# Preparing Project Managers for Faster-Better-Cheaper Robotic Planetary Missions

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*Abstract*—The authors have developed and implemented a week-long workshop for Jet Propulsion Laboratory (JPL) Project Managers, designed around the development phases of the JPL Project Life Cycle. The workshop emphasizes the specific activities and deliverables that pertain to JPL managers of NASA robotic space exploration and instrument development projects.

The structure and content are responsive to NASA's Program and Project Management Guide (NPG) 7120.5, with a focus on the planning and risk management necessary for strict budget and schedule demands unique to planetary exploration. Most deadlines for such projects are driven by planetary flight mechanics, and the slipping of launch periods is generally not acceptable, if even possible. This is decidedly different than management in industries where slipping milestones will result in cost overruns, while the project remains viable. Additionally, costs are "capped" in NASA's competitive selection of these projects, so designing to cost and managing to budget must be more than goal-oriented rhetoric.

The workshop addresses the unique risks and opportunities inherent in unmanned, robotic flight projects, and focuses on specific practices and processes developed by JPL in over 40 years of experience in managing such projects. These processes have been revised and updated for relevance to NASA's "Faster-Better-Cheaper" development paradigm, and include corrective actions taken after in-flight failures of recent missions.

Based on JPL's Project Life Cycle, the curriculum structure and learning objectives include transitional gates and reviews, planning, risk management, control, testing, flight operations, project staffing, and transition/archiving. The curriculum content has also been validated against JPL's Flight Project Practices, which are applicable to all JPL-managed flight projects. Readers are encouraged to consider the workshop approach as a benchmark against existing, more-generic management education paradigms.

## 1. Introduction

In March of 1992, NASA's then-Administrator Dan Goldin had posed a challenge to JPL: "How can we do [projects] better, faster, and cheaper without compromising safety?" The challenge of "faster-better-cheaper" or "FBC," as it became known, caused a shift in JPL's operating paradigm, with significant challenges to JPL's traditional culture arising from such FBC features as:

- Emphasis on smaller spacecraft and more frequent missions (and the accompanying requirement for multiple project teams operating in parallel)
- Reduction of cycle time
- Increased use of new technology
- Acceptance of risk where warranted by potential high return
- Revision of proven engineering and management practices to use in the new FBC environment.

Following the loss of two Mars missions in the Fall of 1999, management at NASA and the Jet Propulsion Laboratory appointed a Special Review Board to investigate the loss of those missions, and identify corrective actions and lessons learned from those losses. As a result, a total of 28 Corrective Action Notices (CANs) were issued – 13 for the Mars Climatic Orbiter and 15 for the Mars Polar Lander. Each CAN corresponded to a Review Board Finding and

[1] IEEEAC paper #1430, Updated November 25, 2002
[2] 0-7803-7651-X/03/$17.00 © 2003 IEEE

pointed to a process that contributed to the mission failures. Among the CANs was a requirement that managers of JPL flight projects receive training specific to the management of projects within the JPL operating environment. This education was to convey *consistent* understanding and application of NASA and JPL processes. Further, these processes were to be revised to correct missing or flawed elements deemed to have contributed to the failures.

A report by the Mars Program Independent Assessment Team [1] found that although there had been significant successes in implementing FBC, results were inconsistent, in part because managers of individual JPL projects had been left to determine for themselves what FBC meant and how it would be implemented for each project. It was determined that JPL processes needed re-tooling to reflect the FBC approach clearly and consistently, and current and future JPL Project Managers needed training to a consistent understanding and use of those updated processes.

In response to the training requirement, JPL developed a week-long workshop for current and future leaders of JPL space exploration projects. To date, the class has been offered five times to a total of 168 participants, and is now required for all JPL project managers to complete within six months of their appointment.

## 2. Special Requirements for the JPL Environment

Simply implementing standard project management training, even if tailored to a JPL audience, would not have been sufficient. Off-the-shelf project management training typically includes instruction in setting goals and milestones within established cost parameters, but without considering the specific processes, interfaces, and constraints characteristic of robotic space exploration projects, such as:

- Competed, cost-capped missions
- NASA Program Guideline 7120.5
- The unforgiving impact of planetary flight mechanics on schedule slippage
- Unique technology developments
- Risk management constraints specific to the organization, such as JPL's Design Principles.

## 3. Identifying and Refining the Course Scope, Objectives, and Outline

The basic requirement for the program was that it acquaint current and future JPL project managers with the entire spectrum of project implementation processes, addressing requirements, constraints, and interfaces encountered during the management of a JPL space flight project. This in turn meant that the processes themselves had to be well-defined, responsive to the CANs, and follow a meaningful structure reflecting the continuum of activities and deliverables in a JPL flight project.

While the project manager does not use or require detailed knowledge of all the implementation processes, a major subset of these processes is key to the success of the project manager. This subset provided the outline and scope for the workshop.

We recognized that our best (and perhaps only) chance for success would be to provide the training in a single training event, rather than a series of classes. Experience had shown us that all too often, curricula that are developed and delivered one class at a time fall victim to competing organizational priorities and attrition in attendance. Therefore, our challenge was to provide a single educational event.

**Figure 1** – JPL Project Implementation Processes List

- ❑ Define Mission / Science Objectives & Data Products
- ❑ Plan the Project
- ❑ Plan, Manage, and Control Resources
- ❑ Manage and Mitigate Risk
- ❑ Secure Launch Approval
- ❑ Lead and Build the Team
- ❑ Staff and De-Staff Projects
- ❑ Plan and Execute Project Acquisitions
- ❑ Provide and Manage Project Information
- ❑ Manage International Participation
- ❑ Engage the Educational and Public Community
- ❑ Manage Mission Assurance
- ❑ Assure Product Quality
- ❑ Assure Product Reliability
- ❑ Ensure Parts Reliability
- ❑ Ensure System Safety
- ❑ Manage Configuration of Project Elements
- ❑ Implement Project Reviews
- ❑ Design Project Architecture
- ❑ Engineer the Project
- ❑ Engineer Mission and Navigation Systems
- ❑ Engineer Flight Systems
- ❑ Engineer Mission Operations Systems
- ❑ Design Product Systems
- ❑ Develop Hardware Products
- ❑ Develop Software Products
- ❑ Integrate and Test Products
- ❑ Operate Product Systems
- ❑ Integrate and Test Mission Systems
- ❑ Provide Operation Services
- ❑ Infuse and Transfer Technology

Even before the Mars '98 failures, JPL's top management had already begun the institutional transition to a process-based culture, following concepts from Hammer and Champy's *Reengineering the Corporation* [2]. Initially begun as part of NASA's emphasis on FBC, as well as NASA's directive to JPL to become certified under the International Standards Organization (ISO), these initiatives took on a new imperative in light of the Mars losses. Work was already underway on a set of consistent project implementation processes (see **Figure 1**) with process owners and process-engineering teams focusing on the FBC paradigm and ISO objectives. As a rule, the owner of each process was a senior line manager with responsibility for the product of the relevant process, or a senior leader with experience in the process.

