need enough interest to acquire the basic knowledge to understand what you are budgeting for. Usually your effectiveness will increase in direct proportion to your real concern for accomplishing the objectives of the program.

Ability to Work with Others. You are always reliant on the work of other people. Sometimes our requests on others are somewhat unreasonable and have the potential of working against their interests. There is necessarily a good deal of stress involved in a budget operation, but success is dependent on ability to maintain a satisfactory rapport with the people with whom you need to work. I believe the main elements in this capability are:

- Openness in letting them know what we are doing,
- Giving them a sense of confidence on how we will use data, and
- An ability to distinguish between friction that arises in business and your personal relationship with an individual.

Detail Work. I believe that an analyst should actually enjoy a certain amount of spread-sheet work, even if it is partially automated. In my opinion, you need to work with the figures before they really become part of your thought processes.

Big Picture. All of our detail work is done for a purpose. To be effective, you need to be able to keep the objective in mind even while you are working on the detail. You also need an ability to depart from the detail approach when the objective requires that you do so. You need to be prepared to accept the fact that those above you may reach conclusions which differ from the results of your detailed analysis. You need to realize that the detail work is only one input into a large arena of decision-making.

Communication. For the results of our work to be effective, we need to express our ideas and conclusions both orally and in writing. We need to learn to express them in a way that will reach the person for whom they are intended. Often, the ability to put the message into a concise written form is a good test of your real understanding. The approach will differ with different people and at different levels of management. For the top level, we need to say what needs to be said briefly and clearly when the opportunity presents itself.

Sense of Timing. This involves judgment as to which deadline needs to be met. It also means acceptance of the fact that a 70% job available a half-hour before a meeting is usually better than a 100% job a half-hour after the meeting. One of the most important aspects of providing support to management is providing it when needed. As an analyst, you need to be willing to take the risks involved in providing something less than a completely satisfactory product in time to do some good. This is a matter of accepting the goals involved in the overall purpose of the work rather than taking particular pride in any individual piece of the total effort.

Common Sense and Good Judgment. A requirement for these characteristics is inherent in any responsible job. It is implied in all of the above points. The need for common sense and judgment becomes especially important when guidance is inadequate, when there is not enough time to meet all requirements, or when dealing with matters which have become emotional issues. In much of our work, all three of these factors are present.

General Comment on Qualifications

No mention has been made on academic training. Over the years, I have worked with many excellent analysts, and I am not aware of any particular correlation of specific types of education and success in budgeting. Some accounting and management courses are probably desirable, if not taken too seriously. In programs such as space or defense, some background in science and engineering can be helpful. Training in written and oral communication has value. In general, I believe successful performance in the academic and work environment is more important than any specific training.

Programs, Projects, and Headaches

by Homer Newell

Former Chief Scientist, NASA
(from his 1981 book Beyond the Atmosphere)

As with its predecessor, the National Advisory Committee for Aeronautics, NASA's principal technical strength lay in the field centers. At the time of the metamorphosis into an aeronautics and space agency, NACA had three principal centers: the Langley Aeronautical Laboratory near Hampton, Virginia; the Ames Aeronautical Laboratory at Moffett Field, California; and the Lewis Flight Propulsion Laboratory in Cleveland. In addition there was a High Speed Flight Station at Edwards Air Force Base in California and a small rocket test facility on the Virginia coast at Wallops Island. The first four of these became under NASA the Langley, Ames, Lewis, and Flight Research Centers, the research orientation of which Deputy Administrator Hugh Dryden was so desirous of protecting. Wallops Station was assigned primarily to the space science program.

