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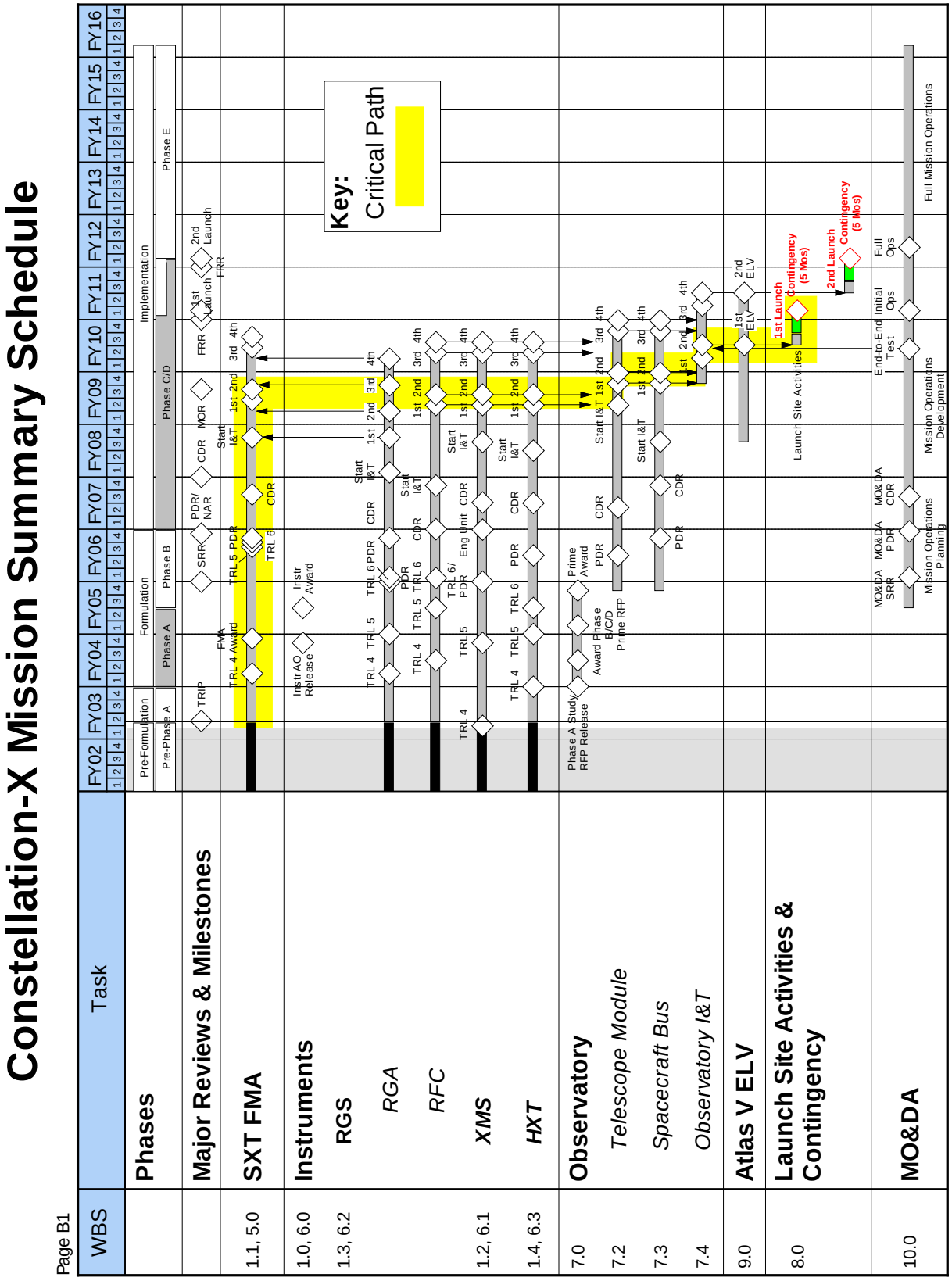
Constellation-X Mission Summary Schedule
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FY02 FY03 FY04 FY05 FY06 FY07 FY08 FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16
Phases
Pre-Phase A
Pre-Formulation
Phase A
Formulation
Phase B
Phase C/D
Implementation
Phase E
Major Reviews & Milestones
TRIP
SRR
PDR/ NAR
CDR
MOR
FRR
1st Launch
2nd Launch
FMA
Start I&T
1.1, 5.0
SXT FMA
TRL 4
TRL 4 Award
TRL 5
TRL 5 PDR
TRL 6
CDR
1st
2nd
3rd
4th
1.0, 6.0
Instruments
Instr AO Release
Instr Award
1.3, 6.2
RGS
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RFC
TRL 6 PDR
PDR TRL 6
TRL 6/ PDR
Eng Unit CDR
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XMS
1.4, 6.3
HXT
7.0
Observatory
Phase A Study RFP Release
Prime Award
Award Phase E/C/D Prime RFP
7.2
Telescope Module
7.3
Spacecraft Bus
7.4
Observatory I&T
9.0
Atlas V ELV
1st ELV
2nd ELV
8.0
Launch Site Activities & Contingency
Launch Site Activities
1st Launch
Contingency (5 Mos)
2nd Launch
10.0
MO&DA
MO&DA SRR
MO&DA PDR
MO&DA CDR
Mission Operations Planning
Mission Operations Development
End-to-End Test
Initial Ops
Full Ops
Full Mission Operations
Key:
Critical Path

Major Mission Review Schedule

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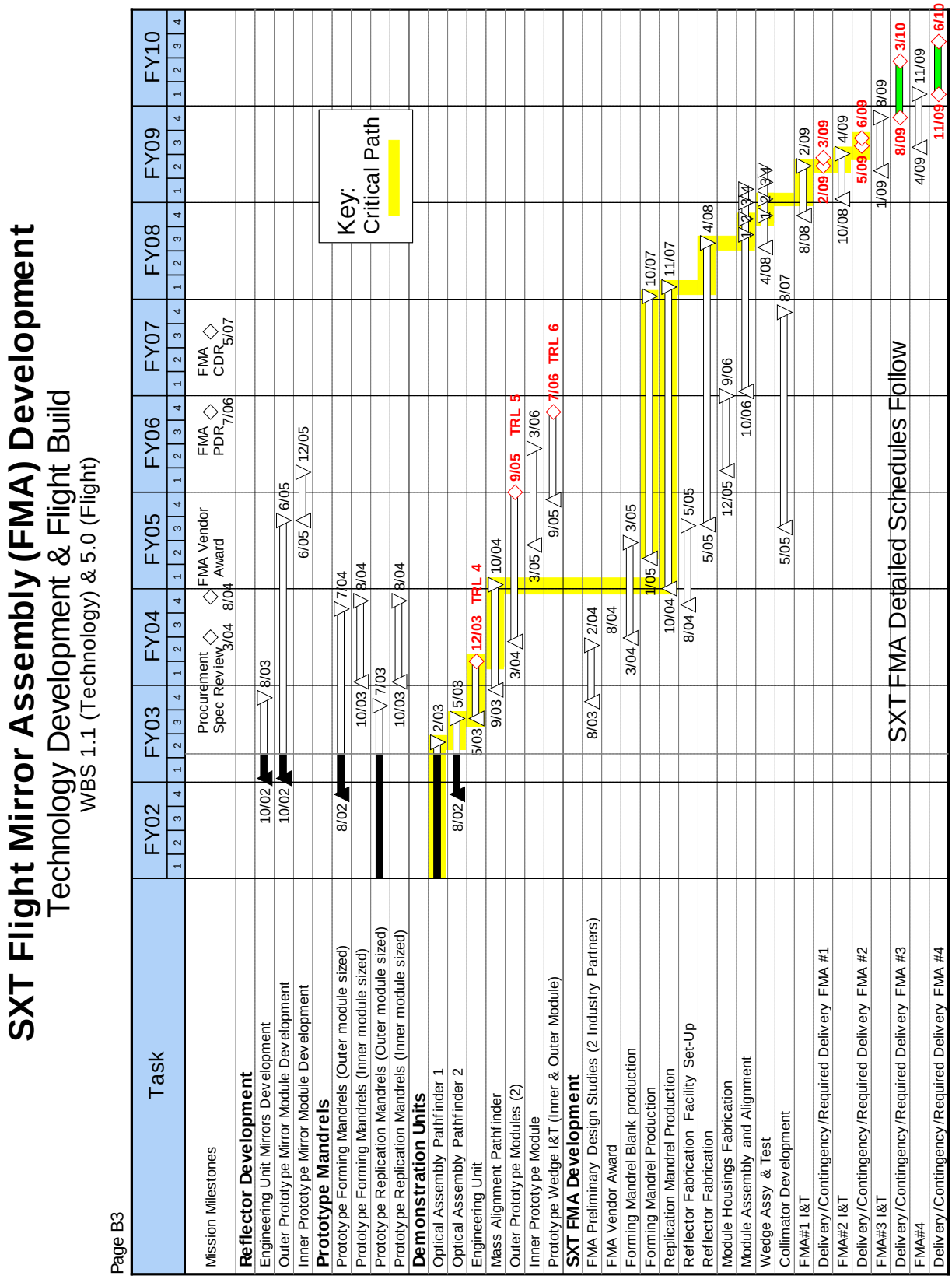
Task	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Technology Readiness and Implementation Plan (TRIP)	2/03	TRIP									
Mission Definition Review (MDR)			2/05	MDR							
Systems Requirements Review (SRR)				9/05	SRR						
Preliminary Design Review (PDR)					8/06	PDR					
Non-Advocate Review (NAR)					8/06	NAR					
Critical Design Review (CDR)						9/07	CDR				
Mission Operations Review (MOR)								6/09	MOR		
1st Observatory Pre-Environmental Review (PER)								7/09	1st PER		
2nd Observatory Pre-Environmental Review (PER)								10/09	2nd PER		
1st Launch Pre-Ship Review (PSR)								3/10	1st PSR		
Operations Readiness Review (ORR)								4/10	ORR		
1st Launch Flight Readiness Review ,(FRR)									10/10	1st FRR	
1st Launch Readiness Review (LRR)									11/10	1st LRR	
3rd Observatory Pre-Environmental Review (PER)									7/10	3rd PER	
4th Observatory Pre-Environmental Review (PER)									10/10	4th PER	
2nd Launch Pre-Ship Review (PSR)									3/11	2nd PSR	
2nd Launch Flight Readiness Review									2nd FRR		10/11
2nd Launch Readiness Review (LRR)										2nd LRR	11/11


SXT Flight Mirror Assembly (FMA) Development
Technology Development & Flight Build
WBS 1.1 (Technology) & 5.0 (Flight)
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Task
FY02
FY03
FY04
FY05
FY06
FY07
FY08
FY09
FY10
Mission Milestones
Procurement Spec Review 3/04
FMA Vendor Award 8/04
FMA PDR 7/06
FMA CDR 5/07
Reflector Development
Engineering Unit Mirrors Development
Outer Prototype Mirror Module Development
Inner Prototype Mirror Module Development
Prototype Mandrels
Prototype Forming Mandrels (Outer module sized)
Prototype Forming Mandrels (Inner module sized)
Prototype Replication Mandrels (Outer module sized)
Prototype Replication Mandrels (Inner module sized)
Demonstration Units
Optical Assembly Pathfinder 1
Optical Assembly Pathfinder 2
Engineering Unit
Mass Alignment Pathfinder
Outer Prototype Modules (2)
Inner Prototype Module
Prototype Wedge I&T (Inner & Outer Module)
SXT FMA Development
FMA Preliminary Design Studies (2 Industry Partners)
FMA Vendor Award
Forming Mandrel Blank production
Forming Mandrel Production
Replication Mandrel Production
Reflector Fabrication Facility Set-Up
Reflector Fabrication
Module Housings Fabrication
Module Assembly and Alignment
Wedge Assy & Test
Collimator Development
FMA#1 I&T
Delivery/Contingency/Required Delivery FMA #1
FMA#2 I&T
Delivery/Contingency/Required Delivery FMA #2
FMA#3 I&T
Delivery/Contingency/Required Delivery FMA #3
FMA#4
Delivery/Contingency/Required Delivery FMA #4
TRL 4
TRL 5
TRL 6
SXT FMA Detailed Schedules Follow
Key:
Critical Path

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Detail 1 of 9

Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
SXT Flight Mirror Assembly Development										
Flight Mirror Assembly Detailed Design										
Study solicitation and contractor (2) selection			2/03 – 7/03							
FMA Preliminary Design Studies			7/03 – 1/04							
Prime solicitation and selection				1/04 – 8/04						
Optical Contractor under contract				8/04						
Detailed design (continues from study)				8/04 – 7/05						
Release module housing designs					1/05					
Release Wedge structure designs					4/05					
Release FMA housing designs					7/05					
Structural - Thermal Model (STM)										
Design				11/04 – 7/05						
Fabrication					5/05 – 1/06					
Assembly					12/05 – 3/06					
Mechanical Test						3/06 – 4/06				
Optical stability Test						4/06 – 4/06				
Design Review						4/06 – 5/06				
Test and calibration plans (continued from Technology					**4/05** – 3/06					
Module test and calibration plans					4/05 – 10/05					
FMA test and calibration plans					5/05 – 11/05					
Test and verification plan and matrix					5/05 – 3/06					
Flight Mirror Assembly Production engineering and					**7/05** – 5/06					
GSE, tooling, and infrastructure definition					7/05 – 5/06					
Process and procedure development					7/05 – 5/06					
Flight Assurance		8/02 – 1/03								
Contamination Control		8/02 – 1/03								
Contamination Control Plans and Procedures		8/02 – 1/03								
Contamination Monitoring and Reporting		8/02 – 8/02								

