



The Power of a “Can Do” team: Conducting the Constellation SRR

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CONSTELLATION



Agenda



- ◆ **Introduction**
- ◆ **Team Environment**
- ◆ **Program Need**
- ◆ **Programs Culture**
- ◆ **Teams Motivation**
- ◆ **Summary**



Important First Step for CxP



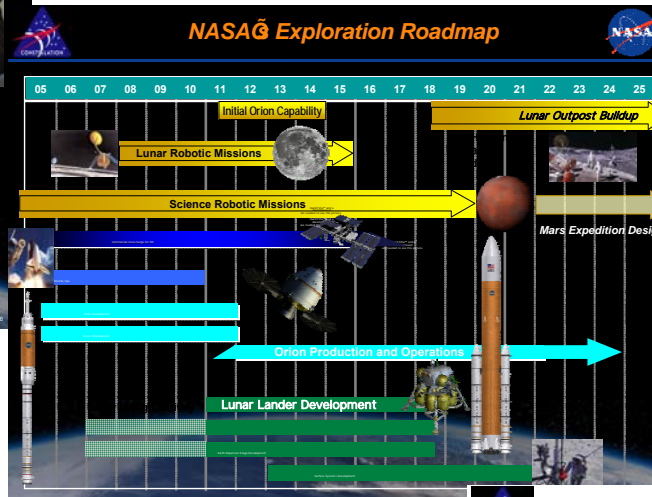
A Bold Vision for Space Exploration, Authorized by Congress

- Complete the International Space Station
- Safely fly the Space Shuttle until 2010
- Develop and fly the Crew Exploration Vehicle no later than 2014
- Return to the Moon no later than 2020
- Extend human presence across the solar system and beyond
- Implement a sustained and affordable human and robotic program
- Develop supporting innovative technologies, knowledge, and infrastructures
- Promote international and commercial participation in exploration

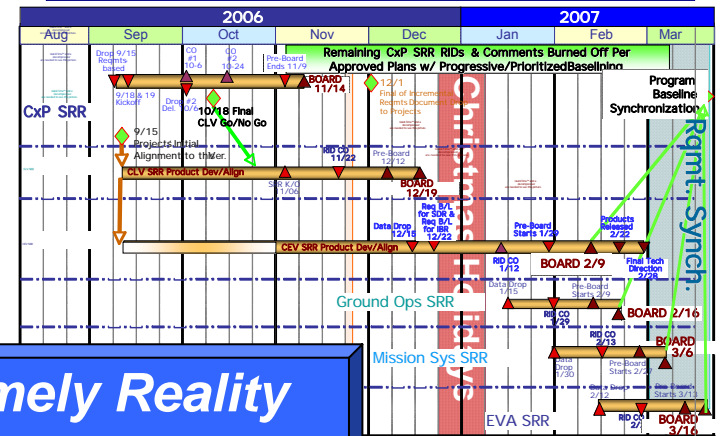


NASA Authorization Act of 2005

The Administrator shall establish a program to develop a sustained human presence on the Moon, including a robust precursor program to promote exploration, science, commerce and U.S. preeminence in space, and as a stepping stone to future exploration of Mars and other destinations.



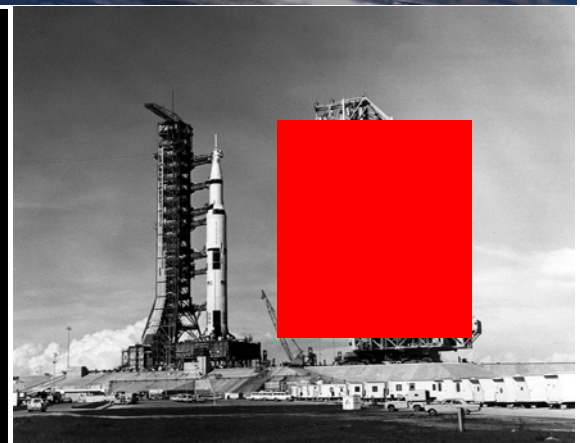
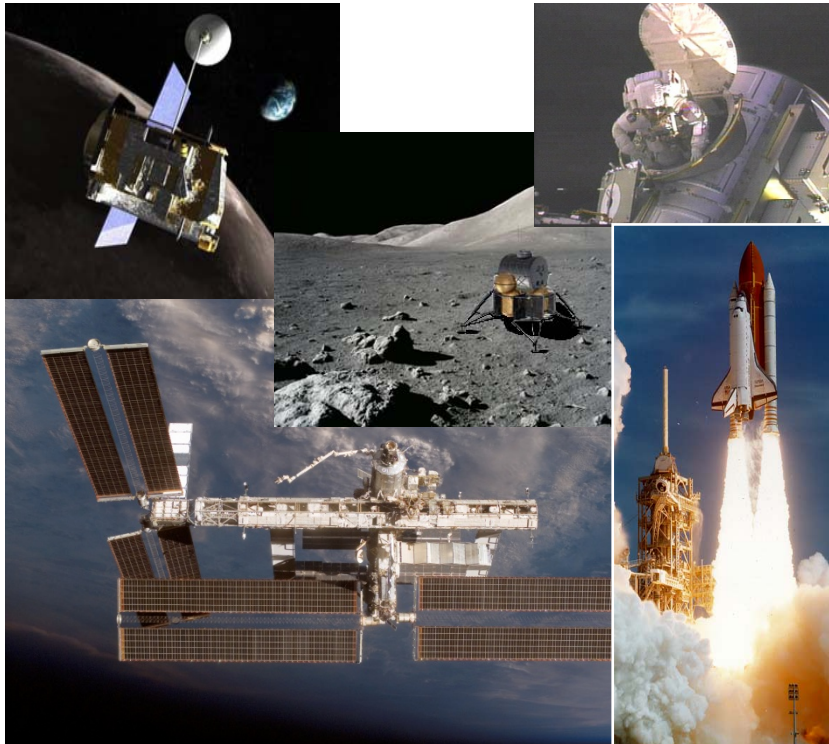
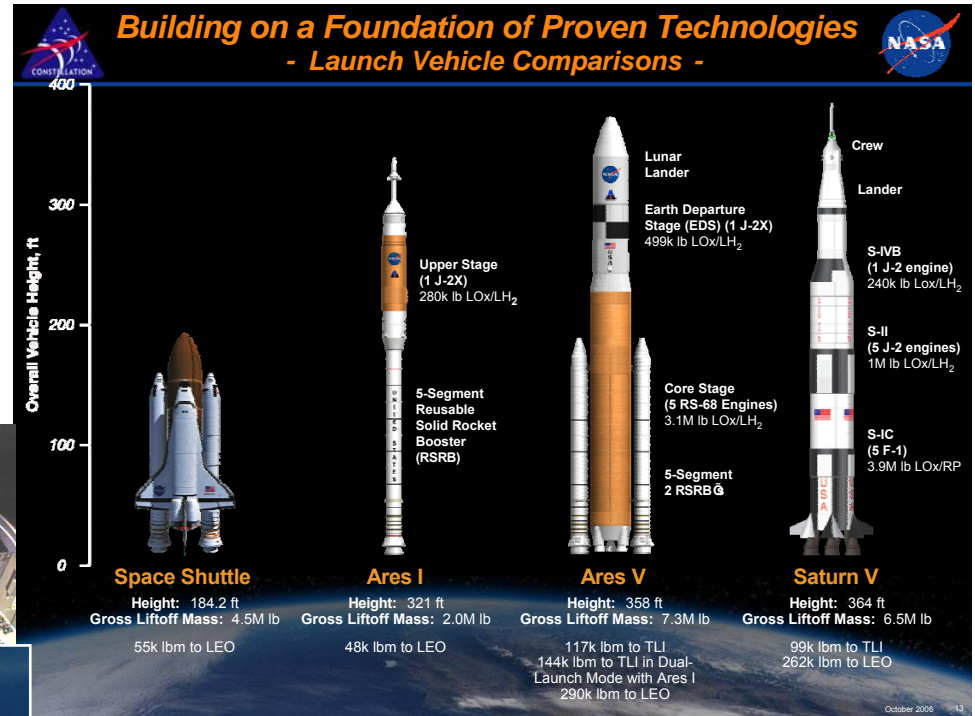
SRR Schedule Overview - Updated 10/30



Translating Vision into Timely Reality

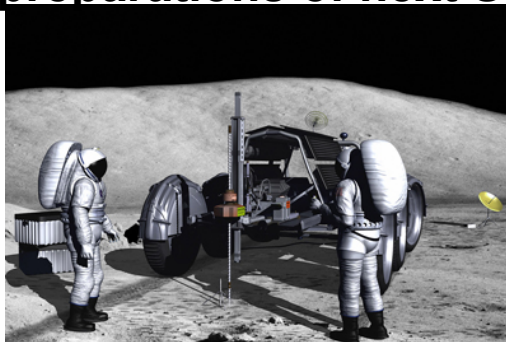
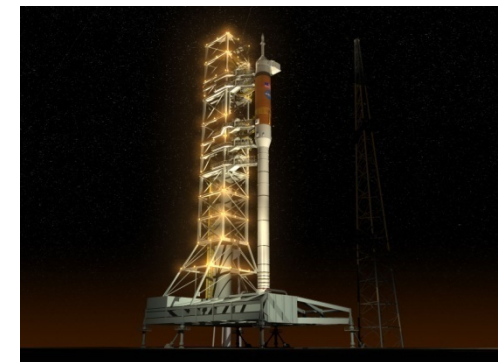
Learning & Leveraging From the Past as We Lean Forward with Today's/Tomorrow's Technologies

- **34 Years since last Human Space Transportation SRR**
 - People working together will be the key to our success
 - Must learn from/leverage robotics/unmanned expertise
 - Need to strategically engage Industry and DoD



