁵⁵¹ Concurrent with this,

the major impetus to research now comes not from private individuals in pursuit of knowledge for its own sake, but from public agencies in pursuit of specific, predetermined results. For every blackboard there are now a thousand drawing boards. [...] research is the pathfinder of progress. Where it leads, all else must follow. Yet we must also be alert to the opposite danger that public policy may itself become the captive of technological opinions and pressures.⁵⁵²

On the international stage was “yet another change – perhaps the most momentous of all – giving shape to the patterns of tomorrow.” This was the expanding independence of peoples throughout what was coming to be known as the Third World: postcolonial regions no longer under direct control of European powers but not yet aligned either with the Western First World or the Soviet-style Second World. “The most important thing about this great emancipation movement is that for the first time in the history of the world, the concept of equality among nations has come to be recognized as an operating

⁵⁵⁰ Memo to “Mac,” unsigned, undated, attached to “Commencement” draft, fldr Farewell Address (2), Box 16, Moose Papers, DDE.

⁵⁵¹ Farewell Address draft, Dec 16, 1960, fldr Farewell Address (3), Box 16, Moos Papers, DDEL.

⁵⁵² Farewell Address draft, Dec 16, 1960, fldr Farewell Address (3), Box 16, Moos Papers, DDEL.

principle of international politics. The acceptance of this principle is as yet partial and imperfect, but it is there, even among cynical totalitarians” with the maintenance of the United Nations. International law “is the surest and best approach to the goal of world peace; for without justice there can be no peace, and without equality there can be no justice.” The hope for the future lay in “mutual trust and respect. The conference table may be marked by a sense of frustration and disappointment with the past, yet scarred though it may be, we must not forsake it for the certain terrors of nuclear war.” The draft’s end emphasized internationalism and hope but it did not purport to stand as an ending. “I say to you at this time – not goodbye – but onward and forward into the bright light of peace with justice. So striving, we shall build a world where not one nation under God, but all nations under God can live in peace and freedom amidst a society in which the scourge of war, poverty, and disease have been banished from the earth.”⁵⁵³

In view of the Farewell Address’s final form, several salient features stand out in the December 16 draft. First, with respect to technology, the more remembered phrases did not yet appear. Instead of a tangible “technological elite,” less tangible “technological opinions and pressures” threatened to captivate the nation. Other pending changes introduced some distance between ideas and their starkest expressions. The rise of a technological momentum or entity identified on December 16 as “closely akin to the sweeping changes in our concept of midair readiness - and indeed, responsible for much of” the development of a military-industrial complex would be toned down to eventually read “akin to, and largely responsible for the sweeping changes in our industrial-military posture [...]” Strikingly, “the certain terrors of nuclear war” would finally stand as “the certain agony of the battlefield.” On one hand, “battlefield” could be taken as a synonym for “nuclear war,” particularly if applying a strict policy of massive retaliation and hypothesizing its failure. Vocal advocates of a flexible range of responses might not have presumed the two terms to be necessarily synonymous. This alteration softened the rhetorical punch of evoking images of nuclear destruction; it should be remembered that many listeners could

⁵⁵³ Farewell Address draft, Dec 16, 1960, fldr Farewell Address (3), Box 16, Moos Papers, DDEL.

envision a (nonnuclear) battlefield, as World War II and the Korean War had been relatively recent experiences in many American lives.

Certainly, however, the most dramatic change was the eventual elimination of the passage lauding the United Nations as a forum to encourage international equality and law. Its removal indisputably redirected the focus and trajectory of the address at large. By dropping the international section, as would eventually be done, the speech's appeal to disarmament and negotiation hangs toward the end of the speech with far less linking it to contemporary forces. Disarmament and negotiation also became, somewhat peculiarly and impossibly, more domestic or unilateral in the absence of further reference to disarming counterparts or negotiating partners. Since Washington's speech had provided a sort of standard, and since the memo to Moos prior to the December 16 draft identified the liberation of postcolonial peoples as a significant element on par with the military-industrial complex and changes in the technological processes, its removal ought to seem surprising and probably significant. Indeed, the removal of one of the speech's three principle themes serves to draw even more particular emphasis to the other two themes. The record indicates Eisenhower's intense interest in emphasizing his concerns about the first two issues and their interconnection. The international passage would be sacrificed toward that end.

Eisenhower and his writers worked extensively on the Farewell Address in the coming weeks, developing several drafts during the next two weeks. In the process, "government and citizen alike" were cautioned against "the impulse to live off of today for tomorrow – to plunder the precious resources of our children and grandchildren." Conjoining his thinking on security as sufficient defense and economic strength, the December 19 draft argued that democracies cannot survive if they become "the insolvent phantoms of tomorrow" or "the forgotten upholders of freedom yesterday." Prosperity existed not to distract its citizens nor to lull them to complacency. The Father of the Interstate Highway system considered telling his countrymen that "the role of government is not that of a giant turnpike, well stocked with comforts, but rather a role that maximizes liberty and opportunity – the twin goals of all free

societies.”⁵⁵⁴ Strength was a tool, because “our moral, material, & military strength should give us confidence as we go to the conference table.”⁵⁵⁵ The President’s trusted brother Milton contributed his input in the last days of the year, and at this point the “technological opinions and pressures” became the ultimately delivered “technological elite.” Revisions – almost to the point of elimination – trimmed the ungainly paragraph intended to statistically reinforce the assertion about the technological revolution. References to the speech’s *three* main points were also slated for deletion, as was the “not goodbye – but onward” tone in the proposed ending.⁵⁵⁶

As this first round of revisions continued to shape the Farewell Address, Eisenhower reiterated his earlier thinking about space exploitation in a discussion with advisor Gordon Gray. On the morning of December 29, while the two men discussed the NSC’s recent decisions, Gray “told the President that [he] was having difficulty with the paragraph relating to the man in space program[,] as it might involve projects beyond the completion of MERCURY which had been discussed in the NSC meeting of December 20.” Gray noted that, within the OCB and among department heads, voices had called for further consideration of future space projects. Eisenhower suggested language which Gray noted “would be objected to by the Department of Defense because it would probably rule out further development of DINOSAUR [sic].”⁵⁵⁷ Thus far, this memo strongly implied that the Dyna-Soar was an annoying impediment from the President’s vantage point.

Then the President indicated that he was perhaps more aware – and more specifically critical – of the Dyna-Soar program than he had been during his previous encounters with the program. “The President said that he questioned whether we should proceed with DINOSAUR [sic] in any event but agreed with

⁵⁵⁴ Farewell Address draft, Dec 19, 1960, third draft, fldr Farewell Address (6), Box 16, Moos Papers, DDEL.

⁵⁵⁵ Farewell Address draft, Dec 29, 1960, second draft, fldr Farewell Address (8), Box 16, Moos Papers, DDEL.

⁵⁵⁶ Farewell Address draft, Dec 30, 1960, first draft, fldr Farewell Address (9), Box 16, Moos Papers, DDEL

⁵⁵⁷ Gordon Gray, “Memorandum of Meeting with the President (Thursday, 29 December 1960 at 8:50am),” Dec 31, 1960, fldr 1960 – Meetings with President – Volume 2 (2), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL.

my point that this was not the vehicle to use for stopping that program if indeed he wanted to.”⁵⁵⁸ Given his support for the establishment and use of reconnaissance satellites, his opposition to factors which promised to hamper the reconnaissance role, and the Administration's aversion to plowing ever deeper into space with manned vehicles, one can readily and confidently conclude that the President would indeed have preferred to eliminate the Dyna-Soar. Any doubts of this could be further dispelled by the December 5 notes describing the Dyna-Soar as useless. But this did not mean that all civilian arms of the government took the same uniformly dim view of the glider.

Keith Glennan submitted a report to the President which confirmed an earlier press claim about NASA involvement in the Dyna-Soar. Edward Kolcum's article in *Aviation Week* the previous month had indicated that NASA supported the Dyna-Soar by considering it as an aeronautical program rather than a military space vehicle. Glennan's December 28, 1960, report to Eisenhower on the “accomplishments of the National Aeronautics and Space Administration” proudly identified the speed and altitude records set by the X-15 thus far and noted that this had been accomplished with an interim engine to be replaced by a more powerful X-15 power plant. A separate section titled “Manned Space Flight” reported on Mercury but not on considerations about Apollo within NASA or Dyna-Soar or Saint in DOD.⁵⁵⁹ None of these latter vehicles had yet flown and not even Mercury had yet launched a human into space. The X-15 thus represented the only actual accomplishments in manned aerospace flight, so the trajectory of this project spoke powerfully to the potential future of space flight.

NASA's intentions regarding its far more proven rocket plane were explicit and sounded in keeping with the character with the agency's old advisory predecessor. “As was the case with earlier experimental airplanes, the basic purpose for which the X-15 was built is the extension of our knowledge of the conditions to be encountered in the control of an aircraft in flight at increasingly high speeds and

⁵⁵⁸ Gordon Gray, “Memorandum of Meeting with the President (Thursday, 29 December 1960 at 8:50am),” Dec 31, 1960, fldr 1960 – Meetings with President – Volume 2 (2), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL.

⁵⁵⁹ Edward H Kolcum, “Services Challenge NASA's Dominant Role,” Nov 28, 1960, *Aviation Week* (microform). Keith Glennan, “Accomplishments of the National Aeronautics and Space Administration, 1958-1960,” Dec 28, 1960, fldr Glennan Dr Keith – NASA, Box 15, AWD, DDEL.

altitudes. Much higher speeds and altitudes are in prospect during the coming months. Research in aerodynamics ranged widely from vertical take-off and landing aircraft to Dynasoar, a joint project with the Department of Defense for a man-maneuverable vehicle to explore hypersonic flight up to orbital speeds.”⁵⁶⁰ Glennan’s NASA report to Eisenhower did not dwell on the military, weaponized features which the Air Force envisioned for the Dyna-Soar III. Perhaps this should not be surprising, however. Before the transformation of the agency and the addition of space responsibilities, the NACA had provided technical research assistance on questions about flight. This assistance had greatly benefited the Air Force in its previous decades, and the service had valued that help in pushing the technological envelope. A similar pattern in smoothing the rocky technical road on yet another Air Force aspiration might not have seemed altogether alien to people who had done similar work in years past. NASA saw the Dyna-Soar for the technological issues which pertained to the agency, and Air Force leaders saw the Dyna-Soar for its Phase III objective and its successors beyond that. The transition from tortured research vehicle to operational system would be greatly assisted by a green light coming from the Chief Executive’s office in Washington.

Eisenhower did not intend to provide such encouragement. But, in the middle of drafting his last speeches, he recognized the imminent diminution in his role. The Air Force had tapped into culturally valued ideas about the excitement, revolutionary nature, and potency of the modern bomber, and the service’s leaders saw the Dyna-Soar as a bright star within a constellation of future high-tech defense marvels. The Air Force, in promoting the Dyna-Soar, had simultaneously to inspire excitement while framing the vehicle as too practical to be dismissed as a Flash Gordon-style science fiction fantasy. These ambitions clearly ran contrary to Eisenhower’s goals and values, and the President had fought to contain these efforts. With his tenure about to ebb, Eisenhower too would need to appeal to the nation and convince it of his vision, in terms consistent with their values.

⁵⁶⁰ Keith Glennan, “Accomplishments of the National Aeronautics and Space Administration, 1958-1960,” Dec 28, 1960, fldr Glennan Dr Keith – NASA, Box 15, AWD, DDEL.

The State of the Union address, encompassing a broad range of the nation's challenges, and opportunities, and general situation, as well as the President's own exhortations and proposals provided the outgoing president with one other forum. This time, of course, with Eisenhower's tenure coming to a close, there would be "not proposals, but a review of the record." Nearly each of the speech's envisioned fourteen sections would conclude with a "statement of principles."⁵⁶¹ Efforts to complete the 1961 State of the Union message displaced the redrafting of the Farewell Address, which seemed to have been essentially laid aside for a week.

The December 31 State of the Union draft included several points aimed at addressing skeptics on defense, foreign policy, and space science. It directed attention to a variety of nuclear weapons. The tactical nuclear weapon called Davy Crockett was the first atomic system identified by name, and the Atlas ICBM, and the Air Force's Thor and the Navy's Jupiter IRBMs were named too, while aircraft-borne weapons received a more general reference. "More and better ICBMs are on the horizon," the draft promised. Writers planned to introduce the section focusing on education by explaining that "the Federal government spent well over \$1 billion in 1960 to assist American education." The draft boasted too of a 700% increase in spending toward "the exploration of space for peaceful purposes" since 1958. "Our goal always has been to add to the strength of our great nation."⁵⁶² Taken cumulatively, these points relating to the contexts surrounding the Dyna-Soar place emphasis on investments made and under way. The identification of current nuclear systems underlined the notion that national security had nonetheless been secured as much as possible in the contemporary period.

The Dyna-Soar, though not a topic within the State of the Union, was nonetheless affected by the policies which the speech summarized. The January 3 draft identified four major US international

⁵⁶¹ The sections were: the Introduction; Foreign Policy; National Defense; Commerce (later renamed The Economy); Government Finance and Administration; Agriculture; National Resources; Education, Science, and Technology; Civil Rights; Health and Welfare; Housing and Urban Development; Immigration; Veterans; and the Conclusion. Drafting envisioned a statement of "spiritual goals" in the introduction, a "prayer for the future" in the conclusion, and a "statement of principles" closing each of the sections, although the outline does not suggest this planned for the Health and Welfare section.

⁵⁶² State of the Union draft #1, Dec 31, 1960, fldr 1961 State of the Union Message Draft #1, Box 18, Moos Papers, DDEL.

initiatives: “enforceable programs of arms reduction, inspection against surprise attack, peaceful use of outer space, and suspension of nuclear testing.” These initiatives intertwined: inspection helped make arms reduction possible, and the peaceful (defined as nonweaponized) use of space would play an increasing role in inspection. The Dyna-Soar, as a manifestation of the Air Force’s aerospace doctrine, would certainly have threatened these first three initiatives; developing practical space-to-earth weapons could conceivably jeopardize the fourth as well. The program stood counter to Eisenhower’s priorities as president.

The theme of contemporary strength, tempered by reminders to avoid the pitfall of waste, was reinforced by revisions on January 3. One memorable sentence would survive to the final version: “Every dollar uselessly spent on military mechanisms decreases our total strength and, therefore, our security.” It echoed a theme covering the span of Eisenhower’s presidency and famously evident in his “cross of iron” speech just three months into his tenure. “The nation can ill-afford to reverse a national policy which so adequately provides for a constant, steady level of effort for the long pull” since the cold war challenge promised to be an ongoing one. Implicitly, Americans were entreated to confidence, informed that US policy was working. “Cracks were opened in the Iron Curtain through a comprehensive agreement” with the Soviets “for cultural, technological and educational exchange.” Separately, “despite the absence of permanent agreement, West Berlin has remained free.”⁵⁶³ Abrupt changes in this balanced approach to national security would be not only unnecessary but unwise.

Some elements of the draft seemed more at home in the pending Farewell Address, and were destined for further revision. “The major reorganization” of the Defense Department, “which I have long championed, allows responsible planners to pursue steady and sound programs, rather than be forced to follow the false voice of current fad.” Immediately on the heels of this sentence came another: “In this manner, programs of value are carried out and fictions like ‘bomber gap’ and missile gap’ have been exploded.” The assertive characterization of the past cries of a bomber gap and the present fears of a

⁵⁶³ State of the Union draft #1A, Dec 31, 1960, fldr 1961 State of the Union Message Draft #1A, Box 18, Moos Papers, DDEL.

missile gap being “fictions” was overshadowed only by the imagery of their being “exploded” as falsehoods. The emphatic tone reflected the weeks of concentrated thought which the Administration had been focusing on these issues while crafting the Farewell Address. The eventual replacement of these sentences with considerably more reserved imagery indicates Eisenhower’s efforts to frame his cautions and advice in a serious manner so that they would be taken seriously.⁵⁶⁴

Though certainly not the only item on the President’s mind, the Dyna-Soar did recurrently claim his attention in the final weeks as he considered the country’s future path and his own legacy as a head of state. And the problem of the Dyna-Soar lurked not only deliberation of the State of the Union message for January 12 and the Farewell Address for January 17, but for the Fiscal 1962 Budget message in between, set for January 16. On the afternoon of January 3, Gray spoke with Eisenhower again on the subject of future manned space flight. Gray, in fact, apologized for this topic’s repeatedly returning to demand the highest attention, competing with all the other subjects ever in need of Presidential consideration.

The manned space issue had been discussed in December by the NSC, which had moved toward closing the door on manned programs extending beyond Mercury. But language in the upcoming budget speech touched on this too. Gray showed the President an excerpt from the contemporary draft:

In the program for manned space flight the reliability of the complex booster, capsule, escape and life support components of the Mercury system is now being tested to assure a safe manned ballistic flight into space, and hopefully a manned orbital flight, in calendar year 1961. Pending further testing and experimentation, there appears to be no valid scientific or security reason at this time for extending manned space flight beyond the Mercury program.⁵⁶⁵

Gray told Eisenhower “that in any event the word ‘space’ should be inserted and that the phrase ‘or security’ probably impinged upon Defense programs such as DINOSAUR [sic] and the Space Plane.”⁵⁶⁶

In fact, such language would certainly impinge on programs along the lines of the Dyna-Soar or the Space

⁵⁶⁴ State of the Union draft #1A, Dec 31, 1960, fldr 1961 State of the Union Message Draft #1A, Box 18, Moos Papers, DDEL.

⁵⁶⁵ Attachment to memo by Gordon Gray, Jan 4, 1961, fldr 1960 – Meetings with President – Volume 2 (1), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL.

⁵⁶⁶ Gray, “Memorandum of Conversation with the President (Tuesday, January 3, 1961 at 2:35pm),” Jan 4, 1961, fldr 1960 – Meetings with President – Volume 2 (1), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL.

Plane. The phrase “or security” would represent a public announcement of the conclusion in the December 5 budgeting paper: that the Dyna-Soar was of no military value. The two also apparently deliberated the wisdom of dredging space issues again. Gray informed the President that the Defense Department, the State Department, NASA director Glennan and PSAC chairman Kistiakowsky advised against language appearing in the budget message which “might raise issues rather than put them to rest.” Eisenhower “agreed that ‘security’ should be stricken and found the remainder of the language satisfactory.”⁵⁶⁷ Eisenhower would indeed assert in his budget for Fiscal Year 1962 that no self-evident scientific reason existed to reach past Mercury, but on the question of security rationales, he would maintain a silence. The consequences of his other speeches were to imply an answer to that question.

The theme of sufficiency overall gathered steam during the several rounds of revision on January 5 and 6. An exception to this rule was the planned reference to a need for “constant progress” (changed to “consistent progress”) on civil defense preparations. The rules outnumbered the exceptions. The draft already identified the Davy Crockett tactical weapon and several ballistic missiles; drafters considered but opted against including reference to a future “Mobile Minuteman,” whose prospective strategic utility would be debated for many years to come. Challenges in foreign affairs began receiving increasing amounts of drafters’ attention during these days: instability in Berlin, problems in Laos, in Latin America, and in Africa bore mentioning. Although Cuba deserved it too, Fidel Castro’s revolution had still not been mentioned in any draft of the 1961 State of the Union. Language held contemporary policy as balanced and sufficient. A January 5 revision dialed down rhetoric but retained the message: “The ‘bomber gap’ of several years ago was always a fiction, and the ‘missile gap’ is shortly to become one.” Later in the day, this was revised again, to “the ‘bomber gap’ of several years ago was always a fiction,

⁵⁶⁷ Gray, “Memorandum of Conversation with the President (Tuesday, January 3, 1961 at 2:35pm),” Jan 4, 1961, fldr 1960 – Meetings with President – Volume 2 (1), Box 5, Presidential Subseries, Special Asst National Security Affairs Special Asst Ser, DDEL.

and the ‘missile gap’ has become one.”⁵⁶⁸ “Exploded” was an obviously inflammatory term and was cut, but the gaps remained “fiction.” Eisenhower and his writers continued to adjust this important sentence, in particular the time frame. At first on December 31, the missile gap *had been* disproven, then on January 5 it *will be* corrected, then later the same day it *had been* corrected once again. While insisting the imbalance to stand in the past, this most recent (third) rendition conceded something important which the first version had not – that a gap had indeed once existed. This concession would be erased before the speech’s delivery on January 12.

