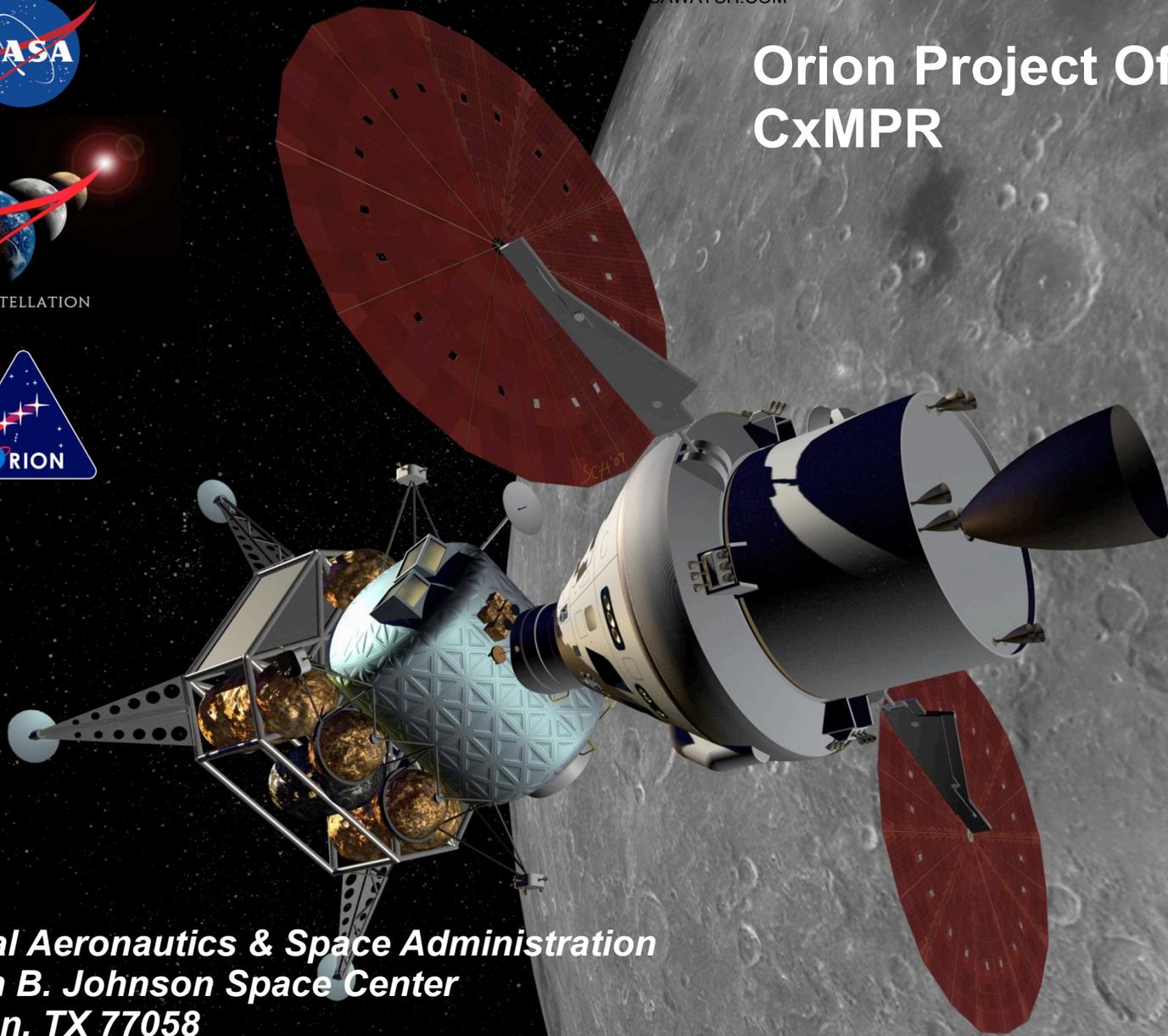


Orion Project Office CxMPR



**National Aeronautics & Space Administration
Lyndon B. Johnson Space Center
Houston, TX 77058**

July 2, 2008

Orion Summary



	<u>May 08</u>	<u>June 08</u>	<u>Comments</u>
Overall Status	Y	Y	-FY08-10 Budget Challenges will require a re-planning of work. Impact on CDR and IOC is in work.
Financial Performance	R	R	- Significant progress made on FY08 budget issues - FY08-10 spending constraints require schedule re-plan and risk assessments
<u>Integrated Project Schedule Accomplishments/Milestones</u>	Y	Y	- Assessing effects of significant budget challenges in FY08-10 on major milestones -Assessing the ability to meet DAC2 Closure Criteria on the current schedule in light of the adjustments made to resolve the FY08 Budget issues
<u>Technical Performance and Emerging Issues</u>	Y	Y	- Recent change to new C&T Architecture will require a delta PDR for this subsystem -Mass issues among modules

Current Risk Status



FY08 Cost Issue



- Orion experienced a large cost overrun in FY08 (~\$80M), primarily due to Lockheed/Orbital issue with their Attitude Control Motor vendor performance issues.
- Additionally Orion was directed to protect for a FY09 Continuing Resolution and maintain 1 month of funding for next FY.
- Conducted EOY reviews with LM to define options to slow 08 spending based on an adjusted flight test schedule which were followed up formally by a detailed plan to meet the NASA cost target
 - 7 pages of detailed content for subs and the prime
 - Protected PDR and PA-1 but deferring other content including procurements
 - Significantly reduced travel, loaned labor, overtime
- Non-prime targets were also defined and reviews held to review content reductions for FY08
 - Protected FTE and minimize loss of contract labor
 - Initiated procurements and test delays, and stop work on non-critical activities
- As of June 23, Orion now has a plan to get out of FY 08, and May actuals reflect this plan.



- PMR08 R1 guidance significantly impacted Orion
 - Loss of ~\$200M buying power in order to protect 4 weeks (per year) of funding required to transition across fiscal years, partial funding of IRMA Threats, and direction that project must create reserves to cover the QRA (remaining and future threats).
 - This is compounded by the work moving out of FY08 (\$80M) to accommodate the EOY issues, and potential loss of buying power due to the risk of losing the LM loan.
- Marks have been issued to the Prime and non-prime organizations along with a notional schedule
 - Held at guideline for FY09 and FY10
 - Asked for an assessment of what would be required for FY11 and subs to meet the revised manifest
- Due to the aggressive schedule, the project has developed the following approach for PMR Rev1
 - Inputs from Prime and Non-Prime will focus primarily on FY09/10
 - FY11 and subs will be based on models and assessment tools
 - Post PMR Rev1, we will perform a project sync-up to develop the detailed schedule, costs, and confidence level from the bottoms up. Plan will be established by the end of July



Orion PMR08R1 Milestones



- Current Internal Project Schedule to meet July 16th F2F Presentation
 - July 2-3
 - Initial briefing to the Project Manager by the Prime and Non-Prime CAMs
 - It is expected that there will be issues and follow on actions that require additional time to be worked prior to the F2F Review with the Cx Program
 - July 7-11
 - Address issues and follow on actions with Prime/Non-Prime areas
 - Report of Assessment results on FY 14 feasibility and post FY 9/10 plan
 - July 11-13
 - Develop F2F presentation package
 - Begin working Data Submit Formats
 - July 14
 - Present F2F presentation to Project Manager
 - July 15
 - Finalize F2F presentation based on July 14th feedback from Project Manager



AS OF

5/31/2008

ORG

ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



Orion Financial Status

WWW.NASAWATCH.COM



FY08 SUMMARY (\$B) as of 5/31/08

	<u>FY08 Phasing Plan</u>	<u>Rolling Baseline</u>	<u>3 Mo. SL Trend</u>	
Underspend From FY07	0.515	0.449	0.449	
FY08 New Obligations Authority	<u>0.855</u>	<u>0.890</u>	<u>0.890</u>	
Total FY08 Funding Available	1.370	1.339	1.339	
FY08 Cost Plan	<u>-1.121</u>	<u>-1.228</u>	<u>-1.244</u>	
Under spend to FY09	0.249	0.111	0.095	
FTE (avg)	726	726	690	YTD Avg
WYE (avg) - Prime	680	680	745	YTD Avg

Approved Changes:

NOA and Cost Adjustments:

CR 187 - Arc Jet	0.002
CR 209 - SPF Mods	0.019

NOA Adjustments:

SOMD ISS Payment Rephase	0.023
ARES CoF Rephase	-0.009

Cost Adjustments:

FY07 Cost Plan Underspend	0.024
CR 1230 - ALAS (50% reduction & sched adj)	0.011
CR 1119 - ESM (schedule adj)	0.024
CR 1859 - Contract Alignment (schedule adj)	0.022
CR 2519 - Cx CRs (20% reduction, schedule adj)	0.006
CR 1134 - DSIL HW/SW Integration Capability - CR#183	0.000



AS OF

5/31/2008

Orion Financial Status

WWW.NASAWATCH.COM

ORG

ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



FY08 OBLIGATION SUMMARY (\$M) as of 5/31/08

	Cum May Plan	Cum May Actual	Delta	FY08 Plan	EOY Estimate	Delta
Total	\$644.9	\$618.1	(\$26.8)	\$945.7	\$932.0	(\$13.6)
Labor	\$0.0	\$60.3	\$60.3	\$0.0	\$95.8	\$95.8
Travel	\$0.0	\$3.1	\$3.1	\$0.0	\$4.7	\$4.7
Procurements	\$615.7	\$518.7	(\$97.0)	\$882.4	\$760.4	(\$122.0)
CoF	\$29.2	\$30.1	\$0.9	\$63.2	\$63.2	\$0.0
Service Pools	\$0.0	\$5.9	\$5.9	\$0.0	\$7.9	\$7.9

Comments: - May Variance (-\$26.8M)

FY08 Plan in Cx accounting system has been updated. Currently working with Cx to understand change in EOY obligation plan. No EOY issues anticipated with ability to fully obligate funding.



AS OF 5/31/2008

Orion Financial Status

WWW.NASAWATCH.COM

ORG ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



FY08 COST SUMMARY (\$M) as of 5/31/08

	Cum May Plan	Cum May Actual	Delta	FY08 Plan	EOY Estimate	Delta
Total	\$713.3	\$776.3	\$63.0	\$1,228.1	\$1,205.2	(\$22.8)
Labor	\$69.1	\$60.2	(\$8.9)	\$104.8	\$94.425	(\$10.4)
Travel	\$2.6	\$2.8	\$0.2	\$3.6	\$4.659	\$1.1
Procurements	\$635.6	\$695.4	\$59.8	\$1,085.8	\$1,077.4	(\$8.3)
CoF	\$6.0	\$11.9	\$6.0	\$25.4	\$20.8	(\$4.6)
Service Pools	\$0.0	\$5.9	\$5.9	\$8.5	\$7.928	(\$0.6)

Comments: - May Variance (+\$63.0M)

- Current plan has not been updated to accommodate the PMR08 Rv.1 revised manifest. Current EOY estimate was provided by Prime/Non-Prime CAMs in an EOY Review with the Project Manager on June 23rd. The EOY estimate provided by the Prime/Non-Prime CAMs is their FY08 estimate based on the revised PMR08 Rv.1 manifest.



AS OF 5/31/2008

Orion Financial Status

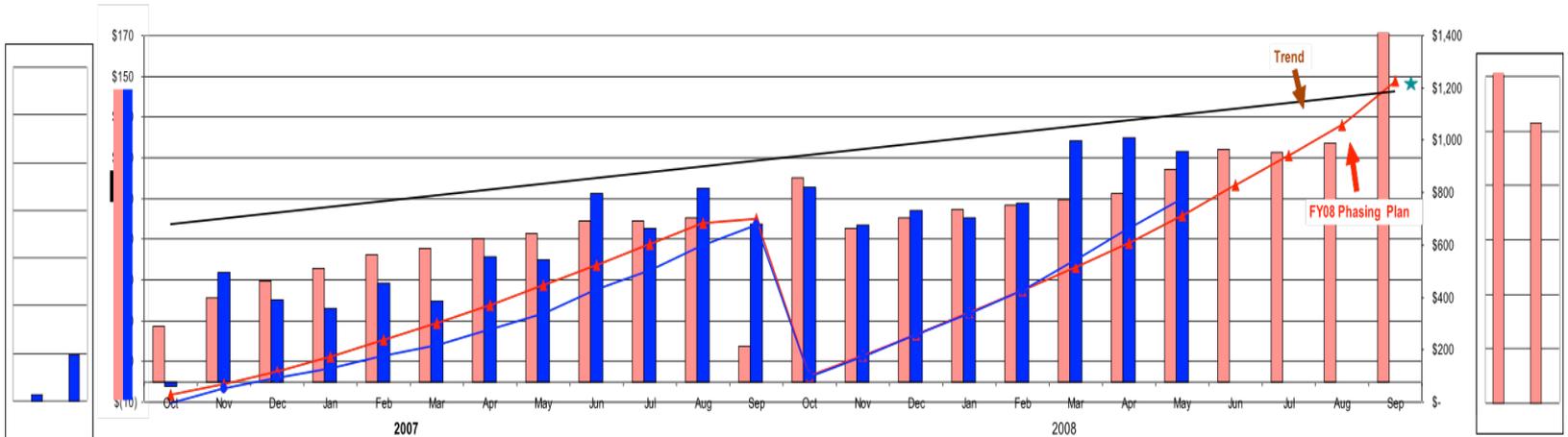
ORG ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



PROJECT COST SUMMARY – BY WBS (\$B) as of 5/31/08



	Actual Costs		1000																								Planned		
	FY05	FY06	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	FY09	FY10
★ Total Cum Plan	\$ 27	\$ 69	\$ 118	\$ 174	\$ 237	\$ 302	\$ 372	\$ 445	\$ 524	\$ 603	\$ 683	\$ 701	\$ 100	\$ 175	\$ 256	\$ 341	\$ 427	\$ 516	\$ 609	\$ 713	\$ 827	\$ 940	\$ 1,057	\$ 1,228	\$ 1,929				
◆ Total Cum Actual	\$ (2)	\$ 51	\$ 91	\$ 127	\$ 176	\$ 215	\$ 276	\$ 336	\$ 429	\$ 505	\$ 599	\$ 677	\$ 96	\$ 172	\$ 256	\$ 337	\$ 425	\$ 543	\$ 663	\$ 776							\$ 677		
Delta	\$ (30)	\$ (18)	\$ (27)	\$ (47)	\$ (61)	\$ (87)	\$ (96)	\$ (108)	\$ (95)	\$ (98)	\$ (84)	\$ (24)	\$ (4)	\$ (3)	\$ 1	\$ (3)	\$ (2)	\$ 27	\$ 54	\$ 63							\$ (1,252)		
■ WBS 1.1 Plan																													
■ WBS 1.1 Actuals																													
Delta																													
■ WBS 1.2 Plan																													
■ WBS 1.2 Actuals																													
Delta																													
■ WBS 1.3 Plan																													
■ WBS 1.3 Actuals																													
Delta																													
■ WBS 1.4 Plan																													
■ WBS 1.4 Actuals																													
Delta																													
■ WBS 1.6 Plan																													
■ WBS 1.6 Actuals																													
Delta																													
■ WBS 1.10 Plan																													
■ WBS 1.10 Actuals																													
Delta																													
■ Travel Plan																													
■ Travel Actuals																													
Delta																													

Orion Project Office



AS OF 5/31/2008

Orion Financial Status

WWW.NASAWATCH.COM

ORG ZV

POC

Mark Geyer 281-244-7441

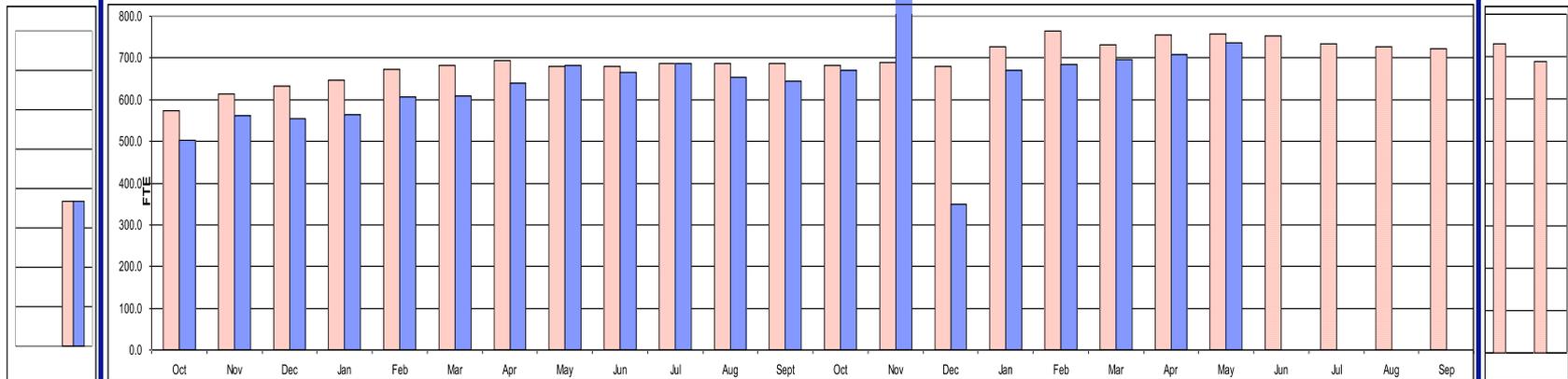
Mark.S.Geyer@nasa.gov



FY08 FTE ACTUAL -- By Project as of 5/31/2008 (\$M)

FY07

FY08



Actual FTE																						Planned FTE					
FY05	FY06	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	FY09	FY10
Plan FTE	573.0	612.5	632.9	646.6	671.8	682.4	694.2	680.5	680.2	685.7	687.6	687.7	683.0	690.0	679.0	726.0	764.0	731.0	754.0	758.0	753.3	734.9	727.8	722.2	690		
Actual FTE	502.4	560.6	554.0	564.2	605.5	608.1	640.5	682.4	666.6	687.1	654.5	644.6	670.0	1001.0	350.0	671.0	685.0	695.0	709.0	736.0	0.0	0.0	0.0	0.0			
Delta FTE	(70.6)	(51.9)	(78.9)	(82.4)	(66.2)	(74.3)	(53.7)	1.8	(13.6)	1.3	(33.1)	(43.0)	(13.0)	311.0	(329.0)	(55.0)	(79.0)	(36.0)	(45.0)	(22.0)	(753.3)	(734.9)	(727.8)	(722.2)			

Plan FTE																								
WBS 1.1														64.0	64.0	60.0	64.0	64.0	64.0	64.0	64.0	62.8	62.3	64.1
WBS 1.2														251.0	250.0	245.0	246.0	246.0	246.0	246.0	246.6	246.5	246.6	246.5
WBS 1.3														30.0	31.0	32.0	34.0	34.0	33.0	33.0	33.0	33.0	33.0	33.0
WBS 1.6.1														114.0	117.0	111.0	115.0	114.0	114.0	115.0	115.0	115.6	114.9	115.0
WBS 1.6.2														67.0	67.0	67.0	67.0	67.0	67.0	68.0	68.0	67.0	67.0	67.0
WBS 1.6.4														39.0	38.0	36.0	51.0	51.0	54.0	55.0	50.5	50.5	50.5	50.5
WBS 1.10														118.0	123.0	128.0	149.0	189.0	156.0	174.0	177.0	177.8	160.2	153.4

Actual FTE																								
WBS 1.1	152.2	220.0	241.9	259.9	274.8	280.8	308.3	324.3	321.0	328.5	314.9	59.4	58.0	89.0	31.0	57.0	57.0	62.0	63.0	61.0				
WBS 1.2 (incl. 1.6.5)	149.8	102.7	92.4	85.4	95.2	91.1	95.8	110.0	96.4	91.6	86.9	226.6	227.0	339.0	103.0	215.0	211.0	217.0	224.0	231.0				
WBS 1.3	9.9	12.1	7.9	10.1	9.1	9.4	9.9	9.9	10.1	9.8	10.9	22.2	26.0	34.0	11.0	26.0	28.0	29.0	27.0	32.0				
WBS 1.6.1 (incl. 1.4)	54.1	48.9	48.0	42.1	48.7	41.7	35.6	38.0	39.3	38.1	31.6	96.8	106.0	154.0	49.0	97.0	101.0	109.0	111.0	113.0				
WBS 1.6.2	45.4	64.6	54.0	65.8	66.8	68.2	63.6	65.8	59.7	62.5	55.4	59.1	66.0	89.0	43.0	60.0	62.0	62.0	64.0	70.0				
WBS 1.6.4	31.5	26.9	30.2	26.8	32.1	33.7	30.1	32.3	31.2	34.3	29.7	31.3	34.0	45.0	17.0	32.0	34.0	34.0	35.0	45.0				
WBS 1.10	59.5	85.4	79.7	74.2	78.9	83.2	97.1	102.1	106.9	122.3	125.1	149.1	153.0	251.0	96.0	184.0	192.0	182.0	185.0	184.0				

Corrected FTE: November FTE 686; December FTE 655

Orion Project Office



AS OF 5/31/2008

Orion Financial Status

WWW.NASAWATCH.COM

ORG

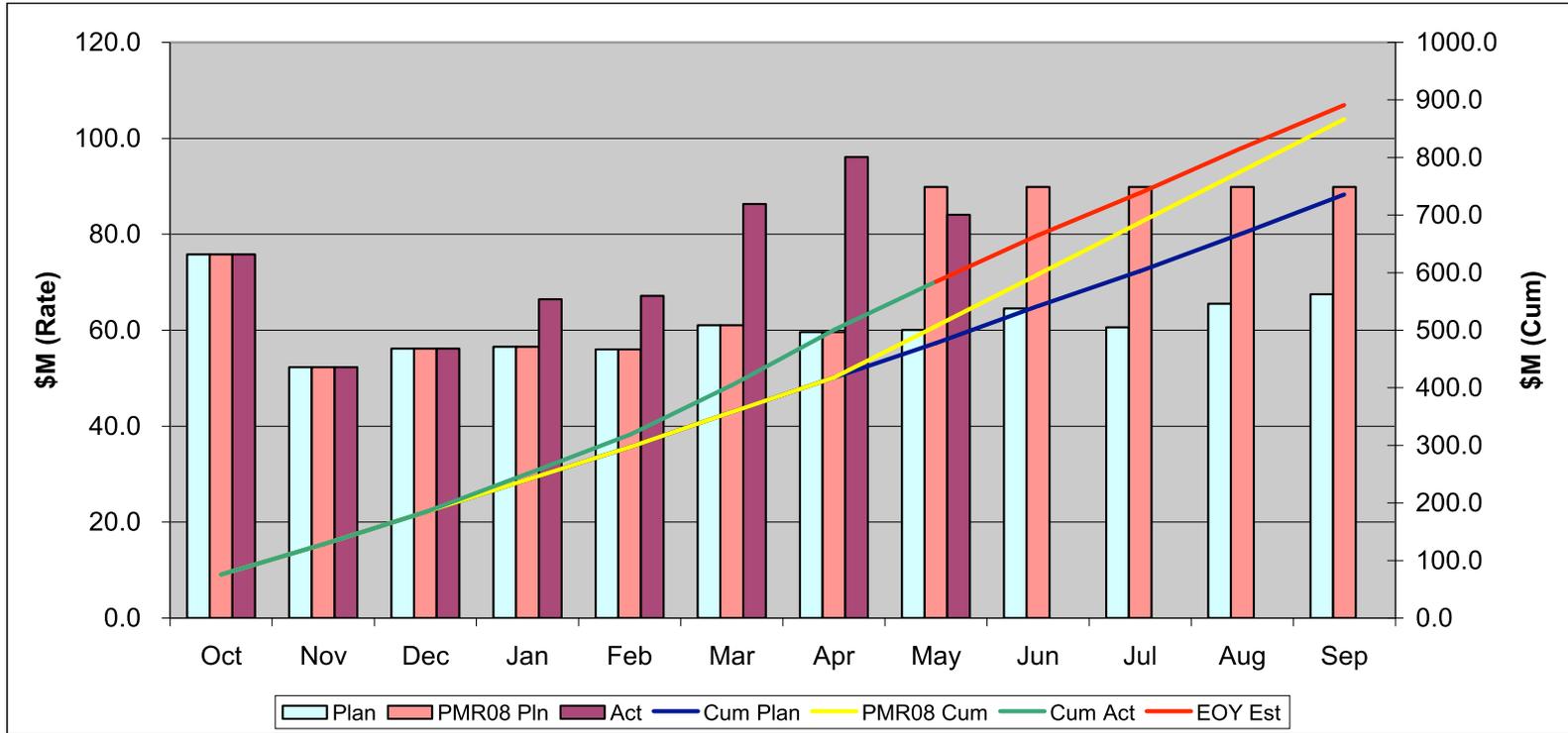
ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



FY08 Prime Contract (\$M) as of 5/31/2008



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Plan	75.8	52.3	56.2	56.5	56.0	61.1	59.6	60.0	64.6	60.6	65.5	67.5	735.8
PMR08 Pln	75.8	52.3	56.2	56.5	56.0	61.1	59.6	89.9	89.9	89.9	89.9	89.9	866.9
Act	75.8	52.3	56.2	66.5	67.2	86.3	96.1	84.1					584.4
Delta	0.0	0.0	0.0	9.9	11.2	25.2	36.5	24.0					106.8

Cum Plan	75.8	128.1	184.3	240.8	296.8	357.9	417.5	477.6	542.1	602.8	668.3	735.8
PMR08 Cum	75.8	128.1	184.3	240.8	296.8	357.9	417.5	507.4	597.3	687.2	777.0	866.9
Cum Act	75.8	128.1	184.3	250.7	317.9	404.2	500.4	584.4				
Cum Delta	0.0	0.0	0.0	9.9	21.1	46.3	82.8	106.8				
EOY Est								584.4	665.0	738.3	816.8	891.3



AS OF 5/31/2008

Orion Financial Status

WWW.NASAWATCH.COM

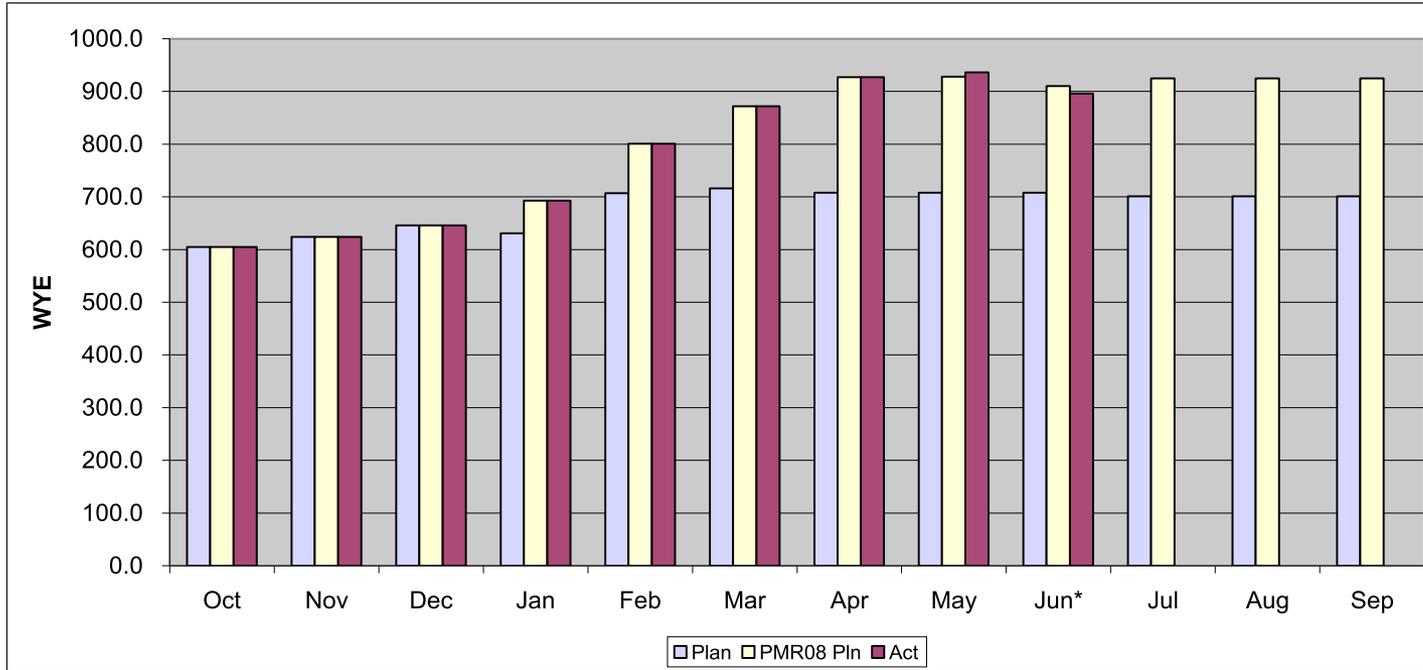
ORG ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



FY08 WYE ACTUAL -- By Prime (LMSSC) as of 5/31/2008



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun*	Jul	Aug	Sep	FY08 Avg
Plan	605.0	624.0	646.0	631.0	707.0	716.0	708.0	708.0	708.0	701.0	701.0	701.0	679.7
PMR08 Pln	605.0	624.0	646.0	693.0	801.0	872.0	927.0	928.0	910.0	925.0	925.0	925.0	815.1
Act	605.0	624.0	646.0	693.0	801.0	872.0	927.0	936.0	896.0				777.8
Delta	0.0	0.0	0.0	62.0	94.0	156.0	219.0	228.0	188.0				105.2

*Estimated Actual

Comments:

Contractor workforce decline reflective of PMR08 Rv.1 revised manifest.



