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***Source Selection for a
Co-designed Spacecraft***

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Project Overview



Salient Features

- Nuclear-fission-powered electric propulsion systems would enable a new era of exploration across the solar system
- There would be unprecedented science data return through high-power science instruments and advanced communications technology

Science

- The Europa orbiter mission is the highest priority for a flagship mission in this decade (Academy decadal report)
- Search for evidence of global subsurface oceans on Jupiter's three icy Galilean moons that might harbor organic material

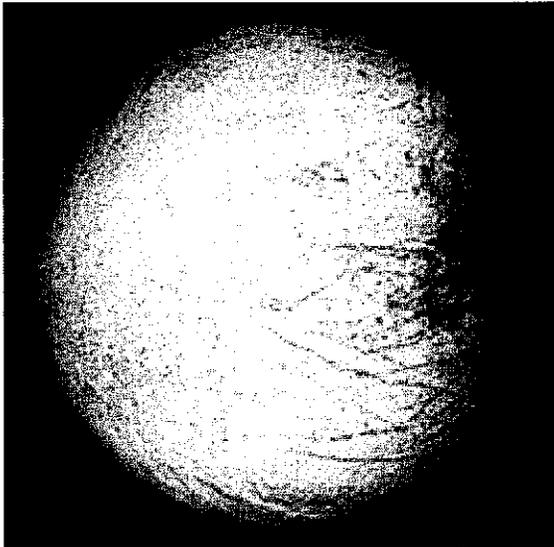




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The Icy Moons



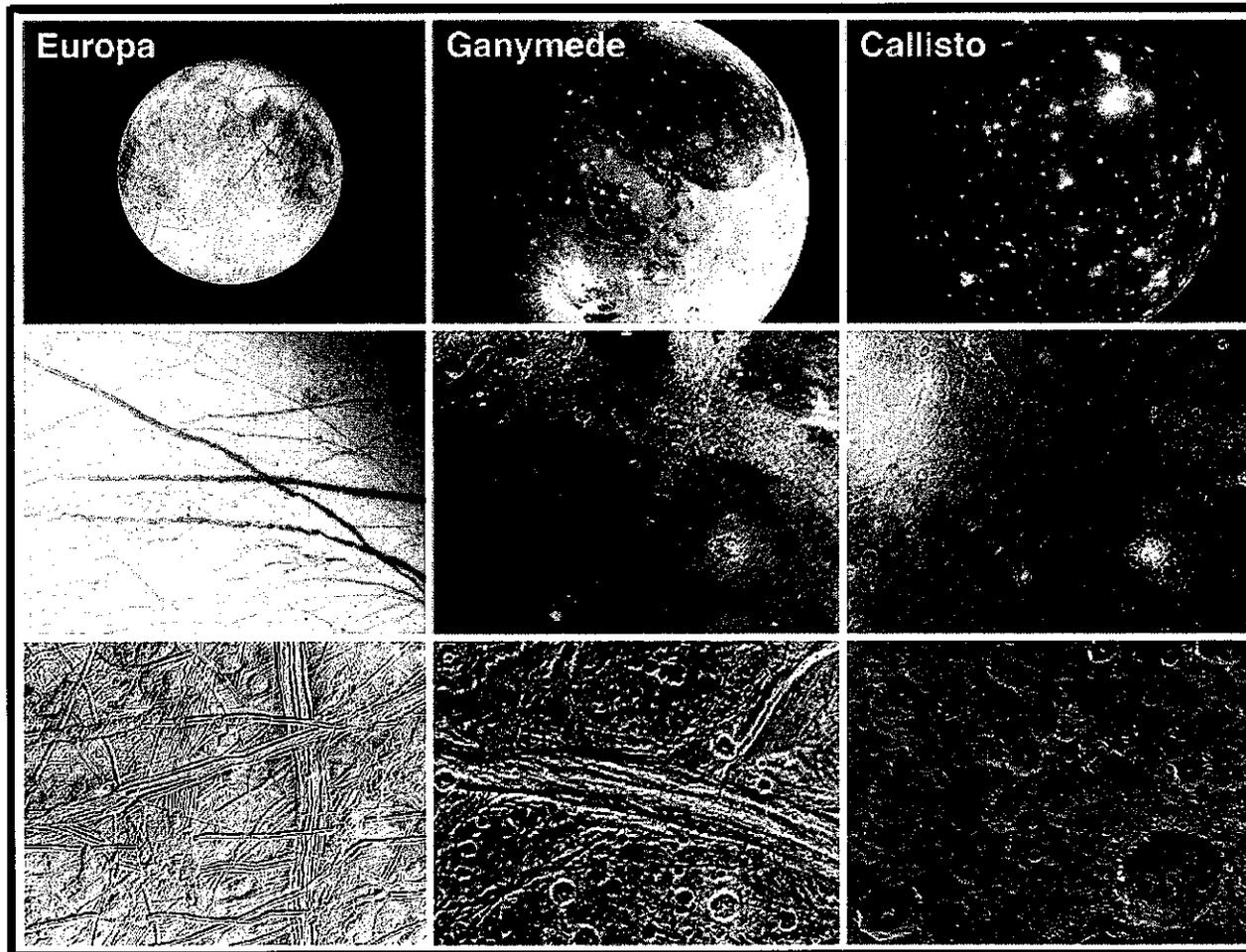
- Europa, Ganymede, and Callisto very likely have global liquid water oceans beneath their icy crusts
...one of the major discoveries in solar system science in the last decade
- There is spectral evidence for salts and organic materials on their surfaces, and geologic evidence that the European ocean might have been in contact with the surface in the geologically recent past (less than about 100 million years)
... these bodies are among the most exciting in the solar system for geophysical, geochemical and astrobiological exploration





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The Icy Moons (cont.)





