

The Space Age at the Grass Roots: NASA in Cleveland, 1958–1990

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Summary

This essay provides a rare glimpse of the Space Age at the grass roots of American politics and society, in the then ninth-largest city in America in which NASA's third-oldest research center is located. It expands recent discussion of NASA's "organizational culture" into the wider social, economic, and political environments in which NASA necessarily operated. Using local archives, it finds that NASA was a technologically innovative organization which was socially detached, and thus unable to market itself effectively to local opinion leaders on political, economic, or social lines. NASA's attitude towards grassroots community support closely resembled the "town and gown" separation and socio-political distance customary in many university and college towns and cities. Not until the bells also tolled for NASA's center did its leaders realize that it could not prosper while the largest community around it declined.

NASA as a Socio-Political Institution

The formative years of the Space Age are generally discussed in terms of heroism, high technology, transcendent goals, prestige-based space races, and Cold War power politics. Accordingly, we have a great deal of top-down history centered in Washington, DC, and especially within the top management of the

National Aeronautics and Space Administration (NASA). We know much about what key leaders (especially presidents) wanted, and about what leading technical and scientific administrators did and didn't do to achieve varied policies. What we know far less about, however, are the nationwide, local, or regional socio-political, economic, and cultural contexts in which space exploration advocates and programs operated.¹

These dynamic and varied contexts were inevitably important. NASA was born in an era of universal competition between thermonuclear superpowers known as the Cold War. But it was also created as both a civilian and a scientific agency. Like the Atomic Energy Commission (AEC) on which Congress and the Eisenhower White House carefully modeled it, NASA was to forward peaceful civilian uses of space, just as the AEC involved itself with forwarding nuclear electricity generation and the development of therapeutic medical isotopes. This meant that NASA was never *sui generis*. Nor was it ever layered in levels of military secrecy like the wartime Manhattan Project, or the military and intelligence agency space-based spy satellite programs.²

Because NASA was both non-military and public, it inevitably had to operate in arenas of public understanding and acceptance and political priority-setting. Military or prestige competitions with Communist powers would not guarantee the new agency uncomplicated or long-term deference. So NASA was advised early and often. Science was harnessed to the growth and power of the modern state in very many ways during and after World War II. The 1950s, to give but one example, were the decade of the double helix and DNA (and the beginnings of the modern era of genetic engineering), as well as the decade of Sputnik. NASA was one of scores of major research and development (R&D) funding agencies which, combined, would account for one-eighth of total federal spending by the late 1960s. Therefore, NASA was either going to prove itself in terms of new scientific and technological discovery, or it risked losing to fields where practical and potential applications (i.e., in areas including medicine) were more immediate, thoroughgoing, and profitable.³

NASA's civilian status was also a supremely public one. The agency was created with a unique requirement to explain what it was doing in the "widest practicable and appropriate" ways. It was also supposed to do long range studies regarding the opportunities and problems involved in the social understanding and utilization of aeronautical and space projects. NASA was not just an inward-looking research organization in which engineers designed spacecraft for pilots to fly. It was, instead, given responsibilities effecting every aspect of the nation's civilian aviation and space programs. It was performing many new tasks the federal government had never before undertaken. It had to create ongoing support for those programs in some fashion to prosper.⁴

Years later, sociologist William Sims Bainbridge of the National Science Foundation nicely summarized NASA's challenge. There were worldly and transcendent motives for spaceflight. The latter allowed small groups of well-placed advocates to get lavish funding for specialized projects for brief periods. The

former needed—and could enjoy—far more popular support, but would also more easily allow for sustained programs. NASA could emphasize transcendent and thoroughly “political” priorities like sending astronauts to the Moon or robotic spacecraft to Mars. Such programs, however, were inevitably going to be more fragile than, say, weather or communications satellites which made clear differences to masses of peoples’ daily lives.⁵

NASA’s mix of transcendent goals and worldly advantages especially mattered because the new agency also existed in a society undergoing important and enduring changes in areas as diverse as race relations, gender roles, and science-based movements, including modern environmentalism. The America of 1957 was a place where state-mandated *Apartheid* ruled in a third of the nation. De facto racisms were common generally. Women scientists, engineers, physicians, or managers of any kind were extremely rare. All this was about to change. Simultaneously, the explosive growth of suburbs was popularizing public health and quality of life debates from specialists concerned with distant wilderness areas to far larger groups of people debating issues like malfunctioning backyard septic tanks. Space exploration, therefore, never existed in a separate socio-political or other universe of its own, though it is rarely written about in terms of competing science and technology priorities; or fast changing social and occupational roles of racial minorities or women. With the honorable exception of several recent volumes on the exclusion of women from NASA’s Astronaut Corps until the late 1970s, however, the first twenty years of NASA’s existence are generally discussed as if the agency was a special and unique place.⁶

Scholarly and other treatments, here, mirror NASA’s dominant opinion of itself. A high-morale, elite, and can-do agency, NASA has generally seen itself as an organizational example of what government, in cooperation with private industry, can do if unconstrained by competing political, economic, social, or scientific claims. With earned pride, however, could go unearned hubris. What a high-level panel investigating the loss of a second Space Shuttle in 2003 called NASA’s “deeply ingrained human spaceflight culture” could “resist external pressure for adaptation and change” even when NASA leaders operated on the basis of “flawed decision making, self deception, introversion, and diminished curiosity” about the world outside the “perfect place” of NASA. These denials and avoidances, the Columbia Accident Investigation Board added, were as responsible for the Shuttle Columbia’s fiery end as were technical failures.⁷

NASA Gets Forewarned

As this paper will show, the flaws, introversions, and self-deceptions identified and discussed by the Columbia Accident Investigation Board of 2003 have long existed at NASA. They also have had broader socio-political components; ones which have strongly effected the public profile of and attention paid to the space agency from its earliest beginnings in 1958.

NASA's internal "organizational culture" is the subject of recent books. This essay expands that discussion to the wider social, economic, and political environments in which NASA operated. NASA was a new agency doing something government never had done before. No popular constituencies existed regarding the peaceful exploration or development of outer space. Science fiction novels had promoted imaginary and unbudgeted ideas of human spaceflight. But this did not prove or guarantee ongoing public or political support for the realities of expensive NASA programs. In the years immediately after the Sputniks orbited, moreover, the vast majority of adult Americans knew as little about the realities of space as they understood about other alien realities at the bottom of the world's oceans.⁸

In February of 1961, NASA hired a Harvard Business School-based consultancy to gauge levels of understanding and support for space efforts among college-educated professionals. The report arrived at NASA three months before John F. Kennedy proposed to base America's prestige on an Apollo lunar landing by 1970. Nobody, said the consultants, was against NASA—yet. But its budgets were doubling every year, and very soon, NASA would spend one-third of what the Defense Department spent. Centers of interest group opposition would then inevitably arise. If NASA wanted far more visible and expensive space explorations to remain a political priority, it could presume it was a military-essenced agency on a presidential—or other—"mission" in which civilians were not involved. Or it could presume that educated opinion-maker professionals, then composing about 10 percent of all adults, were an important constituency that could influence Congress and the wider society alike. Journalism of the national loin-girdling sort was not going to create a secure future for NASA. Such press coverage rhetorically equated a huge and diverse nation with a single mass mind which had somehow determined to win universal space races with the Russians in the aftermath of Russia's first earth satellites and lunar probes. But such editorial hyperbole and high-flown news media coverage was not the scope or scale of popular attitudes. Even if public opinion was defined only as those with four-year college degrees, popular knowledge about peaceful uses of space was limited—both before and after Sputnik. Space exploration was vaguely glamorous; but few lawyers and closed system ecologists polled at length by the consultancy had given sustained attention to anything NASA did immediately before President John F. Kennedy put his political capital behind a space race to land astronauts on the Moon's surface by 1970. After three years of sustained print and electronic media coverage, few lawyers knew that NASA existed or what it did and few better informed scientific specialists had anything but a "disinterested and dubious attitude toward the scientific validity of the [manned] space effort."⁹

Media-based mass or elite mobilization, in short, had not happened. NASA had not risen above "background noise" in public awareness or discourse. Television coverage, in particular, had not—and did not—sell space politically for NASA. Later arguments that NASA's manned space program's relation to

America's advertising industry "resembled that of a guest conductor to a resident symphony orchestra" presumed NASA had ambitious, targeted, and long-term political marketing strategies. What NASA's Public Affairs Office press handlers had, instead, was a very high rate of turnover (five public affairs chiefs at NASA headquarters in the 1,000 days of the Kennedy administration) and, after that, a head manager who never did any media or public opinion research at all during his decade long Apollo Era tenure, while believing newspeople "could interpret events almost at will and hold sway over millions of television viewers for better or worse as far as NASA was concerned."¹⁰

NASA as a Decentralized Agency

Just because key political managers at NASA headquarters in Washington had simplistic ideas about building secure bases of political support for their new agency early in the Space Age did not necessarily mean the same would be true of NASA as a whole, however. NASA and the 8,000-person-strong aeronautical and aerospace research agency which had preceded it, the National Advisory Committee on Aeronautics, were decentralized organizations. This was convenient, because space was a place, not a program, and NASA, accordingly, speedily became a coalition of interests ranging from aviation to astronautics to astronomy. Most of NASA's varied work was done in what soon became twelve research centers around the country. Each center had different project responsibilities and technical specialties; and their relationships to each other resembled those of the high status branches of a major state university system. (Berkeley and UCLA were both part of the same University of California system. But both flagship campuses competed as well as cooperated, and possessed local traditions and loyalties.)