AS
OF

5/31/2008

ORG

ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



Orion Financial Status

www.NASAWATCH.COM

FY08 NOA Trace -- By Project as of 5/31/2008 (\$M)

	FY05 Act.	FY06 Act.	FY07	FY08	FY09	FY10	FY11	FY12	FY13	Total		FY14	FY15	FY16	FY17	FY18	FY19	FY20
										FY07-13	FY14-20							
Program Manager's Recommend'07	75.6	811.4	521.5	856.1	1,014.0	1,008.0	1,287.0	1,228.0	987.0	5,914.6	5,035.9	853.9	846.0	803.0	768.0	704.0	522.0	539.0
PDM #28 SMA Tech Auth Trsfer to CMO				(1.0)	(1.1)	(1.1)	(1.1)	(1.2)	(1.2)	(5.5)	0.0							
1962 FY19/20 adj -- PPBE clean up										0.0	498.5						245.7	252.8
PMR'07-Rev 1	75.6	811.4	521.5	855.1	1,012.9	1,006.9	1,285.9	1,226.8	985.8	5,909.1	5,534.4	853.9	846.0	803.0	768.0	704.0	767.7	791.8
Submit To OMB (PPBE'08)	75.6	811.4	521.5	855.1	1,012.9	1,006.9	1,285.9	1,226.8	985.8	5,909.1	5,534.4	853.9	846.0	803.0	768.0	704.0	767.7	791.8
FY06/FY07 Funding Swaps		(129.3)	129.3															
CR 187 - Arc Jet				1.6						1.6	0.0							
CR 209 - SPF Mods				18.9	0.5					19.4	0.0							
SOMD ISS Payment Rephase			(72.9)	22.9	50.0					0.0	0.0							
ARES CoF Rephase			9.0	(9.0)						0.0	0.0							
FY09 President's Budget	75.6	682.1	586.8	889.5	1,063.4	1,006.9	1,285.9	1,226.8	985.8	6,059.4	5,534.4	853.9	846.0	803.0	768.0	704.0	767.7	791.8
Orion Adjustment to match PMR08 Guidelines				(62.6)	71.9	(10.0)	139.0	(10.0)	(3.0)	128.3	(90.9)	(75.9)	(18.0)	2.0	(3.0)	3.0	1.0	0.0
CR 1603 - Full scale CM water recovery test design & fab - CR#236				0.0	0.0													
CR 1230 - ALAS (50% reduction& sched adj)				11.0	27.8		30.7	24.7	12.1	2.3	106.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR 1119 - ESM (schedule adj)				24.0	59.7		46.0	17.8	10.2	4.6	157.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CR 1859 - Contract Alignment (schedule adj)				21.6	35.6		26.4	22.6	19.3	16.2	125.6	12.8	12.8	0.0	0.0	0.0	0.0	0.0
CR 2519 - Cx CRs (20% reduction, schedule adj)				5.5	10.2		7.2	4.6	4.1	4.4	31.6	6.8	4.5	2.3				
Nominal Water Landing (NOT in IRMA)										8.0	0.0	192.0	12.0	16.0	20.0	26.0	34.0	40.0
CR 1134 - DSIL DSIL HW/SW Integration Capability - CR#183				0.4	1.0		0.7	0.1										
PMR08 Guidelines	75.6	682.1	586.8	889.5	1,269.6	1,108.0	1,494.6	1,262.5	1,018.4	6,611.1	5,655.1	807.3	846.3	825.0	791.0	741.0	808.7	835.8
Orion/Adjustment to match PMR Mark		0.0	(2.4)	0.0	0.0	2.1	(100.5)	0.5	0.6	(100.3)	128.9	115.7	14.7	(4.0)	(1.0)	2.0	1.3	0.2
Prior Year Adjustment from AEP		(0.0)	0.3															
PMR08 Marks	75.6	682.1	584.8	889.5	1,269.6	1,110.0	1,394.1	1,263.0	1,019.0	7,530.0	5,784.0	923.0	861.0	821.0	790.0	743.0	810.0	836.0

Orion Project Office



AS OF 5/31/2008

Orion Financial Status

WWW.NASAWATCH.COM

ORG ZV

POC

Mark Geyer 281-244-7441
Mark.S.Geyer@nasa.gov



FY08 Cost Trace -- By Project as of 5/31/2008 (\$M)

	FY05 Act.	FY06 Act.	FY07	FY08	FY09	FY10	FY11	FY12	FY13	Total FY07-13	FY14-20	FY14	FY15	FY16	FY17	FY18	FY19	FY20	
Program Manager's Recommend'07	26.0	194.8	700.9	1,122.2	1,216.4	1,031.4	1,226.5	1,237.5	991.6	7,526.5	5,580.7	899.2	846.3	803.4	768.3	704.1	767.7	791.8	
Cx Adjustment to Prime - CM Challenge										0.0	(498.5)							(245.7)	(252.8)
Cx Adjustments				(0.2)	(0.4)	(0.4)	0.5	0.5	0.4	0.3	(1.2)	(0.2)	(0.3)	(0.4)	(0.3)	(0.1)	0.0	0.0	
Orion/PDM #28 SMA Tech Auth Trsrfer to CMO			(0.0)	(1.0)	(1.1)	(1.1)	(1.1)	(1.2)	(1.2)	(6.7)	0.0								
Orion/1962 FY19/20 adj -- PPBE clean up										0.0	498.5						245.7	252.8	
PMR07-Rev 1	26.0	194.8	700.9	1,121.0	1,214.9	1,029.9	1,225.9	1,236.8	990.8	6,529.4	5,579.5	899.0	846.0	803.0	768.0	704.0	767.7	791.8	
Changes																			
Submit To OMB (PPBE'08)	26.0	194.8	700.9	1,121.0	1,214.9	1,029.9	1,225.9	1,236.8	990.8	6,529.4	5,579.5	899.0	846.0	803.0	768.0	704.0	767.7	791.8	
CR 187 - Arc Jet				1.6						1.6	0.0								
CR 209 - SPF Mods				18.9	0.5					19.4	0.0								
FY07 Content Roll			(24.6)	24.1	(0.0)					(0.6)	0.0								
FY09 President's Budget	26.0	194.8	676.3	1,165.5	1,215.4	1,029.9	1,225.9	1,236.8	990.8	6,549.8	5,579.5	899.0	846.0	803.0	768.0	704.0	767.7	791.8	
CR 1603 - Full scale CM water recovery test design & fab - CR#236				0.0	0.0					0.0	0.0								
CR 1230 - ALAS (50% reduction & sched adj)				11.0	27.8	30.7	24.7	12.1	2.3	108.6	0.0								
CR 1119 - ESM (schedule adj)				24.0	59.7	46.0	17.8	10.2	4.6	162.3	0.0								
CR 1859 - Contract Alignment (schedule adj)				21.6	35.6	26.4	22.6	19.3	16.2	141.8	12.8	12.8							
CR 2519 - Cx CRs (20% reduction, schedule adj)				5.5	10.2	7.2	4.6	4.1	4.4	36.0	6.8	4.5	2.3						
Nominal Water Landing (NOT in IRMA)									8.0	8.0	192.0	12.0	16.0	20.0	26.0	34.0	40.0	44.0	
CR 1134 - DSIL DSIL HW/SW Integration Capability - CR#183				0.4	1.0	0.7	0.1			2.2	0.0								
PMR08 Guidelines	26.0	194.8	676.3	1,228.1	1,349.8	1,141.0	1,295.6	1,282.5	1,026.4	6,973.2	5,791.1	928.3	864.3	823.0	794.0	738.0	807.7	835.8	
Orion/Rephase after Mark					28.9	(29.2)	(22.9)	(159.0)	111.2	(71.0)	70.9	40.9	(8.0)	(32.0)	4.0	39.0	15.0	12.0	
Prior Year Adjustment from AEP		(0.0)	0.3							0.3	0.0								
			0.0	(0.0)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	(0.0)	(0.3)	0.0	0.0	0.0	0.3	0.2	
Current Orion Cost Posture	26.0	194.8	676.5	1,228.1	1,378.7	1,111.8	1,272.7	1,123.5	1,137.6	6,791.3	5,862.3	969.3	856.0	791.0	798.0	777.0	823.0	848.0	

Orion Project Office

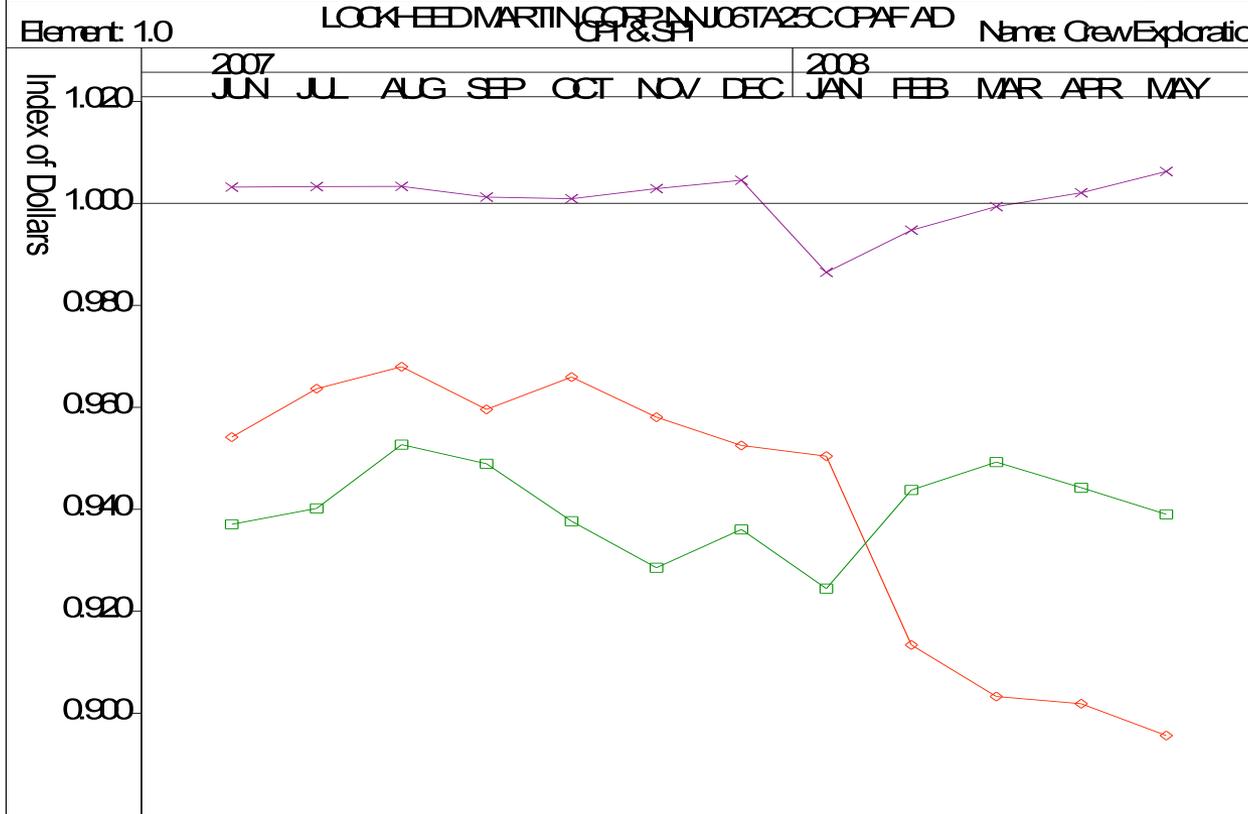


Prime Monthly Earned Value Overview



Orion Project Office

\$\$ In Thousands	BCWS	BCWP	ACWP	Schedule Variance			Cost Variance			Summary
Current Pd.	69,704	61,086	74,322	-8,619	-12.4%	R ↓	-13,237	-21.7%	R ↓	The variance at complete is due to the Orbital Subcontract effort. Targets have been issued to the prime for FY08.
Cumulative	908,567	853,146	952,575	-55,421	-6.1%	Y ↔	-99,429	-11.7%	R ↔	



The variance at complete is due to the Orbital Subcontract effort. Targets have been issued to the prime for FY08.

Performance	
BAC	4,080,669
EAC	4,160,103
VAC	-79,434
SPI	Current: 0.88 Cumulative: 0.94
CPI	Current: 0.82 Cumulative: 0.90
Percent Scheduled	22.3%
Percent Complete	20.9%
Percent Spent	23.3%
EAC Forecast	Min. 4,471,034 Max. 5,159,455

TCPI	1.003	1.003	1.003	1.001	1.001	1.003	1.005	0.986	0.995	0.999	1.002	1.006
CUMCPI	0.954	0.964	0.968	0.960	0.966	0.958	0.953	0.950	0.913	0.903	0.902	0.896
CUMSPI	0.937	0.940	0.953	0.949	0.938	0.929	0.936	0.924	0.944	0.949	0.944	0.939

R Worse than -10%
 Y Between -10% and -5%
 G Better than -5%
 Change Threshold = 10%
 ↑ Improving ↓ Worsening



Prime Stoplight Chart

Level 2/3 Status



	Wbs	Description	SV	CV	VAC	BCWS	BCWP	ACWP	SV	SV%	CV	CV%	BAC	EAC	CPI	SPI	VAC
1	1.0	Crew Exploratio	↔	↔	↔	908,566.7	853,146.2	952,575.1	-55,420.5	-6.10	-99,428.9	-11.65	4,080,669.1	4,160,103.3	0.896	0.939	-79,434.2
2	1.01	CEV Mgmt and Ad	↓	↓	↔	141,584.9	141,470.8	144,432.7	-114.1	-0.08	-2,961.9	-2.09	529,812.9	529,795.7	0.979	0.999	17.2
10	1.02	CEV Vehicle Int	↓	↓	↔	97,524.0	93,479.2	94,884.8	-4,044.8	-4.15	-1,405.6	-1.50	337,782.2	337,792.2	0.985	0.959	-10.0
56	1.03	Safety Mission	↓	↓	↔	24,220.3	23,000.1	22,929.4	-1,220.2	-5.04	70.7	0.31	120,325.6	120,243.4	1.003	0.950	82.2
63	1.06	CEV Spacecraft	↔	↔	↔	599,362.4	554,816.9	648,947.6	-44,545.5	-7.43	-94,130.7	-16.97	2,464,770.6	2,544,294.5	0.855	0.926	-79,523.9
64	1.06.01	Crew Module	↓	↓	↓	260,106.4	240,906.0	257,442.6	-19,200.4	-7.38	-16,536.6	-6.86	1,333,311.3	1,333,319.0	0.936	0.926	-7.7
90	1.06.02	Service Module	↔	↓	↔	73,801.2	67,837.0	74,706.2	-5,964.2	-8.08	-6,869.2	-10.13	451,492.5	451,492.5	0.908	0.919	0.0
112	1.06.04	Launch Abort Sy	↔	↔	↔	203,055.8	185,008.1	259,026.5	-18,047.7	-8.89	-74,018.4	-40.01	393,451.8	472,968.0	0.714	0.911	-79,516.2
133	1.06.05	CEV Software	↓	↔	↔	62,399.0	61,065.8	57,772.3	-1,333.2	-2.14	3,293.5	5.39	286,515.0	286,515.0	1.057	0.979	0.0
144	1.10	Test Verificati	↔	↓	↔	45,861.7	40,365.8	41,358.0	-5,495.9	-11.98	-992.2	-2.46	267,994.3	267,994.3	0.976	0.880	0.0
150	1.11	Education & Pub	↔	↔	↔	13.4	13.4	22.6	0.0	0.00	-9.2	-68.66	13.4	13.4	0.593	1.000	0.0

R Worse than -10%
 Y Between -10% and -5%
 G Better than -5%
 Change Threshold = 10%

Prime thresholds for variance explanations

5 largest cum cost variances exceeding +/- \$100K and +/- 10%

5 largest cum schedule variances exceeding +/- \$100K and +/- 10%



Prime Top 5 Cost Drivers

WWW.NASA.WATCH.COM



	WBS	DESCRIPTION	SV	CV	VAC	BCWS	BCWP	ACWP	CV	CV%	CPI	LRE
1	1.06.04.03	LAS Subsystem	↔	↔	↔	163,908.6	148,602.4	220,382.1	-71,779.7	-48.30	0.674	348,918.6
2	1.06.01.06	Crew Module Ass	↓	↓	↔	33,570.9	29,043.1	36,813.4	-7,770.3	-26.75	0.789	169,715.5
3	1.06.02.03	Service Module	↔	↔	↔	50,968.9	46,046.6	51,099.1	-5,052.5	-10.97	0.901	335,295.3
4	1.06.05.03	Software Produc	↔	↔	↔	8,973.4	8,515.9	10,404.6	-1,888.7	-22.18	0.818	75,875.3
5	1.06.04.06	LAS Assembly (A	↑	↑	↔	8,272.4	6,515.8	8,049.7	-1,533.9	-23.54	0.809	21,801.4

WBS 1.06.04.03	Cause	Large variance due to the Abort Motor, Jettison Motor and Attitude Control Motor subcontract. The subcontract was let with a higher than planned budget and design and requirement changes.
	Impact	Costs are considered unrecoverable.
	Corrective Action	Intensive design and requirements hopefully will forgo rework and retesting in later production on these systems.
WBS 1.06.01.06	Cause	Unfavorable variance due to bringing the PEC cards into production with procurement delays, process development, testing and higher level of rework and an error in the USA CPR, material phasing, and increased hours to support drawing releases
	Impact	Three month schedule impact to the PA-1 dates for PEC cards, additional resources and overtime were used to complete the PEC work.
	Corrective Action	Manufacturing center is conducting team meetings to improve efficiency, schedule more work on second shift to become less reliant on overtime. A WAD will be processed to reflect material phasing variance.
WBS 1.06.02.03	Cause	The cost baseline is completely out of synch with the technical baseline for the encapsulated service module design that has resulted in a significant and expected cost overrun. This cost variance will be resolved when CCO 24 is completed.
	Impact	Overtime and workshare of personnel costs are unrecoverable.
	Corrective Action	Offload workshare, replace with direct staff, reduce overtime, replan as necessary to ensure design maturity for PDR, budget to be replanned in June.
WBS 1.06.05.03	Cause	The unfavorable cost variance is due to the continuation of the prior cost variances associated with the development and implementation in response to requirement changes for FTA PA-1 flight software. The FTA SW activities have evolved into a separate development activity than can not leverage Orion SW artifacts as was originally planned.
	Impact	The rate of the FTA related cost variances is expected to be reduced as a result of the corrective action.
	Corrective Action	Management Reserve has been approved for the additional resources needed to perform the separate FTA SW development activity.
WBS 1.06.04.06	Cause	Unfavorable variance in EGSE because of the unexpected complexity of the system, and MGSE subcontract overrunning the estimated cost of GSE deliveries, and Delta V subcontract overrunning initial budget due to adding additional scope for clarification to existing AIT spec.
	Impact	Unfavorable labor will have minimal impact. As schedule is regained in the following months additional labor will not be needed.
	Corrective Action	CAM has included subcontract overrun in EAC and is working to identify opportunities to help reduce the overrun caused by subs.



Prime Top 5 Schedule Drivers

WWW.NASA.WATCH.COM



	WBS	DESCRIPTION	SV	CV	VAC	BCWS	BCWP	ACWP	SV	SV%	SPI	LRE
1	1.06.01.06	Crew Module Ass	↓	↓	↔	33,570.9	29,043.1	36,813.4	-4,527.8	-13.49	0.865	169,715.5
2	1.10.06	Flight Test	↔	↓	↔	12,291.5	10,318.6	11,668.9	-1,972.9	-16.05	0.839	35,980.2
3	1.06.04.06	LAS Assembly (A	↑	↑	↔	8,272.4	6,515.8	8,049.7	-1,756.6	-21.23	0.788	21,801.4
4	1.10.01	Test Verificati	↓	↑	↔	3,771.3	2,913.5	3,197.9	-857.8	-22.75	0.773	52,308.0
5	1.06.02.06	Service Module	↓	↓	↔	5,799.6	5,033.3	5,267.6	-766.3	-13.21	0.868	51,674.3

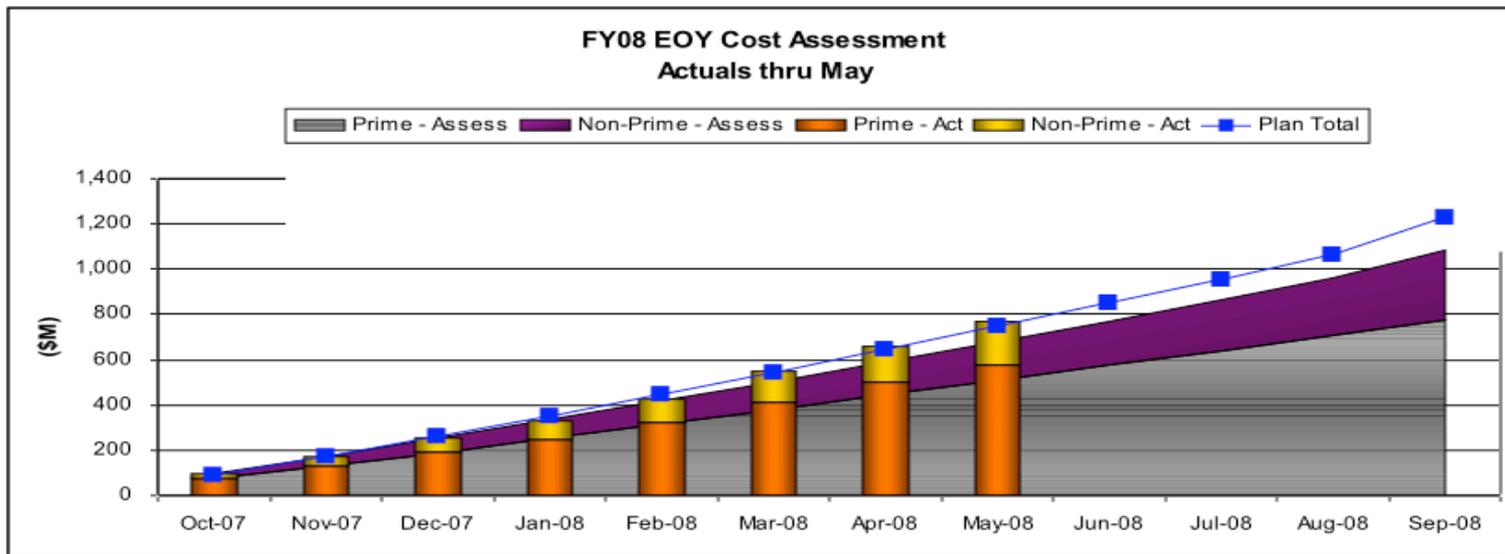
WBS 1.06.01.06	Cause	Unfavorable variance due to an error in the USA CPR, replan of EGSE end-items, late hardware deliveries to the EDL pushing out PA-1 integration and verification, delinquent engineering reviews, delays in releasing GTA engineering drawings.
	Impact	Test schedules have been adjusted to accommodate the delays in drawing release and procurement, additional resources have been brought in that could negatively impact cost. Delays in tooling and facilities schedule is recoverable.
	Corrective Action	Additional resources to be brought on for drawing checking and expediting and the requirements realignment will update the schedule milestones.
WBS 1.10.06	Cause	Unfavorable variance due to the unplanned work to keep PA-1 on schedule including test and verification planning and PDR prep, and the Orion Ops Directive that moved tasks that will be replanned and the delay development of Post DD-250 procedures.
	Impact	Schedule dates to be moved after receipt of Ops Directive, potential EAC impact with other non-planned tasks. Negative schedule variance will continue until PA-1 environments issues are resolved.
	Corrective Action	An SIA event will be held in June to evaluate impacts related to reducing the number of flight tests.
WBS 1.06.04.06	Cause	The unfavorable variance is due to PA-1 Shock & Vibe test not occurring in March due to Canard Stop Work which slipped canard testing. Additional variance is caused by later than baseline start on AA-1 Integration. Integration was delayed due to design and requirement changes (ALAS, CLA5a).
	Impact	The impact caused by the Canard Stop Work will have be minimal. Expected that this test will not be needed. Waiting to receive direction from LM before full impacts of Stop Work can be assessed. AA-1 schedule variance will continue to grow as assessments on CLA5 loads are completed. Any additional changes to design or requirements will negatively effect schedule.
	Corrective Action	PA-1 variance caused by the Canard Stop Work CAM will work with PM office to ensure once direction is received from LM the control account reflects changes. AA-1 Orbital CAM will adjust control account once proposal is completed and accepted by LM.
WBS 1.10.01	Cause	Unfavorable variance due to the USA subcontract CPR error, unplanned work to keep PA-1 on schedule including test and verification planning and PDR prep, and the Orion Ops Directive that moved tasks that will be replanned.
	Impact	Schedule dates to be moved after receipt of Ops Directive.
	Corrective Action	USA has planned a lean event to determine the disconnect between their flash data and their final CPR.
WBS 1.06.02.06	Cause	Unfavorable schedule variance because Build schedule was not re-assessed at the beginning of RW3 and manufacturing is due to delinquent Engineering reviews and delays in releasing GTA engineering drawings.
	Impact	The lack of definitive requirements, ICDs more force futher rework. GTA engineering release slips will impact on dock delivery dates
	Corrective Action	Re-spread the BCWS in the next baseline for RW3, releasing tool orders to Interface Definition Agreements (IDAs), expedite the release of Engineering drawings through the Structured Improvement Activity (SIA).



FY08 Assessment Performance



Orion Project Office



	Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
FY08 Plan - By Period												
Prime - Plan	64	62	62	63	62	71	69	70	75	70	76	78
Non-Prime - Plan	23	23	25	29	32	28	32	32	31	33	33	88
Plan Total	87	85	87	92	95	99	101	101	105	103	109	166
FY08 Assessment												
Prime - Assess	73	55	59	64	64	64	65	65	65	67	67	68
Non-Prime - Assess	20	24	23	16	18	22	23	26	26	27	27	59
Assess Total	93	79	82	80	82	86	88	91	91	94	94	127
FY08 Actuals												
Prime - Act	73	55	62	56	75	92	85	79				
Non-Prime - Act	20	24	20	22	20	32	24	29				
Actual Total	93	80	82	78	95	124	109	108				
FY08 Plan - Cumulative												
Prime - Plan	64	126	188	251	314	384	453	523	597	668	743	821
Non-Prime - Plan	23	46	70	99	131	160	191	223	254	287	320	408
Plan Total	87	172	258	350	445	544	644	746	851	954	1,063	1,229
FY08 Assessment												
Prime - Assess	73	128	187	251	315	379	444	509	574	641	708	776
Non-Prime - Assess	20	44	67	83	101	123	146	172	198	225	252	311
Assess Total	93	172	254	334	416	502	590	681	772	866	960	1,087
FY08 Actuals												
Prime - Act	73	129	190	246	321	413	498	577				
Non-Prime - Act	20	44	65	86	107	139	163	192				
Actual Total	93	173	255	333	428	552	661	769				

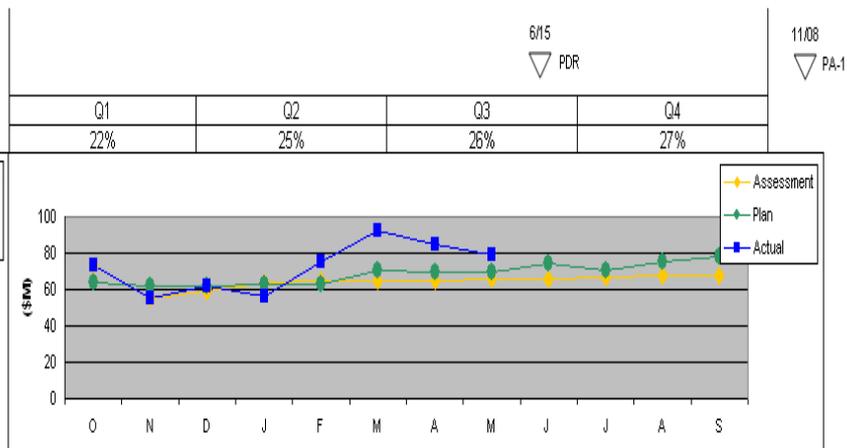
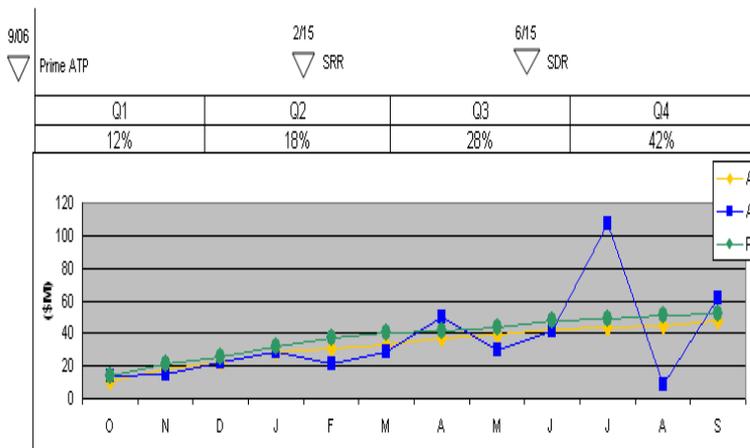
• Estimated FY08 Prime Fee included in Assessment and Actuals (\$50M)



Assessment – Orion Prime Only



Orion Project Office



	O	N	D	J	F	M	A	M	J	J	A	S	Total	O	N	D	J	F	M	A	M	J	J	A	S	Total
Plan	14	22	25	32	38	40	42	43	47	49	51	52	453	64	62	62	63	62	71	69	70	75	70	76	78	821
Assessment	11	18	22	28	31	33	38	39	43	43	45	48	398	73	55	59	64	64	64	65	65	65	67	67	68	779
Actual	14	15	22	28	21	29	50	30	42	107	9	62	427	73	55	62	56	75	92	85	79					577

Notes:

Through May, the Prime is over running our EOY Assessment to date by \$68M (13%) due to increased spending on the Orbital Subcontract (motor issues) and aggressive spending to meet project milestones (PDR/PA-1).

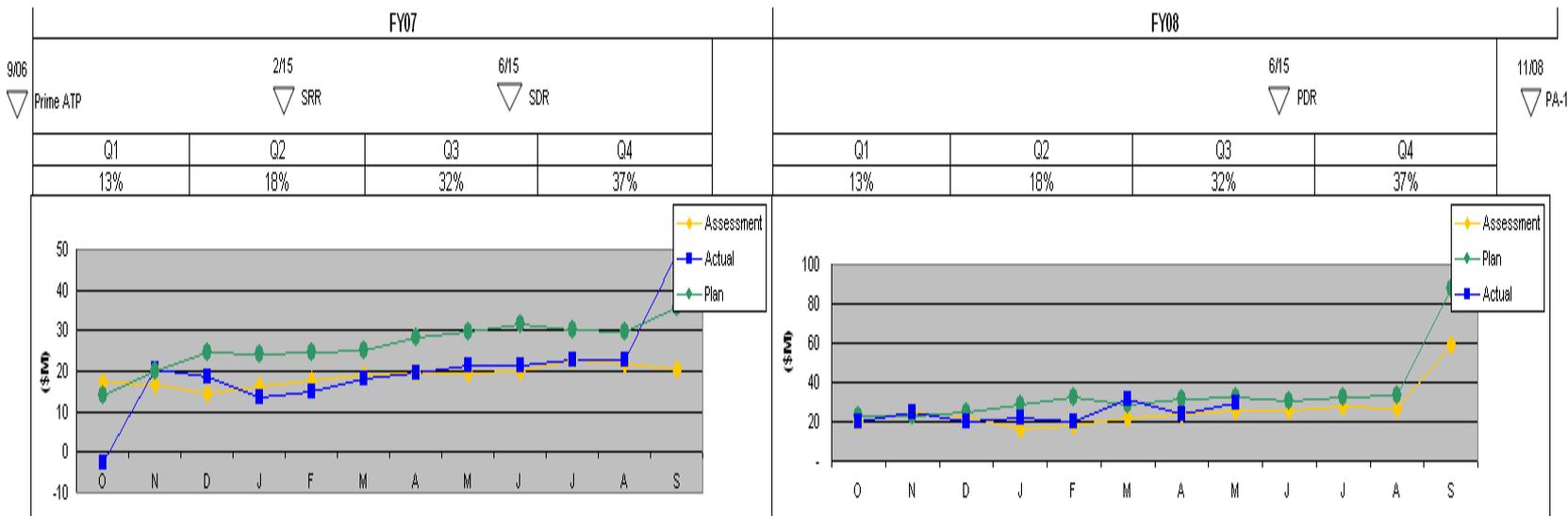
We are now expecting the Prime to have a monthly burn rate of \$75M, and spend \$891M for FY08.



Assessment – Orion Non-Prime Only



Orion Project Office



	O	N	D	J	F	M	A	M	J	J	A	S	Total	O	N	D	J	F	M	A	M	J	J	A	S	Total
Plan	14	20	24	24	25	25	28	30	32	30	30	36	318	23	23	25	29	32	28	32	32	31	33	33	68	408
Assessment	17	17	15	17	18	19	20	19	20	23	22	20	227	20	24	23	16	18	22	23	26	26	27	27	59	311
Actual	-2	20	19	14	15	18	20	21	22	23	23	49	240	20	24	20	22	20	32	24	29					192

Notes:

Non-Prime spending through May is over running our EOY estimate to date by \$20M (12%), but we are still expecting spending to be in line with our EOY target.

