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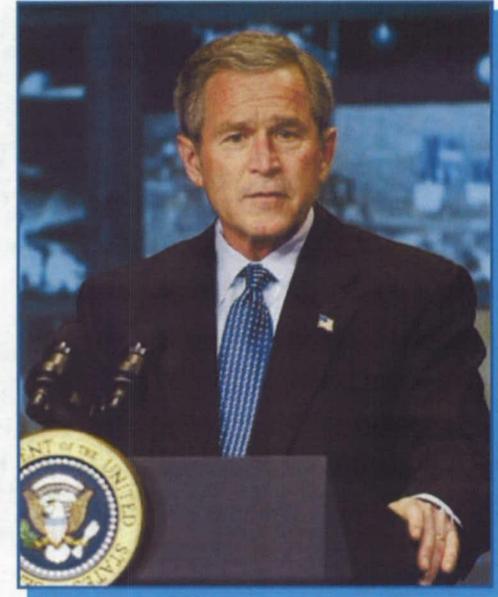
Constellation Program SR&QA Overview



Russ DeLoach
KSC Constellation S&MA Project Office

A Vision for Space Exploration, Authorized by Congress

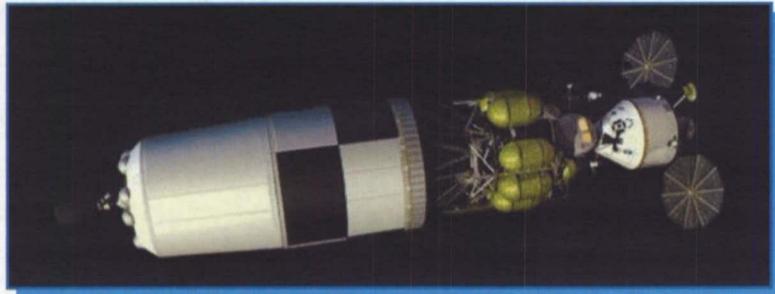
- ◆ **Complete the International Space Station**
- ◆ **Safely fly the Space Shuttle until 2010**
- ◆ **Develop and fly the Crew Exploration Vehicle (Orion) no later than 2014**
- ◆ **Return to the Moon no later than 2020**
- ◆ **Extend human presence across the solar system and beyond**
- ◆ **Implement a sustained and affordable human and robotic space 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.