Components of NASA's fast-growing federalized bureaucratic system, therefore, could experiment in more than science and engineering. The new NASA centers of the 1960s could join the already-established ones as laboratories for innovation regarding NASA's legislatively required duty to explain its new activities in the "widest practicable" ways. One clear benefit of such activity could be discovering ways to gain support among important opinion-making groups for ambitious, expensive, and ongoing space programs in which they were especially involved.

Three of NASA's oldest labs, additionally, were advantageously sited to do this work in or near major cities. NASA-Ames was at Moffett Field just south of San Francisco; the Jet Propulsion Laboratory in Pasadena was near Los Angeles; while NASA-Lewis (now NASA-Glenn) was located at the up-to-date municipal airport in Cleveland, the ninth largest city in America when the Space Age began. NASA-Lewis, like NASA-Ames and NASA-Langley near Washington, moreover, were well-established aviation research labs, well positioned to attract public attention to civil aerospace. This was especially important because the 1950s and 1960s were massive growth years for civilian passenger

aviation. Only 1 in 4 American adults had ever experienced flight in 1960. Half the adults in the top quarter of family income had flown, to only one-fifth in the bottom three income quarters. Flight was still for the wealthy, or the military. By 1970, however, one-half of all adults had flown; and, by 1990, three-fourths. Travel for those affluent enough to do it increasingly meant going to airports, not bus or train stations, or ports full of trans-oceanic liners. As Apollo spacecraft were being built so were revolutionary designs like the Boeing 747 jetliner (flight-tested as Apollo 8 circled the Moon).¹¹

The aviation portion of the National Aeronautics and Space Administration's work, then, very clearly involved Earthly advantages for citizens and taxpayers who might care little for lunar prestige-races, the possibility of life on Mars, or the structure, composition, or age of the universe. Cleveland's leaders, additionally, had important worldly economic reasons to concern themselves with high-tech aerospace development; and they possessed, as we shall see, unusually good personal connections to NASA. Despite such advantages and interests, however, NASA's experience in Cleveland from the 1950s to the end of the 1970s was a case study in how not to expand local support for an agency.

NASA in Cleveland

"Rust-belt" Cleveland, Ohio, and NASA may at first seem a curious association. But stereotypes deceive. The Wright Brothers were Ohioans. Cleveland investors started making the city an aviation center in 1920. From 1929 to 1949, Cleveland hosted the National Air Races. Connections to a premier aviation event paid off in 1940. As the Roosevelt administration mobilized for war, a federal aviation research lab that later became NASA's third-oldest facility was built at Cleveland's new airport, eight miles from the city center. By 1961, the NASA-Lewis lab employed 3,000. Aerospace, clearly, paid.¹²

Few understood this better than the political manager who created NASA. T. Keith Glennan ran a technical university in Cleveland for ten years before spending two and a half years as NASA's first Administrator. When Glennan returned to what became Case Western Reserve University as president in 1961, he brought with him a determination to transform Cleveland into a high-technology center. He increased graduate students ten-fold; faculty by 60%; and opened all science and engineering classes to women a decade before most other technical schools. Raising huge amounts of money and building fast, Glennan wanted the "University Circle" area around his campus to become "one of the world's major research centers." Glennan's school also reached-out over color lines. In 1964, Case awarded a doctorate in Physics to Dr. Dudley McConnell, an aerospace engineer, who became NASA's only high-ranking African-American scientific or technical official in the following decade. By 1965, *Science* magazine, *Saturday Review*, and others, had noticed such efforts.¹³

Meanwhile, at the NASA-Lewis lab, Dr. Abe Silverstein was newly in-charge, after spending two years away from Cleveland in Washington as a key Glennan aide responsible for overseeing both manned and unmanned space flight at NASA headquarters. Given such important local NASA connections, Cleveland journalists saw aerospace as a key factor in the economic future of city and region.

The interest of local journalists was illustrated by Louis B. Seltzer's editorship of the *Cleveland Press*, the flagship of the Scripps-Howard newspaper chain. The *Press* had employed—very unusually—an “aviation reporter” since 1940. The day after Sputnik, this journalistic specialist clearly explained how experts meeting at Lewis would analyze the “red satellite.” Such local interest, activity, and involvement were a Seltzer trademark. Seltzer had a national repute as “Mr. Cleveland” from *Life* magazine, CBS reporter Edward R. Murrow, *Saturday Review*, and others. He was networked into the city's neighborhoods and was a political kingmaker. Democratic mayors, governors, U.S. Senators, and several members of President Kennedy's Cabinet owed him favors.¹⁴

Seltzer's longtime enthusiasm about aviation also quickly became enthusiasm about aerospace. Sputnik, he told *Scouting Magazine* in 1958, was a wake-up call. It would increase levels of “patriotic obligation.” To fulfill Seltzer's obligation, “Mr. Cleveland” ran supportive editorials, human-interest profiles of local NASA staff, and front-page stories about local accomplishments such as the first Mercury test capsules built by Lewis. All this activity mixed pragmatism and patriotism. NASA-Lewis grew from 3,000 to almost 5,000 employees in the several years after 1961, becoming one of Cleveland's largest employers. Seltzer knew Cleveland's traditional heavy manufacturing base of steel and auto manufacturing was starting to contract. NASA jobs, however, were the high-tech future. Helping to achieve that future was intelligent selfishness. For without good jobs, people didn't buy newspapers.¹⁵

Journalistic Mass Mobilization Begins

Seltzer's mix of self-interest and community service regarding NASA only intensified after Keith Glennan returned to Cleveland after service as NASA's first Administrator in March of 1961. The very next month, Case's reinstated president hosted “the most complete exhibition of space vehicles ever assembled under one roof.” The presentation consisted of 14 full-scale models of early NASA satellites circling a suspended eight-foot globe circled by multi-colored aluminum tubing illustrated the orbits of all America's then-46 satellites. Twelve and a half thousand people went through the exhibit in two weeks; Case Western's exhibit was covered in 162 local and national news stories—making this “one of the more broadly publicized events of the year” at the school. Others quickly realized that if Glennan could get a display that also visited Washington, Montreal, and Chicago to Cleveland, he and Silverstein might also

help advertise NASA and Cleveland (and the *Cleveland Press*) with a bigger show with full-sized rockets and space capsules at Lewis' 300-acre grounds.¹⁶

NASA-Lewis, after all, was hardly flush with visitors. In 1959, the lab, which did significant amounts of classified military work, "cleared" only 4,994 visitors. Since 1942, 3,000 to 5,000 guests a year—10 to 14 people every day—visited Lewis. This was at a time when Cleveland's population was 900,000 and Ohio's population grew from 7 to 10 million. Included in this small number of visitors were civilian scientists using Lewis's state of the art supersonic wind tunnels or then-rare room-sized Univac computers.¹⁷

Louis Seltzer knew NASA could do far better than this. So, in 1961 and early 1962, he sparkplugged a twentieth anniversary celebration aimed at bringing 25,000 people to Lewis on a single weekend.

The "Youth Days" celebration that the *Cleveland Press* and NASA-Lewis co-sponsored on August 5 and 6, 1962, was unprecedented. Though America's first astronauts had just gotten into orbit, no NASA facility was tourist-friendly in 1962. The Cape Canaveral launch site in Florida, for example, did not open the first NASA Visitor Center until 1967. Not until December of 1963 could visitors at the Cape even drive through a distant part of the mostly-military facility in their cars on Saturday and Sunday afternoons only . . . without stopping. NASA-sold souvenirs, such as postcards or T-shirts, were unknown in 1962—and for almost a decade afterwards. As the first astronauts reached the Moon's surface in July 1969, NASA headquarters tried—and failed—to stop sales of Apollo 11 mission patches of an American eagle delivering a wreath of olive branches to lunar soil. NASA, in 1962, barely tolerated reporters, never mind the public for whom those journalists wrote.¹⁸

Unprecedented or not, Youth Days of 1962 were successful. 17,000 of the hoped for 25,000 people showed up. This in a summer school vacation season when boys and girls were often harder to locate, and less likely to be studious. Their average age was fifteen; three-quarters of whom were male. Cameras, high heels, and smoking were all prohibited. The *Cleveland Press* distributed free tickets, arranged free transportation, and headlined NASA exhibits, which included an eight-story high Redstone rocket and mock-ups of Mercury and Apollo spacecraft. Here was exactly the community outreach and education effort that premier aerospace industry trade journal *Aviation Week and Space Technology* had just advised NASA it needed to increase public awareness and gain greater political support in Congress. NASA headquarters sent observers. *Life*, *Look*, and *Time* magazines sent reporters. Other cities asked Seltzer about creating Youth Days of their own. NASA-Lewis had just had three and one-half times as many visitors in two *days* as it had in any of the twenty *years* since its creation.¹⁹