The Administration wrestled too with the best way to present initiatives in space science. “Americans can look forward to a remarkable future in space exploration” took credit for the nation’s real but often underestimated achievements. This sentence was sharpened on January 5 with the word “dazzling” to describe the achievements. The writers returned again on the 8th, considering whether to describe “dazzling achievements,” “new dazzling achievements,” or “dazzling new achievements.”⁵⁶⁹ Such semantic adjustments might be uncharitably dismissed as trivial, but communication depends on effectively conveying concepts and meanings, and words are the tools by which this is often accomplished.

The Farewell Address meanwhile incorporated one flourish which matched its audacity with its impossibility. The President was intended to explain that government-directed research teams seeking specific outcomes were displacing lone inventors focused on scientific knowledge. At first, the draft asserted that “for every blackboard there are now a thousand drawing boards.” It was a highly improbable claim, but as a rhetorical tool it served its function. Over time, it became “thousands of drawing boards.” Now, on about January 6, the phrase reached its ultimate form: “for every blackboard there are now hundreds of electronic computers.” This statistic made its point, but it was patently,

⁵⁶⁸ State of the Union draft #1B (1), Jan 5, 1961, fldr 1961 State of the Union Message Draft #1B (1), Box 18, Moos Papers, DDEL. State of the Union draft #1B (2), Jan 5, 1961, fldr 1961 State of the Union Message Draft #1B (2), Box 18, Moos Papers, DDEL.

⁵⁶⁹ State of the Union draft #3, Jan 8, 1961, fldr 1961 State of the Union Message Draft #3, Box 18, Moos Papers, DDEL.

farfically incorrect. The CIA had conducted a recent study on the development of computing power in the US and the Soviet bloc, and it had estimated the number of electronic computers in the US at 3000. Obviously, the US possessed more than *thirty* blackboards across the schools in the nation's now fifty states. One administration reviewer promptly caught this exaggeration, writing in the margin "Probably not. These are million-dollar pieces of hardware."⁵⁷⁰ But the new wording stood, an uncharacteristic example of the speech embracing rather than shedding passages which promised to lend a seeming intemperance to the President's parting message.

In other respects, the Address's rhetoric softened, or rather became more generalized. Previous drafts had noted that even the Soviet Union was compelled in the new international order maintained by the United Nations to "respect" the rights of smaller countries. While drawing boards became computers, giving respect became "must give lip service to" the rights of small countries. However, the Soviet Union was no longer referred by name, as the less explicit phrase "cynical totalitarians" took its place. A separate description of the Soviet Union as "ruthless in purpose, insidious in method" remained, its position shifting as writers searched for an appropriate home within the speech. The United States, earlier described as "a free Christian people," became a more pluralistically termed "free and religious people." As addressed earlier, the final version of the speech presented "the certain agony of the battlefield" as the alternative to the galling but imminently preferable frustrations of negotiation. Until January 9, however, the drafts had successively identified the more evocative phrase "the certain terror of nuclear war." The context of this adjustment reinforces the impression that the phrase was modified in an effort to tone down some of the rhetoric which might be dismissed as fearful.

The United States, both in relative and in real terms, was indeed prosperous in the years following World War II. In fact, drafters had noted that the United States had emerged "from these holocausts" as the most powerful nation on the planet. They hadn't felt comfortable with this phrase, which suggested that the nation had benefited from global war. This risked the inference domestically or abroad that war

⁵⁷⁰ Draft "Farewell Address," n.d. (about January 1, 1961), first draft. Fldr Farewell Address (12), Box 16, Moos Papers, DDEL. Draft "Farewell Address," n.d. (about January 1, 1961), second draft. Fldr Farewell Address (12), Box 16, Moos Papers, DDEL.

was seen as being in the interest of the United States. However, a workable substitute phrasing was not yet at hand. And the cultural temptation about technology remained: of spending and worshipping anticipated technological silver-bullet solutions to any problem. The January 9 revisions cautioned against yielding to that temptation. This penchant for technology could (in the short run, and the short run only) be indulged by a prosperous society; whether “from” or “despite” World War II, the United States possessed spectacular prosperity and power. Technology in the home had increased the comforts of daily life, and medical advances like the Salk vaccine had made that life more possible to lead. Technology had accomplished marvels. Eisenhower had specifically acknowledged some of these accomplishments when he spoke to the nation in the wake of Sputnik I and II. The faith in technology was tempting.

However,

In meeting the many foreign and domestic crises of our time, there is a recurring temptation to feel that some forward action could become the miraculous solution to all current difficulties. A massive increase in newer elements of our defense; a spectacular attack on our deficiencies in education; a rapid expansion in basic and applied research – these and many other possibilities, each desirable in itself, may be suggested as the open sesame to the road we wish to travel.⁵⁷¹ The President would immediately remind the public of the importance of balance, of weighing each proposal “in the light of a broader consideration.”⁵⁷² Science was a tool, not a deity, and even its welcome accomplishments did not guarantee that they would be worth their price. In the light of this reasoning, programs pursuing the fulfillment of the Air Force’s unwelcome aerospace doctrine obviously were not worthy of their vast and inevitably growing prices.

This afternoon draft from January 9, only recently found and introduced to the historical record, stands as the last of the preserved drafts of Eisenhower’s most famous speech. And yet, several interesting and significant changes remained to be made during the seven intervening days between this draft and the date of delivery.

⁵⁷¹ Draft “Farewell Address,” January 9, 1961, second draft. Fldr Farewell Address (16), Box 16, Moos Papers, DDEL.

⁵⁷² Draft “Farewell Address,” January 9, 1961, second draft. Fldr Farewell Address (16), Box 16, Moos Papers, DDEL.

Noteworthy alterations occurred in the State of the Union as well. January 8 involved pondering the optimal characterization of upcoming space science achievements. That day also saw, finally, the introduction of Cuba to the Foreign Affairs section and conclusion of the address. The sentence that “despite constant threats to its integrity, West Berlin has remained free” arrived at its final form. While the Soviets were accused of “torpedo”ing the 1960 summit out of fear that accomplishments would disadvantage the Communists, the January 8 draft also toned down the rhetoric about cultural exchange making “cracks” in the Iron Curtain; it would instead lead to “better understanding.” With respect to education, the leading sentence that \$1 billion in federal moneys had gone to education was excised. This had perhaps been because of the President’s reluctance to introduce the federal hand into the erstwhile state-level realm of education. Such had contributed to his hesitance in using federal power to enforce the integration of the high school in Little Rock as well as prompted his disinclination to spend federal money on education by more local government. Also cut was the mention of the Davy Crockett nuclear weapon. The “tactical” nuclear arm accomplished nothing in deflecting criticisms of a US lag in ballistic missiles, so that line was removed.

Although sufficiency had been a pillar of Eisenhower’s defense philosophy, its rhetorical power was dubious. During the next two days, further revisions to the State of the Union message therefore cut the word “sufficient” from discussion of the US deterrent strength. Earlier drafts had cautioned that “further revolutionary changes in the structure [of DOD] at this time would be a mistake” now bowed to the seeming inevitability of upcoming adjustments, and new words appeared instead: “gradual improvements in its structure and procedures are to be expected.”⁵⁷³ President-Elect Kennedy had campaigned successfully on an agenda which included the rejection of Eisenhower’s outlook – that the long pull nature of the Cold War demanded careful balance of economic and military strength and that this balance required military sufficiency. Although his ideas seemed to have been popularly repudiated, Eisenhower still held firm to his belief; while he would not affect deliberate and radical last-minute policies to hamper

⁵⁷³ Draft “State of the Union,” January 8, 1961, draft 3. Fldr 1961 State of the Union Message Draft #3, Box 18, Moos Papers, DDEL. Draft “State of the Union,” January 9-10, 1961, draft #4/5. Fldr 1961 State of the Union Message Draft #4/5, Box 18, Moos Papers, DDEL.

his successor's efforts, it lay well within his role as outgoing President to remind the country of his perspective and its underlying reasons. And in fact the Farewell Address aimed to do that.

Eisenhower's final considerations about space topics reflected this. Although US space accomplishments carried scientific and (as of August 1960) actual strategic significance, large portions of the public would probably not have considered them "dazzling" in comparison to the showy Soviet feats. Perhaps this influenced the writers during January 9 and 10 as they reconsidered their description of future scientific projects; these continued to be identified as "new" but they would not be announced as "dazzling." A reference to unmanned projects bound for Mars and for Venus was questioned, but kept.⁵⁷⁴ In effect, the existence of some space projects would be reiterated, but little real effort would be made to "sell" space. It would have been anathema to the President's outlook to promote an expensive race for only the most conjectural of purposes.

Language in his Fiscal 1962 budget complemented his messages from his final State of the Union delivered four days earlier and to the Farewell Address whose delivery would come a day afterward. The implied culmination with the Mercury capsule remained, but as was the case with the State of the Union and the Farewell, editing softened the final language. "Further testing and experimentation will be necessary to establish whether there are any valid scientific reasons for extending manned space flight beyond the Mercury program."⁵⁷⁵ A potentially unpopular sentiment had been molded into a minimally unpalatable form – but the assertion had survived the editing process.

As with the State of the Union, the Budget message explored the promise offered by unmanned space science. The upcoming Ranger, Surveyor, and Prospector lunar satellite vehicles were each named, and Eisenhower identified Mariner as intended to journey to Mars and Venus in 1962. Further work would be

⁵⁷⁴ Draft "State of the Union," January 9-10, 1961, draft #4/5. Fldr 1961 State of the Union Message Draft #4/5, Box 18, Moos Papers, DDEL.

⁵⁷⁵ Public Papers of the Presidents, Dwight D. Eisenhower, #414 "Annual Budget Message to the Congress: Fiscal Year 1962. January 16, 1961."

http://books.google.com/books?id=KakPtFqwJ0gC&pg=PA934&lpg=PA934&dq=eisenhower+budget+message+1962&source=bl&ots=iU1boDBw6d&sig=Ij6zTqgpNGTY9LCCZ8ZSDFUtPGM&hl=en&ei=OQu0TouzJ_Ly2gXtxs_nMDQ&sa=X&oi=book_result&ct=result&resnum=1&ved=0CB0Q6AEwAA#v=onepage&q=space&f=false

(Accessed November 2, 2011)

done in earth-orbiting scientific satellites as well. “We have just cause to be proud of the accomplishments of our space programs to date and can look forward with confidence to future achievements which will succeed in extending ever further the horizons of our knowledge.”⁵⁷⁶ The President aimed to encourage satisfaction with past progress and its current pace; this effect would of course assist his popularity, but more importantly it would help support the legacy of his policymaking. In contrast, pride or unbridled exhilaration with accomplishments thus far, and certainly expectant demands for “dazzling” feats in the future, ran counter to the policy legacy which Eisenhower meant to set in space.

The January 9 rendition of the Farewell Address did not mark the ultimate state of the speech. Though the record does not provide the details of the final important round of revisions, the differences can be identified and the window of uncertainty can be narrowed to a space between January 9 and delivery on January 17. The troublesome phrase “from these holocausts” became “despite these holocausts,” working to dispel misinterpretations of the President’s characterization of the nation’s recent history in world war. The important warning against overarching faith in “miraculous solutions” to the nation’s problems remained. But the examples of problems altered. “A huge increase in newer elements of our defenses” continued to lead the list, with significant import regarding the Dyna-Soar. The second item, as mentioned earlier, had been “a spectacular attack on our deficiencies in education.” This was replaced by “development of unrealistic programs to cure every ill in agriculture.” The specific reference to “a rapid expansion in basic and applied research” was altered only by the introduction of the word “dramatic.”⁵⁷⁷ In short, the list had consisted of three items, two of them relevant to the Dyna-Soar, and the other (occupying the rhetorically least powerful space) saw the exchange of two mutually dissimilar

⁵⁷⁶ Public Papers of the Presidents, Dwight D. Eisenhower, #414 “Annual Budget Message to the Congress: Fiscal Year 1962. January 16, 1961.”

http://books.google.com/books?id=KakPtFqwJ0gC&pg=PA934&lpg=PA934&dq=eisenhower+budget+message+1962&source=bl&ots=iU1boDBw6d&sig=Ij6zTqgpNGTY9LCCZ8ZSDFUtPGM&hl=en&ei=OQu0TouzJ_Ly2gXtxs_nMDQ&sa=X&oi=book_result&ct=result&resnum=1&ved=0CB0Q6AEwAA#v=onepage&q=space&f=false
(Accessed November 2, 2011)

⁵⁷⁷ Eisenhower, Dwight D, “Farewell Address,” January 17, 1961.
<http://www.americanrhetoric.com/speeches/dwightdisehowerfarewell.html> (accessed August 1, 2011).

items. The specter of programs like the Dyna-Soar bothered President Eisenhower sufficiently for them to occupy his focus in his farewell.

Two of these last days' alterations deal closely with pivotal elements of the speech and its popular memory. First, the President saw the rise of the "scientific-technological elite" as a complementary development, but one worthy of very much equal attention. Toward that end, the passages on technology emerged during this period as an independent section in their own right. Eisenhower was deeply troubled by the regrettable necessity of a military-industrial complex, and it was a danger which only resolute, informed vigilance could corral. To drive this point home, Eisenhower asserted that "only an alert and knowledgeable citizenry can compel the proper meshing of the huge industrial and military machinery of defense with our peaceful methods and goals, so that security and liberty may prosper together." But Eisenhower's meaning would be misinterpreted if it were interpreted solely as a harangue about the military-industrial complex. Rather, it focused on the combination of the nation's need to maintain a nonetheless troubling permanently armed status with the dangerous potential that the government would either come to dominate science or that scientists would ultimately dominate the government. Both the former warped model of bureaucratic stateism and the latter of technocracy represented anathematic alternatives debasing the very purpose of the United States.

The eclipse of the message about the "scientific-technological elite" might indeed be found in the exuberant reaction to the space program to be announced in the near future. Part of that section's eclipse coincided with the attention devoted to the catchier first warning, about a military-industrial complex. Yet a crucial element of that section was a late-addition as well, as the italicized portion indicates:

In the councils of government, we must guard against the acquisition of unwarranted influence, *whether sought or unsought*, by the military-industrial complex. [italics added]⁵⁷⁸ Since the core of this message had stood through the procession of drafts, the late insertion of "whether sought or unsought" requires some consideration. Perhaps the President wished to clarify that he meant no slander on business interests; perhaps this modification represented something similar to the

⁵⁷⁸ Eisenhower, Dwight D, "Farewell Address," January 17, 1961. <http://www.americanrhetoric.com/speeches/dwightdeisenhowerfarewell.html> (accessed August 1, 2011).

introduction of the word “despite” about World War II, to illuminate that war was not seen as a positive experience. This author, however, finds it more likely that the phrase in question appeared with a slightly different nuance in reasoning. Likely, it was less to affirm a belief in the good intentions of defense-oriented businesses than it was to avoid casting aspersions which would diminish his message’s impact. Comments which would seem accusatory, out-of-touch, or off-topic would complicate the President’s efforts and hinder his effectiveness. The danger was the dynamic of increasing, encroaching influence. In the President’s mind, motivation was not as central to the danger as was the dynamic itself. And to help make that warning heard, Eisenhower opted for a phrasing which excused him from a need to prove corporate malevolence.

The final revisions also removed some of the Presidential starch, in which the speaker was the Chief Executive addressing the people. By January 17, Eisenhower and his staff recognized that since he was on the brink of becoming a former president and a contemporary citizen, the tone needed to more fully embrace a first-person collective “we” tone. Drafts already identified this as his final speech in office and his impending future “as a private citizen.” This was emphasized more fully by modifying “I bid you, my fellow citizens, to be strong in your faith that all nations, under God, may reach the goal of peace with justice.” The more collective, final, version read, “You and I, my fellow citizens, need to be strong in our faith [...]” The prayer for world peace “guaranteed by the binding force of mutual respect and love” had been the planned closing. Eisenhower ended another short message, again reaffirming his changing station. “Now, on Friday noon, I am to become a private citizen. I am proud to do so. I look forward to it. Thank you, and good night.”⁵⁷⁹

The media’s initial reaction seemed mixed. In the space between Eisenhower’s delivering the State of the Union and his Farewell Address, the Los Angeles *Times* noted a parallel between Dwight Eisenhower and George Washington, praising “the striking similarity in the way these two General-Presidents regarded their high office.” The Los Angeles *Times* anticipated, however, that “there are some

⁵⁷⁹ Eisenhower, Dwight D, “Farewell Address,” January 17, 1961. <http://www.americanrhetoric.com/speeches/dwightdeisenhowerfarewell.html> (accessed August 1, 2011).

smart ones, to be sure, who compose cruel parodies of Eisenhower syntax and smirk at savage caricatures of ‘Old Bubblehead,’ who quote archly all the clever columnists and churlish wisecracks by the current late club bores.” Listings in the *New York Times* and *Washington Post* indicate that viewers could tune in to the Farewell Address on any of three New York and four Washington stations, or listeners on any of six Washington radio stations. But the President’s farewell did have competition; in New York, two stations skipped the speech, one of them featuring Shakespeare as competition. In Los Angeles, the use of television to project the farewell “seem[ed] fitting.” Journalist Cecil Smith explained that “the span of the Eisenhower administration is virtually the span of television as a potent force,” with the 1952 nomination coverage standing as a crucial marker. Despite the expected “smirks” of the late night comedians, networks could demonstrate respect for the transition. Actors Art Carney and Lee Remick had prepared a parody of John and Jacqueline Kennedy entering the White House, but this eight-minute sketch was ordered cut by the National Broadcasting Company.⁵⁸⁰

The *Washington Post* jabbed the President just prior to the Farewell, saying he “firmly rejected any need for a recession cure and left President-elect Kennedy with a forecast of a thinly balanced budget. [...] Mr Eisenhower said pointedly that his budget ‘reflects my confidence in the strength of our economy now and in the years to come.’ Outside his official family, however, virtually all authorities agree that business is currently slumping.” The *New York Times* had already voiced a similar conclusion with a story titled, “1960, a Year of Great Promise, Developed ‘Hidden Recession.’”⁵⁸¹ This environment did not promise unanimous hospitality to notions about the dangers which Eisenhower meant to warn against.

The Farewell Address evoked diametrically opposed responses within the media. The *Wall Street Journal* advised readers that “the American people, who have so often listened to this man, might do well

⁵⁸⁰ Hartmann, Robert T, “The President: First in War, Peace, Hearts,” pB4, January 13, 1961, *Los Angeles Times*. TV listing, pX14, January 15, 1961, *New York Times*. TV advertisement, p75, January 17, 1961, *New York Times*. “Farewell Speech On Air Tonight,” pA1, January 17, 1961, *Washington Post*. Smith, Cecil, “The TV Scene: Video Farewell Seems Fitting,” January 17, 1961, *Los Angeles Times*.

⁵⁸¹ “Ike Offers Budget of Record Size,” January 17, 1961, *Washington Post*. Bedingfield, “1960, a Year of Great Promise, Developed ‘Hidden Recession,’” pF1, *New York Times*.

to listen again.” Rather than “raising any specter of a power-hungry military,” Eisenhower noted “that as the enormous defense program begins to work its way into the warp of our whole economic life [...] we risk having ‘defense come insidiously to dominate our thinking in matters actually remote from military needs. America as a permanent armed camp could become a very different America.” The *Journal* conceded that Eisenhower’s message sounded “so simple – we are almost tempted to say obvious – that to self-styled sophisticates it may sound like just another homily out of a discarded copybook.”⁵⁸² For the journal, the apparent simplicity of the argument stood at the core of its veracity.