The process-based management framework provided a natural basis for a workshop outline and learning objectives, which would expose participants to all areas of information required to manage a JPL flight project. Accordingly, the outline of the first three offerings of the workshop was based directly on JPL's process-based management structure. This was a successful structure, and met with positive reactions from workshop participants.

However, in-class discussions at those three workshops consistently confirmed that project managers had various interpretations of the development cycle, because there was no one agreed-upon definition of the development phases, and what represented acceptable criteria for moving from one phase to the next. This mirrored the inconsistencies experienced by the project managers and their teams outside of the classroom. It became clear that JPL needed to address the problem of synchronizing actions in parallel processes being used by the implementation teams.

JPL's senior management had recognized the need for an updated, consistent definition of the Project Life Cycle activities, and had assigned a team to develop it. The publication of a standard JPL Project Life Cycle **(Appendix C)** provided the timing/synchronizing tool for matching process outputs at transitions, or "gates," between development phases. This provided an opportunity to improve the learning sequence by emphasizing the lifecycle gates in the course outline and highlighting the timely use of the project management processes.

This not only focused participants' attention on the sequence of events in a flight project, but also emphasized the deliverables required for flight projects to make the transition from one phase of the life cycle to the next. The workshop objectives fell into place naturally from these deliverables, since the overarching objective of the course was to expose project managers to all the information necessary for them to successfully and consistently complete each phase-to-phase "gate" transition. The most recent course agenda, which reflects this construct, is shown in **Appendix A**.

In JPL's efforts to better define processes, the process owners and their teams produced constituent sets of procedures and actions (checklist guidance) to achieve better consistency in application with a resulting lower risk. These were compiled in a Flight Project Practices publication [4]. This provided a standard against which we could cross-check the focus of the workshop, and ensure the completeness of the content. **Appendix B** shows the list of JPL's Flight Project Practices.

## 4. STAKEHOLDER INVOLVEMENT

The involvement and support of top JPL management, and of owners of the JPL processes supporting flight projects, was crucial in every aspect of development and delivery of the Project Manager Workshop. Nowhere was this truer than in development of the educational modules themselves.

In JPL's matrix structure, line organizations provide technical and administrative personnel that affiliate with a project, forming the implementation team. As a result, it is typical for individuals to multitask, supporting more than one project at a time. Efficiencies in staff utilization are traded against inefficiencies in focus and conflicts in availability of personnel. Excellent communication between the project and line organizations is crucial. As the primary producers and users of the hardware and software development processes, line organizations are necessarily key stakeholders in the education of project managers. (Details on JPL's matrix structure can be found in *Implementing Projects in JPL's Matrix: Project-Line Interaction* [3]).

For example, mission success is an objective shared by the project and line. The Mission Assurance (MA) organization provides project team members and processes to ensure reliability, quality, and safety. Therefore, it is incumbent on Mission Assurance to contribute to the education of project managers about managing this key element of the project. Senior members of the Mission Assurance organization develop and present the educational materials for the MA module, and encourage the corps of project managers to implement MA consistently from one project to the next. This serves the dual purpose of reducing risk and supporting JPL's ISO certification, which is based on consistent application of documented processes. Just as important, it provides an opportunity for the Project Manager Workshop participants to meet, face-to-face, the individuals who own the processes that support the Mission Assurance objectives of their projects, and discuss those processes with them directly.

## 5. Panel Discussions to Reinforce Learning and Promote Acceptance

To complement the presentations and discussions led by owners of the processes most important to JPL flight projects, we identified key users of those processes – typically experienced project managers, with lessons learned both from success and failure, and line managers – to participate in interactive panel discussions at strategic points during the workshop. Since the workshop agenda follows the sequence of the JPL Project Life Cycle, we scheduled a panel discussion for the end of each "phase" of the workshop, to allow participants to discuss all of the processes and resources prominent in the preceding phase, in conjunction with discussion of the gate products for that phase and project managers real-world experiences in negotiating the pitfalls of each phase

These panel discussions allow workshop participants an opportunity to pose their questions and comments about the real-world utility of the existing processes and infrastructure, and to learn how those resources have performed in the context of actual flight projects. In addition, the panel discussions provide a forum in which to identify any areas for improvement. This attribute, in fact, is an important reason for characterizing this week-long learning event as a "workshop" rather than a "class": While we take care to ensure the workshop doesn't become a design review for the Life Cycle, the Flight Project Practices, or the supporting processes, the workshop routinely results in owners of those practices and processes being apprised of needed improvements, and taking on corrective action assignments.

Course evaluations completed by students during and at the end of the workshop validate that these panels of users and practitioners effectively reinforce the learning that takes place, and illustrate real-world application. Since the panel sessions are discussions by definition, these also provide an opportunity for workshop participants to become involved and engaged in the topics, contributing to the dialog and taking ownership of the elements of the Life Cycle phases.

Panels are also used in the workshop to address special topics that may or may not fit neatly into one of the Life Cycle phases. For example, JPL recognizes the importance of improving the relationship between JPL projects and the science community, both within and external to JPL. An evening panel composed of project scientists and principal investigators provides an opportunity for participants to discuss the nature of the projects' relationship with the science community, and to explore JPL's successes and challenges in fostering that relationship.

Panels of both varieties (special topics and end-of-phase-summaries) expand the opportunity for students to receive advice, help, mentoring, and solutions. They are among the most highly-rated workshop segments, according to participant feedback.

## 6. Informal Workshop Discussions

From the early moments of the workshop, participants are encouraged to engage one another, the presenters, and the panelists in discussion throughout the week. The success of the workshop is largely, perhaps even primarily, the result of the discussions generated by the workshop presentations, rather than the presentations themselves.

To enhance the prospects for meaningful discussion, the workshop is held at an off-site location about 70 miles from JPL. Participants stay all week at the conference facility, with workshop activities beginning Sunday afternoon and continuing through the following Friday. Presenters and panelists typically arrive well ahead of the time scheduled for their activities, and sit in on workshop presentations and participate in discussions alongside the full-time workshop participants. Workshop discussions usually continue during mealtimes, when participants are able to engage in more detailed discussion with presenters, panelists, and one another.