Things weren't over yet. The *Press* was a Democratic paper. Its Republican competitor, the *Cleveland Plain Dealer*, wasn't amused. The *Plain Dealer's* ferociously competitive editor, Thomas H. Vail, soon put on a NASA gala of his own. What Seltzer co-sponsored out at Cleveland's airport and Lewis lab, Vail

and the “PD” did in the city’s largest downtown hall: Cleveland Public Auditorium. Its 80 foot-high ceilings allowed everything from an X-15 rocket plane to Saturn 5 rocket engines to be exhibited. For ten days from November 23 to December 2, 1962, during the prime post-Thanksgiving shopping season, the *Plain Dealer*/NASA-Lewis “Space Science Fair” was a big show for Cleveland and the surrounding region—twice as large as an exhibit NASA had just put on for the Seattle World’s Fair. The *Plain Dealer* estimated that over 300,000 people attended, including about 50,000 students, plus 15,000 employees and their guests from TRW, Cleveland’s biggest aerospace employer.

Vail’s “Space Science Fair” was as well organized and marketed as Seltzer’s. The *Plain Dealer* advertised the event for a month, averaging two space stories a day. The paper paid for special premieres, dinners, and talks for local educators. Deluxe treatment was reserved for 1,000 people in tuxedos and minks in the main ballroom of Cleveland’s most luxurious hotel. NASA’s initials were carved into four-foot high, 400-pound blocks of ice as a centerpiece. A press office was created for visiting print and electronic journalists.

Vail thought big. NASA Administrator James Webb and ex-Administrator Glennan officially co-sponsored the event. So did both of Ohio’s Senators, five Congresspeople (three Democrats and two Republicans—one of whom was a woman), two of Cleveland’s most-powerful ex-mayors, the heads of the city’s Chamber of Commerce and AFL-CIO, and others. NASA, the Air Force, aerospace companies, and local universities helped with “technical hosts,” demonstrations, exhibits, and special instructors for 17,000 gifted science students. Twice in five months, as the Apollo and the manned Mercury programs began, NASA had just put on the most ambitious, organized, and successful exhibitions it had ever attempted. Cleveland seemed poised to be a model for the future of popular education and mobilization by NASA.²⁰

As a result: No repeat of a Youth Days co-sponsored by the *Cleveland Press* ever happened at Lewis. The *Plain Dealer* also never repeated its “Space Science Fair.” When NASA-Lewis celebrated its twenty-fifth anniversary a year early in 1966, lab director Abe Silverstein limited guests to 2,000 “top executives from across the country.” “Congressmen, educators, and businessmen” listened to NASA’s Administrator James Webb and viewed a Gemini spacecraft recently returned from orbit—and from the New York World’s Fair of 1965, an exposition NASA almost didn’t attend at all. None of NASA-Lewis’s 1966 celebration had any local focus or concern. The *Cleveland Press* ignored the occasion. The *Plain Dealer* barely mentioned it. What had happened? How had a model of press-orchestrated community mobilization in Cleveland gone awry?²¹

What Went Wrong?

Some aspects of the answer involved NASA; others, Cleveland itself. On the NASA side, the *Press* and *Plain Dealer* events of 1962 put NASA-Lewis in touch with 3,000 science teachers in a seven-state region of the Midwest includ-

ing Chicago, Detroit, and Indianapolis. The lab seems to have limited its outreach efforts to these teachers—and to (non-Cleveland) high schools—for almost fifteen years after 1962. This science educator centered effort complemented Abe Silverstein's views of Lewis as an R&D campus and advertised NASA to engineering students of particular interest as later potential employees. Said one person who worked for him as public affairs head during his 1960-1969 tenure as lab director, Silverstein would "do a few goodwill things." Then, however, Silverstein wanted Lewis left alone. So much so that Lewis did not become the last (of twelve) NASA facilities to hire an outside contractor to open and operate a Visitors Center (instead of requiring visitors to be pre-approved as individuals or small groups several weeks in-advance) until 1976, twenty years after Sputnik. Silverstein served on the boards of three local universities. According to his wife, he also socialized mainly with NASA and university people. But he did not realize, as fellow NASA center director William L. Pickering of the Jet Propulsion Laboratory quipped in 1960, that the future may belong to the youth, but the "present is the property of the middle-aged."²²

Another thing Silverstein forgot and Pickering didn't was that the general public normally had never set foot on a college campus or the grounds of a NASA lab. These people paid the bills for exploring space as taxpayers, but, as Pickering put it, "Like any good budget manager, the taxpayer is ultimately going to revolt against paying a rather large bill for something he really doesn't understand."²³

The apparent lack of strong personal or institutional ties between Glennan and Silverstein illustrated these wider problems. The two men had worked together for two and a half years in Washington creating NASA. Back home in Cleveland, their institutions clearly needed one another. Hundreds of NASA-Lewis people, for example, received advanced science and engineering degrees at what became Glennan's Case Western in the 1960s. Case faculty had also started putting together research proposals for NASA evaluation and possible funding at Glennan's request as early as 1958. For all this, however, Glennan and Silverstein weren't close. Glennan, for instance, could write to a friend two years after he and Silverstein both returned to Cleveland, "I see Abe Silverstein once in a while and we hope to be doing some research projects under the sponsorship of the Lewis Research Center."²⁴

Informality and vague hopes after two years was not the energetic local cooperation and creation of concrete benefits which could help sell NASA's programs to groups including Cleveland's businesspeople. And that was what second NASA Administrator James Webb was telling NASA's laboratory heads that he wanted in 1962 and 1963. Nor did Silverstein's lack of interest in cooperation with Case help Glennan's efforts at academic entrepreneurship. Glennan wanted large awards of NASA money for things like an in-house computer-development and electronic research lab in this period. Glennan also clearly tried to maximize the benefits Case received from his earlier NASA associa-

tions. But his success was spotty, at best. It was not until May of 1965, for example, that a retiring Glennan finalized a \$2.6 million NASA grant for a space science building at Case named after him. This single award almost doubled the amount Case had received from NASA since 1959. Given that NASA's budget peaked, in purchasing power terms, at just over \$5 billion in 1965 dollars during that same year, Case's 1959-1965 total of about \$5 million was a small fraction of what better-known technical schools like MIT got from NASA in a single year.²⁵

One reason why Case lagged might have involved an apparent lack of personal respect or chemistry between Glennan and Silverstein. Silverstein received an honorary PhD from Glennan's Case in 1958. But he waited to become a Case trustee until 1965, the same year Glennan departed. No note or letter from Silverstein to Glennan, meanwhile, exists in key files in Glennan's personal or university papers; while Glennan's few remaining letters to Silverstein demonstrate no personal familiarity. As one result of this social distance, Silverstein didn't formally request aid from NASA headquarters regarding a small \$30,000 effort to offer summer workshops for engineering professors in conjunction with Case until February 1963. This American Society of Engineering-initiated project also didn't get funded in 1963, went awry somehow in 1964, and only seems to have succeeded in 1965. Case Western academics, meanwhile, applied for NASA money a total of fifty-one times from 1959 to 1964. The "yield-rate" of dollars-requested to dollars-received for the school was 38%—or just over \$2 million over five years. An average of \$400,000 per annum did not appear to demonstrate any patterns of ambitious cooperation between Cleveland's long-established technical university and its also long-established NASA lab. The Ford Foundation put Case (\$8 million) in the same league as Stanford (\$25 million) and MIT (over \$9 million) in terms of the higher educational funding it awarded by 1960. NASA, however, seems to have acted otherwise. Not until January of 1964 did Case's chief academic officer receive a letter from NASA-Lewis's assistant director saying, "Case would be a logical organization to serve as an interface between aerospace technology [research and development programs] and industry" in and around Cleveland.²⁶

Abe Silverstein's papers, meanwhile, remain mute. They sit at a new one-person archival office at NASA-Lewis/Glenn awaiting lengthy processing. But Silverstein's apparent inattention to cooperation with a premier local and regional technical university was part of wider patterns. NASA-Lewis did very little to advertise what it did to the hundreds of thousands who passed through the fast-growing municipal airport right next door every year in the 1960s and early 1970s. In the 1970s, Cleveland's city schools even created an Aviation High School named after Benjamin O. Davis, the first African-American general in the U.S. Army. This aviation high school limped along for ten years, and may or may not have benefited from any assistance by NASA personnel. Both the *Cleveland Press* archives and spot-checks of the NASA-Lewis newsletter of

the period, however, show no human or financial links on the NASA side of the equation.²⁷

The Politics of Race

NASA-Lewis's curious distance from the city of Cleveland only increased with the major and still-ongoing political and social changes which commenced in Cleveland in 1964. At issue was race: the major and defining domestic issue of America in the 1960s. Cleveland's first civil rights protests began with African Americans picketing the city's School Board and White protestors countermarching through Black neighborhoods. African Americans had tripled from 1 in 12 to 1 in 4 of Cleveland's population between 1940 and 1960. Internal immigrants joined foreign immigrants looking for entry-level jobs in Cleveland's relatively-large manufacturing sector, which supplied half the city's jobs until the 1950s. Once a subsequent 30-year slide in industries like steel and auto began, however, the political economy of dividing gains was replaced with the politics and economics of apportioning losses. New arrivals from Alabama and Slovenia now fought over diminishing jobs. Schooling, housing, and other debates soon intermingled with such struggles.²⁸

Cleveland's power structure ignored such raw and unsettling racial realities in a civil rights era for as long as they could. Cleveland was segregated by custom, not law. Most recent foreign immigrants lived apart from each other, as well as Blacks. Older-stock Whites, meanwhile, tended towards bland denials. They also lived apart in older "streetcar suburbs" which hemmed-in Cleveland itself. Keith Glennan's Case Western Reserve University, only four miles east of the city's center, sat on—and across—one such boundary between an increasingly-Black city and then almost completely-White suburbs.