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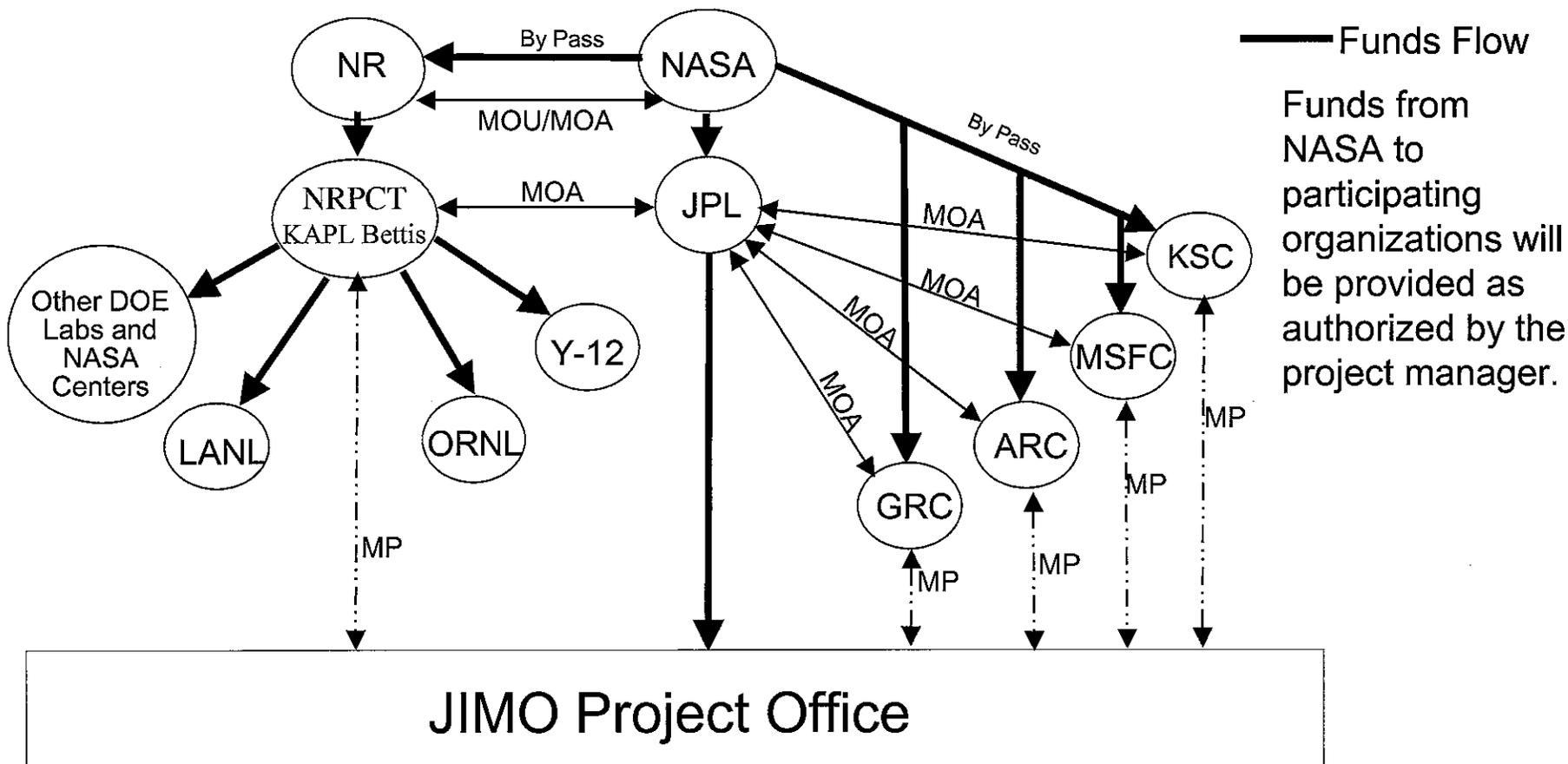
Prometheus Technology