To the former NACA installations, NASA added six more: the Goddard Space Flight Center in Greenbelt, Maryland; the Jet Propulsion Laboratory in Pasadena; the John F. Kennedy Space Center at Merritt Island, Florida; the George C. Marshall Space Flight Center in Huntsville, Alabama; the Lyndon B. Johnson Space Center (which for many years was known as the Manned Spacecraft Center) in Houston; and, briefly, an Electronics Research Center in Cambridge, Massachusetts, which was transferred to the Department of Transportation. A sizable facility for testing large rocket engines was established in Mississippi not far from New Orleans and placed administratively under Marshall, which had prime responsibility for the Saturn launch vehicles used in the Apollo and Skylab programs. The Jet Propulsion Laboratory and Marshall were transferred to NASA from the Army; the others were created by NASA. As its original name suggests, Johnson was in charge of the Mercury, Gemini, and Apollo spacecraft and most of the research and development was related to those programs. Kennedy, originally the Launch Operations Directorate of Marshall, provided launch support services for both manned and unmanned programs, but the former required by far the greater capital investment and manpower. Both Goddard and the Jet Propulsion Laboratory were principal centers for the space science program, the former for scientific satellites, the latter for planetary probes.

Management at headquarters guided the space program, directed the overall planning, developed and defended the budget for the agency, and fostered the kinds of external relations and general support that the space program needed. In a very real sense headquarters people labored at the center of action where the political decisions were made that permitted the space program to proceed. Yet the story of headquarters activity is mostly one of context, of background--essential, indispensable, but background nevertheless--against which the actual space program was conducted. Research, the essence of the space science program, was done by scientists at NASA centers, in universities, and at private and industrial laboratories.

It follows that the mainstream of space science must be traced through the activities of these institutions. With occasional exceptions, like the upper atmospheric research of the Geophysical Research Corporation of America and the pioneering work of American Science and Engineering in x-ray astronomy, the contribution of industry was more to the development and flight of space hardware than to conducting scientific research. It remains, then, to take a look at the part played by the NASA centers.

The principal space science centers were the Goddard Space Flight Center and the Jet Propulsion Laboratory (JPL being operated by California Institute of Technology under contract to NASA). Wallops Island, which for a time was placed administratively under Goddard, provided essential support to the sounding rocket and Scout launch

vehicle programs. But not all NASA space science was done at these centers. The Ames Research Center managed the Pioneer Interplanetary probes and took the lead in space biology and exobiology--a term coined to denote the search for and investigation of extraterrestrial life or life-related processes. Langley had responsibility for the Lunar Orbiter and later the Viking Mars probe. Most notable was the lunar research fostered by Johnson in the early 1970s with the samples of the moon and other Apollo lunar data, which for a time made Houston a veritable Mecca for lunar scientists. But Apollo lunar science was an exception generated by the special nature of the manned lunar exploration program; and, generally, Dryden's policy stood in the way of more than a limited participation of the research centers in space projects.

Over the years the NASA centers built up an enviable reputation of success on all fronts, in manned spaceflight, space applications, and space science. In the last mentioned, by 1970 Goddard had flown more than 1000 sounding rockets, more than 40 Explorer satellites, 6 solar observatories, 6 geophysical observatories, and 3 astronomical observatories, most of them successfully. In applications Goddard enjoyed comparable or better success rates with weather and communications satellites. The experience of the Jet Propulsion Laboratory was similar. By the end of the 1960s JPL had sent 3 Rangers and 5 Surveyors on successful missions to the moon and dispatched 5 Mariners to Mars and Venus. These achievements are bound to be recounted repeatedly and will rightfully be judged as success stories. Success, however, was not bought without a price of some mistakes, temporary failures, and occasionally severe personal conflict, which form an instructive part of the total history. In reviewing the struggles and problems that preceded the achievements, a proper sense of perspective is important, for troubles often tend to magnify themselves in the eye of the beholder. The difficulties were, after all, overcome in the ultimate successes that were achieved. Still, as part of the total story, perhaps as illustrating the natural and usual course of human undertakings, those difficulties are important to the historian. They should also be instructive to later managers. Thus, without at all deprecating their splendid achievements, it is appropriate to delve briefly into some of the trials endured by the Goddard Space Flight Center and the Jet Propulsion Laboratory.