White suburb dweller Keith Glennan understood earlier and more clearly than most that continued denial wouldn't work. He had created massive multi-million dollar capital improvements including hospitals, labs, and dormitories at Case Western which were difficult or impossible to relocate. He also knew what disturbance and fear could do to his school's reputation. Glennan began efforts to stabilize and improve the socio-economic makeup of the areas near Case's campus. He also used the occasion of his retirement as Case Western's president in June of 1965 to tell Cleveland's leaders that the good old days were over. African Americans were a "new center of power and influence in the community." Old "compartmentalizing" ethnic politics strategies that played groups off against each other wouldn't work much longer. New class and racial groups had to be involved in solving city problems.²⁹

Louis B. Seltzer and the *Cleveland Press* loved it. "He took the town's measure," an editorial lauding Glennan's speech said, "He pointed his finger accurately." Glennan's final address to a city where he'd spent fifteen busy and productive years was frank good sense. Thomas Vail's *Plain Dealer* agreed, "camouflaging" urban problems wouldn't work. Two very high profile opinion-

shapers and reporters—one Republican and the other Democrat—agreed that Cleveland’s leaders and the city’s key institutions had to address changing political realities in their own and the city’s better interests. Denial and avoidance were both insufficient and vain.³⁰

As if to demonstrate the often unwelcome truths the city’s premier journalists reported, just over a year after Glennan spoke, six days of rioting began in Cleveland after an inter-racial dispute in a bar. The National Guard was called out after four deaths, thirty injuries, 300 arrests, and 240 fires. All saloons were closed for several days to assist sober reflection. One year later, Cleveland became the first big city in America to elect an African-American mayor, Democrat Carl Stokes. Levels of racial tension directly affected levels of editorial support for NASA programs in the *Cleveland Press* from 1963 until 1967.³¹

What was happening meanwhile out at NASA-Lewis, 8 miles west of Cleveland’s city hall? Abe Silverstein was a civil servant who thought of his center as an R&D campus. But unlike fellow campus manager Keith Glennan, he avoided any high-profile involvement in Cleveland’s problems. NASA-Lewis opted for separation. Institutional self-segregation was relatively easy on three counts: Economically, Lewis spent as much as two-thirds of its 1960s budgets on subcontracts with already-established aerospace companies in places like southern California instead of becoming a major engine of local high-tech economic growth. Geographically, NASA-Lewis was located on the very tip of a long finger of the city. It was also ringed by affluent white suburbs with names like Lakewood, Rocky River, Fairview Park, North Olmstead, and Berea. Psychologically, eight miles could be 800. NASA, finally, was a technical agency. It had the lowest percentage of racial minorities and women employed of any federal agency as late as the 1970s. Its facilities were located mostly in the South. Its leaders were at least as prone to elite denial as universities, gentlemen’s clubs, professional organizations, and other self-consciously intellectual organizations of the period. When problems didn’t have technical solutions, it apparently simply didn’t know what to do. Even in its own best interest; even as laws requiring race and gender diversity came into existence; and even as Cleveland, together with Chicago and Detroit, became one of the three most residentially segregated cities in America.³²

The Effects of Self-Segregation

How little community coverage of NASA-Lewis exists in the *Cleveland Press* archives after the abortive space galas of 1962 provides one clear indicator of how quickly NASA ceased being a prominent part of public notice and discussion in the city in which its third-oldest aviation and rocketry lab was located. NASA hired an African-American lecturer as part of its suburban schools-based education effort by 1965. But otherwise, individuals acted without institutional support regarding community outreach. In 1960, for instance, seven African-American engineers and chemists at Lewis got together semi-

formally to talk about promising scientific and technical careers to Black teenagers and parents on the city's largely-Black East Side, where all seven NASA men lived.³³

These seven African Americans lived sometimes inconveniently far from their work rather than in surrounding west side Cleveland communities because non-white NASA employees "had difficulty finding housing" there, a NASA "Chief of the liquid metals branch" told a *Plain Dealer* reporter four and a half years later in July of 1964. Dr. Louis Rosenblum was trying to get his 4,800 colleagues at NASA-Lewis to sign cards pledging themselves to "support the right of any law-abiding and responsible person of whatever race, religion, or national origin to move into my neighborhood" and to work to maintain "a community which is good for all." The Civil Rights Act of 1964 outlawing discrimination in public accommodations and employment had just become law two weeks before, and an ecumenical religious effort was underway in Cleveland to end housing segregation voluntarily. Two hundred of NASA's 4,800 employees offered to help distribute these pledge-cards. What—if anything—the other 4,600 did is unknown.³⁴

It is unlikely that a vast majority of NASA's employees extended themselves very much to expand the coverage of civil rights laws. For, in 1967, Lewis was blasted in an internal NASA report for its lack of community connection or concern. 1967 was an important year for NASA. Two flat budgets were followed by one in which it took an unprecedented 10% decrease. Prominent Democrats in Congress had charged NASA's leadership with a cover-up of safety problems with the Apollo spacecraft following the deaths of three Apollo astronauts in a launch simulation training exercise in January. In July, NASA's formal opening of its first Visitor Center at Cape Kennedy demonstrated headquarters finally was beginning to understand the need for greatly increased popular access and regard a decade after the Space Age began. In October of 1967, significantly, NASA headquarters' first survey of visitor policies at *all* NASA facilities was also completed. The report's author, Brain Duff, later headed NASA's Public Affairs program. He was no malcontent. Neither, however, was Duff an apologist for those within NASA who still believed the agency could or should exist without greater public exposure, understanding, and support. Newer NASA centers, he concluded, were starting to get concerned about general public access, as opposed to "VVIP [Very very important person], technical, and special interest groups." But *older*, aviation-concerned, NASA labs like Lewis, Ames (San Francisco), and Langley in Virginia were resisting. They "... have hung out signs saying 'Do not disturb—(but keep sending money),' " Duff acidly but accurately concluded.³⁵

Such socio-political avoidance, Duff continued, only insured that: "Some centers have used the ostrich approach even more effectively than the ostrich. After generations in the communities, they really have achieved near invisibility."³⁶

NASA's two big city-based aviation centers insured their obscurity even in a passenger aviation era which gave tens of millions of Americans their first experience of flight. Ironies abounded. Lewis, actually, spent three times as much money security inspecting handfuls of visitors after 1967 as the Kennedy Space Center spent busing thousands along sixty miles of bus routes. The Ames Center near San Francisco was more restrictive than the Navy base surrounding it about allowing tourists to do things like take photographs. "Only VIPs [very important people] and technical groups" were encouraged to visit Lewis, Duff observed. "Turndowns" to others were "acknowledged to be high." "We could run a tour program," Duff quoted one "restive staff center man" at a place like Lewis as saying, "with energy we spend now just trying to keep people away."³⁷

Given, however, that a decentralized NASA also still had no overall visitor policy agency-wide ten years after Sputnik, it is also not surprising that Duff's criticisms about Lewis's self-defeating segregation from the world around it accomplished nothing. Nor is it surprising that the *Press* archives then remained silent about NASA-Lewis and any community issue connected with race for the thirteen years from 1964 to 1977.³⁸