Workshop discussions are also enhanced by the presence contributions of top-level JPL management and stakeholders. In addition to the approximately forty full-time workshop participants, representatives of JPL's executive-level management are present for most of the week to participate in the dialog.

Finally, the participants themselves are chosen not only for the benefit they will derive from attending, but from the contributions they can make to the workshop discussions. Attendees include up-and-coming managers of future projects, as well as seasoned project managers. The experienced project managers share their expertise and viewpoints both informally (during workshop discussions) and formally (as presenters of their own modules). Inviting a limited number of participants from outside JPL (including NASA Headquarters, other NASA Centers, and contractors, among others), serves to further enhance the quality and breadth of the workshop discussions, while at the same time allowing representatives of these organizations better insight into JPL's project management environment.

The participation of all these individuals results in workshop participants reporting that they learn as much from their fellow attendees as they do from the scheduled presenters.

## 7. Guidance for Workshop Contributors

An essential attribute of the Project Manager Workshop is

that it is presented almost entirely by practitioners and owners of the relevant JPL processes. We believe this is key to the credibility and success of the workshop. Of course, there are inherent challenges in a workshop design that relies on the contributions of more than fifty presenters, each with their own presentation styles, viewpoints, and areas of expertise. Since workshop materials are developed concurrently by their owners, it is impossible for all of the developers to collaborate with one another on their content to ensure consistency in terminology, content, and level of detail throughout the workshop, and to ensure that there is no unwanted overlap between workshop segments.

To address potential difficulties in these areas, we first provide contributors with a simple outline:

- What is it?
- Why is it important to Project Managers?
- What do Project Managers need to know?
- What specific actions and responsibilities are incumbent on Project Managers?
- What resources, templates, information, or other help are available to Project Managers?
- What lessons have been learned on past projects that will be useful to Project Managers?

To ensure conciseness, we impose a guideline of one viewgraph for every three minutes of time allotted for the presentation (Typical presentations are 20-30 minutes.) Information beyond this limit is placed in a "Resources and References" section at the end of each presentation, so students can refer to it in the workshop binder after the class. This allowed presenters to provide organization charts, checklists, and other ancillary resources useful to project managers, without their becoming the focal point of the presentations.

Finally, we hold "walkthrough" sessions a few weeks before the workshop, in which presenters give summary versions of their presentations to the workshop review board. The presenter of a half-hour workshop presentation is typically given three minutes to summarize the main points of his or her presentation, showing the viewgraphs most key to the presentation. For each presentation, feedback is provided on the spot by workshop sponsors, which include JPL's Associate Director for Flight Projects and Mission Success. One-on-one followup meetings are held as necessary with presenters whose materials require adjustments.

## 8. Evaluation and Continuous Improvement

We evaluate the quality and effectiveness of the workshop in a number of ways.

First, we distribute a separate course evaluation for each day of the workshop, asking participants to score each individual workshop session (presentation, panel session, etc.) based on how well it provides information of use to project managers, and how well the topic was covered.

After the workshop, presenters are provided with their scores, as well as any written comments submitted by class participant. This feedback is used as a basis for improving each session before the next workshop. In some cases, the feedback indicates to us that a topic is being addressed by the wrong individual, and in at least one case, that ownership of the process itself has been placed with the wrong organization (albeit the most logical one, based on superficial criteria).

At the end of the workshop, we ask participants to complete an evaluation of the course as a whole. From this we find that, in general, the whole is greater than the sum of the parts – that is, although scores for individual workshop segments are more than satisfactory, the average overall score for the workshop is consistently higher than the average score of the workshop segments.

To test for comprehension, we administer a multiple-choice final exam at the end of the class. The exam questions are derived directly from the JPL Flight Project Practices. This helps us evaluate how well participants absorbed the workshop content, as well as to check for any flaws in the content itself (such as Flight Project Practices that were inadequately covered in the workshop, or Flight Project Practices that themselves require refinement or clarification).

## 9. Benefits Beyond Education of Individuals

In the two years since the first offering of the Project Manager Workshop, JPL has reaped benefits that go beyond the education of its current and future project managers. Offering the workshop at six-month intervals affords us an opportunity to iteratively review the course contents on the one hand, and JPL's institutional processes and practices on the other: The workshop content is influenced by how things work at JPL, and how things work at JPL are influenced by discussions held at the workshop. Byproducts of the workshop discussions and feedback have included identification of processes that require substantial revision because they don't meet the needs of the projects.

We have also identified some important topics, such as cost planning and risk management, that are too broad to cover adequately in the workshop, and have developed separate classes on those topics.

The JPL Flight Project Practices as updated for use in the post Mars '98 FBC era are still new, and using them as a basis for validating the workshop content gives us the

opportunity to identify needed refinements and improvements in the Flight Project Practices.

After five offerings of the workshop, we can point to a number of beneficial results as a status/conclusion at this point:

- The workshop has contributed to a significantly improved, focused proposal development process at JPL.

- We have cultivated a positive image at NASA Headquarters and other NASA centers, affirming that JPL is serious about educating its Project Managers, meeting its ISO obligations, and implementing lessons learned.

- The workshop has reinforced JPL's top-down focus on consistent application of processes and reduced risk. The workshop supports our efforts to address corrective actions by implementing standards for our processes; it provides a context for healthy critique of those processes, contributing to improvement in implementation and reduced risk.

- As the class evolves, it influences continuous culture change at JPL for successful implementation of FBC projects.

## REFERENCES

[1] *Mars Climate Orbiter Mishap Investigation Board Phase I Report,* November 10, 1999.

[2] Michael Hammer and James Champy, *Reengineering the Corporation,* New York: Harper Business, 1993.

