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Why Project Control/Project Management Emphasis in UAVSDP

The basic question that most of the PI's probably have is why do we care so much about project management and project control for these research grants? The answer; in PI Mode, we have combined the roles of science customer/user (i.e., the PI) and mission manager. Functions that NASA has traditionally accomplished are transferred to the PI, so the PI must be prepared to take on these tasks. Experience with the ESSP and other PI-mode programs indicates that PI's may not be knowledgeable enough in project management to act effectively. In emphasizing the need for project management/control in the proposal phase, we can assess whether the PI is actually capable of fulfilling the project manager role. (We realize that some of the project manager function may be delegated to another individual, but the PI is still ultimately responsible.)

Ideally, the merging of the management function with the PI will result in a more efficient operation with the PI able to directly control project decisions, resulting in a scientifically better product. The issue, of course, is that the management tasks completed by NASA in the past may have been transparent and unfamiliar to the PI. These tasks include the integration of the project, management of cost and schedule reserves, team building, procurement of goods and services, development of facilities, data archiving, shipping, risk management, quality management, and performance reporting.

A successful mission is defined as one that accomplishes the measurement objectives that are needed for the research and analysis activity, within the time and funds approved/available. The PI has always determined if the first (technical) performance objective is met; in PI-mode, the PI is also responsible for the cost and schedule performance objectives.

In other words, you are responsible not only for the success of the mission in achieving technically what you planned, but also to control and manage the costs and schedule. You need to be prepared to pull the plug if it appears that the mission will not succeed, based on cost, instrument or vehicle performance. Additional funds to bail out "I forgot's" and problems that should have been resolved through appropriate management simply are not available. It is, therefore, in your best interest (1) to assure yourself that you understand what needs to be done and what risks are associated with your objectives; and (2) to control costs so that costs are not incurred for which UAVSDP funds do not exist.

What is Project Control?

A project control system is simply a tool for the PI/project manager. It enables recognition of problems before they become unsolvable. The essence is that it integrates the actual work to be done with the cost of doing the work and the time needed to do it. How elaborate a system is depends on the size and scope of the task to be managed, as well as the size and distribution of the team working on it. Large, lengthy and distributed projects are more likely to require elaborate,

disciplined systems to ensure that all the pieces remain coordinated. Smaller projects such as the anticipated UAVSDP projects usually tailor the formal system into an informal systematic approach that may tradeoff a project manager's skills against detailed, formal procedures.

An effective systematic approach has 3 elements:
1. define the baseline to set the mileposts along the way to the final goal,
2. track progress against the mileposts so that you know where you stand, and
3. decide when corrective action is needed to maintain the final goal.

Baseline Definition

Any kind of performance reporting requires a standard against which the performance is to be measured. In project management, that standard is the project plan, or project baseline. In the UAVSDP, that essentially will be the commitments made in the proposal. To create the project baseline, the overall project is explicitly defined into its contributing components, into lower and lower levels, until each component can be specified, priced and scheduled. The components are then summarized and re-integrated into a baseline plan that represents the overall standard against which you as the PI will yourself track your team's progress.

In practice, the baseline plan is normally a description of the project components (a Work Breakdown Structure is a standard method), accompanied by a time-phased spending plan and schedule with discrete milestones representing substantive work. Example milestones are the vehicle functional checkflight demonstrating minimum flight performance requirements needed for the requisite dataset, the vehicle Certificate of Authorization from the FAA, instruments laboratory tests, integration hardware designed/built, deployment plan written, awards of contracts, deliverables from vendors, key reviews, etc.

In the NASA project management process (see NPG 7120.5A), four subprocesses are defined. These can be applied to the UAVSDP as follows:

Formulation = NRA Proposals & Implementation Plans
Approval = Project Selection & Award
Implementation = Execution of grant
Evaluation = Project Evaluation, Independent Peer Review & UAVSDP Program Office Oversight

A project performance baseline is an output of the Formulation subprocess. The baseline would be independently evaluated for completeness under the Evaluation subprocess, and the assessment delivered to the approving official in the Approval subprocess. The output of the Approval subprocess is the approved baseline. By analogy, your proposal should contain the baseline against which you are willing to be measured, peer review will provide an assessment of the baseline plan to the selection official, and if selected, your proposal will become your baseline.