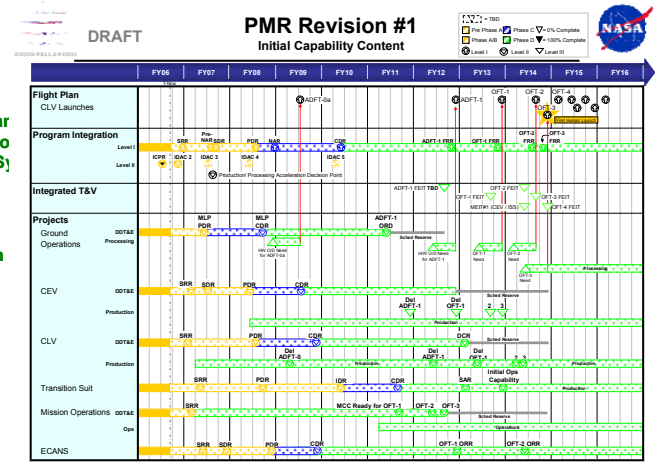
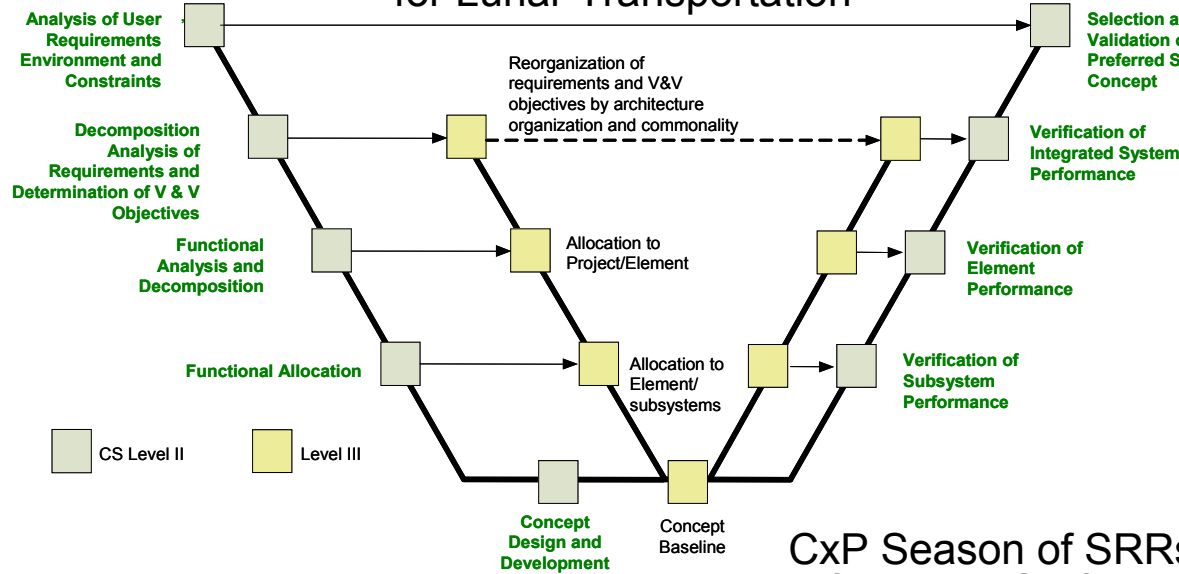
Systems Engineering Near-Term Focus with Long-Term Objectives in Mind

- The scope of this initial CxP SRR and “First Season of SRRs” covers the architecture and engineering artifacts associated with:
 - Transportation to and from low earth orbit
 - Transportation to and from the lunar orbit as it relates to “driving early designs” of CEV/CLV/GO/MO/EVA
- Also Refining Integrated Plan to leverage off of LAT and Lander Studies for performing Systems Engineering in Disciplined Manner in preparations of next Season of SRRs

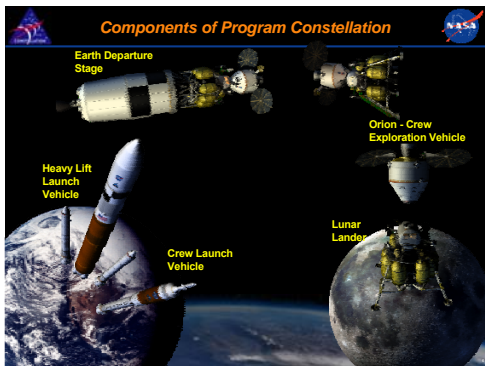
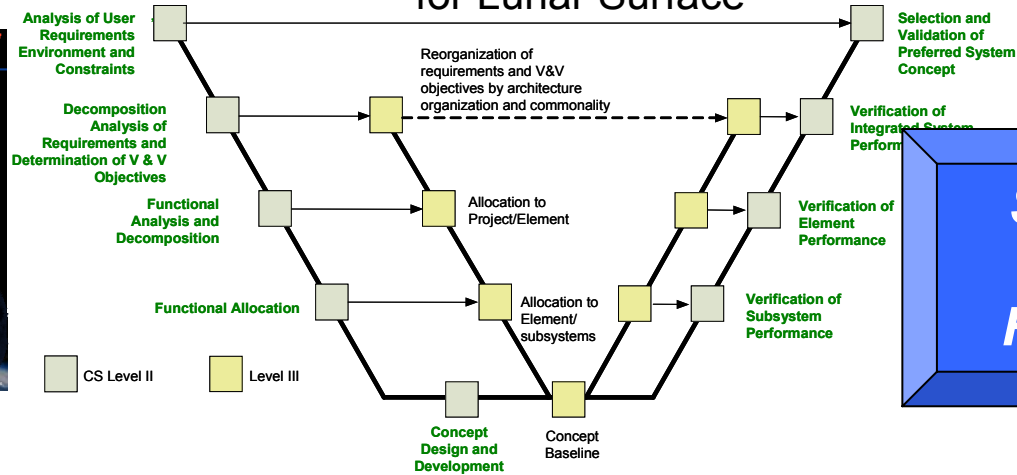


Multiple Time-Phase SRRs Addressing Additional Capabilities

CxP Season of SRRs for Lunar Transportation



CxP Season of SRRs for Lunar Surface

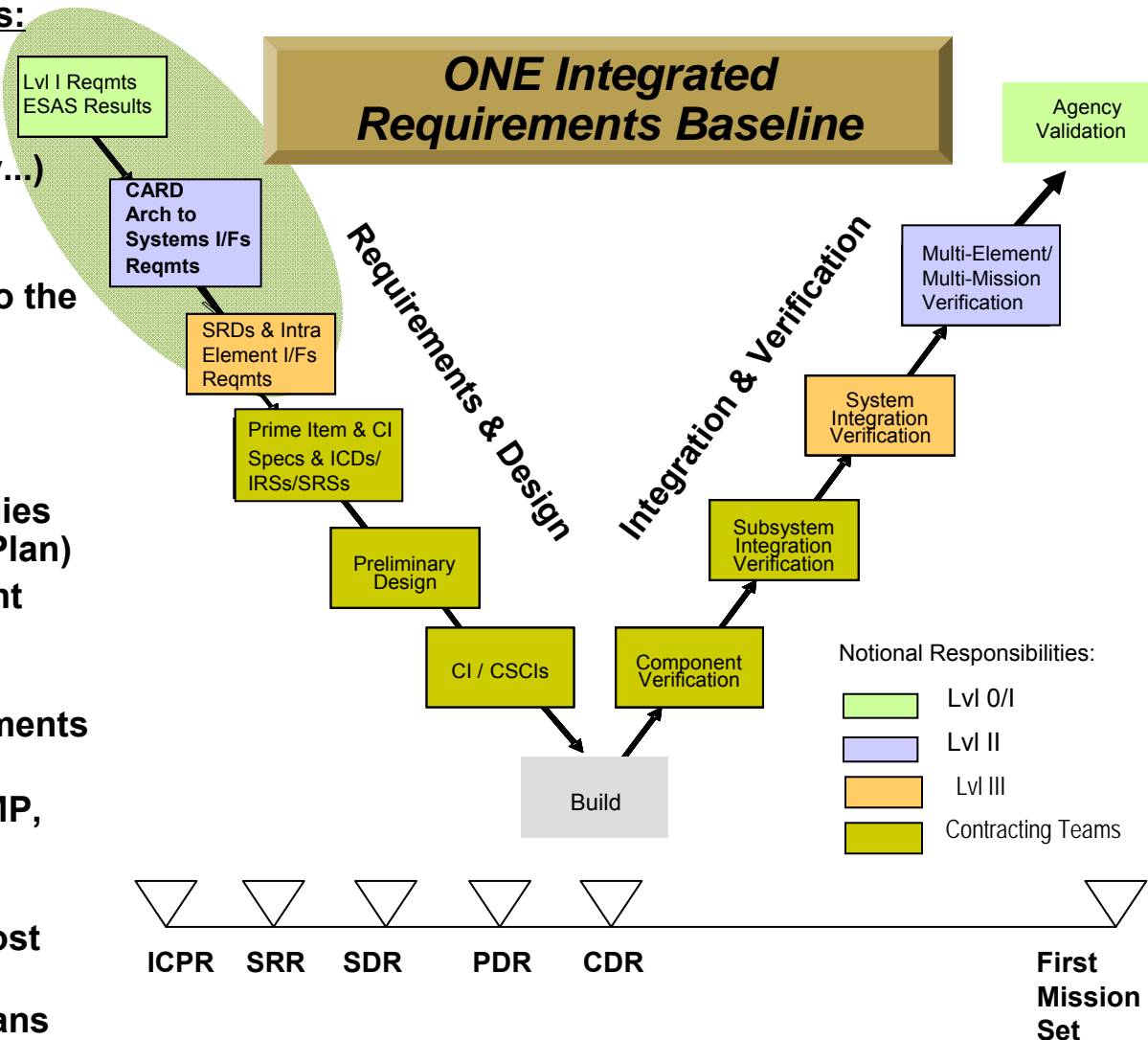


**Setting the
Right
Foundation**

This Year's Focus – Successful Series of SRRs

CxP 1st Season or SRRs Expectations:

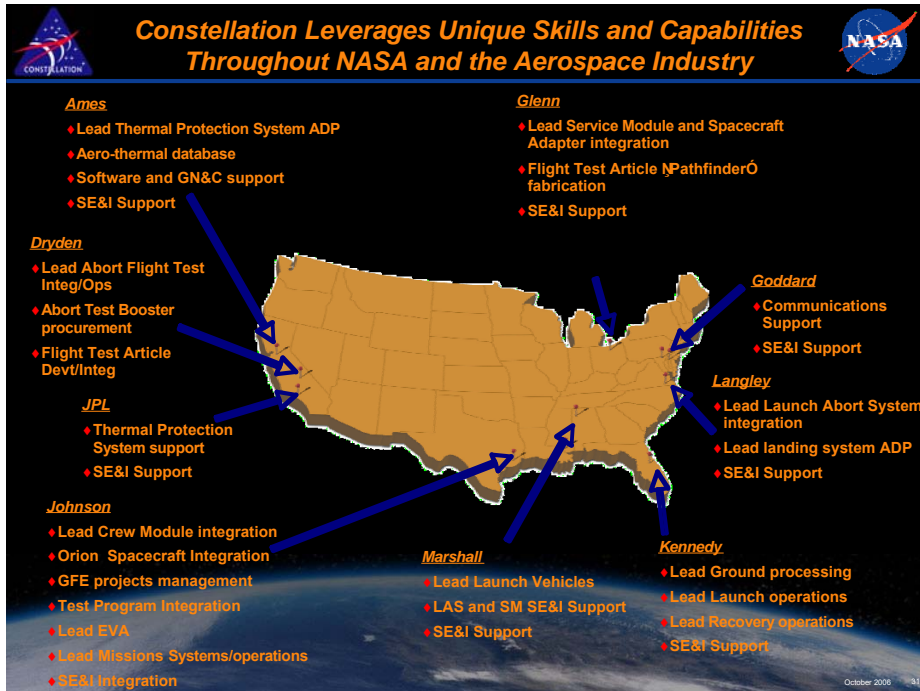
- ✓ Operational concepts baselined
- ✓ CARD and unique specs (HSIR, Power Quality, C3I Interoperability...) baselined
- ✓ CxP Functional and performance allocations to systems complete to the extent SRDs can be baselined at Project SRRs
- ✓ Intra- system interfaces described (IRDs, IDDs)
- ✓ Verification objectives and strategies documented (Master Verification Plan)
- ✓ Architecture Description Document (ADD) baselined
- ✓ Design concepts underway
- ✓ Progressive Performance assessments integrated and in sync
- ✓ Engineering plans published (SEMP, SDP, CMP, RMP,.....) and training invoked
- ✓ Technical Baseline Sync'd with Cost and Schedule Baselines
- ✓ Risks identified with mitigation plans