The Character of the Field Centers

The different centers in NASA had distinctive personalities that one could sense in dealing with them. As might be expected the former NACA laboratories kept as NASA centers many of the characteristics they had acquired in their previous incarnation. One trait was the fierce organizational loyalty that had been displayed as part of NACA. Thus, while officials at those centers were convinced that the real power of the agency lay in the centers and felt very strongly that they should have some voice in formulating orders, and also that once given an assignment they should be left alone to carry it out, they also recognized that the ultimate authority lay in headquarters. Given marching orders, they would march much as ordered.

The new centers in NASA had their difficulties in this regard, to varying degrees. The Marshall center reflected the background and personality of its leader, Wernher von Braun, and his team of German rocket experts. Bold, with a bulldog determination, undaunted by the sheer magnitude of a project like Saturn, they could hardly be deterred by request or by command from their plotted course. The effort to superimpose the Juno space science launchings and the Centaur launch vehicle development on the Marshall team, when Saturn represented its real aspiration, simply did not work out. The Juno launchings had to be canceled after a string of dismal failures, which space science managers in headquarters felt was caused by lack of sufficient attention on the part of the center. Centaur, in the midst of congressional investigation into poor progress, was reassigned to the Lewis Research Center. The Manned Spacecraft Center developed an arrogance born of unbounded self-confidence and possession of a leading role in the nation's number-one space project, Apollo. A combination of self-assurance, the need to be meticulously careful in the development and operation of hardware for manned spaceflight, plus a general disinterest in the objectives of space science as the scientists saw them, led to extreme difficulties in working with the scientific community. But the art of being difficult was not confined to the manned spaceflight centers. In this both the Goddard Space Flight Center and the Jet Propulsion Laboratory were worthy competitors. So, too, was headquarters, for that matter.

The Goddard Space Flight Center's collective personality stemmed from its space science origins. As the first new laboratory to be established by

NASA, Goddard inherited most of the programs and activities of the International Geophysical Year, like the Vanguard satellite program and the Minitrack tracking and telemetering network. Also, many of the scientists and engineers of the Rocket and Satellite Research Panel and the IGY sounding rocket and scientific satellite programs joined Goddard to make up, along with the Vanguard team, the nucleus out of which the center developed. These origins indelibly stamped Goddard as a space science center, even though science accounted for only about one-third of the laboratory's work (and by the nature of things, most of that effort went into the development, testing, and operation of sounding rockets, spacecraft, and space launch vehicles required for the scientific research). In actuality only a small fraction of the Goddard Space Flight Center's personnel was engaged in space science research. Nevertheless, the presence of those persons in key positions, which they came to fill as charter members of the laboratory, imparted to the center a character that accounted simultaneously for its success in space science and for many of the difficulties experienced with upper levels of management.

As professional scientists, these persons were by training and experience accustomed to deciding for themselves what ought to be done in their researches. While subjecting themselves to a rigorous self-discipline required to accomplish their investigations, they nevertheless approached their work in a highly individualistic manner. They questioned everything, including orders from above. While they could and did work effectively as groups, their cooperation included a great deal of debate and free-wheeling exchange on what was best to do at each stage. To trained engineers in NASA--for whom a smoothly functioning team, accepting orders from the team leader as a matter of course, was the professional way of going about things--the seemingly casual approach of the Goddard scientists looked too undisciplined to work.

The Goddard scientists had also been accustomed to determining their own objectives and pacing themselves as they thought best. The accomplishment of an experiment that produced significant new information was what counted; costs and schedules were secondary. That a project took longer to carry out than had originally been estimated was of little consequence so long as the project succeeded, particularly if the additional time was put to good use improving an experiment and ensuring success. This peculiarly science-related sociology of the space scientists at Goddard reinforced the tensions that naturally come into play between a headquarters and the field in large organizations, and led to a major confrontation in the mid-1960s.