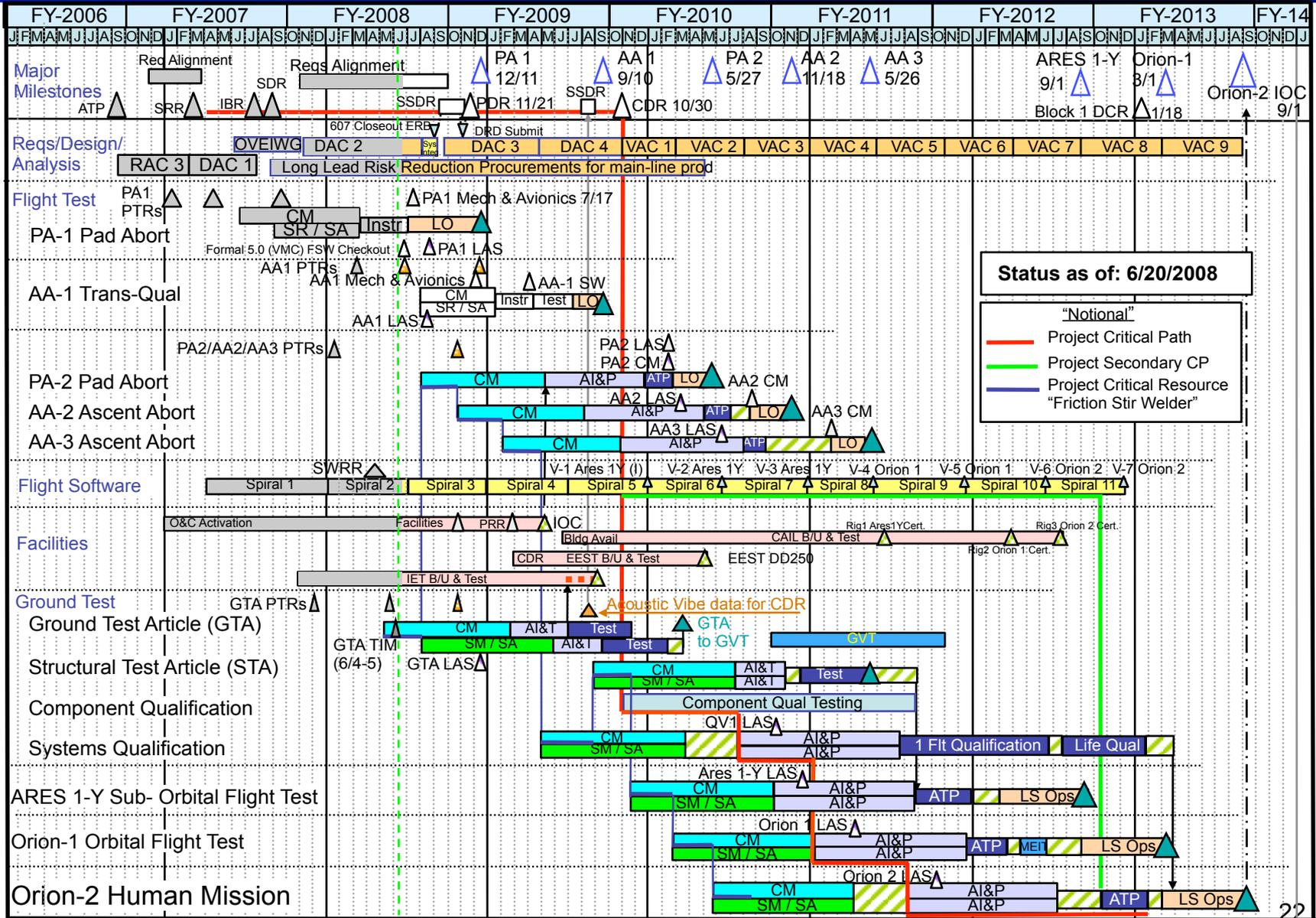


Orion Master Summary Schedule

(PMR08 Rev0)



Orion Project Office

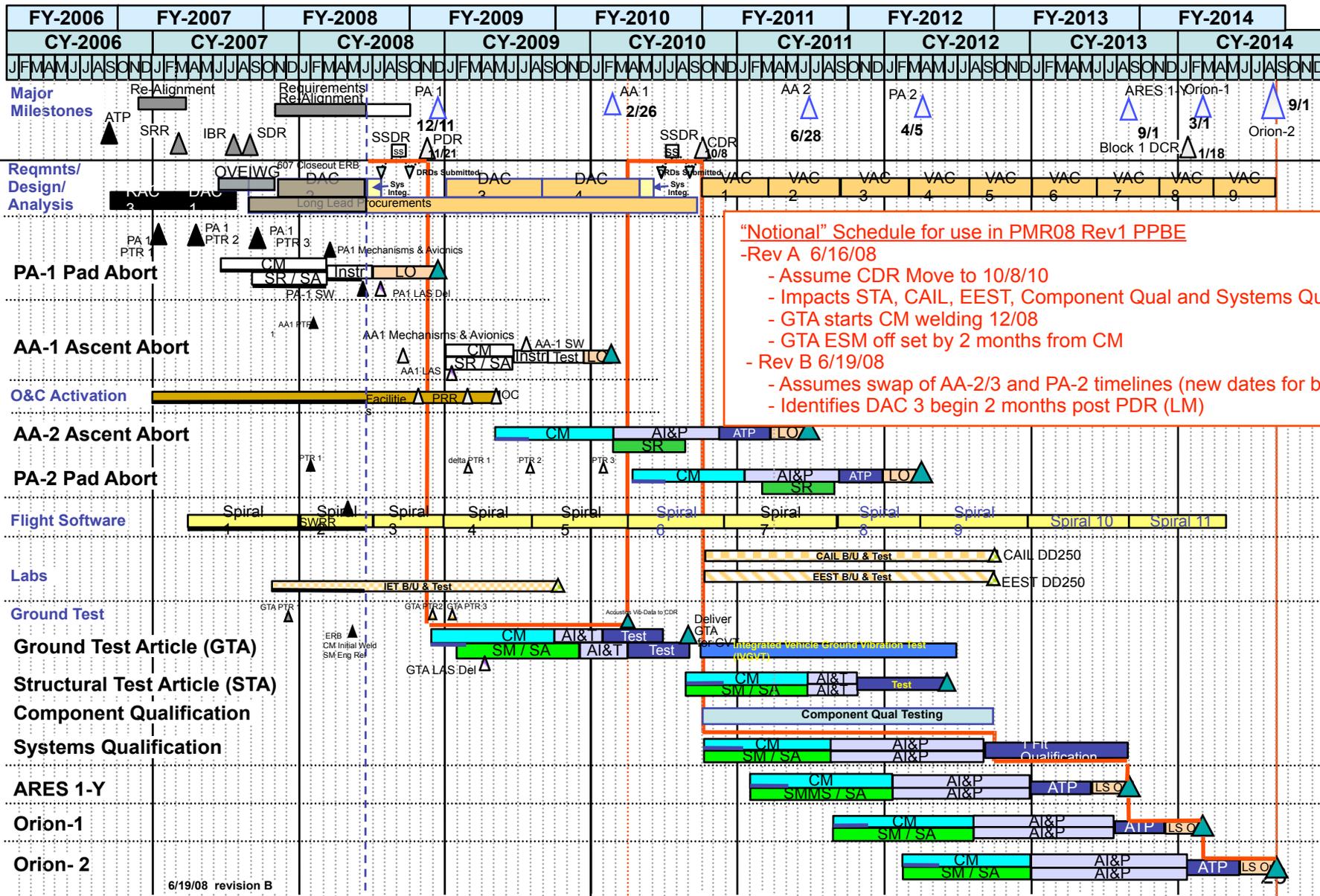




Orion Master Summary Schedule



Notional - PMR08 R1



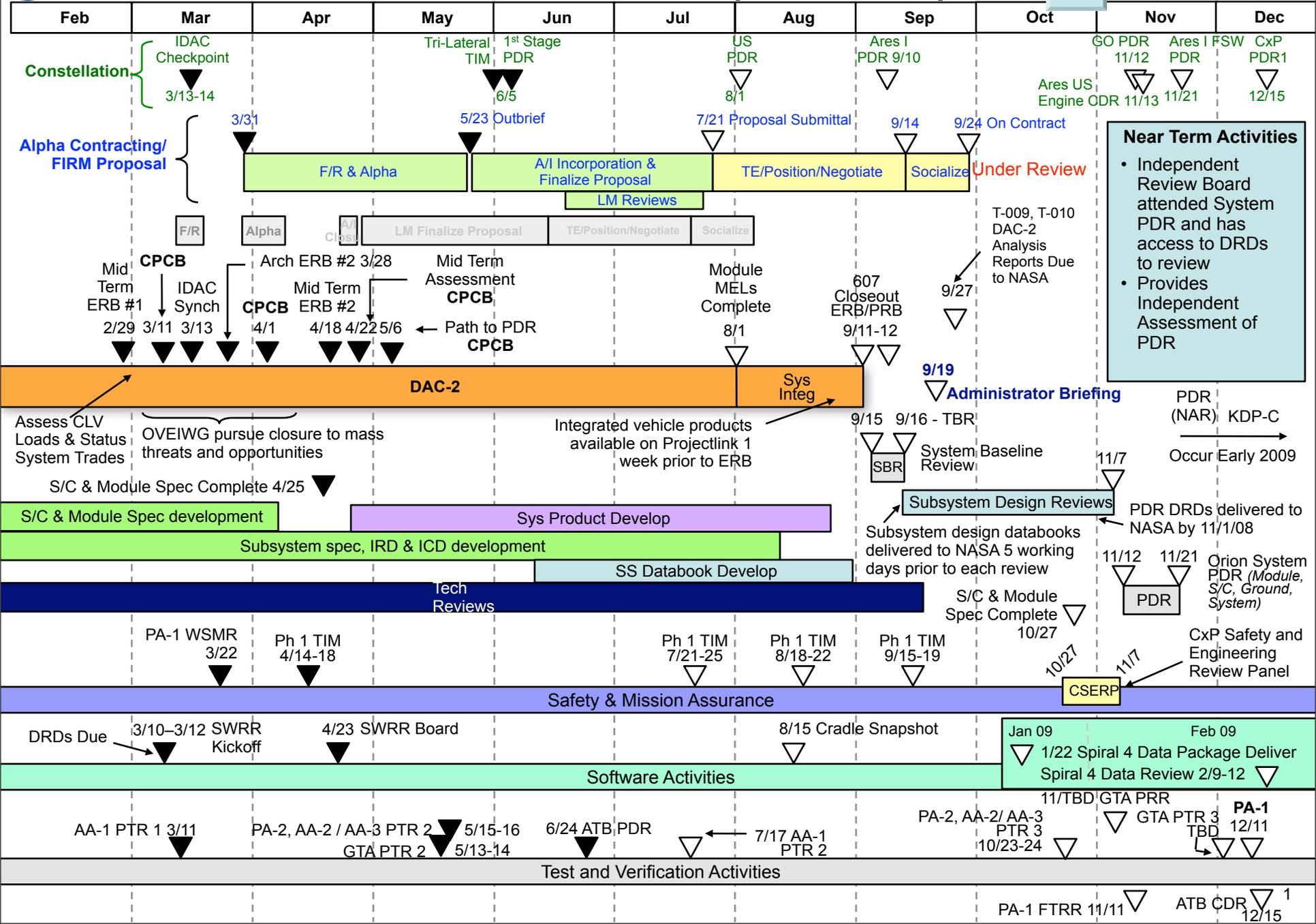
"Notional" Schedule for use in PMR08 Rev1 PPBE

- Rev A 6/16/08
 - Assume CDR Move to 10/8/10
 - Impacts STA, CAIL, EEST, Component Qual and Systems Qual
 - GTA starts CM welding 12/08
 - GTA ESM off set by 2 months from CM
- Rev B 6/19/08
 - Assumes swap of AA-2/3 and PA-2 timelines (new dates for both)
 - Identifies DAC 3 begin 2 months post PDR (LM)

Orion Project Office



Current PDR Schedule (6/18 1247)



Near Term Activities

- Independent Review Board attended System PDR and has access to DRDs to review
- Provides Independent Assessment of PDR

T-009, T-010
DAC-2
Analysis Reports Due to NASA

Subsystem design databooks delivered to NASA 5 working days prior to each review

Orion System PDR (Module, S/C, Ground, System)

CxP Safety and Engineering Review Panel



Technical Performance



	TPM Title	TPM Reqt	Current Analysis	% Margin May	Change From Previous Analysis	Orion Risk
	Spacecraft Mass (GLOM ISS FOC)	27232	26943	1.1%	↑	
	CM Mass (GLOM ISS FOC)	9526	9742	-2.3%	↑	
	SM Mass (GLOM ISS FOC)	10447	9819	6.0%	→	
	LAS Mass (GLOM ISS FOC)	7260	7383	-1.7%	↑	
	Spacecraft Mass (GLOM Lunar Sortie)	30140	30999	-2.9%	↓	1119
	CM Mass (GLOM Lunar Sortie)	8732	9081	-4.0%	→	1119
	SM/SA/SAJ Mass (GLOM Lunar Sortie)	14149	14535	-2.7%	↓	1119
	LAS Mass (GLOM Lunar Sortie)	7260	7383	-1.7%	→	1119
	Power (Lunar) (LLO Mated w/ LSAM)	5672	5136	9%	→	
	Software					
	Instrumentation					
	Manufacturing Operability					
	O&C AI&P Days Turnaround	TBD	214	N/A	N/A	
	LAS Manufacturing Turnaround	TBD	63	N/A	N/A	
	MAF Flowtime	TBD	TBD	TBD	TBD	



Technical Performance, cont.



Orion Project Office

	TPM Title	TPM Reqt	Current Analysis	% Margin May	Change From Previous Analysis	Orion Risk
	Ground Ops					
	Orion/LAS Integration – hrs	67	90	-34%	TBD	
	LRU Accessibility	TBD	TBD	TBD	TBD	
	Recent Update – •To improve operability for Orion/LAS Integration, a new LAS integration baseline, to install the LAS W-Truss and Fillet panels during AI&P, instead of in VAB. •Estimated reduction: 10-15 hours from Current Analysis					
	Flight Ops					
	TBD					
	LOC/LOM					
	ISS LOC	1/1850	1/231	-87.5%		2669
	ISS LOM	1/250	1/19	-92.4%		2669
	Lunar Sortie LOC	1/200	1/170	-15.0%		2669
	Lunar Sortie LOM	1/50	1/9	-82.0%		2669
	Work Injuries	0	0	0		
	PA-1 PTR3 Action Item Burndown	0	10	N/A		
	Change Request Metrics	0	4	N/A		



Orion PDR Progress Metrics as of 6/27/08



The metrics below tally the number of Tech Reviews, Peer Reviews, Engineering review Boards (ERBs), and Software Requirements Control Panels (SRCPs) associated with Orion Preliminary Design review (PDR) DRD deliverables. Orion SEIT tracks and confirms each review to ensure deliverables are meeting milestones and are on schedule to successfully complete prior to PDR.

The **first set** of numbers on the left gives metrics for the set of production documents which is contractually deliverable relative to any milestone between now and the end of the year.

A **second set** of numbers on the right gives metrics for the smaller set of production documents which is specifically deliverable relative to Orion PDR in November.

Document Milestones	Deliverables Relative to All Upcoming Production Milestones (Through December)			Deliverables Relative to PDR Only		
	Scheduled to be held by today	Confirmed as held by today	Total milestones remaining as confirmed	Scheduled to be held by today	Confirmed as held by today	Total milestones remaining as held
Tech Reviews	79	57	1038	8	9	291
Peer Reviews	33	22	283	1	1	219
Engineering Review Boards	0	0	2	0	0	2
Software Requirements Control Panels	0	0	180	0	0	0
Document Deliveries	53	14	343	0	0	300



Emerging Issues

- O&C Roof Leakage into Highbay – damage assessment in work (1500-9000 sq ft of sheetrock may need to be replaced)
- The PA-1 LAS Attitude Control Motor delivery will be delayed full impacts available at QPMR.





Accomplishments



- Scrubbed FY 08 content to meet FY08 spending target and developed a strategy to meet PMR 08 R1 product deliveries
 - Initiated an evaluation of an updated Orion Abort Flight Test Program (Deleted AA-3, Swapped AA-2, PA-2 in sequence and slipped >1yr)
- Completed the initial LAS ACM HT-7 Failure Investigation Team outbrief. [LAS Video Clip and Charts](#)
- Completed the Parachute Cluster Development Test 3 (CDT-3). CDT-3 tested a skipped reefing stage in the drogue, a two main chute deployment, and the drogue 80% reefing stage proposed for PA-1
- Completed LIDS initial Dynamic test runs in building 9 6DOF facility, demonstrating capture throughout the capture envelope. [LIDS video clip](#)
- Conducted Arcjet testing in support of alternate CM Backshell TPS material.
 - Based on this testing a recommendation to change the TPS material on the CM lower windward Backshell panel from PICA to AETB-8 tile material with TUF/RCG coating (mass reduction of 67 pounds).
- [Successfully test fired a 36-inch-long igniter for the abort motor at ATK in Promontory, Utah, and poured the PA-1 Abort Motor.](#)
- Initiated Seat and Harness testing at WPAFB on an acceleration sled.
 - 20G pulses to simulate “off-nominal” loads were applied, acceleration measurements of an instrumented dummy in an ACES suit were recorded to refine models. [Seat Sled Video](#)
- [Completed GRC SPF acoustic test facility foundation pours #1 and #2, and selected MVF implementation option for ALTAIR.](#)
- Awarded support contract for the Lunar Environment Arcjet Facility (LEAF) to ASE/ITT.
- Developed the Orion PDR Process Plan
 - PDR plan includes System Baseline Review, Subsystem Design Reviews, and the System and Module PDR Board.
- Completed the plan for development of a new Communications and Tracking (C&T) architecture implementing phased array antenna technology.
 - System Requirements Review (SRR) and System Definition Review (SDR) in October/November
 - Delta Preliminary Design Review (PDR) in April '09.
- Developed Orion HRR and Fly-ability implementation plans and are currently conducting Road Shows to obtain Program and Agency buy-in.
- Supported the Cx Data Architecture Meeting – [Orion DA Accomplishments to date](#)



Upcoming Milestones

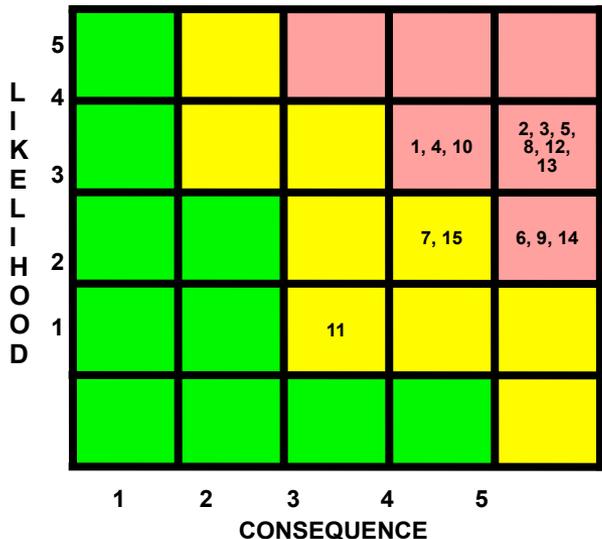


- 7/1 CPAS SRR Kickoff
- 7/8 CAIL B29 construction Notice to Proceed
- **7/9 ORION HITL and Radiation briefings to the NAC**
- 7/15-17 AA1 PTR#2 @ DFRC
- 7/15-18 CAIL PDR Technical Review #2
- 7/15 ICCA SRR Board
- **7/16 PMR08 R1 briefing to Cx**
- 7/16 Table Top Review of Avionics Power Scrub Decision Packages
- 7/22 Delivery of Jettison Interstage Assembly to WSMR
- **7/24 Nominal Land Landing Assessment Outbrief**
- 7/28 CAIL B29 demolition start
- 7/28 Orion Risk Board
- **7/29-30 CPAS Gen1 Parachute Cluster test #2 - Gen 1 PTV Full Sys Test**
- 7/31 CPAS Gen 1 Pilot Mortars shock testing
- **8/1 DAC 2 Module MELs Complete**
- 8/5 Delivery of Nose Cone Assembly to WSMR
- 8/15 Delivery of Adapter cone to WSMR
- 8/19 CPAS SRR Board
- 8/29 Delivery of the Abort Motor to WSMR
- 9/9 Delivery of the Canard Interstage
- **9/11-12 PDR DAC Closeout ERB**
- **9/15-16 SBR**
- **9/24 (Under Review) CCO 24 Definitization**
- **11/12-21 PDR**
- **11/TBD GTA Production Readiness Review**
- **12/3 GTA First Weld**



Top Risk List CEV

Wednesday, June 25, 2008



- New Risk 2784: [Orion Data Network Technology Maturation](#)
- Consolidated all CCO24 related costs into Risk 1859 will be retiring 1400 at the next Risk Board

Legend

- ↓ Decreasing (Improving)
- ↑ Increasing (Worsening)
- Unchanged
- \$ Cost Threat (Level 1, 2, 3)
- ▲ Top Directorate Risk (TDR)
- Top Program Risk (TPR)
- ◆ Top Project Risk (TPProjR)

Rank	Trend	Title	Owning Team	Likelihood	Consequence			
					SAFE	PERF	SCHED	COST
1	→	■ 1119 - CEV Control Mass Effectiveness	CEV VIO Analysis	4	1	4	3	4
2	→	▲ 1401 - First Crewed Lunar Return without adequate ground or flight test qualification plan	CEV CM GEM TPS ADP	4	5	4	5	4
3	↑	◆ 1166 - Thermal Protection System (TPS) material, environment, and integration issues \$ ³	CEV CM GEM TPS ADP	4	0	4	5	0
4	→	▲ 1236 - LAS Development for PA-1	CEV LAS	4	2	4	4	4
5	→	■ 1230 - Orion Vehicle Vibroacoustic Environments \$¹	CEV VIO Sys	4	1	3	5	3
6	→	◆ 1859 - CEV Contract Alignment Cost (Level I Threat) \$¹	CEV PPC	3	0	0	4	5
7	→	◆ 1400 - CEV Contract Alignment Cost (Level II Threat) \$²	CEV PPC	3	1	3	3	4
8	→	◆ 2635 - Contingency Land Landing	CEV CM CEM LRS	4	5	4	4	4
9	→	◆ 2583 - CEV Impacts Due to Thrust Oscillation \$³	CEV VIO Sys Str-Mec-Thrm	3	5	5	5	5
10	↑	◆ 1115 - CEV software development cycle may not meet project schedules.	CEV VIO Avncs	4	1	2	4	3
11	→	◆ 1223 - Requirements Maturation - CEV	CEV VIO	2	0	3	3	3
12	→	◆ 1755 - Orion Life Cycle Cost (LCC)	CEV PPC	4	0	0	0	5
13	→	◆ 1505 - Loss of docking adapter due to failure of relative navigation system	CEV VIO FD GNC	4	4	4	5	4
14	→	◆ 2669 - Inability to Achieve LOC/LOM Requirements	CEV SRQA	3	2	5	5	5
15	→	◆ 2113 - Encapsulated Service Module Fairing Separation Shock/Debris Affecting CLV	CEV SM	3	0	4	4	4

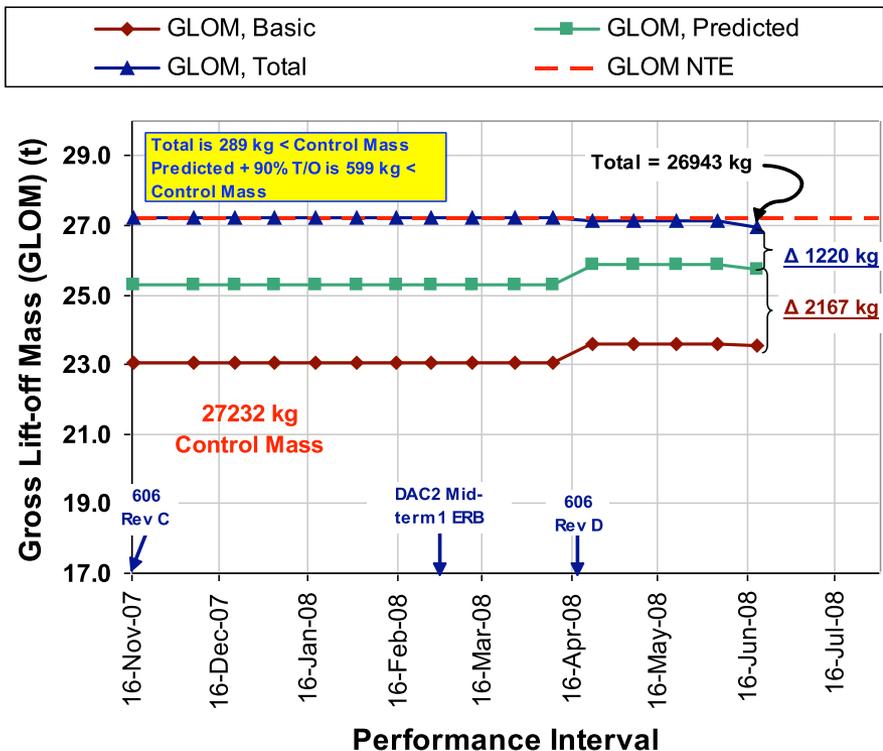


Metrics



Orion Spacecraft Mass Trend

GLOM – ISS FOC



Total Mass change Since Last Report: -103 kg

90th Percentile Threats & Opps: 910 kg

Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

Major Threats* **

		Cat.	Mass Δ (kg)
LAS	DAC-2 Loads Impact on ORB Structures	5	242
CM, SM	Component Loads	3	181
CM	L/D Ballast	3	136
LAS	0.5" Displacement Limit	4	77
LAS	Performance changes to motors	2	136
LAS	Increased Acoustic Blankets	5	40
CM	LIDS MMOD ISS	5	30
CM, SM	DFI Instrumentation	2	88
LAS	Fairing Assembly Paint	5	29
LAS	LAS Raceway	3	50

Major Opportunities*

		Cat.	Mass Δ (kg)
LAS, CM	Decreased LAS Loads	4	-152
SA, SAJ	6 Ply Face Sheets	3	-79
LAS	Canard Section Redesign	4	-45
SM	Full COPVs (SM-Prop)	2	-77
SM	CM-SM Loads Relief	3	-45
SM	2-Loop ATCS	3	-45
CM	Increase Heatshield bondline temp	3	-45
SA, SAJ	SA W-Truss Revisited	3	-45
SM	Upstream Tank Depletion Mitigation	4	-32
CM	Wire Shielding Material	3	-33

Changes Incorporated this Period

		Mass Δ (kg)
LAS	LAS Updates to ISS FOC	-18
CM	CM Updates to ISS FOC	-106
SM	SM Updates to ISS FOC	30
SA	SA Updates to ISS FOC	-4
SAJ	SAJ Updates to ISS FOC	-4

ISS IC assumes 6 crew members and associated equipment.

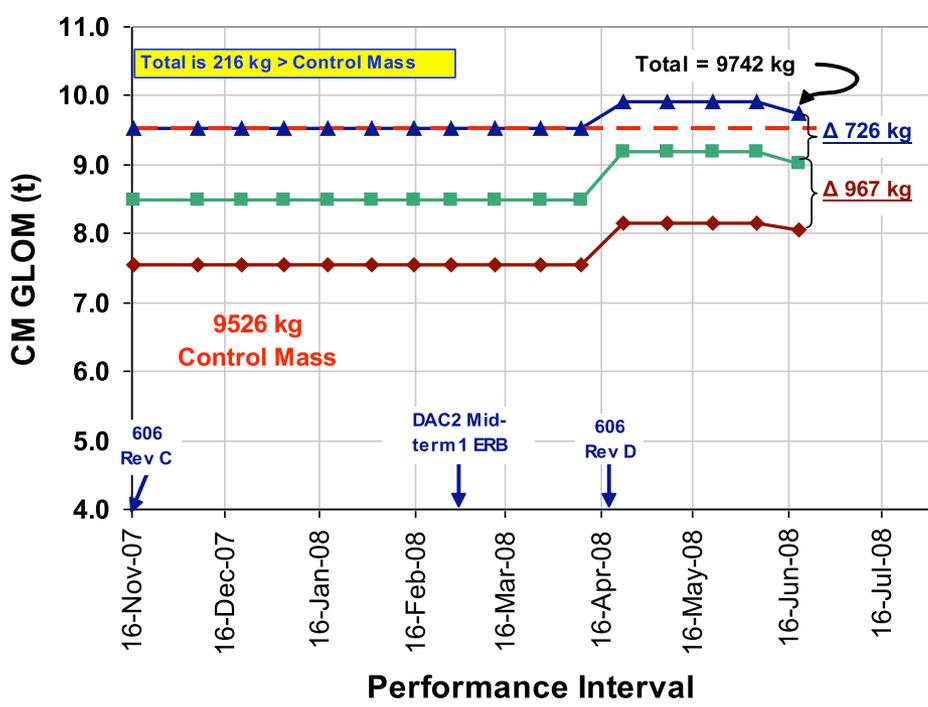
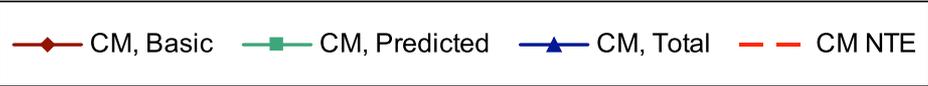
* Threats and Opportunities and SWEL data current as of 6/19/2008

** A 0 kg threat *does* exist for Thrust Oscillation.



CM Mass Trend

GLOM – ISS FOC



Major Threats*		Cat.	Mass Δ (kg)
CM	Component Loads	3	91
CM	L/D Ballast	3	136
CM	LIDS MMOD ISS	5	30
CM	DFI Instrumentation	2	74
CM	Add RCS Roll Control Requirements for ALAS	2	5

Major Opportunities*		Cat.	Mass Δ (kg)
CM	Decreased LAS Loads	4	-36
CM	Increase Heatshield bondline temp	3	-45
CM	Wire Shielding Material	3	-33
CM	Lower ISS L/D	3	-25
CM	Audio Control/Audio Interface Units	5	-13

Changes Incorporated this Period		Mass Δ (kg)
CM	CM Updates to ISS FOC	-106

Total Mass change Since Last Report: -106 kg

Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

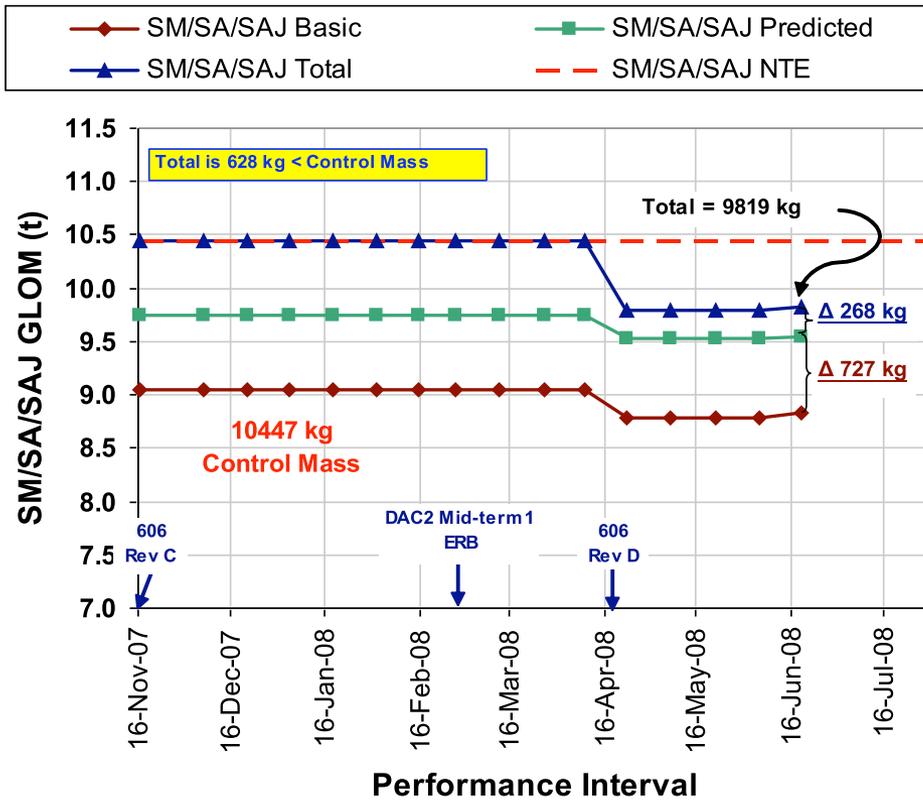
ISS IC assumes 6 crew members and associated equipment.

* Threats and Opportunities and SWEL data current as of 6/19/2008



SM/SA/SAJ Mass Trend

GLOM – ISS FOC



Total Mass change Since Last Report: +22 kg

Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

Major Threats*

		Cat.	Mass Δ (kg)
SM	Component Loads	3	91
SM	DFI Instrumentation	2	13
SM	Propellant and Tank Sizing Refinements	2	82
SM	Secondary Structure Mass	3	45
SM	Thruster Plume Impacts on Solar Array	3	36

Major Opportunities*

		Cat.	Mass Δ (kg)
SM	6 Ply Face Sheets	3	-79
SM	Full COPVs (SM-Prop)	2	-77
SM	SA W-Truss Revisited	3	-45
SM	2-Loop ATCS Refinement	3	-45
SM	CM-SM Loads Relief	3	-45

Changes Incorporated this Period

		Mass Δ (kg)
SM	SM Updates to ISS FOC	30
SA	SA Updates to ISS FOC	-4
SAJ	SAJ Updates to ISS FOC	-4

ISS IC assumes 6 crew members and associated equipment.

* Threats and Opportunities and SWEL data current as of 6/19/2008

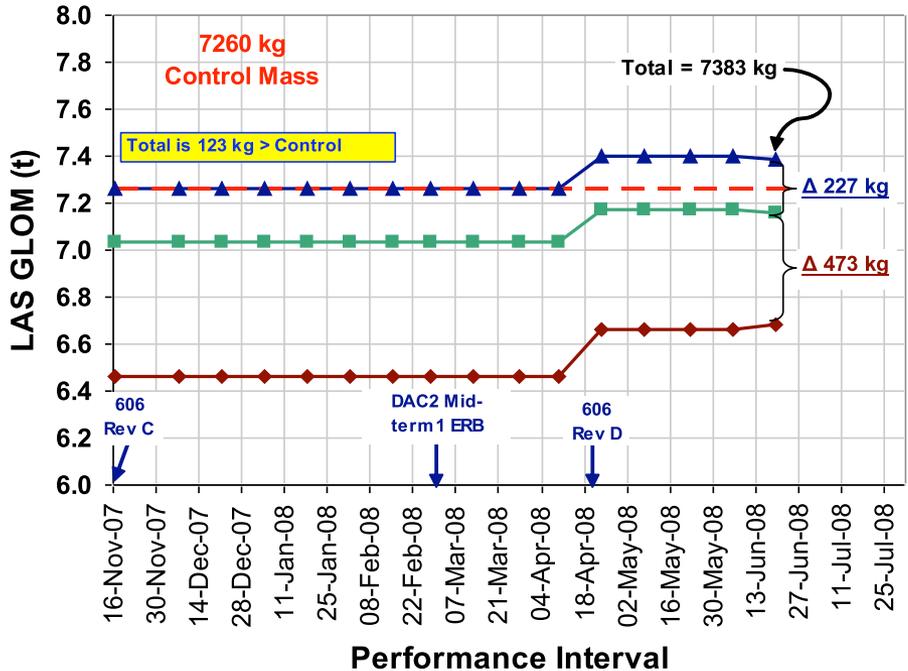
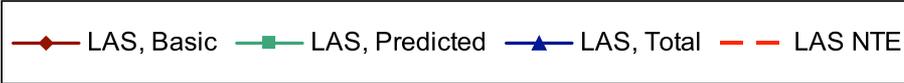


LAS Mass Trend

GLOM – ISS FOC



Orion Project Office



Major Threats*		
		Cat. Mass Δ (kg)
LAS	DAC-2 Loads Impact on ORB Structures	5 242
LAS	0.5" Displacement Limit	4 77
LAS	Performance changes to motors	2 136
LAS	Increased Acoustic Blankets	5 40
LAS	Fairing Assembly Paint	5 29

Major Opportunities*		
		Cat. Mass Δ (kg)
LAS	Decreased LAS Loads	4 -36
LAS	Canard Section Redesign	4 -45
LAS	AM Reduced Thrust	3 -23
LAS	Redesign Hatch/Hatch Frame/Platform	3 -20
LAS	ACM Titanium Case & Closure	3 -18

Changes Incorporated this Period		Mass Δ (kg)
LAS	LAS Updates to ISS FOC	-18

Total Mass change Since Last Report: -18 kg

Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

ISS IC assumes 6 crew members and associated equipment.