At *Aviation Week*, editor Robert Hotz was outraged. Hotz called the Farewell Address the President’s “Parthian shots,”⁵⁸³ and declared that Eisenhower had “never really understood” the concerns held by people in the defense sector. The editorial rejected and repudiated Eisenhower’s message wholesale:

It will probably come as a considerable surprise to the millions of people in the military-industry complex of the defense effort and the smaller group of scientists and engineers who have worked so hard in the face of so many official obstacles to bring this country into the forefront of the new technologies to learn from President Eisenhower that he regards them as serious threats to the future liberty of this nation. We doubt if any significant percentage of the American people will share the outgoing President’s fears and we certainly don’t.⁵⁸⁴

Hotz again dismissed Eisenhower’s hesitance to embrace bold new defense technologies as evidence of an old man with an antiquated outlook, “vexed by energetic young men whose discoveries spawned perplexing new problems for the chief executive’s administration.”⁵⁸⁵

Hotz followed up the next week decrying the President’s further comments. Eisenhower had held his final press conference midmorning on January 18, and a reporter had asked him to elaborate about what steps he suggested would avert the establishment of the scientific-technological elite to which he had referred the previous evening. He answered that he could think of nothing “possible, or useful, except the performance of the duties of responsible citizenship.” Answering journalist Lillian Levy’s question, Eisenhower further softened the sentences which he and his associates had repeatedly polished over the previous weeks. “I did point out last evening that some of this misuse of influence and power could come

⁵⁸² “Parting Words,” p16, January 19, 1961, *Wall Street Journal*.

⁵⁸³ Parthian archers of ancient Iran were known for having shot arrows at their enemies and using horses to then ride away in escape.

⁵⁸⁴ Hotz, Robert, “Editorial: The Partian Shots,” January 23, 1961, *Aviation Week* (microform).

⁵⁸⁵ Hotz, Robert, “Editorial: The Partian Shots,” January 23, 1961, *Aviation Week* (microform).

about unwittingly but just by the very nature of the thing. When you see almost every one of your magazines, no matter what they are advertising, has a picture of the Titan missile or the Atlas or solid fuel or other things,” with the implication “that the only thing this country is engaged in is weaponry and missiles. And, I’ll tell you we just can’t afford to do that.”⁵⁸⁶ Hotz speculated that frustration at having failed to bring about arms control had prompted Eisenhower “to lash out again at his final press conference.”⁵⁸⁷

As has been shown, Eisenhower had not been confounded by the prospect of new technology; rather, he had resisted the counterproductive trends which he anticipated they could establish, undercutting the policies he felt would help guarantee national security. Hotz’s reduction of the issue to a simple “age versus youth” dichotomy proved not only inaccurate but terribly simplistic.

Other journalists noted contrasts too. Comparing Eisenhower’s final speeches in office and Kennedy’s first, Chalmers M Roberts of the *Washington Post* declared, “listeners and readers will be pardoned if they have trouble realizing the two Presidents, only a few days apart, were talking about the same country.” The two did publicly agree that the United States now led the Soviet Union in space, although Congressional Republicans were nonplussed by Kennedy’s pointing out the Soviets’ lead in lifting large vehicles to orbit. The *Los Angeles Times* contrasted Eisenhower’s tone that “he was leaving the country in pretty round shape” with Kennedy’s that “the American economy is in trouble and steps are needed immediately to bolster it.” The report also emphasized a contrast on missiles. “Mr Eisenhower said the ‘missile gap’ shows every sign of being a myth. Mr Kennedy decreed a speed up of ‘our entire missile program.’”⁵⁸⁸ The high-technology advocates had reason for enthusiasm.

Two leading lights in journalism gave less emphasis to the purported contrasts noted by so many. Arthur Krock acknowledged “dramatic differences between a passing regime and its successor,” but these did not profoundly alter “the constancy of the basic policies and purposes of the American people” or the

⁵⁸⁶ <http://www.presidency.ucsb.edu/ws/index.php?pid=12087&st=press+conference&st1=#axzz1crwqH0MG>

⁵⁸⁷ Hotz, Robert, “Editorial: The Arms Control Problem,” January 30, 1961, *Aviation Week* (microform).

⁵⁸⁸ Roberts, Chalmers M, “Kennedy and Eisenhower Find Big Contrast in State of Union,” pA1, January 31, 1961, *Washington Post*. “How Kennedy, Eisenhower Differ,” p14, January 31, 1961, *Los Angeles Times*.

consistent nature “of the fundamental aspirations of the United States.”⁵⁸⁹ For his part, Walter Lippmann paid far more shrift to Eisenhower’s message than had the editor of *Aviation Week*. Eisenhower, he said, “dwelt on a question, never before discussed publicly by any responsible official, which is of profound importance to the Nation’s future.” Referring to Eisenhower as “the old soldier,” Lippmann placed emphasis on *soldier* when Hotz had focused on *old*. Eisenhower’s decades of military service had provided a useful vantage point from which to consider the issue of US military preparedness and its implications. Lippmann saw the outgoing President identifying “the danger of unwarranted military influence – or to use an old phrase for it, the danger of militarism.”⁵⁹⁰

Lippmann’s tone indicated agreement that, in the context of the Cold War, military strength could not safely be diminished. Despite his concern about the “military-industrial complex,” Eisenhower did not advocate shrinking the military during the prolonged stand-off with the Soviet bloc. President-elect Kennedy was determined to increase the military further. “Only by making civilian influence greater, not by reducing military power,” Lippmann asserted, could the nation maintain national security and insulate the national character from militarism. “The true solution of the problem that President Eisenhower warned the country against is to be found in civilian appointees who are confident and willing to command. When such civilians are in office, it will be possible for the Administration to wean the Congress and portions of the press from their undue reliance upon the military establishment as the true source of the true American policy.”⁵⁹¹ Civilian appointees thus represented a key element in staving off militarism, and the character and strength of these selected individuals would tremendously impact the country’s future.

Lippmann respected Eisenhower’s parting message and found reason for encouragement in the incoming Kennedy team. “There is, I am convinced, solid ground for confidence in the Administration which Mr Kennedy has organized.” Lippmann thus gave his reasons:

⁵⁸⁹ Krock, Arthur, “Inaugural Contrast: Kennedy Dramatizes the Change but the Basic Aspirations Remain,” pE11, January 22, 1961, *New York Times*.

⁵⁹⁰ Lippmann, Walter, “Today and Tomorrow,” January 19, 1961, *Washington Post*.

⁵⁹¹ Lippmann, Walter, “Today and Tomorrow,” January 19, 1961, *Washington Post*.

It is not an administration led by corporate executives. It is not an Administration composed primarily of professional politicians, although the head of it is among his other aptitudes a professional politician of the first order. It is not an Administration made up of professors drawn out of an academic life of scholarship and research. It is, for the first time in our history, an Administration manned primarily by professional public servants – by men whose primary careers have long been the public service.⁵⁹²

History would introduce some irony, since the most prominently remembered of the incoming Kennedy cabinet members would be Robert S McNamara, who came to the new Administration fresh from a job as a corporate executive at Ford Motors, advancing there since service as an Army Air Force analyst and, prior to that, work as a Harvard professor. McNamara had already been tapped for the top position in the Defense Department when Lippmann wrote this, but McNamara was known as a clever worker who had risen to the top of a corporate ladder through his talents.⁵⁹³ By taking a firm hold over the defense establishment, McNamara seemed able to achieve the kind of civilian authority which Lippmann felt imperative in preventing the militarism which Eisenhower considered both possible and dangerous.

This did not imply an easy path. Lippmann said the new officials “will need public support. They will need a lot of luck. But I do not know of any Administration in our times in which the level of competence has been so high.”⁵⁹⁴ Kennedy’s incoming administration had campaigned on accomplishing far more in many realms, including prominently defense- and space-related fields. Now, with its entry to the White House, the Kennedy team would have the opportunity to try to shape policies which would guarantee national safety and interests while also appealing to the public’s culturally informed perceptions about themselves, their country, and the potential and promise held by technology.

⁵⁹² Lippmann, Walter, “Today and Tomorrow,” January 19, 1961, *Washington Post*.

⁵⁹³ “McNamara, Named Defense Secretary, Rose From Ranks,” *St Joseph Missouri Gazette*, December 14, 1960, <http://news.google.com/newspapers?id=ZhRdAAAAIBAJ&sjid=HFoNAAAAIBAJ&pg=836,4387904&dq=mcnamara+named+defense+secretary&hl=en> (accessed November 2, 2011).

⁵⁹⁴ Lippmann, Walter, “Today and Tomorrow,” January 19, 1961, *Washington Post*.

Chapter 9: "EQUAL ATTENTION TO BOTH":
KENNEDY AND THE NATIONAL CULTURE TOWARD SPACE

So far the Air Force is precluded from the man-in-space field. But with each Soviet feat there is a growing impetus on Capitol Hill and in the Pentagon to accelerate the Dynasoar project. --John W Finney, the *New York Times*, August 7, 1961⁵⁹⁵

I am very disappointed that the United States is still making only a hesitant and half-hearted effort on the Dyna-Soar program when this project deserves, in fact, the highest possible priority. [...] Disaster will follow if we are as negligent as we were with ICBMs 10 years ago. – Frederick Pilcher, KU student, letter in *Aviation Week*, November 27, 1961⁵⁹⁶

John F Kennedy had vowed action during his campaign, and with his inauguration in January 1961, the new President's supporters enthusiastically anticipated just that. Aerospace advocates, their dreams frustrated and curtailed in the Eisenhower years, looked forward to dramatic endeavors. For a moment, both the advocates of civilian space programs and of military exploitation of space would think their aspirations enunciated and their plans on course toward fulfillment. That moment was 1961.

Even before the actual inauguration, *Aviation Week's* outlook waxed ebullient. Days prior to the inauguration, Hotz lauded the "new vigor for [the] space program," and reporter Evert Clark noted that Kennedy's selection of Jerome Weisner as his scientific advisor made a "single military space program, revamped management of the civilian space effort and acceleration of ballistic missile programs [...] virtual certainties." A week earlier, the trade journal reported of the influential Louisiana Democrat Congressman Overton Brooks urging Kennedy to increase NASA's budget for Fiscal Year 1962 and of outgoing President Eisenhower affirming NASA's interest in working to support to make commercial satellites possible. A week prior to this, on January 2, *Aviation Week* described NASA's pending abandonment of the DOD-inspired policy of withholding launch information until after the fact. NASA planned instead to release information on launches "about a week ahead of each attempt," so that pre-launch press reports could emphasize the experimental nature of launches and thus what outgoing

⁵⁹⁵ Finney, John W, "Call for Urgency is Expected in US; Demand to be Renewed for Military Man-in-Space," p7, August 7, 1961, *New York Times*.

⁵⁹⁶ Frederick Pilcher, letter to the editor, November 27, 1961, *Aviation Week* (microform).

NASA chief Glennan called “substantial inherent probability of failing to accomplish the full measure of hoped-for results.”⁵⁹⁷

At the same time, some reporting suggested possible reasons for apprehension. Brooks, who headed the House Science and Astronautics Committee, had indeed urged NASA’s next fiscal budget to be raised from Eisenhower’s \$1.1 billion figure to the \$1.5 billion for which NASA planners had hoped. But Brooks also voiced the “first public criticism of the campaign to build a stronger military space program”; while desiring more space work across the board, he was determined that military space work not come at the expense of civilian efforts. As if to corroborate suspicions that such decisions might occur, *Aviation Week* declared that NASA was “interested in Convair’s proposed Atlas-G space booster, but lack of an Air Force requirement for such a vehicle as a weapon system means it probably will not be built.” In the missiles it bought or the boosters it desired, the potential existed that the Air Force might steer the course of space exploration simply by being the leading consumer of missiles. Both NASA and the DOD requested more money for space projects. NASA expected communications satellites to cost \$120 million in Fiscal Year 1962 and for Mercury to each cost an equal sum. The Air Force continued to request \$20 million for studying the extremely ambitious Space Plane, and a dramatically increased figure of \$146 million for Dyna-Soar in the coming fiscal year.

Under study for years, 1961 marked the point at which spending on the Dyna-Soar truly began. During Eisenhower’s tenure, the program had annually cost single-digit millions, until its \$58 million budget in 1960. Eisenhower had been sorely tempted to cut the Dyna-Soar program entirely at that point, but with the end his own Presidency and the President-elect’s ostentatious criticism of technological gaps, eleventh-hour cancellation of the Dyna-Soar had apparently seemed inadvisable. Instead, Eisenhower’s Fiscal 1962 budget called for \$70 million to go to a project whose profile fit snugly into the category of programs which he warned against in his Farewell Address. From Eisenhower’s standpoint, \$70 million

⁵⁹⁷ Hotz, Robert, “Editorial: New Vigor for Space Program,” January 16, 1961, *Aviation Week* (microform). Clark, Evert, “Stronger Space, Missile Efforts Urged,” January 16, 1961, *Aviation Week* (microform). “Washington Roundup,” January 9, 1961, *Aviation Week* (microform). “President Affirms NASA Support of Industry Satellite Operations,” January 9, 1961, *Aviation Week* (microform). “Washington Roundup,” January 2, 1961, *Aviation Week* (microform).

for an unwelcome and counterproductive exercise in weaponized techno-futurism must have seemed an unpleasant concession. From the Air Force's vantage point, the Dyna-Soar I represented the stepping stone to a new realm of flight and a vital arena in which to guarantee the nation's security. The Air Force requested \$146 million to fund its dream. The *New York Times* explained that Seattle's economy hinged on Boeing contracts, and Air Force approval "to work on the Dyna-Soar space glider project" was welcome news there.⁵⁹⁸ A large Air Force glider could plausibly encourage production of dependable and powerful booster rockets and thereby benefit space exploration projects across the board. Alternatively, since the Air Force's Dyna-Soar request overshadowed even the sum to be spent on Mercury, dramatic expansion of military space could portend the eclipse of civil space exploration. If space spending were to be a zero sum game, then a military advance would come at the detriment of civilian work (as Brooks feared), and the dynamic would work in the other direction too.

As addressed previously, Arthur Krock and Walter Lippmann emphasized in positive tones a continuity between the admittedly different outgoing and incoming administrations. Indeed, Kennedy's inaugural message had spoken boldly, and famously, to pay any price, bear any burden, meet any hardship, support any friend, oppose any foe, in order to assure the survival and the success of liberty." Such rhetoric definitely announced interest in more intimate international commitments. But other remarks in Kennedy's first Presidential address echoed notions which might have been said by his predecessor. One in particular pointed to sufficiency in defense: "We dare not tempt [the Soviets] with weakness. For only when our arms are sufficient beyond doubt can we be certain beyond doubt that they will never be employed." Eisenhower had wrestled with the way to most effectively explain the need for an impressive military power indisputably capable of destroying an enemy – but a power within the constraints imposed by the simultaneous need for economic health and maintenance of a free society. Kennedy's statement sought a similar objective, although notably the new President asserted that defense-type spending could invigorate rather than weaken the nation's economic strength. "Let both sides seek

⁵⁹⁸ "Washington Roundup," January 16, 1961, *Aviation Week* (microform). "Industry Observer," January 9, 1961, *Aviation Week* (microform). Booda, Larry, "NASA, Defense Seek More Space Funds," January 2, 1961, *Aviation Week* (microform). Schear, Dwight B, "Seattle Pins Hope on Boeing Orders," January 9, 1961, *New York Times*.

to invoke the wonders of science instead of its terrors” also harkened to an attitude also held by Eisenhower that in rhetoric and perhaps in policy too, science ought to be utilized for nonweaponized purposes.⁵⁹⁹

The press delivered the encouraging support befitting the “honeymoon” moment of a new President’s accession. In New York, the *World-Telegram and Sun* described “a new Administration, a new man with a freshness in look, in some ways a freshness in ideas, a new President of eloquence [...] attuned to our times,” in Baltimore, the *Sun* praised Kennedy’s being “somber without despair, firm without bellicosity, bold without arrogance.” The Detroit *Free Press* deemed Kennedy’s inaugural address “stirring [and] thoughtful” and the Salt Lake City *Tribune* called it “a fine start.” The New York *Times* repeated these and other laudatory remarks from newspapers around the country. The Washington *Post* warned of Khrushchev’s suggestion, distilled by the newspaper as being that “if the United States and its friends will just play dead, there will be no conflict with the Soviet Union.” The *Post* indicated that “the challenge facing the Kennedy Administration, and indeed the entire free world, is to take the initiative away from the Communists and find effective means of blunting their drive.”⁶⁰⁰ The Soviet bloc appeared to have many enticing avenues for taking initiative. With Marxist feats in space, threatened infection throughout the “Third World,” and a lethal nuclear and conventional armory, taking away the Soviet initiative as suggested by the *Post* could involve innumerable efforts and commitments.

Kennedy’s science advisor Weisner offered several reasons justifying efforts in space, but the nation’s image came first in this phalanx of national purposes. “First, there is the factor of national prestige,” Weisner wrote, whereas “second, we believe that some space developments, in addition to missiles, can contribute much to our national security.” New vistas for scientific exploration came third, followed by “a number of important practical non-military applications of space technology” including communications, navigation, meteorology, and mapping. Obviously, these applications could be used for

⁵⁹⁹ Kennedy, John F, 1961 Inaugural Speech, <http://ourdocuments.gov/doc.php?doc=91&page=transcript> (accessed November 4, 2011)

⁶⁰⁰ “Editorial Comment Across the Nation on President Kennedy’s Inauguration,” January 21, 1961, New York *Times*. “Transcript of President Eisenhower’s Farewell Message to Nation,” pA6, January 18, 1961, Washington *Post*.

both military and non-military purposes, and application in one realm could foster eventual adoption by another, as military satellite navigation would ultimately do at the end of the century. Last among Weisner's rationales was that "space activities, particularly in the fields of communications and in the exploration of our solar system, offer exciting possibilities for international cooperation with all the nations of the world."⁶⁰¹ Indeed, "space projects" could involve progress in any of these various directions, and often in several of those directions.

But it would be difficult to kill all five birds with the same stone. This would be especially true if weaponized space programs advanced, since they could preclude international cooperative efforts or transform them into entities similar to already familiar alliances. Within the Air Force, General Schriever expected a committee established by the ARDC to report on the service's space program and provide "a major tool in promoting a much stronger and widerbased military space program than it has had in the past." The New York *Times* reported on a Navy satellite concept which would "assist weather men" whose "military importance [was] stressed."⁶⁰² The nation might practically pursue militarized space projects, or an array of civilian projects with a possible aspect of international cooperation, and some called for projects which pledged to be useful to civilians and to the military. But some signs suggested that accomplishing everything might be impossible, because the trajectories would come ultimately into conflict.

Kennedy's first State of the Union Address did not hint at this tension, nor did the country infer it. He asserted that US space technology outpaced the Soviets, while Soviet booster technology surpassed contemporary US ability. "Both nations would help themselves as well as other nations by removing these endeavors from the bitter and wasteful competition of the Cold War," instead cooperating in all scientific realms, including but extending beyond the stars and back closer to the earth. Moments afterward, however, Kennedy announced that he had "directed prompt action to accelerate our entire missile program." Referring to the Presidential seal, he noted that the emblazoned eagle clutched olive

⁶⁰¹ "Kennedy Group Criticizes Space Effort," January 23, 1961, *Aviation Week* (microform).