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Detail 2 of 9

Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
Contamination Control Engineering		8/02	8/02							
Forming Mandrel Production			4/03					12/07		
Procurement activities for blanks			4/03	10/03						
Procurement activities for forming mandrels			4/03	10/03						
Start of contract to fab blanks			10/03							
Blank production				3/04	3/05					
LOI or MOU to fabricate forming mandrels			10/03							
Forming mandrel ramp up			10/03	9/04						
Start of contract to fab forming mandrels			10/03							
Forming mandrel production					1/05			10/07		
Rough forming mandrel shipment					3/05			12/07		
LOI to Zeiss (from Schott or NASA)			10/03							
Forming Mandrel initial set-up at Zeiss			10/03	7/04						
Lapped forming mandrel shipment					4/05			12/07		
Replication Mandrel Production			4/03					11/07		
Procurement activites for Replication mandrels			4/03	10/03						
Replication Mandrel LOI or MOU			10/03							
Replication mandrel initial set-up			10/03	3/04						
Zeiss Replication Mandrel Contract Start				10/04						
Replication mandrel production				10/04				11/07		
Replication Mandrel shipment					3/05			11/07		
Fabricate Reflectors			10/03					4/08		
Reflector Fab procurement activities			10/03	3/04						
Start of reflector fabrication activity				3/04						
Reflector fabrication set-up				3/04	3/05					
Reflector hot forming (slumping)					4/05			4/08		
Reflector Replication					5/05			4/08		
Outer P reflectors complete						2/06				

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Inner P reflectors complete						11/06				
Outer H reflectors complete							8/07			
Inner H reflectors complete								4/08		
Module Housings					**5/05**		12/06			
Outer Module housing fabrication tooling					5/05	12/05				
Outer module housing fabrication (pairs)					12/05		12/06			
Block A outer module pairs complete						2/06				
Block 1 outer module pairs complete						5/06				
Block 2 outer module pairs complete						7/06				
Block 3 outer module pairs complete						9/06				
Block 4 outer module pairs complete						12/06				
Inner module fabrication tooling					5/05	12/05				
Inner module housing fabrication (pairs)					12/05		12/06			
Block A inner module pairs complete						2/06				
Block 1 inner module pairs complete						5/06				
Block 2 inner module pairs complete						7/06				
Block 3 inner module pairs complete						9/06				
Block 4 inner module pairs complete						12/06				
Module Assembly and Alignment						**5/06**			3/09	
Assembly and alignment tooling and GSE						5/06	3/07			
Outer Module P unit assembly and alignment							**3/07**		12/08	
Block A outer module P units							3/07 4/07			
Block 1 outer module P units							4/07 8/07			
Block 2 outer module P units							8/07 11/07			
Block 3 outer module P units								2/08 5/08		
Block 4 outer module P units								8/08 12/08		
Insert H reflectors to complete outer module pairs							**8/07**		3/09	
Block A Outer module pairs for wedge buildup							8/07 8/07			

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
Block 1 Outer module pairs for wedge buildup							8/07 – 12/07			
Block 2 Outer module pairs for wedge buildup							12/07 – 3/08			
Block 3 Outer module pairs for wedge buildup								3/08 – 7/08		
Block 4 Outer module pairs for wedge buildup								12/08 – 3/09		
Inner module P unit assembly and alignment							4/07 – 2/09			
Block A Inner module P units							4/07 – 5/07			
Block 1 Inner module P units							5/07 – 8/07			
Block 2 Inner module P units							11/07 – 2/08			
Block 3 Inner module P units								5/08 – 8/08		
Block 4 Inner module P units								12/08 – 2/09		
Inset H reflectors to complete inner module pairs								2/08 – 1/09		
Block A Inner module pairs for wedge build up								4/08 – 4/08		
Block 1 Inner module pairs for wedge build up								2/08 – 5/08		
Block 2 Inner module pairs for wedge build up								5/08 – 8/08		
Block 3 Inner module pairs for wedge build up								8/08 – 10/08		
Block 4 Inner module pairs for wedge build up								10/08 – 1/09		
Ready to populate Block A wedge								4/08 ◇		
Ready to populate Block 1 wedges								5/08 ◇		
Ready to populate Block 2 wedges								8/08 ◇		
Ready to populate Block 3 wedges								10/08 ◇		
Ready to populate Block 4 wedges								1/09 ◇		
Wedge Fab and Build Up					4/05 – 6/09					
Wedge Structure and hardware fab					4/05 – 6/07					
Wedge A Structure and hardware fab					4/05 – 8/05					
Wedge 1 - 6 Structure and hardware fab (Block 1)					8/05 – 1/06					
Wedge 7-12 Structure and hardware fab (Block 2)					1/06 – 7/06					
Wedge 13 - 18 Structure and hardware fab (Block 3)						7/06 – 12/06				
Wedge 19 -24 Structure and hardware fab (Block 4)						12/06 – 6/07				

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Wedge Assembly and Alignment					4/05				3/09	
Tooliing and GSE for wedge assembly and alignment					4/05	4/06				
Wedge A Assembly and Alignment								4/08 5/08		
Wedge 1 -6 Assembly and alignment (Block 1)								3/08 5/08		
Wedge 7-12 Assembly and alignment (Block 2)								5/08 8/08		
Wedge 13-18 Assembly and alignment (Block 3)								10/08	1/09	
Wedge 19-24 Assembly and alignment (Block 4)								12/08	3/09	
Wedge Optical Test and Characterization					11/05				6/09	
Tooling and GSE for Wedge optical test and					11/05	9/06				
Wedge A Optical Test and Characterization								5/08 6/08		
Wedge 1 -6 Optical Test and Characterization (Block 1)								3/08 6/08		
Wedge 7-12 Optical Test and Characterization (Block 2)								6/08 9/08		
Wedge 13-18 Optical Test and Characterization (Block 3)									1/09 4/09	
Wedge 19-24 Optical Test and Characterization (Block 4)									3/09 6/09	
X-ray Test and Characterization					4/05				4/09	
Tooling and GSE for X-ray test and characterization					4/05	4/06				
Wedge A characterized								6/08 7/08		
Wedge #1 characterized								7/08 8/08		
Wedge #7 characterized								8/08 9/08		
Wedge #13 characterized									1/09 2/09	
Wedge #19 characterized									3/09 4/09	
Collimator Development					7/05		10/07			
Precollimator design					7/05	11/05				
Postcollimator design					11/05	3/06				
Precollimator fabrication					11/05		10/07			
Tooling					11/05	9/06				
Fabrication						9/06	8/07			
Test							8/07	10/07		

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Post collimator fabrication						3/06 – 2/07				
Tooling						3/06 – 1/07				
Fabrication						3/06 – 1/07				
Test						1/07 – 2/07				
Inner Protective Door						5/06 – 7/07				
Detailed design						5/06 – 9/06				
E-M						8/06 – 1/07				
Test						1/07 – 2/07				
Fabrication						2/07 – 6/07				
Test						6/07 – 7/07				
Flight Mirror Assembly (Buildup, test, and calibrate)					7/05 –					11/09
Infrastructure, tooling, fixturing, and GSE for FMA build-up						5/06 – 6/07				
Detail design/specifications						5/06 – 10/06				
Acquisition/fabrication						8/06 – 2/07				
Assembly/installation						2/07 – 4/07				
Commission/verify						4/07 – 6/07				
Infrastructure, tooling, fixturing, and GSE for FMA test					11/05 –		7/07			
Detail design/specifications					11/05 –	4/06				
Acquisition/fabrication						4/06 –	4/07			
Assembly/installation							4/07 – 6/07			
Commission/verify							6/07 – 7/07			
FMA Structure Manufacture					7/05 –			1/08		
Tooling for subassemblies					7/05 –	6/06				
Design					7/05 –	10/05				
Fabrication					10/05 –	6/06				
Subassembly fabrication						6/06 –		11/07		
FMA#1 subassemblies						6/06 –	11/06			
FMA#2 subassemblies						11/06 –	3/07			

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Task	FY01	FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10
	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
FMA#3 subassemblies							3/07 – 7/07			
FMA#4 subassemblies							7/07 – 11/07			
Tooling for FMA structure build-up and handling					**7/05** – 2/06					
Design					7/05 – 9/05					
Fabrication					9/05 – 2/06					
FMA Structure assembly						**11/06** – 1/08				
FMA#1 structure assembly						11/06 – 3/07				
FMA#2 structure assembly							3/07 – 5/07			
FMA#3 structure assembly							7/07 – 9/07			
FMA#4 structure assembly							11/07 – 1/08			
FMA#1										
Mirror Assembly Build-up								**7/08** – 10/08		
Wedge installation and alignment								7/08 – 8/08		
Grating Installation and alignment								8/08 – 10/08		
Collimator Installation								10/08 – 10/08		
Auxilliary assemblies installation								10/08 – 10/08		
Mirror Assembly Test, Characterization, and Calibration								**10/08** – 1/09		
Mirror Assembly PV test								**10/08** – 12/08		
Mechanical								10/08 – 11/08		
Thermal and thermal balance								11/08 – 11/08		
Optical alignment								11/08 – 12/08		
Mirror Assembly Calibration								**12/08** – 1/09		
Throughput (optical).								12/08 – 12/08		
Final alignment check and data base								12/08 – 2/09		
Preship Review								1/09 – 2/09		
Deliver for integration								1/09 – 2/09		
FMA#1 ready for OM integration									2/09 ◇	
FMA#2										

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Task	FY08	FY09
Mirror Assembly Build-up	**9/08** 12/08	
Wedge Installation and alignment	9/08 10/08	
Grating Installation and alignment	10/08 12/08	
Collimator installation and alignment	12/08 12/08	
Auxiliary assembly installation	12/08 12/08	
Mirror Assembly Test, Characterization, and Calibration	**12/08** 4/09	
Mirror Assembly PV test	**12/08** 2/09	
Mechanical	12/08 1/09	
Thermal	1/09 2/09	
Optical alignment	2/09 2/09	
Mirror Assembly Calibration	**2/09** 3/09	
Throughput (optical).	3/09 4/09	
Final alignment check and data base	4/09 4/09	
Preship Review	4/09 4/09	
Deliver for integration	4/09 5/09	
FMA#2 ready for OM integration	5/09 ◇	
FMA#3		
Mirror Assembly Build-up	**2/09** 6/09	
Wedge installation and alignment	2/09 4/09	
Grating installation and alignment	4/09 5/09	
Collimator installation and alignment	5/09 5/09	
Auxilliary assembly installation	5/09 6/09	
Mirror Assembly Test, Characterization, and Calibration	6/09 9/09	
Mirror Assembly PV test	6/09 8/09	
Mechanical	6/09 6/09	
Thermal	6/09 7/09	
Optical alignment	6/09 7/09	
Mirror Assembly Calibration	7/09 8/09	

SXT FMA Flight Development

WBS 1.1 (Technology) & 5.0 (Flight)

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Detail 9 of 9

Task	FY09	FY10
Throughput (optical)	7/09	7/09
Final alignment check and data base	7/09	8/09
Preship Review	8/09	8/09
Deliver for integration	8/09	8/09
FMA#3 ready for OM integration	8/09	
FMA#4		
Mirror Assembly Build-up	**4/09**	8/09
Wedge Installation and alignment	4/09	6/09
Grating Installation and alignment	6/09	7/09
Collimator installation and alignment	7/09	7/09
Auxiliary assembly installation	7/09	8/09
Mirror Assembly Test and Calibration	**8/09**	11/09
Mirror Assembly PV test	**8/09**	10/09
Mechanical	8/09	8/09
Thermal	8/09	9/09
Optical alignment	9/09	10/09
Mirror Assembly Calibration	**10/09**	11/09
Throughput (optical)	10/09	10/09
Final alignment check and data base	10/09	11/09
Preship Review	11/09	11/09
Deliver for integration	11/09	11/09
FMA#4 ready for OM integration	11/09	

RGS Grating Array (RGA) Technology & Flight Development

WBS 1.3 (Technology) & 6.2 (Flight)