Components of Program Constellation



Earth
Departure
Stage



Orion – Crew
Exploration
Vehicle



Ares V -
Heavy Lift
Launch
Vehicle



Ares I - Crew
Launch Vehicle

Lunar
Lander





Constellation Manifest

CR# C0000145A
May 24, 2007



Test Flights



Legend
Manned
Unmanned
Test

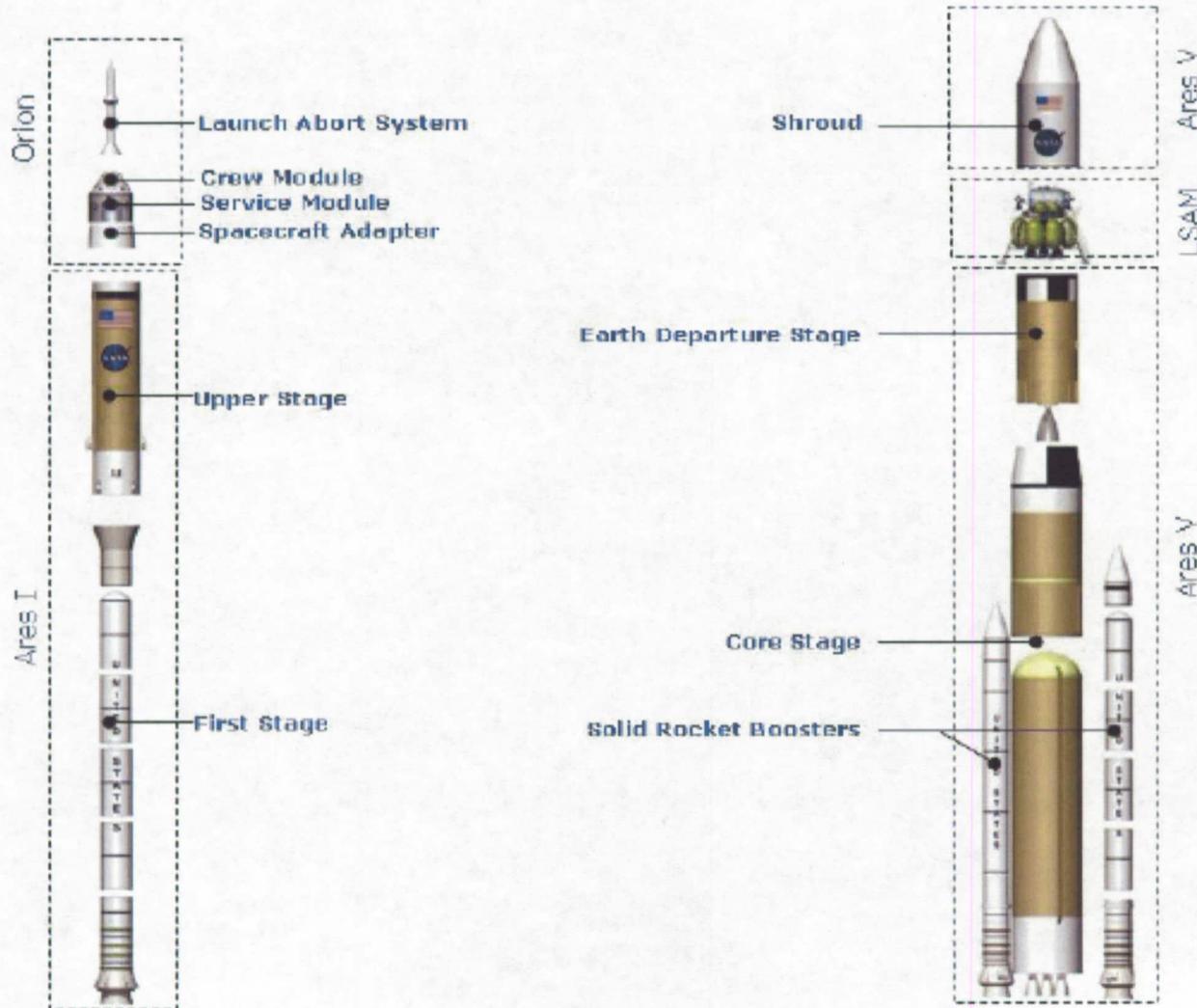


	2009		2010		2011		2012		2013					
	Ares I-X		AA-1		AA-2		AA-3		Ares I-Y		Orion 1	Orion 2		
														
	Apr		Sep Max Q		Aug Transonic		Feb Off Nom Att		Sep		Mar	Sep ATLAS		
	2014		2015		2016		2017		2018		2019		2020	
	Orion 3		Orion 4		Orion 5		Orion 6		Orion 7		Orion 8		Orion 9	
														
	Mar ATLAS		Sep		Mar		Sep		Mar		Sep		Mar	
	Orion 10		Orion 11		Orion 12		Orion 13		Orion 14		Orion 15		Orion 16	
														
	Mar		Sep		Mar		Sep		Mar		Sep		Mar	
	Orion 17		Orion 18		Orion 19		Orion 20							
														
	Mar		Sep		Mar		Sep							
	2018				2019				2020					
	Ares V-Y				LSAM 1		LSAM 2		LSAM 3		LSAM 4			
														