⁶⁰² "ARDC Preparing Report Stressing Need for Military Space Program," January 23, 1961, *Aviation Week* (microform).

branches as well as a brace of arrows. Kennedy vowed that his administration would give “equal attention to both.” The Washington *Post* noted that Congressional Democrats “generally hailed” the speech “as a sober, courageous challenge to the Nation,” whereas “Republican reaction was tinged with resentment and a how-much-will-it cost skepticism.” Separately, the *Post* explained the day after the speech that Kennedy’s message “triggered a wave of enthusiasm today that carried the stock market to its highest level on average since June, 1960.” Investment brokers interpreted from the speech an “inflationary and, therefore beneficial [impetus] to the stock market.” Specifically, “heavy buying in the aircrafts and most other defense-oriented issues spread rapidly to include the steels, chemicals and many of the major electronic and oil shares.”⁶⁰³

Launch mishaps, which had occurred and been embarrassing, would pose particularly acute problems when national prestige provided the foremost national objective in its space efforts. Launches needed to succeed, and policymakers needed to know that they would. The NASA had not thus far included an arm with “explicit responsibility for providing [...] ‘objective, quantitative analysis of the anticipated operational reliability’ of major NASA systems and missions.” Work began in early 1961 toward “securing greater acceptance throughout NASA of the quantitative approach toward reliability analysis and assessment.” It was not as if the NASA’s personnel had before been haphazard or shoddy, but they had considered quantitative reliability estimates to be useful investments. The NASA was poised to enter the big time, the focus of national attention and the recipient of national investment. The launch of a Saturn booster was estimated to be \$20 million, and NASA staff recognized that “the money and effort expended during the subject investigation (\$150,000) should yield a return several orders of magnitude greater.”⁶⁰⁴ Saturn would be a critical booster; it was imperative that it function.

⁶⁰³ John F Kennedy, 1961 State of the Union Address, January 30, 1961, <http://www.jfklibrary.org/Asset-Viewer/Archives/JFKWHA-006.aspx> (accessed Nov 5 2011). Jan 31 1961 Washington post democrats; Jan 31 1961 Washington post speech triggers

⁶⁰⁴ Gephart, Landis S, to Seamans, “General Management Instructions Pertaining to the NASA Reliability Program,” January 26, 1961. 3059 “Glennan Select Correspondence,” NASA HQ. Saturn Reliability Steering Committee to Seamans, “ARINC Study of S-1 Reliability,” January 25, 1961. 3059 “Glennan Select Correspondence,” NASA HQ.

Efforts toward coordination continued while the Saturn's payload remained to be determined. Certainly, a Mercury capsule would not require such an enormous booster. Eisenhower had seen the Saturn as insurance against the need to lift very heavy objects into space. The Dyna-Soar glider and the Apollo capsule were, respectively, military and civilian vehicles eligible for coupling with the NASA's super booster. Ballistic Missile Division Commander Major General Ritland had contacted the NASA about this prior to Kennedy's inauguration, and NASA deputy Robert Seamans answered the general with a cordial tone in February. One agenda item, "joint research program on the effort of dynamic loads on launching vehicles," certainly implied potential use of the dynamically shaped Dyna-Soar vehicle. One of the other eight items was more explicit still: "Saturn use in NASA and Dynasoar programs."⁶⁰⁵ The Aeronautics and Astronautics Coordinating Board meanwhile sought to bring coherence to various space efforts. A NASA internal memo announced that "probably the most significant achievement of the Board was the formulation of a National Launch Vehicle Program Summary containing the currently approved vehicles of both DOD and NASA and also the follow-on coordination procedure whereby NASA and DOD shall obtain the approval of each other for new space launch vehicles prior to giving departmental approval or allocating funds for hardware development."⁶⁰⁶

Aviation Week quickly proved itself capable of mixing praise and criticism toward Kennedy. Weisner appeared ready to pour cold water on some of the more extreme space ambitions, and the journal indicated that the classified version of the scientist's report advocated the scrapping of Mercury. *Aviation Week* believed Weisner's advice was because "the new Democratic Administration would get the blame if this first attempt at manned space flight fails," but that Kennedy would probably "reject the suggestion, taking the attitude that the US government – not a political party – succeeds or fails when a national program is involved." Hotz simultaneously criticized Kennedy for tapping Webb to run NASA. Webb

⁶⁰⁵ The agenda items were: joint research on dynamic loads' effects on launch vehicles; Centaur project review; housing near BMD; NASA and/or Dyna-Soar use of the Saturn; "Scout relationships"; life sciences and Discoverer satellites; manned lunar landing; NASA orbital docking and Air Force rendezvous projects; Atlas pad modifications; flight safety on Atlantic and Pacific Missile Ranges. Seamans to Ritland, February 13, 1961. 11324 "X-20 Correspondence Martin 1962-64," NASA HQ.

⁶⁰⁶ "Aeronautics and Astronautics Coordinating Board Activities," February 6, 1961. 11130 "DOD in Space Thru 1972," NASA HQ.

was a business pro and a political angler, but a space-science neophyte, and *Aviation Week* worried that “the area of space technology” could become “so entangled with political ties that it cannot progress technically.” *Aviation Week* conveniently forgot that space had not been a depoliticized issue up to this point, and that the President had gotten on a bandwagon largely started by his Vice President who then led the Senate Democrats. National prestige was laudable, but a politician could scarcely be expected (or believed) to avoid seeking to associate himself or the party with that prestige. Even in the fresh wake of the election and the recent Eisenhower and Kennedy addresses, *Aviation Week* staff persisted in considering space science separate from politics. Far from it: the value of space science was gauged by the populace within the parameters of a representative society. It would be affected by politics. This did not deterministically make it dirty. But it did speak to the link between the nation’s space programs and policy on one hand and the nation’s culturally influenced ideas about technology on another.

During the transition, *Aviation Week* editor Robert Hotz declared that “the Eisenhower ‘open skies’ policy and other efforts along this line were hastily tossed together gimmicks aimed at a quick headline impact rather than at any real, long-term gains in the diplomatic chess game,” and that U-2 flights had “not exposed [...] the location of Soviet IRBM and ICBM bases other than the experimental test operations at Krasny Yar and Tyura Tam.”⁶⁰⁷ To the President’s skeptics, Eisenhower’s aversion to permitting the weaponization of space seemed the feeble ignorance of an antiquated luddite, and “space for peace” sounded like a retread of the “open skies” which these same critics disparaged. In late January 1961, when Hotz’s essay saw print, the country did not know information to which only Eisenhower and only a handful of Presidential advisors were privy: the other Soviet missile bases had not been photographed because they appeared not to exist. Proving a negative can be difficult, and guessing can be dangerous, but contemporary Soviet missile strength had been a Potemkin Village.

That “missile gap” had also been a notable Kennedy criticism of the Republican administration. Now President, Kennedy had directed his Defense Secretary Robert McNamara to investigate critical defense

⁶⁰⁷ Hotz, Robert, “Editorial: The Arms Control Problem,” January 30, 1961, *Aviation Week* (microform).

issues. A DOD study informed the Administration in early February that the campaign claim appeared to have been false, just as Eisenhower had asserted. The New York *Times* noticed the report and reported both its conclusion and the fact that Eisenhower had indicated the point before stepping down. The new Administration promptly responded by denying that it had concluded that the missile gap concept (and its campaign allegations) had been undercut.⁶⁰⁸ Despite having access to a clearer intelligence picture, Kennedy in the remainder of 1961 would mostly follow the current on the missile-related field of space. Air Force officers and political figures (including then-candidate John Kennedy) had utilized the culturally induced beliefs in technology in order to decry the supposed inactivity of Eisenhower and to promote themselves and the alternatives they touted. Kennedy followed the current, but he had stood among those who directed the contour of its shores.

Throughout late winter, the Dyna-Soar appeared to undergo integration into picture of upcoming space exploration. *Aviation Week* noted in mid-February that the glider's proposed Titan I booster would be replaced by the more powerful Titan II. Hotz quickly reminded readers that "the 'booster gap,' as the daily newspaper pundits will probably call it when they discover it, is the key factor in the space race, and it is the reason we will have to continue to engage in a stern chase of the Soviet achievements." Recommended alterations in NASA's program and in the Air Force's role, the journal asserted, could soon be expected, but Hotz's next editorial got far more specific. US space efforts existed in three phases, he informed readers, starting with the X-15 rocketplane which NASA, the Air Force, and the Navy had collaborated on and which had flown since mid-1959. "Mercury fits roughly in the middle," and Hotz wrote that the selection of seven Mercury astronauts indicated that "the Mercury program has reached a point of no return psychologically if not technically." With its pilots chosen and its capsules preparing for flight, Mercury would fly. It would demonstrate whether humans could survive and work in space. This made it "crystal-clear that the United States and the Soviet Union are again competing in a significant episode of the fierce technological race that began in the early years of the last decade,"

⁶⁰⁸ Raymond, Jack, "Kennedy Defense Study Finds No Evidence of a 'Missile Gap,'" p1, February 7, 1961, New York *Times*.

presumably with the race for a hydrogen bomb.⁶⁰⁹ If the X-15 provided the first step and Mercury the second, the third would be more ambitious still.

“Beyond the Mercury goal is the Dyna-Soar program, which although currently planned and funded through suborbital flight, is aimed at eventually providing manned vehicles that can perform useful missions in orbital flight.” Mercury data would “provide the foundation on which Dyna-Soar, Apollo and other manned scientific and military space vehicles can build,” but Hotz’s tone left little doubt that the real future beyond Mercury lay with a dramatically more sophisticated space vehicle rather than with an upsized ballistic capsule. NASA’s Director of Advanced Research Programs, Ira Abbott, seemed to agree in a March 1961 speech which invited the inference that Dyna-Soar stood as an approachable step beyond Mercury. Boost-glide veterans chimed in, as Eugen Sanger (evidently thinking along the lines of the Space Plane concept) envisioned future European development of an aerospace vehicle to enable spaceflight without the requirement for massive boosters.⁶¹⁰

Space topics, including the Dyna-Soar, received prominent attention even when policymakers preferred otherwise. Almost simultaneous with Sanger’s pronouncement, Krafft Ehrlicke spoke on the subject of superboosters. Speaking to the Joint Committee for Atomic Energy, Ehrlicke called it “almost axiomatic, that techno-scientific (in distinction from a purely scientific) progress in a specific area is accomplished faster and more economically if the work is tied to a major mission requirement.” Though the ex-Nazi scientist had boosters in mind, the same could be said of the vehicles they were to lift. The Air Force continued to assert mission requirements for aerospace programs. The Administration seemed poised to confirm the Air Force’s position as leading military operator in space. Air Force officers envisioned establishing a manned global surveillance system “by 1966 or earlier,” but this sounded

⁶⁰⁹ “Industry Observer,” February 13, 1961, *Aviation Week* (microform). Hotz, Robert, “Editorial: The Stern Chase in Space,” February 20, 1961, *Aviation Week* (microform). “Washington Roundup,” February 20, 1961, *Aviation Week* (microform). Hotz, Robert, “Editorial: Good Luck, Astronauts,” February 27, 1961, *Aviation Week* (microform).

⁶¹⁰ Hotz, Robert, “Editorial: Good Luck, Astronauts,” February 27, 1961, *Aviation Week* (microform). Abbott, Ira H, “Advanced Research Programs,” March 1961. 6 “Abbott, Ira H (Speeches), NASA HQ. “Global Surveillance System Study Planned,” February 27, 1961 Hotz, Robert, “Editorial: Good Luck, Astronauts,” February 27, 1961, *Aviation Week* (microform).

excessively optimistic to industry observers who kept in mind that only the X-15 had flown and after it, “there is only the Dyna-Soar boost glider, and it will be essentially a research vehicle through its initial stages.”⁶¹¹

Leaks were another problem, as they divulged information in ways that could pose security problems and garble political messages. Rumors held that the long-embattled B-70, recently reinstated as a weapon system because of Congressional pressure, was again in trouble; these anecdotes were accurate but annoyed the President. McNamara cracked down on leaks after learning of an Air Force general’s speech stating that the Dyna-Soar would fly within three years. The Dyna-Soar reference had in fact been approved by the Pentagon and was not thus a “leak,” but McNamara “still was reported to feel that too much weapons information was being cleared for release in generals’ speeches.” In the House’s space committee, Representative Brooks voiced his “concern over the ‘quasi-public fashion’ in which military use of space was being promoted.” Brooks feared “that the executive branch was contemplating ‘a radical change in our national space policy’ that would accentuate military space ‘at the expense of civilian and peaceful uses.’”⁶¹² Such rumored contemplations did not indicate decided policy, however. Kennedy’s upcoming proposals show that the President had not settled on a course in space – whether to pursue a primarily civilian path, primarily military, or a combination following dual tracks simultaneously.

The question regarding a lunar quest remained unresolved, and in turn it left further questions open as officials sought to preserve options without spreading resources so thinly as to become ineffectual. On November 27, 1960, NASA’s associate administrator Robert Seamans and outgoing deputy administrator Hugh Dryden met incoming administrator James Webb to discuss production proposals for a possible Apollo space capsule. Two stood out in particular: “Martin led on technical approach, North American

⁶¹¹ Ehrlicke, Krafft, statement, March 1, 1961. 559 “Ehrlicke, Krafft A (General Bio),” NASA HQ. “USAF May Gain Stronger Role in Space,” March 6, 1961 Hotz, Robert, “Editorial: Good Luck, Astronauts,” February 27, 1961, *Aviation Week* (microform). “Washington Roundup,” February 27, 1961, *Aviation Week* (microform).

⁶¹² “Washington Roundup,” March 6, 1961, *Aviation Week* (microform). Norris, John G, “News Leak Crackdown Ordered by McNamara,” March 3, 1961, *Washington Post*. “Washington Roundup,” April 3, 1960, *Aviation Week* (microform).

led on technical competence.” Although the deliberations would be second-guessed in the wake of the Apollo 1 fatal mishap seven years hence, either contractor seemed a good choice, and Webb a March 1961 report noted that Webb had chosen North American to build the successor capsule. Meanwhile, Budget Director David Bell looked to the moon and beyond. “The fundamental question,” Bell informed Kennedy, was “whether or not we wish to undertake, as a long-term national objective, the large-scale and costly efforts required for objectives such as manned lunar landing and return and manned flight into interplanetary space.” Nuclear rockets would not be necessary for comparatively modest manned earth-orbit projects or for unmanned lunar ventures, and chemical alternatives could exist even for some potential nuclear rocket destinations. Ambitious space goals demanded investment both in the Rover and in large chemical rockets. Between alternatives of status quo, modest increases, and initiating a \$50 million flight program for Rover, Bell advised steering a middle course. He reminded the President that “the basic question is whether the tangible and intangible benefits of manned space flight to the moon and beyond are worth the cost and effort.”⁶¹³

In his first months as President, Kennedy found himself unable to answer that question. Information and advice conflicted, a standard challenge facing policymakers, and the exploded missile gap likely accentuated the sense of confusion. Logically, it might have led to some limits on defense buildup and should dramatically have undercut futuristic projects like the Dyna-Soar. Speaking to Congress in late March about defense spending, Kennedy indeed did respond by reaccelerating the retirement of B-47 medium-range bombers from SAC service. He also clarified that “the acquired missile capability programmed [...] also makes unnecessary and economically unjustifiable the development of the B-70 Mach 3 manned bomber as a full weapons system.” Minimal research would continue about Mach 3 flight. Similarly, “the possibility of achieving a militarily useful aircraft [nuclear powered] in the foreseeable future is still very remote,” so the study would be drastically curtailed and moved to the

⁶¹³ “Statement of the Administrator, National Aeronautics and Space Administration on Selection of a Contractor for the Apollo Spacecraft,” March 16, 1961. 03799 “Chronological Reading File June 1962,” NASA HQ. Bell, David, to Kennedy, March 22, 1961. 12456 “BOB,” NASA HQ.

non-military AEC “where it belongs.”⁶¹⁴ Given the fate of the aging B-47 and the troubled B-70, listeners acquainted with the Dyna-Soar might have anticipated it suffering a dire fate too.

But space was another story, and Kennedy said as much. Dyna-Soar was one of four space systems Kennedy named as “related to our strategic and continental air defense forces which I find require additional support.” Disquieting news in March included the Soviet orbit and recovery of a dog and several other creatures in Sputnik IX, providing the Soviets with an opportunity to predict a manned spaceflight in the future.⁶¹⁵ Perhaps such boasts seemed to require a reply. Even so, the President had not yet sided fully with the aerospace advocates. The Administration meant to provide \$100 million for Dyna-Soar, a figure almost exactly between the \$70 million which Eisenhower had decided upon and the \$130-146 million which Congress and the Air Force had chosen. Within the speech, the section dedicated to the strengthening of US deterrent strength focused on missile numbers and accuracy and on aircraft survivability; the Dyna-Soar and the other space projects shared a modest but significant paragraph at the section’s end. The New York *Times*’s subtitle in its report identified Kennedy’s call for base closiers to save money needed elsewhere on defense. In sum, Kennedy’s March 28 speech suggested a world leader willing to spend larger sums to keep space defense options open, but not yet committed to a truly emphatic space policy.

The notion of “aerospace” gathered steam since its introduction by General White into the lexicon in 1958. For example, the New York *Times* reported in March 1961 that the Keystone Low-Priced Common Stock Fund S-4 had established a new category designated “aerospace – to list portfolio holdings in the space fields.” *Aviation Week* almost simultaneously noted that “Kennedy budget shifts” could “accelerate [a] slight rise in aerospace sales.” The *Times* again reported within the month on the nonprofit Aerospace Corporation which had been instituted to assist in planning and supervising (but not policymaking) of

⁶¹⁴ Kennedy, John F, Special Message to Congress on Defense Spending, March 28, 1961 <http://www.presidency.ucsb.edu/ws/index.php?pid=8554#axzz1crwqH0MG> (accessed Nov 5 2011).

⁶¹⁵ Kennedy, John F, Special Message to Congress on Defense Spending, March 28, 1961 <http://www.presidency.ucsb.edu/ws/index.php?pid=8554#axzz1crwqH0MG> (accessed Nov 5 2011). “Soviets Predict First Manned Flight on Basis of Sputnik IX Recovery,” March 20, 1961, *Aviation Week* (microform).

space projects.⁶¹⁶ Even if the President had not yet decided upon a final trajectory for his policy, investors and journalists sensed accelerating momentum in aerospace activity.

In early April, Bergen Evans of the *New York Times* commented on the “new world, [and] new words.” Evans reported that “the Air Force, in its space program, has definitely outsoared the former limits of our language. [...] They haven’t hesitated to coin whatever words they needed,” among them aerospace, which meant “an upper region in which the atmosphere ceases to function as a factor in flight.” Evans also defined the Dyna-Soar as “a projected manned orbital glider or bomber now under study.” He added that “a ‘dyne’ is a unit of force. It’s hard to believe that there wasn’t a touch of humor in the coinage.”⁶¹⁷ Dyna-Soar was one of a host of words defined in the story, which indicated the *Times*’s perception that the general public would be interested in explanatory reporting about aerospace terms. Furthermore, Evans’s description of the Dyna-Soar was accurate, as the program under study was a glider and the goal remained a bomber. The public had access to fairly reliable general information about the Air Force’s intention regarding its planned gilder.

Kennedy appeared to lurch closer to accepting military space development alongside civilian work. Before the President’s March 28 speech on the defense budget, Brooks had publicly warned against taking from NASA in order to give to the military. After it, *Aviation Week* reported Kennedy answering that “there are ‘major missions in space for which the military serviced should assume responsibility,’” although NASA should retain authority over other “‘major missions, such as the scientific unmanned and peaceful’” projects. The journal reported that Kennedy aimed to increase NASA funding and to use nearly all of the increase on major boosters – Saturn, the Centaur, F-1, and Rover.⁶¹⁸ *Aviation Week* told readers that Boeing was undertaking a study of “space bomber concepts,” with the Dyna-Soar

⁶¹⁶ “Fund Notes Innovation; Aerospace Category is Added by Keystone S-4 Company,” March 9, 1961, *New York Times*. “Kennedy Budget Shifts May Accelerate Slight Rise in Aerospace Sales,” March 12, 1961, *Aviation Week* (microform). Beckner, Bill, “New Unit Studies Rocket of Future; Aerospace Corporation Has No Stockholders – Works on Air Force Projects,” p42, March 26, 1961, *New York Times*.

⁶¹⁷ Evans, Bergen, “New World, New Words,” April 9, 1961, *New York Times*.

⁶¹⁸ Saturn would of course become a lunar booster; Centaur pioneered high-energy thrust in a rocket upper stage; the F-1 booster would be a Saturn component; Rover was a nuclear rocket research project. “Washington Roundup,” April 3, 1961, *Aviation Week* (microform). Kolcum, Edward H, “Propulsion Key to NASA Budget Increase,” April 3, 1961, *Aviation Week* (microform).