Field Versus Headquarters

Headquarters and field in any effective and productive organization support each other, working as a team in the pursuit of common goals--those of the organization. Yet many aspects in even the most normal of headquarters-field relationships serve to pit one against the other at times. When circumstances exacerbate those normal centrifugal tendencies, serious trouble can arise. To understand the nature of the problem, a few words about the difference in headquarters and center jobs in a technical organization like NASA are in order.

At the heart of the difference is the matter of programs and projects. The raison d'etre of an agency is reflected in its various programs, where the term program is used to mean a long-term, continuing endeavor to achieve an accepted set of goals and objectives. NASA's overall program in space included the exploration of the moon and the planets, scientific investigations by means of rockets and spacecraft, and the development of ways of applying space methods to the solution of important practical problems. Each of these programs could be, and when convenient was, thought of as a complex of subprograms, such as a program to develop and put into use satellite meteorology, a program to improve communications by means of artificial satellites, or a program to investigate the nature of the cosmos. Barring an arbitrary decision to call a halt, one could foresee no reason why these programs, including the subprograms, should not continue indefinitely. Certainly, if past experience is a good indicator, the effort to understand the universe must continue to turn up new fundamental questions as fast as old ones are answered. As for exploration, the vastness of space, even of that relatively tiny portion of the universe occupied by the solar system, is so great that generations could visit planets and satellites and still leave most of the job undone. And it would be a long while before diminishing returns would call for an end to applications programs.

Unlike a program, a project was thought of as of limited duration and scope, as, for example, the Explorer II project to measure gamma rays from the

galaxy and intergalactic space. A program was carried out by a continuing series of projects, and at any given time the agency would be conducting a collection of projects designed to move the agency a number of steps toward the agency's programmatic goals and objectives. The Explorer II *project* contributed to the *programmatic* objective of understanding the universe by determining an upper limit to the rate of production of gamma rays in intergalactic space, which eliminated one candidate version of the continuous creation theory of the universe.

A project like a sounding rocket experiment might be aimed at only a single specific objective, last only a few months or a year, and cost but a few tens of thousands of dollars. Or a project could require a series of space launchings, many tens or even hundreds of millions of dollars, and take years to accomplish. The Lunar Orbiter, with five separate launchings to the moon, and the Mariner-Mars project that sent two spacecraft to Mars in 1971 were examples. Some projects were huge in every aspect, as was Apollo. In fact, because of its size and scope, Apollo was more often than not referred to as a program, although more properly Apollo should be thought of as a mammoth project which served several programs, among them the continuing development of a national manned spaceflight capability, the exploration of space, and the scientific investigation of the moon.

With these definitions of program and project in mind, one can describe rather simply the difference between headquarters and center jobs. Headquarters was concerned primarily with the programmatic aspects of what NASA was up to, whereas the task of the centers was mainly to carry out the many projects that furthered the agency's programs. The distinction is a valid but not a rigid one. Occasionally headquarters people participated in project work, but this was an exception to the general rule. The most notable exception was Apollo, the size and scope of which were such as to make the administrator feel that the uppermost levels of management for the project should be kept in Washington. Nevertheless, the prime task of headquarters, working with the centers and numerous outside advisors, was to put together the NASA program, to decide on the projects best designed at the moment to carry out the program and assign them to the appropriate centers for execution, and to foster the external relationships that would generate the necessary support for the programs and projects. As an essential concomitant to programming, much time was occupied in preparing budgets, selling them to the administration, and defending them before Congress.

Also, each center, while project-oriented, had its center programs toward which the center directed its own short- and long-range planning. Thus, the research centers conducted programs of advancing aeronautical and space technology. In addition to a program of space science, the Goddard Space Flight Center pursued extensive programs of space applications and space tracking and data acquisition, with tracking and acquisition occupying almost 40 percent of the center's manpower. Unmanned investigation of the solar system was the Jet Propulsion Laboratory's principal program.