	Jun				Dec		Jun		Dec		Jun			
					Orion 13		Orion 15		Orion 17		Orion 19			
														
					Dec		Jun		Dec		Jun			

Ares 1 and Ares V Ref. Configuration

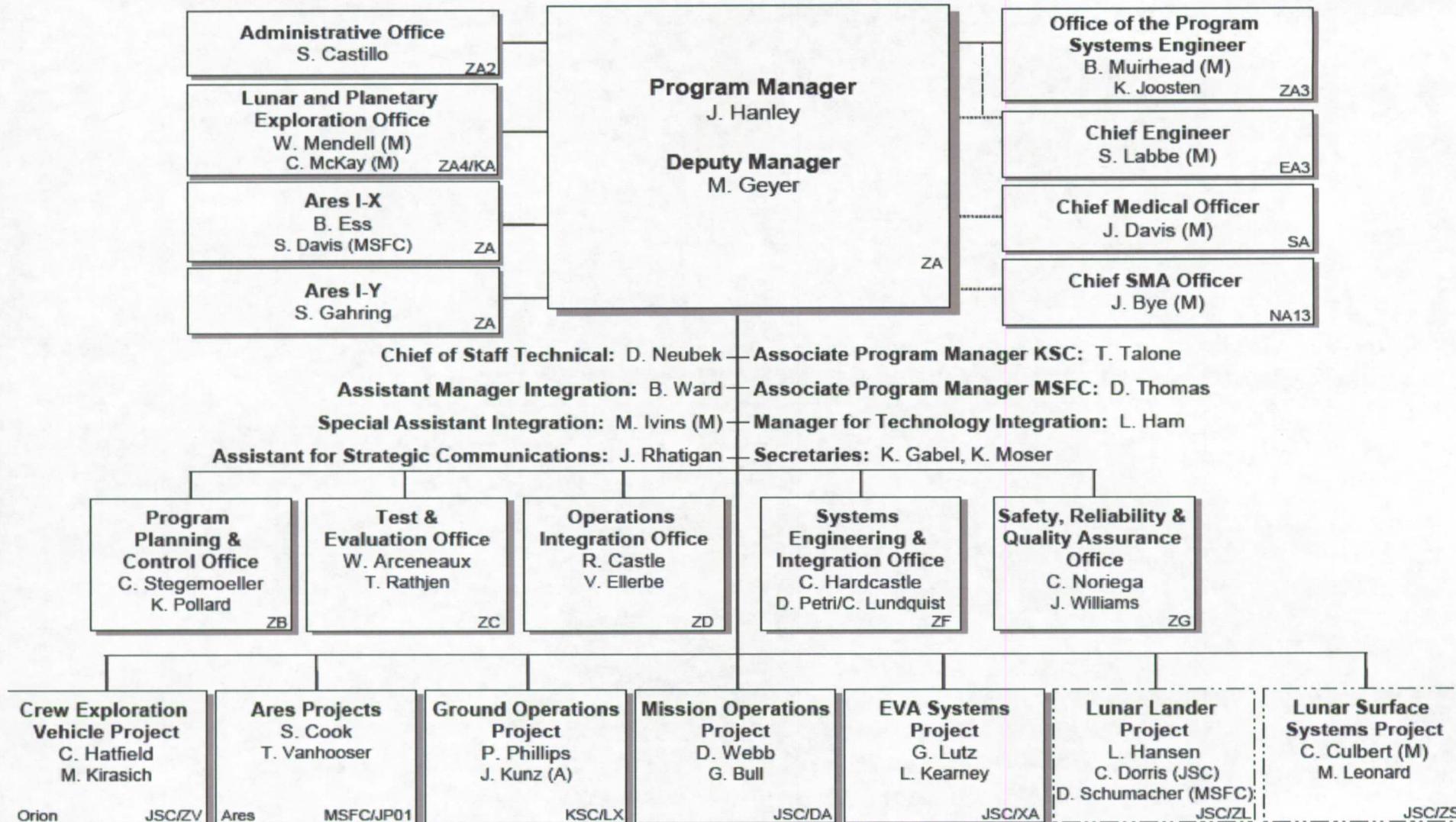
Ares I/Orion

Ares V/LSAM (Final Configuration TBD)