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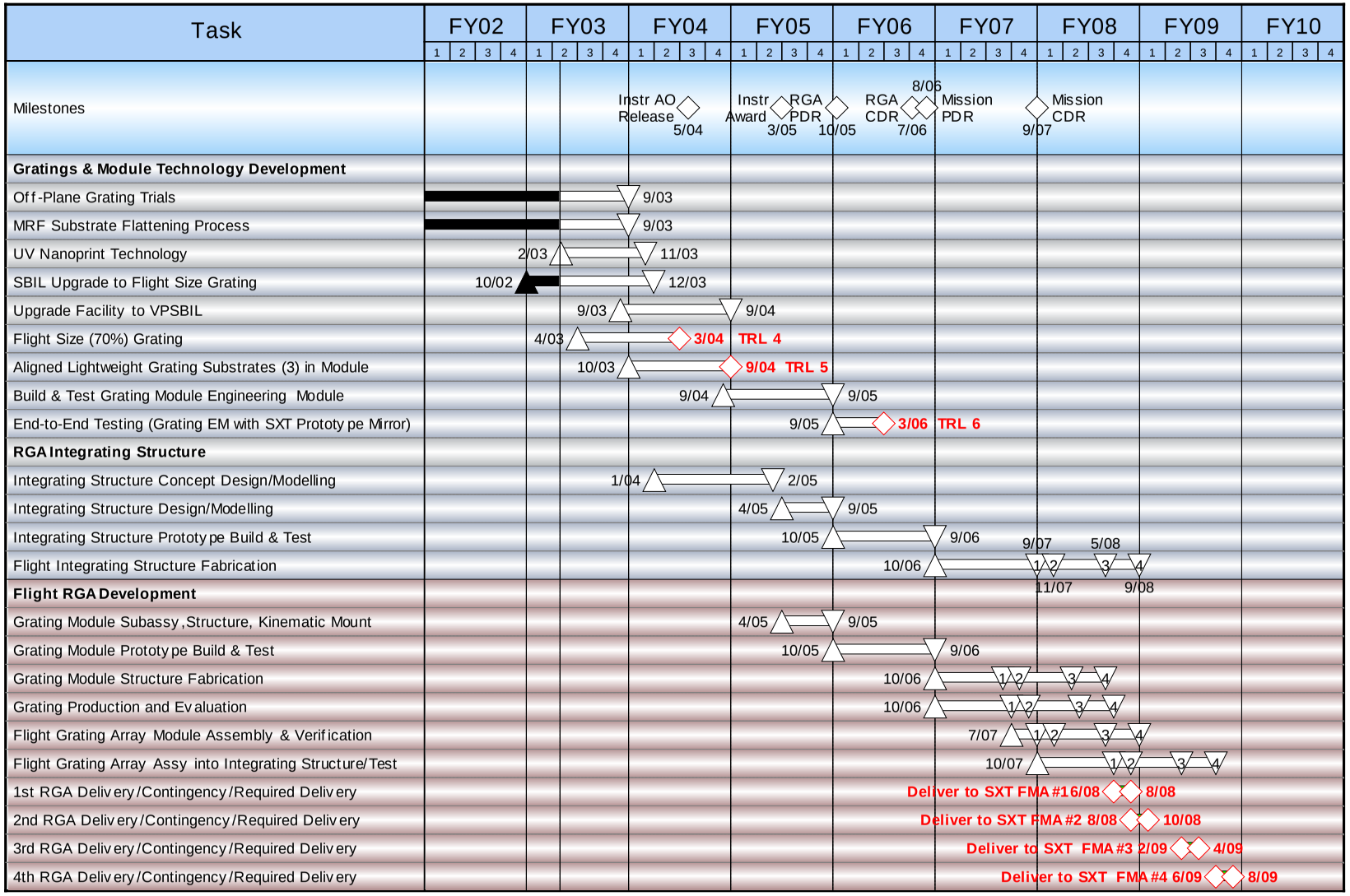

RGS Focalplane Camera (RFC)

Technology Development

WBS 1.3

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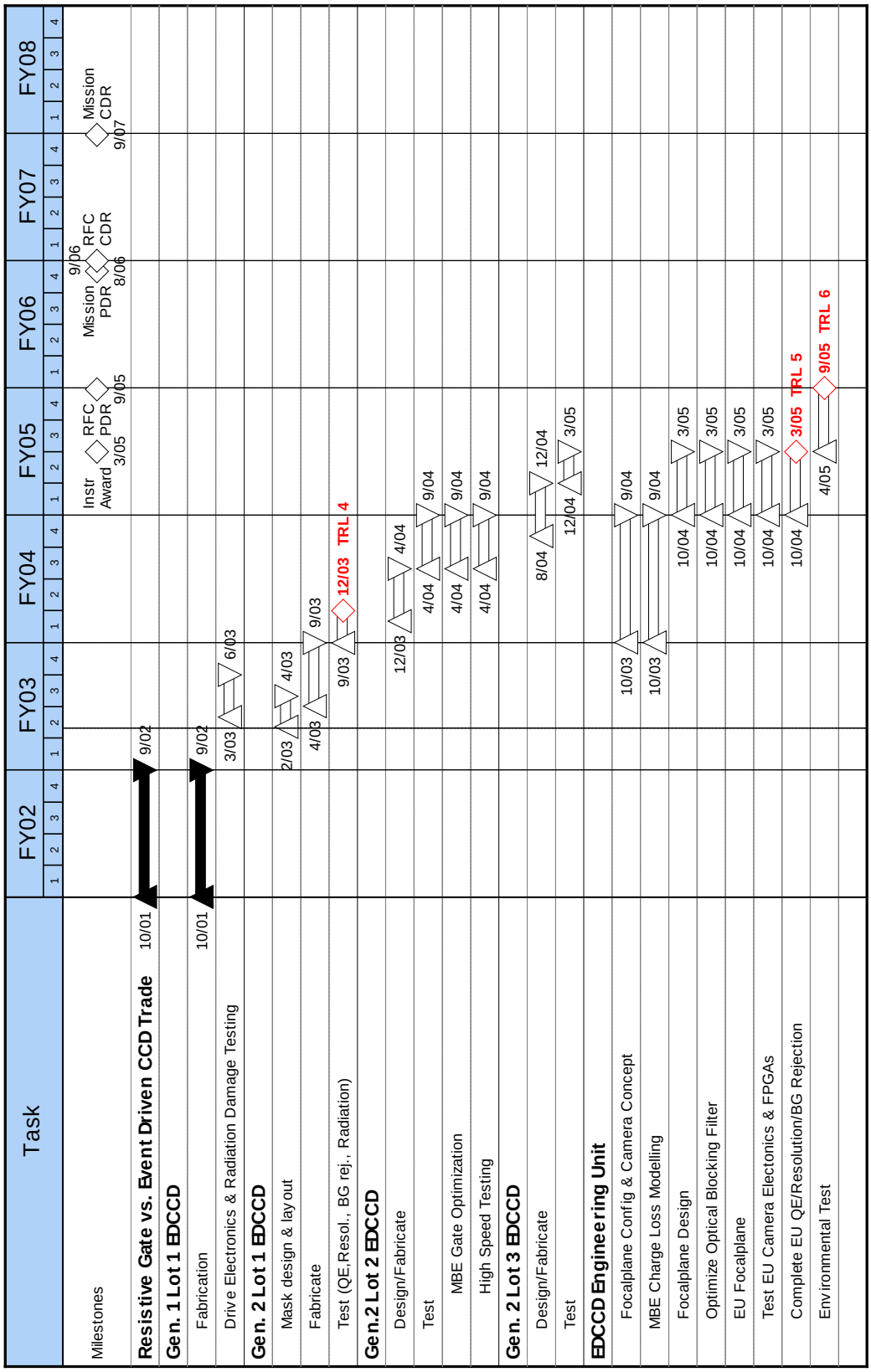

RGS Focalplane Camera (RFC)

Flight Development

WBS 6.2

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Detail 1 of 2

Task	FY05				FY06				FY07				FY08				FY09				FY10				
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1
Milestones			RFC PDR 9/05				Mission PDR 8/06		RFC CDR 9/06				9/07 Mission CDR												
ZOC Design																									
Focal Plane design	4/05				9/05																				
Zero Order Camera (ZOC) mechanical design			10/05				3/06																		
ZOC Optical Bench Design			10/05				3/06																		
ZOC Thermal Design			10/05				3/06																		
ZOC Electronics Design			10/05				3/06																		
SRC Design																									
Spectroscopy Readout Camera (SRC) mechanical design			10/05				3/06																		
SRC Optical Bench Design			10/05				3/06																		
SRC Electronics Design			10/05				3/06																		
SRC Thermal Design			10/05				3/06																		
FPA Housing																									
Focal Plane Readout Array Housing Design					4/06				9/06																
Focal Plane Readout Array Housing Door Design					4/06				9/06																
Procurement							7/06						9/07												
Focal Plane Readout Array Housing Fabrication									4/07		1st 7/07			2nd 1/08	3rd 4/08	4th 7/08									
Focal Plane Readout Array Housing Door Fabrication									4/07		1st 7/07			2nd 1/08	3rd 4/08	4th 7/08									
EDCCD Camera Prototype																									
Event Driven CCD (EDCCD) design	4/05				9/05																				
EDCCD camera Prototype			10/05					6/06																	
EDCCD Analog Electronics Prototype			10/05					6/06																	
EDCCD Digital Electronics & FPGA Prototype			10/05					6/06																	

RGS Focalplane Camera (RFC)

Flight Development

WBS 6.2

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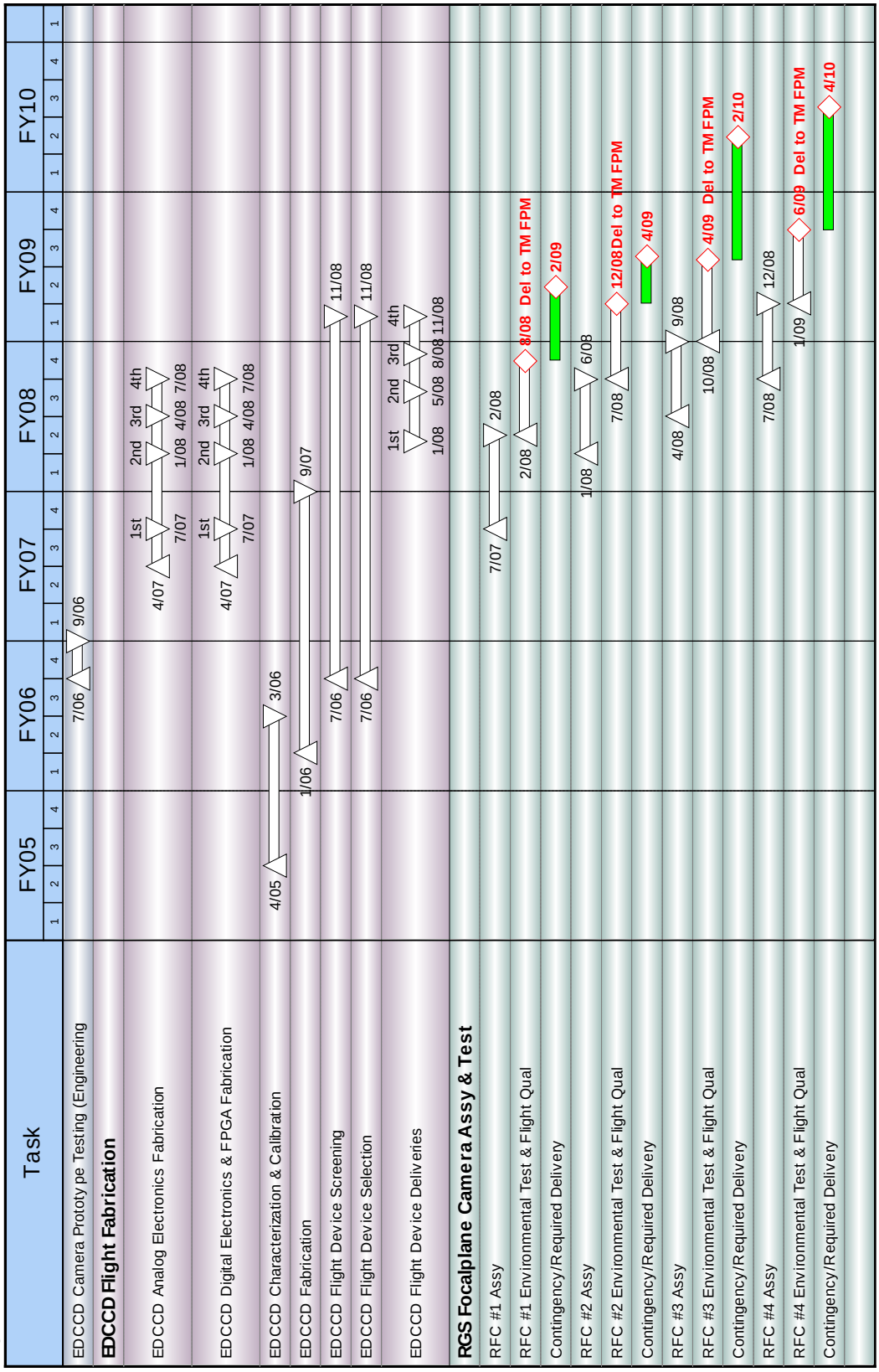
Detail 2 of 2