The End of Avoidance

Avoidance about racial matters at NASA-Lewis and elsewhere within NASA continued until NASA headquarters in Washington got in very high profile trouble regarding institutionalized racism and sexism during the climax of the Watergate Crisis. It fired its highest-ranking Black female for pointing out the agency's unconcern with minority or female hiring and technical training in October 1973. NASA's timing was awful. This was the same month that Richard Nixon sacked the first Special Prosecutor in the Watergate case and made political crisis perpetual for the remainder of his presidency. An Affirmative Action era in employment was underway. The nation's capital was moving from half to two-thirds African-American. Many of those African Americans worked for the area's largest employer: the federal government. Washington was a southern town and NASA a mostly-southern based agency. So, after threats from three Senate committees, protests from numerous organizations, and a legal appeal from the NAACP Legal Defense Fund, NASA reluctantly rehired the woman who had pointed out NASA's imperfections ten months after her firing, and just as Nixon resigned his office. Neither what the *Washington Post* called NASA's "simple pieties" nor its "eloquent declarations of principle" was sufficient any more. NASA had to stop talking and start doing. Specifically, it had to apply civil rights laws to employment in the 1970s to avoid a reprise of the riots of the 1960s, just like any other institution in American society. By 1978, longtime exclusions of females and Blacks were even slowly and reluctantly ending in a hitherto all-white and all-male astronaut corps. NASA was being forced to open-up to new social constituencies—just like the society around it.³⁹

Simultaneously, NASA-Lewis began to end its effort to ignore the soon-to-be half-Black city of which it was a part. Opening a Visitor Center in 1976 and creating a Speaker's Bureau that same year were part of this belated opening-up process. In the fall of 1977, NASA-Lewis apparently also gave its first organizational support for Cleveland's city schools since it had funded a mathematics program at a single technical high school in the early 1960s. Two staff members, one a recently-arrived African-American Physics PhD from the University of Michigan, received \$45,000 in seed money to create a science and engineering career-preparation program in two schools in African-American and mixed neighborhoods. Funding was initially for one year only and involved only 120 students. But it was nevertheless the start of a long-delayed recognition that NASA-Lewis couldn't thrive while the community around it died, any more than could Keith Glennan's Case Western Reserve University.⁴⁰

Just in case anyone at Lewis wondered, rumors started circulating that NASA was going to close Lewis and several other labs to save money as NASA budgets fell to half of their Apollo Era peak. Suddenly, Cleveland's NASA Lab became far more devoted to local public relations and public outreach.

As an indicator, NASA-Lewis seems to have tried another "open house" in 1973 that attracted very few. But its effort in 1981 drew just over 10,000 visitors in two days. It was fortunate that people came in 1981, for rumors were especially persistent and widespread then that Lewis and other NASA labs and programs were going to be discontinued by Reagan budget-cutters. Lewis's workforce numbers, meanwhile, had sagged to between 2,600 and 2,700. This was slightly below the 3,000 it had had before Apollo began in 1961. Suddenly Lewis opened a souvenir shop, and got rid of the last vestiges of "clearances" for individuals or families. Tourist groups, however, still had to apply 2-3 weeks in advance and organizations wanting speakers, 8-10 weeks in advance. From 1981 onwards, Lewis' status within NASA has remained tenuous enough that the lab protectively renamed itself NASA-Glenn (after first U.S. orbital astronaut, John Glenn of Ohio) in 1998, just after NASA orbited a then-77 year old Glenn in the Space Shuttle. Finally, after keeping the public mostly at bay for the first twenty-five years of the Space Age, NASA-Lewis/Glenn ironically became the leading NASA laboratory for public education in the 1990's, and began performing that role capably.⁴¹

Public support is now, clearly, a basic element of NASA-Glenn's survival. This is particularly true because NASA's current aviation budget is once again shrinking after a goals-rich and funding-poor Moon-Mars initiative introduced by President George Bush in 2003 in the wake of the loss of a second U.S. Space Shuttle. NASA-Glenn will survive. It remains NASA's only center outside of the South and West. It has historic strengths in developing new propulsion systems NASA will need to get its Mars exploration efforts economically underway. NASA, however, is also learning many socio-political lessons late. This occurred because NASA's early leaders often all too successfully defined

themselves in *sui generis* terms: as brilliant engineers providing cutting edge hardware for “right stuff” pilots to take into orbit or beyond.

NASA was always more than this, and inevitably so. But so long as Cold War missions obscured other earthly exploration or science goals, NASA’s dominant engineering and piloting culture could and did see spaceflight in self-justifying terms. In such mindsets, paying attention to any sort of public opinion could seem analogous to asking a class of high school science students what they felt about gravity.

Archival and other data used in this research, accordingly, provides little evidence for the successful mobilization of grass-roots political support by NASA in Cleveland during the first 25 years of the Space Age. NASA-Lewis talked to already-interested engineering and science specialists. Otherwise, it seems to have basically ignored its political, economic, educational, and social surroundings for over two decades after Sputnik, until it belatedly went public to survive. As one ironic result, an aviation research laboratory next to a major airport benefited little from the 1960s and 1970s jet airline travel revolution that changed America. NASA-Lewis did not care that Cleveland withered or died . . . until bells also tolled for it. The only local “public” it seems to have had were suburban science teachers, interested students, a scattering of local academics and an unknown number of professional people, corporate leaders, and the general public. NASA mostly talked to itself, and addressed the already-enthusiastic.

What NASA-Lewis did, NASA headquarters also did. Not until 1976—after civil rights embarrassments, plummeting budgets, and fast-fading political support in Congress, and as NASA-Lewis became the last NASA lab to open a visitor center, did NASA sponsor another study in connection with a bicentennial effort to create more public engagement with space-based activity between 1980 and 2000. In 1961, NASA’s first—and for the next fifteen years, only—such analysis had been buried. This time, a military-industrial think-tank known as the Hudson Institute largely repeated the utterly-forgotten message of the earlier-mentioned Harvard Business School-based consultants of 1961. NASA, for instance, should take special care to link up with national, state, and local professional constituencies—like aviators—who identified with specific NASA programs. Twenty years—a full human generation—after Sputnik, NASA was very reluctantly re-learning lessons it could have learned—in Cleveland, as elsewhere—in 1961 and 1962.⁴²

The Ongoing Influence of Illusion

None of this reluctance is accidental. Official histories of NASA labs produced before the 1990s normally said nothing about the communities in which those labs were located. Nor did they refer to wider social movements such as the movement of millions of women and minorities into hitherto-closed portions of America’s labor force. A “town and gown” mindset was evident. NASA was a beloved alma mater and a special and elite institution. On its research and

development campuses, unique and eternal truths were discovered and transcendent purposes achieved. Lesser matters of society, politics, or economics did not enter in. The social history of the space age at the grass roots, accordingly, was non-existent.⁴³

Lacking much in the way of external reality-checks, NASA's ideas about the degrees of public support that it did—or did not—enjoy stayed largely anecdotal, miscellaneous, or illusory. NASA talked, but it rarely listened. It still had a social research function written into the legislation establishing it which it still normally ignored. Early assumptions that widespread live television coverage of early Mercury, Gemini, and Apollo missions would change the world-views of millions of Americans were still unaccompanied with any effort to determine what opinion effects TV (or other press) coverage was actually having at any point during NASA's formative decades. A science and technology-based agency was still reluctant to apply very-basic scientific principles to itself. Anecdote still substituted. It still too-often does. Advocates can, for instance, look to Hollywood space epics or science fiction novels or to the (now-deceased) Star Trek TV series for support for their positions.⁴⁴

Twenty years after Sputnik (and twenty years after that), accordingly, it was not unusual to hear high NASA officials and space advocates enunciate grand visions of space exploration. America is a nation of explorers and frontiers, the argument goes. Discovery is essential to national vigor, vitality, and survival. Nor was it unusual for these space advocates to believe NASA enjoyed periods of uncomplicated and thorough public support during the first decade of the Space Age. Transcendent-transformative ideas that result often have a spiritual, even religious, overlay. To “understand popular attitudes towards space,” a panel of high-ranking NASA lab managers wrote in 1976, “[I]t is necessary to go far beyond explicit, rational calculations of profit and loss.” The “most striking effects” of the Space Age, they continued “are likely to come in the [twenty-five] years just ahead, as humans who have lived entirely within the space age become adults.” A Copernican, Galilean, or post-Christopher Columbus revolution in socio-economic, religious, and intellectual ideas and institutions so often and insistently hoped-for by space exploration advocates in the years immediately after Sputnik had not yet happened. But the transformative delay would only be temporary. A new millennium would see a new heaven and a new earth in the minds of humanity, and NASA would lead the way into that new era.⁴⁵

Thirty years further along, the millennium has come; but not for space exploration advocates. The planet most people care about most is clearly Earth. And earthly environmentalism, not space exploration, is the chief science-based political phenomenon of the age. NASA is honored and space is important for meteorology, climatology, communications, resources, intelligence, and military command and control. But young people do not connect cell phones, global warming debates, and live, satellite-based weather reports with NASA. This

is in large part because NASA long avoided key Earth-related research opportunities, and so insured the National Oceanic and Atmospheric Administration, the Energy Department, and others would be created to do what it would not in areas including climate research and the ozone layer.⁴⁶

Illusions and Realities

Thus a contemporary NASA is long on goals, short on money and political constituencies outside of the aerospace sector, and facing more staffing cuts. This as the Space Age approaches the half-century mark and as pioneering NASA Mercury and Apollo spacecraft have been on display at the Smithsonian National Air and Space Museum since it opened in 1976. None of this is an accident. Politics is largely priority-setting and public mobilization. Space exploration, as a scientific priority, has come off badly, as compared with alternate basic or applied research uses, ever since the first popular and educated science professional preference polls were done by reputable organizations like the Institute of Social Research of the University of Michigan (in 1959) and the American Association for the Advancement of Science (in 1964).⁴⁷

Reasons are not difficult to find. People wish to avoid illness or affliction. Physicians and hospitals are prominent features of daily life. Urban centers—including Cleveland, Ohio—are internationally-known for their medical treatment facilities—such as those located in and around Glennan’s Case Western Reserve University. From the 1950s to the present, medicine—powered by advances in molecular biology and genetic research—today’s “genetic engineering”—have regularly trumped spacecraft to other planets.

