



Space Communications and Navigation (SCaN) Program Implementation Review (PIR) Standing Review Board (SRB) Assessment

Excerpts from the June 9, 2010 Agency Program Management Council (APMC)
Presentation

Presented to:

NASA Advisory Council

By:

Dolly Perkins, SRB Member

W. James Adams, SRB Chair (telecon)

February 10, 2011



Agenda

- SCaN Overview
- SCaN History
- Review Description
- Review Overview
- SRB Membership and Roles
- Review Criteria
- Program Strengths
- Documentation Maturity
- Assessment Results
- Independent Cost/Budget Assessment
- Independent Schedule Assessment
- SRB Issues/Concerns/Observations
- SRB Response to SOMD DPMC Action
- SRB Assessment Summary and Conclusions



SCaN Overview



Organization

- **Mission Lead:** NASA Headquarters
- **DAA for SCaN:** Badri Younes
- **Mission Description:** SCaN is responsible for providing communications and navigation services, including systems engineering and planning, to flight missions and for supplying terrestrial communications services. SCaN is responsible for maintaining and evolving the SCaN architecture to effectively and efficiently meet flight missions' present and future needs.
- **Organizations:** All NASA Centers, Jet Propulsion Laboratory (JPL), White Sands



SCaN History

- Established by NASA Administrator's memorandum July 19, 2006
- SCaN serves as the Program Office for all of the Agency's space communications activities and navigation infrastructure
- SCaN functions are defined in NASA Associate Administrator's memorandum of September 24, 2007
- Program Commitment Agreement (PCA) signed Oct. 18, 2008
- After dissolution of the Space Operations Missions Office (SOMO) and prior to NASA AA memo, current SCaN activities were largely un-integrated
- SCaN is challenged to implement an integrated architecture from existing networks while maintaining operations



Review Description

As indicated in NPR 7120.5, NID, Table 2-5, Space Flight Program Reviews, Program Status Reviews (PSRs) are conducted by the Program to examine the Program's continuing relevance to the Agency's Strategic Plan, the progress to date against the approved baseline, the implementation plans for current and upcoming work, budget, schedule, and all risks and their mitigation plans. PIRs are conducted as part of this review to provide Agency management with an independent assessment of the readiness of the Program to continue with implementation.

Additional purposes of these reviews are to:

- Identify to Agency management the Program strengths, issues and concerns
- Identify specific areas where improvement is needed and provide recommendations on means to strengthen the Program
- Identify broader Agency issues that have potential impact on present or future Program performance



Review Overview

- The PIR was conducted in conjunction with the SCaN Program Management Review (PMR) on April 6-7, 2010 at NASA HQ. The review was performed per the Terms of Reference (ToR) of November 9, 2009, signed by the Convening Authorities
- The SRB reviewed numerous program documents prior to the PIR. Members submitted questions to the program throughout the document review process. The program responded to all questions in a timely and quality manner prior to or at the PIR
- SCaN team presentations were comprehensive and addressed all required topics
- Written evaluations were prepared by each SRB member and advisors on their area of expertise
- SCaN presentation and SRB review were comprehensive and consistent with NASA Review requirements
- The PIR resulted in 4 “informal” Request for Actions (RFAs) (all closed), 8 notable Strengths, 4 Issues, and 7 Concerns
- The SRB caucus took place on April 8, immediately following the PIR. The SRB findings were briefed to SCaN management the following day.
- SRB identified Strengths, Findings, Concerns, and Observations
- Out-briefing schedule:
 - April 19 – SRB Quicklook
 - April 26 – DPMC
 - June 3 - IPCE/IPAO Pre-brief
 - June 9 - APMC



SCaN Standing Review Board Consensus with Consultant Support

SCaN SRB

Name	Organization	Knowledge Area
Jim Adams	HQ	SRB Chair
Robert Frazier	HQ	SRB Review Manager
Phillip Engelauf	JSC	Mission Integration / Operations
Neal Newman	HQ	International
Dennis Vander Tuig	GSFC	Program Management / Integration
Expert Support		
Dr. Paul Morris	Consultant	Cost/Schedule
Gael Squibb	Consultant	Space Operations / Standards
Dolly Perkins	Consultant	Program / Project Management



Review Criteria

Review Criteria IAW the Standing Review Board Handbook,
effective date: November 12, 2009

Program Implementation Review Criteria

1. Alignment with and contributing to Agency needs, goals, and objectives, and the adequacy of requirements flow-down from those.
2. Adequacy of technical approach.
3. Adequacy of the integrated cost and schedule estimate and funding strategy in accordance with NPD 1000.5.
4. Adequacy/availability of resources other than budget.
5. Adequacy of risk management approach and risk identification/mitigation per NPR 8000.4.
6. Adequacy of management approach.