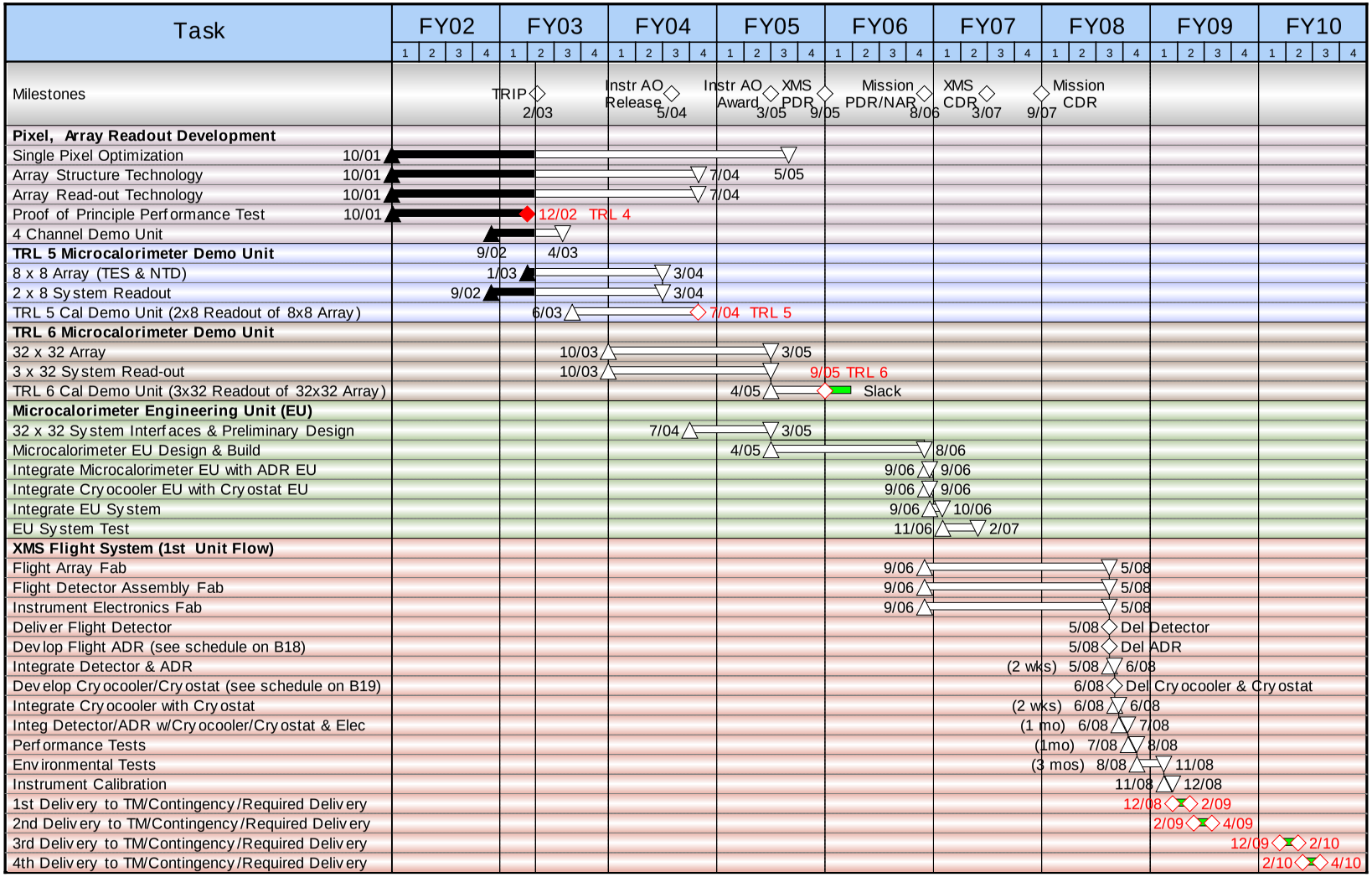


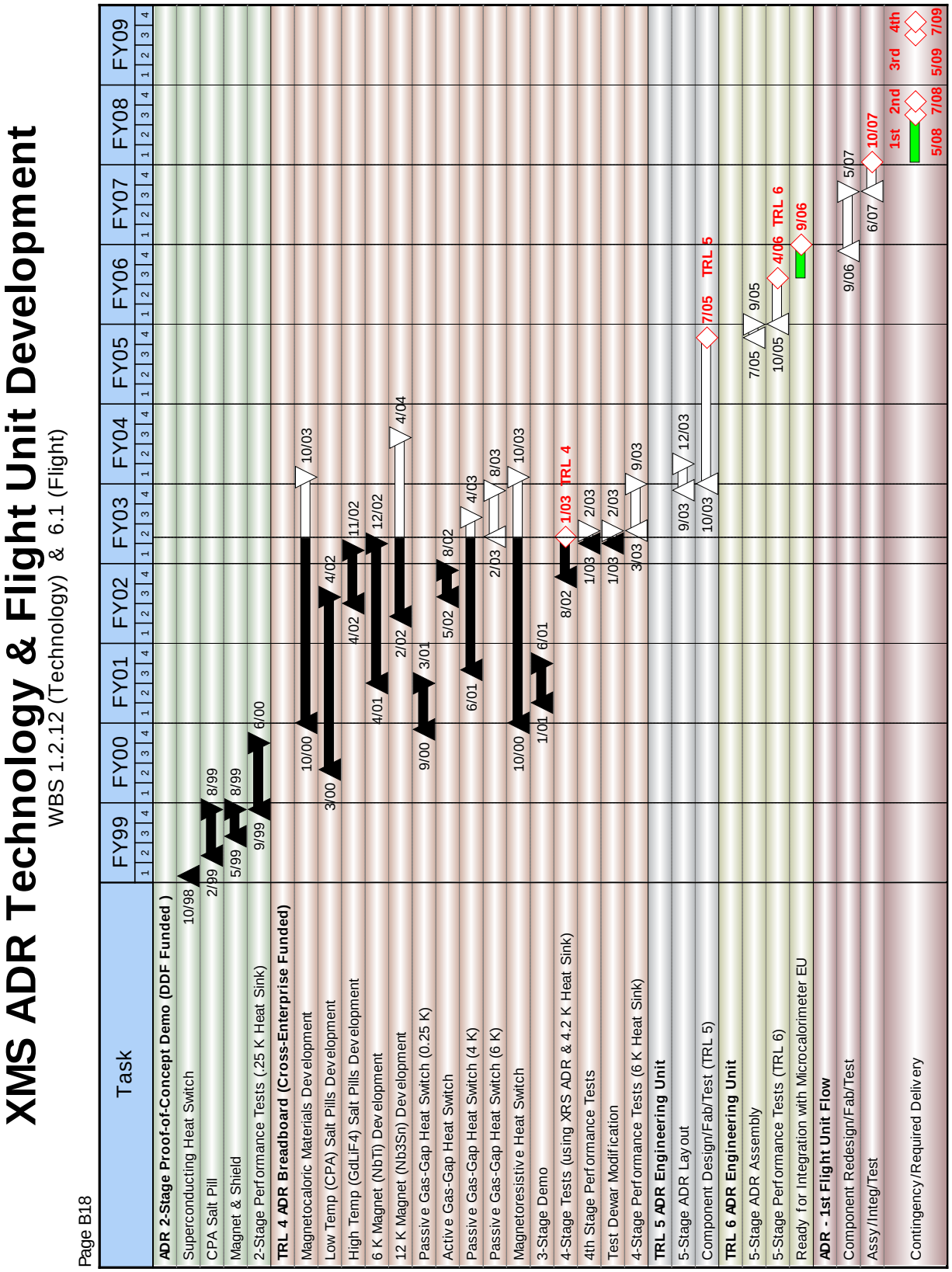
XMS X-Ray Microcalorimeter

Technology & Flight Instrument Development

WBS 1.2 (Technology) & 6.1 (Flight)

Page B17




XMS ADR Technology & Flight Unit Development
WBS 1.2.12 (Technology) & 6.1 (Flight)
Page B18
Task
FY99
FY00
FY01
FY02
FY03
FY04
FY05
FY06
FY07
FY08
FY09
ADR 2-Stage Proof-of-Concept Demo (DDF Funded)
Superconducting Heat Switch
CPA Salt Pill
Magnet & Shield
2-Stage Performance Tests (.25 K Heat Sink)
TRL 4 ADR Breadboard (Cross-Enterprise Funded)
Magnetocaloric Materials Development
Low Temp (CPA) Salt Pills Development
High Temp (GdLiF4) Salt Pills Development
6 K Magnet (NbTi) Development
12 K Magnet (Nb3Sn) Development
Passive Gas-Gap Heat Switch (0.25 K)
Active Gas-Gap Heat Switch
Passive Gas-Gap Heat Switch (4 K)
Passive Gas-Gap Heat Switch (6 K)
Magnetoresistive Heat Switch
3-Stage Demo
4-Stage Tests (using XRS ADR & 4.2 K Heat Sink)
4th Stage Performance Tests
Test Dewar Modification
4-Stage Performance Tests (6 K Heat Sink)
TRL 5 ADR Engineering Unit
5-Stage ADR Layout
Component Design/Fab/Test (TRL 5)
TRL 6 ADR Engineering Unit
5-Stage ADR Assembly
5-Stage Performance Tests (TRL 6)
Ready for Integration with Microcalorimeter EU
ADR - 1st Flight Unit Flow
Component Redesign/Fab/Test
Assy/Integ/Test
Contingency/Required Delivery
10/98
2/99
8/99
5/99
8/99
9/99
6/00
10/00
3/00
4/02
4/01
11/02
12/02
2/02
9/00
3/01
5/02
8/02
6/01
4/03
2/03
8/03
10/00
1/01
6/01
10/03
8/02
1/03
TRL 4
1/03
2/03
1/03
2/03
3/03
9/03
9/03
12/03
10/03
7/05
TRL 5
7/05
9/05
10/05
4/06
TRL 6
9/06
9/06
5/07
6/07
10/07
1st
2nd
3rd
4th
5/08
7/08
5/09
7/09

XMS Cryocooler/Cryostat Technology & Flight System Development

WBS 1.2.13 (Technology) & 6.1 (Flight)

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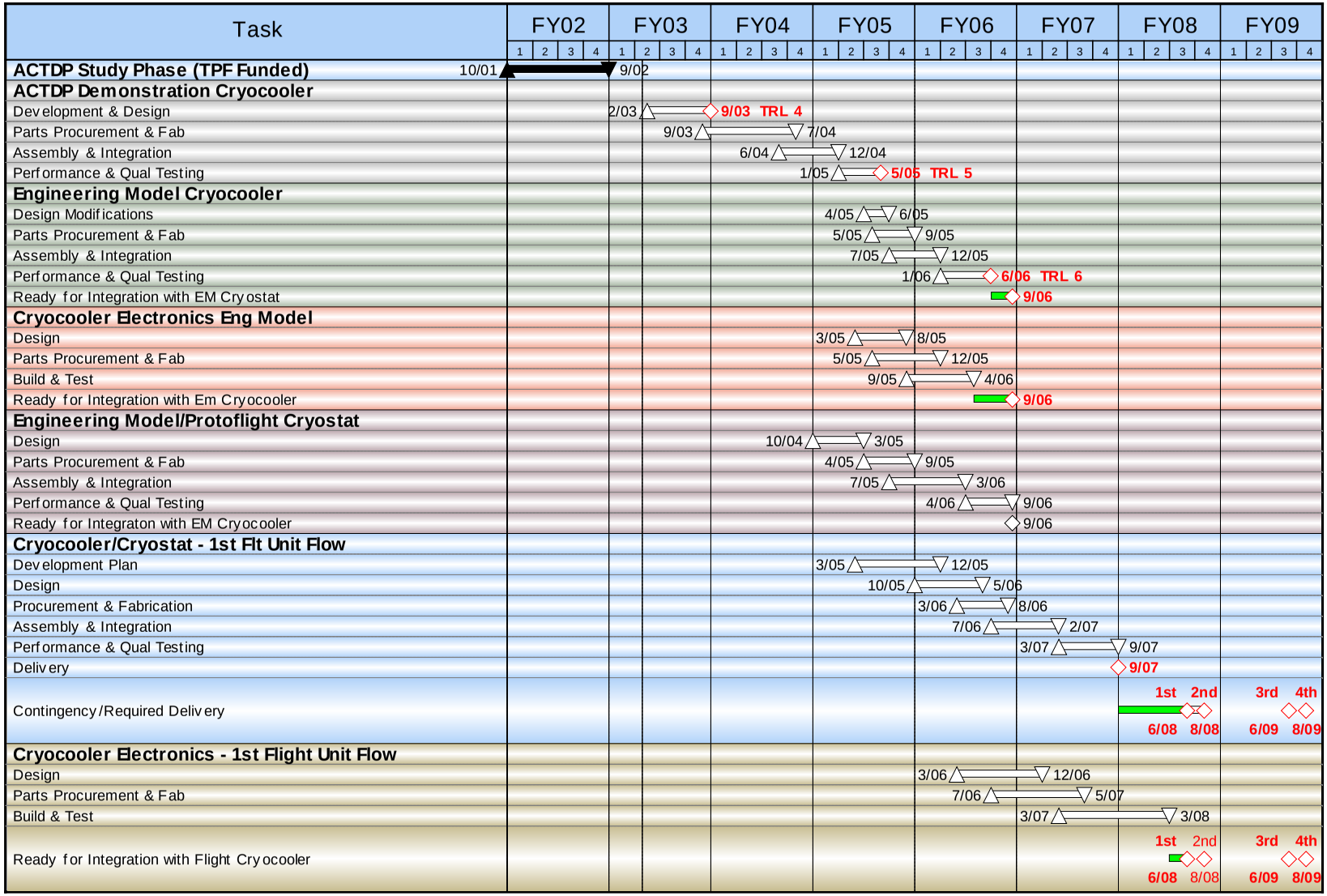