Progress Reporting

As a PI/project manager, you will need to keep track of the work being accomplished by your team, as well as the costs. You should plan for a reporting system that will collect the information you think you need to know what is happening on your project. The information needs to be comprehensive, addressing all components of the project, and should directly correspond to the information in your baseline plan.

An example: if you planned your budget, schedule and flight by instrument, and one of your team members is responsible for more than one instrument, you will need to track the multiple instrument activities by that team member separately. That will seem intuitively obvious for technical performance of the instrument and its progress along the schedule timeline, but you will also need to know the costs separately as well, meaning that your team member will have to note separately the workhours and materials spent on each instrument.

There are different ways of collecting progress data: written reports, monthly cost reports (such as the NASA 533), periodic visits by the manager to the work sites, weekly or monthly staff meetings where individuals report on tasks accomplished, possibly also labor hours spent, invoices and shipments received, etc. The key is that information is collected the way the project was planned, scheduled and budgeted; and the status information then is compared to the baseline plan. The result is a periodic assessment whether the project is on track regarding time, cost and technical performance.

The program office (in this case, NASA Ames Research Center) will also use progress data as the primary means of monitoring progress and watching for problems.

If an independent review team is used to assess progress, note that the team will need to have a complete set of information of all the project's components: the instruments that make up the payload, instrument designs & test results, integration hardware drawings, vehicle performance, costs of each element, current schedule status, and so on. You should consider how much documentation you want to prepare throughout the project lifetime to support such a team.

Corrective Action

It's inevitable that the project won't happen exactly the way it was planned. The utility of a project control system is that the project manager not only knows when you diverge from the plan, but usually knows it sooner because he or she is consciously staying aware of the project's progress through whatever method chosen to collect status data. The project manager also has trend data that can be used to assess whether the different path that's developing will still get the team to the final goal.

It is here that a risk management plan and a quality management plan can make a difference to having a successful project or not. These processes encourage a project manager to think ahead and consider more precisely what performance is necessary for success and what to do to ensure the right performance (quality management plan), or to consider what could go wrong and what might be done instead (risk management plan). By having planned ahead for contingencies, decisions to descope or implement alternatives can be made more quickly with less argument and less time to set up the alternative work plans. For example, if you've thought ahead about whether a particular component will meet the performance specification or not, you will have already decided whether you can live with a reduced performance, or will need an alternative component already selected, with a vendor identified and possibly even the backup components ordered and/or in stock.

If you choose to have an independent team review your project, be sure you scope their charter appropriately, so that you are prepared to implement whatever their recommendations may be. If the independent team comes back to recommend changes to the basic science or a switch to another vehicle or deployment site, will you know how to respond? It will be your choice to incorporate the recommendations **within** the approved baseline of your proposal, i.e. changes must be consistent with your approved science result, budget and timeline. In the UAVSDP, with no NASA-held reserves for changes in scope, any change will be subject to a reapproval by the selecting official, in a repeat of the original proposal process.

The key is that these decision points are considered ahead of time, so that when the time comes and decisions to adjust or replan have to be made, you are not paying for your full manufacturing/test/integration team while you stop and think of how to replan your project.

REFERENCES

References 1 & 2 are requirements for NASA development projects & programs. The UAVSDP is not subject to these requirements, but may utilize the concepts where appropriate.

Reference 3 is a book of best practices from certified Project Management Professionals.

Reference 4 is a resource for all NASA-sponsored projects and project managers, from the agency professional development department.

1. NASA Policy Directives, *NASA Program & Project Management (NPD 7120.4A)*, http://nodis.hq.nasa.gov/Library/Directives/NASA-WIDE/Policies/Program_Formulation/N_PD_7120_4B.html

2. NASA Procedures and Guidelines*, NASA Program & Project Management (NPG 7120.5A)*, http://nodis.hq.nasa.gov/Library/Directives/NASA-WIDE/Procedures/Program_Formulation/N_PG_7120_5A.html

3. Project Management Institute, *Project Management Body of Knowledge*, http://pmibookstore.org/photoframe.cfm?ItemID=5506&Pointer=5506

4. NASA Academy of Program and Project Leadership, http://appl.nasa.gov/