Although the qualifications should be kept in mind to have the correct picture, nevertheless the main distinction between the responsibilities of headquarters and those of the centers is clear. Center personnel members were primarily occupied with project work, while headquarters people spent--or should have spent--their time on program matters. That is where difficulties arose, for numerous pressures drove headquarters managers to get involved in project or project-related work. Such actions could only be regarded by a center as undue interference from above.

Naturally, NASA space science managers were vitally interested in what was happening in the various space science projects. They were responsible for proper oversight. But there was more to it than that; project work was where the action was. That was where interesting problems were being attacked and where exciting results were being obtained. Alongside project work, programmatic planning often seemed like onerous drudgery. As a consequence oversight tended to degenerate into meddling, to the distress of project managers and center directors. Even when headquarters managers took pains to couch their thoughts in the form of mere suggestions, their positions in headquarters made suggestions look more like orders. That program chiefs in headquarters occupied staff, not line, positions often was lost sight of in the shuffle, and some headquarters managers became adept at wielding what amounted in practice to line authority.

To this natural tendency to get into the act were added the pressures of the job. As the NASA program grew in size, scope, and expense, upper

levels of management demanded more and more detail on schedules, costs, and technical problems. Nor was the demand for information confined to NASA management. Becoming increasingly familiar with the programs and their projects, the legislators also demanded what seemed an impossible amount of detail, either to provide while still getting the job done or for the Congress to assimilate. On the science side, members of the authorizing subcommittee in the House, under Chairman Joseph Karth of Minnesota, frequently concerned themselves with the details of engineering design decisions and were not loath to second-guess space project engineers on matters that seemed to NASA people to lie beyond the competence of the legislators to judge. An example of this searching interest was furnished by the investigation of the Centaur liquid-oxygen and liquid-hydrogen fueled rocket stage which Karth's subcommittee undertook in 1962. NASA and contract engineers found it difficult to defend the propellant feed system which they had chosen and which could be shown to be most efficient for a rocket the size of Centaur, against a different system for which the committee expressed a preference and which admittedly would likely have more growth potential.

Because of this increasing demand for information of various kinds, headquarters in turn demanded of the centers the detailed reporting that centers felt was appropriate for project managers but went far beyond what headquarters really needed. While program managers were willing to concede that the information they were calling for was more than they ought to need, yet they were caught in the middle; to do their jobs as circumstances were shaping them, they did need the data. They were forced, therefore, to insist, and the extensive reporting required, with its implied involvement of headquarters with what were strictly center responsibilities, remained as a continuing source of irritation.

The irritation transferred to headquarters when centers were late or deficient in their reporting, especially when a center simply refused, sometimes through foot dragging, sometimes in open defiance, to supply the information requested. A center might be reluctant to respond when it felt that the request was premature, that the data were not yet properly developed, and that the center might later be called to task if the information supplied prematurely turned out to be incorrect.

A related source of irritation arose in connection with the center's management process. At almost any time throughout the year a program manager might be called upon to furnish information about projects in the program. It was essential, therefore, to be continuously aware of the status of projects which might have to be reported. For this it was not enough to rely on written reports which came only so often. In addition, space science program managers kept in close touch with the project managers and attended many of the meetings held by the project managers with their staffs and with contractors' representatives. This practice came to be a particularly sore point with the management of Goddard Space Flight Center.

Strains on the Family Tie

The Goddard Space Flight Center and NASA Headquarters, only half an hour's drive apart, were connected by close ties. Between the two staffs, many personal associations dated from the days of the Rocket and Satellite Research Panel and the sounding rocket and satellite programs of the International Geophysical Year. An easy relationship existed from the very start of the center. John Townsend--who served as acting director of the center until the permanent director, Harry Goett, formerly of NACA's Ames Aeronautical Laboratory, took over--had been associated with John Clark and the author at the Naval Research Laboratory. For many years Townsend had been the author's deputy in the NRL's Rocket Sonde Research Branch. Harry Goett and Eugene Wasielewski, whom Goett brought into Goddard as associate director, had long been acquainted with Abe Silverstein from the days of the National Advisory Committee for Aeronautics. These friendships served to mitigate the divisive forces between headquarters and field, but were not enough to avert an ultimate break.