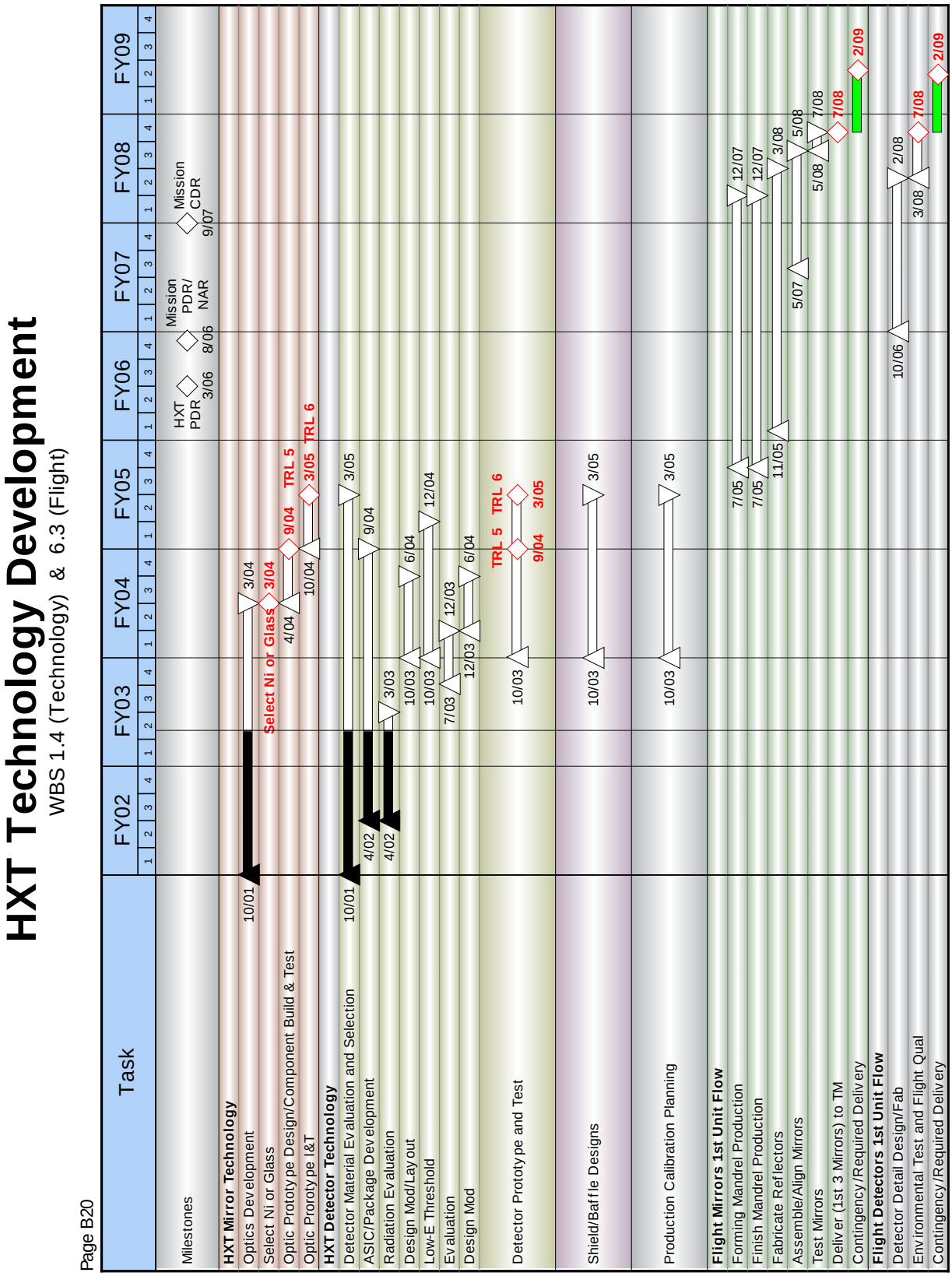
HXT Technology Development
WBS 1.4 (Technology) & 6.3 (Flight)
Page B20
Task
FY02
FY03
FY04
FY05
FY06
FY07
FY08
FY09
Milestones
HXT PDR 3/06
Mission PDR/ NAR 8/06
Mission CDR 9/07
HXT Mirror Technology
Optics Development
Select Ni or Glass
Optic Prototype Design/Component Build & Test
Optic Prototype I&T
HXT Detector Technology
Detector Material Evaluation and Selection
ASIC/Package Development
Radiation Evaluation
Design Mod/Layout
Low-E Threshold
Evaluation
Design Mod
Detector Prototype and Test
Shield/Baffle Designs
Production Calibration Planning
Flight Mirrors 1st Unit Flow
Forming Mandrel Production
Finish Mandrel Production
Fabricate Reflectors
Assemble/Align Mirrors
Test Mirrors
Deliver (1st 3 Mirrors) to TM
Contingency/Required Delivery
Flight Detectors 1st Unit Flow
Detector Detail Design/Fab
Environmental Test and Flight Qual
Contingency/Required Delivery
10/01
4/02
4/02
3/04
Select Ni or Glass 3/04
4/04
9/04 TRL 5
10/04
3/05 TRL 6
3/05
9/04
3/03
10/03
10/03
7/03
12/03
12/03
6/04
6/04
12/04
TRL 5 TRL 6
10/03
9/04 3/05
10/03
3/05
10/03
3/05
7/05
7/05
11/05
12/07
12/07
3/08
5/07
5/08
5/08
7/08
7/08
2/09
10/06
2/08
3/08
7/08
2/09

HXT Mirror Flight Development

WBS 6.3

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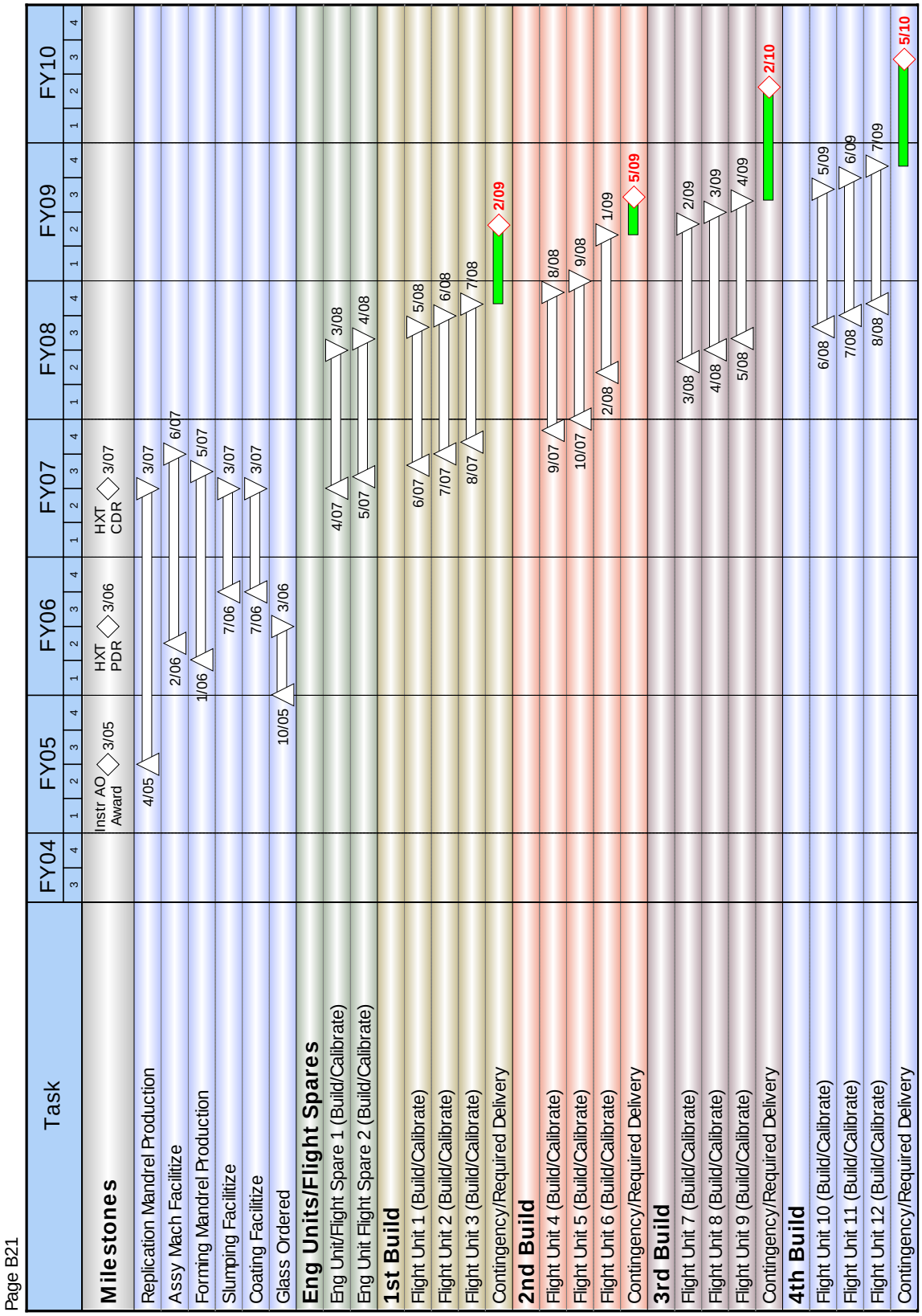

HXT Detector Flight Development

WBS 6.3

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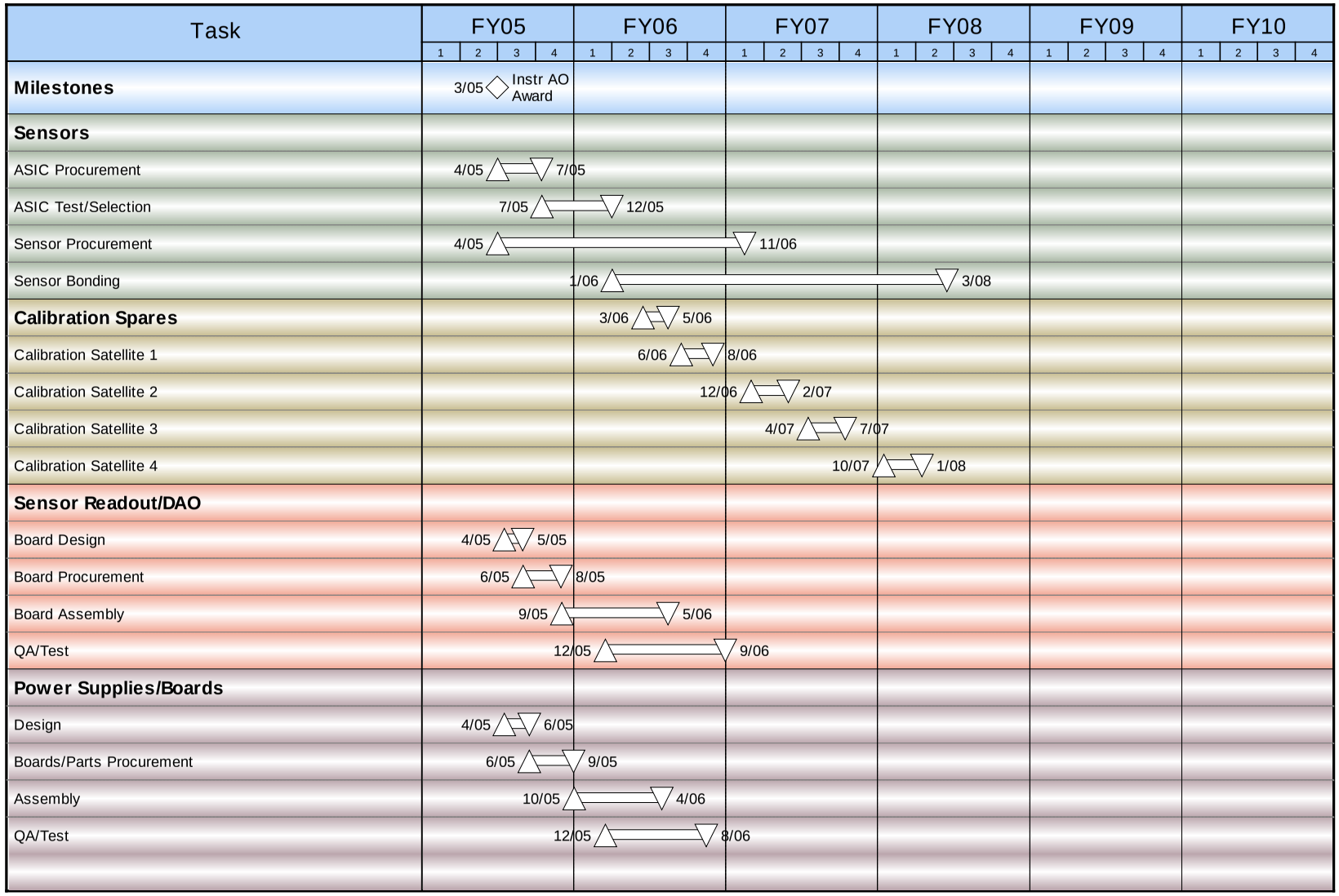
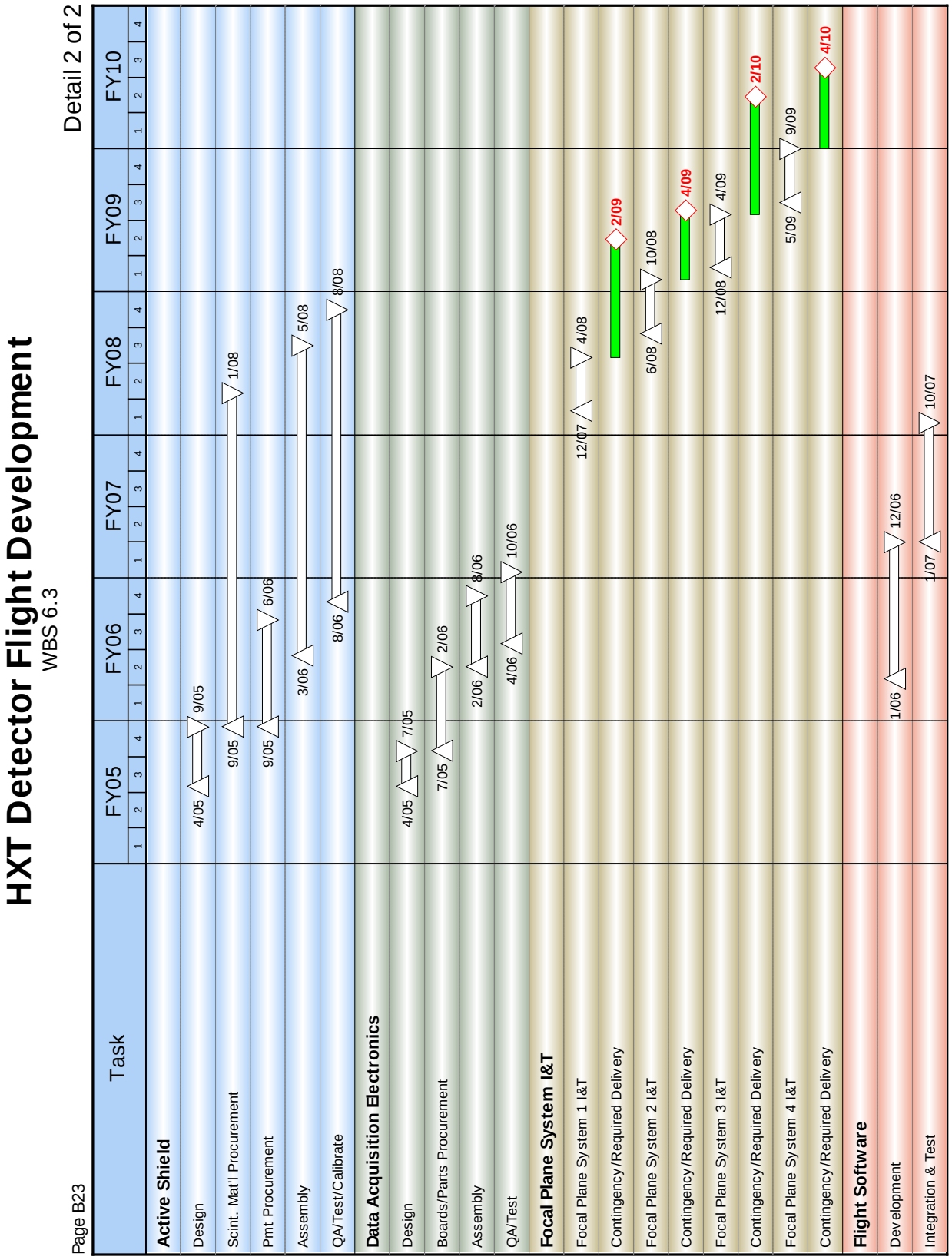
Detail 1 of 2




