

QUARTERLY REVIEW

December 10, 2002

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GNIRS Quarterly Review

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Introduction

- This is the 10th GNIRS Quarterly Review
- GNIRS is in the integration phase
 - Mechanism integration complete
 - OIWFS integration complete
 - Warm testing with mux completed
 - 1st cold test with engineering array in December

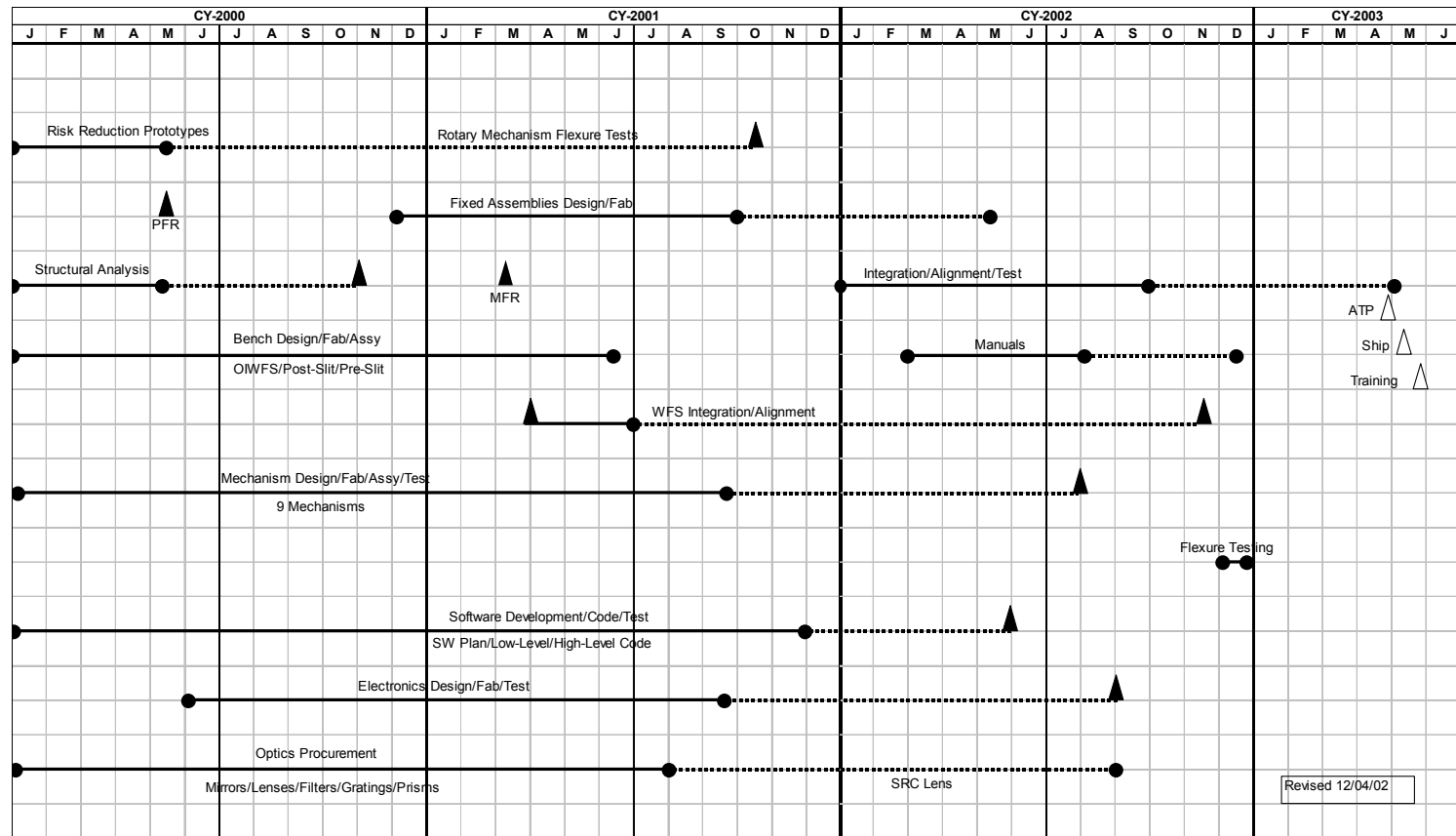
Progress Overview

- The project is currently 94% complete overall
- We have completed 215 of 227 original project milestones
- Major activities over this quarter:
 - Dewar wiring and ring-out
 - Shield rework
 - Assembly
 - Manuals
 - Warm testing with MUX