Program Strengths

Management Strengths

- Well-established structure to run as a Program
- Architectural Design Document (ADD)/roadmap well-conceived and communicated
- Team has a strong sense of direction
- Fully engaged team, stakeholders, and users
- Focus on strategic communications
- Solid workforce development and succession planning to mitigate industry wide problem...lack of available critical skills

Technical Strengths

- Delivery of services
- Well-balanced Program using both commercial and government assets



Program Products Maturity (NPR 7120.5D, NID, Table 4.1)

Document	Status	Assessment
PCA	Signed Oct. 2008	Due to be updated
Program Plan	December 2008	Comprehensive and Complete, Minor Updates Required (budget & schedule)
Interagency & International Agreements	Discussed at PIR	SCaN and future review teams could benefit from a compendium of agreements and their status
Traceability of Program Requirements on Projects to the Agency Strategic Plan	Demonstrated at PIR	Sufficient



Assessment Results (NPR 7120.5D, NID Criteria)



Assessment Results (1)

Success Criteria (NPR 7120.5D, NID)

Criteria*	Status - April 2010		Expected Status - November 2010	
	Adequacy	Comments	Predicted Trend	Comments
Goals	G	The SCaN reflects Agency goals, objectives and requirements as recorded in the PCA, dated October 18, 2008 and the NASA Administrator's memo of July 19, 2006	Same	No Change.
Technical	G	Good, balanced technical approach with well defined set of requirements.	Same	No Change.
Budget / Schedule	R	Integrated architecture at risk with no reserves and SN Operations at risk without secure funding. Agency decision required on TDRS M/N and Optical Comm.	R/Y	SCaN is seeking cost savings through operational efficiencies. Infusion of funds required.
Resource	Y	Acquisition of specialized skills are needed: SGSS, DTN skills mix	Same	No Change.
Risk	G	Need experience executing to newly defined processes	Same	No Change.
Management	G	Well-established structure to run as a Program	Same	No Change.



Independent Cost Analysis and Budget Summary

SCaN SRB

- Program requires \$53M per year to fund at the 70% Confidence Level (CL) (excluding TDRS K/L) for sustained operations
- Program Undistributed Future Expense (UFE)/Reserves should be at least \$22M per year for NPD 1000.5 compliance, they are currently at \$3M per year
- Funding for Space Network (SN) operations starting in FY13 is critical, and not included in the CL analysis
- Contract and budget decision for TDRS M/N requires timely action



Independent Cost Analysis and Budget Summary (Separating Op's and Development)

SCaN SRB

- At the SOMD DPMC Review of the SRB findings, an action was placed on the SRB/SCaN Program to evaluate the change to the cost analysis if the Development activities were separated from the Operations activities in the current Budget snapshot
- The Program supplied a budget update, in which they identified \$30-33M a year of the Deep Space Network (DSN) budget from 2013 onwards that would be allocated to the 70m Replacement development project.
- The SRB re-ran its probabilistic model with the revised DSN budget, with a medium uncertainty applied to DSN Development and low uncertainty applied to DSN Operations. As a result the predicted annual budget shortfall to achieve a 70%CL fell from \$53M to \$19M.
- The required annual UFE/Reserves needed to satisfy NPD 1000.5 fell from \$22M to \$5M.

SCaN Program (6 Year Snapshot) - Cost Probabilistic Analysis (Final Rating)						
Cost Element	Budget (\$M)	Margin (\$M)	50%CL (\$M)	70%CL (\$M)	70%CL Delta (\$M)	Annual Budget Delta (\$M)
SCaN Program (Original Budget)	2329	42	2514	2645	316	53
SCaN Program (Ops / Dev Separation)	2329	42	2412	2444	115	19



Independent Schedule Analysis Summary

- Integrated Management Schedule (IMS) is in planning and development (challenging: as prior to 2007, each element of SCaN was independent)
- SCaN projects have a reasonable understanding of the schedule margin needed for their development plans.
- However, no funded schedule margin is currently identified in their budgets (with the exception of TDRS K/L).