Cities like Cleveland, however, have airports too. Pilots and airplanes are as essential to relatively affluent citizens as physicians or hospitals. So are many other uses of aerospace. But, as the local history of the National Aeronautics and Space Administration laboratory adjoining Cleveland’s airport since 1942 demonstrates, NASA managers in Cleveland failed to follow-up on fine political opportunities in the formative decades of the Space Age. They wanted money without much community involvement, outreach, or disturbance for NASA’s first quarter-century. The results of this political lag at the grass roots of politics are with us still, as embodied history. Imagine a rocket or spacecraft experiencing a political, social, or economic tweak early in its flight path; one that has a far larger effect on where the vessel ends-up, or how long it takes to get there. An initially small direction change has it flying over Europe, not Africa; a small difference in thrust causes a trip to take years longer, or even insures a destination can’t be reached at all. At the grass roots in Cleveland, the proof for a Golden Age of popular support for space exploration is very slight. In part because NASA leaders did little with unusually advantageous local circumstances in the formative years of the Space Age.

The past, however, is not a trap. In 1977, as we’ve seen, a young African-American PhD from the University of Michigan received belated NASA sup-

port to begin creating science and engineering career preparation programs in Cleveland's schools. By 1993, that same man, Dr. Julian Earls, played an important role in creating NASA's "Science, Engineering, Mathematics, and Aerospace Academy" (or SEMAA) program, targeting groups like racial minorities and women long under-represented in science and technology fields. Beginning in Cleveland with 800 students per year, it has since expanded to a national organization serving 62,000 parents, students, and teachers at over twenty major sites. Ten years later, Dr. Earls became the Director of the NASA Glenn Research Center at Lewis Field, serving until May of 2006. From belated and marginal beginnings, educational outreach had become a progressively more important factor in a NASA center's organizational existence in Cleveland, Ohio.⁴⁸

Notes

1. Two volumes which broaden and deepen the usual technology and policy history emphasis are: Walter A. McDougall, . . . *the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985) and Howard A. McCurdy, *Space and the American Imagination* (Washington, DC: Smithsonian Press, 1997).

2. For NASA's creation, see: Glenn P. Wilson, "Lyndon Johnson and the Legislative Origins of NASA," Prologue: *The Journal of the National Archives* (Winter 1993), 363-373; John M. Logsdon, moderator, "Legislative Origins of the National Aeronautics and Space Act of 1958" (Washington, DC: NASA Monographs in Aerospace History #8, 1998), *passim*; Ken Hechler, "Toward the Endless Frontier: History of the House Committee on Science and Technology, 1959-1979" (Washington, DC: GPO, 1980).

Two classics that also provide clear overviews of the context out of which NASA came are: Vernon Van Dyke, *Pride and Power: The Rationale of the Space Program* (Urbana: University of Illinois, 1964) and John M. Logsdon, *The Decision to go to the Moon: Project Apollo and the National Interest* (Cambridge, MA: MIT Press, 1970).

3. For an early warning that Cold War military and prestige competition was an insufficient political basis for NASA, delivered by social scientists from the Council on Foreign Affairs, the RAND Corporation, the Social Science Research Council, and a collection of leading universities including Harvard and Yale, see: "Transcript of Discussion of Non-Scientific Problems of the Space Age, Washington, DC, December 18, 1958," in Keith Glennan papers, Subject Files, NASA History Office, Washington, DC, (hereafter designated: NHO); for the degree to which Life Sciences-focused R&D began beating out Physical Sciences and Engineering-focused R&D in the 1970s, see: Daniel S. Greenberg, *Science, Money, and Politics: Political Triumph and Ethical Evasion* (Chicago: University of Chicago Press, 2001); Bruce L. R. Smith, *American Science Policy Since World War II* (Washington, DC: Brookings, 1990).

4. For a good discussion of this, see: Tom Crouch, *Aiming for the Stars: The Dreamers and Doers of the Space Age* (Washington, DC: Smithsonian, 1999), especially 150. NASA Act of 1958, Public Law 85-568, Section 203—A (3), in John M. Logsdon, ed., *Exploring the Unknown: Select Documents in the History of the U.S. Civil Space Program*, Volume 1: *Organizing for Exploration* (Washington, DC: NASA, 1995), 337.

5. William Sims Bainbridge, *Goals in Space: American Values and the Future of Technology* (Albany: SUNY, 1991).

6. Three of the books on non-minority women's exclusions from the Astronaut Corps are: Martha Ackmann, *The Mercury 13: The Untold Story of Thirteen American Women and the Dream of Spaceflight* (New York: Random House, 2003); Bettyann Holtzmann Kevles, *Almost Heaven: The Story of Women in Space* (New York: Basic, 2003), revised edition (Cambridge, MA: MIT, 2006); and Margaret A. Weitekamp, *Right Stuff, Wrong Sex: America's First Women in Space Program* (Baltimore: Johns Hopkins, 2004). Kevles's coverage extends into the 1970s and 1980s to discuss the experiences of the earliest female astronauts and cosmonauts. For the scarcity of women engineers and scientists, see: Margaret Rossiter, *Women Scientists in America: Before Affirmative Action, 1940-1972* (Baltimore: Johns Hopkins, 1995). For a suggestive argument regarding the suburban origins of environmentalism, see: Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (New York: Cambridge, 2001). For a good survey of how racism and racial fears were widespread even in the

second-largest racially-diverse state in the nation, see: Stephen Wrinn, *Civil Rights in the Whitest State in America: Vermont's Perceptions of Civil Rights, 1945-1968* (Lanham, MD: University Press of America, 1998).

7. For NASA's morale—currently the highest of any civilian or military agency in the federal government, see: "Is Everybody Happy?" *Aviation Week and Space Technology* (November 21, 2005), 17.

8. For NASA's culture, see, i.e., Howard E. McCurdy, *Inside NASA: High Technology and Organizational Change in the U.S. Space Program* (Baltimore: Johns Hopkins, 1993) and Diane Vaughan, *The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA* (Chicago: University of Chicago, 1996). For widespread lack of information, see, i.e., "Satellites, Science and the Public," Survey Research Center, Institute for Social Research, University of Michigan, 1959 (a 57-page report funded by the Rockefeller Foundation). For two good surveys of the differential impacts of different forms of science fiction and astronomy interests over time, see: William Sims Bainbridge, *Dimensions of Science Fiction* (Cambridge, MA: Harvard, 1986), 151-178, 219-222; Elizabeth N. Waterhouse, "The Children of the Blue Marble," *Mercury* [magazine published by the Astronomical Society of the Pacific] vol. 26, March-April, 1997, 10-16.

"Organizational Culture," to quote the CAIB, "refers to the basic values, norms, beliefs and practices that characterize the functioning of a particular institution" which resists change and which survives "reorganization and the departure of key personnel," 101.

9. Paul Cherington, Dan Fenn, Ellis R. Mottur, Raymond A. Bauer, et al., "A Pilot Research Study to Determine the Patterns of Communication Between NASA and Groups within the Scientific and Professional Community, NASA Contract #168, February 1961" (United Research, Inc., Cambridge, MA, February, 1961), copy courtesy of Ellis R. Mottur of Bethesda, Maryland, especially vi-viii, 1-5, 148-163. Cherington, Fenn, and Mottur all enjoyed successful careers in and around government in the Kennedy White House, Commerce Department, Civil Aeronautics Board, U.S. Tariff Commission, Congressional Office of Technology Assessment, and the National Archives and Records Administration.

10. *Ibid.*, 20-25; Eugene Emme, "Notes on Seminar Discourse of Mr. Julian Scheer, July 26, 1967" [six months after the first deaths of U.S. astronauts in an Apollo spacecraft launchpad fire], Julian Scheer files, NHO; Michael L. Smith, "Selling the Moon, the U.S. Manned Space Program and the Triumph of Commodity Scientism," in: Richard W. Fox and T. J. Jackson Lears, eds., *The Culture of Consumption: Critical Essays in American History, 1880-1980* (New York: Pantheon Books, 1983), especially 178.