* Threats and Opportunities and SWEL data current as of 6/19/2008

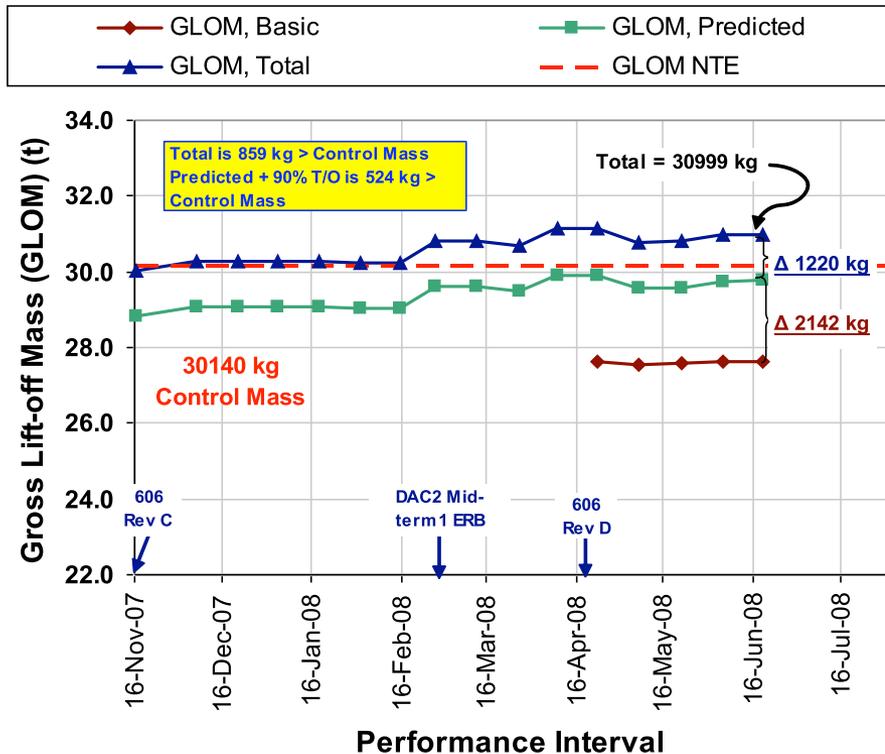


Orion Spacecraft Mass Trend

GLOM – Lunar Sortie



Orion Project Office



Major Threats* **		Cat.	Mass Δ (kg)
LAS	DAC-2 Loads Impact on ORB Structures	5	242
CM,SM	Component Loads	3	181
CM	L/D Ballast	3	136
LAS	0.5" Displacement Limit	4	77
CM, SM	Radiation Shielding	3	102
LAS	Performance changes to motors	2	136
LAS	Increased Acoustic Blankets	5	40
CM,SM	DFI Instrumentation	2	88
LAS	Fairing Assembly Paint	5	29
LAS	LAS Raceway	3	50

Major Opportunities*		Cat.	Mass Δ (kg)
SM	Fail-safe Analysis Assumption	4	-136
LAS,CM	Decreased LAS Loads	4	-152
SA,SAJ	6 Ply Face Sheets	3	-79
LAS	Canard Section Redesign	4	-45
SM	Full COPVs (SM-Prop)	2	-77
SM	CM-SM Loads Relief	3	-45
SM	2-Loop ATCS Refinement	3	-45
CM	Increase Heatshield bondline temp	3	-45
SA	SA W-Truss Revisited	3	-45
SM	Upstream Tank Depletion Mitigation	4	-32

Changes Incorporated this Period		Mass Δ (kg)
SA	Structures Design Refinements	40
SAJ	Structures Design Refinements	-11
SM	Structures Adhesive estimate update	-10
SM	Wiring estimate updates	-6
SM	Miscellaneous SM Changes	9
CM	Wiring estimate updates	29
CM	Structures changes	-26
CM	Miscellaneous CM Changes	3

Total Mass change Since Last Report: +29 kg

90th Percentile Threats & Opps: 885 kg

Date: 6/26/2008 (TCSR)

Orion MP Lead: Jim Geffre (NASA)

Next Update: 7/8/2008 (CPCB)

Tim Booth (LM)

* Threats and Opportunities and SWEL data current as of 6/19/2008

** A 0 kg threat *does* exist for Thrust Oscillation.

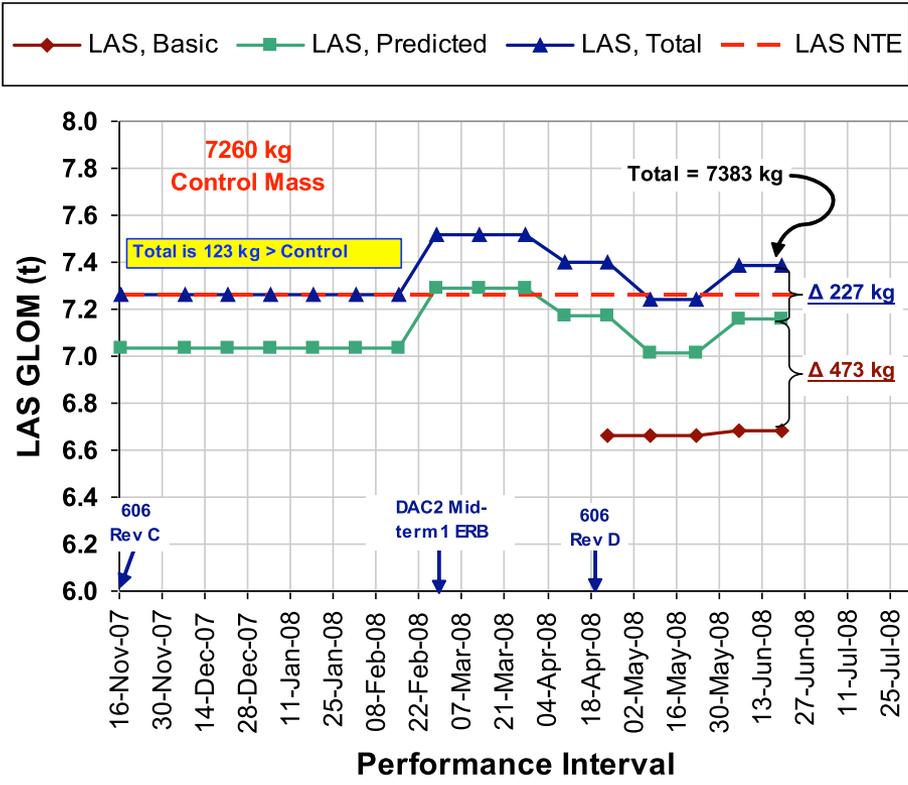


LAS Mass Trend

GLOM – Lunar Sortie



Orion Project Office



Major Threats*

		Cat.	Mass Δ (kg)
LAS	DAC-2 Loads Impact on ORB Structures	5	242
LAS	0.5" Displacement Limit	4	77
LAS	Performance changes to motors	2	136
LAS	Increased Acoustic Blankets	5	40
LAS	Fairing Assembly Paint	5	29

Major Opportunities*

		Cat.	Mass Δ (kg)
LAS	Decreased LAS Loads	4	-36
LAS	Canard Section Redesign	4	-45
LAS	AM Reduced Thrust	3	-23
LAS	Redesign Hatch/Hatch Frame/Platform	3	-20
LAS	ACM Titanium Case & Closure	3	-18

Changes Incorporated this Period

None	Mass Δ (kg)
None	

Total Mass change Since Last Report: 0 kg

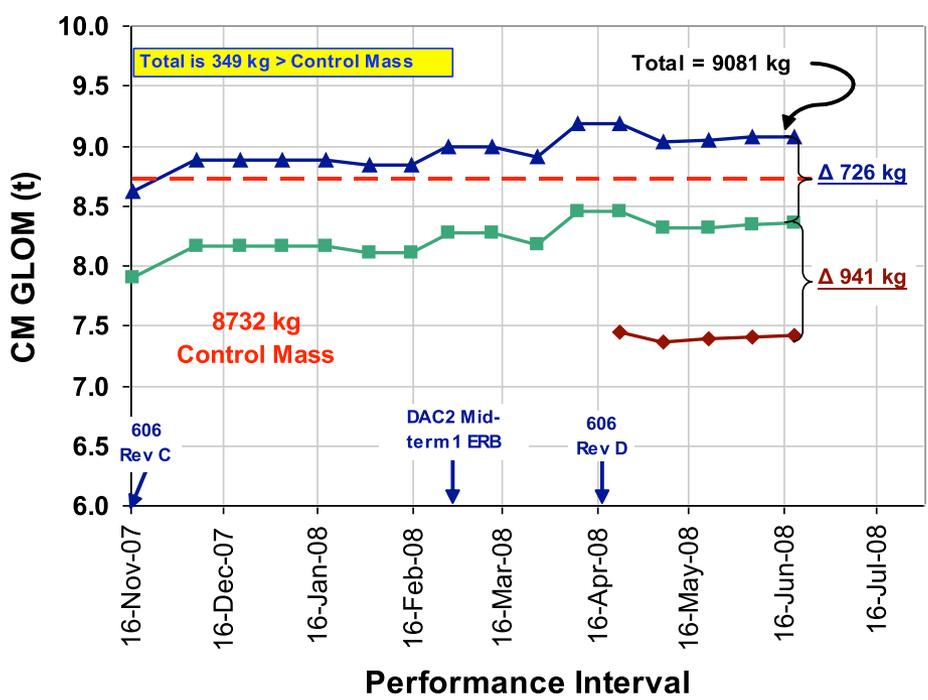
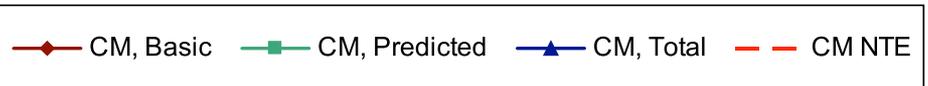
Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

* Threats and Opportunities and SWEL data current as of 6/19/2008



CM Mass Trend

GLOM – Lunar Sortie



Major Threats*

		Cat.	Mass Δ (kg)
CM	Component Loads	3	91
CM	L/D Ballast	3	136
CM	Radiation Shielding	3	102
CM	DFI Instrumentation	2	74
CM	Add RCS Roll Control Requirements for ALAS	2	5

Major Opportunities*

		Cat.	Mass Δ (kg)
CM	Decreased LAS Loads	4	-36
CM	Increase Heatshield bondline temp	3	-45
CM	Wire Shielding Material	3	-33
CM	Audio Control/Audio Interface Units	5	-13
CM	CM/SM Separation Interface	3	-23

Changes Incorporated this Period

		Mass Δ (kg)
CM	Wiring estimate updates	29
CM	Structures Changes	-26
CM	Miscellaneous CM Changes	3

Total Mass change Since Last Report: +6 kg

Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

* Threats and Opportunities and SWEL data current as of 6/19/2008

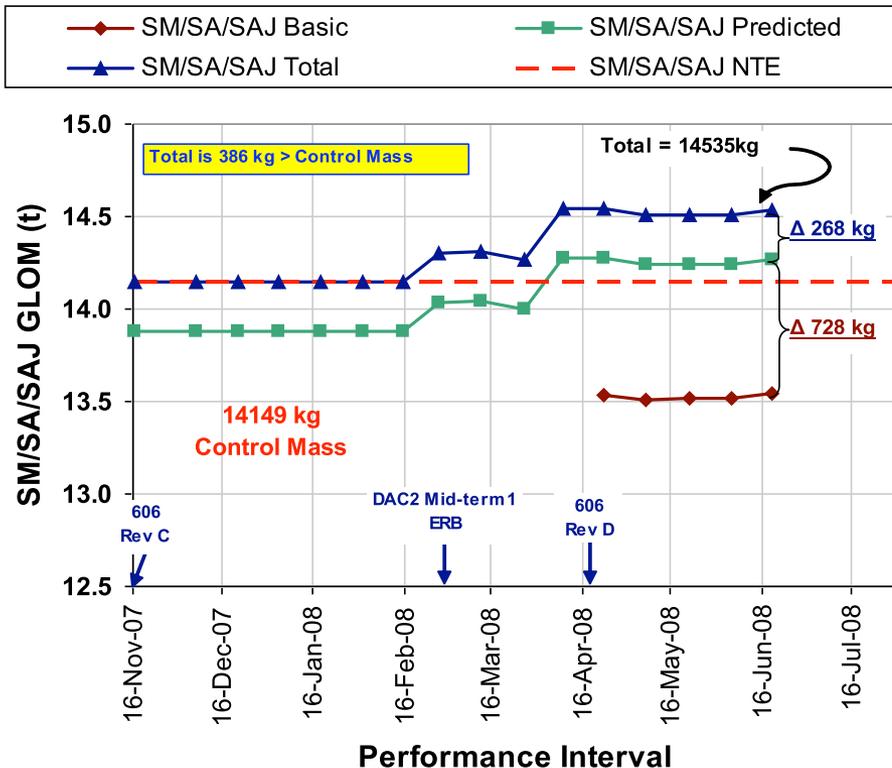


SM/SA/SAJ Mass Trend

GLOM – Lunar Sortie



Orion Project Office



Major Threats*

		Cat.	Mass Δ (kg)
SM	Component Loads	3	91
SM	DFI Instrumentation	2	13
SM	Propellant and Tank Sizing Refinements	2	82
SM	Secondary Structure Mass	3	45
SM	Thruster Plume Impacts on Solar Array	3	36

Major Opportunities*

		Cat.	Mass Δ (kg)
SM	Fail-safe Analysis Assumption	4	-136
SM	6 Ply Face Sheets	3	-79
SM	Full COPVs (SM-Prop)	2	-77
SM	SA W-Truss Revisited	3	-45
SM	2-Loop ATCS Refinement	3	-45

Changes Incorporated this Period

		Mass Δ (kg)
SA	Structures Design Refinements	40
SAJ	Structures Design Refinements	-11
SM	Structures Adhesive estimate update	-10
SM	Wiring estimate updates	-6
SM	Miscellaneous SM Changes	9

Total Mass change Since Last Report: +23 kg

Date: 6/26/2008 (TCSR) Orion MP Lead: Jim Geffre (NASA)
 Next Update: 7/8/2008 (CPCB) Tim Booth (LM)

* Threats and Opportunities and SWEL data current as of 6/19/2008



SM,SA, SAJ PDR Opportunity Summary



- Potential SM Opportunities to be implemented by PDR**

Opportunity	Un-weighted Mass (Lbm)	Implementation date	Probability
5- SM Loads Relief	-100 (SM)	Start decrease on 8/1/2008	4
19 – FPR Analysis refinement	-60 (SM)	8/1/2008	4
3 – Fail Safe Analysis Assumption	-300 (SM)	8/1/2008	3
Spacecraft Separation Mechanisms Spring Material Change	-36 (SA)	6/25/2008	4
Solar Array Drive Eddy Current Damping	-40 (SM)	8/15/2008	4
6 ply vs 8 ply facesheets	-50 (SA)	7/9/2008	3
6 ply vs 8 ply facesheets	-125 (SAJ)	7/26/2008	3
Reduced Adhesive Thickness	-22 (SM)	7/9/2008	3
Reduced Adhesive Thickness	-14 (SA)	7/9/2008	3
Reduced Adhesive Thickness	-27 (SAJ)	7/9/2008	3
PSA Redesign	-TBD (SM)	Mid August	TBD
Total PDR Opportunity (GLOM)	Un-Weighted 774 lbm (351 kg); Weighted 434 lbm (197 kg)		

**Opportunities, implementable Prior To PDR, Reduce Control Mass Overage by 58%
SM Aggressively Looking Into Other Potential Pre and Post PDR Opportunities**



ESM Opportunity Status



Orion Project Office

Opportunity	Status
5- SM Loads Relief	<ul style="list-style-type: none"> Structures and Mechanisms received reduced loads on 6/17 (CEV-LD-030 Rev A) Team is working to create a new FEM to represent current configuration due 6/30 Insert SM into stack and run new loads on FEM – Initial iteration complete by 7/15 Perform strength and stability MS assessment Minimize mass on high margin parts (iterate) – Start to incorporate reductions on 8/1
19 – FPR Analysis refinement	<ul style="list-style-type: none"> Overall reduction in usable propellant will be in a single value. Developed tool for refining analysis (MCAT – Mission Capability Assessment Tool) – complete
3 – Fail Safe Analysis Assumption <small>(Analysis team is refining all of the analysis used to determine amount of loaded propellant. Model refinements are targeting the 1.875 figure of merit used for Flight Performance Reserve (FPR) and other areas where propellant is used in flight)</small>	<ul style="list-style-type: none"> Collecting final inputs that will affect total propellant load Preliminary review of results during week of July 1 Final results will be from Monte Carlo analysis – Should incorporate by 8/1



ESM Opportunity Status



Orion Project Office

Opportunity	Status
<p>Spacecraft Separation Mechanisms Spring Material Change (Assumes switch of spring material from steel to titanium. Preliminary feedback from vendor shows 36 lb savings based on current spring requirements.)</p>	<ul style="list-style-type: none"> • Briefed SM IPT on 6/20 • Will incorporate into SWEL on 7/2
<p>Solar Array Drive Eddy Current Damping (Assumes elimination of gimbal lock, and reduction in size of gimbal support bearings due to decreased loads (loads decreased via the eddy current damping))</p>	<ul style="list-style-type: none"> • Expect preliminary design and analysis complete by 7/15 • ERB planned for 7/31. • Would incorporate into SWEL 8/13.
<p>6 ply vs 8 ply facesheets (All composite honey comb composites currently have an 8 ply face sheet. This would reduce the thickness to 6 plies.)</p>	<ul style="list-style-type: none"> • Performing analysis on SA & SAJ with 6 ply face sheets and new load set • M&P to develop plan for additional required testing due on 7/3 (SA & SAJ) • Incorporate SA opportunity into SWEL on 7/9 • Evaluate heating rates on SAJ with 6 ply face sheet due on 7/16 • Incorporate SAJ opportunity into SWEL on 7/26
<p>Reduced Adhesive Thickness (All honeycomb composite prts have a film adhesive thickness of 0.08 lbm/ft². This would reduce the thickness to 0.06 lbm/ft².)</p>	<ul style="list-style-type: none"> • M&P developing plan for additional required testing due on 7/3 • Incorporate opportunity into SWEL on 7/9
<p>Redesigned PSA (Concept utilizes PSA structure to perform two functions – hold propellant tanks in place and protect tanks and associated plumbing from MMOD potentially allowing the elimination of MMOD blankets)</p>	<ul style="list-style-type: none"> • Design concept completed • Mass evaluation on going • ERB to evaluate merits of Resigned PSA vs the baseline PSA in late Mid August



Threats & Opportunities Summary

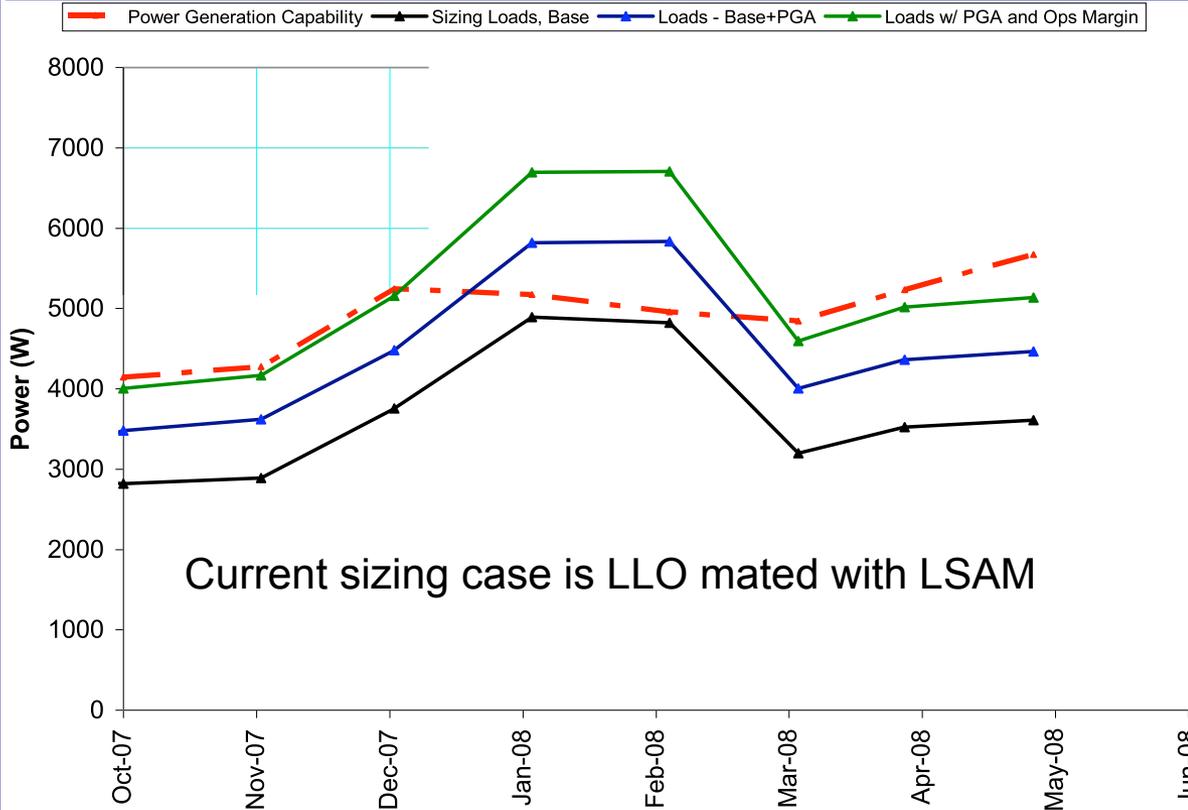


Orion Project Office

6/6/08 (Weighted EPM)	6/20/08 (Weighted EPM)
<ul style="list-style-type: none"> • 90th Percentile Lunar T/Os = 617 kg • Total Lunar Threats (83) = 754 kg <ul style="list-style-type: none"> –Category 5 = 83 kg –Category 4 = 103 kg • Total Lunar Opps (50) = -380 kg • Total Active Lunar T/Os = 374 kg 	<ul style="list-style-type: none"> • 90th Percentile Lunar T/Os = 546 kg • Total Lunar Threats (89) = 787 kg <ul style="list-style-type: none"> –Category 5 = 99 kg –Category 4 = 104 kg • Total Lunar Opps (60) = -495 kg • Total Active Lunar T/Os = 292 kg
<ul style="list-style-type: none"> • 90th Percentile ISS T/Os = 662 kg • Total ISS Threats (84) = 719 kg <ul style="list-style-type: none"> –Category 5 = 115 kg –Category 4 = 103 kg • Total ISS Opps (49) = -279 kg • Total Active ISS T/Os = 440 kg 	<ul style="list-style-type: none"> • 90th Percentile ISS T/Os = 571 kg • Total ISS Threats (90) = 752 kg <ul style="list-style-type: none"> –Category 5 = 131 kg –Category 4 = 104 kg • Total ISS Opps (60) = -407 kg • Total Active ISS T/Os = 345 kg



Orion Spacecraft Power Trend Solar Arrays – Lunar



Current sizing case is LLO mated with LSAM

- Solar array size increased from 5.5m dia. to 5.84m dia.
- Margin is reported in terms of % increase in load power that the system could tolerate (watts)
- Margin is on top of the power growth allowance
- Array load capability is calculated from loads and load margin and includes all system losses.

Threats

Thermal analysis may increase required heater power

Powerdown strategies may be too aggressive

Opportunities

Power scrub will challenge the subsystems as well as evaluate powerdown strategies

Review of driving load cases and associated requirements, groundrules, and assumptions

Changes Since Last Report

Conducted detailed reviews of lunar scenarios with ops team

Date: 17 June 2008 Orion solar array and battery sizing Lead:
 Next Update: 15 July 2008 Adrian Adamson (LM)



Preliminary Production TPMs



Orion Project Office

TPM Title		TPM Req't	Current Analysis	% Margin	Change from Previous Analysis	Orion Risk	Assumptions
FLIGHT RATE CAPABILITY	1	O&C AI&P Inline Critical Path (days)	tbd	214	x %	n/a	- Based on qualification unit schedule - 3 shift per day, 5 days per week. - Four work stands (1,2,3,Integration)
	2	LAS AI&P Inline Critical Path (days)	tbd	63	x %	n/a	- Based on WSMR schedule - 1 shift per day, 5 days per week. - One work stand
	3	MAF Inline Critical Path (days)	tbd	tbd	x %	n/a	
	4	O&C AI&P pacing task duration (days)	tbd	83	x %	n/a	Measure of the limiting process or step in the production line (bottleneck). Indicator of where improvements can be made.
	5	LAS AI&P pacing task duration (days)	tbd	63	x %	n/a	"
	6	MAF pacing task duration (days)	tbd	tbd	x %	n/a	"
OPERABILITY	7	O&C AI&P production hours (hrs)	tbd	tbd	x %	n/a	Measure of the amount of labor required to produce each vehicle. Indicator of production costs.
	8	LAS AI&P production hours (hrs)	tbd	tbd	x %	n/a	"
	9	MAF AI&P production hours (hrs)	tbd	tbd	x %	n/a	"
	10	O&C AI&P Inline Task Efficiency (%)	95%	tbd	x %	n/a	Efficiency measured in "LEAN" terms. Ratio of value added work to (waste + NVA work).
	11	LAS AI&P Inline Task Efficiency (%)	95%	tbd	x %	n/a	"
	12	MAF inline Task Efficiency (%)	95%	tbd	x %	n/a	"

Plan to work with Cx Office of Operability to set Production TPMs



CEV AI&P Activities in O&C



Orion Project Office

Qualification Unit						
O&C Qualifiction Unit AI&P						
(In days based on 2 shift/day, 5 days per week)						
	CM			SM		
	All	Crit Path	Ratio	All	Crit Path	Ratio
Station-1:	91	42	46%	78	0	0%
Proof Pressure Cell:	4	4	100%	7	0	0%
Station-2:	99	83	84%	49	0	0%
Station-3:	76	50	66%	60	0	0
Total:	270	179	66%	194	0	0%
	All	Crit Path	Ratio			
Integration Cell:	90	68	76%			
Total:	360	247	69%			

- Based on [qualification unit schedule](#)
- Schedule based on 2 shifts per day over a 5 day work week
- Extrapolation made to 3 shifts / day over 5 day work week to determine maximum capability
- Extrapolation assumes 70% efficiency of added shift (inefficiency of shift turnover)

Qualification Unit						
O&C Qualifiction Unit AI&P						
(In days based on 3 shift/day)						
	CM			SM		
	All	Crit Path	Ratio	All	Crit Path	Ratio
Station-1:	79	36	46%	68	0	0%
Proof Pressure Cell:	3	3	100%	6	0	0%
Station-2:	86	72	84%	42	0	0%
Station-3:	66	43	66%	52	0	0%
Total:	234	155	66%	168	0	0%
	All	Crit Path	Ratio			
Integration Cell:	78	59	76%			
Total:	312	214	69%			

Length of critical path

Assumes adding extra shift provides 0.7 shift benefit (inefficiency in shift turnover)

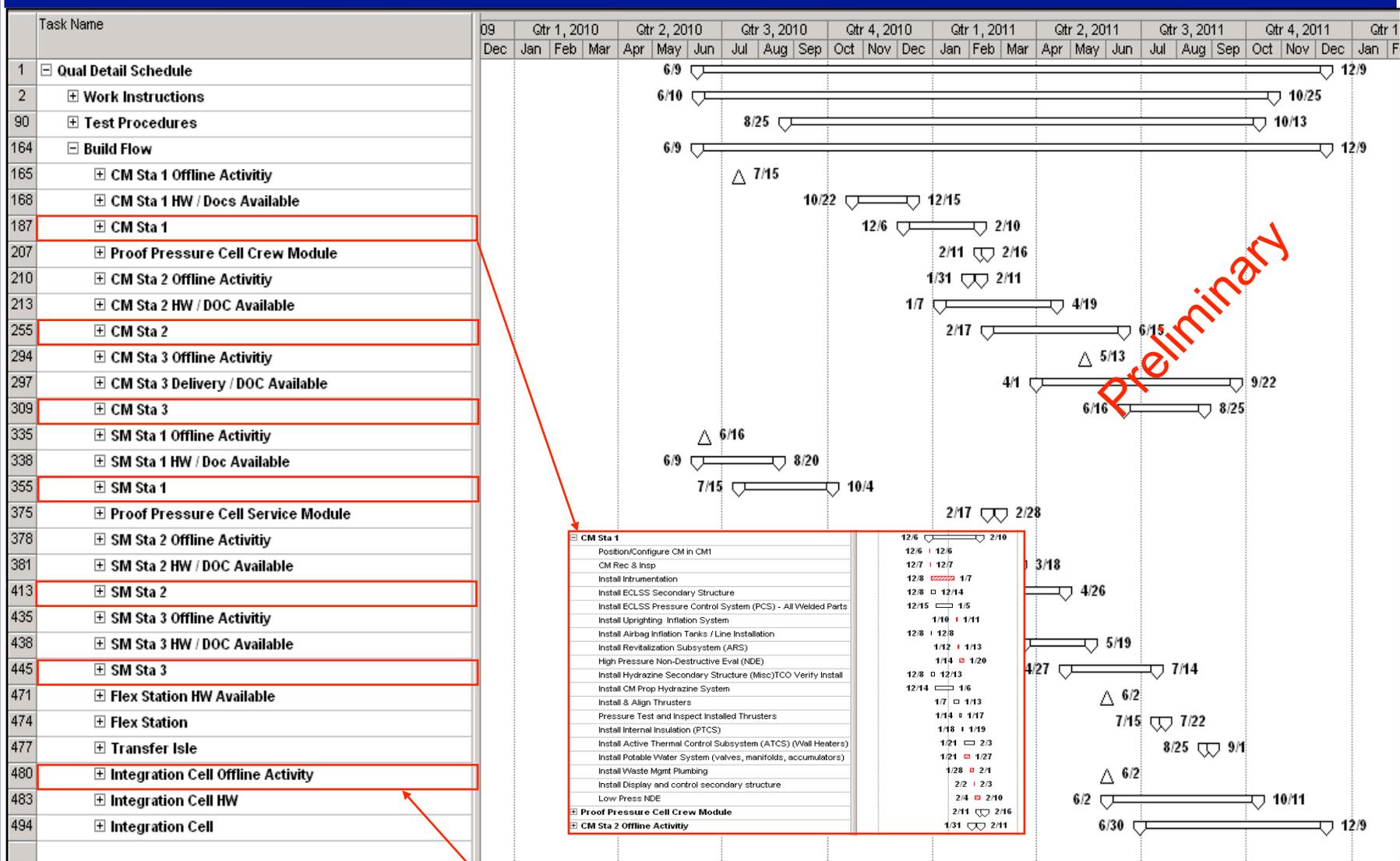
Yellow indicates pacing tasks



CM/SM AI&P Schedule (O&C)



Orion Project Office



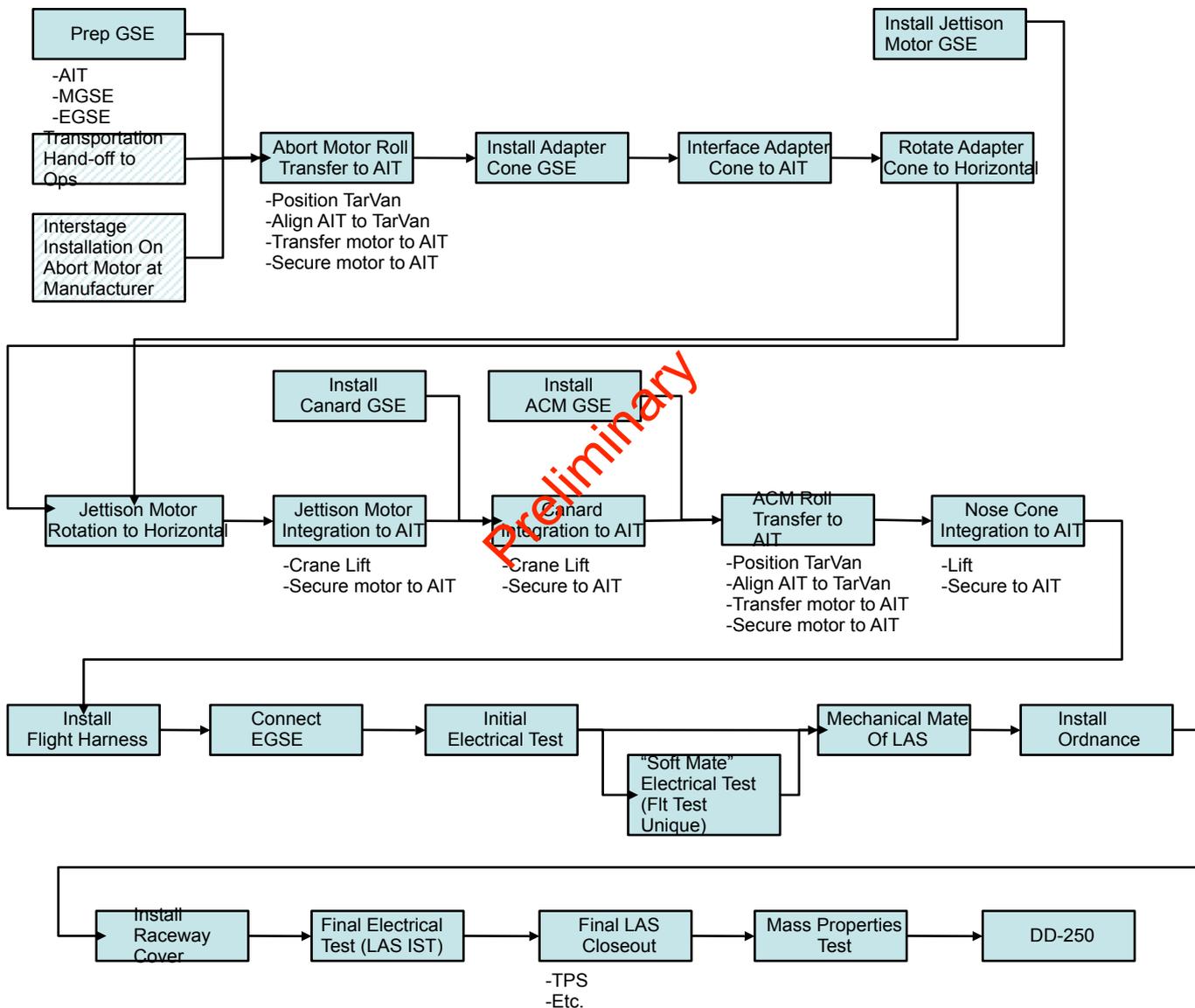
Preliminary

NOTE: Qualification unit schedule

Inline Tasks



LAS AI&P Schedule (RPSF)



Preliminary



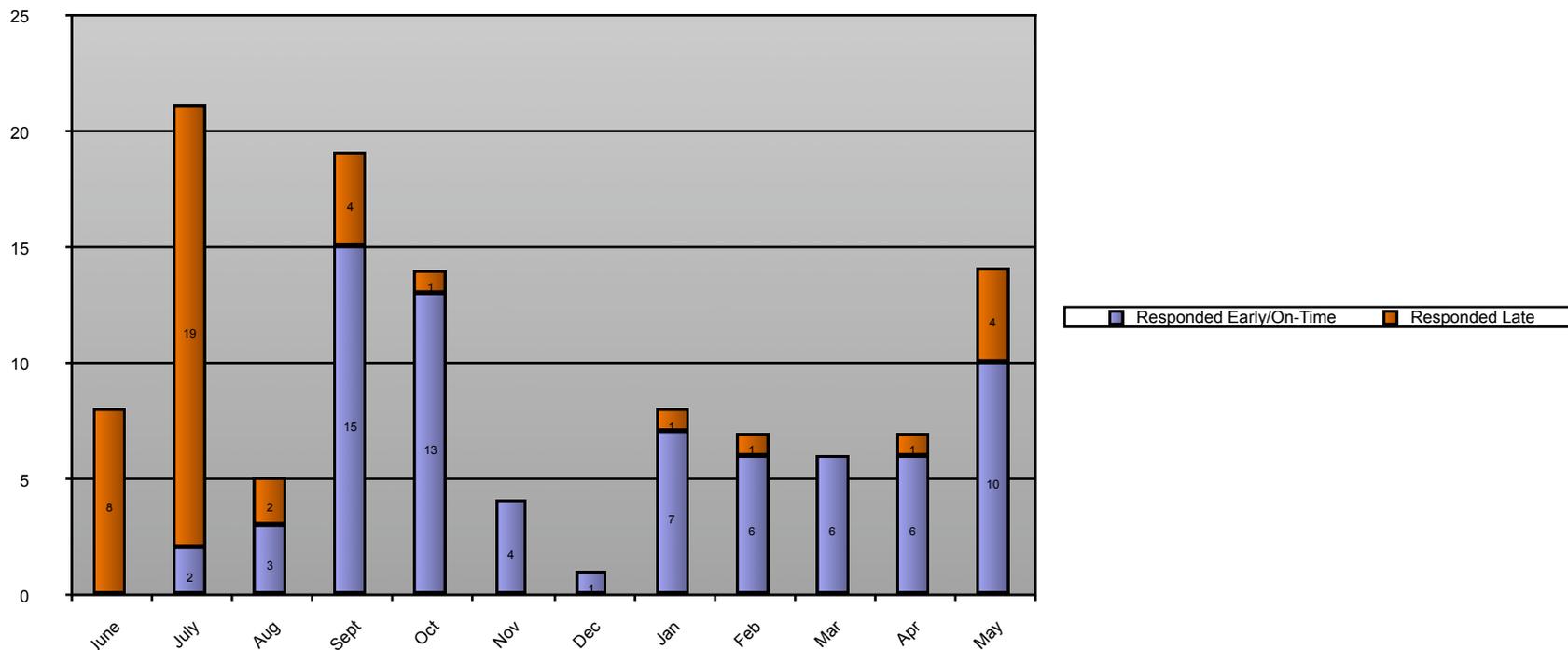
Change Request Metrics



Metric Description: For the month of May, CEV was late in providing a response to four CxP CRs evaluation.