Addressing Verification Aggressively and Concurrently



Agency-wide Team Stood-up and Worked Together to Deliver the CxP SRR Product Line



NPR 7123.1 SRR Entrance Criteria

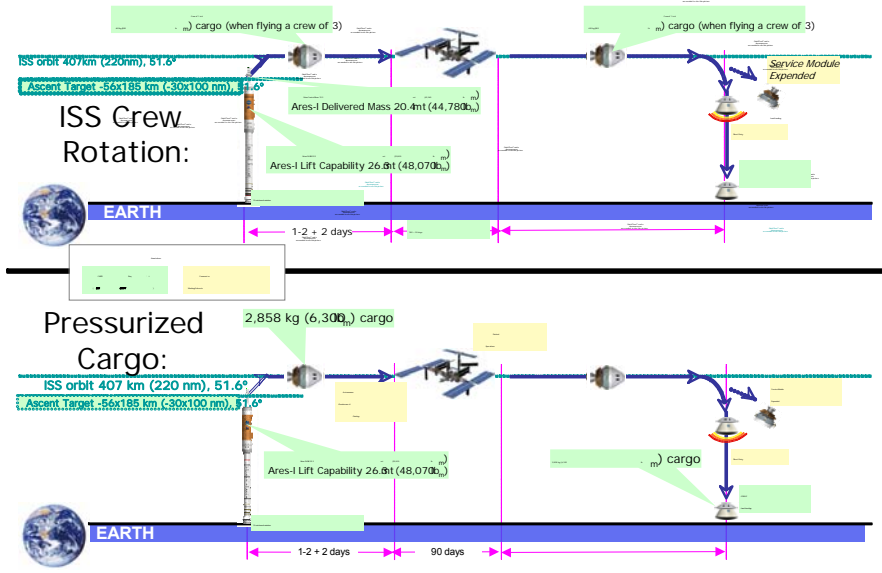


◆ The following technical products for hardware and software system elements are available to the cognizant participants prior to the review (blue text indicates Annex deliverable) :

- § System Architecture. **ADD, draft at SRR**
- § System requirements document. **CARD, IRDs, Standards**
- § System software functionality description. **SADD, draft at SRR**
- § Updated concept of operations. **Ops Con (baselined Prior)**
- § Updated mission requirements, if applicable. **DRMs (in Ops Con)**
- § Baselined SEMP. **Baselined SEMP**
- § Preliminary system requirements allocation to the next lower level system. **CARD 3.7 = SRD 3.2 §3.6, FAM**
- § Updated cost estimate. (**ID areas of Cost Risk Relative to POP and populate in ARM), Life Cycle Cost plan**
- § Technology Development Maturity Assessment Plan. **Tech. Insertion. Strat., Draft at SRR**
- § Preferred system solution definition including major trades and options. **DAC Results, RAD, draft at SRR**
- § Updated risk assessment and mitigations. **Top Risks I.D. @d in ARM and mitigation plans in place**
- § Updated schedule data (**Integrated Master Schedule**)
- § Logistics documentation (preliminary maintenance plan, etc.). **R&M Plan, Logistics supportability Plan draft at SRR**
- § Preliminary human rating plan, if applicable. **HRP, Vol 1, draft at SRR**
- § Software Development Plan (SDP). **SMPP, draft at SRR**
- § System safety and mission assurance plan. **SR&QA Plan (baselined prior)**
- § Configuration management plan. **MSR V1 (baselined prior)**
- § Project management plan. **PP (baselined prior)**
- § Initial document tree. **MSP A3 (baselined prior)**
- § Verification and validation approach. **MT&V, draft at SRR, Sect 4 of CARD initially populated**
- § Preliminary hazard analysis (PHA). **Draft PHA via IDAC2**
- § Other specialty disciplines as required (**targeted items from Program doc tree- see PP&C presentation**)

CxP SRR Annex § Defined all Deliverables & Maturities

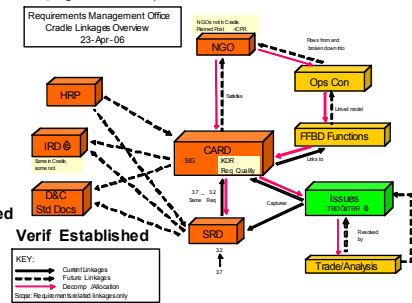
NGO, DRMs/Operational Concepts, Functional Analyses & Requirements Maturation Performed Across Summer and Fall



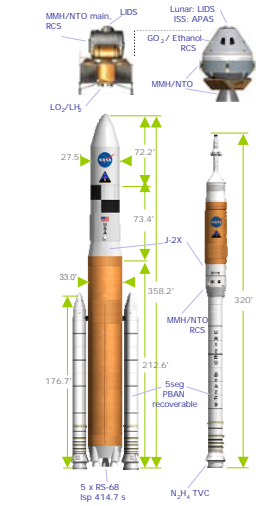
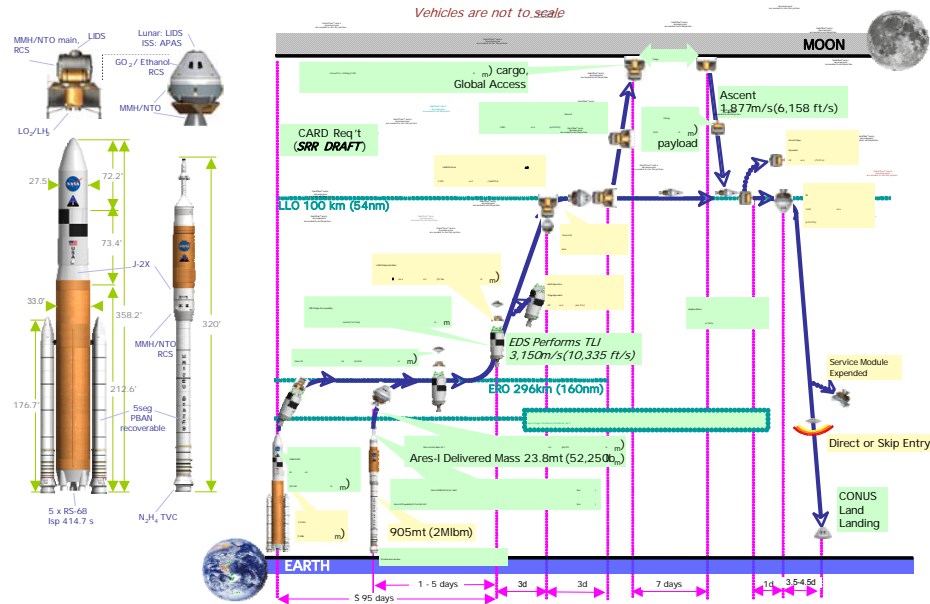
Requirements Enhancement Leading to SRR

Focused Maturation of the CARD/ Lvl 2 Standards/IRDS/SRDs for the SRR

- Gap Analyses/Resolution
 - § NGOs/ OpsCons/FFBDs to decomposition/trace to CARD 3.2 & 3.7
 - Horizontal Traceability with links in CRADLE § to FFBDs/Ops Cons
 - § CARD Top down checked against SRD bottoms up
 - CARD-to-SRD Allocation § 3.2 to 3.7 to SRD 3.2
 - § Vertical Traceability with LINKS in CRADLE § Right O& no orphans
 - Owners/Stakeholders O&D in CRADLE
 - Clarity § Concise & Measurable
 - Rationale/justification for Reqmt
 - Validation method ID O&
 - Verifiability/ Verif. Methods -Sect 4
 - TBD/TBR Planning O& Map to TDSs
 - TBD/TBR Non TDS O& burn-down plans
 - TBD/TBR real-time resolution
 - Prioritization § Tied to KDRs
 - IRDs/Applicable Standards & Reqmts Invoked
 - IRD to SRD Standardized Format/Approach &
 - Initiate Achievability Assess.
 - Prep for Just -In-Time IDAC2
- Trade results/recommendations



2



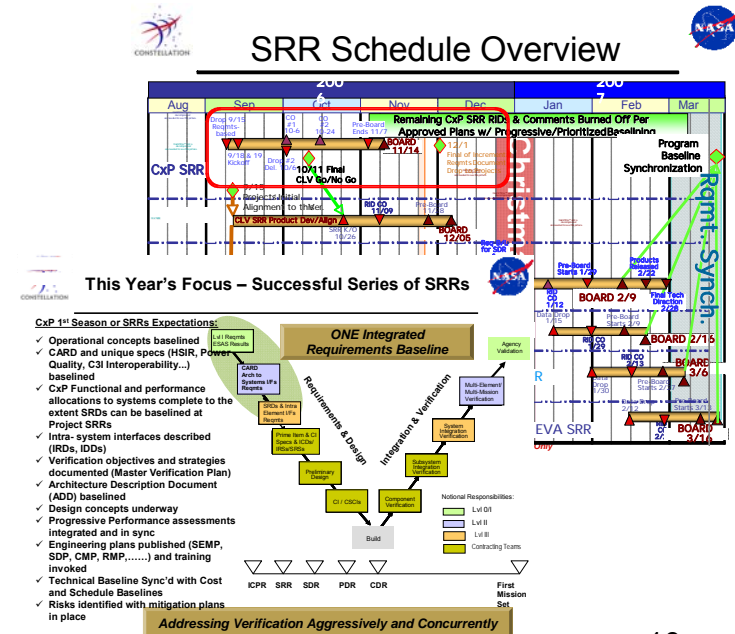
Key Level II SE&I Tenets

- Recognize people are our key resource
- Service the needs of our customers
 - Projects, HQs & CxP Offices
- Build a high performance, virtually distributed, nationwide team that strives for seamless operations and overcomes cultural obstacles
 - Leverage the best of the Agency and value the governance model
- Address architecture – ground and flight systems – as one complex inter-dependent system
- Focus on reliability, maintainability, interoperability, interchangeability, supportability and extensibility to enhance safety and long-term operability/affordability
- Architect/integrate engineering tools, processes, models and data systems always looking/building towards the future
- Set the right foundation for the future Human Space Exploration then focus on timely execution