Schedule Update

- Instrument will ship in 2nd quarter of 2003 if all cold cycles needed
- Critical path:
 - Cold testing
 - Flexure testing
- Documentation and Deliverables
 - Software Manual delivered in November
 - Hardware Service & Calibration Manual in process
 - User's Manual in process
 - As-Built Fabrication Drawings complete as of this review
- Shipping container fabrication completes in December
 - Last item for fabrication complete milestone

Summary Project Plan



Expanded Integration Schedule

- Detailed integration schedule now in place
 - Covering period from start of integration through ship to Chile
 - Has expanded detail for assembly, testing, etc.
 - Updated on a weekly basis
 - Includes work on manuals and drawing package deliverables
 - Available on the GNIRS web site in pdf format
- Expanded list of milestones
 - Tied to the above schedule
 - Enables more detailed accounting of progress
 - There are 42 milestones listed that are tracked separately from the original milestone list, which is still valid but not as detailed

Integration Milestones

Calendar Year	Month Due	Number of Milestones Due	Running Total	Number of Milestones Comp	Running Total
2002	September	1	1	1	1
2002	October	4	5	4	5
2002	November	6	11	6	11
2002	December	7	18	3	14
2003	January	5	23	0	14
2003	February	4	27	0	14
2003	March	5	32	0	14
2003	April	5	19	0	3
2003	May	5	24	0	3
TOTAL		42		14	

Significant Events (since last QR)

- Flexure facility complete and ready for use
 - Should meet all goals and expectations
 - Portable clean room ordered and will be installed in late-January
- OIWFS
 - Failed Gimbal mirror mechanism
 - Repaired by IFA
 - All known upgrades to OIWFS mechanisms accomplished by IFA
 - Done in less than one week
 - Precludes Gemini having to upgrade later
- Diagnostic cold cycle completed
 - Verified vacuum, thermal control and cooldown
 - Verified mechanism operation
- Warm testing with Mux completed

Daily Progress and Status Reporting

- We have instituted a daily morning coordination meeting
 - Purpose is coordinate/outline daily activity
 - Held in work area
 - 15 minutes only at 9:15 AM
- We have instituted daily status reports
 - Outlines accomplishments for the day
 - Plans for next day
 - Produced at the end of the normal work day
- The meetings and status reports have been extremely beneficial to the project
 - Keeps everyone on the project informed
 - Has helped in keeping work on track and identifying items that could have been otherwise overlooked

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Technical Progress - Integration and Test

- Integration Completed
- First Cold Tests Completed
- Problems Corrected
- Warm Tests with Optics & MUX Completed

Technical Progress - Integration and Test

- General Procedures
 - Devise a checklist for each major task sequence
 - Reviewed by project team
 - Daily coordination meeting and progress reports
 - Write-up of significant results after tests complete

Technical Progress - Integration and Test

- General Procedures
 - Work is largely serial: access to instrument is critical factor