“figure[ing] prominently in the investigation.” Although Boeing looked to a “Dyna-MOWS” (manned orbital weapon system) as a refinement even on the Dyna-Soar III, the problem remained of getting such craft into orbit. The same issue of the journal carried an artist’s rendering of the Dyna-Soar riding a Titan II rocket. Though the caption explained that “the Dyna-Soar [...] will be lofted into space by the Titan II booster,” it could not be lofted into *orbital* space without something more powerful.⁶¹⁹

On April 12, the New York *Times* published a report identifying hopes to lift a manned Mercury capsule into space by years’ end. But the Mercury capsule did not monopolize the article. Reporter Richard Witkin described the X-15’s flight plan as “only slightly less ambitious than Mercury’s orbital goals.” Moreover, Dyna-Soar was identified as “a long step beyond Mercury, [...] much more agile” than the capsule, and “under energetic development by the Air Force.” Finally, Witkin mentioned a NASA initiative for a three-man capsule to conduct either earth-orbit missions lasting from two weeks to two months or “a week-long trip around the moon.”⁶²⁰ A bigger surprise still lay in store on April 12, however: a 27-year-old Soviet Air Force major had orbited the earth in a five ton spacecraft. The President had already, repeatedly, conceded “months” of Soviet superiority in booster development and journals like *Aviation Week* had estimated the Soviets to have a four-year lead there. With Yuri Gagarin’s flight the Soviets’ tallied another spectacular first.⁶²¹ While the timing of the Soviet accomplishment was known and widely unsettling, the rudimentary character of the vehicle was unsettling precisely because of what was not known but imagined. To someone in a seat of authority and still sitting somewhat on a fence, it might have seemed that something needed to be done to rally the nation and galvanize a sense of purpose.

⁶¹⁹ “Boeing Study Space Bomber Concepts: Three-year Air Force Boss-Wedge program includes assessment of manned, unmanned military systems,” April 10, 1961, *Aviation Week* (microform). “USAF Dyna-Soar,” April 10, 1961, *Aviation Week* (microform).

⁶²⁰ Witkin, Richard, “US Project Mercury Hopes to Send an Astronaut Aloft by the End of this Year; Efforts Dogged by Test Failures, Space Agency to Need Some Luck to Achieve Its First Manned Operation,” April 12, 1961, New York *Times*.

⁶²¹ United Press International, “187-Mile Heigh [sic]: Yuri Gagarin, A Major Makes the Flight in 5-Ton Vehicle,” New York *Times*, April 12, 1961, p1. Clark, Evert, “Space Strategy Hinges on Time Factors,” March 12, 1961, *Aviation Week* (microform).

Military space advocates girded for further rhetorical battle in the aftermath of Gagarin's orbit, while the President pondered his options. Hotz compared Gagarin's orbit to the Wright Brothers' first flight and regretted that the accomplishment came from the Soviet Union. Anticipating the President's attitude, Hotz remarked that "again we have off slow from the mark and are lagging in the first lap," although "determination [...] in its top leadership" could allow the United States to catch up. *Aviation Week* told readers that "proponents of a bigger military space effort expect the Soviet success in recovering a man from orbit to help them promote an expanded program. They have had relatively little success in the past, but – as usual – Russian success makes a US space push suddenly more popular." Chief of Staff General White was quoted declaring the "Soviet aerospace strength to be perhaps the greatest threat in the history of the country." Leon Trilling of MIT ascribed Soviet space success to superior management arrangements; "Soviet priorities insure the allocation of resources first to those tasks which party and national leadership deem most important." Kennedy assigned Vice President Johnson leadership of the space council, whose authorization was "a key step toward moving the US into its proper place in the space race." *Aviation Week* explained on May 1 that "the term 'space race' has provoked more argument since October 1957 than almost any other single aspect of the space effort."⁶²² Yet the President did not sidestep use of the term.

Though Kennedy saw space in terms of being a race, appearances suggested that it was a race the United States was losing. True, US satellites outworked and outnumbered Soviet counterparts, but the Soviets seemed consistently to steal the show with spectacular accomplishments, and since Kennedy ascribed psychological importance to the competition in space he felt that appearances mattered there.

Aviation Week reported Kennedy fretting that

regardless of how much money we spend on Saturn, we are still going to be second. [...] The question is whether the nuclear rocket or other kinds of chemical rockets offer us a better hope of making a jump forward, but we are second and Saturn will not put us first. [...] In addition, we

⁶²² Hotz, Robert, "Editorial: First Man in Space," April 17, 1961, *Aviation Week* (microform). "Washington Roundup," April 17, 1961, *Aviation Week* (microform). "Soviet Space Rise Keyed to Management," April 17, 1961, *Aviation Week* (microform). "Washington Roundup," May 1, 1961, *Aviation Week* (microform).

have to consider whether there is any program now, regardless of cost, which offers us hopes of being pioneers in a project.⁶²³ Kennedy conceded also that ““it is possible to spend billions of dollars in these projects in space to the detriment of other programs and still not be successful.”” Careful evaluation would show ““whether a real success can be achieved or whether we are so far behind now in this particular race we are going to be second, in this decade.””⁶²⁴ The President would find more inspiring rhetoric three weeks hence, but in the meantime, the nation’s future path in space remained unclear. The Air Force Systems Command’s assistant for bioastronautics warned that a Soviet lead in life sciences could lead to a Soviet capability to deny US vehicles’ access to space in the future.⁶²⁵ For those interpreting the space realm as carrying importance for prestige or national security, that situation could hardly be tolerated.

The Dyna-Soar’s developers at Boeing introduced their Project Streamline on May 4, in an environment which appeared welcoming. Gagarin’s Soviet space feat was barely three weeks old, and the embarrassing American proxy failure against the Communist regime in Cuba had followed Gagarin’s flight in the intervening days. Project Streamline suggested alternative accelerated schedules by which the Dyna-Soar might recover from the lost time suffered by earlier delays. Work continued on the Titan boosters, but Streamline looked beyond the Titan series of boosters, whose power would be insufficient to take the Dyna-Soar into orbit. From a policymaker’s standpoint, an expedited space project such as this might offer an opportunity to seize a Cold War imitative.

The boldest of the three Streamline alternatives, dubbed 3A, proposed using a Saturn rocket to lift the Dyna-Soar as early as the first quarter of 1963, introducing a piloted version of this configuration by the end of that year. Greater maneuverability would be offered by provisioning the Dyna-Soar vehicle with a further maneuverable engine at the end of 1965.⁶²⁶ Conspicuously, schedule 3A bypassed the suborbital stage entirely! The Air Force, while striving to construct an experimental test vehicle leading to an operational aerospace bomber, had long clung to the assertion that their Dyna-Soar I was a suborbital

⁶²³ Eastman, Ford, “Kennedy Seeks US Space Race Gains,” May 1, 1961, *Aviation Week* (microform).

⁶²⁴ Eastman, Ford, “Kennedy Seeks US Space Race Gains,” May 1, 1961, *Aviation Week* (microform).

⁶²⁵ Kolcum, Edward H, “Flickinger Warns of Soviet Space Threat,” May 22, 1961, *Aviation Week* (microform).

⁶²⁶ “Dyna-Soar: Project Streamline,” May 4, 1961. 11325 “X-20 Dyna-Soar Documentation,” NASA HQ.

vehicle. The NASA too had endorsed this, and DDR&E York in the Eisenhower Administration had enforced strictures on the project which emphasized its suborbital research character. With Eisenhower out of office, planners were tempted to conclude that the political constraints on the glider were in the process of disappearing. Technological challenges certainly remained, but talented scientists and engineers could overcome these too. The suborbital might safely be circumvented, and precious time thereby saved.

Boeing also proposed an intermediate schedule, called 3B, and a comparatively conservative schedule 4. Both plans were notably less ambitious than 3A. Timelines extended further, principally because both 3B and 4 proposed retaining the suborbital tests with a booster smaller than Saturn and the plans suggested initiating these in the second and fourth quarters of 1963, respectively. 3B would introduce the Saturn booster at the end of 1964 and would join pilot, craft, and Saturn booster only in early 1965. Schedule 4 proposed using an intermediate booster in mid-1966, and the chart showed a Dyna-Soar atop a Saturn booster labeled indefinitely in the future and emblazoned with a question mark.⁶²⁷

The question of boosters remained potent. Streamline took a hard look at glider, transition, and total air vehicle weight. The transition section served two important purposes: first, it married the boxy contours of the glider to the booster's round diameter; second, it seemed a practical space in which to store provisions and materials for extended missions and in which to place a small engine for maneuverability during missions. The glider's contemporary configuration would weigh 10,608 pounds – as much as Gagarin's craft. Its transition would weigh another 4663 pounds more. Introducing high performance subsystems and the capability to sustain a multiorbital flight did not affect the weight of the glider itself, but the transition section would increase to roughly the weight of the glider itself. The total weight of a multiorbital Dyna-Soar I vehicle could be expected to stand at 17,600 to 22,000 pounds. The Mercury vehicle, in which astronaut Alan Shepard traveled a suborbital trajectory the day after Streamline's release, weighed less than 3900 pounds at launch and under 2300 pounds upon

⁶²⁷ "Dyna-Soar: Project Streamline," May 4, 1961. 11325 "X-20 Dyna-Soar Documentation," NASA HQ.

splashdown.⁶²⁸ Mercury's suborbital Redstone booster could be trusted, but it lacked the capability to lift even the small capsule into orbit; the more powerful Atlas booster inspired far less trust. The Dyna-Soar's booster would have to be enormous and it needed to be reliable.

Kennedy's proposed space quest would point elsewhere, untainted by the residue of obvious weaponized aspirations. As May lumbered on, the New York *Times* noted that the Air Force had established a pilot training course and that NASA had awarded a study contract to Martin on a lunar landing project. The Air Force had "talked about the desirability and inevitability of extending military operations into space, [but] man-in-space activity thus far has been centered in the National Aeronautics and Space Administration," and an Air Force astronaut-training site would help reverse this trend and lead to the selection of the Dyna-Soar's first pilots. Meanwhile, the *Times* used militant allusion to explain that debate concerned the "enormous cost of mounting a manned assault on the moon – estimated to run as high as \$40,000,000,000." *Aviation Week* commented that Kennedy "rejects the conservative viewpoint within the Administration that spending money to send men to the moon and to the planets amounts to stunting, not solid scientific achievement." Dr Clark T Randt of the American Astronautical Society said the costs of the Mercury program, which launched a man into suborbital space in early May, were justified not on scientific return but as serving as a first step toward further manned spaceflight. The *Times* remarked that NASA schedules had "generally set a timetable for landing of a manned expedition on the moon extending 'beyond 1970,'" but recently agency officials hinted that it might be done by 1969.⁶²⁹

⁶²⁸ The lattice tower and emergency escape rockets, to be discarded during the mission, accounted for about two-thirds of the difference between the launch weight and the splashdown weight. Mercury Capsule No 2 Configuration Specification (Mercury-Redstone No 1), http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19740075935_1974075935.pdf (accessed Nov 7 2011).

⁶²⁹ Finney, John W, "Air Force Sets up Space-Man Course; Pilot Training to be Given at California Base," p3, May 13, 1961 "Dyna-Soar: Project Streamline," May 4, 1961. 11325 "X-20 Dyna-Soar Documentation," NASA HQ. Finney, John W, "US Pushes Study of Lunar Landing," May 20, 1961 "Dyna-Soar: Project Streamline," May 4, 1961. 11325 "X-20 Dyna-Soar Documentation," NASA HQ. Wilson, George C, "Kennedy to Launch Major Space Effort: New budget request, expected to total \$600 million, seen as beginning of attempt to outdistance Soviets," May 15, 1961, *Aviation Week* (microform). "Randt Cites Manned Space Flight Hazards," May 15, 1961, *Aviation Week* (microform).

The President began his second State of the Union address in barely four months by explaining that the country faced “extraordinary times.” Domestic economic and social topics gave way to their foreign counterparts, and eventually to military needs for alliances, intelligence, and civil defense. A passage addressing disarmament provided the transition to the speech’s bold challenge to conduct a human lunar mission by the end of the 1960s. Kennedy unambiguously asserted that space accomplishments “impact [...] the minds of men everywhere, who are attempting to make a determination of which road they should take” for their political and economic future during the Cold War. He advocated a lunar goal because “no single space project in this period will be more impressive to mankind, or more important for the long-range exploration of space.” While indicating that it would entail unparalleled costs, the President provided no explicit figures in his speech.⁶³⁰

In fact, lunar estimates of the cost ranged wildly. The day before the speech, the *New York Times* cited a range of \$20 billion to \$40 billion. Kennedy’s decisions, “it was said, came after the Soviet Union succeeded in sending Maj Yuri A Gagarin into orbit and after the civilian space agency managed a successful suborbital flight by Cmdr Alan B Shepard.” Kennedy did, however, offer precise figures on the other space projects he advocated. Each cost was quite modest in relation to the lunar centerpiece: \$23 million for the Rover nuclear rocket; \$50 million for communications satellites; and \$75 million for weather satellites and observation. Kennedy advised careful deliberation by Congress, and after daring the Congress he asserted that if the nation were to stop halfway or revise its goals downward due to challenges, “in my judgment it would be better not to go at all.” Democrats generally supported Kennedy, although some like John A Blatnik of Minnesota urged that space be “kept in perspective” relative to social problems on earth. The *New York Times* reported that Colorado Republican Senator Gordon Allott dismissed the speech “as an ‘example of the latest New Frontier technique – government by stampede.’” The *Times* pointed out that “the loudest and most sustained hand-clapping greeted [Kennedy’s] promise that he would make it clear to Premier Khrushchev at their meeting in Vienna next

⁶³⁰ Kennedy, John F, State of the Union address, May 25, 1961, <http://www.jfklibrary.org/Research/Ready-Reference/JFK-Speeches/Special-Message-to-the-Congress-on-Urgent-National-Needs-May-25-1961.aspx> (accessed Nov 6 2011).

month that ‘America’s enduring concern is for both peace and freedom.’” For his part, Brooks deemed Kennedy’s proposal ““a tremendous stride forward.””⁶³¹ Gerald DeGroot’s history argued that Kennedy effectively created a crusade to which he himself was not truly committed. Certainly, Kennedy’s statement could be read to suggest an inclination to make a bold speech and lay responsibility for the decision with the legislative branch.

However, it seems reasonable to conclude that the President had still not definitely set his mind regarding space. A long-range objective would both excite the country and potentially buy time for policymakers (though definitely not for project designers). Kennedy’s proposed figure for Rover straddled the BOB recommendation of modest increase and the alternative of a major \$50 million investment. Rover’s utility depended on the existence of a space program looking to and past manned lunar missions, and the President’s recommendation implied both a reluctance to shut the door on such possibilities and a hesitation to commit the country to that direction. Several key advisors, such as Weisner, had after all urged against wildly ambitious manned projects which would suck the air out of other worthy projects in space science and on earth.⁶³² And, too, while military space did not get to enjoy the role of banner project, the Dyna-Soar too continued. The *New York Times* told readers at the end of May that Boeing had announced it would spend \$40 million on major subcontracts related to the Dyna-Soar.⁶³³

Still, Kennedy’s May speech did implicitly signal his preferences about the character of future space endeavors. The section on space was longer than any other section of the speech; it did not explicitly state whether the first lunar astronaut ought to wear a military uniform under his space suit. The President had cited the propaganda value of a landing, but the character of this might be open to

⁶³¹ Lawrence, WH, “President to Ask an Urgent Effort to Land on Moon,” May 24, 1961, *Aviation Week* (microform). Shuster, Alvin, “Congress Wary on Cost, But Likes Kennedy Goals,” p1, May 26, 1961, *New York Times*. Wilson, George C, “Congress is Expected to Support Kennedy’s Space Race Program,” June 5, 1961, *Aviation Week* (microform).

⁶³² The *New York Times* noted that “until recently, Mr Kennedy seemed to have been largely influenced by these scientists.” Finney, John W, “A 3-Man Trip to Moon by 1967 Projected by White House Aides,” p13, *New York Times*.

⁶³³ “Contract Awards,” May 31, 1961, *New York Times*.

interpretation. However, the placement of the space section suggested an aspiration that a lunar quest might point away from weaponization of space. The preceding section was titled “disarmament,” and the following section was the conclusion, in which the word “peace” appeared four times. This word had not appeared in any section of the speech up to that point, and its profligate placement at the speech’s end hinted at the intention that lunar adventure might provide distraction from weaponized employment. This provided no guarantee however. Kennedy’s May 25 speech made clear that the Dyna-Soar (and projects like it) would not foreseeably find center stage, but nothing seriously indicated that the Kennedy administration would kill the Dyna-Soar.

If the Cold War provided impetus for a lunar quest, the Soviet Union precluded the comfortable abandonment of the Dyna-Soar. For years, the Soviets hid the fact that Gagarin had parachuted from the Vostok craft separately after reentry and before landing, because such a maneuver lay beyond the strictures of the IGY provisions defining a manned space first. For years, too, the Soviets proved relatively secretive about the very *shape* of the Vostok craft which Gagarin flew. Imagination soars both in times of fear and hope, and some in the United States and in Britain suspected that Gagarin’s craft had not been a primitive capsule but rather an advanced Dyna-Soar-style glider.

DDR&E York, who had two years earlier confined the Dyna-Soar to suborbital hypersonic research, told the House Appropriations Committee that the Soviets were believed to be interested in an equivalent to the Dyna-Soar. Tokaev’s account of Stalin’s interest in “aircraft of the Sanger type” had been available for years. However, public suspicions by the DDR&E in the United States and by secretary Leonard Carter of the British Interplanetary Society attracted new attention from the *Washington Post*. York specifically cited Soviet superiority in boosters as enabling more advanced work in such heavy vehicles. York, who had confined the Dyna-Soar in 1959, labeled the “Dyna-Soar a ‘serious program’ – but ‘not a high priority program.’” In contrast, Air Force Deputy Chief of Staff Lieutenant General Roscoe Wilson “called it ‘the most important program we have in the Air Force because we will never be able to talk about space flight until we are able to take off at the pilot’s option, control the vehicle and return it at the

pilot's option.”⁶³⁴ Certainly, an operational vehicle would be of finite practical use to the military unless it could be used with greater dexterity than the ballistic capsules whose launches were at the mercy of unalterable climatic factors and whose landings involved Navy search and recovery actions.⁶³⁴ Left unmentioned, however, in *Aviation Week's* report and Wilson's statements was the reiteration that the Dyna-Soar's ultimate operational mission would fit into the profile of a bomber. A week later, another article noted acceleration “in development as a research vehicle,” but reporter Craig Lewis quoted Deputy Defense Secretary Roswell Gilpatric that “it is unclear at this time” whether the Dyna-Soar would become a weapon system.⁶³⁵

Hints emerged of controversy about the degree to which space would or should be weaponized. In mid-June, a letter to the editor in *Aviation Week* promoted the peaceful use of space as a means by which to curtail “this overdone sword sharpening contest.” Alluding to military space advocates, the letter writer indicated that “if a child wants to do something dangerous or injurious to himself you don't focus his attention on it but rather you dig up something of more interest to divert his attention and the problem has solved itself.” This appraisal quickly drew fierce fire from another reader, who claimed that “we have enjoyed peace thus far because we, the United States, have been able to enforce the peace.” This letter writer suggested the introduction of the slogan, “space is for peaceful purposes, and aerospace power is for the preservation of peace.” A contemporary letter to the editor came from none other than Chief of Staff General White, praising an article which had showed that “aerospace is truly our new frontier.” Congress, convinced along similar lines, voted added funds for SAC long-range bombers and for the Dyna-Soar.⁶³⁶ Then, as in general, the public was composed of individuals and did not speak with a single voice; furthermore, many who spoke out urged a cautious stance, and they interpreted caution as requiring unassailable levels of military strength.

⁶³⁴ Johnsen, Katherine, “Missiles Dominate Research Budget Plan,” June 12, 1961, *Aviation Weeks* (microform).