From LEO to the Moon - the First Step to Mars and Beyond

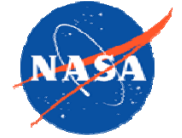
- Servicing & Learning from ISS
- Regaining and extending operational experience in a hostile planetary environment
- Developing capabilities needed for opening the space frontier
- Preparing for human exploration of Mars
- Science operations and discovery

The Next Step in Fulfilling Our Destiny As Explorers



The Path To CxP SRR Board



- Jan ERTT Product Line
 - Rapid Requirements Development to Facilitate Procurement Strategies
- Mar- May ICPR Product Line
 - Level-setting Program on a Plan Forward
- May –October Integrated Design Analysis Cycle (IDAC)
 - 170+ Analyses across Level I-III
- June F2F Efforts
 - Focused SIG-centric Requirements Maturation
- July Virtual Mode of Ops
 - Continued Maturation of Requirements for all characteristics of good requirements
- August Table Tops
 - Full Stakeholder Reviews - Project Focused
- September/October Agency-wide Product-line review & RID/Comment Submittal
 - 92 Engineering/Program Artifacts
 - 1898 RID initiators
- October/November Disciplined Review Panels with Stakeholders to Disposition
 - 5138 RIDs and 3367 Comments
- November Pre-Boards
 - Summaries, Issues & Reclamas

Building a Requirements/Process/Strategy Foundation while Building a Team

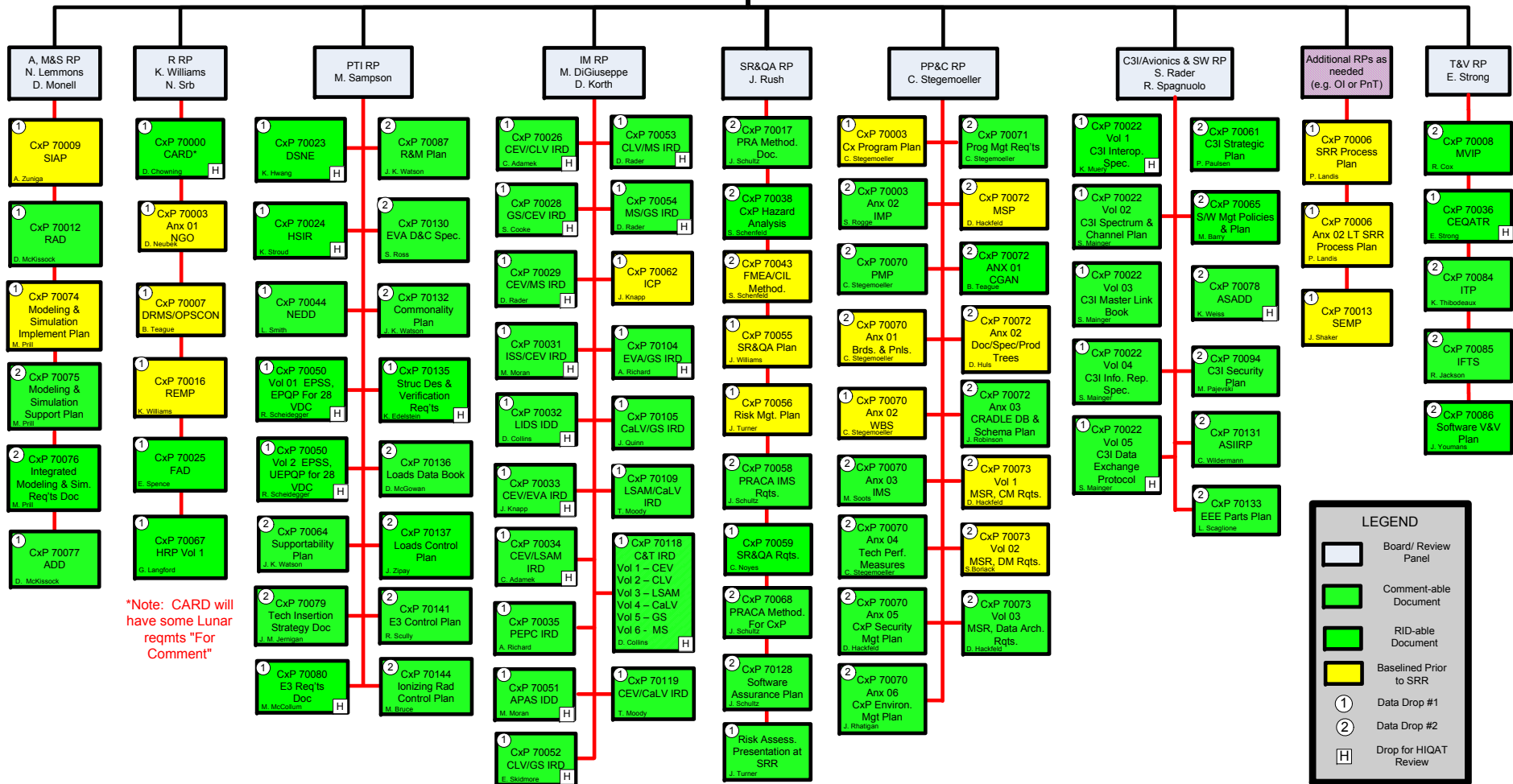
Purpose of CXP SRR

- **The Purpose of the SRR(s) is to ensure that :**
 - **CxP Program Level I and II requirements are understood and technically mature to provide an architecture that will meet the mission needs, goals and objectives within the constraints of Budget/Cost/Schedule/law etc...**
 - Requirements-based products have been prioritized book-to-book and cover-to-cover for requirements RIDable for this Season of SRRs
 - **Program-level key processes, strategies and plans are documented to manage the development of the architecture**
 - These products have also been prioritized for future baselining
 - **Operations concepts and Program requirements have been analyzed, allocated, and flowed down to support development of Level III product requirements**
 - Focused on Aligning Level III and II and Meeting Level III Needs
 - **Major risks to the Program are re-addressed and mitigation strategies discussed**

Per 7123.1 The SRR examines the functional and performance requirements defined for the architecture and the preliminary program or project plan and ensures that the requirements and the selected concept will satisfy the mission.

Level II SRR Products

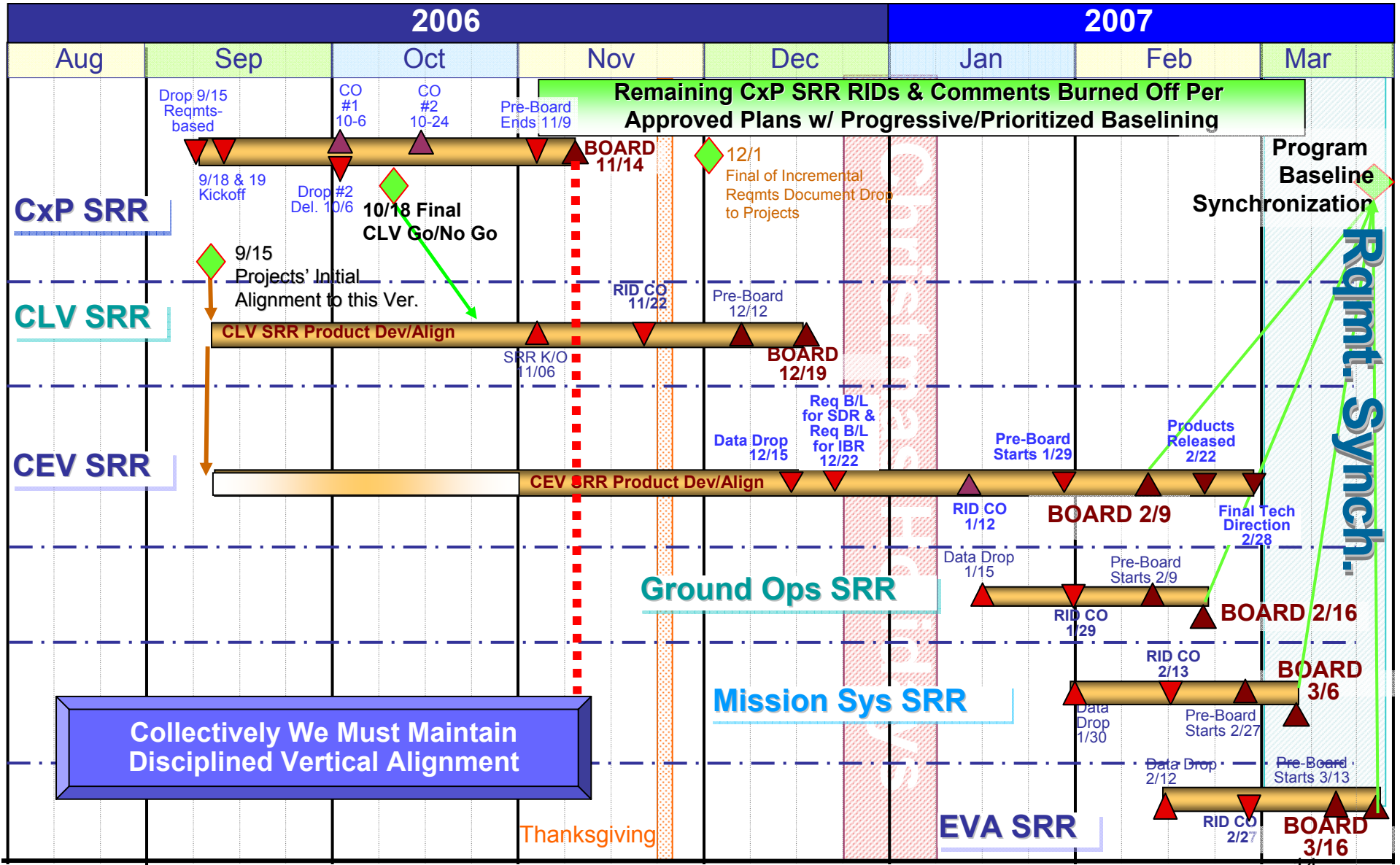
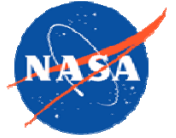
SRR Review Panels & Products



92 Products and Associated RIDs/Comments Assigned to 8 Review Panels



SRR Schedule Overview - Updated 10/30





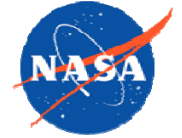
SRR Execution Team Background



- A RID process and tool were implemented for Initial Constellation Program Review (ICPR) that buckled under the onslaught of a large number of users and RIDs
- Key program review stakeholders identified the need to prevent similar problems from occurring for upcoming SRRs
 - ICPR users and stakeholders were contacted and ICPR lessons learned were captured along with recommendations for future reviews
- Requirements document was written to capture RID process overview description and detailed RID process tool requirements
- Trade study was performed to assess Off-The-Shelf (OTS) RID Tools and government OTS tools vs. requirements



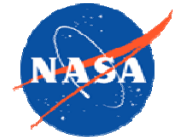
SRR Execution Team Background (cont')