Harry Goett assumed the directorship of Goddard in September 1959. As was his nature he quickly entered personally into every aspect of the center's work. From his first day until he left, he kept in close touch with every project. As an untiring battler for the center and his people, Goett endeared himself to his coworkers. He was a warm, emotional person who showed a deep interest in the men and women working for him, and on both sides a deep affection developed.

In the first weeks and months of NASA's planning for its program, many center people had been drawn into headquarters working groups to help get things under way. But as center project work grew, these assignments, which tended to persist, began to

interfere with center duties. Finding Goddard people still working on headquarters tasks a year after NASA's start, Harry Goett began to protest that his personnel should be relieved as fast as possible of these additional duties. On the other hand, center people's taking part in headquarters planning was advantageous to the center. Both organizations tried to keep center participation within reasonable bounds.

As Goett, Townsend, and their people built up Goddard and launched their initial projects, program managers were developing their own methods of keeping themselves and their superiors informed. Simultaneously the Congress was increasing its demand for detailed information, which it was incumbent on headquarters to supply. As the requirements for reporting increased, project managers complained that they were spending too much time with program managers and in preparing reports, time that would be better spent in getting on with the projects. In mounting crescendo, Goett complained to the author and his deputy in the headquarters space science office, Edgar M. Cortright, that headquarters managers were getting in the way of center management. Goett urged that headquarters people keep their hands off project management.

While agreeing in principle with the Goddard director, Cortright and the author strove to get him to see that in the existing climate of continuing congressional scrutiny, keeping informed was an important part of headquarters work. That, space science management insisted, was an absolutely essential part of the program manager's job, but not to usurp the project manager's duties or to interfere with other work. Cortright and the author urged upon their people great care in working with the project managers to avoid any kinds of action that would undercut, or appear to undercut, the project manager's responsibilities and authority. It was no advantage to the program for any project managers to feel that responsibilities had been in any way lifted from their shoulders.

Headquarters was far from Simon pure in these matters, unfortunately, and there was considerable justice in Goett's complaints. The natural urge to meddle plus the incessant pressure to keep informed led many program managers to get into the project business. Sometimes this led to strong adversary relations between program and project managers; at other times to close "buddy-buddy" relations. Both situations caused problems for center management and called for continuing attention.

By the fall of 1962, Goett found the situation so disturbing that he felt impelled to complain openly at a NASA management meeting held at the Langley Research Center that headquarters got too much into projects and should stick to program management. His barbs were aimed not only at space science managers, but also at those responsible for applications programs and for tracking and data acquisition. He felt that there was not enough contact between the center director and the associate administrator. Goett also felt he did not have enough contact with the author. The last complaint stemmed from the mode of management the author had adopted, about which a few words are in order.

Being a scientist, the author felt it wise to name as deputy an engineer whose training and experience would complement his own. Edgar M. Cortright, an aeronautical engineer with considerable research experience in the National Advisory Committee for Aeronautics, filled the bill very nicely. An implication of this philosophy of organization was that the deputy should be more than an understudy, more than just someone to sit in when the principal was away. Rather, the deputy should take responsibility for important aspects of the top management job that came within his sphere of expertise. This was the arrangement agreed on between Cortright and the author. Cortright would handle engineering matters, which meant oversight of much of the project work, dealing with contractors, and a great deal of the relations with the space science centers. The author would work on program planning, advisory committees, and most of the space science program's external relations including those with the Academy of Sciences, the scientific community, and the universities. Such an arrangement had worked well at the Naval Research Laboratory, where John Townsend's engineering and experimental bent had complemented the author's theoretical background. Moreover, in addition to providing the top level of management in the office with talents and experience complementing those of the director, it was an effective way of providing a deputy with substantive work and to continue his professional growth. A deputy with nothing more to do than to wait around for the principal to be away must find life deadly dull, unrewarding, and stultifying.