- A key element of the planned JIMO mission is the requirement to develop a nuclear reactor powered spacecraft and show that it can be processed safely, launched safely, and operated safely and reliably in deep space for long-duration deep space exploration
 - Nuclear electric power (NEP) provides
 - Much greater delta V for mission use
 - 30 - 50 km/sec compared to
 - 2 - 3 km/sec with chemical propulsion, and
 - 6 - 7 km/sec with Nuclear Thermal Propulsion
 - Unconstrained electrical power for payload and communications – factors of 100 for both telecom data rates (10 mbps) and payload power (10 kW)
 - Radioisotope Power System limited by low specific power: 3 - 5 W/kg
 - Solar arrays limited by 1 over R² effect: 8 - 10 W/sq meter at Jupiter
 - Much greater payload mass – factors of 10
 - 1500 kg for JIMO compared to
 - 50 kg for Europa Orbiter
- The high power and high data rate afforded by nuclear power would enable science data return that is unprecedented in quality and quantity



PROMETHEUS Government Team

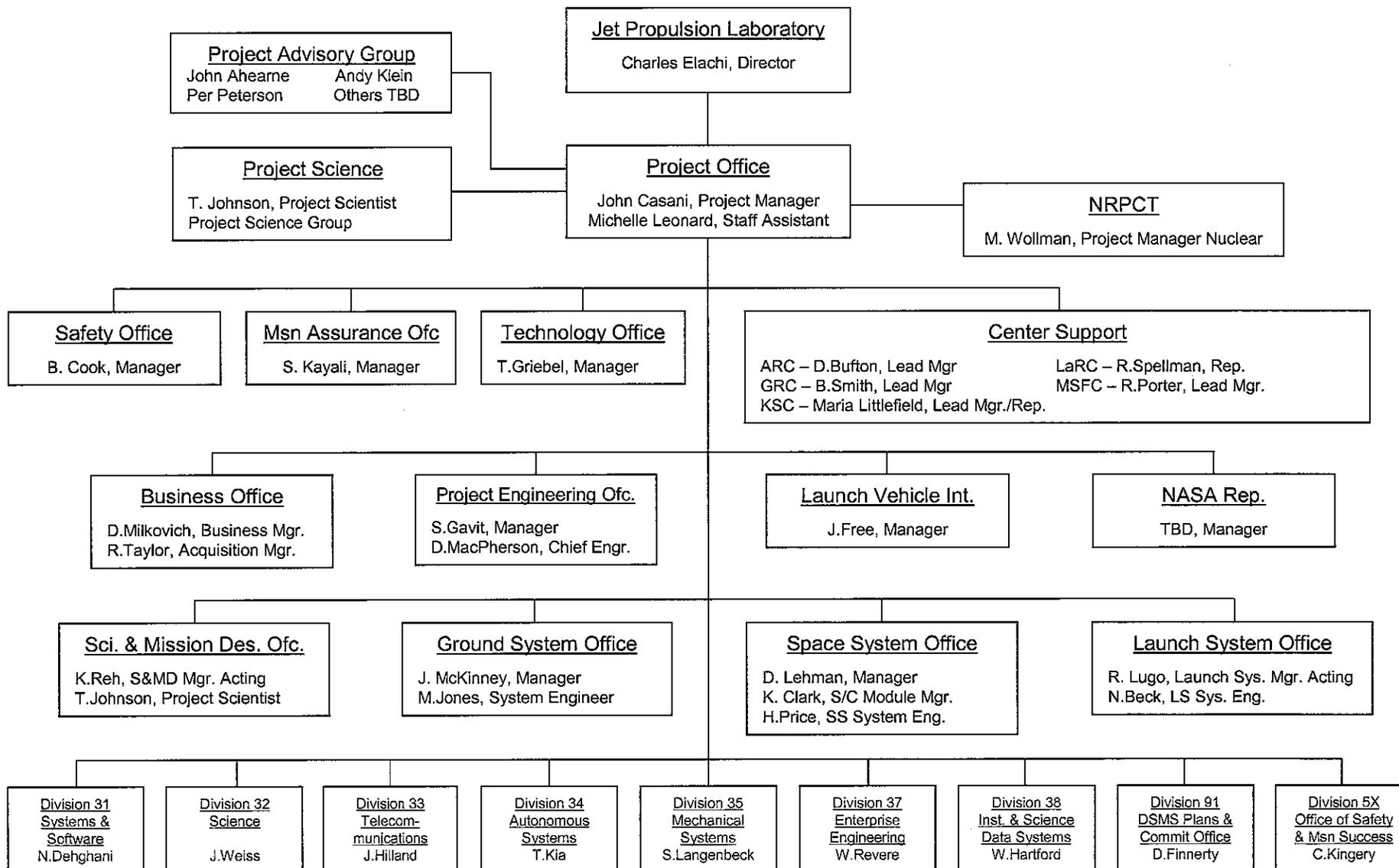


- MOU Broad statement of scope and Agency commitment
- MOA Statement of agreement on areas of project participation
- MP Definition of management responsibilities, tasks and support
- By Pass By Pass Funding and Work Scope Determined by JIMO Project Office



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Multi-Organizational Team





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Challenge #1 — Plan and Sell the Program

- In November 2002, the NASA Administrator, Sean O’Keefe, asked JPL to plan a new project, the Jupiter Icy Moons Orbiter (JIMO), on a rapid-turn-around basis
 - Needed to form a Project planning team immediately
 - Directed to deliver the following on January 31, 2003
 - A draft Project Plan
 - An Acquisition Strategy
 - A plan for issuing a Request for Proposal (RFP) to industry in February 2003
- If successful and approved by the Administrator, JIMO would be recommended to the President for inclusion in the NASA FY04 budget request to Congress
 - If not successful, wait a year (or forever)
- Team completed these and supporting products on schedule
- Team additionally completed the industry studies RFP ahead of schedule
- **Result:** JIMO was included in the budget request and Congress liked it so much that, in February 2003, they included it in the still-pending FY03 budget

Three months, from precursor studies to a national initiative.