19 Total External CRs “Closed”
 -14 due in May with formal response
 -5 info only

Late:
 -C000260 HSIR Rev C
 -C000261 NEDD Rev A (3 days late)
 -C000262 CSADD Rev A (4 days late due to CPM error)
 -C000271 CxP Flight Manifest (2 days late due to CPE)





Instrumentation Margins

Update: June 2008 (page 1 of 2)



RIU Operational Flight Instrumentation (OFI)

Margin Depletion Schedule

	Control	Pyro	Sensor	Serial
PDR	15%	15%	20%	15%
CDR	12.5%	12.5%	12.5%	12.5%
IOC	10%	10%	10%	10%

**Remaining Margin =
Quantity Unused / Quantity Used**

Resource	Parameter	CM			SM		
		Driving Case Requirements	Design Capability	Margin	Driving Case Requirements	Design Capability	Margin
Avionics - C&DH							
RIU I/O Channels	Ch. Count	377	1060	181.2%	303	1020	236.6%
Control Signals	Ch. Count	90	272	202.2%	106	272	156.6%
Solenoid Driver Outputs (Hi)	Ch. Count	85	144	69.4%	53	144	171.7%
Solenoid Driver Outputs (Hi/Lo)	Ch. Count	0	48	None	42	48	14.3%
5V Discrete Outputs	Ch. Count	4	40	900.0%	5	40	700.0%
28V Discrete Outputs	Ch. Count	1	8	700.0%	6	8	33.3%
Analog Outputs	Ch. Count	0	32	All	0	32	All
Pyro Signals	Ch. Count	56	80	42.9%	21	40	90.5%
Sensor Signals	Ch. Count	210	680	223.8%	162	680	319.8%
Temperature - RTD	Ch. Count	35	64	82.9%	32	64	100.0%
Temperature - AD590	Ch. Count	0	192	All	0	192	All
Pressure Xducer - Current Loop	Ch. Count	51	96	88.2%	73	96	31.5%
Contact Switch Discrete Inputs	Ch. Count	40	112	180.0%	46	112	143.5%
5V Discrete Inputs	Ch. Count	59	112	89.8%	5	112	2140.0%
28V Discrete Inputs	Ch. Count	1	8	700.0%	4	8	100.0%
Analog Inputs	Ch. Count	24	96	300.0%	2	96	4700.0%
Serial Buses	Ch. Count	21	28	33.3%	14	28	100.0%



- Developmental Flight Instrumentation (DFI)
 - Summary of existing requests
 - Have not been prioritized
 - Exceed the current uRIU capability (120 Channels)

 - Aeroscience: 138 channels
 - Dynamics: 219 channels
 - Propulsion: 14 channels
 - Thermal: 521 channels
 - Struct/Mech: 54 channels
 - TOTAL: 946 channels



Operations Metrics

(page 1 of 8)



	TPM Title	TPM Req't	Current Analysis	% Margin May 2008	Change from Previous Analysis	Orion Risk
	Flight Ops (Hart/Arnold)					
O	Flight Ops Watch List Red Items	0	13	n/a	+8	
P	Operability Goal Assess. (Attributes)	2.5	2.04	-18.4%	↓	
E	ORU/IFM Capability	TBD	TBD	TBD	TBD	
R	Net Habitable Volume	TBD	TBD	TBD	TBD	
A	Ground Ops					
B	Ground Ops Watch List Red Items	0	11	n/a	+2	
I	Operability Goal Assess. (Attributes)	2.5	2.28	-8.8%	↓	
L	Orion/LAS Integration - hrs	79.7	TBD	TBD	TBD	
I	LRU Accessibility	TBD	TBD	TBD	TBD	
T	Limited Life/Time & Cycle	TBD	TBD	TBD	TBD	
Y						



Operations Metrics

Watch List Backup Info (page 2 of 8)



	Currently Open	Previously Open	% Change
Total	84	44	90.9%
Red	24	14	71.4%
Yellow	46	20	130.0%
Green	14	10	40.0%

Note: The large increase in red watch list items is due to ongoing review and ranking of the items

Definitions:

Red - "Must have" items for operations. The absence of these capabilities would result in a vehicle that has unacceptable operability, could render a system unusable, or could lead to injury or loss of the crew

Yellow - "Should have" items for operations. These items are marginally acceptable under optimum conditions but could become unworkable or unsafe in off-nominal conditions

Green - "Nice to have" items for operations. The absence of these items could result in an increase in operational workload and/or an increase in crew time required



Operations Watch List “Red” Items

(Back-up, page 3 of 8)



Item	Subsys	Title/Description	Required Functionality	Operational Impact/Workaround
3	EPS	No Post Landing Deservicing Power-up Capability Given that there is no capability to re-power the CM once the CM batteries are discharged after landing; there is a possibility that ground operations personnel will not be able to perform de-servicing/decommissioning operations, recover flight data, and maintain thermal control.	The CM EPS shall be capable of receiving and managing post-landing power from an external source in order to provide power to Avionics, ECLSS, and Propulsion System components required for post-landing operations.	Cannot perform de-servicing/de-commissioning operations or recover any flight and configuration data from the CM.
5	Mech	Side Hatch Closure Requires Multiple Ground Personnel The hatch design currently being considered does not meet basic functionality. The hatch mechanism design is not complete and Operations is coordinating with the subsystem designers to ensure the required functionality is incorporated into the design.	A) Nominal Single Hand/Arm Opening/Closing with Dampening B) Hatch opening/closing will not injure ground crew or damage vehicle C) Unlimited number of times to open/close the hatch D) Reliable Tactile & Internal/External Visual Indication of Good Closure/Latching	A) Closing hatch may risk damage to TPS B) Ground and Flight Crew risk injury C) May not be possible to open and close the hatch during contingency water landing scenarios D) Ground and Flight crews may not achieve full closure/sealing of hatch
9	Prop	SM Propellant Insufficient Low Point Drain SM has reduced drain capabilities.	Provide Low Point Drain capability	If complete de-servicing is required, the ground operation will be complicated and extended due to the lack of low point drains.
10	ECLSS	No Snorkel System Hazard Detection & Crew Notification There is no way to determine whether the crew will be exposed to hazardous vapors post-landing via the snorkel vent.	Provide in cabin hazard detection capability post-landing	Crew may ingest toxic vapors while in crew module
22	ECLSS	No Filter Cleaning Capability Filter cleaning is not possible on orbit due to access Past operational experience strongly suggests on orbit cleaning will be necessary	Periodically clean HEPA filters	Blocked HEPA filter could result in degraded CO2 removal or cabin air temp control. No IFM requirement on filters is unrealistic in light of past operational experience;
24	ECLSS	Short term backup for PSA A short term method of CO2 control is necessary in the event the PSAs are unavailable for more than an hr.	System should protect short term CO2 control in the event of a common mode PSA failure for 24 hrs (PLS).	CO2 levels will exceed limits in TBD hrs without CO2 control.



Operations Watch List “Red” Items

(Back-up, page 4 of 8)



Item	Subsys	Title/Description	Required Functionality	Operational Impact/Workaround
31	Prop	<p>Mission Impact due to SM Priming Post Launch</p> <p>Given the current baseline, Orion SM Propulsion Subsystem during Ascent, prior to LAS jettison. When priming the lines/manifolds, there is a risk of thruster failures due to ingestion of the blanket pressure</p>	<p>No thrusters can fail off due to gas ingestion.</p> <p>Suggest FDIR limits to be set at such levels to prevent thruster failures.</p> <p>AND/OR</p> <p>Suggest priming sequence to mitigate gas ingestion.</p>	<p>Thrusters failing off can have multiple impacts.</p> <p>Examples:</p> <ol style="list-style-type: none"> 1) CLV recontact - LOC. 2) Inability to perform first attitude adjustment burn. 3) Inability to perform Circ burn with OME <p>Etc.</p>
32	Prop	<p>Undetectable SM Thruster Leak</p> <p>Undetected thruster leak would lead to propellant loss as well as hardware damage if leaking thruster is fired.</p>	<p>Ability to detect leaks both high rate and low rate.</p>	<p>Thruster leakage below current detectable levels could cause loss of propellant and may potentially lead to hardware damage.</p>
35	SM	<p>ESM Load Bearing Fairing Constrains Contingency SM Access</p> <p>SM access requires the capability to remove the SM fairings without destacking the CM/SM.</p> <p>The ESM fairings are installed prior to when the CM is integrated to the SM (prior to DD-250). Removal of</p>	<p>Capability to remove/ reinstall the SM fairings without destacking the CM and SM.</p>	<p>Contingency access into SM area would require roll back and destack.</p> <p>Although contingency (there are no planned operations that require access into the SM area under the fairing) the likelihood of a fleet issue being identified during the manufacturing</p>
37	Mech	<p>ALAS Hatch Open Speed Risks Ground Crew Injury</p> <p>The LAS Hatch design may not provide for safe and easy ground operations. The LAS hatch mechanism design is not complete and operations coordination with the subsystem designers needs to be ensured so that a</p>	<p>A) Single person close/open hatch</p> <p>B) Person opening hatch does not get injured</p> <p>C) Backup external method to open hatch – RESOLVED</p> <p>D) Backup emergency method for flight crew to open hatch</p>	<p>A) Difficulty closing the hatch within the white room (estimation now is it's a 2 person job)</p> <p>B) After hatch is unlatch hatch could swing open before ground crew is out of the opening path</p> <p>C) If hatch latches fail to unlatch hatch cannot be opened</p>



Operations Watch List “Red” Items

(Back-up, page 5 of 8)



Item	Subsys	Title/Description	Required Functionality	Operational Impact/Workaround
39	General	<p>Water Landing Impact on Propulsion System Deservice</p> <p>Water landings will result in severe corrosive effect on all electrical and mechanical components under the backshell, causing them to no longer function properly when required for deservicing operations</p>	The propulsion isolation valves just upstream of the catalytic beds will need to be activated to purge the propulsion system	Water landings will result in severe corrosive effect on all electrical and mechanical components under the back-shell, causing them to no longer function properly when required for de-servicing operations. It is expected that the components will not be c
54	ECLSS	<p>Insufficient Potable H2O allocation</p> <p>2.0 L/day/crew member vs. 2.5 L. Too low, should be higher. Water tanks are sized for 2.5 L/day/crew, but current loading is 2.0 L/day/crew. HSIR defines req't as 2.5</p>	Meet requirements for crew water requirements.	Medical Ops is advocating for higher H2O amounts due to previous issues with post flight health
56	ECLSS	<p>No Suit Air Circulation Isolation Valve or Restrictor</p> <p>Currently not in design</p>	System needs to protect crew from individual suit leaks because of the series nature of suit loop and provides greater operations flexibility for suit leak checks. Isolation needs to exist on both the Suit Side and Vehicle sides.	System needs to protect crew from individual suit leaks because of the series nature of suit loop.
58	EPS	<p>Post-landing Batteries</p> <p>Number of batteries may increase if active cooling is required post-landing more than 15 minutes (projected 2 hrs)</p>	Post landing active cooling for 2 hrs and still leave enough power for the full post landing requirement.	Currently, post-landing requirement for power cannot reach 24 hours with active cooling. No or minimal active cooling is risk to the crew.



Operations Watch List “Red” Items

(Back-up, page 6 of 8)



Item	Subsys	Title/Description	Required Functionality	Operational Impact/Workaround
60	Avionics	Uncrewed VMC State PEL carries 1 set of VMC modules + BFCS during unmanned LLO Ops	Uncrewed ops may require more redundancy in these modules to improve vehicle autonomy.	Total loss of comm with vehicle which does not allow commanding to prepare for Altair rendezvous and docking. Ops workaround is to leave a crewmember on board.
62	PVD	CEV Purge Pressure Limitation CEV Purge pressure requirements may exceed 0.5 psid	Minimize Purge delta pressures to achieve less than 0.5 psid if possible	Upgrade Pad Air Handlers to provide minimum delta pressure to achieve CM/SM/SA purge Cost Risk to GOP for ECS system upgrade at Pad 39A ~\$100 million
64	LRS	CM GSE Requirements not Defined CM Extraction, Handling, Safing, and Support GSE requirements have not been defined.	Provide Post-Landing Recovery Aids such as: flotation collar, sea anchor, auto-safing, hatch access GSE	???
66.1	C&T	CEV Instrumentation Concern that following the OVEIWG instrumentation scrub, the instrumentation no longer provides the necessary insight into the health and performance of the CEV systems.	The Instrumentation system need to provide 1) Adequate insight into the system performance. 2) Allow FDIR to perform unaided by crew or ground. 3) Need for some level of instrumentation redundancy to ensure the FDIR doesn't stop working after first failure 4) Provide one or more confirming cues for situations leading to a catastrophic or hazardous condition 5) Need adequate insight for troubleshooting and understanding the cause of the failure	Minimal instrumentation loss results in loss of automated FDIR. LOM declared with more frequency due to loss of insight into critical system health and performance. Insufficient redundancy for a robust design.
73	Avionics	Hand Controller Cable Routing Obstructs Ingress/Egress Most recent concepts for routing Rotational Hand Controller (RHC) and Cursor Controller Device (CCD) cables essentially box the P1 and P2 crew members in their seats by running the cables directly from the Display and Control Panel to the controllers, which are currently mounted on each side of the P1 and P2 seats by the crew members' knees. Controllers will have a second mounting position for in-flight operations when the seats are not installed. Expect that controllers will be in this position during ingress/egress. Note: This design is still very fluid.	Cable routing shall provide for unobstructed crew ingress/egress without the need to disconnect cables or relocate hardware.	Amount of interference with ingress/egress is unquantified. Adds an extra task to be performed during an emergency egress scenario, where the P1 and P2 crew members would have to relocate the controllers or disconnect the cables to create an unobstructed egress path. Situation could be worsened by incapacitated crew member in the P1 or P2 position. Potentially increases ingress time.



Operations Watch List “Red” Items

(Back-up, page 7 of 8)



Item	Subsys	Title/Description	Required Functionality	Operational Impact/Workaround
77	LRS	<p>Manual Main Canopy Jettison</p> <p>The current design of the Landing and Recovery System (LRS) main parachute canopy jettison system requires a manual jettison command by the crew after landing.</p>	<p>Automatic LRS main parachute canopy jettison after landing</p> <p>Manual (backup) main parachute canopy jettison – crew commanded, MO commanded</p>	<p>Automatic main canopy jettison protects against failure of crew to perform jettison command due to deconditioning or incapacitation. Failure to perform jettison command may result in CM dragging or floatation in an unusual attitude</p>
78	LRS	<p>Manual Uprighting Bag Inflation</p> <p>The current design of the Landing and Recovery System (LRS) requires CM uprighting bag inflation to be manually initiated by the crew prior to vehicle</p>	<p>Automatic inflation of the uprighting bag after water landing</p>	<p>The current design of the Landing and Recovery System (LRS) requires CM uprighting bag inflation to be manually initiated by the crew prior to vehicle powerdown</p>
87	ECLSS	<p>CM O2 Supply</p> <p>Provide alternate access method to this tank.</p>	<p>Crew access to O2 for all phases of flight is a required functionality.</p>	<p>Loss of access CM O2 supply for post SM sep usage. This would preclude the crew from going “visors down.”</p>
91	Prop	<p>Insufficient Number of OME Starts</p> <p>There is a discrepancy regarding the number of required OME starts. Current Requirement is 7 starts per the GNC-Prop IRD. GNC released a memo that the OME may be needed to be started up to 18 times for an Altair conti</p>	<p>The OME should be operable for all planned burns and contingency burns</p>	<p>If the OME Starts run out for a lunar mission, then the Aux engines will have to be engaged earlier than planned. This will prolong the mission and put the CEV in a Zero-Fault Tolerant state for TEI.</p>
95	Crew Sys	<p>Landing and Recovery External CM Hand Holds</p> <p>There are currently no external hand-holds to aid Landing and Recovery Personnel with gaining access to to the CM side hatch, docking hatch, and forward bay area.</p>	<p>The CM shall have external hand holds available for use by landing and recovery personnel.</p>	<p>From Apollo lessons learned, the capsule moved faster than the divers could keep up with it. Therefore, they need something to grab.</p>



Operations Metrics

WWW.NASAWATCH.COM



606D Operability Goal Assessment – Flt/Ground Ops Overview (Back-up) (page 8 of 8)

Orion Project Office

	TPM Title	TPM Req't	Current Analysis	% Margin June 2008	Change from Previous Analysis	Orion Risk
O P E R A B I L I T Y	Flight Ops (Hart/Arnold)					
	Operability Goal Assessment Avg.	2.5	2.04	-18.40%	↓	
	Servicing/Maintenance	2.5	1.00	-60.00%		
	Health Management	2.5	1.81	-27.60%		
	Flexibility	2.5	2.63	5.20%		
	Simplicity	2.5	2.27	-9.20%		
	Margin/Robustness	2.5	2.41	-3.60%		
	Hazards	2.5	2.76	10.40%		
	Situational Awareness	2.5	1.43	-42.80%		
	Ground Ops					
	Operability Goal Assessment Avg.	2.5	2.28	-8.80%	↓	
	Servicing/Maintenance	2.5	1.77	-29.20%		
	Health Management	2.5	1.17	-53.20%		
	Flexibility	2.5	2.31	-7.60%		
	Simplicity	2.5	2.74	9.60%		
	Margin/Robustness	2.5	2.79	11.60%		
Hazards	2.5	2.46	-1.60%			
Situational Awareness	2.5	2.74	9.60%			

Note: All attributes are subjectively ranked on a scale of 0 (worst) to 3 (best). Changes from due to the configuration changes between 606C and 606D

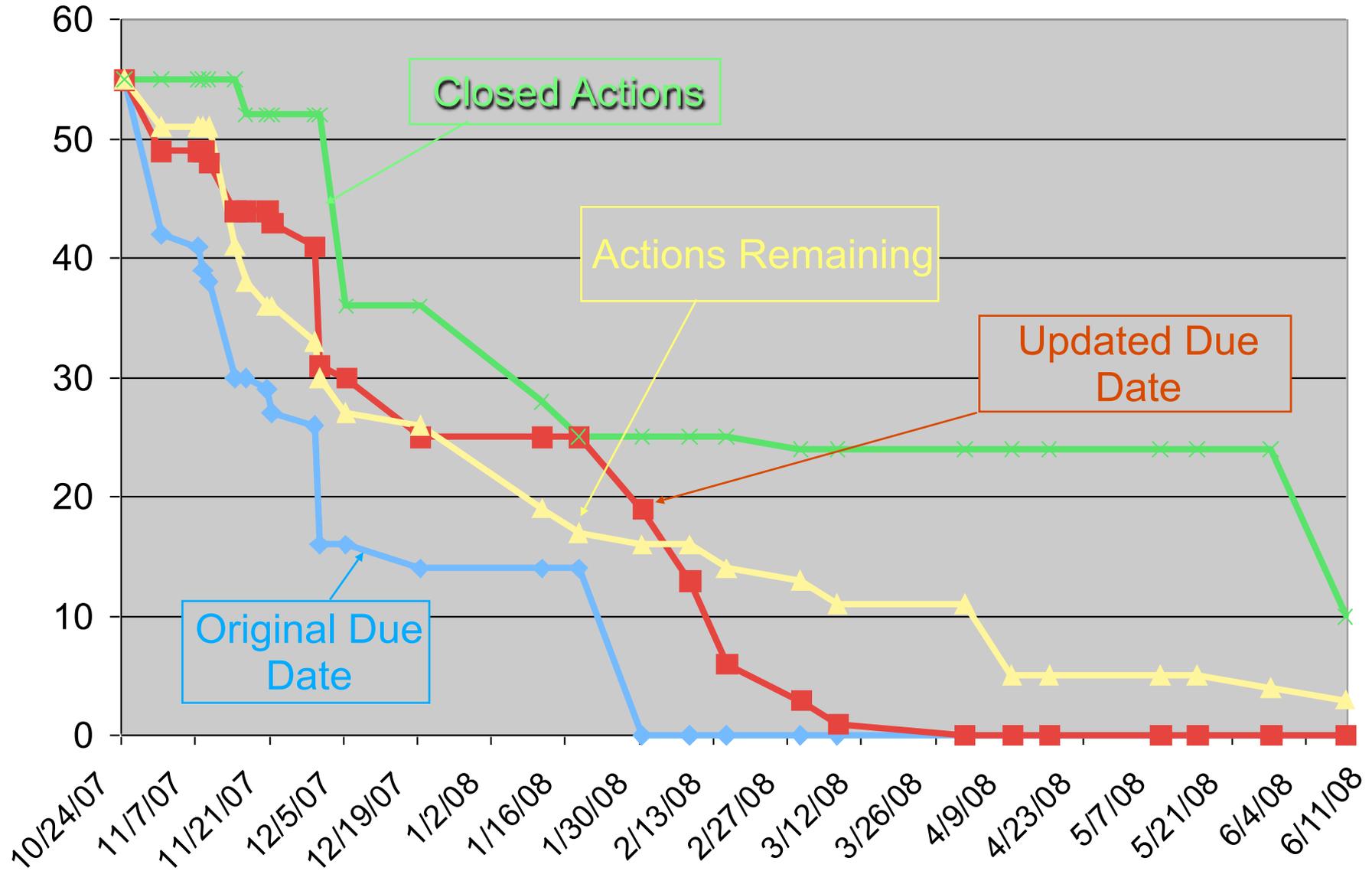


PTR-3 ACTION ITEMS

As of 06/17/08



Orion Project Office



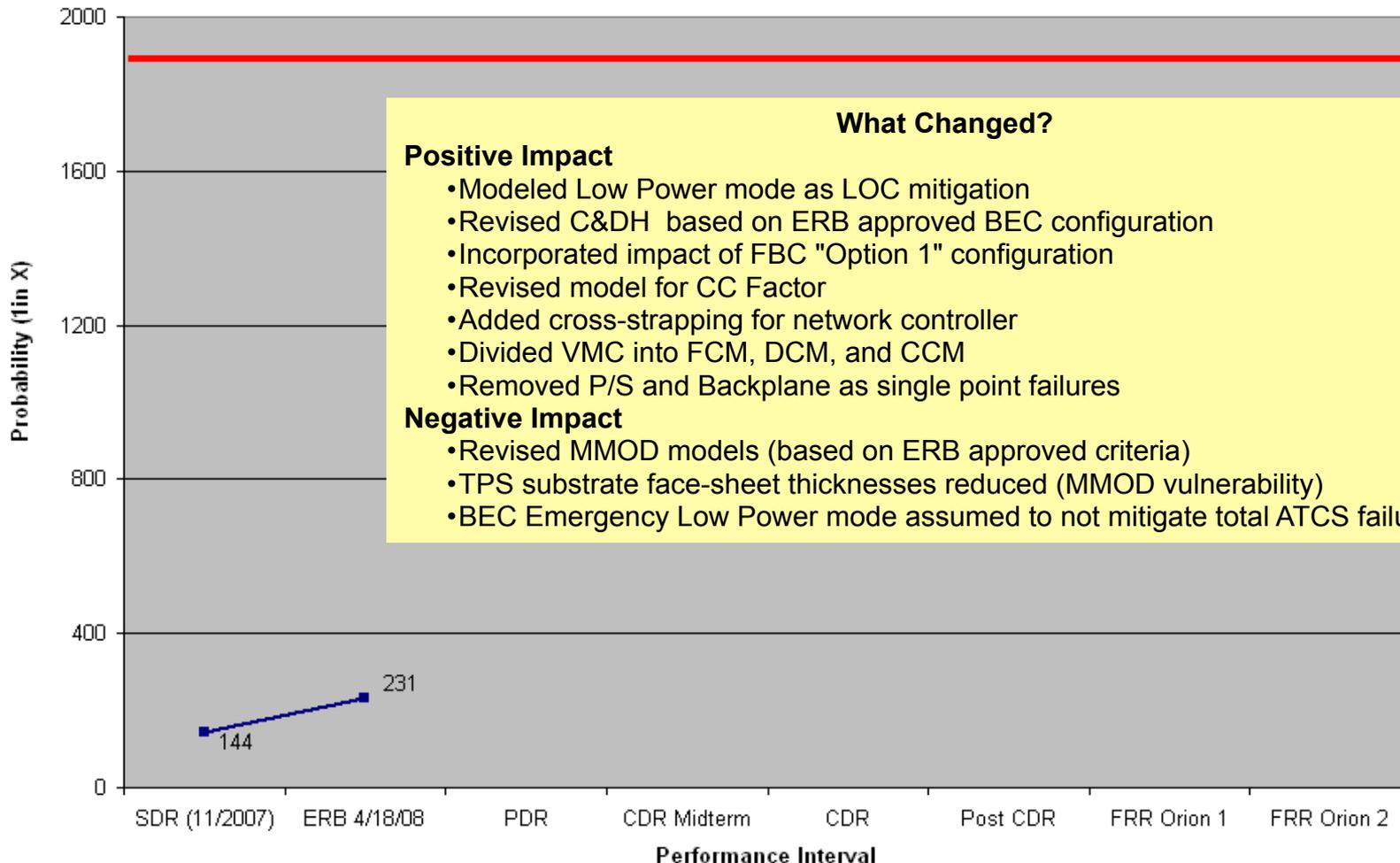


Technical Performance: ISS LOC



ISS Sortie LOC

ISS LOC Best Estimate
 ISS LOC Requirement

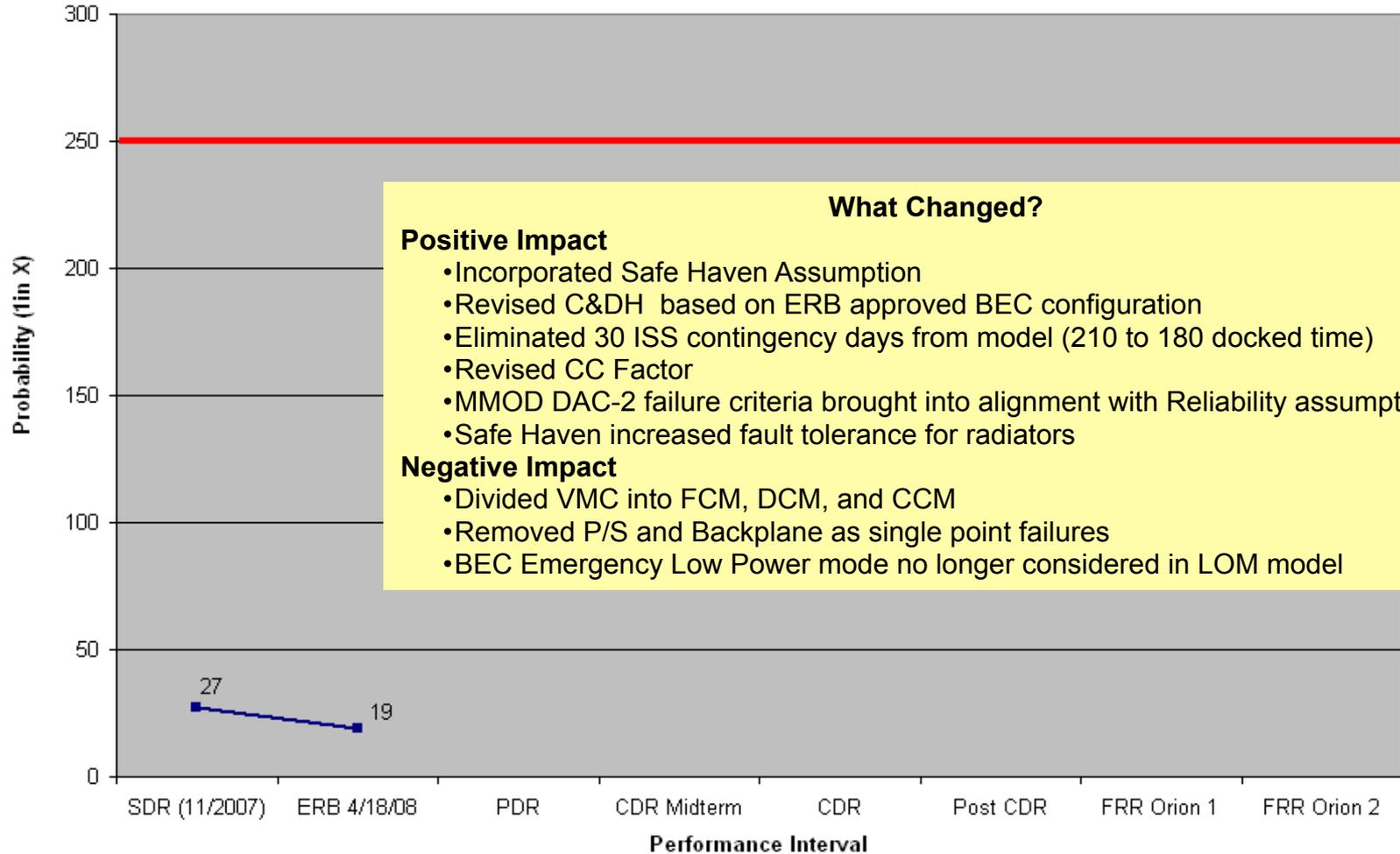




Technical Performance: ISS LOM

ISS LOM

—■ ISS LOM Best Estimate
— ISS LOM Requirement





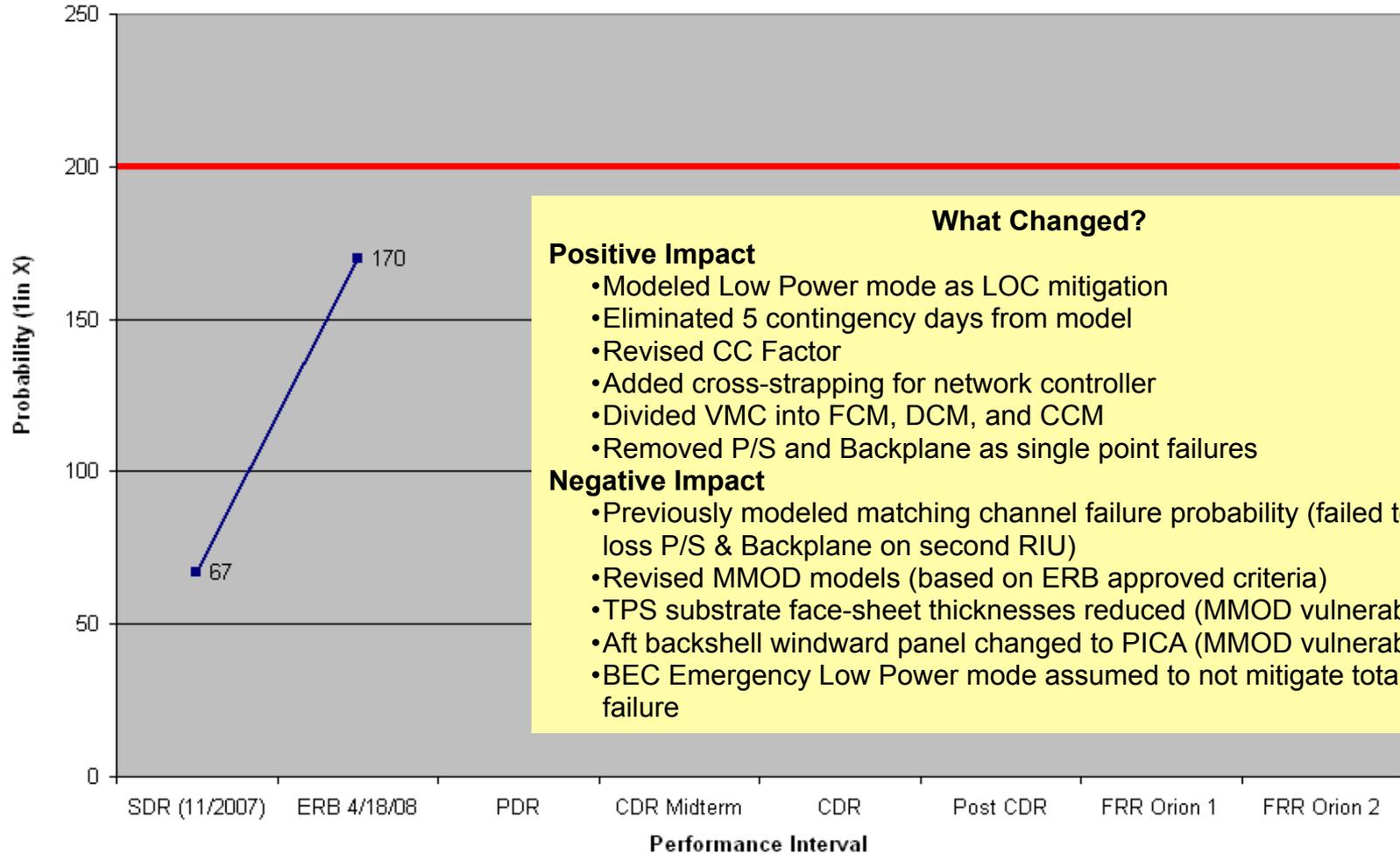
Technical Performance: Lunar Sortie LOC



Orion Project Office

Lunar Sortie LOC

■ LS LOC Best Estimate
— LS LOC Requirement



What Changed?