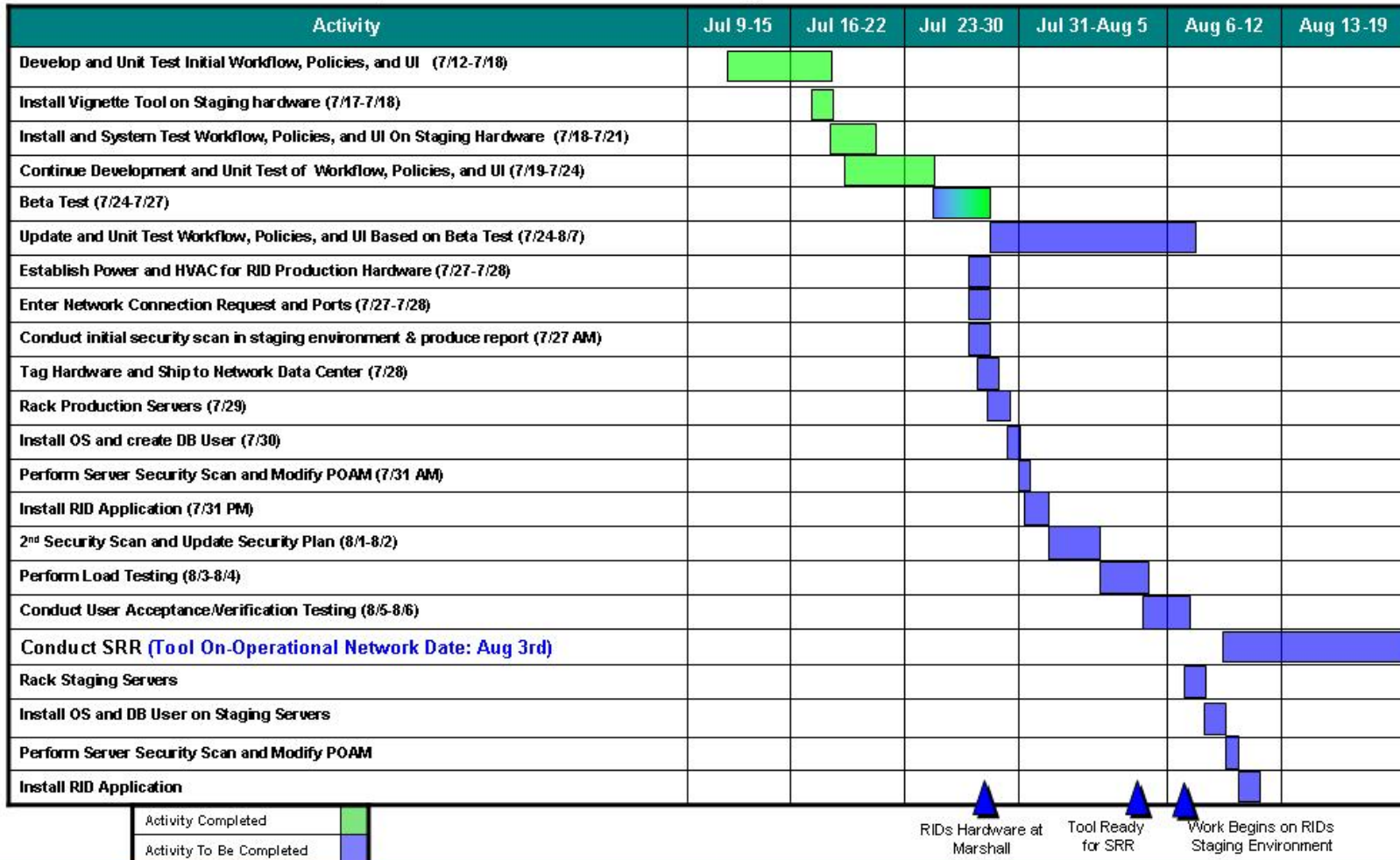
- The team was tasked to produce a working process in ~60 days
- Key team members included:
 - NASA Constellation Program
 - NASA Integrated Collaborative Environment (ICE) Program
 - Booz Allen Hamilton
 - Vignette
 - Wyle Laboratories
 - And many others
- The result was Constellation and Community Electronic RID Tool (ConCERT)

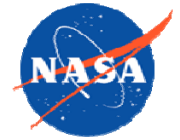


Hardware Installation, Get Ahead Plan (in work)

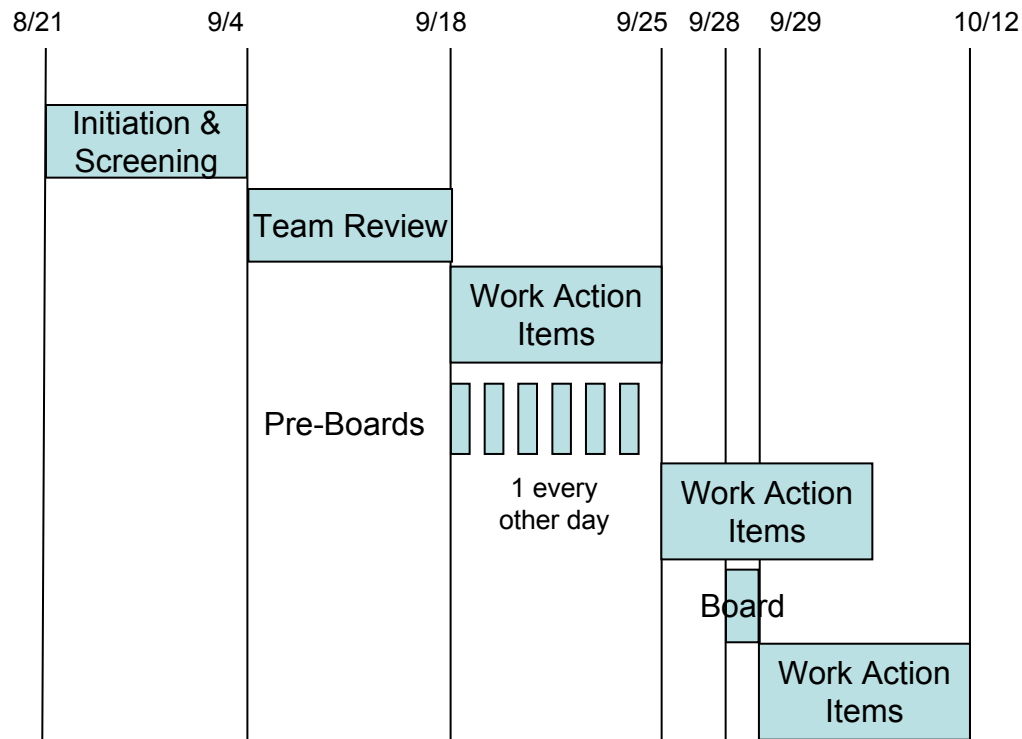
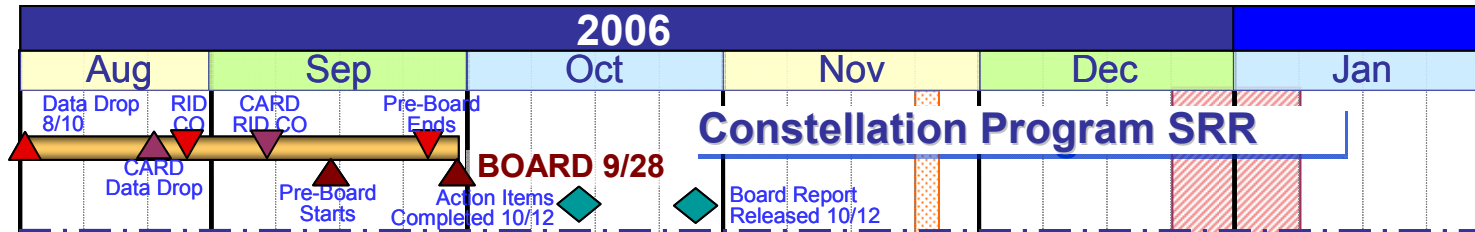