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Study Contract Phase



- A rapid procurement cycle was employed to solicit and issue fixed-price JIMO study contracts
 - Draft RFP to industry: February 10, 2003
 - Pre-proposal conference: February 18, 2003
 - One-on-one dialogues with companies: February 19, 2003
 - RFP issued: March 21, 2003
 - Letter contract awarded: April 7, 2003
- The RFP contained mandatory qualification criteria (must meet or proposal will not be evaluated)
 - Broad spacecraft system engineering experience and capability in listed disciplines
 - Experience in complex flight systems of at least 5000 kg in size
 - US-owned company

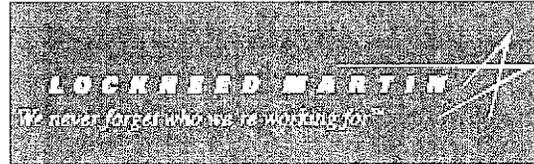


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Study Contract Phase (cont.)



- The following companies received awards



- Teams were selected for base and option periods of performance
 - Task 1 — Trade Studies (April – December 2003)
 - Task 2 — Conceptual Design Studies (December 2003 – September 2004)
- Subsequently added Task 2A – Derivative Mission Studies (lunar base, Mars cargo transport, Mars base)
- Managed per Study Contract Surveillance Plan



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Study Contract Phase (cont.)