Perceptions that media—and especially television—sold space exploration remain widespread. But almost all argument is anecdotal. For a sustained treatments, see: James L. Kaufman, *Selling Outer Space: Kennedy, the Media, and Funding for Project Apollo, 1961-1963* (Tuscaloosa: University of Alabama, 1994). For a broader treatment by a noted Canadian science journalist which argues against technodeterminism, see: Lydia Lotto, "Mass Media Coverage of the American Space Program," thesis manuscript. Dated September 1971, Box 1, NASA Public Affairs Office paper, NHO.

11. For NASA's aviation roots, see: Alex Roland, *Model Research: The National Advisory Committee for Aeronautics, 1915-1958* (Washington, DC: NASA, 1985); James R. Hansen, *Engineer in Charge . . . Langley Aeronautical Laboratory, 1917-1958* (Washington, DC: NASA, 1987); and (for aviation generally) Roger E. Bilstein, *Flight in America, Revised Edition* (Baltimore: Johns Hopkins, 1994). For the quiet revolution in passenger air travel, see: Gallup Organization, *Air Travel Survey-1993* (Washington, DC: Air Transport Association of America, 1993) 111-12; *The Travel Market, 1955: A Report to the Travel Research Association by John Lansing and Ernest Lilienstein* (Ann Arbor: Survey Research Center, University of Michigan, 1955); *The Travel Market, 1958: a Report on the Vacation Travel, Travel Patterns, and Attitudes of American Families. . . . John B. Lansing* (Ann Arbor: Survey Research Center, University of Michigan, September 1958); Eva Mueller, et al., *The Travel Market, 1959-1960* (Ann Arbor: Survey Research Center, University of Michigan, May 1961)—all courtesy of Ms. Marian Mistrik, Air Transport Association Librarian, Washington, DC.

12. For NASA-Lewis, see: Virginia P. Dawson, *Engines and Innovation: Lewis Laboratory and American Propulsion Technology* (Washington, DC: NASA, 1981), especially chapter 8.

13. The best biography of McConnell is in *93rd Congress, second session, U.S. Senate, Committee on Aeronautical and Space Sciences*, "Hearings on NASA's Equal Employment Opportunity Program, January, 1973" (Washington, DC: GPO, 1974), 5. In these hearings, Southern-based NASA labs, particularly those in Huntsville, Alabama, Houston, Texas, and Cape Canaveral, Florida, were under strong political scrutiny for hiring few African Americans to do anything. At the time, NASA employed fewer minorities than any agency of the federal government. It had also just fired its Affirmative Action headquarters manager, an African-American woman with an MBA from New York University, for strongly advising that the days of all-White panels of people given restricted powers to begin to hire racial minorities and women in uncustomary ways were past.

Bud Weidenthal, "Glennan Eyes Circle Research Center," *Cleveland Press* (hereafter: *CP*), March 10, 1961; "Glennan Tells Alumni About Space Future," *Cleveland Plain Dealer* (hereafter: *CPD*), May 20, 1961—both in Cleveland Press Archives, Cleveland State University. See also the folders for Glennan, and Silverstein, in this collection. (Hereafter designated: CPA/CSU). *Science*, Vol. 145, July 24, 1964: 369-371, and Glennan's essay, "Inventing an Education for Engineers," *Saturday Review*, November 20, 1965, offprint in Box 20, T. Keith Glennan papers, record group 19DD4, Case Western Reserve University archives, Cleveland (hereafter: Glennan papers/CWRU).

14. Charles Tracy, "Aeronautical Scientists Meeting Here Sure to Analyze Red Satellite," *CP*, October 5, 1957, "NASA" files, CPA/CSU; Seltzer's autobiography is *The Years Were Good* (Cleveland: World Publishing, 1956), 8, 13, 303 in his pro-space attitudes, pre-Sputnik. His scrapbooks are at the Western Reserve Historical Society in Cleveland. Character sketches are in Dick Feagler, *Feagler's Cleveland* (Cleveland: Gray and Co., 1996), 300-312 and George C. Condon, *Cleveland: The Best-Kept Secret* (Cleveland: Zupal and Doyle Publishers, 1981), 108-110. See also: *Current Biography* (1956), 564-566.

15. Glennan to James Modarelli, May 6, 1961, Box 13 (record group 19DD4) and George Mann to Glennan, May 15, 1961, Box 83 (record group 19DC), Glennan/CWRU; Paul Dickson, *Sputnik* (New York: Walker, 2001), 224; Al Ostrow and Charles Tracy, "Cleveland's Moon Men Are Down To Earth," *CP*, March 4, 1958; "Roaring Rockets at NACA Bring Mars Closer," *idem*, March 3, 1958; "Atom Plane Engine is Goal of NACA Lab," *idem*, March 6, 1958; Charles Tracy, "NASA Experts Help U.S. To Conquer Space," *idem*, March 19, 1958, all in CPA/CSU. "NASA Info," April 10, 1959, NASA PAO/NHO.

16. Ted Princiotto, "Space Vehicles, In and Out of Orbit, Displayed At Case," *CPD*, April 11, 1961, CPA/CSU.

17. Lee Berton, "She Leads Thousands Through Air Center," *Cleveland News*, July 30, 1959, CPA/CSU.

18. For how late Cape Kennedy opened up, see, i.e., *New York Times*, December 31, 1964, 30; *idem*, March 28, 1965, Section 10, 9; *idem*, June 27, 1965, section 10, 17; Brian Duff to Julian Scheer, July 5, 1967, Julian Scheer correspondence files, NHO.

19. "Requests Begin Arriving At Press For Youth Days Tour of Space Lab," *CP*, July 18, 1962; Charles Tracy, "25,000 Youths to Tour," *idem*, July 17, 1962; Charles Tracy, "Orbit Time At Hand for Youth Tour of NASA," *idem*, August 3, 1962, CPA/CSU.

20. Interview with Mr. Cal Weiss of Parma Heights, OH, May 11, 2002. Mr. Weiss worked in Public Affairs at NASA-Lewis from 1959 to 1979. He very kindly provided me with a well-illustrated 108-page report titled "Report on Space Science Fair: Cleveland Public Auditorium, November 23—December 2, 1962: Sponsored by NASA and the Cleveland Plain Dealer" which was published by NASA-Lewis as Educational Document #E-2098 in December of 1962. See especially 1-2, 5, 45-52, 60, 69, 104. Author's collection.

21. For NASA's difficulties with the New York World's Fair, see: "1964 World's Fair" file, NASA PAO/NHO; see also: Robert Caro, *The Power Broker: Robert Moses and the Fall of New York*, paperback ed. (New York: Random House, 1975), 1082-1114; McCandlish Phillips, "Fair is Uncertain On Space Exhibit," *New York Times*, August 5, 1962. Not until April of 1964 did NASA and the New York World's Fair Committee agree to share 50/50 in the \$1 million costs of a NASA exhibit at the Fair, the first in New York in 25 years. Fair organizers had wanted NASA, like others, to pay to exhibit at the Fair. NASA refused. See "New York World's Fair," file NASA headquarters Public Affairs Office files, NHO. "Marking 25th Year: Lewis Open House Set for 2,000," *CPD*, September 30, 1966—all in CPA/CSU.

22. See Abe Silverstein file in CPA/CSU, especially *CPD* articles of November 14, 1968, January 29, 1969, October 2, 1963, and the biography of Silverstein dated May 7, 1965. See also *CP*, March 2, 1962, and November 22, 1965, for the only educational outreach I was able to find in the Cleveland suburbs. Cal Weiss interview, May 11, 2002 (Weiss could not recall science fair or other outreach into the Cleveland public schools in the 1960s and 1970s).

23. "Public Understanding in the Space Age . . . An Address by Dr. William L. Pickering, Director, Jet Propulsion Laboratory . . . April 9, 1960," 3-4 and "Impact, Social (1958-1964)" file, NHO.

24. Glennan to Morton Stoller, January 31, 1963, Box 13—collection 19-DD4, "Education Programs, Space Flight Problems, 1958," Box 42—collection 19 DC (Case Central File), Glennan/CWRU.

25. Box 29 of the Case Western University Central Files, collection 19-DC are full of Glennan and Case's varied efforts. See, i.e., Glennan to Donald C. Holmes, May 28, 1965; John A. Hrones to Frederick Reines, December 3, 1962 (re: the approx. 160 Lewis people then taking graduate work at Case); H. W. Mergler to Professor R. E. Bolz, December 15, 1961. Case's first big effort at big money from NASA began in January 1959. For Webb's desire for local applications that would help NASA's political visibility with Congresspeople, see Webb's opening remarks to the "Future Applications Conference, February 9, 1962," Box 13, collection 19-DD4, Glennan/CWRU.

26. R. H. Thomas to T. Keith Glennan, October 1, 1964, Box 29, Collection 19-DC (for yield rate data); Glennan, "A Family Chronicle," 223, Box 20, collection 19-DD4; Glennan to Silverstein, April 4, 1961, Box 13, Collection 19-DD4 (for an example of stilted prose); Silverstein to Webb, February 6, 1963, Box 13, Collection 19-DD4 (for the only evidence of personal involvement by Silverstein I could find in the Glennan Papers) and Glennan to Hrones, May 4, 1964, and Hrones to Lloyd Slater, July 28, 1964, "Discussion with Dr. Olsen of Case-NASA Technology Utilization Project," and Olsen to Hrones, January 15, 1964, all in Box 29, Collection 19-DC, all: Glennan/CWRU.