⁶³⁵ Lewis, Craig, “Defense in Evolving New Weapon Plans,” June 19, 1961, *Aviation Weeks* (microform).

⁶³⁶ Muller, Francis J, letter to the editor, June 12, 1961, *Aviation Weeks* (microform). White, General Thomas, July 3, 1961, *Aviation Weeks* (microform). Callam, William K, letter to the editor, July 3, 1961, *Aviation Weeks* (microform). Johnsen, Katherine, “House Votes Bomber, Dyna-Soar Increase,” July 3, 1961, *Aviation Weeks* (microform).

Events suggested building Air Force space momentum in the middle of 1961. A June New York *Times* article about astronaut training specifically named the Mercury, Dyna-Soar, and Apollo in that order. Another *Times* article the following month asserted that Air Force astronaut selection had been done without publicity because of the official policy “that manned space flight was to be primarily a civilian venture under the direction of the civilian space agency.” The July article kept readers effectively informed as to the program’s outline, although another *Times* article the following month acknowledged that “the actual training of the Dyna-soar astronauts has not begun, partly because of the uncertainty and controversy still surrounding the project.”⁶³⁷ That controversy had still not dealt the Dyna-Soar a definitive blow during the new administration’s early tenure.

Chief of Staff General Thomas White, who had pioneered the term “aerospace” and had worked to advance the Dyna-Soar, retired at the end of June after forty-one years of military service. The National Geographic Society honored him with a bronze trophy of a male figure heaving a Saturn rocket into space. The annual award would be given to uniformed and civilian Air Force personnel for outstanding aerospace contributions. Geographic Society president Dr Thomas W McKnew “told President Kennedy that its purpose was to encourage and inspire further conquests of space after the example set by General White.”⁶³⁸ The recognition spoke to a consolidating cultural commitment to aerospace.

Aviation Week treated readers that summer to two very distinct interpretations of the lunar quest. NASA’s deputy administrator Dryden believed that the emphasis on the lunar goal, to the exclusion of concurrent scientific and technological gains from space exploration, was “getting [NASA] in trouble.” He told the journal he wanted the focus regarding the lunar mission to resemble that of the X-15, in which “speed advances are secondary to the flight knowledge gained.” Atomic veteran Trevor Gardner meanwhile warned the ARS that the United States was insufficiently bold with respect to technology: “Unfortunately, our society has a consistent record of having under-imagined the possibilities of the

⁶³⁷ Palmer, CB, “Search for Spacemen,” pSM28, June 25, 1961, New York *Times*. “50 Airmen Picked for Space Flights; Would Fly Military Missions – Projects Still Debated,” p33, July 23, 1961, New York *Times*.

⁶³⁸ “Space Award Set Up; Medal of Geographic Society is in Honor of Gen White,” p3, June 30, 1961, New York *Times*.

technological future, and of having under-reacted to the ominous significance of Soviet technological and military progress.” Furthermore, Gardner challenged contemporary estimates of the cost of a lunar landing. “It seems more probable that the lunar landing and return mission can be accomplished for approximately \$10 billion, rather than \$40 billion.”⁶³⁹ Certainly from the retrospective vantage after the Cold War, the pursuit of the Dyna-Soar seems a strong example of a US penchant for *not* “under-imagining” the potential of technology.

In advertisements, articles, and announcements, July issues of *Aviation Week* displayed the Dyna-Soar and noted the fluid character of air and space definitions. Midmonth, Honeywell Aerospace ran a full-page advertisement featuring the Dyna-Soar, and an illustration of the glider covered half of the page. “New and exciting programs, such as project Dyna Soar, have created these challenging career openings for engineers and scientists,” it announced. Boeing too ran a full-page advertisement in the same issue, announcing “immediate [...] openings for electronic and electrical engineers” to work for Boeing on Minuteman and Dyna-Soar. Boeing chose to divide its page vertically, using the right half as a form for job applicants. Corporations working on the Dyna-Soar recognized its eye-catching potency in attracting new talent. Soviet publications meanwhile decried the Midas III early warning and Tiros III weather observation satellites as spy vehicles similar to the U-2 plane. While strategic uses could be contended, the analogy to the U-2 suggested a potential Soviet rejection of satellites for reconnaissance. The US policy distinguishing between space and air would be in jeopardy, as Soviet intransigence could force the Air Force’s aerospace perspective to the fore. As if anticipating such a development, *Aviation Week* announced that “on September 25, *Aviation Week* and *Space Technology* will publish one of the most important issues in its history [...] ‘Forging military spacepower.’”⁶⁴⁰

⁶³⁹ “NASA Attempts to Sell Program As Broader Than Lunar Goals,” June 26, 1961, *Aviation Weeks* (microform). Gardner, Trevor, “Gardner Analyzes US Lunar Race Plan, July 3 1961, *Aviation Week* (microform). A retrospective estimate made for the House Subcommittee for Science and Astronautics in 1973 identified Apollo’s cost as \$25.4 billion. “America Starts for the Moon, 1957-1963: Project Apollo: The Debate.” <http://history.nasa.gov/SP-4214/ch1-4.html> (accessed Nov 11 2011).

⁶⁴⁰ Honeywell Aero advertisement, July 17, 1961, *Aviation Week* (microform). Boeing advertisement, July 17, 1961, *Aviation Week* (microform). “Washington Roundup,” July 31, 1961, *Aviation Week* (microform). *Aviation Week* advertisement, July 24, 1961, *Aviation Week* (microform).

In July, the New York *Times* identified Shepard's May trip and Captain "Gus" Grissom's spaceflight (the second US suborbital journey) "steps in the right direction." Ominously, however, "the experts consider the Soviet program as a one-way street with military domination of space the ultimate goal." Soviet secrecy, understandable US suspicion, and hysterical press and political claims intersected to prompt fear of hostile Soviet space potency. To answer this, several US projects were in the works but "all [were] several years from fruition." The *Times* identified the aerospace plane, a military space station named MTSS, a space logistics craft Slomar, and the "satellite intercept" craft Saint (which had actually been less belligerently redubbed "satellite *inspector*"). However, the Dyna-Soar, a "rocket-launched, manned orbiting bomber," headed the list of US military space projects underway.⁶⁴¹ Even when referring to fresh space accomplishments, general readership newspapers proved willing to reach for references to the nation's military efforts, and the Air Force's projected space bomber in particular.

The New York *Time*'s John Finney elaborated on this dynamic in the wake of Gherman Titov's 17-orbit trip on Vostok II in early August. Finney indicated that Kennedy's accelerations directed in May precluded the Titov flight from being either a surprise or a discouragement, and "the Soviet flight had no immediate military application." However, "it pointed to future capabilities in orbital reconnaissance or bombing and missile-launching vehicles." Military and Congressional calls for expanded space efforts therefore seemed inevitable. "So far the Air Force is precluded from the man-in-space field. But with each Soviet feat there is a growing impetus on Capitol Hill and in the Pentagon to accelerate the Dynasoar project," which was described as "a rocket-boosted space glider that would be capable of reconnaissance or firing bombs or missiles on earth targets."⁶⁴² Kennedy's May speech had helped provide a temporary inoculation against the worst criticism regarding imminent Soviet space spectacles, but clearly the nation's future course in space was far from settled even in the wake of the speech.

⁶⁴¹ "Soviet 'Space Skipper' Use is Suspected," pD14, June 17, 1961, *Washington Post*. "Scientific Goals Spur Expenditure of Millions in Space Drive," July 22, 1961, *New York Times*.

⁶⁴² Finney, John W, "Call for Urgency is Expected in US; Demand to be Renewed for Military Man-in-Space," p7, August 7, 1961, *New York Times*.

Pentagon officials considered the intersecting aerospace ventures as the executive and legislative branches differed over funding. Air Force Secretary Eugene Zuckert advised McNamara that the service wanted “to participate in the lunar program” both to help assure success and to “benefit from the technological fall-out of the lunar program,” but Gilpatric pointed out that much of the support work which the Air Force would be called to do would “contribute nothing to our current military strength” and that steps had to be taken to assure that the Air Force was not “unduly diverted from [its] primary military mission especially in the field of R&D.” Representing constituents and aware of repeated Soviet space spectaculars, Congress continued to push \$85 million more for the Dyna-Soar than the \$100 million which Kennedy wanted.⁶⁴³

Aviation Week invested late summer into raising alarms of growing Soviet space power. This included an article regretting slow work on anti-ICBM research and an editorial exploring the potential of a Soviet orbital bomber. The USSR had recently boasted of a 100-megaton thermonuclear warhead, and conjecture suggested that such a weapon delivered by a weaponized satellite could be detonated at extreme altitude and spray lethal effects over vast swaths of the planet. “Some will argue that this is an inefficient method of delivering this weapon to a target, and indeed it may be. But the real value of a weapon of terror such as the Soviets now are constructing is not in its actual use but in its psychological effect on the people over whom it is dangled like a Damoclean sword.” Hotz demanded public recognition that the Soviet Union was a “beast that is leaping for our jugular.”⁶⁴⁴ Rumor also suggested Soviet discomfort with allusions to the contrast between the limited piloting which astronaut Shepard had done during his flight and Gagarin’s nil opportunity to participate actively in his own earlier journey. This, however, was overshadowed by other stories.

⁶⁴³ Zuckert, Eugene, to Robert McNamara, August 1, 1961. 11271 “USAF-Docs/Correspondence 1957-1961,” NASA HQ. Gilpatric, Roswell, to McNamara, August 15, 1961. 11271 “USAF-Docs/Correspondence 1957-1961,” NASA HQ. Raymond, Jack, “Sharp Reduction in Troops Likely if Crisis Recedes; Prospect Disturbs the Army – Pentagon Said to Plan 53-Billion Budget for ’63 Troop Cut Likely if Crisis Recedes,” p1, October 7, 1961, *New York Times*.

⁶⁴⁴ Hotz, Robert, “Editorial: Defense Problems,” August 7, 1961, *Aviation Week* (microform). Hotz, Robert, “Editorial: the Nuclear Shoe Drops,” September 4, 1961, *Aviation Week* (microform).

Aerospace advocates promoted patriotic concern, not simply to elicit fear but to harness this for a proactive purpose: support for bold defense programs. For example, the September 4 issue reported on “Soviet space gains [that] threaten US security” and also printed the call to arms by a NACA veteran for a manned orbital assembly program. Hotz remembered the “many laughs in this country when Nikita Khrushchev [...] awarded himself a decoration for [Titov’s] space achievements.” However, Hotz contrasted the Soviet action with Eisenhower’s “ultra-conservatism that has now been ballyhooed into a homegrown American virtue,” and the former President’s attempts to stunt manned space projects at Mercury. Jerome Wiesner had meanwhile “led the ‘kill the Mercury’ wing” of advisers to both Eisenhower and Kennedy. Hotz concluded that “the cost of a medal to Nikita Khrushchev is a small price to pay for the support he has given his space technologists.”⁶⁴⁵ Political use of space was thus firmly endorsed. Furthermore, Hotz compared the Vostok’s suspected 10-day life support capacity with Mercury’s system in which “a 24-hour orbital flight [would be] a risky business,” and Hotz determined that the Soviets might possess capacity “for a quick [manned] round trip to the moon.” This was hardly reason to abandon the US lunar goal, but Vostok II seemed to warn “that it is impossible for the US lunar program recently established by President Kennedy to beat the Russians to a manned landing on the moon.” Contemporary reports listed Mayaguez in Puerto Rico, Santa Lucia Island in the Caribbean, and Recife in Brazil as potential landing sites for a suborbital Dyna-Soar I. Readers were informed that the Air Force hoped to bypass the suborbital stage, which would purportedly save two and a half years, putting the Dyna-Soar ahead of NASA’s Apollo schedule. Garrett Corporation ratified its confidence in the program by using a full-page ad to display its work on the glider’s cooling system.⁶⁴⁶ Fundamentally, the aerospace technology advocates preached a gospel of action.

Despite evidence of a culturally influenced affinity for aerospace development, the press could still convey ambivalent, mixed signals to the public. At the end of September, a New York *Times* article

⁶⁴⁵ Dr Arthur Kantrowitz worked for NACA’s gas dynamics section from 1936 to 1946 and was a Cornell engineering professor from then until 1956. At the time of his article, Kantrowitz worked as vice president of Avco-Everett Research Lab. “Soviet Space Gains Threaten US Security,” September 4, 1961, *Aviation Week* (microform).

⁶⁴⁶ “Industry Observer,” August 7, 1961, *Aviation Week* (microform). “Industry Observer,” August 14, 1961, *Aviation Week* (microform). Garrett Corp advertisement, September 11, 1961, *Aviation Week* (microform).

explained that the Dyna-Soar was a “manned orbital space glider,” whose “concept combines aircraft, missile and satellite technology.” Barely a week later, another *Times* article described the craft as “capable of being put in orbit and also capable of gliding back to earth.” Less flatteringly, the report declared that Dyna-Soar’s was “a name that calls up immediate images of prehistoric bogs and giant beasts.” The same day, another *Times* report described booster development and mentioned the Dyna-Soar “manned space glider.” Notably, none of these three articles identified the Dyna-Soar as a precursor to an Air Force aerospace bomber, although other earlier reports had done so. Significant, too, was the prediction that Saturn tests expected in the coming weeks would be outstripped by new Soviet boosters.⁶⁴⁷

Aviation Week dedicated much of its September issues’ pages to aerospace issues. As advertised, September 25 celebrated military space efforts. Hotz surrounded this issue with a series of editorial essays titled, “The Military Space Role,” with volumes I and II preceding the September 25 issue and volume III following it. Hotz’s series of essays argued strenuously for a military space being granted a more energetic role. The first essay, in the September 11 issue, noted that diverse figures such as longtime aerospace advocate Walter Dornberger, but also Mississippi Democrat Senator John Stennis and NASA Associate Administrator Robert Seamans “have voiced public concern over the current neglect of military aspects of the US space program.” Hotz asserted that military space progress had been restrained by two mistaken estimates by policymakers: overly pessimistic calculations of the time required for space research, and that “hanging the ‘peace’ label on our space program” would “score a great moral propaganda victory.” Hotz dismissed each of these notions as errors. Furthermore, “while it has been proved by the experience in aeronautics and nuclear physics that civil requirements can be accommodated within the framework of a military-oriented research and development program, it is already painfully

⁶⁴⁷ “Dyna-Soar Speeded; Air Force Awards Contracts Totaling 36.5 Million,” September 30, 1961, *New York Times*. Schmeck, Harold M, “What’s in a Name?; How the Many Rockets Receive Designations,” pM22, October 8, 1961, *New York Times*. Witkin, Richard, “US Pushes Rocket Tests; Firing Schedule Puts Nation in the Space Race in Earnest,” pM3, October 8, 1961, *New York Times*.

evident that the reverse is not true.”⁶⁴⁸ Aerospace advocates could indeed explain that military vehicles needed to be more resilient and cheaper than was necessary for science projects.

Hotz’s second and third installments expounded on then modified this point. The second essay argued for greater military representation in the decision-making space council, and it rued that “the USAF Dyna-Soar program [...] is currently stalled in the top Pentagon decision-making bayous.” The final essay assured readers, many of whom had “apparently misinterpret[ed] our comments as a plea for complete military domination of the space effort.” Such may have been conceivable prior to Sputnik, Hotz alleged, but was no longer practical in its wake. He nonetheless criticized “military conservatives” who “want to wait until all the basic research and development in space technology has been done by NASA and then decide at their leisure whether there are indeed any military applications of this technology.” This followed up on a theme from the first essay, that the importance of space “is glimmering among the top USAF brass, although research-minded younger officers have been hammering this theme since well before Sputnik I.”⁶⁴⁹ Although evidence of considerable top-echelon support for aerospace did come after Sputnik, Hotz’s charge must be tempered by remembering that the Dyna-Soar emerged as a unified project only after Sputnik I’s launch, and furthermore that the Air Force quickly moved to establish a Directorate of Astronautics, and furthermore that its top two officers were notable among the figures publicly urging not only the rhetorical and conceptual images of aerospace but of promoting the Dyna-Soar specifically. The Air Force’s highest officers might be accused of being overzealous – certainly not underzealous – in promoting aerospace.

Even in the issues leading up to its September 25 focus on military space, *Aviation Week* included significant information about the topic. LeMay’s interest in a coherent space plan was noted, as were proposals for a study of the feasibility of the Aerospace Plane which was hoped to step even beyond the Dyna-Soar. Dornberger, Vice President of Bell Aerospace, argued to engineers in Tennessee that space

⁶⁴⁸ Hotz, Robert, “Editorial: The Military Space Role – I,” September 11, 1961, *Aviation Week* (microform).

⁶⁴⁹ Hotz, Robert, “Editorial: The Military Space Role – II,” September 18, 1961, *Aviation Week* (microform). Hotz, Robert, “Editorial: The Military Space Role – III,” October 2, 1961, *Aviation Week* (microform). Hotz, Robert, “Editorial: The Military Space Role – I,” September 11, 1961, *Aviation Week* (microform).

belonged within the military's sphere. *Aviation Week* faithfully reprinted his speech, which advised "establishing a space bombardment system, putting reconnaissance and communication systems as well as logistic, inspection, and maintenance systems in space" and explained that these would require increased investment.⁶⁵⁰

Dyna-Soar did not stand alone at the center of attention on September 25, but it made recurring appearances within the context of military space aspirations. For example, one article explained that the Dyna-Soar "bridge[d] a gap between the conventional air-breathing craft of today and the deep-space craft of the future." The article identified the goal of a Step III bomber, but only after noting that the Dyna-Soar (I) "can serve as a laboratory to advance technology, to prove concepts, to test specific systems. Basically, the Air Force wants the Dyna-Soar to be a hypersonic test vehicle to explore the flight regime over a wide range of lift coefficients." The substantial article also described alternative booster arrangements (a far smaller text box elsewhere in the issue concisely accomplished this too), and provided a brief history of the boost-glide regime since Sanger's drafts during World War II. One report announced the Air Force Space Command's "charting future spacecraft needs." These included "a hydrogen air-breather with capability of flying into an orbit after takeoff from conventional runways" (Aerospace Plane), as well as a strategic satellite strike system "for retaliation from space," a recoverable booster, supersonic transport, and a military test space station.⁶⁵¹

Elsewhere, in articles and advertisements, the Dyna-Soar appeared, though usually not receiving as much focus. Three articles pointed to new changes in the wind. One article pondering the role of bioastronautics in setting the pace of space development and suggested that the Dyna-Soar and Apollo could be headed on a collision course for facilities resources: "a pressing schedule problem will exist when NASA's Project Apollo and USAF's Dyna-Soar are both concentrated at Cape Canaveral." Other stories noted Webb's days' old announcement that NASA's Mission Control Center would be cited in the

⁶⁵⁰ "Washington Roundup," September 11, 1961, *Aviation Week* (microform). "Industry Observer," September 18, 1961, *Aviation Week* (microform). "Dornberger Sees Space as Military Area," September 18, 1961, *Aviation Week* (microform).

⁶⁵¹ "Variety of Programs Typifies ASD Effort," September 25, 1961, *Aviation Week* (microform). "USAF Charting Future Spacecraft Needs," September 25, 1961, *Aviation Week* (microform).

Vice President's home state of Texas, and that civilian space paladin Overton Brooks' death on September 16 "will result in a radical change of course" in the House Science and Astronautics Committee which had had overseen. Indeed, in its following issue, *Aviation Week* reported that the new chairman (California Democrat George Paul Miller) "firmly believes the US space effort should be a step-by-step program rather than a headlong race to the moon."⁶⁵² Cumulatively, readers could recognize Air Force interest in space and *Aviation Week's* steadfast advocacy of these efforts; furthermore, while the journal stood among advocates of aerospace development "across the board," ominous signs appeared that it would not necessarily be as possible to pursue military and civilian tracks with simultaneous attention – both because of conflicts of priority and perhaps because of conflicts over resources.