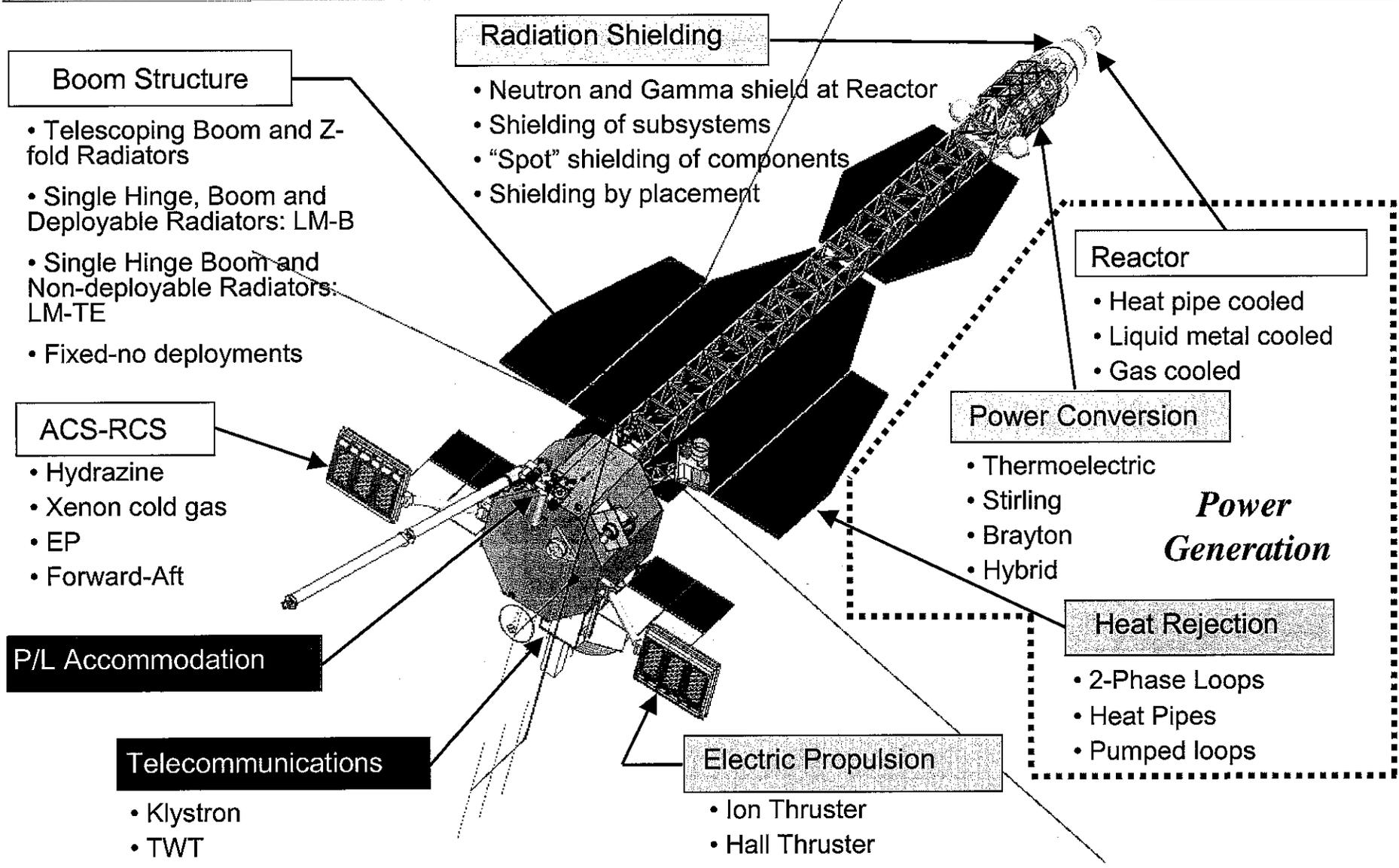


- Contract management required special precautions to preserve a level playing field
 - Due to competing teams who would be preparing down-select proposals in parallel with Task 2
- Generated special Study Contract Rules of Engagement
 - Limited government/industry interactions
 - Government in “listen only” mode
 - Limited JPL and NASA Centers to government internal study role (could not work for industry teams, even if “firewalled”)
 - Allowed Department of Energy national laboratories to choose for whom they would work
 - Argonne, Idaho, and Sandia on industry team(s)
 - Los Alamos, Oak Ridge, and Y-12 on government team
- Conducted internal government team trade studies and conceptual design studies in parallel
 - Provided “smart buyer” capability
 - Provided basis for down-select RFP and for Project planning and cost estimation
 - Documented in Technical Baselines: TB 1, TB 2, and TB 2.5



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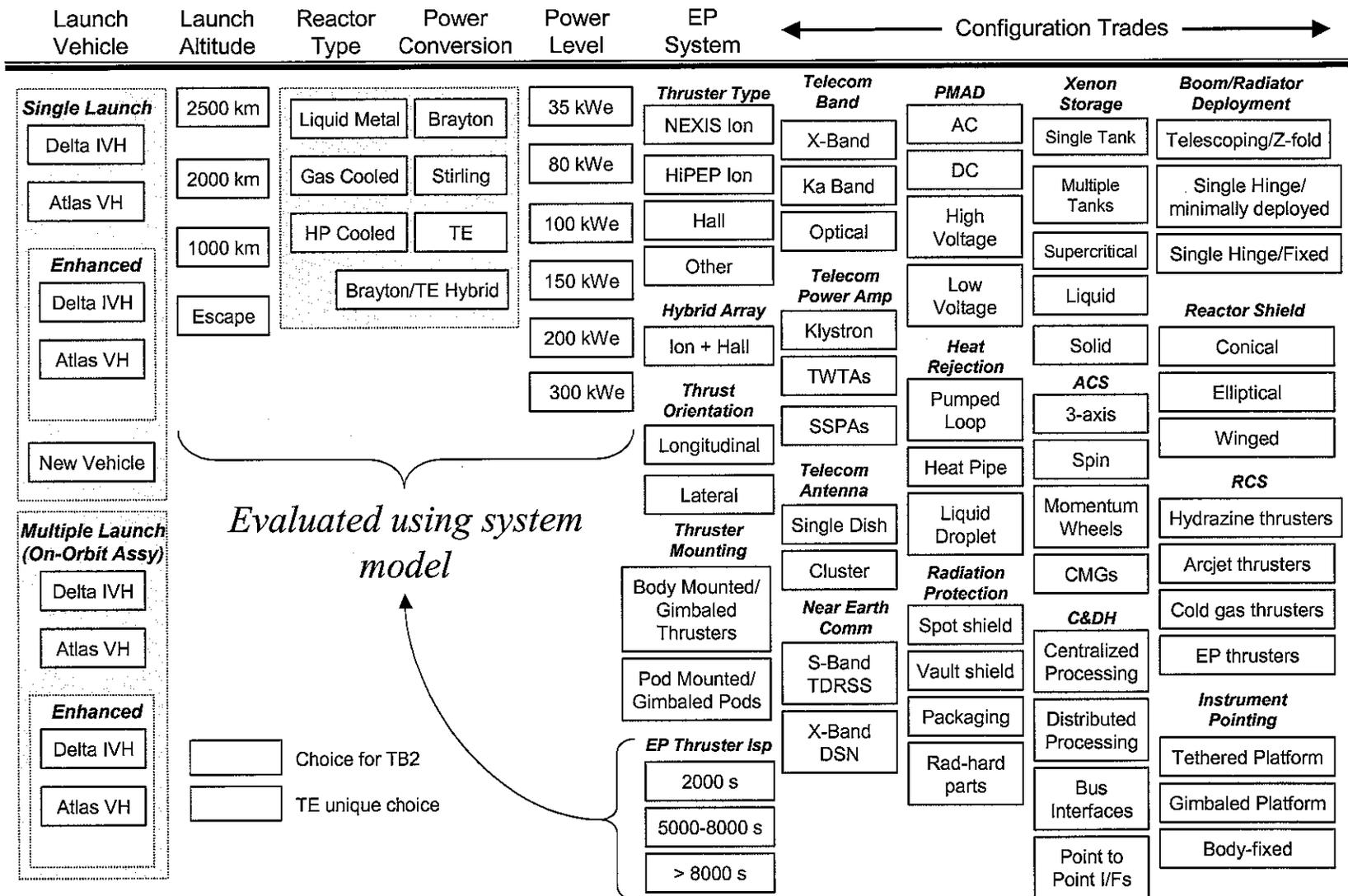
Key Space System Trades