Positive Impact

- Modeled Low Power mode as LOC mitigation
- Eliminated 5 contingency days from model
- Revised CC Factor
- Added cross-strapping for network controller
- Divided VMC into FCM, DCM, and CCM
- Removed P/S and Backplane as single point failures

Negative Impact

- Previously modeled matching channel failure probability (failed to consider loss P/S & Backplane on second RIU)
- Revised MMOD models (based on ERB approved criteria)
- TPS substrate face-sheet thicknesses reduced (MMOD vulnerability)
- Aft backshell windward panel changed to PICA (MMOD vulnerability)
- BEC Emergency Low Power mode assumed to not mitigate total ATCS failure

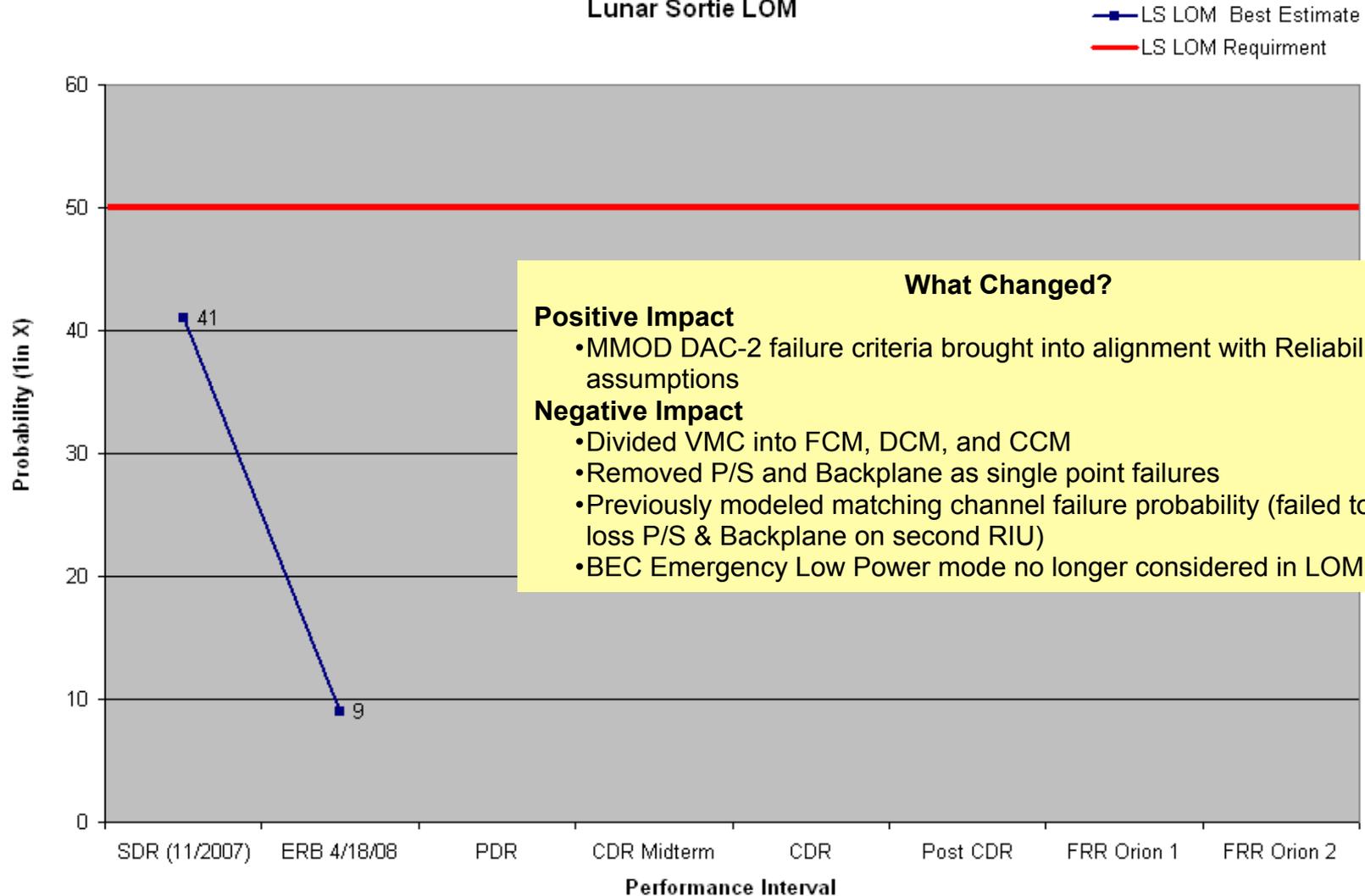


Technical Performance: Lunar Sortie LOM



Orion Project Office

Lunar Sortie LOM





Technical Performance



- Institutional Safety (From CEV-S-004 monthly submission)

Table 2 – Occupational Injury / Illness Statistics

Category	No.	Notes
Lost Workday Cases w/days away	0	Na
Total Days Away	0	Na
Lost Workday Cases w/restricted duty	0	Na
Total Restricted Workdays	0	Na
Medical Treatment Cases (No Lost Workdays)	0	Na
First-Aid Cases	0	Na

1.1 CLOSE CALLS

On 5/14/08, at the Aerojet Mixed Model Facility (20-0002), room 202, Sacramento, CA. while un-packaging WSTF hardware, It was discovered that a sealed bag within the hardware shipment was labeled with a fuels contamination warning tag. The entire shipment was removed to a safe holding facility where the status/condition of the shipment was ascertained. No measurable contamination was found and the logistics communication and packaging marking breakdown was reported to the shipment originator. Corrective actions will be tracked by Aerojet.

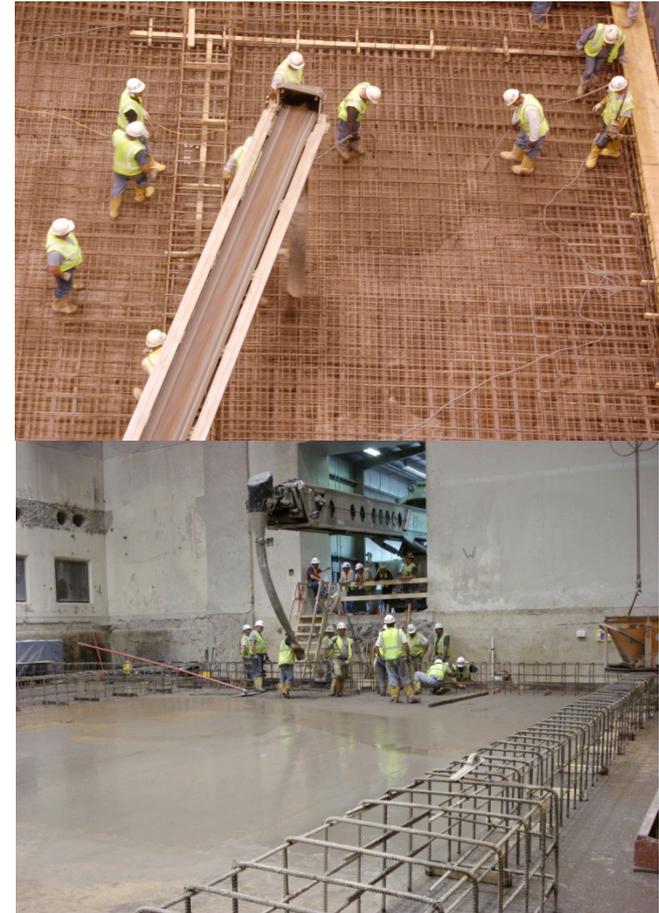
- LAST MONTH: 1 FIRST AID CASE



VIBRO-ACOUSTIC TEST CAPABILITY

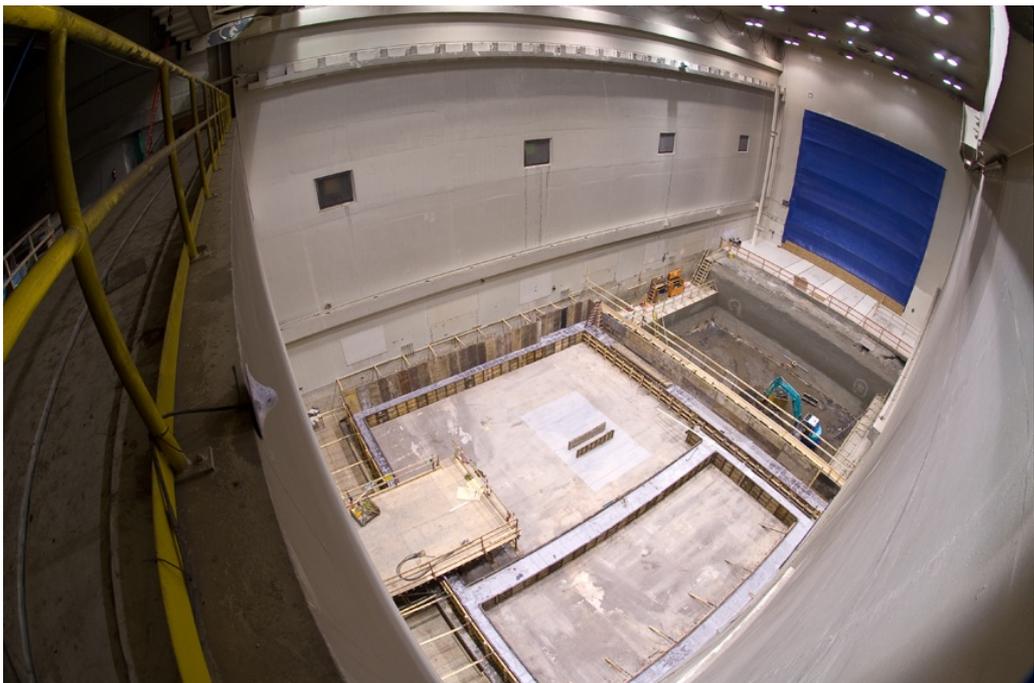


Initial Reverberant Acoustic Test Facility (RATF) foundation pour on May 29, 2008



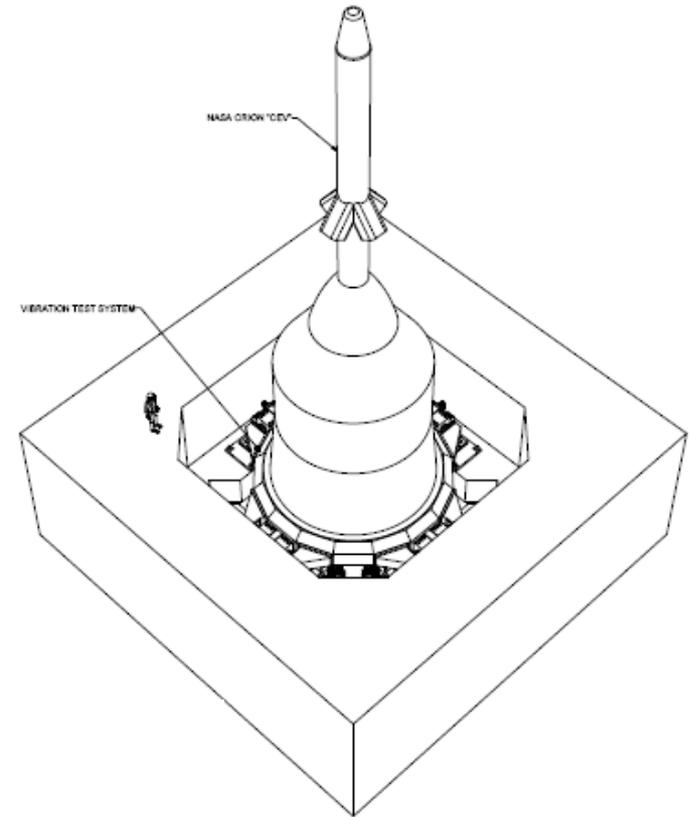
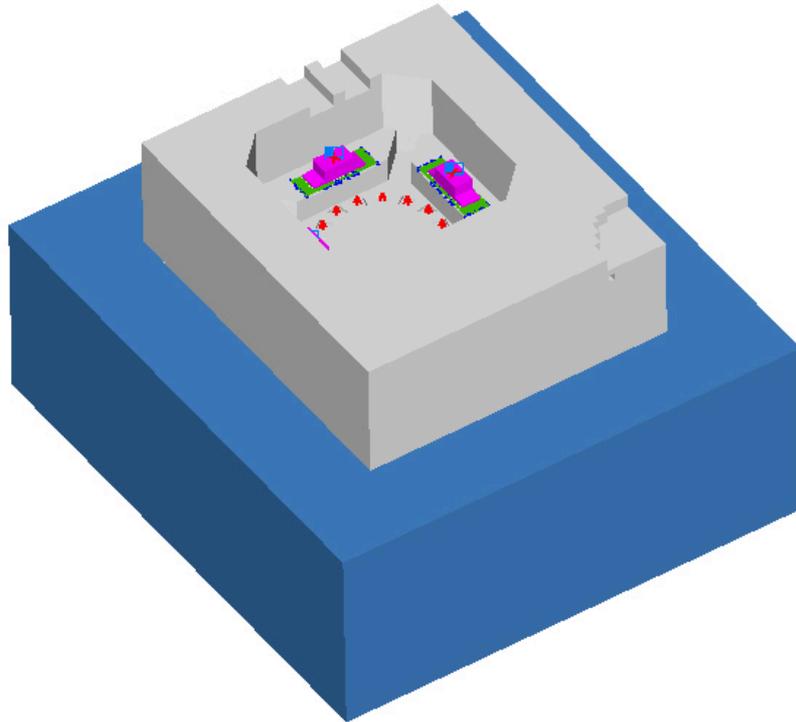


Construction Complexity due to MVF/RATF Swap





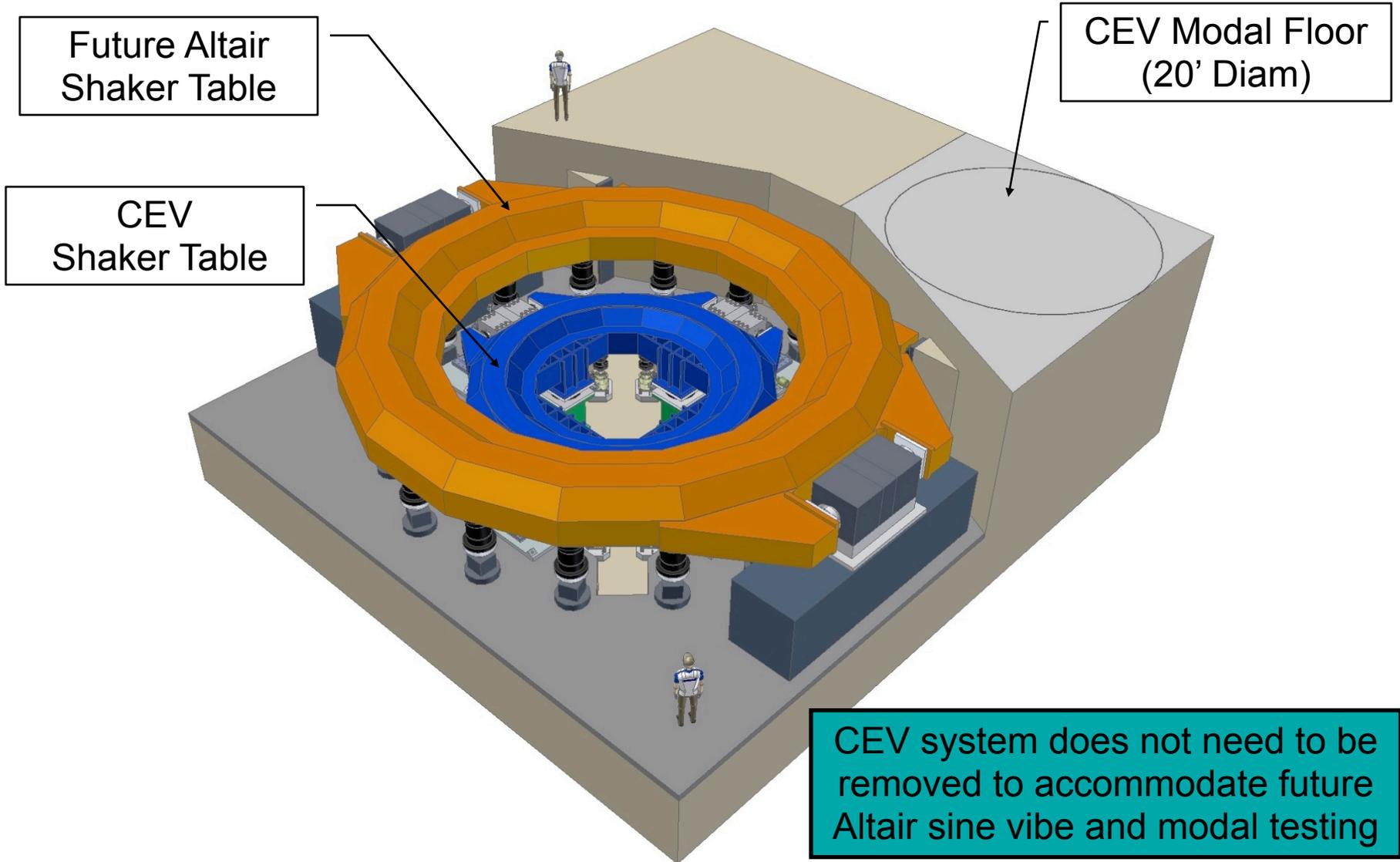
MVF Configuration: Contract Baseline



Enables Orion sine vibrate and non-traditional modal testing
Enables Altair non-traditional modal testing only



Future Altair Overlays Orion Configuration





CxCB Data Architecture Meeting (Continued)

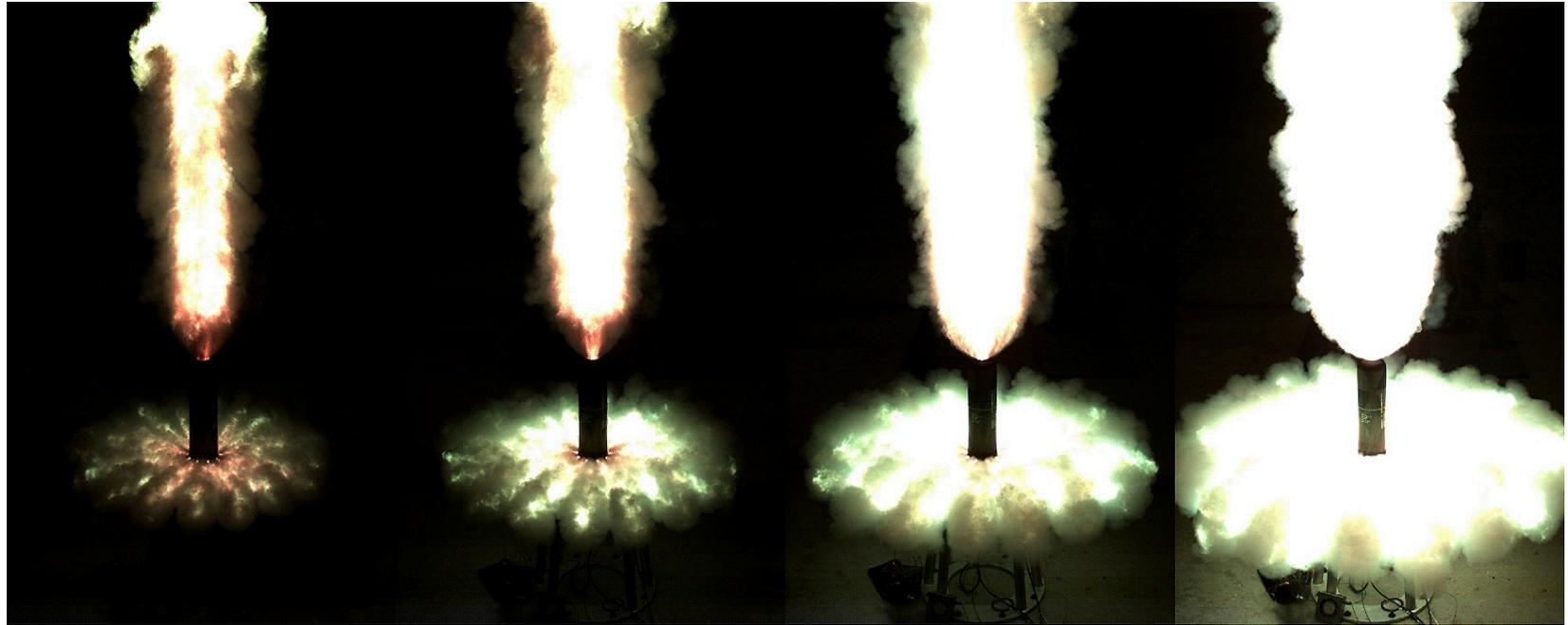


- Orion DA Accomplishments
 - Orion CAD Standards Draft Completed and being formally reviewed by the project
 - Utilizing Windchill routing for CM/DM processes
 - Implemented Orion Library
 - Evolving and expanding Orion Project Structures
 - Hosted Industry Benchmarking Analysis Team (IBAT) Meetings and Discussions at LM in Denver
 - Participated in and Reviewed IBAT Presentation and Report
 - Provided recommendations for Cx DA Documents and Document Contents that were accepted by CxPO

- Orion DA Forward Work
 - Finalize and implement CAD Standards and Delivery Process
 - Portal Pages Structures
 - Orion Library and Product Structures for CAD, Documents, DRDs, etc.



ABORT MOTOR LAUNCH ABORT SYSTEM





Back-Up for Orion Top Risks



WWW.NASAWATCH.COM

CEV Control Mass Effectiveness

RISK 1119 (page 1 of 8)



Risk Statement:

Given the potential requirements growth & instability including current effective payload mass, mass growth allowances, margins, and manager's reserve; there is a possibility that the CEV design will exceed control mass limits impacting performance, schedule and cost.

Context

- Historically designs have faced challenges to meet: gross lift off mass, redundancy, and safety requirements. If not adequately mature in terms of functional allocation, design solution definition, contingency requirements, etc then mass growth allowances will not be sufficient to preclude mass issues downstream which may impact cost and schedules.
- A history of 43 programs is used to generate the Mass Growth Allowance (MGA) schedule. An appropriate MGA is applied to each part in the MEL based on design maturity. In addition to MGA a Managers Reserve is added to the system. MR is applied to the basic mass except for GFE, Propellant and Consumables.
 - The manager's reserve is controlled by the Program Manager and used at their discretion.
- The effective payload mass of the 606A vehicle configuration did not comply with the current SRD requirements. An aggressive requirements and mass review was conducted by a inter-discipline Orion Vehicle Engineering Integration Working Group which helped shape the current 606C ODAC-2 POD design and close within the mass allocations
- Orion Vehicle Integration Team (OVIT) formed with Focused Integration Teams, including Mass and CG Focus integration Team (MFIT)
- Future Risk Tasks are in line with Mass Management Plan



MITIGATION PLAN OVERVIEW

CEV Control Mass Effectiveness- RISK 1119



- The CEV Project has a Mass Properties Control Plan to coordinate and integrate management, design personnel, and mass properties engineers to make design decisions affecting mass allocations.
- A regular mass properties status report will be provided to the Constellation Program.
- If the CEV mass exceeds the allocation given by the Constellation Program then the CEV Project Office will report this to the Constellation Control Board.
 - When all mass reduction options have been exhausted the CEV Project Office can ask the Constellation Control Board to relax some of the CEV SRD requirements that are the mass drivers.
 - Negotiations can also be made with Constellation and CLV on injection orbits and injection mass allocations.



Roles and Responsibilities

CEV Control Mass Effectiveness- RISK 1119



	MEL	SWEL	Threats and Opportunities			Mass Allocation	MGA
			System T&O	Module T&O	T&O database		
Who owns it?	MP	MP	MFIT	IPTs	MFIT	ERB	SPTs/IPTs
Is there engineering config control?	yes - MP	yes - MP	No	No	Yes	ERB package and minutes	MEL & SWEL
Is there a users guide?	yes	yes	No	No	Yes	No	Mass Properties Control Plan, DRD-T-042
Who provides inputs?	SPTs	SPTs	anyone with a good idea	anyone with a good idea	MFIT/IPTs	MP/MFIT	SPTs/IPTs
Who approves inputs?	IPTs	IPTs	MFIT	IPTs	MFIT	ERB	SPTs/IPTs
Who compiles product?	MP	MP	MFIT	IPTs	MFIT	ERB	MP
Who validates the product?	MP/IPT	MP/IPT	MFIT/OVIT	IPTs	MFIT	ERB	MP (push back)/IPTs (push back on SPTs)
Who approves the product?	ERB	IPT/CE	MFIT	IPTs	MFIT/IPTs	ERB	IPT (SWEL) ERB (MEL)
Frequency of updates.	For each DAC: K/O ERB, midterm ERB, final ERB	Bi-weekly	Bi-weekly	Bi-weekly	Bi-weekly	For each DAC: K/O ERB, midterm ERB, final ERB	bi-weekly in the SWEL
How is it communicated?	ERB Integrated Products	Bi-weekly mass status report, CPCB	Bi-weekly mass status report, CPCB, T&O database, ERB Integrated Products	Bi-weekly mass status report, CPCB, T&O database, ERB Integrated Products	CPCB, T&O database, ERB Integrated Products	ERB	bi-weekly mass status report, CPCB
Who ensures consistency between IPTs, SPTs?	MP/MFIT	MP/MFIT	MFIT	MFIT	MFIT	MFIT	MP/MFIT
Who integrates between IPTs?	MP/MFIT	MP/MFIT	MFIT	MFIT	MFIT	MFIT	MP/MFIT
Who does risk leveling?	N/A	N/A	MFIT	MFIT	N/A	MFIT	MFIT

MP = Mass Properties

CE = Chief Engineer

MFIT = Mass Properties Focused Integration Team



Risk 1119 Orion Mass Reduction Overview



- Status
 - Incorporated the early DAC-2 Trades studies at MID DAC-2 ERB 4/18.
 - Updated the MEL.
 - The Mass exceeded the objective for PDR but demonstrated the Mass process could meet the PDR objectives
 - LM held “mass process audit” with Level 2 and 3 on 5/15/08
 - Reviewed process for mass updates and changes, design maturity, threats and opportunities
 - Reviewed CPCB bi-weekly reporting process and coordinated CxP needs to be in
 - LM implemented Spacecraft Leadership forum and OVIT to improve integration across program and provide prioritization of resources
 - OVIT also contains Focused Integration Teams (FIT)
 - One specifically created in area of mass and c.g. (MFIT)
 - Outlined mass change processes and roles & responsibilities in following slides
 - Developed new format for Bi-weekly CPCB mass status reporting
 - Based on Subsystem Working Equipment List (SWEL)
 - Current Best Estimate from IPTs