SRB Issues

1. Space Network funding
2. Optical Communications funding
3. Goddard Flight Dynamics Facility (FDF) funding
4. Disruption Tolerant Networking (DTN) Implementation Plan



SRB Issue 1: Space Network Funding

SCaN SRB

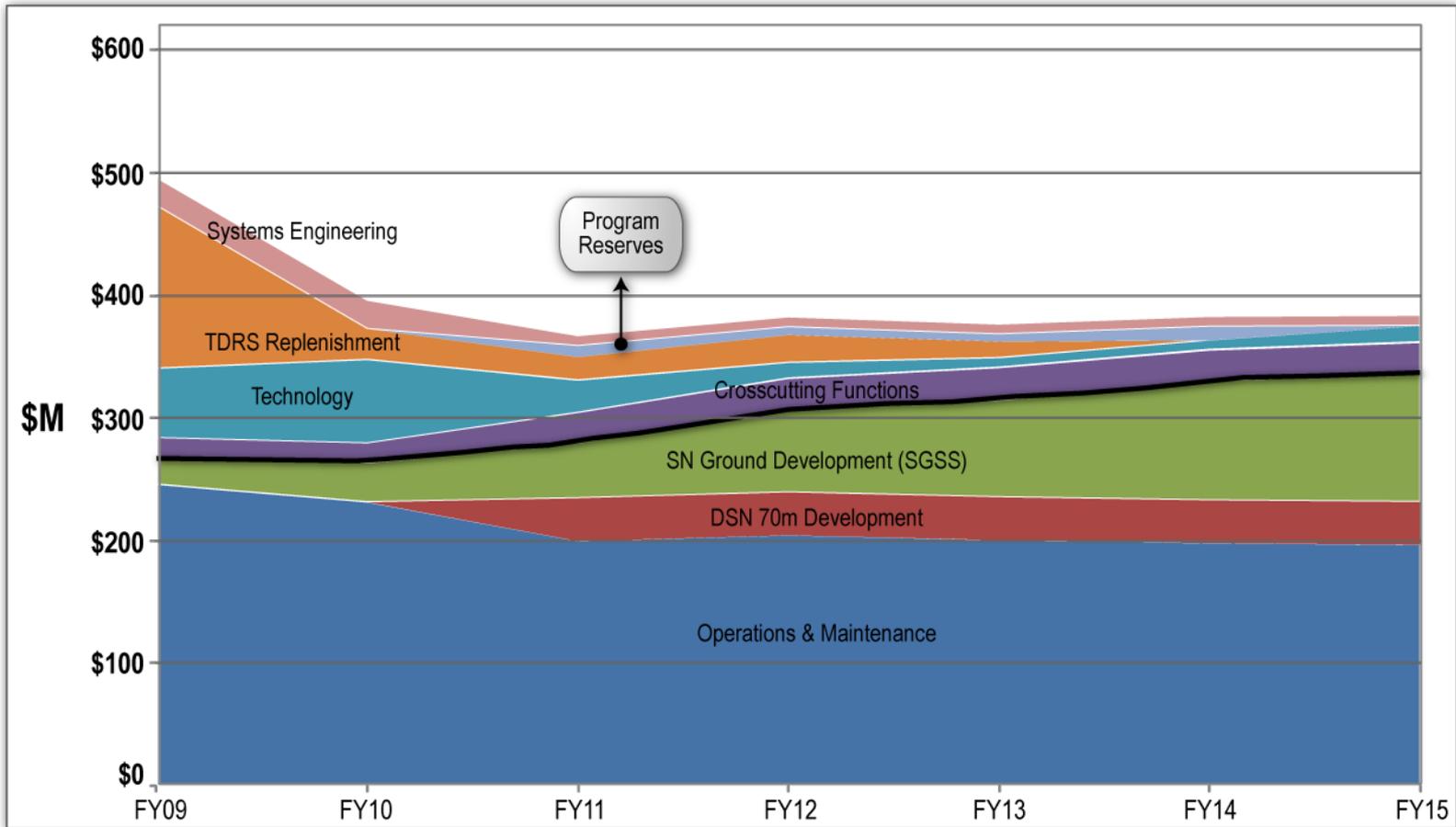
Issue: The current Agency budget plan does not provide adequate funding for continued operation of the SN starting in FY13.

This situation arises from loss of external reimbursements under existing agreements without provision of NASA funding to support the SN operations costs. If not corrected, this situation has the potential for significant impacts to both NASA and external users of the SN.

SRB Recommendation: The Agency should direct fund (~\$80M/yr) the SN for FY13+ and begin renegotiation of SN reimbursable operations.



SCaN Budget Composition NASA Appropriated Budget as Presented at PIR



Note: Does not include additional funds required to offset the loss of reimbursable SN funds starting in FY 13



SRB Issue 2: Optical Communications Funding

SCaN SRB

Issue The Program lacks Optical Communications funding for continued demonstration, technology, and network.