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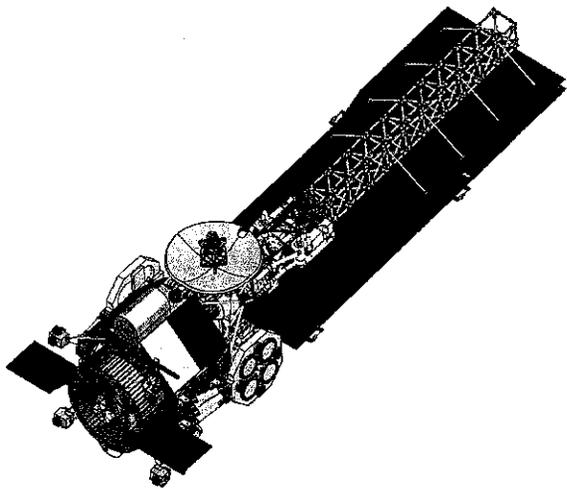
Government Team Trade Studies



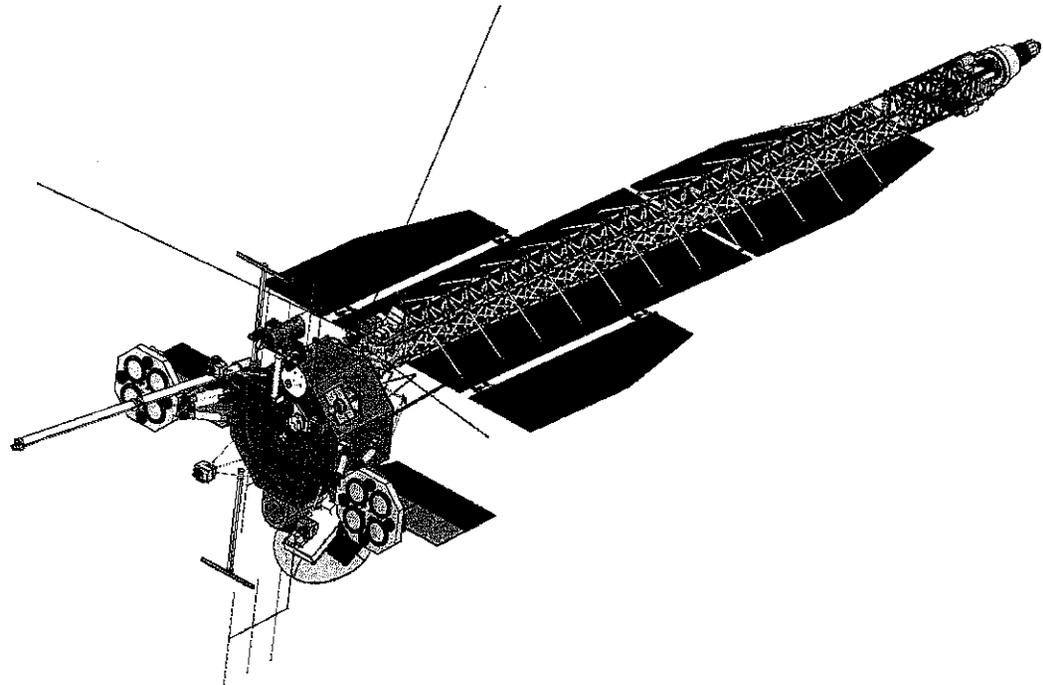


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Government Team Spacecraft Concept