NASA RIDs Implementation Project Plan

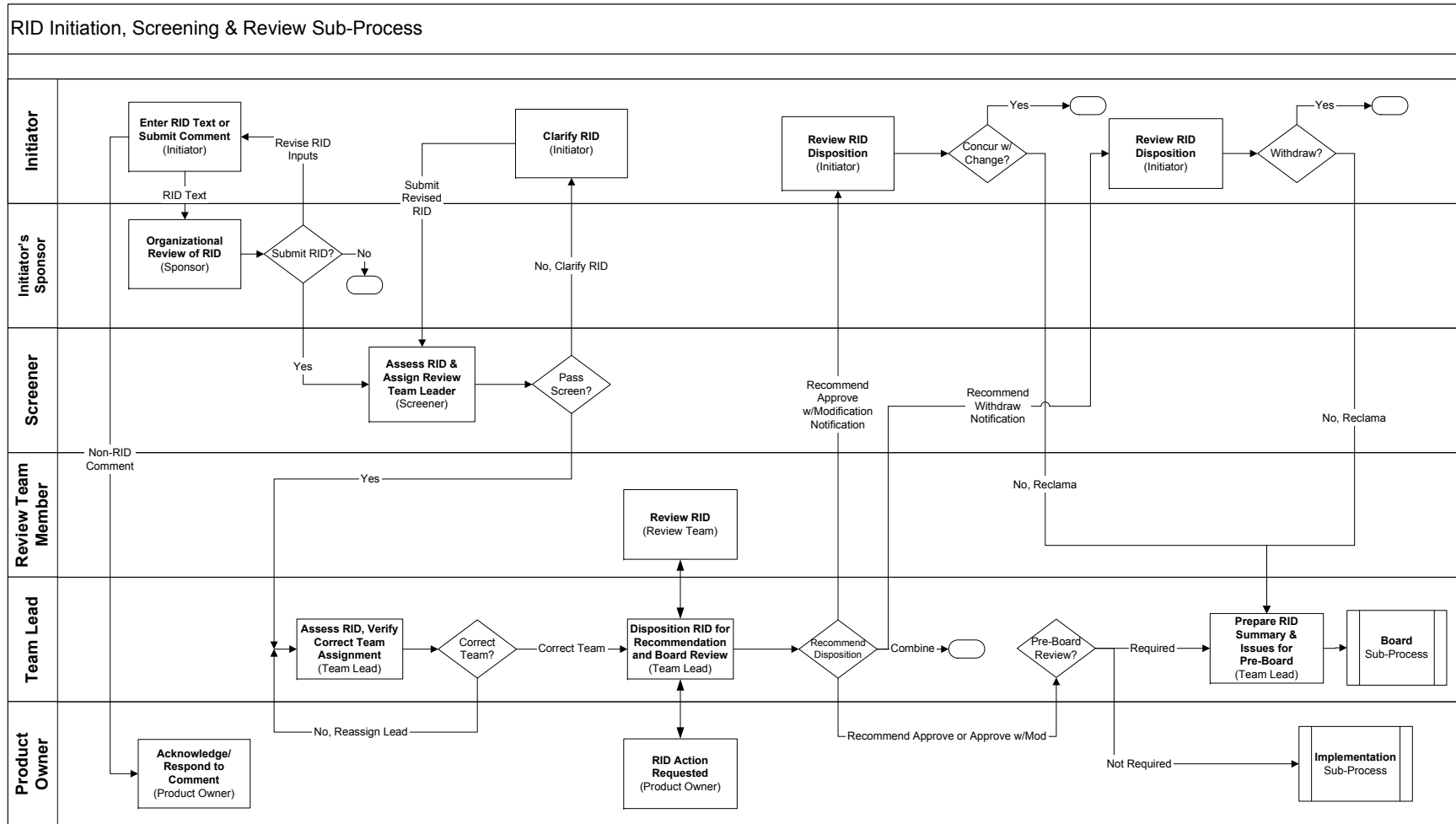




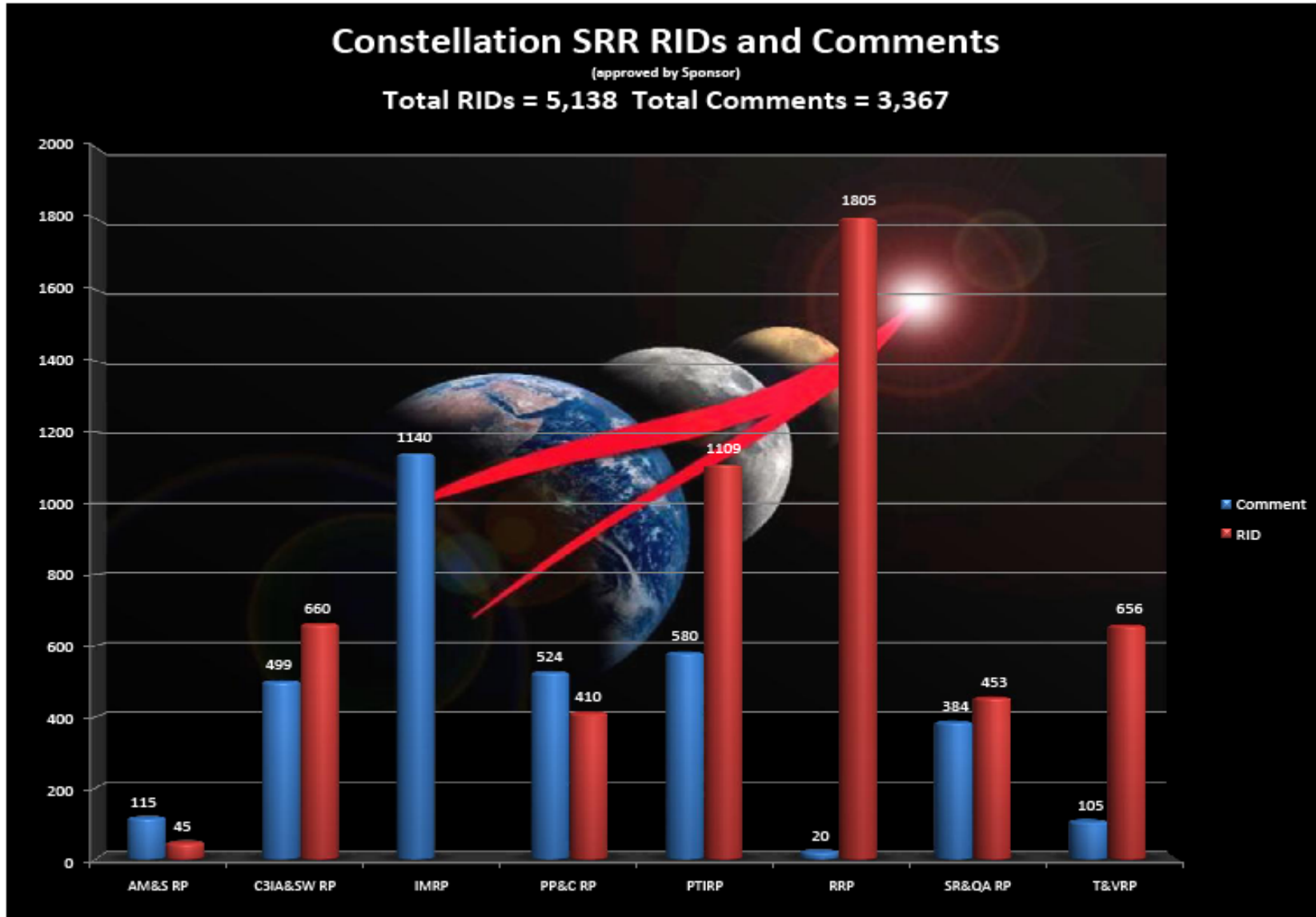
RID Process Timeline for SRR



RID Process Flow example



Overall SRR Metrics



Sal Bonaccorso 11/10/2006



Review Panels SRR risk input

1. Risk whose source are RIDs brought to SRR pre-board discussion
2. Panels reviewed current CxP risk profile and suggested risks that should be captured and tracked or changes made to current risk mitigations based on insight after SRR. These could be non RID-related (current program risk detail to be posted as reference to Windchill “CxPO SRR Board document”)

Focus was on significant risk to Program that we should consider start tracking post SRR per Program Risk Process/Tools



C3I Panel Candidate Risk

C3I panel RIDs/Comments by Initiators LxC assessment (All docs, Drop 1&2)

L 5	9	7	25	25	53
L 4	4	38	46	44	5
L 3	3	21	318	17	4
L 2	6	80	14	6	1
L 1	42	3	13	3	2
	CONSEQUENCE				
	1	2	3	4	5

RIDs (SAIR) : 12182, 9242, 11701, 12489

RIDs (C3I) for Disp: 8388
RIDs (C3I) for Info: 4988, 5099

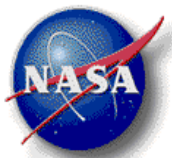
RIDs/Comments to pre-board by panel LxC assessment

L 5					
L 4		1	1	2	
L 3			3		
L 2					
L 1					
	CONSEQUENCE				
	1	2	3	4	5

Candidate Risk out of RIDs/Comments to pre-board

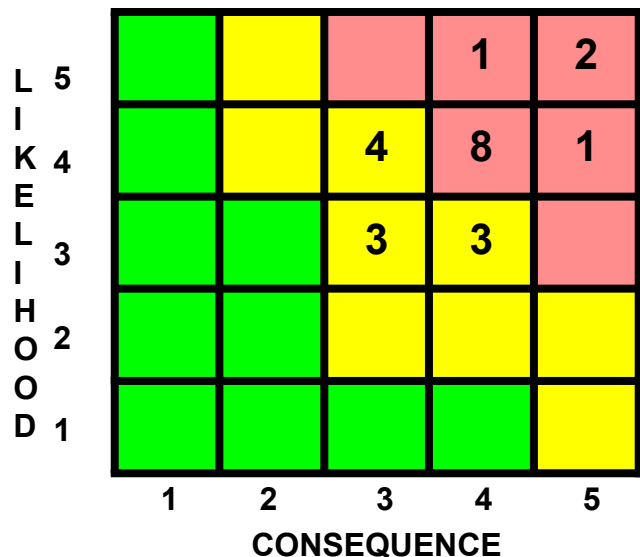
Proposed Owning Team	Risk Statement: Given CONDITIONS, there is a possibility that CONSEQUENCES could occur		Context Supporting info (can use RID info)	Likelihood	Consequence			
	Condition (Given that...)	Consequence (There is the possibility that...)			S A F E	P E R F	S C H E D	C O S T
C3I	C3I spec is scoped to apply to all Cx systems rather than just interfaces	Wording will result in non compliance with the spec for non Cx specific interfaces and supporting systems such as weather systems and Cheyenne mountain interfaces	RID 8388	4		2		3

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Top Risk List

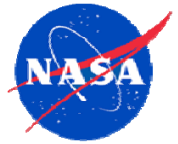
Friday, November 10, 2006



	Owning Team	L i k e	Consequence			
			S A F	P E R F	S C H E D	C O S T
<ul style="list-style-type: none"> ▲ - Top Directorate Risk (TDR) △ - Proposed Top Directorate Risk (P-TDR) ■ - Top Program Risk (TPR) 						
△ 1102 - Inability to Close the Human Launch Gap from Shuttle retirement in 2010	PP&C	5	0	0	5	5
△ 1413 - Development of a Program-Wide Earned Value Management System (EVMS)	PP&C	4	0	0	4	0
■ 1432 - Development of a Program-wide Integrated Master Schedule (IMS)	PP&C	4	0	4	4	4
△ 1407 - Tool Impacts from Lack of Program Data Architecture	PP&C_MSO	3	0	4	0	0
■ 1401 - First Crewed Lunar Return without adequate ground or flight test qualification plan	ORION_TPS_ADP	5	4	0	5	4
△ 1236 - LAS Development	ORION_LAS	4	2	4	4	4
■ 1119 - CEV Control Mass	ORION_INT_VEH_PERF_ANSYS	4	1	3	3	4
△ 1239 - Flight Termination System (FTS) RF Command Format	ARES I 1ST STAGE	4	0	0	5	5
■ 1118 - Ability for CLV to Meet Performance Requirements	ARES_I_VE H_INT	5	0	4	0	3
■ 1128 - J2X Development Schedule	ARES UP STAGE ENG	4	0	0	4	0