HXT Detector Flight Development
WBS 6.3
Page B23
Detail 2 of 2
Task
FY05
FY06
FY07
FY08
FY09
FY10
1 2 3 4
Active Shield
Design
4/05
9/05
Scint. Mat'l Procurement
9/05
1/08
Pmt Procurement
9/05
6/06
Assembly
3/06
5/08
QA/Test/Calibrate
8/06
8/08
Data Acquisition Electronics
Design
4/05
7/05
Boards/Parts Procurement
7/05
2/06
Assembly
2/06
8/06
QA/Test
4/06
10/06
Focal Plane System I&T
Focal Plane System 1 I&T
12/07
4/08
Contingency/Required Delivery
2/09
Focal Plane System 2 I&T
6/08
10/08
Contingency/Required Delivery
4/09
Focal Plane System 3 I&T
12/08
4/09
Contingency/Required Delivery
2/10
Focal Plane System 4 I&T
5/09
9/09
Contingency/Required Delivery
4/10
Flight Software
Development
1/06
12/06
Integration & Test
1/07
10/07

Observatory Structures

WBS 7.2 & 7.3

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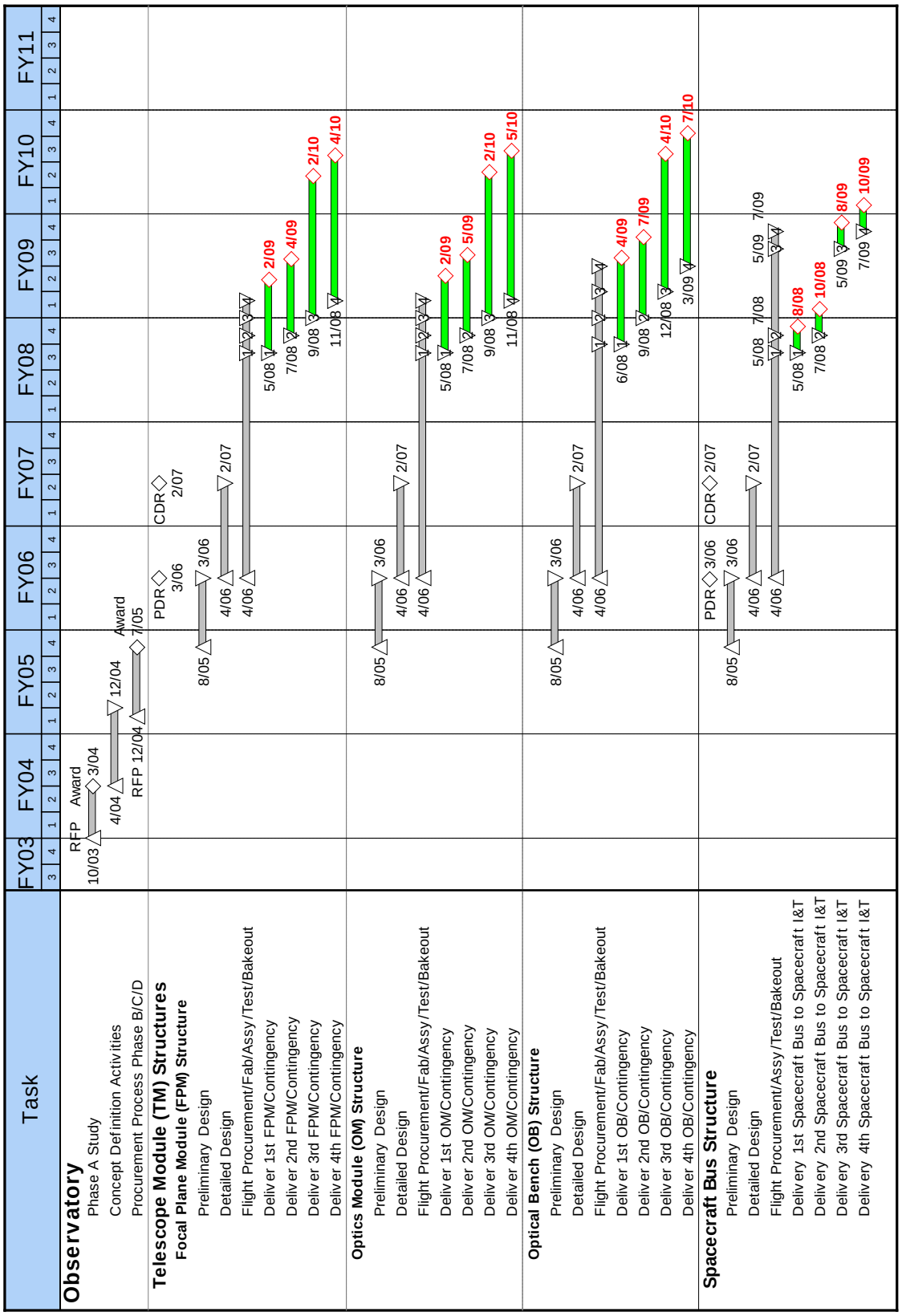

Spacecraft Bus Development Schedule

WBS 7.3

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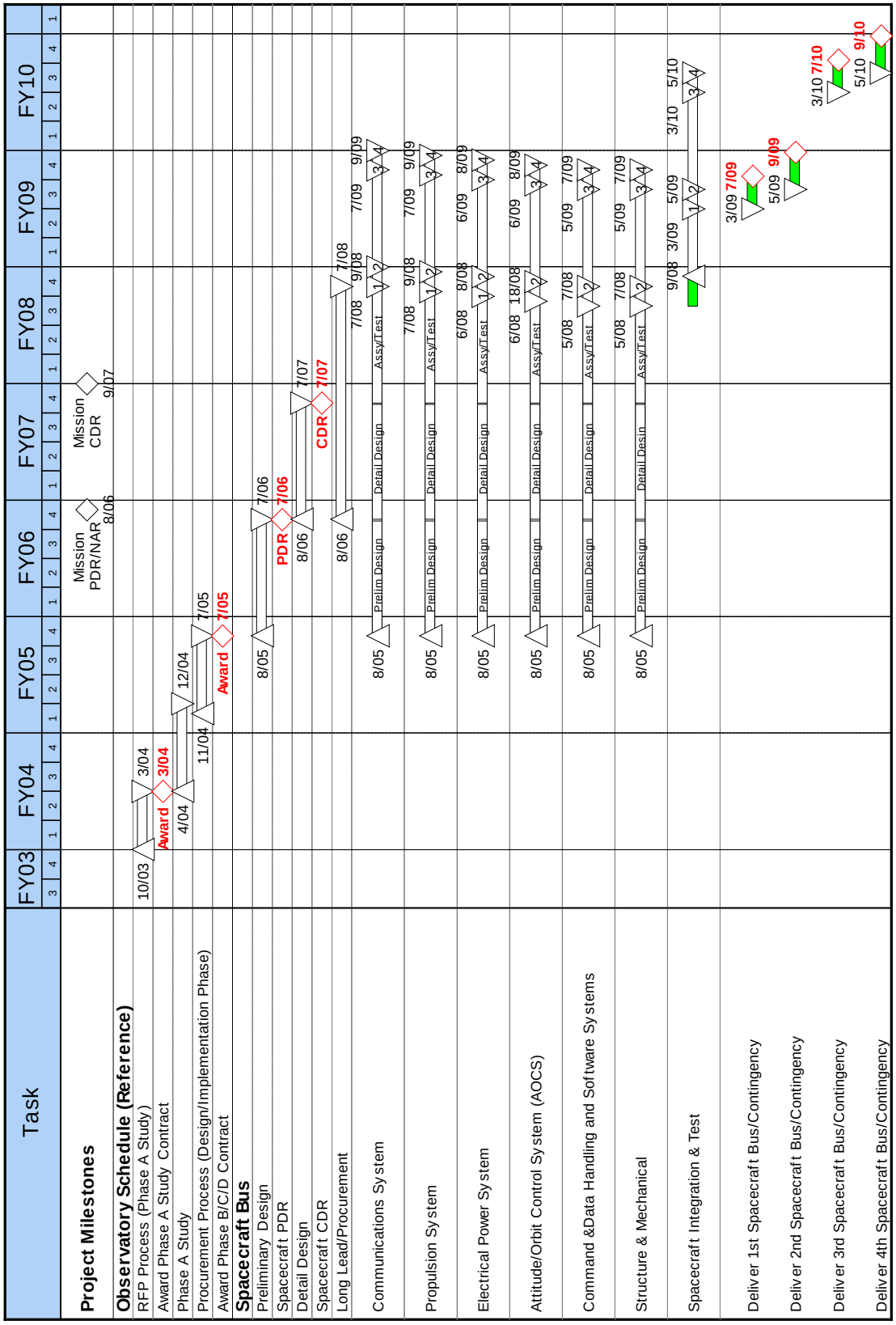

Integration & Test Schedule

1st Telescope Module (TM) & Observatory

WBS 7.2.1.3 (FPM I&T) 7.2.1.4 (OM I&T) 7.2.1.6 (TM I&T) 7.4.1 (Obs I&T)

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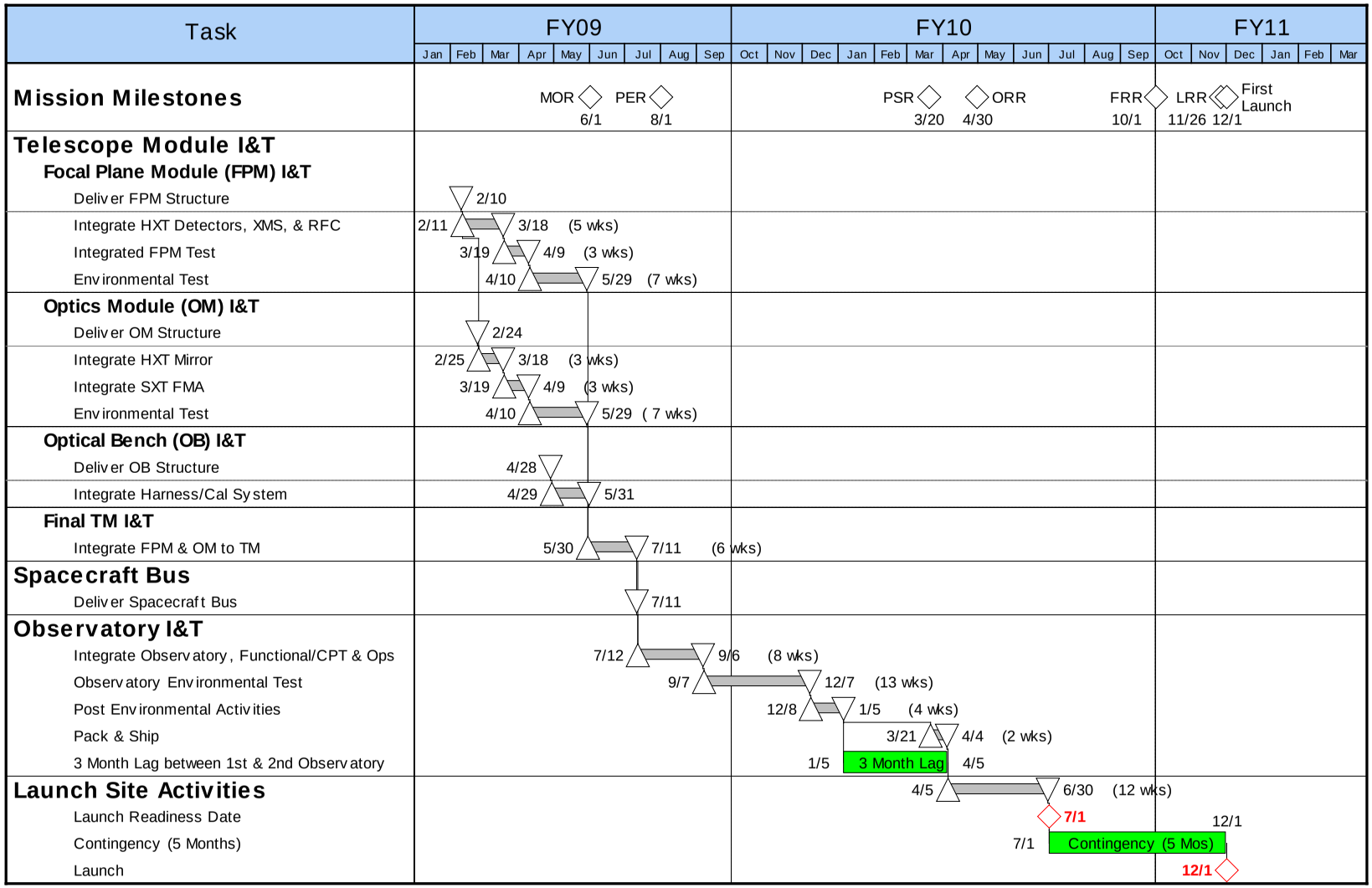