*Government Team design,
stowed configuration*



*Government Team design,
deployed configuration*

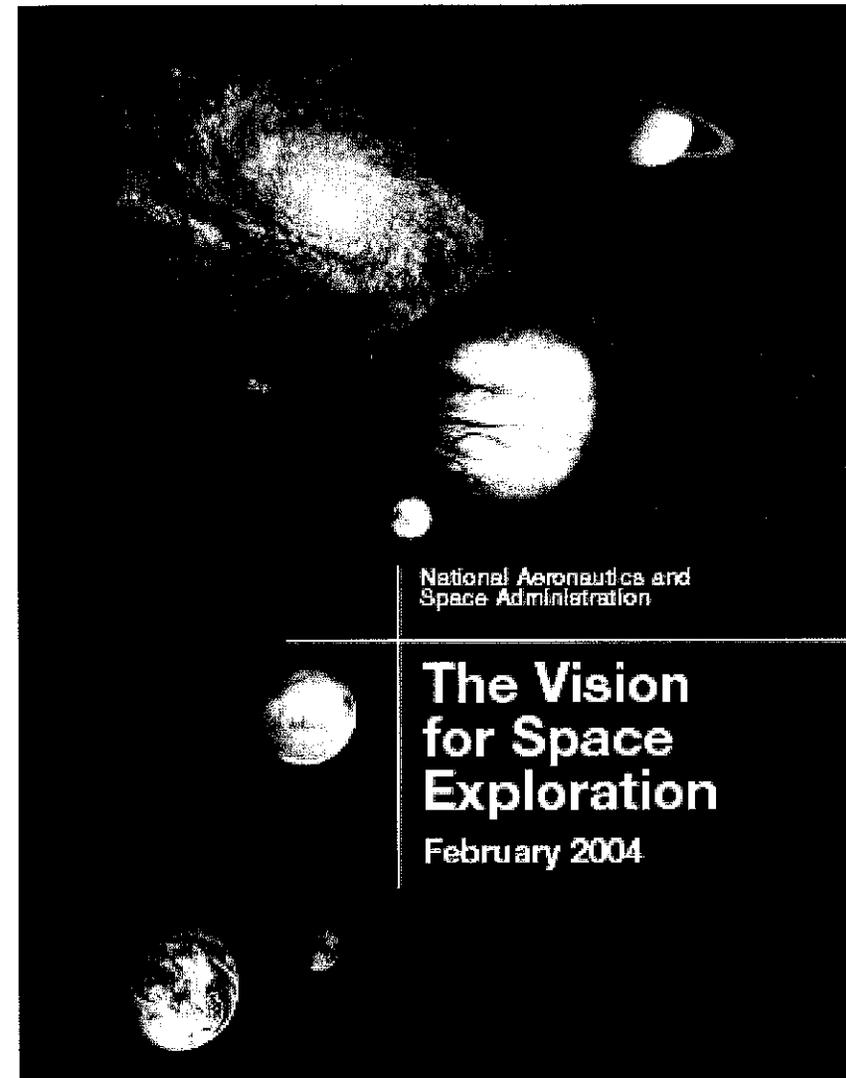


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Challenge #2 — Quick, Fair Down Selection

- To meet NASA agency decision gate and support the federal budget cycle, the Project needed to complete source selection and contract placement on an aggressive schedule
 - NASA Exploration Systems FY Objective
 - Competitively award follow-on Project Prometheus JIMO contract (NLT, September 30, 2004)





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Acquisition Strategy Process



- Project utilized a Project Acquisition Team
 - Project Acquisition Manager (lead) – Randy Taylor
 - Project Manager – John Casani
 - Space System Manager – David Lehman
 - Contract Technical Manager – Karla Clark
 - Subcontract Manager – Kathleen Hahn
- Team supported by Project and independent personnel as needed



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Acquisition Strategy Process (cont.)



- Team performed research and benchmarking efforts to define the acquisition option space
 - Reviewed federal (FAR), NASA (NASA FAR Supp. and NPG 7120.5B), DoD (D 5000.2), and NSS (03-01) guidance
 - Conducted benchmarking visits/telecons with major programs
 - James Webb Space Telescope (JWST)
 - International Space Station (ISS)
 - National Polar-orbiting Operational Environmental Satellite System (N-POESS)
 - Reviewed key recommendation documents
 - Defense Studies Board, “Acquisition of National Security Programs” (Tom Young Report)
 - Columbia Accident Investigation Board (CAIB) Report
 - Dialogued with acquisition experts
 - Tom Young
 - Bob Watts and Charlie Smith (ex-USAF)
 - Bob Krilowicz and David Tsui (USAF SMC)



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Acquisition Strategy Process (cont.)

