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## Program Excellence: NASA's New Management Instruction

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In late 1992 the NASA Administrator established a Program Excellence Team (PET) to "strengthen and streamline the policies and processes governing management of our major system development projects." The Administrator promised the Space Council a single, comprehensive policy to combine NASA's program and acquisition management procedures. The new NASA Management Instruction 7120.4, dated November 8, 1993, is a product of our team findings and represents a major effort in genuine reform of program management at NASA.

Actually, the major factors leading to poor program and project management had been repeatedly identified for perhaps two decades, going back at least to NASA's Low Cost Systems efforts in the mid- to late-1970s. Over and over again, NASA had initiated new projects that exceeded available resources, both financial and institutional. There had been talk of major "buy-ins" on the part of contractors as well as NASA, and an unstable commitment from the Administration and Congress. Too many of these new starts suffered from inadequate definition, including poorly specified requirements and responsibilities that were either unclear or undefined, or both. As a result, program control to a defined baseline was virtually impossible. We knew all this, and yet there was poor follow-up on past studies, and where recommendations were put into policy, they were followed loosely or not at all.

Earlier in 1992, the new NASA Administrator Dan Goldin formed a Project Planning Team headed by Jack Lee, Director of the Marshall Space Flight Center, to identify chronic project planning problems and to offer solutions once and for all. The severity of these problems had been shown through a just-completed study of 29 recent projects that found schedule growth of 40 percent median (63 percent average), cost growth of 37 percent median (63 percent average), and a nominal definition/development life cycle time of 12 years. Clearly, NASA projects were troubled.

The 1992 Lee Study found eight major factors that typically drove NASA program cost and technical risk:

- Inadequate Phase B definition
- Unrealistic dependence on unproven technology
- Annual funding instability
- Complex organizational structures, including multiple or unclear interfaces
- Cost estimates that were often misused
- Scope additions due to "requirements creep"
- Schedule slips
- An acquisition strategy that did not promote cost containment.

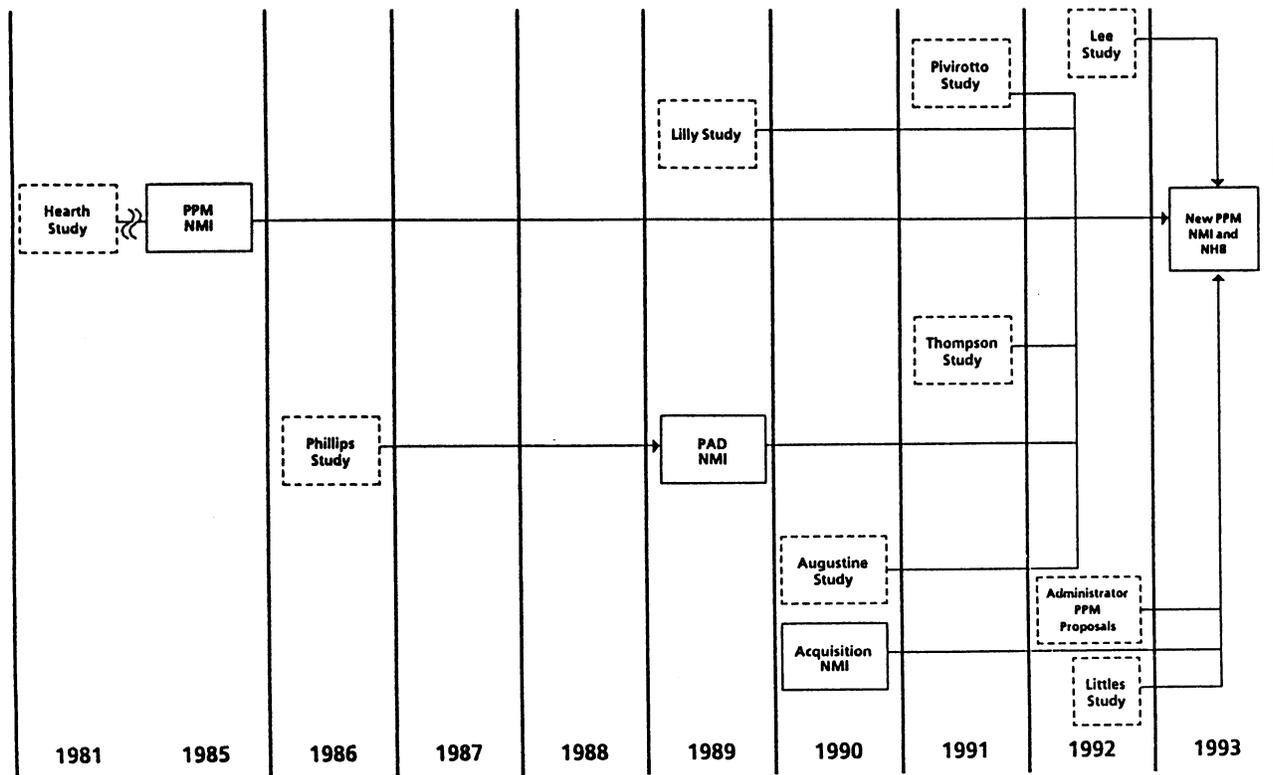


Figure 1. Program/Project Management History: 1981-1993

These factors were historically well known and undisputed, but the Lee team verified them in more than two dozen recent programs and projects. These chronic problems were still with us. Many of them had been duly noted in Don Hearth's classic 1981 study of project management, the Phillips NASA Management Study of 1986, the Lilly Program Control Study of 1989, the Augustine Report of 1990, Donna Pivrotto's Program/Project Management (PPM) Summer 1991 Study and J.R. Thompson's 1991 study on NASA Roles and Missions.