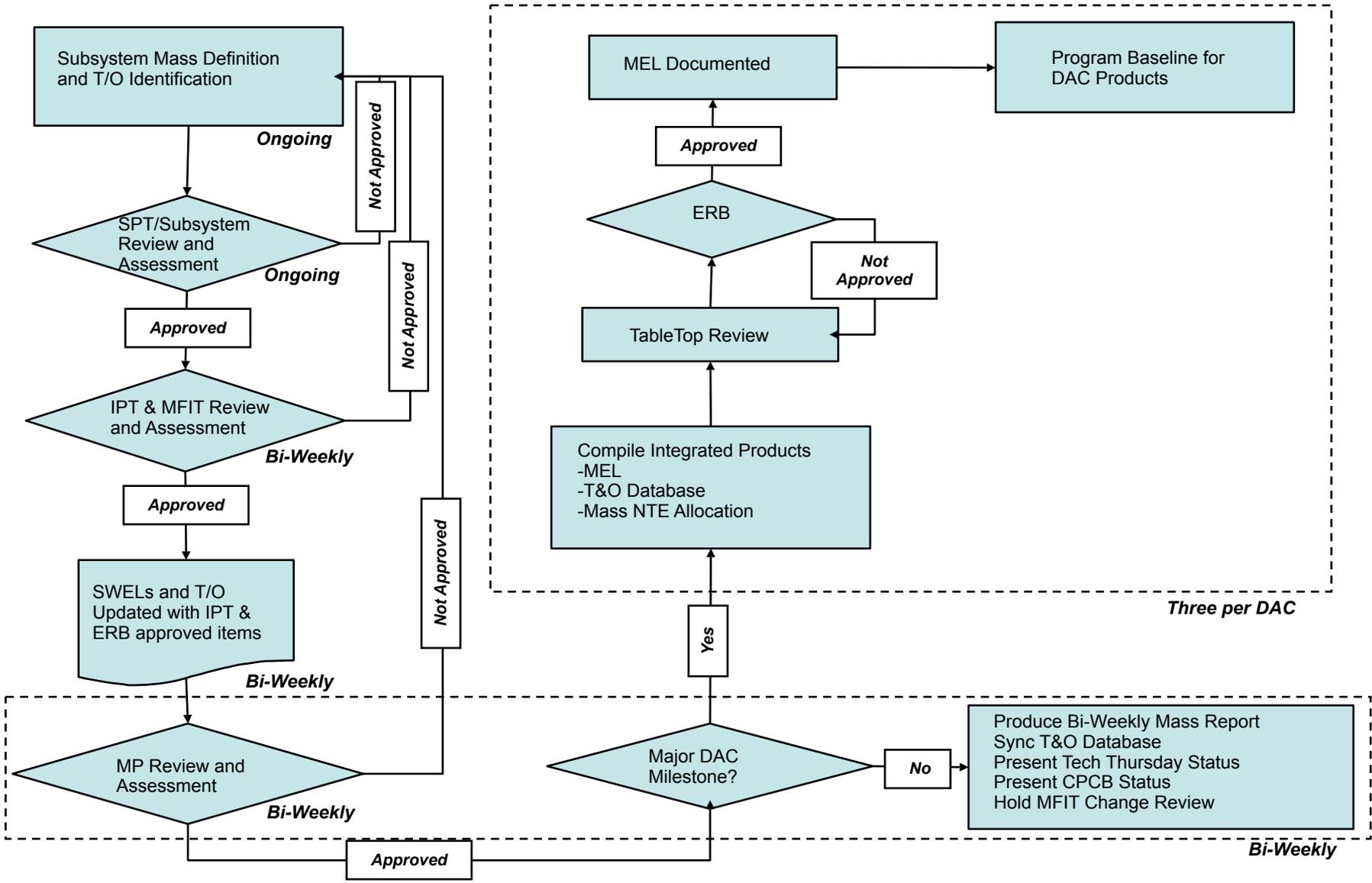


Mass Control Flow - Overview

CEV Control Mass Effectiveness- RISK 1119



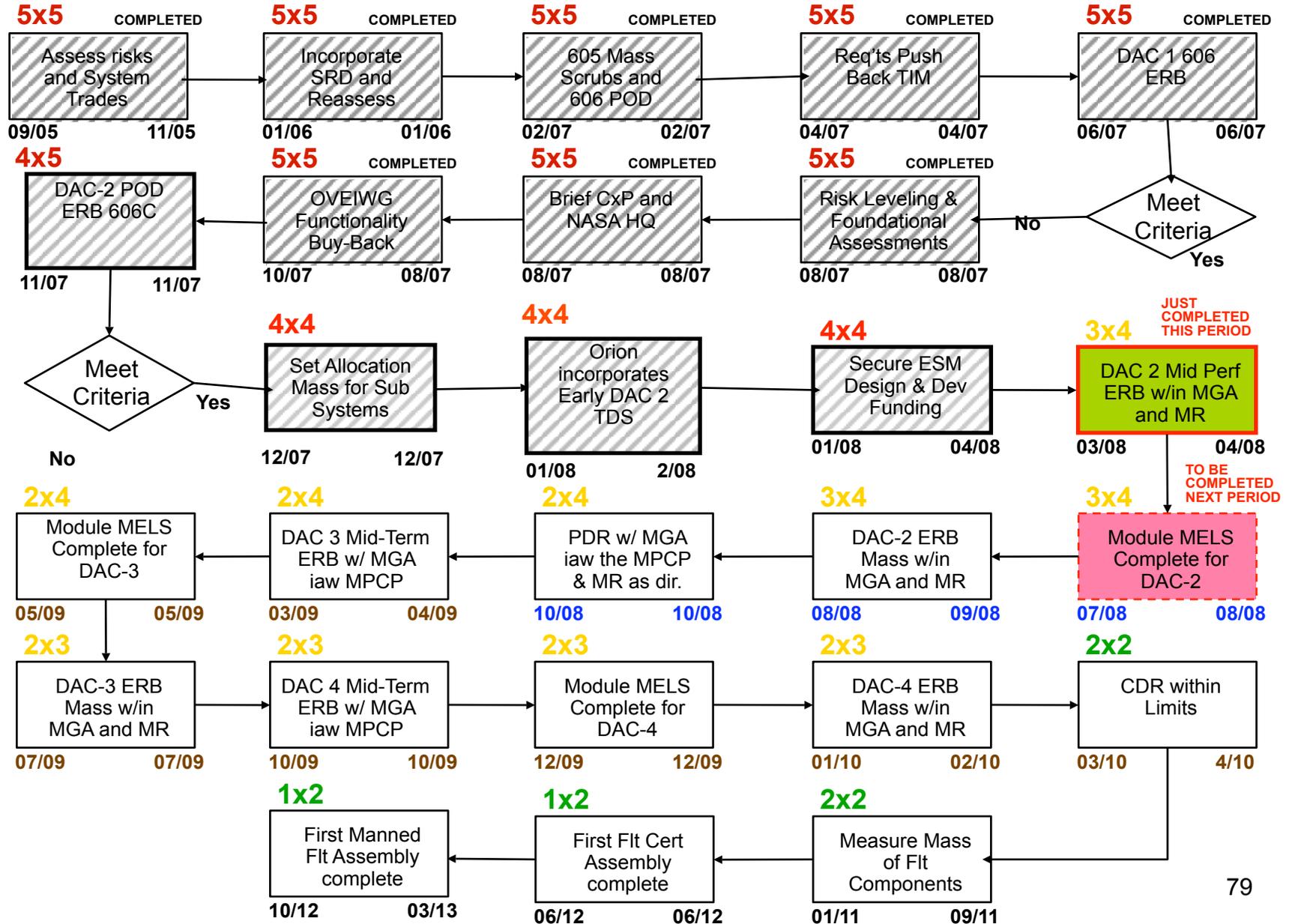
Orion Project Office





Risk 1119 MITIGATION PLAN FLOW DIAGRAM

New PDR and Option 1B CDR Estimates





Risk 1119: Threats & Opportunities Summary



Orion Project Office

6/6/08 (Weighted EPM)	6/20/08 (Weighted EPM)
<ul style="list-style-type: none"> • 90th Percentile Lunar T/Os = 617 kg • Total Lunar Threats (83) = 754 kg <ul style="list-style-type: none"> –Category 5 = 83 kg –Category 4 = 103 kg • Total Lunar Opps (50) = -380 kg • Total Active Lunar T/Os = 374 kg 	<ul style="list-style-type: none"> • 90th Percentile Lunar T/Os = 546 kg • Total Lunar Threats (89) = 787 kg <ul style="list-style-type: none"> –Category 5 = 99 kg –Category 4 = 104 kg • Total Lunar Opps (60) = -495 kg • Total Active Lunar T/Os = 292 kg
<ul style="list-style-type: none"> • 90th Percentile ISS T/Os = 662 kg • Total ISS Threats (84) = 719 kg <ul style="list-style-type: none"> –Category 5 = 115 kg –Category 4 = 103 kg • Total ISS Opps (49) = -279 kg • Total Active ISS T/Os = 440 kg 	<ul style="list-style-type: none"> • 90th Percentile ISS T/Os = 571 kg • Total ISS Threats (90) = 752 kg <ul style="list-style-type: none"> –Category 5 = 131 kg –Category 4 = 104 kg • Total ISS Opps (60) = -407 kg • Total Active ISS T/Os = 345 kg



Risk 1119: Threats & Opportunities Summary

(page 8 of 8)



Lunar MC 90th Percentiles:

GLOM 885 kg
 EPM 546 kg
 Injected 504 kg

Weighted	Threats and Opportunities Totals							
	LAS	CM	SM Inert	SM Prop	SA	SAJ	GLOM	EPM
Likelihood 5	300.1 kg	38.7 kg	1.3 kg				340.0 kg	76.0 kg
Likelihood 4	0.4 kg	38.8 kg	-7.6 kg	-95.3 kg	-11.4 kg	7.6 kg	-67.5 kg	-74.5 kg
Likelihood 3	4.4 kg	161.1 kg	71.9 kg		-46.5 kg	-34.5 kg	156.5 kg	182.9 kg
Likelihood 2	52.8 kg	37.4 kg	-6.8 kg	16.3 kg	11.2 kg		110.9 kg	64.5 kg
Likelihood 1	-0.7 kg	38.1 kg	4.8 kg				42.2 kg	42.8 kg
Total	356.9 kg	314.1 kg	63.6 kg	-78.9 kg	-46.8 kg	-26.9 kg	582.1 kg	291.6 kg

ISS MC 90th Percentiles:

GLOM 910 kg
 EPM 571 kg
 Injected 529 kg

Weighted	Threats and Opportunities Totals							
	LAS	CM	SM Inert	SM Prop	SA	SAJ	GLOM	EPM
Likelihood 5	300.1 kg	70.8 kg	1.3 kg				372.2 kg	108.1 kg
Likelihood 4	0.4 kg	38.8 kg	-7.6 kg		-11.4 kg	7.6 kg	27.8 kg	20.7 kg
Likelihood 3	4.4 kg	94.4 kg	71.9 kg		-46.5 kg	-34.5 kg	89.8 kg	116.3 kg
Likelihood 2	52.8 kg	22.0 kg	-6.8 kg	24.5 kg	11.2 kg		103.6 kg	57.1 kg
Likelihood 1	-0.7 kg	38.1 kg	4.8 kg				42.2 kg	42.8 kg
Total	356.9 kg	264.2 kg	63.6 kg	24.5 kg	-46.8 kg	-26.9 kg	635.6 kg	345.1 kg

Orion Project Office



IRMA 1401 (Parent) - First Crewed Lunar Return without adequate ground / flight test qual plan (for TPS) Children – 3172, 3111



- **Risk Statement:** Given the absence of a lunar-return flight test prior to Lunar IOC, coupled with the current ground test facility limitations; there is a possibility that full lunar return environment certification of the TPS heat shield will not be achieved prior to the first Lunar IOC crewed mission.
- Risk Context
 - IRMA 3172 Ground Test Facilities Upgrades to Support Lunar TPS Certification (LEAF)
 - Risk description:
 - The current capabilities of U.S. arc jet facilities do not provide full coverage of lunar return entry environments
 - » Cannot test combined environments concurrently – heat rate (convective & radiative), pressure, shear, enthalpy
 - » Coverage is limited for several of these parameters – radiative heating (none), shear, enthalpy, boundary layer
 - Current Status
 - CxP Independent Review completed May '08
 - » Preliminary findings validate need for facility mods
 - LEAF facility design contract awarded June '08
 - IRMA 3111 Crewed Lunar Return Flight Test
 - Risk description:
 - There is no flight test at lunar return conditions currently scheduled to occur prior to Lunar IOC
 - Without a flight test, the first time the full scale TPS heat shield will be exposed to the lunar entry return environment is during the first crewed return from the moon.
 - TPS problems uncovered at this time could jeopardize crew safety and would cause potentially significant cost and schedule impacts to the Program
 - Current status
 - LEX project on “stand-down”
 - Orion 13 now planned as un-crewed flight test (TPS validation objectives TBD)
 - CxP Independent Review findings pending regarding flight test



LAS Top Risk As of May 29, 2008



Orion Project Office

Risk No.	Apr '08 L x C	Jun '08 L x C	Title	Current Status	Risk ECD
	Escalation	Escalation			
1236	4 x 4	4 x 4	LAS Development for PA-1	<p>6/4/2008 LAS risk board on 5/29/08 approved two changes to the mitigation plan: 1. Removal of step 46, Canard Energetic Dynamic Deployment test (justification is that the canard is not operational on PA-1). 2. Modification of step 37, Motor Case Burst Test. Abort Motor Super Proof Test to removed the case burst test portion (justification is that it was not a test done for PA-1). The board also saw tweaks to the ECD dates on most of the mitigation steps, but wanted to wait to change them officially until the July LAS Risk board. The board also decided to wait on the closure of Step 35, JM Static Fire Development Test until several actions (documented in the LAS Risk Board minutes) are met.</p>	12/11/2008
	TDR	TDR			



RISK STATEMENT & CONTEXT

CEV Contract Alignment (Level I/II) 1859



Risk Statement:

Given the additional requirements that have not been approved for Orion Implementation, such as CEQATR, SRD, etc; there is a possibility that Orion will not be able to cover the technical requirements within current cost allocations.

Context

- Orion received the additional documentation following the Cx SRR and updates to Orion documentation.
- The 27 documents were provided to Lockheed Martin, and a ROM was requested to quantify the cost impact for the additional requirements which were over and above what was already on contract.
- Originally, approximately half of the ROM was expected to be able to be mitigated, and the remainder remains a risk and is documented here.
- These requirements are likely to be baselined at Program Baseline Sync (PBS) and require contract modifications in the post-SDR timeframe.
- Child Risk:
 - Risk 1400: CEV Contract Alignment Cost (Level II Threat)
 - Threat 2519

Status

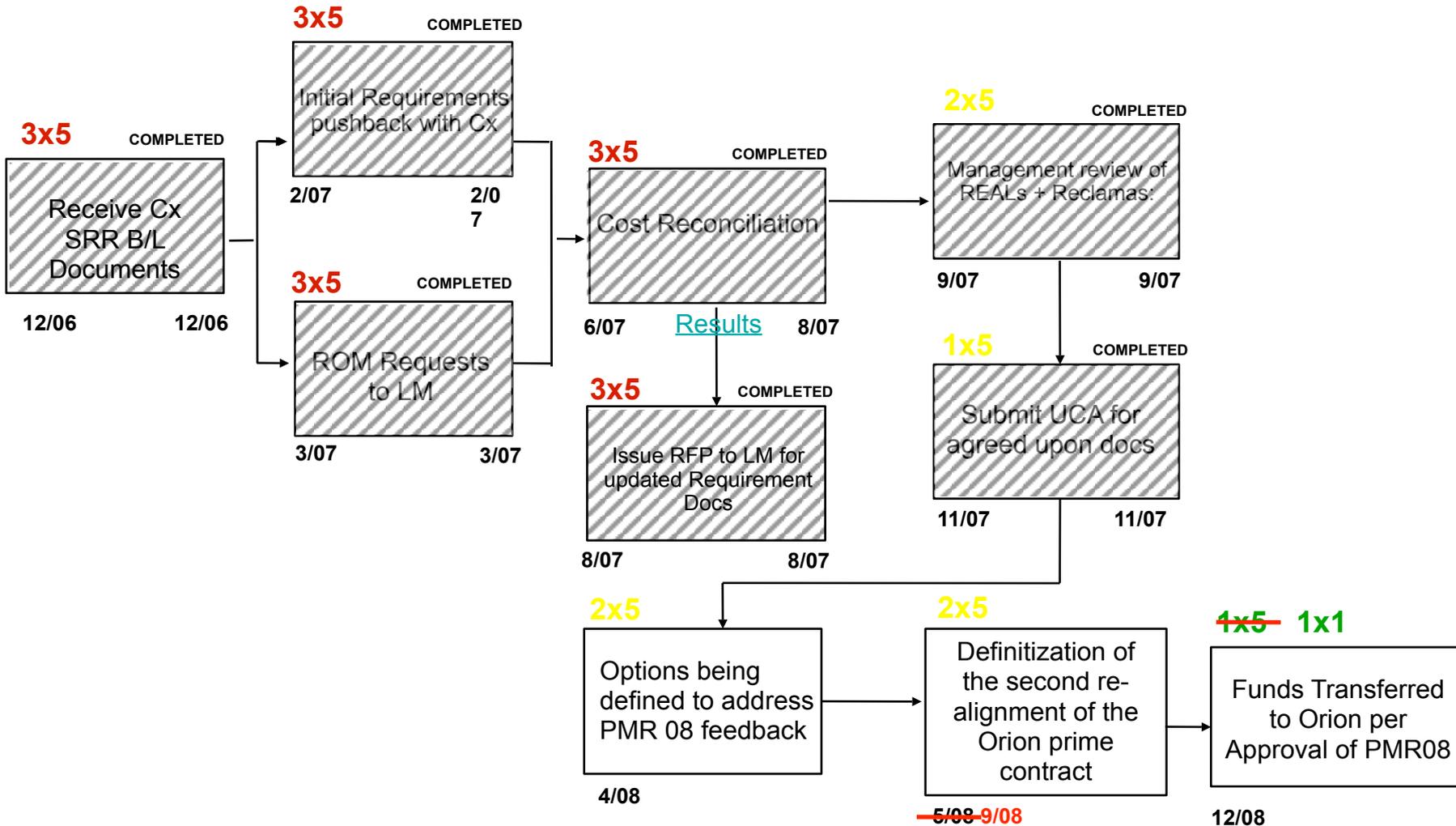
- This risk has been updated to track the portion of the ongoing Orion requirements alignment contract modification that has not been funded by CxP. In addition, the schedule for contract definitization has been updated. This risk is tied to IRMA numbers 1230, 1119, and 2519.
- Risk 1400 has been incorporated into to Risk 1859 and can be closed.
- \$101M for induced loads has been moved from Risk 1230



MITIGATION PLAN FLOW DIAGRAM CEV Contract Alignment (Level I/II)



Orion Project Office





Major Cost Categories in Reqt's Alignment Mod



Orion Project Office

Category	Cx Funded	Additional Cost in Reqt's Alignment Mod (includes fee)	Total (includes fee)	Notes
Induced Environments	\$109M	\$224-336M	\$346-458M	\$101M from Risk 1230
Weight Reduction	\$162M	\$112-336M	\$293-517M	
Updated Requirements	\$155M	\$252-420M	\$426-594M	
BEC	\$0M	\$168-224M	\$168-224M	
Other	\$0M	\$56-78M	\$56-78M	
Total (w/o fee)	\$426M	\$812-1394M	\$1289-1872M	



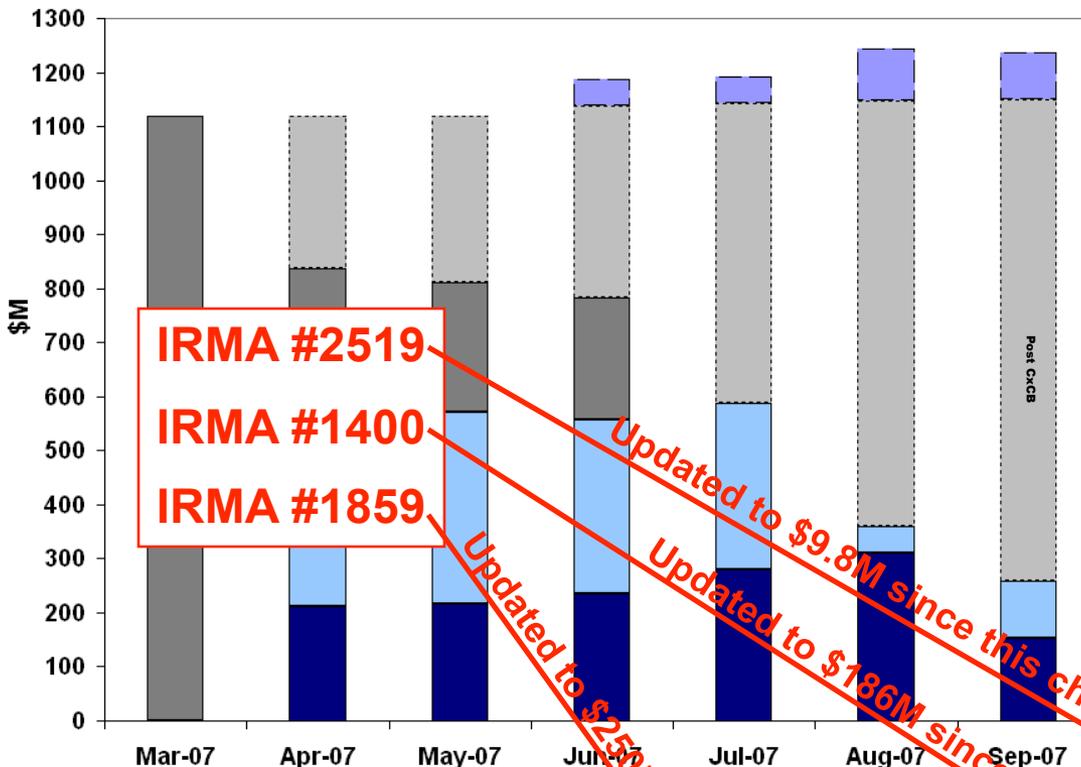
Requirements Cost Reconciliation Status



Results

Note:

Cost numbers are LM provided parametric estimates, not LM commitments, and are provided to evaluate the cost impact of the new requirements to the existing contract baseline. Firm cost estimates will be provided as part of the contract modification process.



- Directed at 9/24 CxCB to defer the following till after 607 POD completed:
 - CV0736; SW Common Cause Failure = \$56M
 - CV0736; Centralized Nav = \$47M
- \$1.1B Cost Threat:
 - 9% of the costs currently in In Work
 - 13% of the costs accepted as Real
 - 78% of the costs Eliminated
- 150 Requirements:
 - 32% Booked Full cost as REAL
 - 13% Booked a partial amount as REAL
 - 39% Reviewed and Eliminated cost

Orion Project Office

Eliminated			
CEQATR	180.4	EVA	11.3
SRD	240.0	DSNE	32.6
SDVR	161.1	STD 6016	14.2
STD 5019	65.5	HSIR	17.4
C3I Vol 1,2,3,5*	57.1	PEPC/EPS*	4.2
E3	19.0	NEDD	4.1
CxP 70038/43	35.4	PEPC/EPS	1.2
Pyro	11.3	LIDS IDD	2.2
IRD*	35.2	Total	892.2

Final Status Details (With 24/26 Sep CxCB Results)

Real			
SRD	15.3	STD-6016	12.0
IRD	25.5	E3	0.9
STD-5019	45.2	SDVR	9.9
C3I (1,2,3,5)	24.6	PEPC/EPS	0.5
HSIR	12.0	Pyro	0.1
DSNE	6.7	Total	152.5

New CR's (In Work)	
CR Total	84.9

In Work	
SRD	106.0
Total	106.0

(SW Common Cause Failures, Centralized Nav, Crash Survivable Data Recorder)

Not Reviewed	
Total	-



* Deferred to Block 2 for consideration (Sch C); Total C3I Sch C cost is \$75M; IRD includes LPTU (\$31.1M)



CxIRMA Risk 2669

CEV SR&QA Top Risk: LOC/LOM Summary



- Next LOC/LOM estimate to be available is the Lunar Sortie PRA in mid July (July 21).
 - Quantified model is due August 1.
 - ISS Crewed DRM model is due in November.
 - This will essentially be the first significant PRA model change since the one we received last Dec.
 - It will be the first PRA model change that has had an opportunity to see if the OVIEWG updates and review comments have been incorporated.
- Reviews of the most current drop of the OVIEWG fault trees are being done.
 - There are changes to the drivers that could be significant from what one could expect to see in the PRA drops that are upcoming.
 - BEC and COPV are some of the changes that will be apparent.
- Component level allocations will be incorporated into Subsystem and Component level Specs
 - Subsystem allocations still being fine-tuned – the expectation is that LM will start incorporating them into the subsystem specs shortly (early-mid July).
 - Once subsystem allocations are complete, LM will be flowing them down to the component level.
 - LM should be largely done incorporating the component-level allocations into the component specs by mid-Sept.
- OVIEWG work has transitioned into OVIT and FIT teams are being defined to address drivers and design changes to address them.
- Participation in the OVIT activities to mitigate the top risk drivers from the 5/2/08 LM Fault Tree analysis will continue until Aug. 1 SBR.
- PRA Models and analysis due for SBR and PDR.
- Resources for doing GAP analysis, PRA and, and OVIT/FIT work are tight and are in competition with each other for resources as well as work to support Level 2 work in the same areas.



Road to SBR - PDR

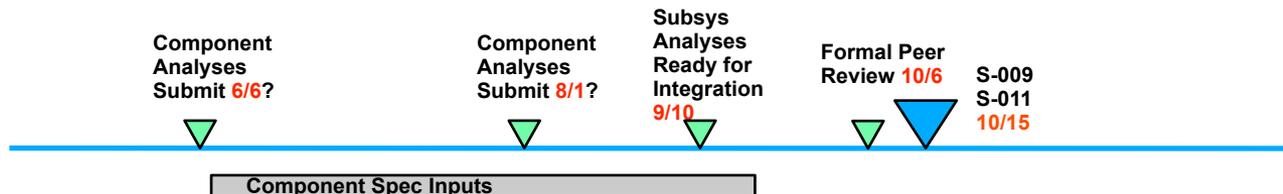


PROJECT MILESTONES



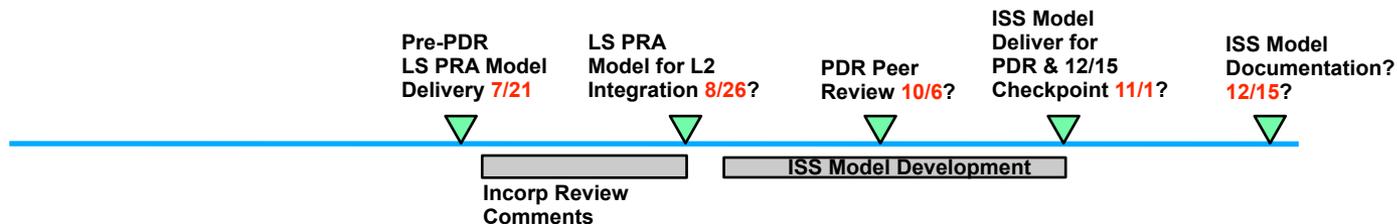
RMS Products/ Analysis

S-009 / S-011

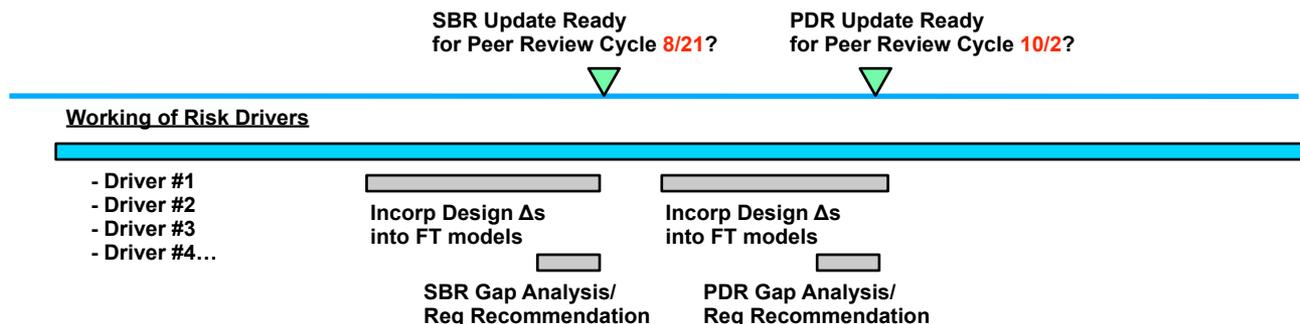


PRA

(see detailed slide)



LOC/ LOM



Instrumentation & Channelization



as of May 23, 2008

Orion Project Office



Risk 2784: Orion Data Network Technology Maturation

WWW.NASA.WATCH.COM



- Risk Title
 - Orion Data Network Technology ~~TRL~~ **Maturation**
- Risk Statement
 - Given the Time Triggered Gigabit Ethernet (TT-GbE) Protocol to be used for the Orion Data Network is currently a low TRL for several elements in development; there is a possibility that CEV will not meet our requirements for TRL 6 by PDR **the TT-GbE technology will not mature as quickly as needed by the Orion project.**
- Risk Context
 - The TT-GbE technology is currently in development.
 - TT-GbE Intellectual Property (IP) is not complete and is currently shared between Honeywell and TTTech, which is an international company.
 - COM-MON protocol lacks maturity and selection has not been made
 - The TT-GbE protocol has not been implemented in a radiation hardened ASIC.
 - Protocol validation has not been completed on the physical layer or protocol layer devices.
 - TT-GbE hardware can not be procured from commercial vendors for development needs across the Constellation Program.
 - SERDES maturity demonstrated at 100 Ohm differential -- 1000Base-CX standard that we have selected is 150 Ohms.
 - A complete set of requirements is needed to fully commit to design



Risk Mitigation Plan Overview

Risk 2784: Orion Data Network Technology Maturation



- Physical (PHY) Layer will be 1000BASE-CX compliant
 - 150 ohm bus impedance selected is per 1000BASE-CX standard
 - Cable/connectors identified
- Driving issue is the effectiveness of the COM-MON (Command-Monitor) message truncation scheme and the impacts to the Phy Layer performance
 - Drives BER
 - IRAD experiments (6) are designed to determine the most optimal and effective message truncation design.
 - Optimal design answer targeted for NLT 6/30 2008 to support production schedule. Results to be documented IRAD Reports, phy-layer spec and other applicable design and requirements documents
 - Use of existing TRIVOR cards may accelerate activity
 - Experiment boards in work
 - Back-up plan in work in the event none of the experiments produce acceptable results
- Secondary objectives are to use flight/flight-like cables and connectors (as available) to apply more fidelity to the outcome
- Document and communicate results and network design/requirements



Risk Mitigation Status **since April PMR**

Risk 2784: Orion Data Network Technology Maturation



- Successful review regarding Orion Network Progress and Risk
 - Gained agreement that most items currently tracked as mitigation are actually forward work
- TIM held with HI Plymouth ASIC team
 - Technical and contractual issues resolved/in-work
- Initial Switch IP/RTL drop received 3/31 (on time)
 - Synthesis indicates fit and timing closure with margin
 - Memory, management function, COM-MON not included
- IP walkthrough with HI Clearwater design and verification team
- COM-MON IP/RTL drop 4/18
 - Integrated in AT lab proto-switch
- Orion Network Spec 8273976 Rev Basic out for review
- Progress in Phy Proto/TRL-6 IRAD projects
 - Parts ordered, board layouts in work
 - Use of existing TRIVOR cards may accelerate activity
- TAA application for cooperation between HI and TTTech submitted to State Department w/e 4/18/2008
 - 2-3 month gov't review and approval cycle
 - TAA documentation provided to NASA and LM for reference purposes



MITIGATION PLAN CHANGES

Risk 2784: Orion Data Network Technology Maturation



Mitigation Steps **Changes/Deleted**:

Task No.	Task Description	Actionee	ECD	ACD	Like	Perf	Sched	Cost	Resulting L x C	Success Criteria
1	Determine physical layer specification. (strictly 1000Base-CX or deviation for impedance).	RTaylor	12/31/07	1/23/08	5	3	4	2	23	Definition of physical layer specification.
2	Deliver TTEthernet (TTE) specification to LM and NASA	RTaylor	5/30/08		5	3	4	2	23	TTE Specification submitted to LM and NASA for review
3	Obtain-Submit Technical Assistance Agreement (TAA) between TTTech, NASA, LM and HI to the State Department.	RTaylor	6/2/08	4/18/08	4 5	3	3 4	2	23	Signed TAA. Submit TAA application from HI.
4	Submit Technical Assistance Agreement (TAA) between TTTech and NASA to the State Department. [MMcClellan, NASA]	MMcClellan	6/27/08		5	3	4	2	23	Submit TAA application from NASA.
5	Submit Technical Assistance Agreement (TAA) between TTTech and LM to the State Department. [EBarnes, LM]	EBarnes	6/28/08		5	3	4	2	23	Submit TAA application from LM.
6	Complete TTE IP Delivery to HI	RTaylor	6/29/08		5	3	4	2	23	Contractual deliveries from TTTech to HI complete.

Rationale for Change:

- (T2) Added task for completeness and coverage. Replaces previous Task 2 which moved to Task 15.
- (T3,T4,T5) Expanded task for unilateral TAAs and appropriate task owners
- (T6) Added task for completeness and coverage
- Rescore task risk reductions based on revised order of events and expected L or C mitigation



MITIGATION PLAN CHANGES

Risk 2784: Orion Data Network Technology Maturation



• Mitigation Steps **Changes/Deleted**:

Task No.	Task Description	Actionee	ECD	ACD	Like	Perf	Sched	Cost	Resulting L x C	Success Criteria
7	Complete successful formal model checking of TTE IP	RTaylor	6/30/08		4	3	4	2	22	Test Report and/or model output available for review
8	Conduct phy layer experiments to determine optimal COM-MON configuration	RTaylor	7/1/08		3	3	4	2	19	Completion of COM-MON experiments with acceptable BER and message truncation method. Documented in test reports, design descriptions, requirements documents et al.
9	TTE development hardware available to Orion CxP partners to begin early TTGbE development and familiarization activities.	RTaylor MMcClellan	7/2/08		2 3	2 3	2 4	2	19	Delivery of TTE development hardware (not including rad hard SERDES and COM-MON functionality) to Orion CxP partners.
10	TTE development hardware available to Orion prime contractor (LM) to begin early TTGbE development and familiarization activities.	RTaylor EBarnes	7/3/08		3	3	4	2	19	Delivery of TTE development hardware (not including rad hard SERDES and COM-MON) to prime contractor (LM).
11	6/15/08 - Prototype TT-GbE protocol in an FPGA with size representative of code implementable in an HX5000 ASIC.	RTaylor	7/30/08		4 3	3	3	2	15	Representative hardware code with COM-MON demonstrated in hardware, and ASIC modeling, sizing, and performance analyses of code complete.

• Rationale for Change:

- (T7,T8) Added tasks for completeness and coverage
- (T9, T10) Modify task owner to appropriate oversight group
- (T11) Revise date to current plan and update wording for clarity and accuracy
- Rescore task risk reductions based on revised order of events and expected L or C mitigation



MITIGATION PLAN CHANGES

Risk 2784: Orion Data Network Technology Maturation



- Mitigation Steps Changes/Deleted:**

Task No.	Task Description	Actionee	ECD	ACD	Like	Perf	Sched	Cost	Resulting L x C	Success Criteria
12	8/31/08 -Validation of the Ethernet protocol on the physical layer device (SERDES).	RTaylor	8/15/08		3	2	3	2	15	Summary Test Report of physical layer device for implementation and validation in Orion hardware.
13	Validation Verification of TT-GbE protocol and the Intellectual Property (IP) associated with TT-GbE.	RTaylor	8/30/08		3 2	2	2 3	2	11	IP blocks available within Honeywell to build chips for HX5000. Verified IP (RTL) available within Honeywell to build HX5000 NICs and Switches (expected TRL 6).
14	Independent assessment of the TT-GbE test plans, formal models and results.	PMiner	8/31/08		2	2	3	2	11	Whitepaper or analysis report validation the TT-GbE protocol.
2 15	6/1/08 - Document exceptions to physical layer specification based on results of experiments.	RTaylor	9/1/08		3 2	4 2	4 3	4 2	11	Release draft documentation of physical layer specification (multiple documents)
16	Verification of TT-GbE protocol in relevant environment.	RTaylor	10/31/08		1	2	2	2	3	Test Report. Relevant environment to include "flight-like" cables, connectors, topology.