Delivery Commitments to Projects



Doc Number	Doc Title	CxP Priority	CLV Priority	CEV Priority	Release ASAP	Autor's Commitment Date to Deliver to DCA	need baselined by PBS (April)	Need to baseline before SDR	Need to review and update via SDR
OPERATIONAL CONCEPTS									
CxP 70007	Constellation Design Reference Missions (DRMs) and Operational Concepts Document	Release	Released	Released	Only 12 comments r/o v's so in the baseline version today				
SPECIFICATIONS									
CxP 70000	Constellation Architecture Requirements Document (CARD)	Release	Dp1	1	1	Baseline	D. Chowning- Nov. 20th Confidence- Medium		
CxP 70022 Vol 1	Constellation Command, Control, Communication, and Information (C3I) Interoperability Standards Book, Volume 1: Interoperability Specification	Release	Dp1	1	1	Baseline	K. Murray Nov. 27th (DR) Confidence- Medium		
CxP 70022 Vol 2	Constellation Command, Control, Communication, and Information (C3I) Interoperability Standards Book, Volume 2: Constellation Spectrum and Channel Plan	Commentable	Dp1	4	3	1	DRAFT with as many of comments as reasonably can be incorp.	C. Duracka Dec. 5th (draft) Confidence- Medium	
CxP 70022 Vol 3	Constellation Command, Control, Communication, and Information (C3I) Interoperability Standards Book, Volume 3: Constellation Master Link Book	Commentable	Dp1	4	4	1	DRAFT with as many of comments as reasonably can be incorp.	C. Duracka Dec. 5th (draft) Confidence- Medium	
CxP 70022 Vol 4	Constellation Command, Control, Communication, and Information (C3I) Interoperability Standards Book, Volume 4: Information Representation Specification	Commentable	Dp1	4	4	1	DRAFT with as many of comments as reasonably can be incorp.	C. Duracka Dec. 5th (draft) Confidence- Low	
CxP 70024	Constellation Human-Systems Integration Requirements (HSIR)	Release	Dp1	1	1	Baseline	K. Stroud- Nov. 20th Confidence- High		
CxP 70022 Vol 5	Constellation Command, Control, Communication, and Information (C3I) Interoperability Standards Book, Volume 5: Data Exchange Protocol Specification	Commentable	Dp1	4	4	1	DRAFT with as many of comments as reasonably can be incorp.	C. Duracka Dec. 5th (draft) Confidence- High	
CxP 70050 Vol1	Electrical Power System Specification, Volume 1: Electrical Power Quality Performance for 28 VDC	Release	Dp1	1	1	1	Baseline	R. Schenley Nov. 27th (DR) Confidence- Low	
CxP 70050 Vol2	Electrical Power System Specification, Volume 2: User Electrical Power Quality Performance for 28 VDC	Release	Dp1	1	1	1	Baseline	R. Schenley Nov. 27th (DR) Confidence- Low	
CxP 70023	Constellation Program Design Specification for Natural Environments (DSNE)	Release	Dp1	1	1	1	Baseline	K. Heang Nov. 27th (DR) Confidence- Low	
CxP 70044	Constellation Program Natural Environment Definition for Design (NEDD)	Commentable	Dp1	2	2	1	Baseline	L. Smith Nov. 20th (Draft) Confidence- High	
CxP 70080	Electromagnetic Compatibility (EMC) Standard (E3 Reqs)	Release	Dp1	2	1	1	Baseline	M. McCully Nov. 28th (DR) Confidence- Medium	
CxP 70135	Structural Design and Verification Requirements	Release	Dp1	1	1	1	Baseline	Karen Elekta Nov. 27th (DR) Confidence- High	
CxP 70130	Extravehicular Activity (EVA) Design and Construction Specification	Commentable	Dp2	1	1	1	Baseline	Scott Rose Nov. 5th Confidant Medium	
CxP 70036	Constellation Environmental Qualification and Acceptance Testing Requirements (CEQATR) Document	Release	Dp1	1	1	1	Baseline	Ed Strang Nov. 30th Confidant Medium	
CxP 70076	Integrated Modeling and Simulation (IMS) Requirements	Release	Dp2	3	3	2	Baseline	Nancy Walsh Nov. 22nd Confidence- High	
CxP 70118	Constellation Systems to Communication and Tracking (CAT) Networks Interface Requirements Document (IRD)	Commentable	Dp1	3	1	1	Baseline		
CxP 7018a	CxP 70118 - VOL2 Constellation Sys to Comm & Tracking (CAT) Networks Interface Reqs Doc (IRD)	Commentable	Dp1	3	1	1	DRAFT with as many of comments as reasonably can be incorp.		
CxP 70118b	CxP 70118 - VOL3 Constellation Sys to Comm & Tracking (CAT) Networks Interface Reqs Doc (IRD)	Commentable	Dp1	3	1	1	DRAFT with as many of comments as reasonably can be incorp.		
CxP 70118c	CxP 70118 - VOL4 Constellation Sys to Comm & Tracking (CAT) Networks Interface Reqs Doc (IRD)	Commentable	Dp1	3	1	1	DRAFT with as many of comments as reasonably can be incorp.		
CxP 70118d	CxP 70118 - VOL5 Constellation Sys to Comm & Tracking (CAT) Networks Interface Reqs Doc (IRD)	Commentable	Dp1	3	1	1	DRAFT with as many of comments as reasonably can be incorp.		
CxP 70118e	CxP 70118 - VOL6 Constellation Sys to Comm & Tracking (CAT) Networks Interface Reqs Doc (IRD)	Commentable	Dp1	3	1	1	DRAFT with as many of comments as reasonably can be incorp.		
CxP 70119	Crew Exploration Vehicle (CEV) to Cargo Launch Vehicle (CLV) Interface Requirement Document (IRD)	Commentable	Dp1	4	1	1	DRAFT with as many of comments as reasonably can be incorp.		
Key Plans									
CxP 70061	Constellation Command, Control, Communication, and Information (C3I) Strategic Plan	Release	Dp2	1	1	1	Baseline	Philip Paulsen Nov. 20th (DR) Confidence- Medium	Update
CxP 70070-ANX05a	C3I Security Plan CxP 70004	Commentable	Dp2	1	1	1	DRAFT with as many of comments as reasonably can be incorp.	D. Hackfeld Dec. 5th Confidence- Medium	Baseline
CxP 70133	Constellation Electrical, Electronic, and Electromechanical (EEE) Plans Plan	Commentable	Dp2	3	3	2	Baseline	Scaglione Dec. 5th (Draft) Confidence- Medium	
CxP 70072-ANX01	Management Systems Plan, Annex 1: Constellation Glossary, Acronyms and Nomenclature (CGAN)	Release	Dp2	4	4	3	Baseline	Barbara Taggart Dec. 4th (DR) Confidence- High	Update
CxP 70008	Master Integration and Verification Plan (MIVP)	Release	Dp2	1	1	1	Baseline	Renae Cox TBD	Update
CxP 70086	Software Verification and Validation Plan	Release	Dp2	1	1	1	Baseline	Jonella Youmans Nov. 28th (DR) TBD	Update
CxP 70136	Constellation Loads Data Book	Commentable	Dp2	1	1	1	DRAFT with as many of comments as reasonably can be incorp.	J. Zipay Dec. 5th (Draft) Confidence- High	Update
CxP 70137	Loads Control Plan	Release	Dp2	1	1	1	DRAFT with as many of comments as reasonably can be incorp.	J. Zipay Dec. 5th (Draft) Confidence- High	

All Projects' Product needs have been prioritized through coordination going into Season of SRRs

33 Products required to be processed between 11/22 and 12/5 for Formal Baselining or "Draft" Baselining to support CEV with on-going reconciliation efforts

Release, Baseline, Update plan for every CxP SRR product between now and CxP SDR can be found in Backup

◆ What is PBS

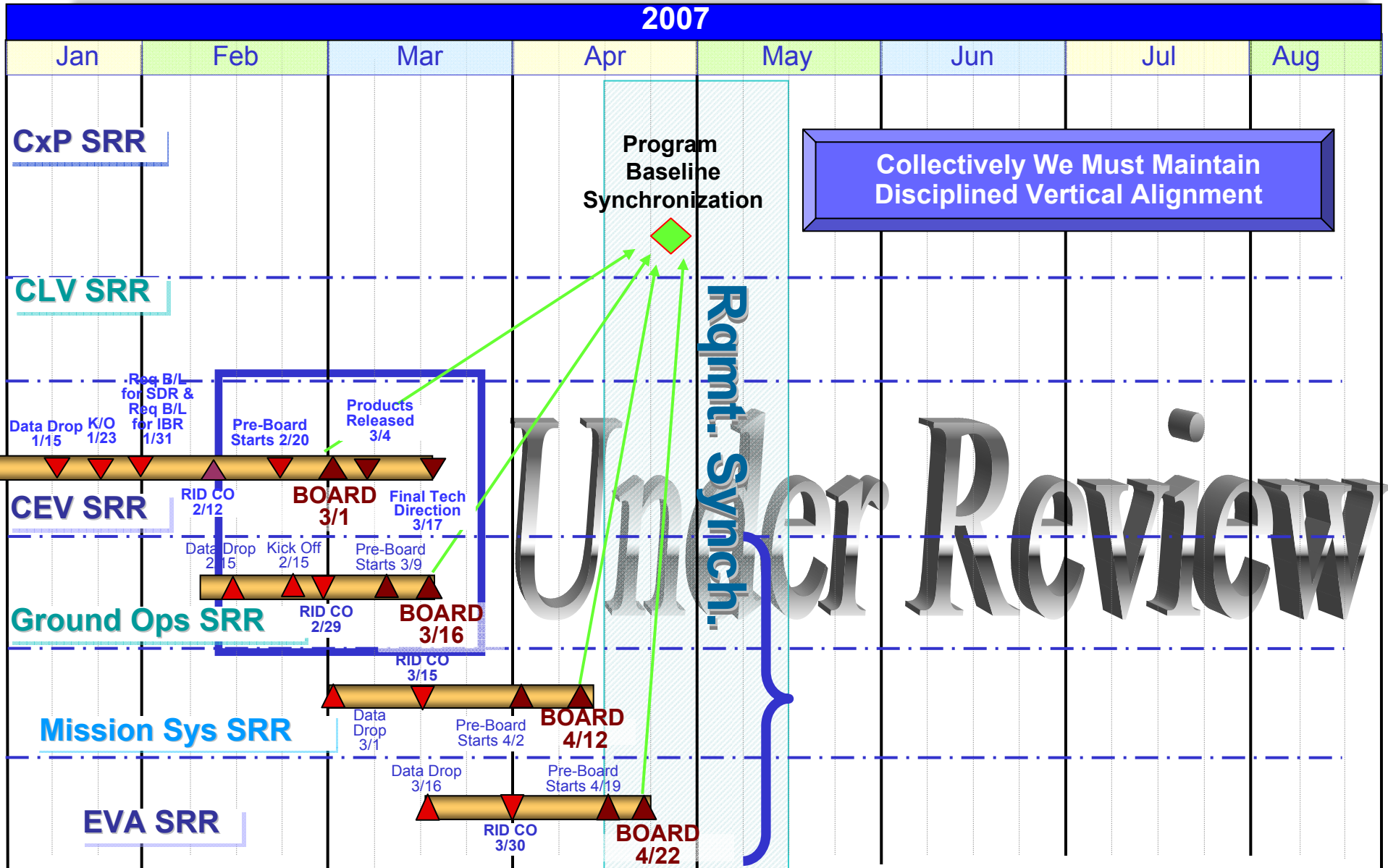
- Opportunity to re-sync the program after the LII SRR and all individual LIII SRRs
 - Recognizing we will all be working very hard all along the path to stay sync'd
- Evaluate where the Program is in terms of satisfying/addressing all actions and baselining plans coming out of CxP SRR
- Incremental planned update of CARD
- PBS assists with closed technical cost and schedule solution for Pre-NAR and validating the glide path to SDR's



CONSTITUTION



SRR Schedule Overview w/ Potential CEV changes





We Intentionally Strived to Exceed Standards Here Because We Believed It Was the Right Thing To Do



NPR 7123.1 Criteria (Written for a Project)



- The resulting overall concept is reasonable, feasible, complete, responsive to the mission requirements, and is consistent with system requirements and available resources (cost, schedule, mass power, etc.).
- The project utilizes a sound process for the allocation and control of requirements throughout all levels, and a plan has been defined to complete the definition activity within schedule constraints.
- Requirements definition is complete with respect to top level mission and science requirements, and interfaces with external entities and between major internal elements have been defined.
- Requirements allocation and flow down of key driving requirements have been defined down to subsystems.
- System and subsystem design approaches and operational concepts exist and are consistent with the requirements set.
- The requirements, design approaches, and conceptual design will fulfill the mission needs within the estimated costs.
- Preliminary approaches have been determined for how requirements will be verified and validated down to the subsystem level
- Major risks have been identified, and viable mitigation strategies have been defined.