Armed with these insightful studies, our Program Excellence Team set out to consolidate and revise the three existing NMIs on

program and project management. NMI 7120.3, dated February 6, 1985, covered just space flight program and project management. NMI 7121.5, dated March 14, 1989, instituted the Program Approval Document (PAD). NMI 7100.14b, dated February 27, 1990, covered major system acquisition.

Our first effort was to make sure the PET membership finally represented both program and critical support areas, such as procurement, comptroller and Safety and Mission Quality. Once formed, the team developed improvement proposals based upon the project planning team's recommendations, the results of the earlier stud-

ies and the Administrator's own program management policy proposals. We focused on internal improvements rather than external changes, and on major programs, we made a single but critically important assumption: that the Agency would operate within the framework of an integrated strategic plan with a set of priorities.

Our objectives were simple: Enhance delivery of performance on schedule and within budget; shorten the life cycle time.

The requirements we had to meet to achieve these objectives were considerably more complex. We knew we had to update PPM policy provisions to expand their applicability and scope beyond space flight and beyond the development phase. We knew we had to strengthen internal support for each NASA program, and that we had to plan and implement within available Agency resources (funding and institutional). We would have to streamline the life cycle process to assure adequate definition, technological readiness and validation of cost estimates with an expedited acquisition process and strengthened program control. Our approach would also have to clarify PPM responsibilities by establishing Agency-level PPM ownership and a clear chain of command.

We recommended the Deputy Administrator be assigned total Agency-level responsibility for all major system programs and projects. These are defined as any connected to an Agency mission entailing allocation of relatively large resources, or warranting special management attention.

They include programs and projects with Development Cost Commitments (DCCs) of more than \$200 million, those requiring external reporting on a regular basis, all multi-Center programs, and the first in a series of projects. The NMI excludes ground-based programs in research, technology development or space science, and exceptions granted by the Administrator, although the intent and underlying principles apply to all system programs and projects. (Recent changes in NMI 7120 may result in the inclusion of some technology development, such as the High Speed Research and the Advanced Subsonic Technology programs.)

The Program Excellence Team also recommended the formation of a Program Management Council (PMC), chaired by the Deputy Administrator, to assure Agency-level integration of planning, oversight and approval recommendation of major system development programs. The PMC would also provide Agency-level review and assessment of Agency technology and advanced development programs. Finally, the PMC would serve as a forum to address PPM policy and management issues as they arise.

To assure that the Agency program is in balance with available resources and to strengthen the support of the Agency senior management team for the total Agency program, approval of new programs and projects now comes from higher levels. Under NMI 7120.4, Phase A pre-implementation approval comes from the Program Associate Administrator, not the

Center Director, after needs are validated by users and mission needs are shown to be in accord with the NASA Strategic Plan. Phase B approval comes from the Administrator instead of the Program Associate Administrator. An additional approval cycle was added early in the program to force better definition efforts as well as to provide increased insight and, hopefully, commitment through all levels of the decision chain, including Congress. The Phase B definition effort was extended through PDR to support this process and avoid costly gaps in program implementation that were required by the existing life cycle.

The technical, schedule and cost commitments are embedded in a Program Commitment Agreement (PCA) process which replaces the Program Approval Document (PAD). In about six pages, the PCA is developed in Phase B studies and becomes a two-way commitment between the Program Associate Administrator and the NASA Administrator that is maintained throughout the life cycle. Similar agreements between Program Associate Administrator and Program Manager, as well as the latter and field Center project managers, form a clear commitment agreement chain, subject to annual or periodic renewal.

While project definition is being improved with additional planning requirements, acquisition management is improved in several major ways under NMI 7120.4. First of all, performance requirements, not design specifications, are specified as a nominal RFP approach, thus enhancing utilization of private sector capability and

experience. Secondly, a "down-select" procedure during Phase B is specified as a nominal approach so as not to impede work flow unnecessarily. (Phase B Requests for Proposals will encompass Phase C/D in order to support competitive down-selection.) Thirdly, a contract budget plan and corresponding annual funding profile are included in the solicitation to promote realistic cost and technical proposals. Our PET team also recommended that a prime contractor be required for systems engineering and integration functions on large, complex programs involving multiple Centers.