[3] *Implementing Projects in JPL's Matrix: Project-Line Interaction, Rev 3,* JPL Doc. 46312, March, 2001

[4] *JPL Flight Project Practices, Rev 3,* JPL Doc. 58032, October 11, 2002

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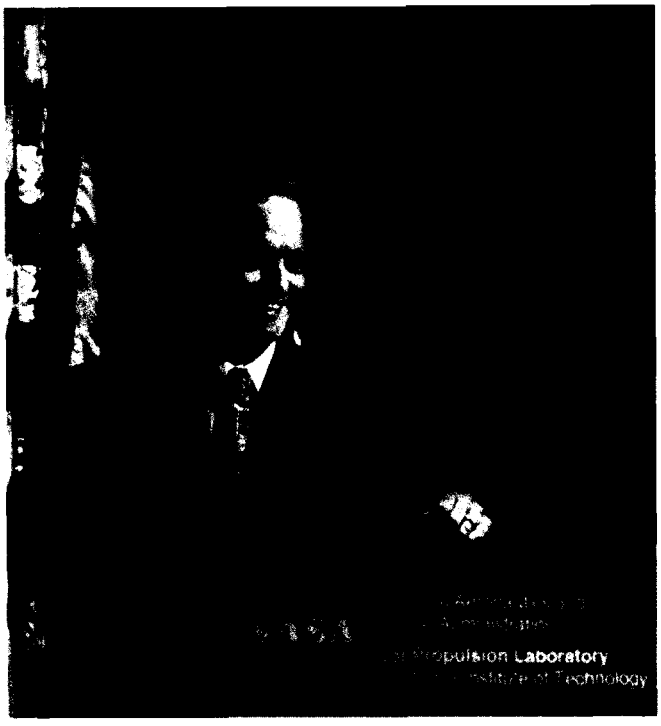
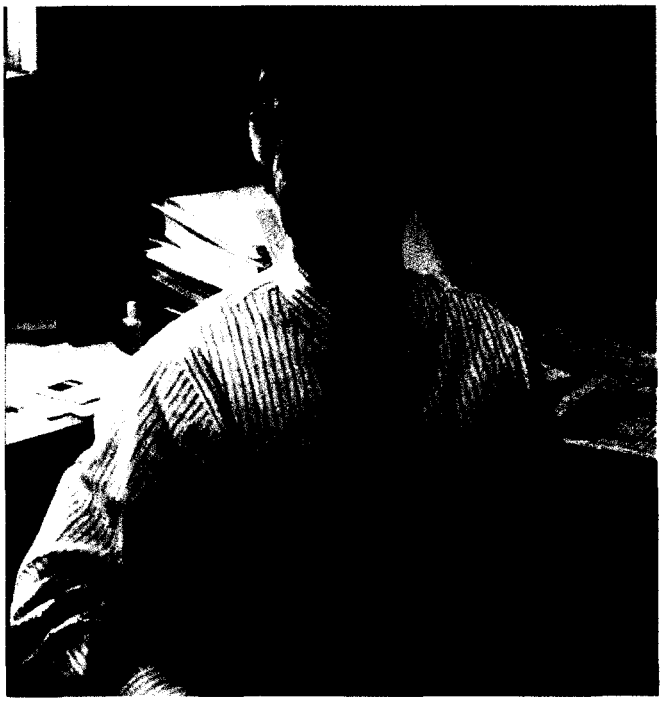


Ken Atkins was Project Manager for NASA's *STARDUST* mission to comet Wild 2 from the beginning in June 1995, through launch in February of 1999, and for the first year and a half of flight. The objective of this mission is to fly through the dusty head of the comet to capture/collect particles and return them to Earth in January 2006. After transferring project management in August 2000, Ken served as JPL's owner for Project Leadership Processes (PLP). In this capacity, he played a central role in the corrective actions necessary in the wake of the Mars 98 failures. Ken retired from JPL in February 2002. But as a retiree, he has continued part-time, providing support for Project Managers with mentoring activities and working the development of the Project Managers Workshop. Ken's background of technical and management activity includes nine years as an officer/pilot in the U.S. Air Force and over 32 years at JPL with a career spanning mission analysis, power systems, avionics systems, and project management. Ken has a B.Sc. in Aeronautical Engineering (AE) from St. Louis University ('58), MSAE from the Air Force Institute of Technology ('66), and Ph.D. in Aeronautical and Astronautical Engineering (AAE) from the University of Illinois ('74).

Paul Gowler is a Senior Training and Development Specialist in JPL's Professional Development section, where he has worked since May of 1996. Paul organizes and facilitates the JPL Project Manager Workshop, as well as workshops designed for JPL line managers. Before coming to JPL, Paul worked for eleven years at the Douglas Aircraft Company in Long Beach, California. He earned his BA in Business Economics and Political Science at the University of California at Santa Barbara in 1983, and an MA in Business Economics from UC Santa Barbara in 1985.