Constellation Program



A- Acting
M - Matrix
--- Pre-Project

Jeffrey M. Hanley 8/29/07
 Jeffrey M. Hanley Date
 Manager



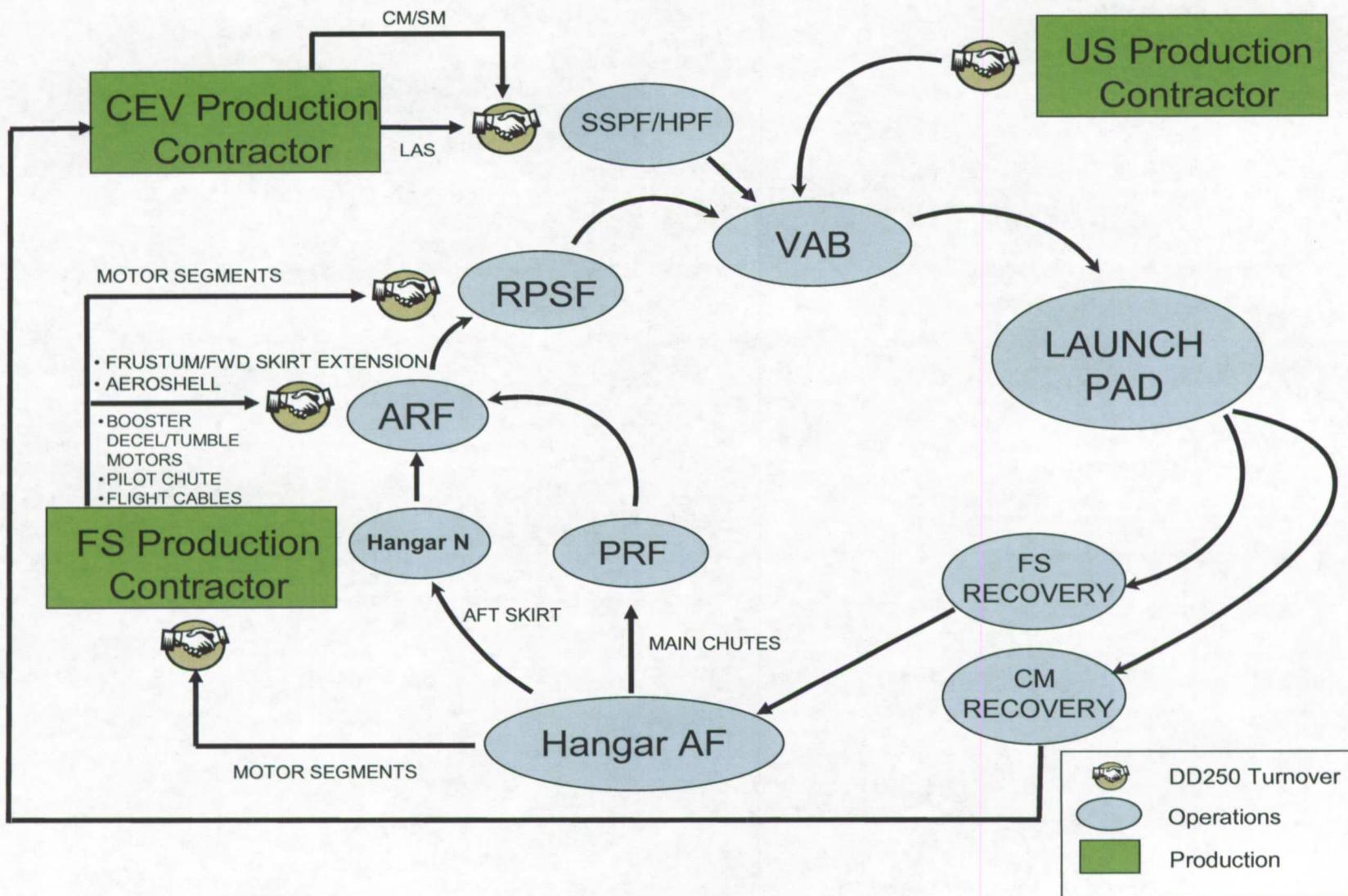
KSC Responsibility for Constellation



- ◆ **A Constellation Ground Operations Project Office is established at KSC, reporting directly to the Center Director. Responsible for the launch site development, ground processing and operations efforts at the launch, landing and retrieval sites in support of the Constellation Program. In addition the GO Project supports spacecraft and launch vehicle design for operability and interface definition to Ground Systems. (CxP 72120, GO Project Plan)**
 - Launch site development includes new and modified facilities, Ground Support Equipment (GSE), and launch processing planning efforts.
 - Ground Operations includes the collection of ground activities performed at the launch, landing and retrieval sites including receiving, ground processing, integration, integrated and interface testing, launch operations, recovery, de-integration, refurbishment, disposal, pad abort, and search & rescue operations.