Under this arrangement, problems of the kind Goett was wrestling with would normally have been taken

up by Cortright. But Goett was not willing to deal with a deputy. As director of the Goddard Center--even though the author was meticulously careful to support agreements Cortright worked out--Goett felt that he should deal directly with the principal in the office for which the center was working. Under the circumstances the author took special pains to make it clear that he was available to Goett at any time, yet expressed the hope that Goett would work with Cortright in the normal course of day-to-day matters.

The strain caused by the project-management versus program-management conflict took increasing amounts of time and attention. A great deal of the time spent with Goett was devoted to this problem. John Townsend, Goett's man for space science matters, pointed out that if a program manager had only one project under way in his program, then it became very difficult to draw a line between program and project, and the pressure on the program manager to get into project management was overwhelming. Townsend recommended that programs be put together in such a way that a program manager would have several projects to deal with. Under such an arrangement a program manager could no longer give the single-minded attention required by a project, and should find it much easier to confine himself to program matters. Cortright and the author agreed and tried to avoid single-project programs.

Goett pointed out that it was not just the cases in which program and project managers were at odds that gave trouble. When the two got along well together, often they would team up to promote their project over other projects which the center management--taking into account existing constraints on dollars, manpower, and facilities--might judge to be more appropriate. Thus, program and project managers working hand in glove for their own projects--perhaps to enlarge them or to extend them beyond existing commitments--were not always working for the best interests of the center.

Goett was most disturbed to have program managers, in the name of keeping in touch, attend meetings with outside contractors. Even if the headquarters people came with the determination to keep their mouths shut, contractors' representatives had a penchant for tossing questions to the headquarters representatives, with the implication that that was where the final word would lie. And when headquarters people did volunteer comments, their comments tended to take on more weight than the word of the project manager. These difficulties became even worse when the headquarters man was technically more competent than the project manager--which Goett didn't feel could happen very often. In that case the project manager tended to defer to the headquarters person for decisions and recommendations that the project manager should make personally, and the contractors were easily confused as to who was calling the shots.

Goett's solution to these problems would have been to keep program managers away from project management meetings, and especially away from meeting with contractors. Considering the program manager's basic responsibility to see to the health of the program and the corresponding need to keep informed--a need that was enhanced by the growing amount of attention given by congressional committees to NASA's programs and projects--Goett's solution was not acceptable. Cortright and the author spent a great deal of time trying to get Goett to appreciate headquarters' needs and to agree to some middle-of-the-road way out of the dilemma. A written description was prepared of the distinction between program management and project management, and the author committed himself to ensuring that the program people understood the bounds of their authorities and responsibilities. But the author also insisted that the way be kept open for headquarters people to keep adequately informed. Goett was not satisfied. In a letter to Associate Administrator Robert C. Seamans 5 July 1963, he outlined some of the problems as he saw them. Shortly thereafter, on 26 July 1963, the Office of Space Science and Applications proposed a revision of NASA Management Instruction 37-1-1. In Appendix A were specific definitions of *program* and *project*. The instruction made the point that the headquarters job concerned itself with program matters primarily, while project managers normally were at field centers. On 5 November 1963 the author wrote Harry Goett on the subject of headquarters-center relations. The letter outlined agreements that it was hoped had been reached to keep headquarters people properly informed, without undercutting the center's position with contractors. But matters continued to deteriorate.

Complaints were not confined to the center side. In a talk given to a number of managers of space science and applications projects, at Airlie House near Warrenton, Virginia, the author spoke on relations between program managers in headquarters and project managers in the centers. By giving what was viewed by headquarters people as too much emphasis