**APPENDIX A.** PROJECT MANAGER WORKSHOP AGENDA

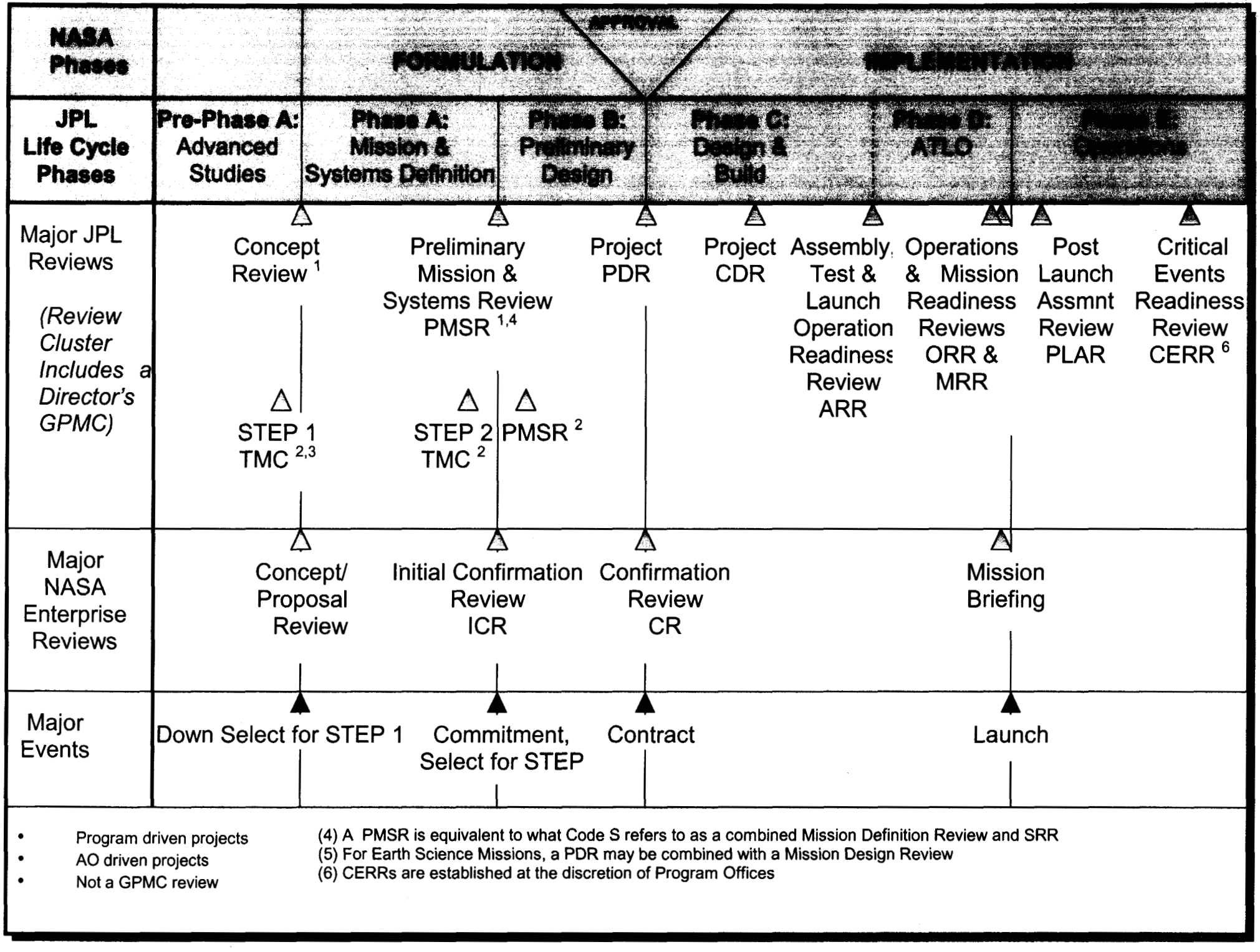
| Time | Mins. | Tab | Subject | Presenter |
|---|---|---|---|---|
| | | | **SUNDAY, October 13** | |
| 4:00 p.m. | | | Check into hotel | |
| 4:30 - 4:45 p.m. | 15 | | Workshop Welcome and Introduction | Paul Gowler |
| | | | **CONTEXT FOR PROJECTS AT JPL** | |
| | | | **a. Setting the Stage** | |
| 4:45 - 5:30 p.m. | 45 | 1 | The External Environment: What Project Managers Need to Know | Gene Tattini |
| 5:30 - 6:15 p.m. | 45 | | Panel/Q&A: New Focuses and Challenges at JPL | Panel: Tom Gavin, Larry Simmons, Gene Tattini |
| 6:30 - 7:30 p.m. | | | *DINNER* | |
| 7:30 - 8:30 p.m. | 60 | 2 | Four-Dimensional Leadership | Charlie Pellerin |
| | | | **MONDAY, October 14** | |
| 8:00 - 8:10 a.m. | 10 | | Agenda | Paul Gowler |
| | | | **CONTEXT FOR PROJECTS AT JPL (cont.)** | |
| | | | **b. Legal Framework and Constraints** | |
| 8:10 - 8:50 a.m. | 40 | 3 | The Legal Environment | Robert C. (Sandy) Pool |
| 8:50 - 9:40 a.m. | 50 | 4 | Operating under the Prime Contract | Steve Proia |
| 9:40 - 10:10 a.m. | 30 | 5 | Getting to Commitment | Gregg Vane |
| 10:10 - 10:25 a.m. | 15 | | *BREAK* | |
| 10:25 - 11:55 a.m. | 90 | 8 | Assuring Mission Success | Tom Gavin |
| 11:55 - 1:00 p.m. | 65 | | *LUNCH* | |
| 1:00 - 1:50 p.m. | 50 | 6 | International Agreements | Ed Momjian |
| 1:50 - 2:35 p.m. | 45 | 7 | Engaging the Public | Blaine Baggett |
| 2:35 - 2:50 p.m. | 15 | | *BREAK* | |
| | | | **c. Institutional Requirements** | |
| 2:50 - 3:20 p.m. | 30 | 9 | Project Life Cycle Gate Products | Neil Yarnell |
| 3:20 - 3:55 p.m. | 35 | | Project-Line Teaming | Panel: Beckman, Casani, Gavin, Landano, Tattini |
| 3:55 - 4:20 p.m. | 25 | 10 | Project Architecture | Tony Freeman |
| | | | **d. Getting Going** | |
| 4:20- 4:50 p.m. | 30 | 11 | Managing Project Information and Information Technology | Tom Renfrow |
| 6:30 - 7:45 p.m. | | | *DINNER* | |
| 7:45 - 8:45 p.m. | 60 | | PM Relationships with Project Scientists and Principal Investigators | Don Burnett, Deb Vane, Mike Werner |
| | | | **TUESDAY, October 15** | |
| 8:00 - 8:05 a.m. | 5 | | Agenda | Paul Gowler |
| | | | | |
| 8:05 - 8:35 a.m. | 30 | | Defining the Science Objectives and Analysis Plan | Mike Werner |
| 8:35 - 9:05 a.m. | 30 | | Systems Management Office (SMO) Process | Rod Zieger |
| 9:05 - 9:45 a.m. | 40 | | Project Plans | Jeff Leising |
| 9:45 - 10:10 a.m. | 25 | | Project Formulation Team Support | John Baker |
| 10:10 - 10:25 a.m. | 15 | | *BREAK* | |
| 10:25 - 11:25 a.m. | 60 | | Cost Estimating, Budgeting, and Scheduling | Bob Metzger |
| 11:25 - 12:30 p.m. | 65 | | Resource Management, Earned Value, Liens, and Reserves | Cal Chambers |
| 12:30 - 1:30 p.m. | 60 | | *LUNCH* | |
| 1:30 - 2:30 p.m. | 60 | | Staffing, Leading, and Destaffing the Project | Tom Fraschetti |