Integration & Test Schedule

2nd Telescope Module (TM) & Observatory

WBS 7.2.2.3 (FPM I&T) 7.2.2.4 (OM I&T) 7.2.2.6 (TM I&T) 7.4.2 (Obs I&T)

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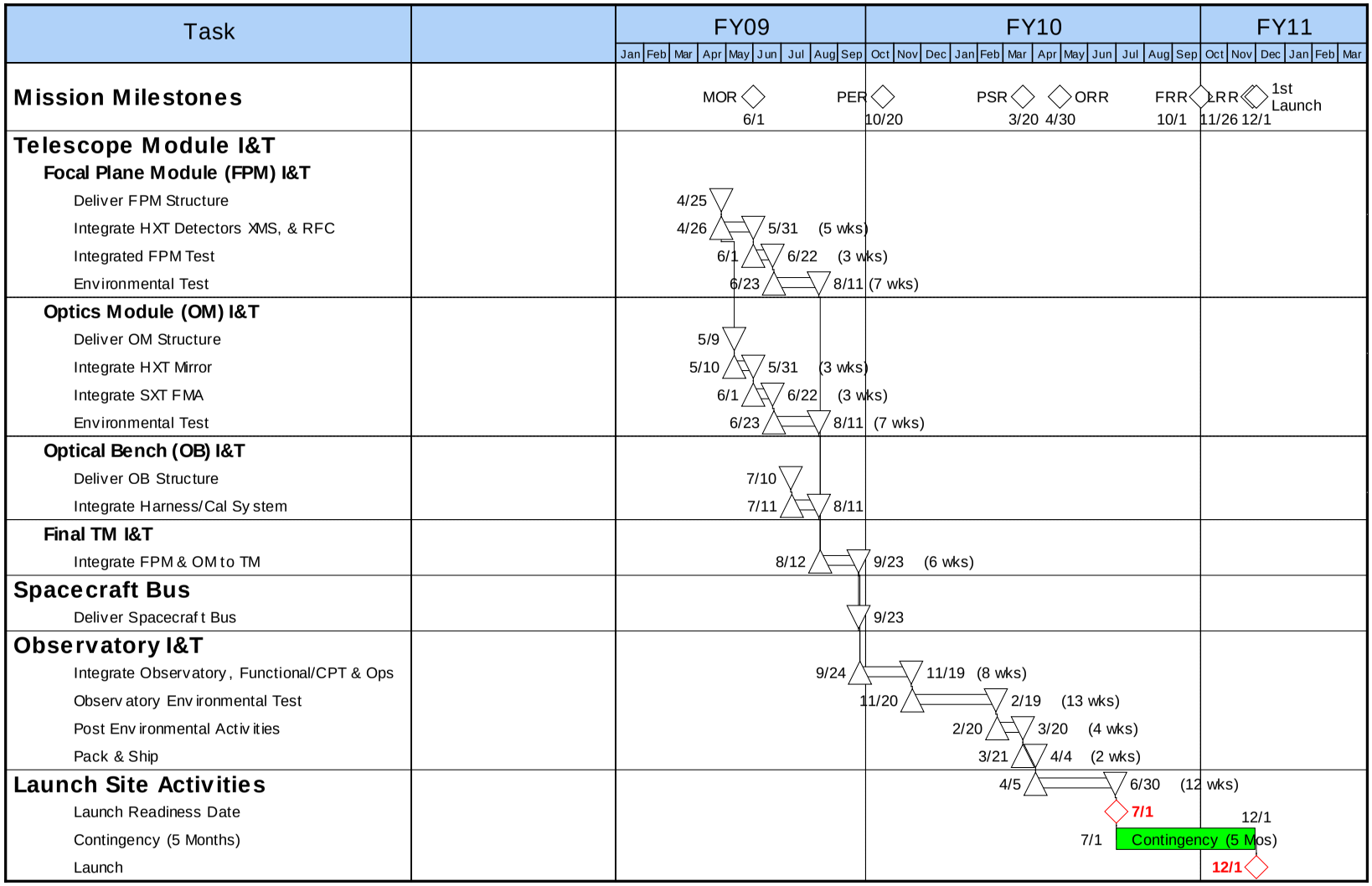

Launch Site Activites

1st Launch

WBS 8.1

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Task	FY10							FY11		
	March	April	May	June	July	August	September	October	November	December
Inspect/Set Up/Store/Store Pyrotechnics	4/5 4/6									
Set Up Observatories	4/7 4/21									
Set Up GSE		4/22 4/26								
Charge Batteries (reconditioning/top-off)		4/27 4/30								
Post-Ship Alivenes Test			5/3 5/3							
Solar Array Test			5/4 5/4							
Alignment			5/5 5/10							
CPT/Sims			5/11 5/17							
End-to-end Tests			5/18 5/19							
Deployment Tests			5/20 5/21							
Install Pyrotechnics			5/24 5/24							
Launch Site Contingency			5/25 6/1							
Mate Observatories to Carrier Plate/Separation Ring				6/2 6/7						
Fuel & Presurize Propulsion Tanks				6/8 6/14						
Preliminary Closeouts				6/15 6/15						
Post-Mate Tests (mainly elec)				6/16 6/16						
Fairing Encapsulation				6/17 6/17						
Post-Mate Tests (mainly elec)				6/18 6/18						
Mate Payload Stack to Transporter				6/21 6/21						
Transport to VIF				6/22 6/22						
Mate S/C and Fairing Assy to LV				6/23 6/23						
Elect Check/Install T-0 Umbilical & AC Cooling				6/24 6/24						
Aliveness Test				6/25 6/28						
Launch Readiness Review				6/29 6/29						
Final Closeouts, Trickle Charge, & Rollout to SLC-41				6/30 6/30						
Launch Readiness Date				7/1 Launch Readiness Date						
Contingency										
Launch									1st Launch 12/1	

Integration & Test Schedule

3rd Telescope Module (TM) & Observatory

WBS 7.2.3.3 (FPM I&T) 7.2.3.4 (OM I&T) 7.2.3.6 (TM I&T) 7.4.3 (Obs I&T)

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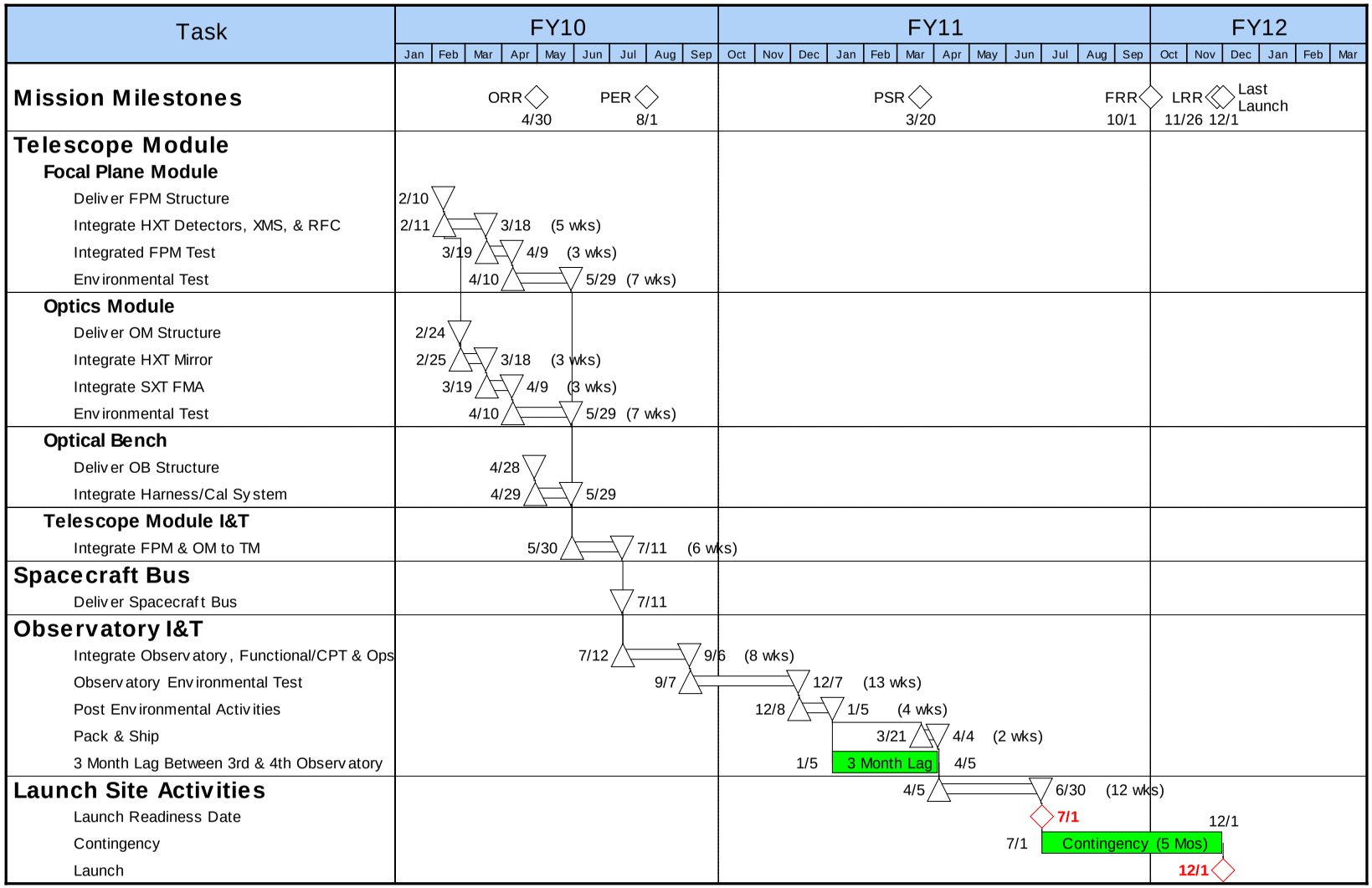

Integration & Test Schedule

4th Telescope Module (TM) & Observatory

WBS 7.2.4.3 (FPM I&T) 7.2.4.4 (OM I&T) 7.2.4.6 (TM I&T) 7.4.4 (Obs I&T)

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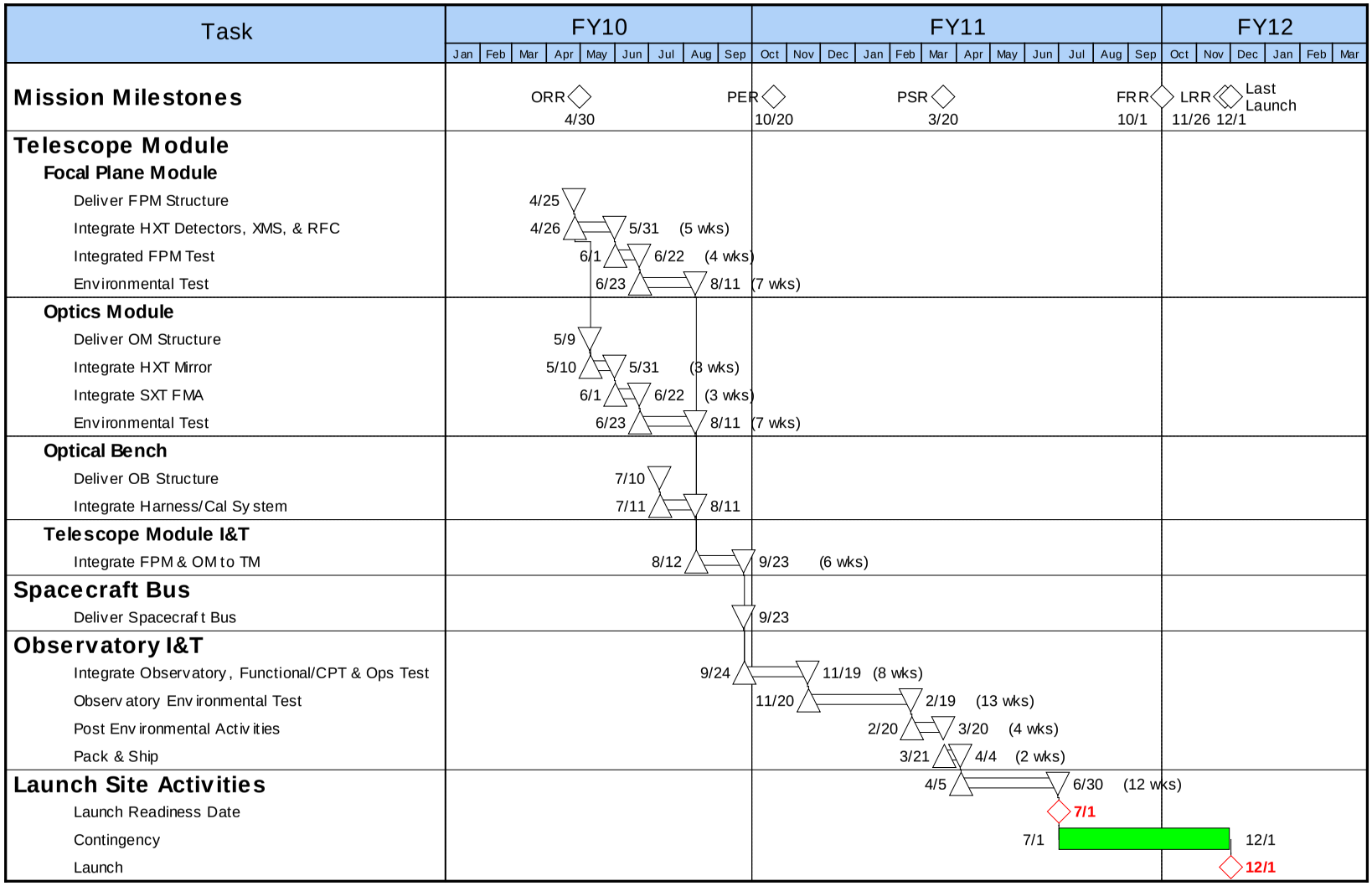