October 1961 witnessed renewed public focus on US boosters. The New York *Times* reported on the 8th that Nova was envisioned as the really big booster which might carry lunar capsules, although that had not yet been decided because "a number of responsible rocket experts [Wernher von Braun] still are advocating" assembly of a lunar vehicle within earth orbit. Atomic Energy Commission Chairman Dr Glenn Seaborg spoke to the International Symposium on Aerospace Nuclear Propulsion at Los Vegas, urging greater funding for nuclear and electrical thrust programs and arguing that nuclear rocket development could be sped by a year through more adequate funding. Finney reported mid-month that the US position relative to the Soviets was "debatable" and that "the Saturn was conceived in a period of anxiety in 1958" without reaching "a priority pace" until January 1960. Finney explained that, "in some ways, Saturn has not kept pace with the growing weight of manned space capsules, and in other ways scientific thinking has not kept pace with the weight-lifting capabilities of the rocket." Doubts lingered as to whether a lunar mission should originate on earth or use earth orbit as a staging area; if the latter path were chosen, rendezvous would become an unequivocally vital capability in the near future. Although

⁶⁵² "Bioastronautics May Set Pace for Space," September 25, 1961, *Aviation Week* (microform). Martin ad, "Booster Ability," September 25, 1961, *Aviation Week* (microform). "Houston Picked for Space Flight Center," September 25, 1961, *Aviation Week* (microform). "Brooks' Death to Alter Space Group's Course," September 25, 1961, *Aviation Week* (microform). Wilson, George C, "Miller Opposes Stress on Race to Moon," October 2, 1961, *Aviation Week* (microform).

the rocket would soon be tested, its payload remained unsettled. “Aside from these orbital flights for the Apollo and possibly for the Air Force’s Dynasoar space craft, no other specific missions have been established for the Saturn rocket. No scientific payloads are being developed for the Saturn.”⁶⁵³ In October 1961, the Saturn’s launch of a prestige lunar capsule seemed likely; of a military prototype glider, possible; and of scientifically relevant projects, unforeseeable.

Debate about boosters followed Johnson during his tour of space installations during the first half of October, and spilled into additional dimensions in the space debate. *Aviation Week* noted that Gardner urged the prompt development of “large booster rockets designed for warfare,” and he deemed the lack of such rockets (whether liquid or solid chemical fueled, or nuclear propelled) as the most prominent technical shortcoming in the US space realm. The ARS too publicly assessed the “goals [and] gaps” in US programs; in New York, physicist James Van Allen noted particularly “what I regard as ‘the great chasm’ in our space exploration by the youngsters of the nation and the general public.” The availability of highly advanced space science literature did not address “a striking paucity of solid, fundamental literature in the field and a similar lack of treatises on the basic aspects of the subject. As a result, “our national ambitions have greatly outrun our national competence.”⁶⁵⁴ Van Allen’s concern about the need for an informed public bore similarities to the message Eisenhower had intoned in his Farewell about the need for an “alert and knowledgeable citizenry.” A representative structure of government, while necessary, was not alone sufficient.

While the ARS met, five months after Kennedy’s call for a lunar adventure, the method by which to reach the moon remained unsettled. Von Braun had noisily advocated launch and rendezvous in earth-orbit, assembling a final lunar vehicle at that point. This demanded not only perfection of

⁶⁵³ Witkin, Richard, “US Pushes Rocket Tests; Firing Schedule Puts Nation in the Space Race in Earnest,” pM3, October 8, 1961, *New York Times*. Hill, Gladwin, “Funds are Urged for Atom Rocket; AEC Chairman Warns of Program ‘Bottleneck,’” p20, October 25, 1961, *New York Times*. Laurence, William L, “Space Propulsion; Nuclear and Electrical Thrust Held the Best Means for Flights,” October 29, 1961, *New York Times*. Finney, John W, “US Plans to Fire Saturn this Week; Giant Is Slated for 225-Mile Test Flight,” p46, October 15, 1961, *New York Times*.

⁶⁵⁴ Kolcum, Edward H, “Vice President Begins Nationwide Tour of Major Space Installations,” October 9, 1961, *Aviation Week* (microform). Hotz, Robert, “Editorial: Education’s Role in Space,” October 16, 1961, *Aviation Week* (microform).

rendezvous techniques but also the in-space assembly of the lunar vehicle, but it promised to allow the project to move forward without having to wait for the development of extremely powerful superboosters. Webb believed that this step would save one to two years in the journey to a lunar mission. Nicholas Golovan, a Russian émigré educated in the United States and working as Associate Director of NASA, chaired the Large Launch Vehicles Group which sought to deliver recommendations on standardized boosters for the growing space program. *Aviation Week* predicted that the Dyna-Soar's first orbital launches "will probably employ a modified Titan II booster" because "chances of using a Saturn or other large booster now appear nil in view of Defense Secretary McNamara's coolness toward the Dyna-Soar program."⁶⁵⁵ Decisions on boosters were pending, and the country was now nearly a year into the administration of a space supporter, but the Dyna-Soar still appeared to be in distress.

Schriever championed the Dyna-Soar during this pivotal moment. Newly minted a full general, Bernard Schriever commanded the also new Air Force Systems Command, and spoke at the New York Coliseum to the American Rocket Society. At a pre-event press conference, he announced that a plan for accelerating Dyna-Soar would be presented to the Pentagon within 30 days. The *New York Times* wrote that Schriever and other aerospace advocates objected to "the frequent refusal of the Pentagon over the last few years to support ambitious research on manned space flight until a mission requiring such capabilities could be defined." Schriever laid most of the blame on the Eisenhower Administration and "went on to say that there [has] 'definitely been a change' with the Kennedy Administration" since both President Kennedy and Vice President Lyndon Johnson supported space research. "Yet it was evident from his plea for removal of 'inhibiting' restriction that he was far from satisfied." Reporters asked whether projects like the Dyna-Soar were inconsistent with a speech Kennedy had made to the United Nations the previous month, calling for space to be reserved wholly for peaceful uses. The general denied any consistency, arguing that "'it is desirable to reserve any medium for peaceful purposes. But I think we are living in a practical world and have to develop those things necessary for the nation's security,

⁶⁵⁵ "ARS Underscores US Space Goals, Gaps," October 16, 1961, *Aviation Week* (microform). "Industry Observer," October 16, 1961, *Aviation Week* (microform).

[and] if certain things can be done best in space,' he continued, 'then certainly we must do them. I don't think the President infers that we won't.'⁶⁵⁶ Schriever's answers projected a definite degree of confidence which Kennedy's own rhetoric and policies had not fully indicated.

The day after Schriever's speech, the Pentagon approved an Air Force proposal to use a new booster in place of the Titan II, which had displaced the less powerful Titan I earlier in the year. The new rocket, Titan III, was a Titan II but modified by the addition of a pair of solid propellant boosters on its sides. The *New York Times* reported in early November of Golovan's search for rockets "to serve the over-all national space program" which would be "used interchangeably in civilian or military programs," and thereby avoid unnecessary waste through establishing parallel, siloed civilian and military booster programs.⁶⁵⁷

Ironically, common boosters risked blurring a line whose existence Schriever had bemoaned to the ARS, but which the Eisenhower Administration had been so careful to preserve that it had prevented von Braun's team from lifting a satellite into orbit by using a converted ICBM in 1955-58. Schriever and others had noted the hostile sign of the Soviet Union lifting space probes and nuclear warheads with the same rockets. Contemporary Mercury boosters were Redstone and Atlas rockets (ICBMs), and successor boosters in the Titan class were ICBMs too. But the effort to consolidate booster programs went a step further. It potentially opened the door to military projects in space far too large to be launched by a mere ICBM. The *Times* noted that the Titan III could conceivably lift Advent military communications satellites into a 22,500-mile orbit, but the most likely task would be to carry Dyna-Soar craft on orbital flights.

Distinction – or lack of it – between military and civilian projects carried operational implications as well as political ones. In keeping with his earlier positions, Johnson favored greater closeness between civilian and military space efforts. *Aviation Week* reported his assertion that it was "not useful to pretend

⁶⁵⁶ Witkin, Richard, "Air Force to Push Dyna-Soar Drive; Schriever to Urge Earlier Test and Wider Capacity," p15, October 13, 1961, *New York Times*.

⁶⁵⁷ Witkin, Richard, "Agreement Near on Hybrid Rocket; Solid-Fuel Building Blocks' Would Help Loft Titans," p17, November 1, 1961, *New York Times*.

that arbitrary distinctions can or should be made between the two,” because “the same engineering, the same scientific knowledge, and the same values of man in space are applicable to defense and non-defense objectives.” The Air Force, however, was not entirely convinced that it wanted to use the Saturn booster; a solid booster system could offer greater flexibility in use. Even more significant for the future, a separate Air Force booster could help guarantee an autonomous role for the service in assuring the peaceful use of space by its aerospace power presence. *Aviation Week* noted that the Dyna-Soar itself evoked “sharp division” even within the Air Force. However, “*some Air Force supporters feel its greatest contribution is to get the Air Force back into large booster development, for which it must have a mission-oriented program*” [italics added].⁶⁵⁸ For these conditional supporters, the objective of the Dyna-Soar was not the mission it would fulfill in space or even the research that it would accomplish, but rather the fact that it would be a payload requiring a potent booster capable of lifting something else in the future.

For Kennedy, space initiatives pursued multiple goals. Arguably, they provided credible opportunities for cooperation, and they certainly offered the chance to compete against the Soviet Union for prestige at home and globally. Parallel purposes could be achieved also by taking stances on issues such as the Soviet’s atmospheric test of the 50-megaton Tsar warhead that fall; Kennedy led “worldwide protest” to what was not only history’s biggest nuclear detonation but the 28th announced Soviet test in barely two months. Additionally, Kennedy viewed government spending, including that on space, as one of the tools for reversing the nation’s frustrating signs of recession lingering from 1958. Contemporary articles in *Aviation Week* noted the Administration’s “attempt to harness space and military spending to its economic recovery effort.” The journal also noted “plans to control [the] space dollar impact.” In

⁶⁵⁸ “Solid Booster to be Developed for USAF,” October 30, 1961, *Aviation Week* (microform). Kolcum, Edward H, “Rendezvous is Urged for Moon Flight,” November 6, 1961, *Aviation Week* (microform).

particular, the objective was “to invoke a far larger proportion of the nation in the space program” because of a “fear that enthusiasm for [space spending] will slacken once the true costs are realized.”⁶⁵⁹

Costs had to be weighed against benefits, and space investment needed to measure up. On the NASC, Edward C Welsh considered the lunar mission “necessary,” but conceded that “it is not easy to give an educated answer to a question about something which has never been accomplished” or to reply to the question “aren’t there better uses for the money?” A San Diego electronics engineer wrote to *Aviation Week* in defense of space investment. “Space competition can take the place of war, as long as space enthusiasm holds up.”⁶⁶⁰ Crucially, this view of the space race as an alternative to war presupposed that the space race would not be a weaponized field of conflict. The Dyna-Soar’s aerospace advocates were determined to defend the nation’s security; they were suspicious of the potent totalitarian regime headquartered in Moscow; they were convinced that the peaceful use of space had to be guaranteed through strength rather than clumsily depended on through promises.

Yet this point marked a departure for the Dyna-Soar. *Aviation Week* reported on November 20 that the Dyna-Soar “is no longer being pushed as a potential offensive weapon system.” Instead, “emphasis [was] being placed on surveillance, maintenance and rescue tasks.”⁶⁶¹ As has been seen, advocates had placed additional possible tasks on a hypothetically operational Dyna-Soar since the program’s origins. Its promoters had made these additions to show the flexibility of the boost-glide system and actions had testified to their enthusiastic interest in the concept. The Dyna-Soar had seemed to manifest incredible potential, which might be applied in multiple directions.

Technological limitations stood at the core of this concession. The vehicle’s design reportedly housed a 75-cubic-foot space in the “belly [...] for installation of about 1000 lb of payload.” Most US nuclear weapons exceeded this weight. Furthermore, as had been recognized by skeptical scientists

⁶⁵⁹ “Kennedy Leads Worldwide Protest on Soviet Plan to Test Huge Bomb,” October 23, 1961, *Aviation Week* (microform). “50-Megaton Blast Tops Soviet Nuclear Test Series,” November 6, 1961, *Aviation Week* (microform). “Washington Roundup,” October 16, 1961, *Aviation Week* (microform). Wilson, George C, “US Plans to Control Space Dollar Impact,” November 13, 1961, *Aviation Week* (microform).

⁶⁶⁰ Welsh, Edward C, “Welsh Analyzes US Space Expenditures,” October 30, 1961, *Aviation Week* (microform). Flarity, Warren H, letter to the editor, November 6, 1961, *Aviation Week* (microform).

⁶⁶¹ “Industry Observer,” November 20, 1961, *Aviation Week* (microform).

almost since the first advocacy of orbital weapons platforms, a bomb could not simply be “released” into orbit but instead needed to carry a guidance system which would control its return to earth on a relatively precise spot. Nonnuclear weapons harnessing the potential of light (lasers) or of microwave energy (masers) remained at the stage of hypothesis only.⁶⁶² In truth, the Dyna-Soar not only faced its technological challenges as a vehicle, it needed to house a considerably larger payload before it offered any technologically feasible promise as a weapons platform.

Cumulatively, then, modifying the focus of the Dyna-Soar in the fall of 1961 indicated a setback at least as damning as the limitations which York had introduced in April 1959 with his call for a suborbital research priority or as the time-consuming Phase Alpha which Charyk had directed six months afterward. The Air Force had begun to come to grips with the limitations of the Dyna-Soar during LeMay’s 1960 evaluation of future systems, when he concluded that the B-70 and even nuclear jet propulsion held more foreseeable promise than did a top-priority investment in a boost-glide aerospace bomber. McNamara enunciated even less eagerness when he told Congressional representatives that the program was being “re-examin[ed].” If the program warranted redirection, the Administration could “react quickly.” However, possible reorientation would be conducted “within the funds requested by Fiscal 1962.”⁶⁶³ McNamara did not leave the door open wide to spending the \$85 million extra dollars which Congress had voted for the glider, but which the President had not requested.

In spite of the hardships, the Dyna-Soar still inspired support from interested members of the public who were frustrated by the seemingly lackadaisical pursuit of the boost-glide pioneer. Frederick Pilcher was then a physics student seeking a Masters degree at the University of Kansas. *Aviation Week* had already published his letter to the editor commenting on the October failure of the space-related communication project West Ford. On November 27, *Aviation Week* published another letter from Pilcher; this one addressed the Dyna-Soar program and a surplus of seats in commercial aviation. He expressed disappointment at the country’s “still making only a hesitant and half-hearted effort on the

⁶⁶² “Industry Observer,” November 20, 1961, *Aviation Week* (microform). “Complete List of All US Nuclear Weapons.” <http://nuclearweaponarchive.org/Usa/Weapons/Allbombs.html>

⁶⁶³ Booda, Larry, “Kennedy to Stand Firm on Bomber Funds,” November 6, 1961, *Aviation Week* (microform).

Dyna-Soar program when this project deserves, in fact, the highest possible priority.” He continued that “Dyna-Soar has a number of very useful applications as a weapons system: an optical surveillance platform invulnerable to ordinary anti-satellite defense measure because it is maneuverable; a carrier of nuclear weapons for bombardment of enemy countries; and a means to intercept and destroy Russian Dyna-Soar type craft.”⁶⁶⁴ Pilcher spoke for Dyna-Soar’s advocates when listing potential range of operational uses for a working boost-glide vehicle functioning in a Cold War aerospace realm.

Pilcher identified psychological impact as well. “A panic of unprecedented proportions” would “sweep the country [...] if the Russians get the Dyna-Soar first and start flying nuclear weapons over our skies.” Developing a Dyna-Soar before the Soviets built one would turn the tables “and keep the Russians in line.” As policymakers had done before, citizen Pilcher too acknowledged that the Soviets’ precise plans could not be known but their intentions seemed hostile; the future of technology appeared far more knowable. “Dyna-Soar is the next big advance after the ICBM. Disaster will follow if we are as negligent as we were with ICBMs 10 years ago. I hope that the Russians are not working on Dyna-Soar type craft; otherwise this country is facing more trouble than it ever knew existed.”⁶⁶⁵

While Pilcher studied science at KU, Donald Wollheim continued writing a popular science fiction series published by Doubleday. Wollheim had written science fiction since 1933 and had reputedly invented the paperback science fiction genre. Space was an enticing subject. Normally far outside the science fiction realm, HA and Margaret Rey published *Curious George Gets a Medal*, in which the simian protagonist takes a suborbital trip into space. Ironically, this addition to the *Curious George* series appeared just weeks before the Soviets’ Sputnik II put a live creature into orbit (although without plans for recovery). By 1961, the prospect of manned space travel provided a terrific environment for writers seeking to attract youth readers. Wollheim’s protagonist was the fictional Air Force astronaut Mike Mars. A pattern worthy of youths’ emulation, Mike Mars drank milk instead of coffee (or liquor), displayed

⁶⁶⁴ Biography, “Frederick Pilcher.” <http://enchantedskies.org/pilcher.pdf> (accessed October 10, 2011). Pilcher, Frederick, letter to the editor, November 27, 1961, *Aviation Week* (microform).

⁶⁶⁵ Pilcher, Frederick, letter to the editor, November 27, 1961, *Aviation Week* (microform).

modesty and determination, and minded his parents' advice given during his boyhood.⁶⁶⁶ Of the eight books ultimately in the Mike Mars series, Doubleday printed the first four in 1961: *Mike Mars Astronaut*, *Mike Mars Flies the X-15*, *Mike Mars at Cape Canaveral*, and *Mike Mars in Orbit*.

Next in the series would be *Mike Mars Flies the Dyna-Soar*, published in 1962. This time the Air Force hero would fly the Dyna-Soar into orbit (implausibly) using a Titan I booster in order to rescue his Cherokee-descended counterpart Johnny Bluehawk; Bluehawk's thinly veiled "Quicksilver" capsule was unable to land because of a hurricane, so Mike Mars used the Dyna-Soar to conduct an in-space rendezvous and rescue. Published in 1962, the work on this volume of the Mike Mars series would have been conducted while the first four volumes were printed and as the US space program began to truly solidify under Kennedy. Significantly, the Dyna-Soar features as the rescuing *salvation* for the trapped Mercury astronaut. Introducing a hurricane to the story, challenging the concept of oceanic capsule recovery, underscored the advantages which Dyna-Soar's advocates boasted that a glider would possess. But flying as a rescue vehicle placed the Dyna-Soar deeply within the realm of its erstwhile secondary envisioned functions. Early books in Wollheim's series had identified space exploration as a "race," but had shied away from even overt mention of the Soviets; a bomber mission might have been difficult to place into such a context.⁶⁶⁷ Wollheim's popular children's science fiction works not only played a very indirect role in shaping public opinion about space programs, they also reflect elements of that opinion. The public, Doubleday presumably believed, was ready for science fiction books on space, including works which pointed to the shortcomings of capsules and a more versatile alternative.

Aviation Week reports in December hinted at intersections between military and civilian space endeavors. The public learned statistics about Mercury tests with various boosters, and of plans to construct a series of two-piloted Mercury Mark II craft. It would soon be renamed "Gemini," though the

⁶⁶⁶ "Donald A Wollheim, Publisher, Dies at 76." November 3, 1990, *New York Times*. Flood, Justine, "The Thunder Child? The Mike Mars Series Sourcebook." <http://thethunderchild.com/Books/MikeMars/MikeMars.html> (accessed November 13, 2011). "The Mike Mars Children's Series." http://boggsspace.com/mike_mars.asp (accessed November 13, 2011).

⁶⁶⁷ Justine Flood, "The Thunder Child? The Mike Mars Series Sourcebook." <http://thethunderchild.com/Books/MikeMars/MikeMars.html> (accessed November 13, 2011).

journal related suspicions that the new name had been given “so that Life magazine’s contract with the seven [Mercury] astronauts for exclusive rights to personal accounts of their activities would not extend through the new program.” Gemini crews could “come from the X-15 USAF and NASA pilot pool, or from the pilots being trained for the USAF Dyna-Soar program.”⁶⁶⁸ The most famous of these potential Dyna-Soar pilots who would be taken into NASA for Gemini (and ultimately Apollo) was Neil Armstrong.