27. Personal communication with NASA-Glenn archivist, Ms. Eleanor Blackman; Case Western Reserve archivist, Ms. Helen Conger, December 2004 and January 2005.

28. For Cleveland's history, see: Carol Poh Miller and Robert E. Wheeler, *Cleveland: A Concise History 1796-1996* (Bloomington: Indiana University Press, 1997). The data on race is in an appendix on 199.

29. "Glennan Touches A Nerve" editorial, *CP*, June 3, 1965, (Glennan Folder, CPA/CSU).

30. *Ibid.*; "Glennan Outlines Lube Job: Decision Making Called Rusting," *CPD*, June 3, 1965, CPA/CSU. For Carl Stokes as Mayor of Cleveland, see Kenneth B. Weinberg, *Black Victory: Carl Stokes and The Winning of Cleveland* (Chicago: Quadrangle, 1968) and Philip J. Meranto and William E. Nelson, *Electing Black Mayors* (Columbus: Ohio State, 1977), 67ff.

31. For the effect of race problems on the levels of *Cleveland Press* support for NASA, see the Press editorials of October 3, 1964, and March 18, 1965, and the "Explore America First" editorial of July 28, 1967. For simultaneous *New York Times* editorials backing away from earlier support for NASA, see: November 29, 1963, 36, and January 2, 1965, 18.

32. For racial problems within NASA itself, see Kim McQuaid's "Racism, Sexism, and Space Ventures: Civil Rights at NASA in the Nixon Era," in Stephen Dick and Roger Lanuius, eds., *Societal Impact of Spaceflight* (proceedings of a conference held at the Smithsonian Institution in September 2006), forthcoming, and, in different and earlier form, as "Race, Gender, and Space Exploration: A Chapter in the Social History of the Space Age," *Journal of American Studies* (United Kingdom) 41 no. 2 (2007): 405-434.

33. Seymour Raiz, "Space Workers To Aid Teen-agers," *CP*, January 19, 1960, CPA/CSU.

34. "Lewis [sic] Sets Fair Housing Drive," *CPD*, July 17, 1964, CPA/CSU; Rosenblum began the effort as an *individual*. Lewis did not do so as an organization. Involvements editorial headline writers may have wanted were not the reality.

35. Brian Duff to Julian Scheer, "Survey of NASA Visitor Center Programs," October 12, 1967, with accompanying "General Comment on Visitor Tour and Public Briefing Activity at NASA Installations" report, NASA PAO, NHO, 1 (unpaginated).

36. *Ibid.* The "ostrich approach" refers to a saying of the era that an ostrich would stick its head in the sand until the threat of danger passed.

37. *Ibid.*, 2-3 (unpaginated), and "Lewis Research Center" attachment to *ibid.*, 2-page summary, quotation on 1.

38. Lewis head Abe Silverstein's community involvements in this period are instructive. By 1969, Cleveland was infamous for pollution and a Cuyahoga River that could be set alight. Silverstein, who had suffered a heart attack in 1968 resigned from NASA at age 61 in 1969. Silverstein also resigned two of his three university trustee positions. The next year, he went to work, either part- or full-time, as a director of Republic Steel's pollution control program. Part of his energies also went to a vain effort to locate a relatively non-polluting jetport on Cleveland's then disused Burke Lakefront Airport. But this did not assist his credibility with local neighborhood associations in the city, 14 of which attacked his hiring by Republic. The steel corporation, critics alleged, was hiring a man without any expertise to appear to be starting to abide by new federal clean air and clean water regulations. See the *CP* stories of February 4, 1970, and April 1, 1971, in the Silverstein file, CPA/CSU.

39. See Constance Holden, "Sacking of Top Black Woman Stirs Concern For Equal Employment," *Science*, November 23, 1973, 804-807; Holden, "New EEO leadership at NASA," *idem*, August 30, 1974, 769; the "EEO-very sensitive" file in the George M. Low papers at NHO; and Ruth Bates Harris, *Harlem Princess* (New York: Vantage Press, 1991), 253-281. The *Post* quotation is from the editorial "Racism, Sexism, and Space Ventures," *Washington Post*, November 24, 1973. For NASA's reluctant opening re: astronauts, see Joseph Atkinson and Jay Shafritz, *The Real Stuff: A History of NASA's Astronaut Recruitment Program* (New York: Praeger, 1986); Martha Ackmann, *The Mercury 13* (New York: Random House, 2003); Bettyann Holtzmann Kevles, *Almost Heaven: The Story of Women in Space* (New York: Basic, 2003).

40. Fred Buchstein, "45,000 Spent to Aid Science," *CP*, January 18, 1978, CPA/CSU.

41. See *CP*, November 22, 1965, April 19, 1978, October 2, 1981, and January 9, 1982, and *CPD*, October 2, 1981, all "NASA" files, CPA/CSU.

42. For the lack of NASA-wide policies in the 1960s, see the introduction by Julian Scheer to "Public Affairs: Program Review Document, April 19, 1966," especially 3, 18, NASA PAO, NHO; "Implications of Public Opinion For Space Program Planning, 1980-2000," a draft for the

“Outlook for Space Study Group” at the Goddard Spaceflight Center, June 28, 1975, especially 10-15, NHO.

43. Two examples from good NASA Center histories published in the 1990s may suffice: James R. Hansen, *Spaceflight Revolution: NASA Langley from Sputnik to Apollo* (Washington, DC: NASA, 1995) has nothing about the environment around NASA’s oldest lab in Virginia near Washington, DC. Its coverage of women and minority issues is confined to a single illustration and a brief statistical statement on page 105. In Henry Dethloff, *Suddenly Tomorrow Came: A History of the Johnson Space Center* (Washington, DC: NASA, 1993), civil rights matters are non-existent; while “the Houston community” enters in once, as the new NASA lab opened, as all outstandingly enthusiastic and supportive (see 42ff.). Hansen and Dethloff are improvements over earlier efforts.

44. For two discussions, see McCurdy, *passim*; Roger D. Launius and Howard E. McCurdy, *Imagining Space: Achievements, Predictions, Possibilities, 1950-2005* (San Francisco: Chronicle Books, 2001).

45. *Outlook for Space: Report to the NASA Administrator by the Outlook for Space Study Group* (Washington, DC: NASA, 1976), 17, vi. No NASA TV coverage study exists in the NASA History Office. For two good surveys in a sparse field, see James L. Kauffman, *Selling Outer Space: Kennedy, the Media, and Funding for Project Apollo, 1961-1963* (Tuscaloosa: University of Alabama, 1994), and Robert J. Donovan and Ray Scherer, *Unsilent Revolution: Television News and American Public Life, 1948-1991* (New York and Washington, DC: Cambridge and Woodrow Wilson International Center, 1992), 47-57, 270ff. For NASA’s *ad hoc* print coverage, see the changing contents of its *Current News* newsletter files in the NHO.

46. This story is covered in Kim McQuaid, “Selling the Space Age: NASA and Earth’s Environment,” forthcoming in *Environment and History* (a UK-based academic journal) 12 (2006): 127-163. See also Peder Anker, “The Ecological Colonization of Space,” *Environmental History* (April 2005); Pamela Mack, *Viewing the Earth: The Social Construction of the Landsat Satellite System* (Cambridge, MA: MIT Press, 1990) is the best book-length study.

47. For self-selected polls of students at Harvard and the University of Washington which demonstrate that applied uses of space are more popular than transcendent exploratory uses of space even among the demographic group most likely to be space exploration advocates, see William Sims Bainbridge, *Goals in Space: American Values and the Future of Technology* (Albany: State University of New York Press, 1991).

For four too-little-used contemporary studies of attitudes and opinion in the early space age, see Samuel Lubell, “Sputnik and American Public Opinion,” *Columbia Review*, Vol. 1 (Winter 1958), 15-21; “Satellites, Science, and the Public: A Report of a National Survey on the Public Impact of Early Satellite Launchings . . .” (a 57-page Rockefeller Foundation-funded study) (Survey Research Center, University of Michigan, 1959); “Remarks of Thomas C. Sorensen, Deputy Director of the U.S.I.A., Before the Office of Public Information Staff Conference, NASA . . . Tuesday, June 23, 1961,” Public Affairs Office Collection, NHO; and “Space Program: Results of a Poll of A.A.A.S. Members,” *Science*, Vol. 16 (1964), 368.

48. Dr. Earls began working at NASA in 1965. His official biography is at http://www.nasa.gov/centers/glenn/about/bios/earlsbio_new.html. He also has an oral history at the Johnson Spaceflight Center; see http://www.jsc.nasa.gov/history/oral_histories/participants.htm.