| | | | | |
|---|---|---|---|---|
| 2:30 - 3:00 p.m. | 30 | | Project Systems Engineering | Ron Boain |
| 3:00 - 3:15 p.m. | 15 | | *BREAK* | |
| 3:15 - 4:15 p.m. | 60 | | Flight Systems Engineering, Functional System V&V | Doug Bernard |
| 4:15 - 4:45 p.m. | 30 | | Engineering the Mission and Navigation System | Mike Watkins |
| 6:30 - 7:45 p.m. | | | *DINNER* | |
| **WEDNESDAY, October 16** | | | | |
| 8:00-8:05 a.m. | 5 | | Agenda | Paul Gowler |
| 8:05 - 8:35 a.m. | 30 | | Telecommunications | Rich Horttor |
| 8:35 - 9:05 a.m. | 30 | | Reviews | Jim Rose |
| 9:05 - 9:50 a.m. | 45 | | Risk Management | Jim Rose |
| 9:50 - 10:05 a.m. | 15 | | *BREAK* | |
| 10:05 - 10:35 a.m. | 30 | | Setting the Success Boundaries | John Casani |
| 10:35 - 11:15 a.m. | 40 | | Phase A Panel Discussion | Jim Fanson, Sarah Gavit, Chet Sasaki |
| 11:15 - 11:45 a.m. | 30 | | Launch Approval Engineering | Reed Wilcox |
| 11:45 - 12:25 p.m. | 40 | | Project Acquisitions | Randall Taylor |
| 12:25 - 1:00 p.m. | 35 | | *LUNCH* | |
| 1:00 - 6:30 p.m. | | | *Unscheduled Time (TBD)* | |
| 6:30 - 7:45 p.m. | | | *DINNER* | |
| **THURSDAY, October 17** | | | | |
| 8:00 - 8:10 a.m. | 10 | | Agenda | Paul Gowler |
| 8:10 - 8:50 a.m. | 40 | | Planetary Protection | Tom Luchik |
| 8:50 - 9:30 a.m. | 40 | | Launch Services | Alok Chatterjee |
| 9:30 - 9:45 a.m. | 15 | | *BREAK* | |
| 9:45 - 10:25 a.m. | 40 | | Safety and Mission Assurance | Rick Grammier |
| 10:25 - 10:55 a.m. | 30 | | Configuration Management | Henry Tauchen |
| 10:55 - 11:10 a.m. | 15 | | *BREAK* | |
| 11:10 - 11:50 a.m. | 40 | | Phase B Panel Discussion | Steve Bard, Rick Grammier, |
| 11:50 - 1:00 p.m. | 70 | | *LUNCH* | Tom Luchik, John McNamee |
| | | | [illegible] | |
| 1:00 - 1:35 p.m. | 35 | [illegible] | Hardware Development | Sharon Langenbeck |
| 1:35 - 2:15 p.m. | 40 | [illegible] | Software Development | Dave Eisenman |
| 2:15 - 3:00 p.m. | 45 | [illegible] | Mission Operations System Development | Jody Gunn |
| 3:00 - 3:15 p.m. | 15 | | *BREAK* | |
| 3:15 - 3:45 p.m. | 30 | [illegible] | Acquiring and Using Deep Space Mission System (DSMS) Services | Peter Doms |
| | | | [illegible] | |
| 3:45 - 4:15 p.m. | 30 | [illegible] | Subsystem Integration and Test | Valerie Duval |
| 4:15 - 4:45 p.m. | 30 | [illegible] | Testing the Mission Operations System | Jody Gunn |
| 6:30 - 8:00 p.m. | | | *DINNER* | |

| FRIDAY, October 18 | | | | |
|---|---|---|---|---|
| 8:00 - 8:55 a.m. | 55 | | Flight and Ops Systems I&T and Flight Team Operations | Victor Mora, Julie L. Webster |
| | | | | |
| 8:55 - 9:40 a.m. | 45 | | Postlaunch Issues for Project Managers: STARDUST Lessons Learned | Tom Duxbury |
| 9:40 - 9:55 a.m. | 15 | | *BREAK* | |
| 9:55 - 10:55 a.m. | 60 | | Science Operations and Data Analysis Planning | Rich Zurek |
| 10:55 - 11:25 a.m. | 30 | | Project Closeout | Julie Reiz |
| 11:25 - 12:00 p.m. | 35 | | FINAL EXAM | |
| 12:00 - 12:45 p.m. | 50 | | *LUNCH* | |
| 12:45 - 2:00 p.m. | 75 | | Course Wrap-up | Tom Gavin |

## APPENDIX B. JPL FLIGHT PROJECT PRACTICES LIST

- ❑ Waiver Authority and Change Requests (4.0)
- ❑ MANAGEMENT PRACTICES (5.0)
- ❑ Life Cycle (5.1)
- ❑ Planning (5.2)
- ❑ Science (5.3)
- ❑ Project Organization (5.4)
- ❑ Work Breakdown Structure (5.5)
- ❑ NEPA Compliance and Launch Approval (5.6)
- ❑ Spares, Testbeds, and Models (5.7)
- ❑ Make-or-Buy Decisions (5.8)
- ❑ Scheduling, Cost Estimating, and Cost-Schedule Management (5.9)
- ❑ Information, Data Management, and Archiving (5.10)
- ❑ Level 1 Descope Planning (5.11)
- ❑ Project Staffing and Destaffing (5.12)
- ❑ Project Priorities / Competing Characteristics (5.13)
- ❑ Acquisition (5.14)
- ❑ Project and Institutional Reporting (5.15)
- ❑ Reviews (5.16)
- ❑ Risk Management (5.17)
- ❑ Waivers (5.18)
- ❑ Crisis Response (5.19)
- ❑ Science Data Management (5.20)
- ❑ Lessons Learned (5.22)
- ❑ Margins and Margin Management (5.23)
- ❑ ITAR (5.24)
- ❑ ENGINEERING PRACTICES (6.0)
- ❑ Mission Design (6.1)
- ❑ Telecommunication and Mission Operations Services (6.2)
- ❑ Mission Operations (6.3)
- ❑ System Engineering (6.4)
- ❑ Launch Vehicle and Launch Operations (6.5)
- ❑ Inheritance (6.6)
- ❑ Planetary Protection (6.7)
- ❑ Flight System Fault Tolerance / Redundancy (6.8)
- ❑ Flight Hardware Logistics (6.9)
- ❑ Materials, Processes, and Contamination Control (6.10)
- ❑ Software Development (6.11)
- ❑ Protection of Flight Hardware (6.12)
- ❑ Design and Verification for Environmental Compatibility (6.13)
- ❑ System Level Functional Verification and Validation (6.14)
- ❑ Configuration Management (6.15)
- ❑ Orbital Debris (6.16)
- ❑ Hardware Development (6.17)
- ❑ Mission Operations System Development (6.18)
- ❑ MISSION ASSURANCE PRACTICES (7.0)
- ❑ Mission Assurance Management (7.1)
- ❑ Reliability Engineering (7.2)
- ❑ Quality Assurance (7.3)
- ❑ Software IV&V (7.4)
- ❑ Electronic Parts Reliability, Application, and Acquisition (7.5)
- ❑ Problem Reporting (7.6)
- ❑ Mission Operations Assurance (7.7)
- ❑ Systems Safety (7.8)