- Rationale for Change:**

- (T12) Modify date to current plan
- (T13) Revise wording for clarity and accuracy
- (T14) Added task per NASA request for independent IP validation
- (T16) Added task due to lead times for flight-type cables and connectors
- Rescore task risk reductions based on revised order of events and expected L or C mitigation

Orion Project Office

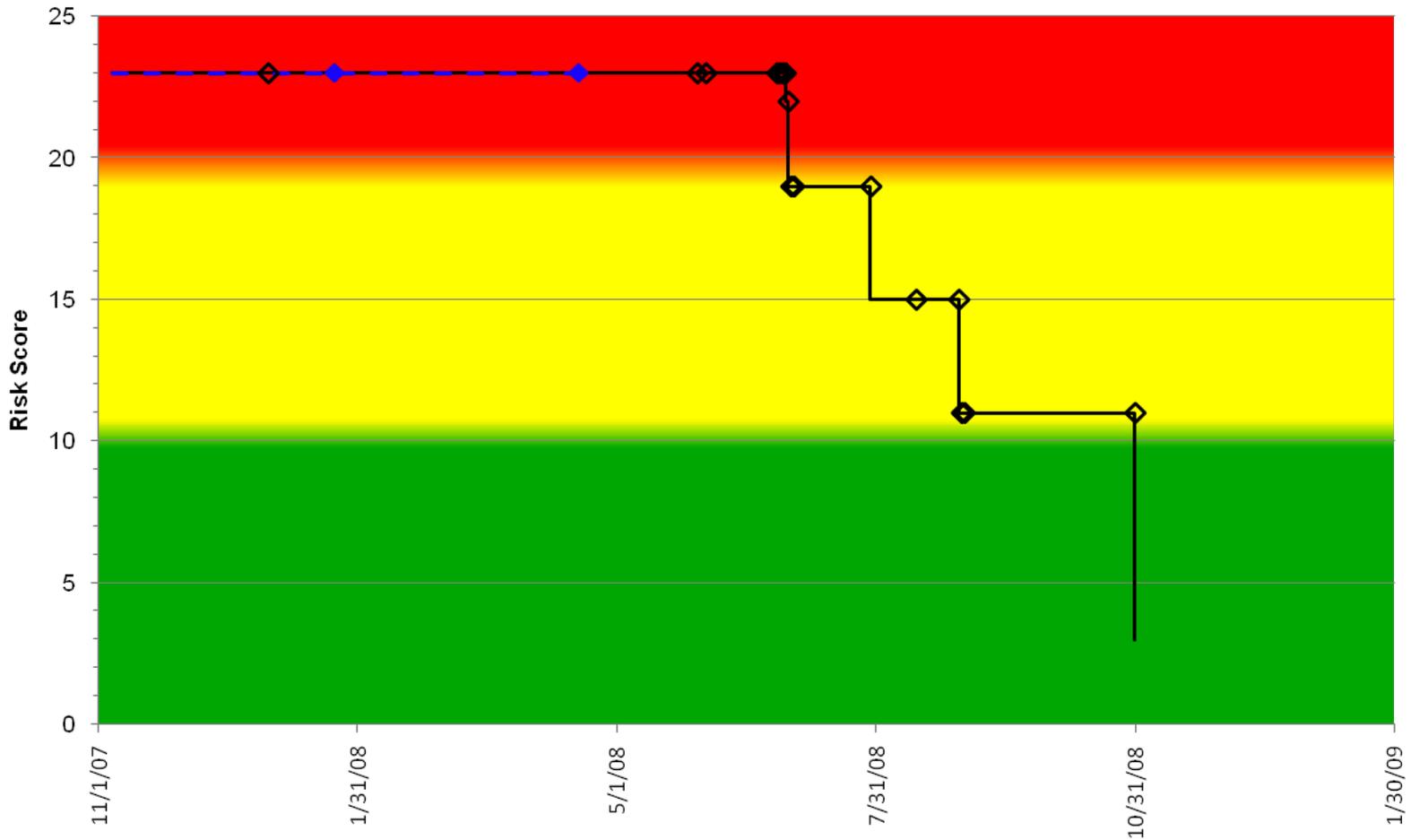


MITIGATION PLAN WATERFALL



Risk 2784: Orion Data Network Technology Maturation

R-2784: Orion Data Network Technology TRL Maturation





Issues/Recommendations



Risk 2784: Orion Data Network Technology Maturation

- **Issues**
 - Tasks needed to be added to communicate mitigation progress
 - Task success criteria needed clarification
 - Task risk reductions were rescored based on revised order of events and expected L or C mitigation
- **Recommendations**
 - Requires changes to mitigation step descriptions, scores, and ECDs
- **Decisions required from the Risk Board**
 - Approve changes to mitigation statement and plan



VIO Risk Status Summary – *Top Program Risks*



Risk #/Title	Status	Issues
<p>1119 CEV Control Mass Effectiveness</p>	<ul style="list-style-type: none"> • Incorporated the early DAC-2 Trades studies at MID DAC-2 ERB 4/18. Updated the MEL. The Mass exceeded the objective for PDR but demonstrated the Mass process could meet the PDR objectives • LM held “mass process audit” with Level 2 and 3 on 5/15/08 • LM implemented Spacecraft Leadership Forum and OVIT to improve integration and provide prioritization of resources. OVIT also contains Focused Integration Teams (FIT). One specifically created in area of mass & c.g. (MFIT) • Outlined mass change processes and roles & responsibilities in following slides • Developed new format for Bi-weekly CPCB mass status reporting 	<ul style="list-style-type: none"> • Aggressively working Threats and Opportunities
<p>1230 Orion Vehicle Vibroacoustic Environments</p>	<ul style="list-style-type: none"> • Conducted test 60-AA of baseline ALAS-11 rev3. Abort flt w/ Cold Gas, Lo-Fi Acoustic • Test Primarily Aerodynamics, Data analysis is very preliminary • All data were scaled to the 605-068 trajectory. • Sensors are sparser than 16-AA however the LAM plumes are a closer match to flight • Identified oscillating shock produced by umbilical cover which correlates with 40 Hz tone found on ESM and heat shield • Analysis of data completion date moved to 5/31 	<ul style="list-style-type: none"> • CEV-00120 “approved” on 5/25/08 for Gov cost in FY08-09 for WTT 80AS; but no money was provided. Costs for WTT 80AS added back to risk, but shifted to FY09.



VIO Risk Status Summary – *Top Project Risks*



Risk #/Title	Status	Issues
2583 - CEV Impacts Due to Thrust Oscillation	<ul style="list-style-type: none"> • Mitigation plan updated for mini-loads cycle • Crew Vibration Performance Boundaries established for analyses 	<ul style="list-style-type: none"> • LM has been supporting TOFT activity at risk of PDR products and requested an IDIQ task for continued support through to PDR. The cost for the IDIQ task was approved by CPCB via CR CEV-00119 on 5/25/08. These costs are not part of CCO24. Do not anticipate slipping out the FY09-10 costs since, if TO impacts are realized, related effort will need to start soon after PDR.
1115 - CEV Software Development Cycle May Not Meet Project Schedules	<ul style="list-style-type: none"> • SwRR kicked off and in progress; Board on 4/23/08 • Spiral 2 test plan review moved to subsystem Design Review for PDR deliveries – July 2008 	<ul style="list-style-type: none"> • This floating requirements baseline has resulted in an SwRR goal for “best effort” of SRS content • The PDR goal will probably no longer achieve 90% complete at PDR <ul style="list-style-type: none"> – An informal post-PDR activity is planned without the benefit of formal community review – This post-PDR activity could increase schedule risk (and possibly technical risk)
1505 - Loss of Docking Adapter Due to Failure of Relative Nav System	<ul style="list-style-type: none"> • Task 8 ECD changed to 11/21/2008 to reflect GNC FDIR efforts based on hardware and firmware plans. FDIR design is still undergoing revisions. 	<ul style="list-style-type: none"> • The VNS “Supplier Selection” decision has slipped. The delay in the decision impacts multiple tasks in the mitigation plan. • Anticipated that at least four (4) mitigation steps’ ECD may be changed: <ul style="list-style-type: none"> – After the supplier has been selected and placed on contract, delivery dates can be updated – After the VNS SRR, the hardware delivery dates should be refined again.



VIO Risk Status Summary – Top Project Risks



Risk #/Title	Status	Issues
1223 / Requirements Maturation	<ul style="list-style-type: none"> Final Mitigation step: S/C and Modules Specs Baselined will be completed per new PDR plan <ul style="list-style-type: none"> S/C and Module Tech reviews for new contractual baseline on 4/7-11; Peer Reviews April 4/15-16; ERBs 4/21-23 	<ul style="list-style-type: none"> Anticipate recommending that risk be “closed” at next Risk Board. Expect some level of requirements change traffic as proceed through design process Requirements disconnects with Cx being stabilized through Coyote team work.
2976 - Closure of 607 Vehicle Power Design	<ul style="list-style-type: none"> At the 4/14/2008 ERB, the canted solar array stowage design was incorporated allowing a solar array wing size diameter greater than 5.5 m. At the 4/18/2008 combined ERB/PRB, the solar array wing size diameter was increased to 5.84 m. This is the largest wing diameter that the vehicle can accommodate without significant impacts to the wiring harness, slip rings, and switching modules. On 5/20/2008, the power load management process was presented to the SIF. This presentation was previously explained to both the CM and SM IPT's. <i>As of 5/27/08, the solar array capability meets requirements, but the battery capability may be insufficient to meet requirements for worst-case return from ISS.</i> 	<ul style="list-style-type: none">



Risk 2113: Encapsulated Service Module Fairing Separation Shock/Debris Affecting CLV

WWW.NASAWATCH.COM



June 2008

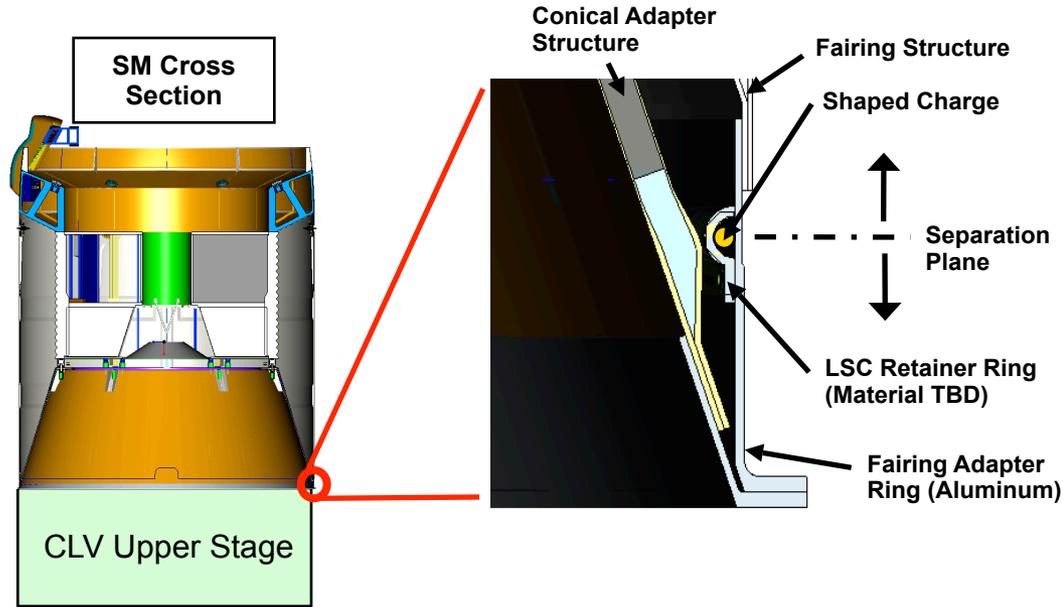
Risk Statement:

Given the close proximity of the fairing separation pyrotechnics with the CLV Instrumentation Ring, there is a possibility that the separation shock event will damage the CLV avionics mounted within the Instrumentation Ring. There is also a possibility that the debris from the event will damage the upper stage.

Risk Context

- The separation linear shaped charge at the base of the fairings contains a 20 grain per linear foot flexible shaped charge.
- The proximity of the shaped charge to the avionics boxes attached to the Instrument Unit gives concern that the shock from the separation event could damage the electronics. After fairing separation, the CLV avionics hardware must continue to operate until ~30 seconds after CEV spacecraft separation.
- Any aluminum debris generated by the linear shape charge must be quantified and analyzed for any detrimental affects on the CLV upper stage.

Linear Shape Charge Location



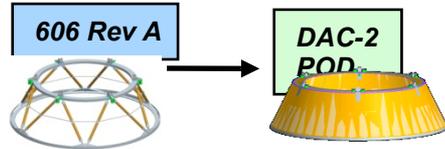


MITIGATION PLAN FLOW DIAGRAM

Risk 2113



Orion Project Office



3x4 COMPLETED

Conical Adapter

10/07 11/07

3x4 COMPLETED

Shock Analysis to Establish ICD Levels

10/07 11/07

3x4 COMPLETED

Separation Linear Shaped Charge Mechanism Baseline in place after completing existing trades, including preliminary debris assessment

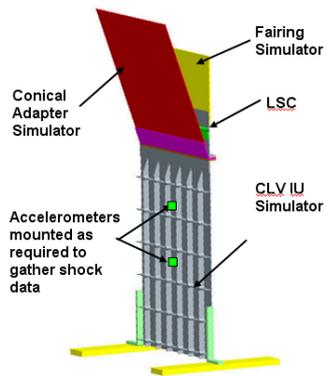
10/07 11/07

3x3 COMPLETED

Gather Heritage frangible joint information to implement a mitigation design in the event the LSC shock and/or debris environments are unacceptable.

1/08 3/08

LSC TEST CONFIGURATION



2x2

Debris & Shock Test: Linear shape charge will be used to cut representative Aluminum fairing coupons to assess the shock, debris, and debris quantities. If possible, field maps and velocity of the debris will also be measured. Correlate test data with shock/debris analysis where applicable

5/08 7/08

NEXT STEP DUE

2x2

CLV Coordination: Provide shock/debris environments to CLV. Negotiate solution if shock exceeds ICD.

7/08 8/08

2x2

Trade Study: As part of DAC-2, perform a formal trade study between LSC and frangible joint for the aft fairing separation mechanism

7/08 8/08



Risk Mitigation Status

- Steps completed since last report:
 - The Separation Linear Shape Charge (SLSC) testing has been started is approximately 30% complete.
 - Completion of the Linear Shaped Charge device testing originally scheduled to be complete in June has been delayed to July 2008.
 - Configuration, data interpretation, and instrumentation have contributed to schedule delays.
- Upcoming:
 - Complete Linear Shaped Charge testing and analyze the shock and debris generation.
 - Final test report due July 2008.
- Future:
 - Review test results with CLV
 - Conduct Linear Shape Charge versus Frangible Join trade study as part of DAC-2 as a future mitigation design, in the event that the Linear Shaped Charge development test results are deemed unacceptable



CX IRMA Risk: 2113 Summary Report

Open Date: 5/29/2007

Status as of 6/23/2008

ECD: 11/1/2008



Risk Title: Encapsulated Service Module Fairing Separation Shock/Debris Affecting CLV
Escalation Level: TProjR
Phase(s): No Phases identified.

Owning WBS Element: CEV_SM
Risk Owner: Lance Lininger

Risk Statement:

Given the close proximity of the fairing separation pyrotechnics with the CLV Instrumentation Ring; there is a possibility that the separation shock event will damage the CLV avionics mounted within the Instrumentation Ring. There is also a possibility that the debris from the event will damage the upper stage.

Context:

CLV is concerned about debris and shock from pyrotechnic events damaging CLV IU electronics. The separation linear shaped charge at the base of the fairings contains a 25-30 grain per linear foot flexible shaped charge. The proximity of the shaped charge to the avionics boxes attached to the Instrument Unit gives concern that the shock from the separation event could damage the electronics. After fairing separation, the CLV avionics hardware must continue to operate after CEV spacecraft separation. Any aluminum debris generated by the linear shape charge must be quantified and analyzed for any detrimental effects on the CLV upper stage. NASA POC: Dan Catalano - Level IV Risk. Risk Score Rationale: Likelihood 3 - The likelihood of this risk occurring was determined to be a 3 - this was due to the types of materials that have been baselined. At this time a linear shape charge separation device is baselined, these devices are known to have high shock events associated with their usage and have directed debris associated with their usage. At this time the allowable shock and debris have not been quantified, thus this was given a moderate rating. Safety 0 - The Safety score of 0 was assigned to this risk, due to the baseline design is a ordnance device and the purpose of this risk is to quantify the shock and debris of the device not to develop a non-pyro activated device - Safety, though important, is not being considered within this risk assessment. Performance 4 - Performance was assigned a 4 for this risk - rating is due to the high concern of debris effecting the nominal performance of the CLV post fairing jettison. Cost 4 - The cost rating was assigned a 4. The high rating was assigned due to the substantial redesign that would be necessary if the concept baseline were found to be unacceptable late in the life of the program. Redesign could have a global effect on avionics equipment due to shock isolation or a substantial re-evaluation of the fairing jettison mechanism system. Schedule 4 - The schedule rating was assigned a 4. From a scale and complexity approach there are many unknowns with the fairing design and lead times for materials and tooling are extensive. Modifications to the existing concept design will have impact on manufacturing schedule and drawing release.

Likelihood: 3

Safe: 0

Perf: 4

Sched: 4

Cost: 4

Status:

6/20/2008 Linear Shaped Charge testing is 20% complete; configuration, data interpretation, and instrumentation have contributed to schedule delays. Proposed changes to the mitigation plan will be presented at the SM Risk Review on May 28, 2008.



CX IRMA Risk: 2113 Summary Report

Open Date: 5/29/2007

Status as of 5/27/2008

ECD: 11/1/2008



Mitigation Summary

Mitigation Plan: Overall mitigation plan will be to perform debris and shock assessments.

Fallback Plan:

Task No.	Task Description	Actionee	ECD	ACD	Resulting L x C	Success Criteria
1	Separation Mechanism Baseline: Completion of the separation mechanisms baseline after performing existing trades including preliminary debris assessment	lininglr	12/4/07	11/16/07	3 x 4 yellow	Completion of the 607 POD ERB. COMPLETE IMS Task # F1301010
2	Conical Shape redesign	lininglr	12/4/07	11/16/07	3 x 4 yellow	Updated DAC2-POD. COMPLETE IMS Task # F1301010
3	Complete shock analysis to define the source shock spectra limit at the CEV-CLV interface.	lininglr	12/4/07	11/16/07	3 x 4 yellow	Shock levels defined and documented in memo CEV-LD-07-045. These shock levels have been coordinated with CLV.
4	Gather Heritage frangible joint information necessary to implement a mitigation design in the event the LSC shock and/or debris environments are unacceptable.	lininglr	3/21/08	3/21/08	3 x 3 yellow	Completion of Frangible joint assessment for input to TDS. IMS Task # F1808115



MITIGATION PLAN CHANGES



- Mitigation Steps Changes:**

Task No.	Task Description	Actionee	ECD	ACD	Resulting L x C	Success Criteria
5	Debris & Shock Test: Linear shape charge will be used to cut representative aluminum fairing coupons to assess the shock, debris type, and debris quantities. If possible, field maps and velocity of the debris will also be measured. Correlate test data with shock/debris analysis where applicable	lininglr	5/27/08 7/2/08		2 x 2 green	Completion of a detailed shock analysis memo indicating fairing pyro shock debris levels are within source shock levels documented in CxP 70143 (also referenced in memo CEV-LD-07-045). IMS Task # F1808116.
6	Debris & Shock Test: Linear shape charge will be used to cut representative aluminum fairing coupons to assess the shock, debris type, and debris quantities. If possible, field maps and velocity of the debris will also be measured. Correlate test data with shock/debris analysis where applicable	lininglr	5/27/08 7/2/08		2 x 2 green	Completion of a detailed debris analysis memo for transmittal to CLV. IMS Task # F1808116.

- Rationale for Change:** Revised ECD for steps 5 and 6. Date slip due test anomalies, instrumentation issues, and data review
- Impacts:** None



MITIGATION PLAN CHANGES



Mitigation Steps Changes:

Task No.	Task Description	Actionee	ECD	ACD	Resulting L x C	Success Criteria
7	Shock environment, CLV coordination.	lininglr	6/9/08 7/2/08		2 x 2 green	If LSC shock levels exceed the ICD levels in CxP 70143, then work with CLV to identify solution (frangible joint is a possible lower shock solution). IMS Task # F1808116.
8	Debris environment, CLV coordination.	lininglr	6/9/08 7/2/08		2 x 2 green	Provide debris environment to CLV and discuss any negative impacts. Work with CLV to identify solution if necessary (frangible joint is a lower debris solution). IMS Task # F1808116.
9	Trade Study: As part of DAC-2, perform a formal trade study between LSC and frangible joint for the aft fairing separation mechanism. This will gather information necessary to implement a mitigation design in the event the LSC shock and/or debris environments are unacceptable.	lininglr	6/9/08 7/2/08		2 x 2 green	Completion of TDS for this trade. IMS Task # F1808115.
10	Deliver memos	lininglr	6/30/08 7/15/08		2 x 2 green	Complete collection of relevant data and submit into project link.

- **Rationale for Change: Revised ECDs for steps 7 - 10. Date slip due to testing delays and final report completion.**
- **Impacts: None**



CEV HT7 Video



Video in Container



LIDS Video



Video in Container



Seat Sled Test



Video in Container



Backup



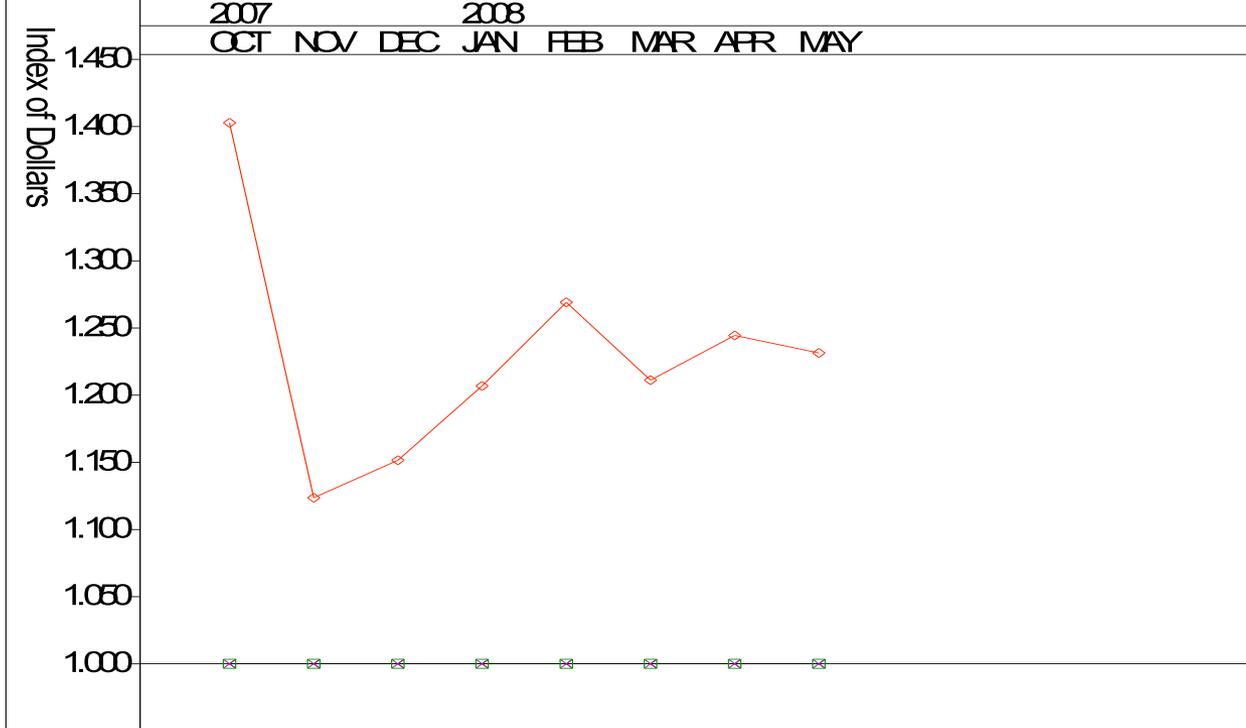
Non-Prime Monthly Earned Value Overview



Orion Project Office

\$\$ In Thousands	BCWS	BCWP	ACWP	Schedule Variance			Cost Variance			Summary
Current Pd.	34,209	34,209	29,499	0	0.0%	G →	4,710	13.8%	B ↓	The cumulative cost data shows significant underspend. Performance measurement data to be collected for the GFE Subprojects after their IBR.
Cumulative	235,426	235,426	191,211	0	0.0%	G →	44,215	18.8%	B →	

Element: 644423 NASA Johnson Space Center FROD Name: Crew Exploration
 CH & SP



TOPILREI	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
CLMCFI	1.403	1.123	1.151	1.207	1.269	1.211	1.244	1.231
CLMSPI	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

BAC	429,735	
EAC	385,520	
VAC	44,215	
SPI	Current	1.00
	Cumulative	1.00
CPI	Current	1.16
	Cumulative	1.23
Percent Scheduled	54.8%	
Percent Complete	54.8%	
Percent Spent	44.5%	
EAC Forecast	<u>Min.</u>	<u>Max</u>
	345,093	365,382

R Worse than -10%
 Y Between -10% and -5%
 G Better than -5%
 Change Threshold = 10%
 ↑ Improving ↓ Worsening



Non-Prime Stoplight Chart Level 2/3 Status



	Wbs	Description	SV	CV	VAC	BCWS	BCWP	ACWP	SV	SV%	CV	CV%	BAC	EAC	CPI	SPI	VAC	CAM
1	644423	Crew Exploration Vehicle				235,426.5	235,426.5	191,211.2	0.0	0.00	44,215.3	18.78	429,734.9	385,519.7	1.231	1.000	44,215.2	
4	644423.01	Project Management				19,484.6	19,484.6	15,156.8	0.0	0.00	4,327.9	22.21	60,702.8	56,374.9	1.286	1.000	4,327.9	PP&C
18	644423.02	Systems Engineering				64,032.4	64,032.4	47,125.2	0.0	0.00	16,907.2	26.40	109,245.9	92,338.7	1.359	1.000	16,907.2	VI
33	644423.03	Safety and Mission Assurance				8,313.4	8,313.4	8,221.9	0.0	0.00	91.5	1.10	12,538.1	12,446.5	1.011	1.000	91.5	S&MA
41	644423.04	Science/Technology				7,424.9	7,424.9	7,034.2	0.0	0.00	390.7	5.26	20,235.0	19,844.4	1.056	1.000	390.7	CM
47	644423.06	Spacecraft				62,703.5	62,703.5	56,105.5	0.0	0.00	6,598.0	10.52	105,386.3	98,788.3	1.118	1.000	6,598.0	CM
52	644423.06.31	Crew Module				43,119.2	43,119.2	33,734.7	0.0	0.00	9,384.5	21.76	74,316.8	64,932.3	1.278	1.000	9,384.5	CM
53	644423.06.32	Service Module				10,276.1	10,276.1	8,917.3	0.0	0.00	1,358.7	13.22	14,880.9	13,522.2	1.152	1.000	1,358.7	SM
54	644423.06.33	Spacecraft Adapter				0.0	0.0	0.5	0.0	0.00	-0.5	0.00	0.0	0.5	0.000	0.000	-0.5	CM
55	644423.06.34	Launch Abort System				8,375.1	8,375.1	6,581.5	0.0	0.00	1,793.6	21.42	14,807.9	13,014.3	1.273	1.000	1,793.5	LAS
56	644423.06.35	CEV Software				902.2	902.2	6,852.2	0.0	0.00	-5,950.0	-659.51	1,341.7	7,291.7	0.132	1.000	-5,950.0	VI
57	644423.07	Mission Operations				0.0	0.0	-0.7	0.0	0.00	0.7	0.00	0.0	-0.7	0.000	0.000	0.7	VI
59	644423.10	Systems Integration & Testing				67,485.7	67,485.7	47,378.8	0.0	0.00	20,106.8	29.79	105,730.8	85,624.0	1.424	1.000	20,106.8	T&V
68	644423.98	CEV Coff Projects				5,982.0	5,982.0	10,189.6	0.0	0.00	-4,207.6	-70.34	36,485.0	40,692.6	0.587	1.000	-4,207.6	T&V

Worse than -10% Between -10% and -5% Better than -5% Change Threshold = 10%

Non-prime thresholds for variance explanations

5 largest cum cost variances exceeding +/- \$250K and +/- 5%

5 largest cum schedule variances exceeding +/- \$250K and +/- 5%



Non-Prime Top 5 Cost Drivers



	WBS	DESCRIPTION	SV	CV	VAC	BCWS	BCWP	ACWP	CV	CV%	CPI	LRE
1	644423.06.31.04	CM GFE Products	↔	↔	↓	4,070.9	4,070.9	25,961.2	-21,890.3	-537.72	0.157	32,268.0
2	644423.02.36	CEV Systems Int	↔	↔	↓	2,446.6	2,446.6	15,291.1	-12,844.5	-525.00	0.160	16,390.4
3	644423.01.31	CEV Mgmt and Ad	↔	↔	↓	1,195.7	1,195.7	7,456.5	-6,260.8	-523.62	0.160	11,893.9
4	644423.06.31.03	CM Subsystems	↔	↔	↓	1,082.2	1,082.2	6,452.6	-5,370.4	-496.24	0.168	7,936.8
5	644423.02.38	Specialty Engin	↔	↔	↓	725.0	725.0	4,550.3	-3,825.3	-527.64	0.159	4,874.7

Variance Explanation (include cost, impact and corrective action)

Time phased baseline to be updated to reflect PMR-08 Rev 1.



ORION Monthly Artificial Intelligence Report



Non-Prime

This element represents 100.0 percent of the total contract.
This element appears to a Level of Effort (LOE) account.
Earned value data indicates that this effort is about 54.78% complete.
Work in process is on schedule.
Period actuals are running at 29,499.4.
There has been a significant increase in the rate of expenditures recently.
This effort has a favorable cost variance of 18.78%.
This effort is maintaining a return of 1.231 per unit expended (Dollars).
The EAC indicates that this effort will underrun.

All accounts are LOE earned value type until the discrete sub-project IBRs are held, FY08 End of year estimates in work, baseline to be updated.

Prime

This element represents 100.0 percent of the total contract.
Earned value data indicates that this effort is about 20.91% complete.
Work in process is behind schedule.
Beware of problems in this element; the budget has been increasing routinely.
Period actuals are running at 74,322.2.
This effort has an unfavorable cost variance of -11.65%.
Performance is holding relatively steady at 0.896 per unit expended (Dollars).

Contract reconciliation effort underway to result in an updated performance measurement baseline.



EVM Definitions



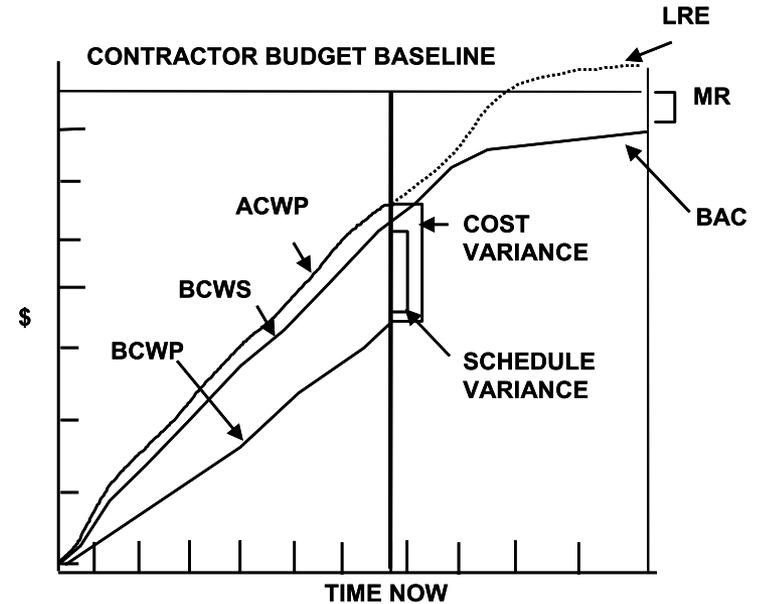
TERMINOLOGY

- ACWP ACTUAL COST OF WORK PERFORMED (ACTUAL COST)
- BAC BUDGET AT COMPLETION (ALLOCATED BUDGETS)
- BCWP BUDGETED COST OF WORK PERFORMED (EARNED VALUE)
- BCWR BUDGETED COST OF WORK REMAINING
- BCWS BUDGETED COST OF WORK SCHEDULED (PLANNED VALUE)
- CBB CONTRACT BUDGET BASELINE (TOTAL AUTHORIZED WORK)
- CPI COST PERFORMANCE INDEX
- CV COST VARIANCE
- EAC ESTIMATE AT COMPLETION (GOVERNMENT'S EAC)
- ETC ESTIMATE TO COMPLETE
- LRE LATEST REVISED ESTIMATE (CONTRACTOR'S EAC)
- MR MANAGEMENT RESERVE
- PMB PERFORMANCE MEASUREMENT BASELINE
- SPI PCHEDULE PERFORMANCE INDEX
- SV SCHEDULE VARIANCE
- UB UNDISTRIBUTED BUDGET

FORMULAS

- CPI $BCWP/ACWP$
- SPI $BCWP/BCWS$
- TCPI/LRE $(BAC - BCWP) / (EAC - ACWP)$
- TCPI/BAC $(BAC - BCWP) / (BAC - ACWP)$
- COST VARIANCE (CV) $BCWP - ACWP$
- SCHEDULE VARIANCE(SV) $BCWP - BCWS$
- VAC $BAC - EAC$
- CV % $(CV / BCWP) \times 100$
- SV % $(SV / BCWS) / 100$
- EAC MIN & EAC MAX ARE GENERATED FROM wInsight

USE OF CONTRACTOR PERFORMANCE MEASUREMENT DATA



- CPR COST PERFORMANCE REPORT
- C/SSR COST/SCHEDULE STATUS REPORT

PURPOSE: TO OBTAIN CONTRACT COST AND SCHEDULE STATUS INFORMATION ON WHICH TO BASE PROGRAM MANAGEMENT DECISIONS



LAS ACM HT-7



- Refer to Sensitive But Unclassified (SBU) handout package.