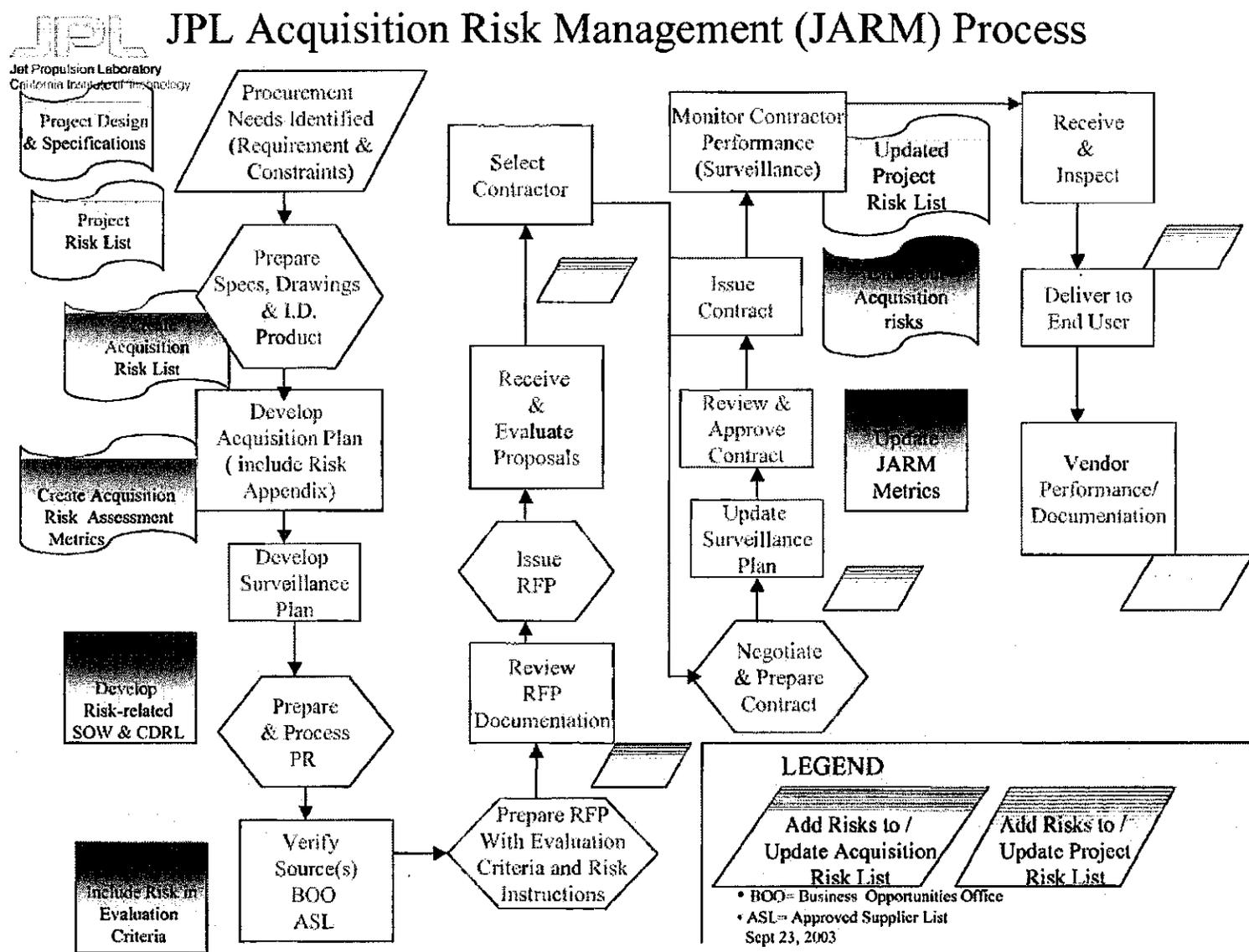


- Team utilized an acquisition risk management approach and generated an Acquisition Risk List for the procurement (see attached flow chart)
- The strategy was formally reviewed
 - JPL Acquisition Strategy Review Board: November 11 and December 8, 2003
 - JIMO Informal Review Board: January 21, 2004
 - Acquisition Strategy Briefing to NASA and NR: March 5, 2004
 - Codes T, S, H, B, G and others, NMO, and NR participated



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Acquisition Strategy Process (cont.)





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Innovative RFP



- Neither industry nor government possess the full range of capabilities necessary to perform this effort
 - Best national team required
- New paradigm: co-design
 - Government and industry will co-design the spacecraft through Preliminary Design Review (PDR) in July 2008
 - The RFP contains a Responsibility Assignment Matrix that identifies the lead and co-location site for each work element
 - Industry would then execute the design (critical design, procurement/fabrication, assembly, and test) with government surveillance after PDR



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Innovative RFP (cont.)



- Unique Statement of Work and requirements in the RFP
 - Co-design tasks
 - No spacecraft specification; instead, Space System Requirements (based on NASA ESMD requirements)
 - Tailored Applicable Documents List and CDRL/DRDs
 - Special Roles and Responsibilities and Guiding Principles Exhibits
- Unique proposal instructions
 - No submission and pricing of a to-be-executed spacecraft; instead, submission of a Design Approach (representative design) as a demonstration of capabilities
 - Supported by representative System Implementation and Verification approach
 - Equally weighted submission of Management and Technical Teaming Approaches for co-design
- Comprehensive review of RFP before issuance
 - RFP Pre-release Review #1 – February 2 and 3, 2004
 - JPL Executive and Senior Management Review: February 12, 2004
 - Draft RFP: February 23, 2004
 - Industry, NASA, and NR comments received
 - Industry one-on-one dialogues: March 15 through 17, 2004
 - RFP issued: May 18, 2004



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Streamlined Evaluation and Selection



- Announcement of source selection was made only 66 days after receipt of proposals
 - Evaluation was fast
 - Evaluation was, however, thorough
- Proposal Evaluation Team convened
 - Senior Source Evaluation Board, dedicated as #1 priority, with non-voting members from HASA HQ
 - Supported by panels and committees
 - Four technical/management panels (which included personnel from JPL, Glenn Research Center, and Marshall Space Flight Center) that focused on evaluating one section of the proposal
 - A past performance committee, which requested early submission of the Past Performance volume
 - A cost committee, instead of a single cost analyst
- Individual and panel evaluations were made using a COTS evaluation tool (Decision Point)
 - Tool captured
 - Major strengths and major weaknesses
 - High risks (new for this procurement)
 - Questions (mandated for weaknesses and risks)
 - Adjective and numerical scoring
 - Tool supported remote participants



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Industry Team (after source selection)





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Summary



- The acquisition strategy was critical to Project approval
- A Nation's Best team was required for a revolutionary development
- The novel co-design paradigm provided the framework for the RFP and proposals
- Acquisition benchmarking and acquisition streamlining can co-exist
- The Government Team, NRPCT, and NGST are pressing full throttle to PMSR