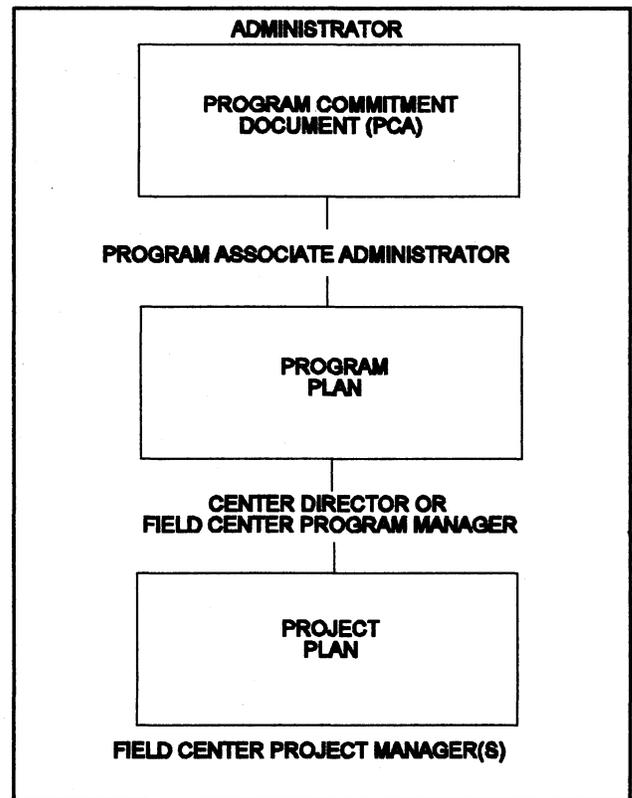


Figure 2. Commitment Agreement Chain

One of the most significant acquisition improvements comes from the addition of NASA "smart buyer" requirements. Phase A studies, which pin down the mission needs, will be conducted by civil service staff. Civil service staff will then parallel industry Phase B efforts, but on a smaller scale.

Also new are improvements in Program Control. Project baselines have to be developed early, and all projects with projected growth above 15 percent against cost commitments will be required to undergo Cancellation Review. Several requirements for external review have been added right through to Phase E, Operations, including the annual PCA validation, quarterly status reviews and mission reviews, now referred to as Independent Readiness Reviews (IRRs) and External Independent Readiness Reviews (EIRRs), coinciding generally with critical development decisions. Thus, the potential for surprises and cost growth is substantially reduced, and stronger program control, coupled with better definition and improved acquisition, should result in less time in the development phase. After all, time is money.

The NASA Administrator has accepted the recommendations of the PET team, approved the consolidated PPM NMI and promised Congress to implement program and project management reform. The PMC has been set up and PCAs approved for existing programs. The PET has conducted numerous briefings on NMI 7120.4, including those to senior management and others

at each NASA Center and to several PPMI classes. After a year of operating under these new approaches, we have initiated selected updates to the process, based upon experience. We are now expanding our efforts to provide training on the new policies and processes, and to explain them to external stakeholders. Much remains to be done to implement and institutionalize the new NMI at Headquarters as well as the Centers. In addition, we need to ensure that OMB and Congress understand and support our new way of doing business.

Perhaps the most formidable challenge is cultural change. We have to learn to operate more at Agency level via integrated, prioritized strategic planning. We will need a more disciplined program implementation approach. The experience thus far indicates the change is taking place. We must make real commitments and renew them bilaterally on at least an annual basis.

We will have to improve our communications with OMB and Congress, who must be willing to provide substantial funding prior to Authority to Proceed. Following this formal approval, we must be disciplined in formally adjusting our commitments based upon their actions.

Contractors, too, need to adjust their strategies in response to NMI 7120.4. The cultural change here may be much more difficult to implement. A typical project may result in a significant contractor work force level prior to Authority to Proceed, creating a possible termination liability issue. In addition, a significant unplanned

gap between Phase B and Phase C/D may create a possible contractual or funding dispute. Buy-ins and unrealistically optimistic contracts will not survive under the new process. Change in this area is slow but already apparent. For example, all the contractors for the EOS contract were told recently to re-bid because of unrealistic cost estimates.

While the thrust of the effort to date has been directed at major programs, judicious application of NMI 7120.4 can help us achieve the objective of better, faster and cheaper on smaller projects as well. Cheaper and faster because of better definition, acquisition and program control, resulting in less development time. Better because it provides an integrated, disciplined approach to NASA program and project management based on a comprehensive response to past problems in project management.

In sum, implementation of the new policy should provide major improvements in program and project management. It assures new start compatibility with NASA's strategic planning and available resources. It enables OMB and Congress to claim "ownership" of each new start prior to

go-ahead. It assures sufficient definition to make genuine, two-way commitments to NASA projects. It takes advantage of private sector experience and capability when performance specifications are part of the nominal Request for Proposal. And it establishes NASA as a "smart buyer" as well as a smart manager when Phase A studies are done inhouse, and Phase B definition is done in tandem with the contractor.

Adoption of the new PPM NMI can lead to substantial improvement, but alone it is not sufficient for real reform. Improvement also requires an aggressive, high visibility PPM continual improvement effort, focusing initially on further streamlining, and then on how to adapt the new policy and process to smaller programs and projects. We must retain the newly established ownership of the PPM function by the Administrator's office and commitment at all levels to be really effective.

Finally, we need to continue the Agency's strategic planning process to ensure our missions, programs and projects are part of a shared vision and common commitment. Only then can we say that we have truly learned from the past.