Technical Progress - Diagnostic Cold Cycle

- Purpose:
 - Determine vacuum and thermal performance

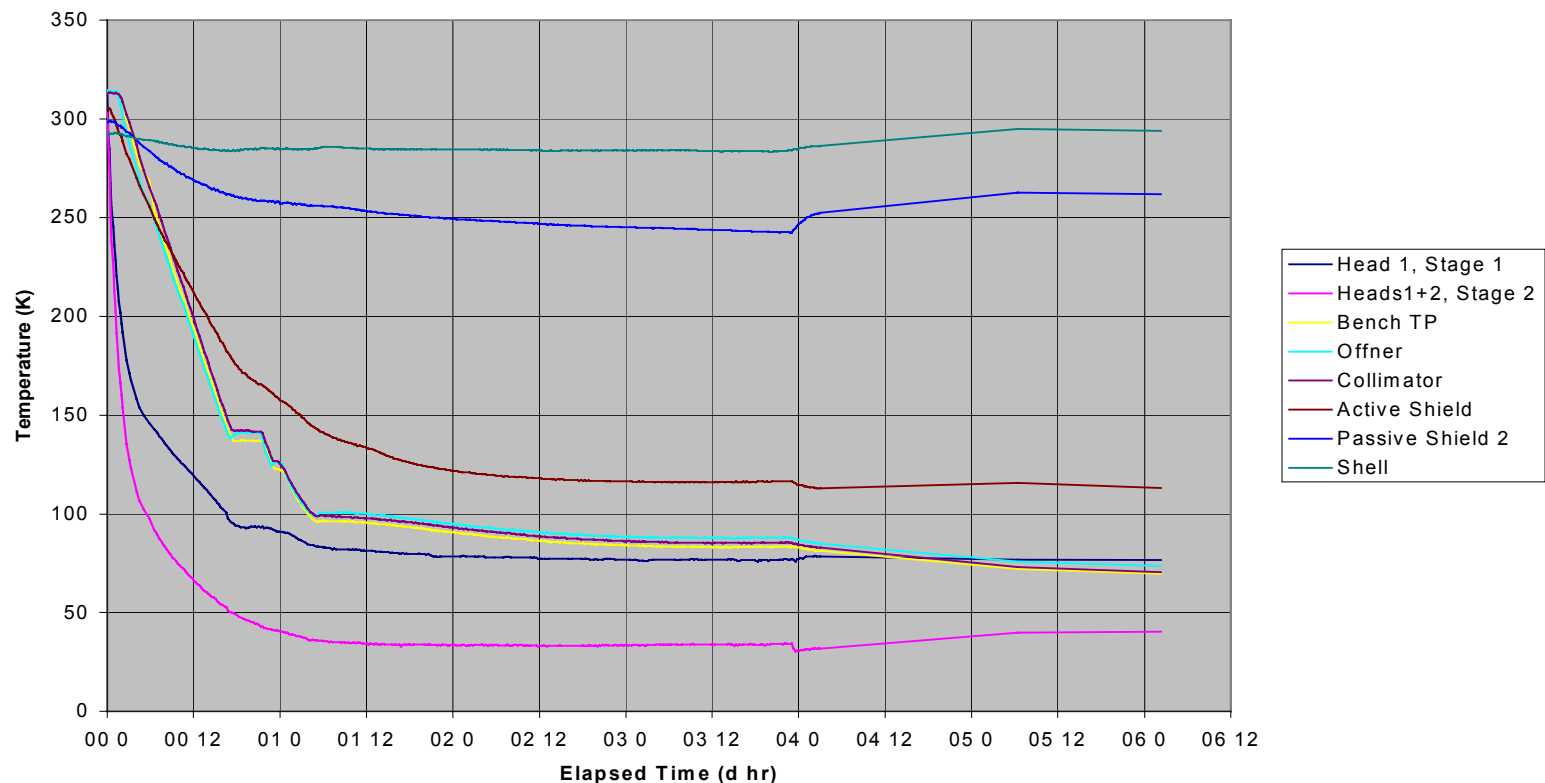
Technical Progress - Diagnostic Cold Cycle

- Results & problems
 - Vacuum OK in principle. However outgassing from paint during initial bench heating led to contamination of some optics.
 - IN2 pre-cool system worked extremely well, matched model predictions. Operation needed simplification.