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# JPL Project Manager Workshop
## October 13-18, 2002

| Time | Mins | Tab | Subject | Presenter |
|---|---|---|---|---|
| **SUNDAY, October 13** | | | | |
| 4:00 p.m. | | | Check into hotel | |
| 4:30 - 4:45 p.m. | 15 | | Workshop Welcome and Introduction | Paul Gowler |
| | | | **CONTEXT FOR PROJECTS AT JPL** | |
| | | | **a. Setting the Stage** | |
| 4:45 - 5:30 p.m. | 45 | 1 | The External Environment: What Project Managers Need to Know | Gene Tattini |
| 5:30 - 6:15 p.m. | 45 | | Panel/Q&A: New Focuses and Challenges at JPL | Panel: Tom Gavin, Larry Simmons, Gene Tattini |
| 6:30 - 7:30 p.m. | | | *DINNER* | |
| 7:30 - 8:30 p.m. | 60 | 2 | Four-Dimensional Leadership | Charlie Pellerin |
| **MONDAY, October 14** | | | | |
| 8:00 - 8:10 a.m. | 10 | | Agenda | Paul Gowler |
| | | | **CONTEXT FOR PROJECTS AT JPL (cont.)** | |
| | | | **b. Legal Framework and Constraints** | |
| 8:10 - 8:50 a.m. | 40 | 3 | The Legal Environment | Robert C. (Sandy) Pool |
| 8:50 - 9:40 a.m. | 50 | 4 | Operating under the Prime Contract | Steve Proia |
| 9:40 - 10:10 a.m. | 30 | 5 | Getting to Commitment | Gregg Vane |
| 10:10 - 10:25 a.m. | 15 | | *BREAK* | |
| 10:25 - 11:55 a.m. | 90 | 8 | Assuring Mission Success | Tom Gavin |
| 11:55 - 1:00 p.m. | 65 | | *LUNCH* | |
| 1:00 - 1:50 p.m. | 50 | 6 | International Agreements | Ed Momjian |
| 1:50 - 2:35 p.m. | 45 | 7 | Engaging the Public | Blaine Baggett |
| 2:35 - 2:50 p.m. | 15 | | *BREAK* | |
| | | | **c. Institutional Requirements** | |
| 2:50 - 3:20 p.m. | 30 | 9 | Project Life Cycle Gate Products | Neil Yarnell |
| 3:20 - 3:55 p.m. | 35 | | Project-Line Teaming | Panel: Beckman, Casani, Gavin, Landano, Tattini |
| 3:55 - 4:20 p.m. | 25 | 10 | Project Architecture | Tony Freeman |
| | | | **d. Getting Going** | |
| 4:20- 4:50 p.m. | 30 | 11 | Managing Project Information and Information Technology | Tom Renfrow |
| 6:30 - 7:45 p.m. | | | *DINNER* | |
| 7:45 - 8:45 p.m. | 60 | | PM Relationships with Project Scientists and Principal Investigators | Don Burnett, Deb Vane, Mike Werner |
| **TUESDAY, October 15** | | | | |
| 8:00 - 8:05 a.m. | 5 | | Agenda | Paul Gowler |
| | | | **PHASE A** | |
| | | | **a. Organizing, Planning, and Costing for Success** | |
| 8:05 - 8:35 a.m. | 30 | 12 | Defining the Science Objectives and Analysis Plan | Mike Werner |
| 8:35 - 9:05 a.m. | 30 | 13 | Systems Management Office (SMO) Process | Rod Zieger |
| 9:05 - 9:45 a.m. | 40 | 14 | Project Plans | Jeff Leising |
| 9:45 - 10:10 a.m. | 25 | 15 | Project Formulation Team Support | John Baker |
| 10:10 - 10:25 a.m. | 15 | | *BREAK* | |
| 10:25 - 11:25 a.m. | 60 | 16 | Cost Estimating, Budgeting, and Scheduling | Bob Metzger |
| 11:25 - 12:30 p.m. | 65 | 17 | Resource Management, Earned Value, Liens, and Reserves | Cal Chambers |
| 12:30 - 1:30 p.m. | 60 | | *LUNCH* | |
| 1:30 - 2:30 p.m. | 60 | 18 | Staffing, Leading, and Destaffing the Project | Tom Fraschetti |
| | | | **b. Designing the System** | |
| 2:30 - 3:00 p.m. | 30 | 19 | Project Systems Engineering | Ron Boain |
| 3:00 - 3:15 p.m. | 15 | | *BREAK* | |
| 3:15 - 4:15 p.m. | 60 | 20 | Flight Systems Engineering, Functional System V&V | Doug Bernard |
| 4:15 - 4:45 p.m. | 30 | 21 | Engineering the Mission and Navigation System | Mike Watkins |
| 6:00 - 6:30 p.m. | | | *Meet at the Whale's Tale Restaurant in Oxnard* | |
| 6:30 - 7:45 p.m. | | | *DINNER at Whale's Tale* | |
| **WEDNESDAY, October 16** | | | | |
| 8:00-8:05 a.m. | 5 | | Agenda | Paul Gowler |
| 8:05 - 8:35 a.m. | 30 | 22 | Telecommunications | Rich Horttor |
| | | | **c. Assessing the Project** | |
| 8:35 - 9:05 a.m. | 30 | 23 | Reviews | Jim Rose |
| 9:05 - 9:50 a.m. | 45 | 24 | Risk Management | Jim Rose |
| 9:50 - 10:05 a.m. | 15 | | *BREAK* | |
| 10:05 - 10:35 a.m. | 30 | 25 | Setting the Success Boundaries | John Casani |
| 10:35 - 11:15 a.m. | 40 | | Phase A Panel Discussion | Jim Fanson, Sarah Gavit, Chet Sasaki |
| | | | **PHASE B** | |
| | | | **a. Engineering for Confirmation** | |
| 11:15 - 11:45 a.m. | 30 | 26 | Launch Approval Engineering | Reed Wilcox |
| 11:45 - 12:25 p.m. | 40 | 27 | Project Acquisitions | Randall Taylor |
| 12:25 - 1:00 p.m. | 35 | | *LUNCH* | |
| 1:00 - 6:30 p.m. | | | *Unscheduled Time* | |
| 6:30 - 7:45 p.m. | | | *DINNER at Hotel* | |