Launch Site Activites

2nd Launch

WBS 8.2

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Task	FY11									FY12		
	January	February	March	April	May	June	July	August	September	October	November	December
Inspect/Set Up/Store/Store Pyrotechnics	4/5	4/6										
Set Up Observatories	4/7	4/21										
Set Up GSE	4/22	4/26										
Charge Batteries (reconditioning/top-off)	4/27	5/2										
Post-Ship Alivenes Test	5/3	5/3										
Solar Array Test	5/4	5/4										
Alignment	5/5	5/10										
CPT/Sims	5/11	5/17										
End-to-end Tests	5/18	5/19										
Deployment Tests	5/20	5/23										
Install Pyrotechnics	5/24	5/24										
Launch Site Contingency	5/25	6/1										
Mate Observatories to Carrier Plate/Separation Ring	6/2	6/7										
Fuel & Presurize Propulsion Tanks	6/8	6/14										
Preliminary Closeouts	6/15	6/15										
Post-Mate Tests (mainly elec)	6/16	6/16										
Fairing Encapsulation	6/17	6/17										
Post-Mate Tests (mainly elec)	6/20	6/20										
Mate Payload Stack to Transporter	6/21	6/21										
Transport to VIF	6/22	6/22										
Mate S/C and Fairing Assy to LV	6/23	6/23										
Elect Check/Install T-0 Umbilical & AC Cooling	6/24	6/24										
Aliveness Test	6/27	6/28										
Launch Readiness Review	6/29	6/29										
Final Closeouts, Trickle Charge, & Rollout to SLC-41	6/30	6/30										
Launch Readiness Date						7/1						
Contingency												
Launch											12/1	

Mission Operations & Data Analysis

WBS 10

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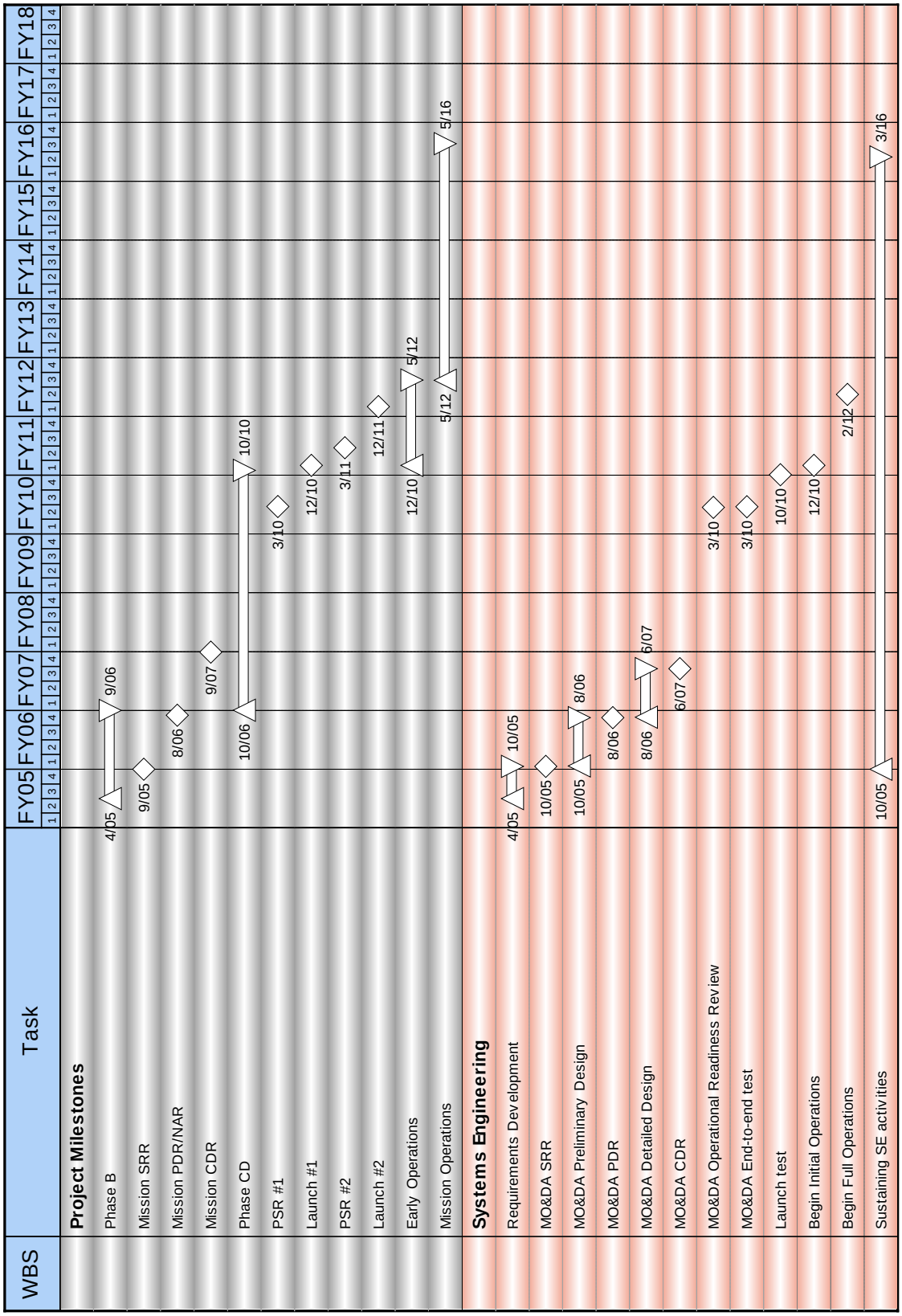
Detail 1 of 7



Mission Operations & Data Analysis

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Detail 2 of 7

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WBS	Task	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Science														
	Calibration Planning	4/05 3/06													
	Develop Calibration Plan	4/05 9/05													
	Develop Calibration Database	9/05 3/06													
	Calibration Support														
	SXT Calibrations			7/07 6/08											
	XMS calibrations			11/07 4/08											
	HXT calibrations			12/07 4/08											
	CCD/Grating calibrations			10/07 7/08											
	I&T 1/2 Support				8/08 6/09										
	I&T 3/4 Support				2/09	12/09									
	Flight Calibration Support						12/10	5/16							
	Calibration Software														
	Design		8/06 3/07												
	Development		3/07	10/07											
	Release #1: Instrument Level calibrations			10/07	2/08										
	Release #2: TM level Calibrations			2/08	7/08										
	Release #3: Observatory Level Calibrations			7/08	11/08										
	Release #4: Flight			11/08	4/09										
	Science Software														
	AO-1 Tools Design		8/06	10/07											
	AO-1 Tools Development (2 s/c support)			11/07			2/10								
	AO-1 Tools testing							10/10 4/11							
	AO-1 Tools Release							5/11							
	AO-2 Tools Development (4 s/c support)						2/10	11/10							

Mission Operations & Data Analysis

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Detail 3 of 7

WBS	Task	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	AO-2 Tools testing							5/11	9/11						
	AO-2 Tools Release							9/11							
	User Support		12/06						7/11						
	AO-1 Tools Design		12/06		1/08										
	AO-1 Tools Development (2 spacecraft support)			3/08			9/09								
	AO-1 Tools Testing					9/09	2/10								
	AO-1 Tools Release						6/10								
	AO-2 Tools Development (4 spacecraft support)						6/10	3/11							
	AO-2 Tools Testing							3/11	7/11						
	AO-2 Tools Release							7/11							
	Scientific Research	4/05											2/16		
	Science Workshops & Meetings	4/05											3/16		
	Data Systems														
	MDS Preliminary Design	9/05		7/06											
	MDS Detailed Design		7/06	2/07											
	Releae #1 (Mini-MDS)		2/07		11/07										
	Release #2 (MDS)			11/07		3/09									
	Release #3 (CXSOC)				3/09	10/09									
	Release #4 (Launch)					2/10	7/10								
	Data Systems Software General Development & Maintenance			11/07					2/16						
	Mission Data Systems (MDS)														
	MDS Preliminary Design	9/05		7/06											
	MDS Detailed Design		7/06	2/07											
	Mini-MDS			4/07	10/07										
	MDS - String 1			10/07	3/08										

Mission Operations & Data Analysis

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Detail 4 of 7

WBS	Task	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	MDS - String 2				8/08	1/09									
	MDS Systems				12/08										3/18
	Science Data Systems (SDS)														
	SDS Preliminary Design	9/05	7/06												
	SDS Detailed Design		8/06	6/07											
	SDS Hardware & Systems Implementation			6/07											1/18
	Science Data Processing			6/07											1/18
	Science Data Distribution						3/11								3/18
	Science Instrument Support														
	SXT				6/08						1/14				
	Calorimeter				6/08								3/16		
	Grating/CCD				6/08								3/16		
	HXT				6/08								3/16		
	Operations														
	Operations Management				10/08								8/16		
	Operations Facilities				10/08									1/17	
	Operations Hardware & Systems					7/09							5/16		
	Ground Stations Procurements					9/09	4/10								
	Ground Station Operations					4/10							5/16		
	FDF					7/09							3/16		
	Flight Operations														
	FO Planning			6/07	10/08										
	FO Preparation				10/08		3/10								
	Early Flight Operations							11/10	5/12						
	Launch #1 Activities							11/10	12/10						

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Detail 5 of 7

WBS	Task	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Transfer Orbit Activities (incl. Verif/Calibr)						12/10	3/11							
	L2 Injection Activities						3/11	4/11							
	2 S/C Operations						4/11		3/12						
	Launch #2 Activities							11/11	12/11						
	Transfer Orbit Activities (incl. Verif/Calibr)							12/11	3/12						
	L2 Injection Activities							3/12	4/12						
	4 S/C initial operation							4/12	5/12						
	Normal Flight Operations							5/12					5/16		
	Ground Operations														
	Ground Operations Planning			6/07		10/08									
	Ground Operations Preparation				10/08		3/10								
	Ground Operations						11/10						5/16		
	Technical Support Team					10/09							2/16		
	EPO														
	Education						6/10								4/18
	Outreach						6/10								4/18
	Media						6/10								4/18
	Grant Programs														
	Observation Cycle Grants					7/09									3/18
	Grant Peer Reviews & Meetings						10/10								12/17
	Grant Peer Reviews & Meetings 1						10/10	1/11							
	Grant Peer Reviews & Meetings 2							10/11	1/12						
	Grant Peer Reviews & Meetings 3								10/12	1/13					
	Grant Peer Reviews & Meetings 4									10/13	1/14				
	Grant Peer Reviews & Meetings 5										10/14	12/14			

Mission Operations & Data Analysis

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Detail 6 of 7

WBS	Task	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	Grant Peer Reviews & Meetings 6											10/15 – 12/15			
	Grant Peer Reviews & Meetings 7												9/16 – 12/16		
	Grant Peer Reviews & Meetings 8													9/17 – 12/17	
	General Observer Grants														
	AO-1							3/11 – 3/12							
	AO-2								3/12 – 3/13						
	AO-3									3/13 – 3/14					
	AO-4										3/14 – 3/15				
	AO-5											3/15 – 3/16			
	Archive Research Grants														
	1								3/12 – 3/13						
	2									3/13 – 3/14					
	3										3/14 – 3/15				
	4											3/15 – 3/16			
	5												3/16 – 3/17		
	6													3/17 – 3/18	
	EPO Grants														
	EPO Grants 1					7/09 – 7/10									
	EPO Grants 2						7/10 – 7/11								
	EPO Grants 3							7/11 – 7/12							
	EPO Grants 4								7/12 – 7/13						
	EPO Grants 5									7/13 – 7/14					
	EPO Grants 6										7/14 – 7/15				
	EPO Grants 7											7/15 – 7/16			
	EPO Grants 8												7/16 – 7/17		

Mission Operations & Data Analysis

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Detail 7 of 7

WBS	Task	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
	DD Time Grants														
1								3/11 – 3/12							
2									3/12 – 3/13						
3										3/13 – 3/14					
4											3/14 – 3/15				
5												3/15 – 3/16			
	Theory Grants														
1								3/11 – 3/12							
2									3/12 – 3/13						
3										3/13 – 3/14					
4											3/14 – 3/15				
5												3/15 – 3/16			
6													3/16 – 3/17		
7														3/17 – 3/18	
	CXM Fellow Grants														
1						7/09 – 7/10									
2							7/10 – 7/11								
3								7/11 – 7/12							
4									7/12 – 7/13						
5										7/13 – 7/14					
6											7/14 – 7/15				
7												7/15 – 7/16			
	GTO Grants							3/11 – 11/13							