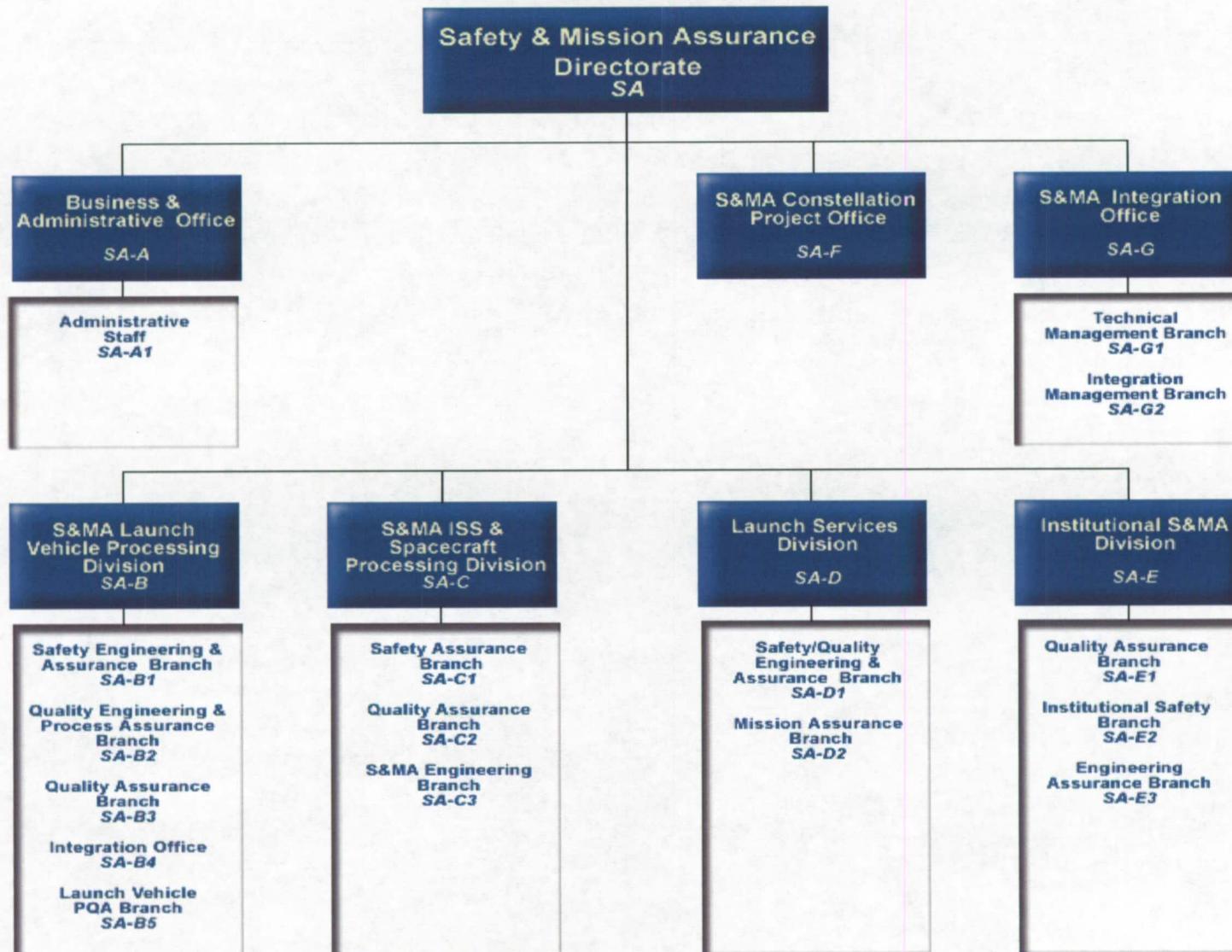
Potential Ares 1/Orion

GO Processing Flow





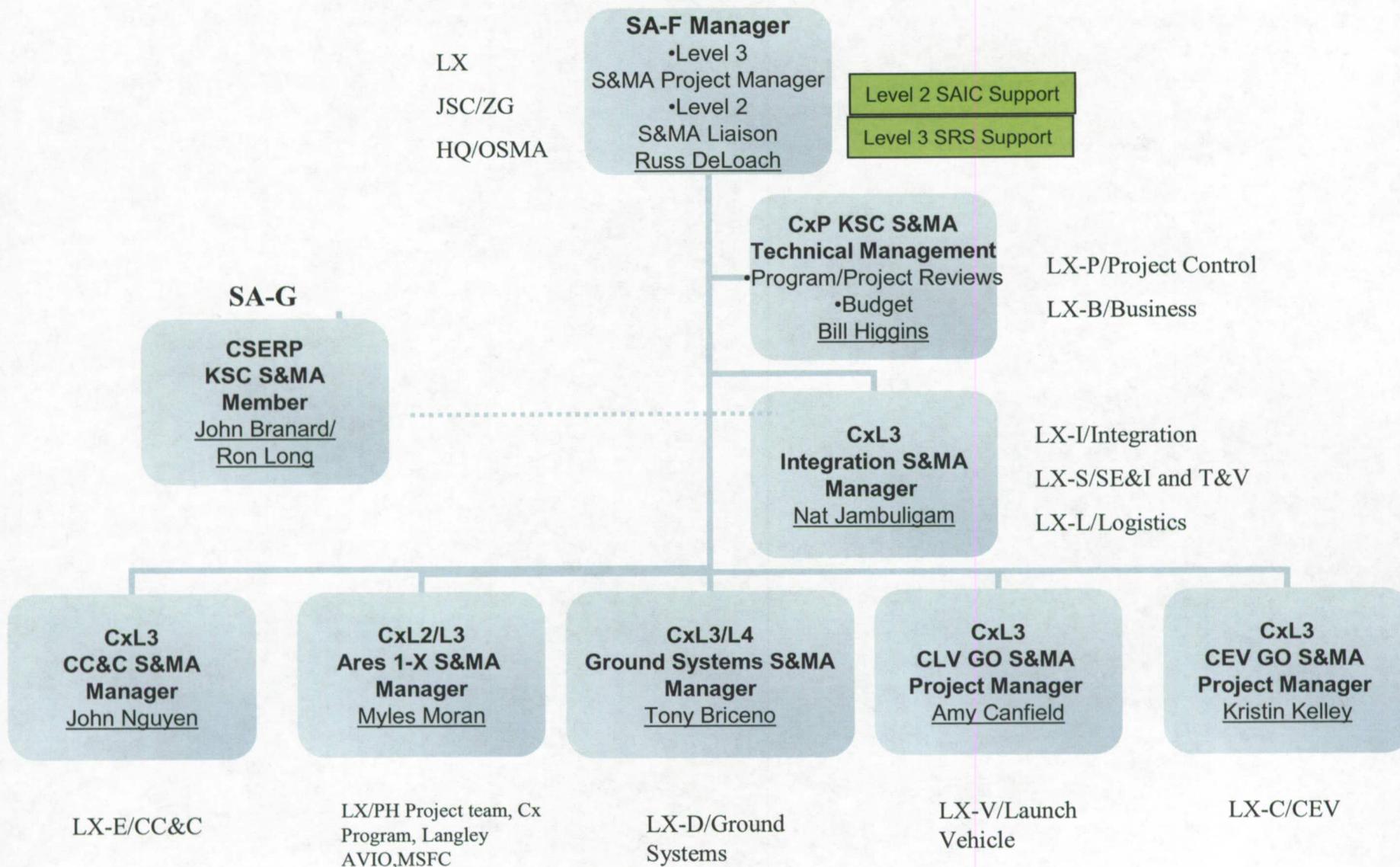
KSC S&MA Organization



07-22-2007



S&MA Constellation Project Office





Program SR&QA Requirements



- ◆ **CxP 70017 CxP Probabilistic Risk Assessment (PRA) Methodology**
- ◆ **CxP 70036 CxP Environmental Qualification & Acceptance Testing Requirements (CEQATR)**
- ◆ **CxP 70038 Methodology for Conduct of CxP Hazard Analyses**
- ◆ **CxP 70043 CxP Hardware FMEA/CIL Methodology**
- ◆ **CxP 70055 CxP SR&QA Plan**
- ◆ **CxP 70056 CxP Risk Management Plan**
- ◆ **CxP 70059 CxP Safety, Reliability, and Quality Assurance Requirements**
- ◆ **CxP 70068 PRACA Methodology for the CxP**
- ◆ **CxP 70087 CxP Reliability, Availability, and Maintainability Plan**
- ◆ **CxP 70128 Cx Software Assurance Plan**

- ◆ **Management Directives**