**JPL Project Manager Workshop**
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| **THURSDAY, October 17** | | | | |
| 8:00 - 8:10 a.m. | 10 | | Agenda | Paul Gowler |
| | | | **PHASE B (cont.)** | |
| 8:10 - 8:50 a.m. | 40 | **28** | Planetary Protection | Tom Luchik |
| 8:50 - 9:30 a.m. | 40 | **29** | Launch Services | Alok Chatterjee |
| 9:30 - 9:45 a.m. | 15 | | *BREAK* | |
| 9:45 - 10:25 a.m. | 40 | **30** | Safety and Mission Assurance | Rick Grammier |
| | | | **b. Configuration Management Process** | |
| 10:25 - 10:55 a.m. | 30 | **31** | Configuration Management | Henry Tauchen |
| 10:55 - 11:10 a.m. | 15 | | *BREAK* | |
| 11:10 - 11:50 a.m. | 40 | | Phase B Panel Discussion | Steve Bard, Rick Grammier, |
| 11:50 - 1:00 p.m. | 70 | | *LUNCH* | Tom Luchik, John McNamee |
| | | | **PHASE C/D** | |
| | | | **a. Build the System** | |
| 1:00 - 1:35 p.m. | 35 | **32** | Hardware Development | Sharon Langenbeck |
| 1:35 - 2:15 p.m. | 40 | **33** | Software Development | Dave Eisenman |
| 2:15 - 3:00 p.m. | 45 | **34** | Mission Operations System Development | Jody Gunn |
| 3:00 - 3:15 p.m. | 15 | | *BREAK* | |
| 3:15 - 3:45 p.m. | 30 | **35** | Acquiring and Using Deep Space Mission System (DSMS) Services | Peter Doms |
| | | | **b. Test like you fly. Fly like you test.** | |
| 3:45 - 4:15 p.m. | 30 | **36** | Subsystem Integration and Test | Valerie Duval |
| 4:15 - 4:45 p.m. | 30 | **37** | Testing the Mission Operations System | Jody Gunn |
| 6:30 - 8:00 p.m. | | | *DINNER at Landmark 78 Restaurant in Ventura* | |
| **FRIDAY, October 18** | | | | |
| 8:00 - 8:55 a.m. | 55 | **38** | Flight and Ops Systems I&T and Flight Team Operations | Victor Mora, Julie L. Webster |
| | | | **PHASE E** | |
| 8:55 - 9:40 a.m. | 45 | **39** | Postlaunch Issues for Project Managers: STARDUST Lessons Learned | Tom Duxbury |
| 9:40 - 9:55 a.m. | 15 | | *BREAK* | |
| 9:55 - 10:55 a.m. | 60 | **40** | Science Operations and Data Analysis Planning | Rich Zurek |
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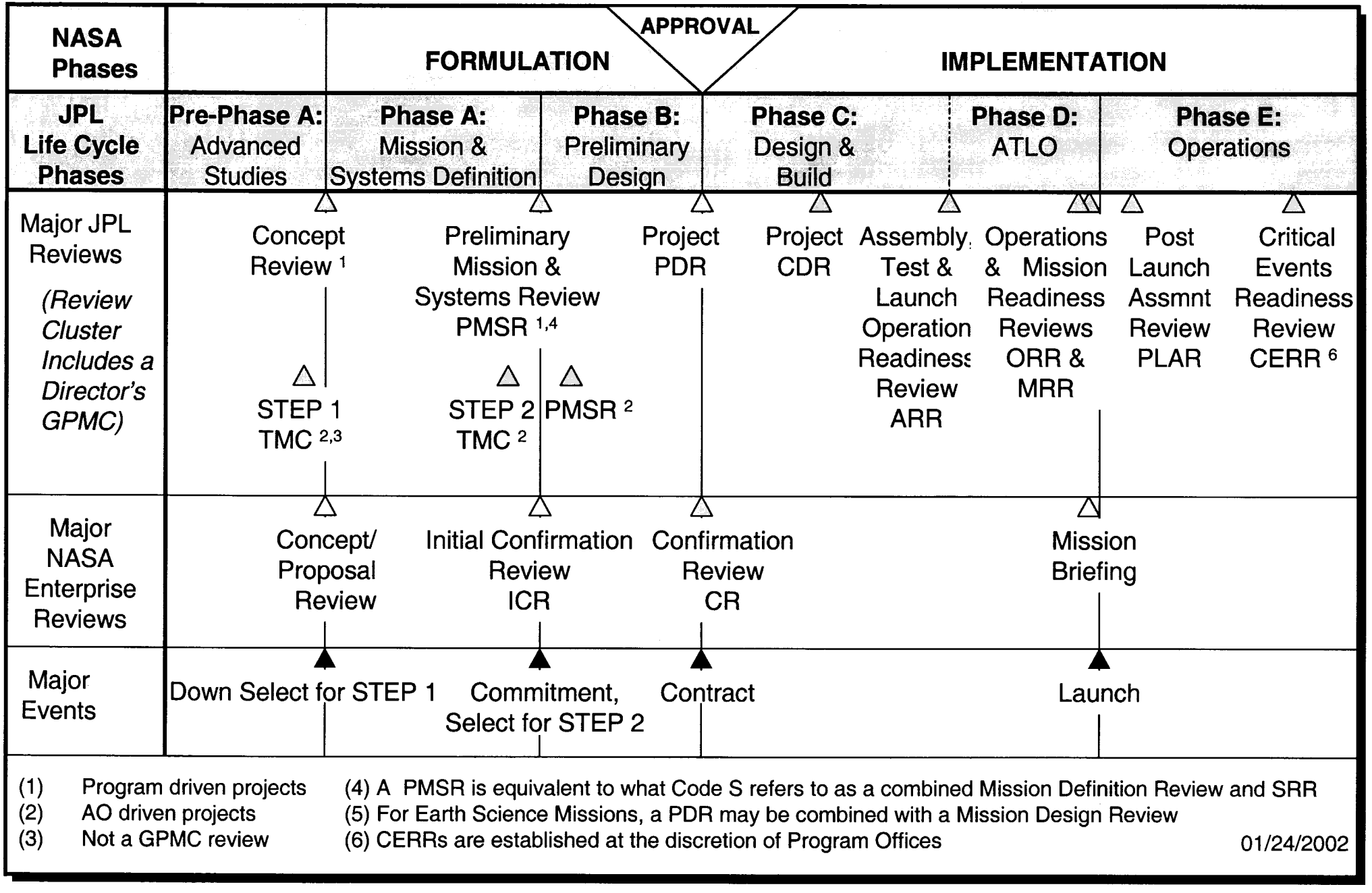


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