Technical Progress - Diagnostic Cold Cycle

- Results & problems (2)
 - Cryocooler system did not reach ultimate temperature (68K reach, <65K required). Problem identified as loosening of bolts on one set of cold straps (out of 2).
 - Thermal short to dewar shell seen, other shield contacts.

Technical Progress - Diagnostic Cold Cycle



Technical Progress - Diagnostic Cold Cycle

- Results & problems (3)
 - Warm-up box worked too well, needed to be run at <100% duty cycle to keep heating rate <10K/hour.
 - Improper allowance for differential CTE for some prisms and mirrors. Damage to prism mirror.
 - OIWFS tested, gimbal failed.
 - Report available on web site.

Technical Progress - Diagnostic Cold Cycle

- Solutions
 - Contaminated optics cleaned. Residual discoloration on collimator, but emissivity measurement shows no excess emissivity (=lost reflectivity)
 - Modified pre-cool system manifold designed and installed for ease of operation
 - Belleville washers added to thermal straps to prevent loosening with head vibration.

Technical Progress - Diagnostic Cold Cycle

- Solutions (2)
 - Shield interferences corrected. Shield assembly fitting procedures documented.
 - Warm-up box re-programmed to limit warm-up rate.
 - Refigured prism mirror. Remounted 2 mirrors with minor damage to prevent propagation. Reviewed and corrected fit problems with all optics.

Technical Progress - Diagnostic Cold Cycle

- Solutions (3)
 - OIWFS gimbal mirror repaired and all OIWFS mechanisms upgraded to reflect NIRI/NIFS upgrades. Mechanical work performed at IfA.
 - Various other minor problems corrected.

Technical Progress - Warm Optics Tests

- Purpose:
 - Test of optical performance at system level
 - Repeat test of mechanism functionality and of performance as measured optically

Technical Progress - Warm Optics Tests

- Tests with targets, etc.
 - Verified overall alignment: shimmed 3 flats, acquisition mirror, 32 l/mm grating.
 - Found and corrected vignetting in 2 baffle locations.
- Test of OIWFS
 - All mechanisms fully functional warm