 - MD003 Launch Cx Range Safety Panel
 - MD007 Charter for the CxP SR&QA Board
 - MD013 Charter for the Cx Safety & Engineering Review Panel (CSERP)
 - MD015 Charter for the CxP Quality Panel
 - MD017 Charter for the Cx Probabilistic Risk Assessment Panel (CPRAP)

- ◆ **Probabilistic Risk Assessment “LOC/LOM”**
 - LOC < 1 in 100 for Lunar Sortie
 - LOM < 1 in 20 for Lunar Sortie
 - LOC < 1 in 1000 for ISS Crew Mission
 - LOM < 1 in 200 for ISS Crew Mission
- ◆ **Launch Availability**
- ◆ **Software S&MA**
- ◆ **Constellation Safety Engineering Review Panel (CSERP)**
 - Phased safety review of risk products rolled up to the Element level
 - CILs reported via Hazard Reports
- ◆ **AS9100B, Quality Management Systems, Aerospace Requirements**
- ◆ **Process Failure Mode and Effects Analysis applicable to manufacturing and operations**
- ◆ **Single PRACA system**
- ◆ **Continuous Risk Management, Top Risk Reviews**

S&MA in Ground System Development

- The Ground System (Level III) is decomposed into Elements (Level IV), which are major divisions of functionality
- Each Element has a NASA Element Project Manager, assigned a budget to develop all ground and facility systems necessary to provide that functionality
- NASA S&MA assigned to support each Element.
- Design work is done at the Subsystem Level (Level V). The NASA Engineering Support Contractor (ASRC) is tasked to provide the S&MA products concurrent with the design as embedded members of subsystem project development teams. These S&MA products are reviewed and approved by NASA S&MA of corresponding Element.
- Deliverable to the CSERP is Element Hazard Reports. KSC continuing to develop process to roll Level V FMEA/CIL and Hazard Analysis products into required Program deliverable.