Key optical technologies are required by 2015 for the successful implementation of the optical communication link capability, including demonstration of efficient direct-to-Earth optical links utilizing photon counting receivers. Currently, only the LADEE laser comm technology demonstration is funded.

SRB Recommendation: The Program should establish Optical Communications as a project within the SCaN Program. The Agency should direct fund the Optical Communications project.



SRB Issue 3: FDF Funding

SCaN SRB

Issue: There has been a loss of external reimbursements under existing agreements without provision of NASA funding to support the Goddard Flight Dynamics Facility (FDF) operations costs.

The FDF provides space navigation and orbit determination services which are critical to the operation and utilization of SCaN's network services. However, while SCaN contributes to the support of this facility, it does not manage the funding for FDF operations, which are shared by the direct users of the FDF products.

SRB Recommendation: The Agency should include the FDF as an integrated element of SCaN (for both budget and architecture purposes).

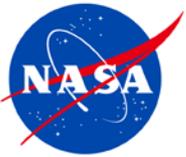


SRB Issue 4: DTN Implementation Plan

Issue The Program does not have a DTN Implementation Plan and therefore the required funding has not been estimated nor budgeted for.

The current DTN project will be completed at the close of FY11, half way through the DTN Technology Demonstration. The Program has not planned or budgeted for an additional follow-on project. The capability to move SCaN from a space link provider to a space internet service provider is a major engineering and implementation challenge. Without a definitive multi-year project plan for the infusion of DTN into SCaN's communications infrastructure, along with the associated schedule and funding commitments, the underlying architectural goals of SCaN will not be realized.

SRB Recommendation: The Program should establish the next phase of DTN as a project (technical, cost, and schedule) and submit a budget request to the Agency as soon as possible to ensure the DTN capability is in place and stable prior to the Mars 2016 launch. Appropriately skilled staff should be expeditiously acquired with a focus on the areas of near term loss in understaffed areas.



Concerns

- 70M Replacement Funding
 - Plan to obtain the necessary funds through the operational efficiencies and preventive maintenance is reasonable but not yet demonstrated. The agency MUST watch the risk associated with this plan.
- TDRS M/N Option Decision
 - The agency must decide before late next year (2011) whether or not to exercise the contract option to procure TDRS M and N or wait until SN reliability analyses indicate that replacement units are required. The former requires significant funding the latter delays budget issues but assures that a 4th generation TDRS will need to be designed at significantly greater expense.
- Compatibility test gear upgrades require funding and focus.
- Workforce and Succession Planning for Critical Skills
 - The Program is challenged with an aging workforce that may result in insufficient staffing with the requisite skills to carry out the technical approach and Program roadmap.
- The System Engineering and Integration (SE&I)
 - The SE&I organization and functional responsibilities are newly established and are crucial to achieve an integrated network of networks. SCaN should continue to facilitate this.
- Technology infusion strategy needs further definition
- Two Level 0 Requirements need clarification (3-highest data rate, 4-internationally interoperable)



SRB Observations

- Management process are newly established and evolving (CM, RM)
- SCaN may require additional funding for future ESMD missions
- Agency would benefit from network independent reviews
- Unclear, in the post-Constellation world, what navigation means
- Paradigm change from stovepipe to integrated is going to take a long time; Program is aware of the challenges and SCaN is handling this incrementally but lacks mandated end date and plan
- Program should address risks as development and operational as opposed to network in order to integrate program risks
- Vague process for determining stakeholder requirements versus enabling capabilities



SRB Assessment Summary and Conclusion

- SCaN is effectively managed, with a strong Program Office and field center support
- Sound Technical Approach to an integrated network of networks
- Risks are being identified and managed with reasonable mitigation plans
- Management challenges remain due to the lack of new funding infusion
 - Space Network Operations funding beginning in FY13 (~\$80M/yr)
 - Program funding reserves are critically low (\$19M-\$53M/yr)
 - TDRS M/N Acquisition Decision requires Agency level attention
 - 70m Replacement, Optical Comm Network, FDF and DTN are significant funding threats

CONCLUSION

- The Program is well-managed with a strong team working toward the common goal of “integrated network of networks.” However, to implement the Agency’s mandate for the future, additional funding is required.
- Recommend SCaN proceed with Operations as planned but the Agency should demonstrate adequate funding profile for SN Operations in FY13+, the 70m replacement effort and bolster annual reserves. Alternatively, reduce SCaN scope of work through a PCA and Program Plan update.