Air Force space advocates pressed ahead, although signs suggested that its dreams did not align with the priorities of the Kennedy Administration and were out of step with events. *Aviation Week* noted an Air Force concept for a three-man lunar rover “capable of performing [...] logistic functions” to support “a military base on the moon” thought possible by 1966. An Air Force study was also under way to consider a prefabricated lunar shelter. But, also in December, representatives of the United States and the Soviet Union “reached agreement [...] on two critical areas – disarmament and the peaceful uses of space,” within the context of United Nations dialogue.⁶⁶⁹ A weaponized Dyna-Soar which complemented Air Force intentions might upset Administration progress in preventing the spread of weapons into space.

Yet aerospace advocates discovered an encouraging Christmas gift in 1961: the Dyna-Soar appeared to be back on track. The accelerated development program was approved on December 11, and the *New York Times* informed readers on December 24 that the Air Force’s 1.5-million-poung-thrust Titan III had been approved. “The permission for the Air Force to proceed with the development of Titan III was an indication that the Administration had acceded to long-held Air Force desires to push the Dyna-Soar project into the orbital phase. [...] This would represent a change in the past Defense Department opposition to military man-in-space missions.” No updates yet came regarding the \$85 million in

⁶⁶⁸ Kolcum, Edward H, “Manned Space Flight Program Expanded: McDonnell to build 12 two-man capsules and modify four Mercury spacecraft for flights of 18 orbits,” December 18, 1961, *Aviation Week* (microform). “Washington Roundup,” January 8, 1962, *Aviation Week* (microform).

⁶⁶⁹ Miller, Barry, “USAF Sees Need for 3-Man Lunar Rover,” December 18, 1961, *Aviation Week* (microform). Stone, Irving, “USAF Plans Lunar Shelter Design Study,” December 25, 1961, *Aviation Week* (microform). “US, USSR Agree of Space, Disarmament,” December 18, 1961, *Aviation Week* (microform).

additional money Congress had voted for Dyna-Soar, which had so far withheld by the Administration.⁶⁷⁰

After the encouragement of a powerful booster, and thus the implicit approval of an orbital flight plan, surely the additional money would be forthcoming to a project now recognized as vital to national security and its future in space. Such might well have been the expectations of the Dyna-Soar's paladins.

Three days later, page 1 of the New York *Times* brought word of a "major revision" in the Dyna-Soar program. On December 26, the Air Force had been authorized to skip the suborbital stage of flight and move on directly toward an orbital test using the powerful new Titan III intended for the glider. DOD had long maintained that the "Dyna-Soar should be limited to relatively low-priority research objectives aimed at exploring the technical problems of maneuverable space vehicles" because of "the absence of clearly established military requirements for manned space flight." Of course, aerospace advocates felt they had effectively – and repeatedly – made just that case. For example, the *Washington Post* had mentioned that Schriever's address to the ARS had reiterated that "man can do much in space that instruments cannot."⁶⁷¹

For those readers who had followed Dyna-Soar news intently, two issues were left unsaid in these late December articles of the New York *Times* and *Washington Post*. First, references to the Dyna-Soar's Phase III operational ambition was absent. It was "a manned space glider" and "an orbital spacecraft," built "to develop and demonstrate the capability of manned space flight in which pilots can return from orbit and land in conventional manner at air bases."⁶⁷² The *Times* noticed that "one reason for bypassing the suborbital flights was the geographical and diplomatic complications of finding a suitable landing spot." The newspaper did not, however, contemplate the possibility of fiscal issues prompting the decision by the Kennedy team. Continuing the program, but eliminating the suborbital phase of

⁶⁷⁰ Finney, John W, "Clearance Given for Giant Rocket; Advanced Missile Slated for Big Load-Lifting Job," p22, December 24, 1961, New York *Times*.

⁶⁷¹ Finney, John W, "Air Force Authorized to Orbit Its Projected Dyna Soar Glider; Air Force Plans to Orbit a Pilot," p1, December 27, 1961, New York *Times*. Simons, Howard, "Schriever Says Peace-War Division Of Space Effort Is Futile, Costly," pA4, October 13, 1961, *Washington Post*.

⁶⁷² Finney, John W, "Air Force Authorized to Orbit Its Projected Dyna Soar Glider; Air Force Plans to Orbit a Pilot," p1, December 27, 1961, New York *Times*. Norris, John G, "AF Revises Dynasoar Program To Speed Up Orbiting of Glider," pA4, December 27, 1961, *Washington Post*.

development, would save both time and money. Aerospace paladins focused on the encouraging factor of saved time. The *Times* and the *Post* and *Aviation Week* did not pause to publicly consider whether the Administration had focused primarily on the fiscal factor. Perhaps Kennedy and his advisors had expedited the program to save funds more than to speed development. The continued withholding of the \$85 million voted by Congress strongly indicated this possibility, but at the time it did not seem to be perceived outside Administration.

Contemporary with these decisions, a new trend seemed to be emerging in the defense sector. New York *Times* reporter Jack Raymond noted that “high officials of the Pentagon are troubled by the number of organizations, some technical, some with business interests and some purely lobbyist, that have sprouted in the defense industries.” Defense officials “recognize[d] that many of these groups are useful to contractors and the Government,” but that both defense industry companies and Pentagon officials wished for fewer organizations.⁶⁷³ Raymond did not provide examples of the lobbying organizations which had overrun Washington and which caused complications as well as opportunities to governance and defense. Strangely, too, the article did not mention whether this was an example of what the former President had warned of just eleven months before. The *Times* closed the year by noting that “procurements are beginning to rise,” according to brokers, “with the approval of the Dyna-Soar, Apollo and the several Saturn programs.” *Times* reporter John Finney told his readers that one more supposition, built on the seemingly rock-solid context of the Pentagon approval but lacking a study of the implications of the money withholding. “The announcement had the effect of putting the Air Force squarely into the manned space flight business on about equal terms with the civilian space agency.” And so it had seemed that the United States would now pursue both arms of space development.⁶⁷⁴

Aviation Week concurred. In its New Year’s Day 1962 issue, the journal pointed to two developments which “indicate[d] a brighter outlook for manned military spacecraft.” First was DOD’s “acceptance of a partly accelerated Dyna-Soar project,” and the other was NASA’s interest in fuller

⁶⁷³ Raymond, Jack, “Pentagon Troubled by Rise in Industry Groups Asking for Help,” p7, November 14, 1961, New York *Times*.

⁶⁷⁴ Crane, Burton, “Market Steady; Turnover Rises,” December 29, 1961, New York *Times*.

cooperation with the military regarding “manned space flight and rendezvous.” Reporter Larry Booda called the Dyna-Soar “unique in one respect. It has received a go-ahead at the Defense Department level without the Air Force having to prove a military requirement for it. About a year ago, USAF was forced to try to justify the project by stating a military mission in order to keep the project alive.”⁶⁷⁵ The Dyna-Soar, which had survived the budget-minded Eisenhower Administration intent on using space for nonweaponized reconnaissance, had now survived the first months of the new Kennedy Administration. The program appeared to exist on a more secure footing, but although work on the glider proceeded, the reason for its existence remained under siege.

⁶⁷⁵ “Washington Roundup,” January 1, 1962, *Aviation Week* (microform). Booda, Larry, “Dyna-Soar Decision Ends Long Impasse,” January 1, 1962, *Aviation Week* (microform).

Conclusion: CULTURE'S ENDURING HAND

Since the general public does not govern, presidential influence is shielded from the vagaries of shifting sentiment. - Richard Neustadt, 1959⁶⁷⁶

Was Neustadt correct, when he wrote toward the end of Eisenhower's Presidency, that the Office was insulated from "shifting sentiment"? This study of the way in which doctrine, policy, and dominant vocalized tenets of culture impacted the development of the Dyna-Soar and the formation of US space policy and programs during the crucial first years of the "space race" suggests that the answer is resoundingly equivocal - yes and no. By standing for election only every four years and by wielding impressive formal power and persuasive opportunity in intervening years, a President is certainly protected from the immediate but ephemeral buffeting which would otherwise confront the officeholder. This notion, however, risks underestimating the staying power and ultimate force of public views in a representative system. When opinions mesh with the contours of culturally vindicated assumptions, sentiments do not necessarily shift like sands.

Culture matters. In the 1950s, a dominant and vocal strain within the US national public culture favored technological solutions to problems because *people believed that technology worked*. Michael Adas asserted a continuous character in the US allegiance to technology. Adrian Lewis added more specifically that "new technologies, operational doctrine, and strategic plans created the belief that the United States could achieve its political objectives without a decisive ground war."⁶⁷⁷ From the middle of the twentieth century, circumstances favored a strong adherence to that belief. In the Second World War, industrial technology had helped ensure victory over Nazis in Europe and atomic bombs had coincided with victory in the Pacific. At home since the war, new and abundant technologies made life more comfortable and exciting. Developments like the Salk vaccine against polio also made life safer, brushing aside what had been a potential tragedy menacing every family. President Eisenhower understood the value which these technologies carried, and he strived to maintain adequacy in defense in the belief that

⁶⁷⁶ Neustadt, Richard E., *Presidential Power: The Politics of Leadership* (New York: Mentor, 1964), 91.

⁶⁷⁷ Adas, Michael, *Dominance by Design: Technological Imperatives and America's Civilizing Mission* (Cambridge, MA: Belknap Press, 2006). Lewis, *American Culture of War*, xviii.

this would allow robust prosperity which Americans enjoyed; Eisenhower specifically noted the importance of Salk's vaccine when describing recent and vital US scientific accomplishments to countrymen in the wake of Sputnik II. Eisenhower applied the cultural proclivity toward technology in defense as well: the "New Look" emphasized technology – especially nuclear and airpower technologies – and alliances which allowed their most advantageous deployment. Dwight Eisenhower was no luddite.

Nonetheless, from the Sputniks forward, Eisenhower would become much maligned by many space advocates in the press and in Congress, and these resentments were heard, sometimes echoed, and normalized by the populace at large. The successive shocks of Sputnik I and Sputnik II disconcerted the US public, because the realm of technology which had produced multiple recent miracles for them had now been harnessed by a superpower considered, in the President's own words, "hostile in nature [and] global in scope." Finite reconnaissance information and a four-decade legacy of military service helped permit the President to recognize the Potemkin character of the Soviets' implied threat more accurately than did a public which could not be privy to secret intelligence images. Without tipping his hand on U-2 reconnaissance, the President's assurances appeared to many people to be hollow or foolhardy. His reluctance to embrace technological paths toward parity with the presumed space power of the Soviets was out of touch with US cultural tenets although it was not a national defense mistake.

The Air Force, principle beneficiary of the widespread cultural support for technology and the specific decisions of the "New Look," looked forward to further extension of its responsibilities and its role as the country's most visible protector. In describing the development of the B-52 bomber which proved the mainstay of SAC units from the Eisenhower years until the Command's disbandment, Mark Mandeles noted that "many weapons or tools have waited years for the emergence of an appropriate social structure to make their employment possible."⁶⁷⁸ Indeed, aerospace advocates within the Air Force remembered this fact and anticipated imminent trends in government policy to follow the course it

⁶⁷⁸ Mandeles, Mark D, *The Development of the B-52 and Jet Propulsion: A Case Study in Organizational Innovation* (Maxwell AFB: Air University Press, 1998), 21.

expected cultural tenets to pave. A dominant element of the US society in the late 1950s was basically prepared to accept, with enthusiasm, the emergence of a Dyna-Soar series if it could be developed.

Administration positions assiduously impeded this path. Civilian officials promptly ordered the disbandment, in December 1957, of the just-announced Air Force Directorate of Astronautics, which would have controlled the Dyna-Soar. The following year saw the establishment of ARPA and the conversion of NACA (which assisted the Air Force) into NASA (which was the Air Force's rival in space). In 1959, DDR&E York confined the Dyna-Soar to hypersonic flight research along the lines which had interested NACA in the 1950s but which the Air Force considered simply prerequisite means and not an objective. At the end of 1959, Air Force Assistant Secretary for R&D Charyk ordered a review which stalled Dyna-Soar development soon after its contractor (Boeing) had been selected. In the face of these Administration steps, the Air Force sought to refine and formalize its aerospace thinking and to present its culturally attuned perspective to interested members of the wider public.

Air Force leaders had reason for confidence, expecting that more permanent cultural forces would overcome resistance by particular officials. Furthermore, the development of earlier strategic bomber weapons systems had encountered and overcome greater difficulties than the annoying obstacles which the Administration had thus far placed in front of the Dyna-Soar. Prior to the Second World War, orders for the B-17 Flying Fortress had once been cancelled. The B-36 Peacemaker had been challenged by the Navy after the conflict. In the sparse years between the end of the Second World War and the adoption of Containment Policy, development of the B-52 Stratofortress had nearly been ended as well. All three of these ultimately survived to become the outright embodiments of US airpower. Given this track record and the cultural affinity for promises offered by new technologies, the Dyna-Soar's advocates felt some justifiable self-assurance that their vision of future national security would become realized.

John Kennedy's election in the fall of 1960 promised dramatic changes in defense and in space as well as in realms like economics, which the President-elect associated in a different way. Bowing to the need for some psychological victories, Eisenhower had acquiesced to modest space projects and to the Project Score stunt in 1958. Focused on the need for reconnaissance, the Administration's officials

wanted useful intelligence satellites to emerge covertly. For four years following the Sputnik launch, Dwight Eisenhower tried to establish a pragmatic space policy and to encourage the public to embrace a more rigorous interpretation of citizenship. Eisenhower continued to base national security on reliance on power projection technology offering nuclear deterrent, and cultural attitudes continued to ascribe potency to technological systems. However, Eisenhower sought to prompt a reevaluation of how these tenets should mesh with future policy and strategy. Rather than trying to reshape cultural values to fit the best space posture that could be mustered (as Eisenhower tried, in a sense, to do), Kennedy worked largely to fit his space posture to conform to public demand, and then to subtly redirect public attention to some elements of the nation's space efforts rather than to others.

Sections of the public, media, and representatives interested in US space activity did not appear to discriminate much between civilian and military initiatives during this critical period. Furthermore, they seemed unable to fathom the implications which accompanied those distinctions. Rather than demanding a change in the culture, Kenney effectively presented the country with an alternative initiative which distracted it from potentially supporting military efforts in space. Kennedy's various calls for action in 1961 could not be interpreted as inactivity the way Eisenhower's had been. The new President appeared willing to move forward on both the military space and the civilian space fronts, a dual approach which might minimize public negative reaction. During 1961 Kennedy effectively drew national attention from military projects such as the growing Dyna-Soar and instead to the bolstered civilian space undertakings by NASA. Under Kennedy at the end of 1961, the Dyna-Soar seemed set to move forward, skipping the limited stage which York had decreed earlier and bypassing the vision which the Air Force had wanted in the first place. The Kennedy Administration was in the process of successfully, if expensively, realigning – not rejecting – the value and faith which so many parts of the culture placed on technology.

Kennedy's approach shows far more political skill and accordance with public mood, but it is simultaneously less deliberate in its leadership and it ultimately proves less than statesmanly. Historian Desmond Ball acknowledged a "hasty" character to early Kennedy defense decisions, but he argued that

“while the haste was unnecessary and quite avoidable, the politics were perhaps inevitable.”⁶⁷⁹ But, with respect to space and the Dyna-Soar, the politics actually became “inevitable” because figures like Johnson and later Kennedy influenced attentions during the late Eisenhower years. Writing in the wake of the Vietnam War, historian Richard Aliano criticized Kennedy’s advocacy of both strategic and conventional buildup and in “confronting crises” as each being “part of the final climactic Communist assault upon world freedom.” As a result, Aliano asserted that Kennedy “failed to define the limits of the United States’ commitments and responsibilities” as his predecessor had.⁶⁸⁰ This charge can in part transcend Aliano’s topic and extend to the contest in space, but it requires an important modification which introduces the potency of cultural beliefs and addresses its interaction with two other mutually decisive factors.

More than any other single individual, a President sets national policy. As Neusdadt’s contemporary remark asserted, this policymaking is not necessarily interrupted and derailed by momentary alterations in the national breeze. However, public opinions galvanize when they mesh with culturally valued attitudes. Policymakers ignore cultural views at the peril of their own careers. Furthermore, in the long run, cultural views will reassert themselves and overcome the actions of individual, isolated, and chronologically finite policymakers. Representative systems deliberately enshrine methods by which realignment can occur smoothly and without violence. That said, while policymakers can indefinitely afford to ignore culturally valued tenets, policymakers can and do seek to interpret, reflect, and influence these values in ways which complement the objectives and methods which the policymakers themselves pursue.

Policy, like military doctrine, must abide by the norms broadly set by the values instilled by a society’s public culture. Air Force doctrine worked to keep in step with the tenets of that contemporary culture in the late 1950s and early 1960s. Eisenhower aimed to maintain a credible deterrent and a powerful economic position by pursuing a posture which agreed with the culturally endorsed belief in technology. Seemingly boundless advances in Soviet space technology triggered concern among many –

⁶⁷⁹ Ball, Desmond, *Politics and Force Levels: The Strategic Missile Program of the Kennedy Administration* (University of California, 1981), 277.

⁶⁸⁰ Aliano, *American Defense Policy from Eisenhower to Kennedy*, 277.

particularly in the Air Force but also in the media and the public and on the political stage – to guarantee national safety by using supposedly tried and true methods. Cultural tenets led many of these people to translate this concern into a determination that national security took the form of space-oriented technological endeavors. In the Dyna-Soar, the Air Force possessed a vision seemingly ready to attract enthusiasm and support.

Policymakers and opinion leaders occupy positions from which it is possible to introduce nuanced adjustments to popular perceptions. During the pivotal time between 1957 and the end of 1961, both Dwight Eisenhower and John Kennedy used their executive office to promote adjustments in the way that cultural tenets were popularly perceived. Some of Eisenhower's most famous speeches sought to refocus attention back toward the long pull character of the New Look. Eisenhower meant not to repudiate the tenet which brought popularity to technology but instead to adjust this tenet in ways which would bolster the policy he had developed while President. His speeches in the wake of Sputnik I and II and his Farewell Address four years later each aimed at achieving this goal.

Kennedy too, in his first year in office, sought to redirect public attention. While doing so, however, Kennedy was cautious not to seem antagonistic toward the enshrined cultural tenet celebrating technological potential. In fact, while both Presidents worked to hone popular understandings of the role of technology, neither Eisenhower nor Kennedy assailed the idea of its importance or usefulness. The more explicit tone of warnings in the Eisenhower addresses, and the urge for calm, obscured this fact. Many at the time dismissed Eisenhower as out of touch with a technological crisis. The dominant cultural ideas about technology meant that bold technological zealotry was a more cautious course in domestic politics. Somewhat counterintuitively, tenets and circumstances were such that calls for calm represented a political risk. Eisenhower, committed to the long haul, the New Look, and if possible the use of space for reconnaissance and *not* deployed weapons, took that risk.

Kennedy's calculations included an element of domestic political caution which ironically appeared bolder and more adventurous than the attitude of his predecessor. Kennedy requested increases in the Dyna-Soar's budget and the initiation of a presumably civilian human lunar landing. Kennedy's early

steps increasingly committed the country to bold and divergent efforts in space. The last half of the year saw the abrogation of the Dyna-Soar's planned offensive potential but paradoxically also saw the acceleration of the program. And so work continued – in readjusted form – on the vehicle that the Air Force had once dreamed would diversify the American deterrent and extend US security and US Air Force power into the heavens.

In the long run, the most potent power lies not with transient policymakers or the military which guards the society, but with the people who collectively affect the national public culture. Officials and opinion leaders shape policy and seek to focus public attention and attitudes. They act within the vague but enduring parameters set by a society's cultural tenets, which themselves are subject to continual renegotiation. Eisenhower had correctly identified the need, therefore, of an “alert and knowledgeable citizenry” which might successfully shoulder an awesome and ongoing burden.

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