Per 7123.1 The SRR examines the functional and performance requirements defined for the system and the preliminary program or project plan and ensures that the requirements and the selected concept will satisfy the mission.

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NPR 7123.1 SRR Entrance Criteria



◆ The following technical products for hardware and software system elements are available to the cognizant participants prior to the review (blue text indicates Annex deliverable):

- § System Architecture. **ADD, draft at SRR**
- § System requirements document. **CARD, IRDs, Standards**
- § System software functionality description. **SADD, draft at SRR**
- § Updated concept of operations. **Ops Con (baselined Prior)**
- § Updated mission requirements, if applicable. **DRMs (in Ops Con)**
- § Baselined SEMP. **Baselined SEMP**
- § Preliminary system requirements allocation to the next lower level system. **CARD 3.7 = SRD 3.2 § 3.6, FAM**
- § Updated cost estimate. (ID areas of Cost Risk Relative to POP and populate in ARM), **Life Cycle Cost plan**
- § Technology Development Maturity Assessment Plan. **Tech. Insertion. Strat., Draft at SRR**
- § Preferred system solution definition including major trades and options. **DAC Results, RAD, draft at SRR**
- Updated risk assessment and mitigations. **Top Risks I.D. @d in ARM and mitigation plans in place**
- § Updated schedule data (**Integrated Master Schedule**)
- § Logistics documentation (preliminary maintenance plan, etc.). **R&M Plan, Logistics supportability Plan draft at SRR**
- § Preliminary human rating plan, if applicable. **HRP, Vol I, draft at SRR**
- § Software Development Plan (SDP). **SMPP, draft at SRR**
- § System safety and mission assurance plan. **SR&QA Plan (baselined prior)**
- § Configuration management plan. **MSR V1 (baselined prior)**
- § Project management plan. **PP (baselined prior)**
- § Initial document tree. **MSP A3 (baselined prior)**
- § Verification and validation approach. **MT&V, draft at SRR, Sect 4 of CARD initially populated**
- § Preliminary hazard analysis (PHA). **Draft PHA via IDAC2**
- § Other specialty disciplines as required (targeted items from Program doc tree- see PP&C presentation)

CxP SRR Annex § Defining all Deliverables & Maturities to CxCB 5/24/06

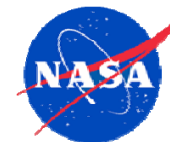
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- **CxP is a Complex Agency-wide Effort with NASA Leading the Systems Engineering and Integration Across Architecture, Systems, Elements Matured by Multiple Projects and at Varying Rates of Time**
 - **We consciously therefore set the bar for this CxP SRR very high**
 - **Exceeding the call-outs by 7123**
 - **Posturing us for not just SRR for putting us on the necessary glide path towards SDR**
 - **Focusing on Processes, Time-Phase Strategies & Plans that we will need to converge on heading to PBS to manage this complex virtual endeavor**

We have Postured Ourselves for Success Beyond SRR



CxP SRR Has Focused Us Collectively on the Right Things Going Forward



- ◆ Tremendous progress to date
- ◆ Much work to go
 - Must stay In sync with Specs
 - PBS will be Our next major Checkpoint
- ◆ People are our Key Resource



Purpose of CXP SRR



- The Purpose of the SRR(s) is to ensure that :
 - CxP Program Level I and II requirements are understood and technically mature to provide an architecture that will meet the mission needs, goals and objectives within the constraints of Budget/Cost/Schedule/Law etc...
 - Requirements-based products have been prioritized book-to-book and cover-to-cover for requirements RIDable for this Season of SRRs
 - Program-level key processes, strategies and plans are documented to manage the development of the architecture
 - These products have also been prioritized for future baselining
 - Operations concepts and Program requirements have been analyzed, allocated, and flowed down to support development of Level III product requirements
 - Focused on Aligning Level III and II and Meeting Level III Needs
 - Major risks to the Program are re-addressed and mitigation strategies discussed

Per 7123.1 The SRR examines the functional and performance requirements defined for the architecture and the preliminary program or project plan and ensures that the requirements and the selected concept will satisfy the mission.

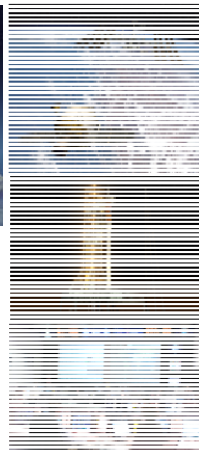
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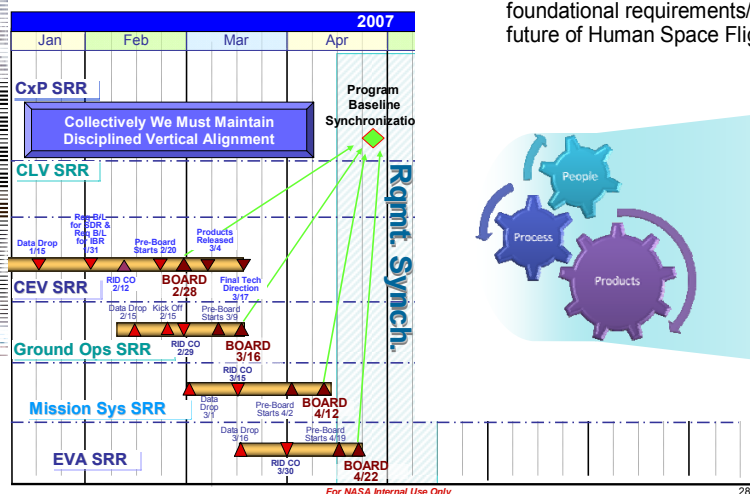
Systems Engineering Near-Term Focus with Long-Term Objectives in Mind



- The scope of this initial CxP SRR and "First Season of SRRs" covers the architecture and engineering artifacts associated with:
 - Transportation to and from low earth orbit
 - Transportation to and from the lunar orbit as it relates to "driving early designs" of CEV/CLV/GO/MO/EVA
- Also Refining Integrated Plan to leverage off of LAT and Lander Studies for performing Systems Engineering in Disciplined Manner in preparations of next Season of SRRs



SRR Schedule Overview w/



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SRR Summary

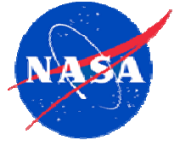


- Program and Agency appreciates your focused participation in the reviews/efforts that has led us to establishing our foundational requirements/programmatic product line for the future of Human Space Flight





Factors of Success



- ◆ **High performance teams are a product of several items:**
 - a) Environment
 - b) Need
 - c) Culture
 - d) Motivation
 - This team met these criteria
- ◆ **The SRR Execution Team (SET) established twice weekly nationwide telecons that overcommunicated status and allowed timely issue identification and resolution**
- ◆ **Constellation Program management empowered the SET**
- ◆ **SET attitude was “whatever it takes”**
 - Whoever it takes, whatever needs done, Get ‘er done
- ◆ **The team understood the importance of their role and strove to succeed, not individually, but as a team**
- ◆ **No options were discounted, team was encouraged to think outside of the box**



Summary



- ◆ **The Constellation Program recognized the SET efforts**
 - NASA Group Achievement Award
 - Nominated for the Rotary Club Stellar Achievement Award
- ◆ **ConCERT has been established as the program wide tool for program and project reviews**
- ◆ **Constellation Program System Engineering and Integration office enacted a knowledge capture effort post SRR that documented the process of conducting future reviews in the same outstanding manner**
- ◆ **High performance teams are a product of several items:**
 - a) Environment
 - b) Need
 - c) Culture
 - d) Motivation
 - e) etc
 - This team met these criteria

“WE LEAVE AS WE CAME, AND GOD WILLING, AS WE SHALL RETURN,
WITH PEACE AND HOPE FOR ALL MANKIND”

EUGENE CERNAN,
COMMANDER OF THE LAST APOLLO MISSION

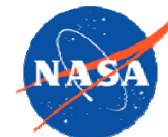




Back-Up



Board Member Discussions

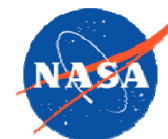


<u>Role</u>	<u>Board Members</u>	<u>Title</u>
Chair	Jeff Hanley	Constellation Program Manager
Member	Ed Stanton	ESMD Constellation Program Executive
Secretary	Deana Hackfeld	Secretary
Member	Mark Geyer	Deputy Constellation Program Manager
Member	Marsha Ivins	Astronaut Office
Member	Barry Waddell	Cx Program Planning & Control
Member	Bill Arceneaux	Cx Test & Verification
Member	Bob Castle	Cx Operations Integration
Member	Lauri Hansen	Cx Safety, Reliability and Quality Assurance
Member	Carlos Noriega	Cx Advanced Projects Office
Member	Chris Hardcastle	Cx System Engineering & Integration
Member	Skip Hatfield	Orion Project Office
Member	Steve Cook	Ares Project Office
Member	Dennis Webb	Missions Systems Project
Member	Jeff Davis	JSC Chief Medical Officer
Member	Tip Talone	Ground Systems Project/Associate Program Manager (KSC)
Member	Todd May	Associate Program Manager (MSFC)
Member	Wayne Hale	Space Shuttle Program
Member	Mike Suffredini	International Space Station Program
Member	Steve Labbe	Cx Program Chief Engineer
Member	Jeff Davis	Manager Extravehicular Activity (EVA) Project
Member	Jeff Bye	Office of Safety and Mission Assurance, Lead Engineer
Member	Geoff Yoder	ESMD



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Ex Officio Members



<u>Role</u>	<u>Name</u>	<u>Title</u>
EX Officio	Mike Griffin	NASA Administrator
EX Officio	Scott Horowitz	Associate Administrator Exploration Systems Directorate
EX Officio	Doug Cooke	Deputy Associate Administrator
EX Officio	W. Michael Hawes	Associate Administrator, Space Operations
EX Officio	Bryan O'Connor	OSMA
EX Officio	Scott Pace	PA&E
EX Officio	Ralph Roe	NESC
EX Officio	Christopher Scolese	NASA Chief Engineer
EX Officio	Richard Williams	NASA Chief Health and Medical Officer
EX Officio	Deb Neubek	Cx Chief of Staff Technical
EX Officio	Rex Geveden	Associate Administrator