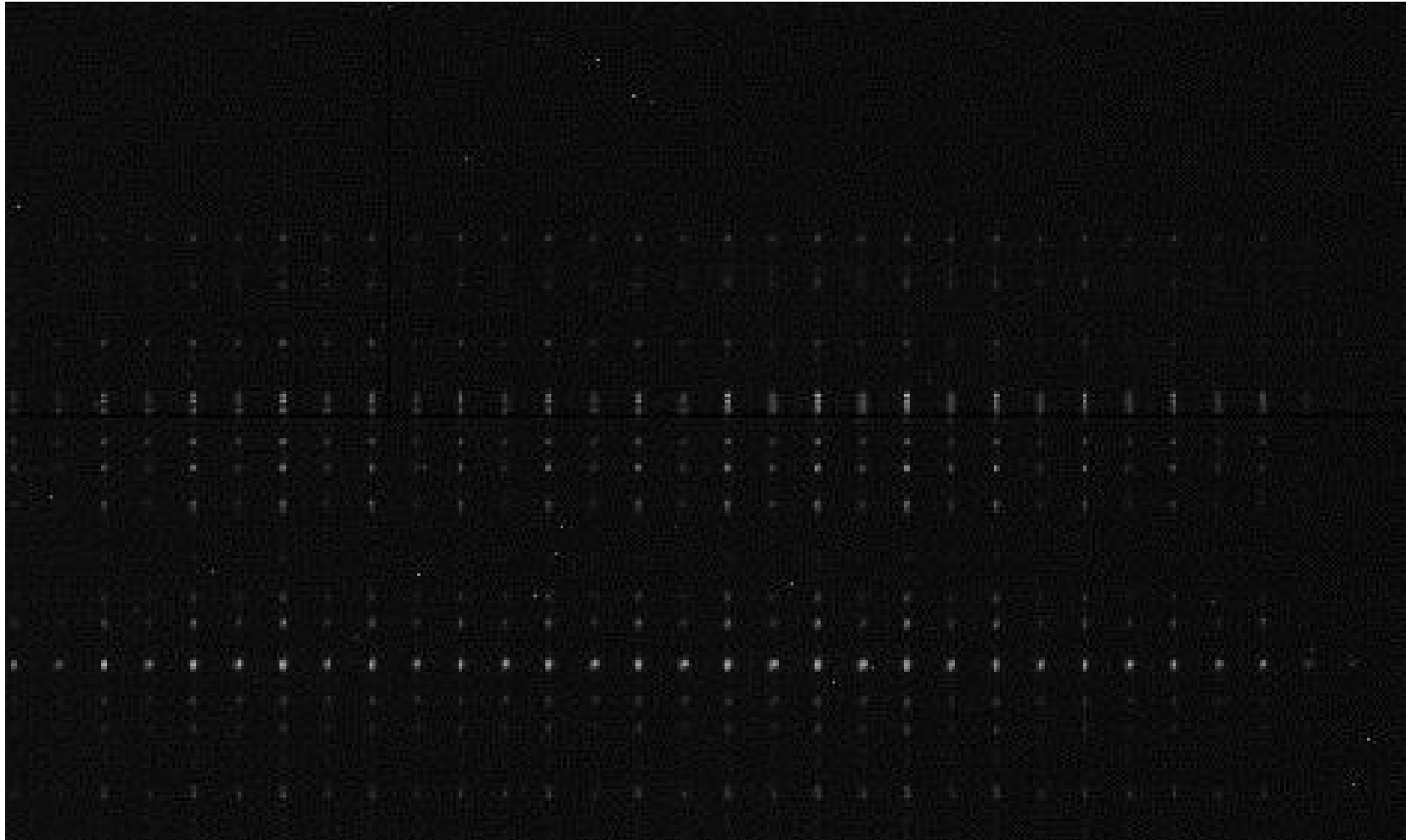
Technical Progress - Warm Optics Tests

- Tests with MUX
 - Required assembly except for end caps & shields
 - MUX operates successfully
 - Mechanisms functional except for 1 (of 2) home switches on camera (still 100% functional but no back-up)

Technical Progress - Warm Optics Tests

- Tests with MUX (2)
 - Imaging tests identified problems with acquisition mirror and cross-dispersion prisms (deformation). Long slit modes fine, Wollaston may have some astigmatism.
 - Repeatability for “worst” mechanisms ~3 pixels for long camera (spec is <10).
 - Verified force response on collimator compensator mechanism

Technical Progress - Warm



Technical Progress - Warm Optics Tests

- Problems and Solutions
 - Will address after cold test & flexure test
 - Disassembly required
 - Adjust prism mounts in optics shop
 - Investigate acquisition mirror problem; performance is acceptable except in 10% seeing.

Technical Progress - Warm Optics Tests

- Problems and Solutions (2)
 - Fix camera home switch (if it does not work cold).
 - Adjust flexure correction
 - Address problems seen cold on flex rig

Technical Progress - Plans

- Cold Test with Engineering Array
 - Pumping and cooling started
 - Moved to flex rig to complete preparation
 - Cold tests to start before Christmas

Technical Progress - Plans

- Disassembly to correct problems to start in January; allow ~4 weeks for corrections
- Cold test with science array underway at next QR

Project Management

- Last QR response
- Schedule update
- Integration plan
- Cost and Schedule
 - Current progress
 - WBS report
 - Work/FTE projections
 - Capital
 - Cost to complete
 - Milestones
 - Deliverables projections
- Work still outstanding
 - Flexure testing
 - Integration and test
- Plans for Next Review

Response to September QR

- Items to be completed by this QR
 - Flexure testing
 - Two cold cycles
 - Manual outlines
 - Final manuals to Gemini for review
 - Deliver design documentation
 - Shipping container fabrication
 - Mechanical parts rework
 - Short Red Camera rework and test
 - Dewar vacuum integrity
 - Verify cooldown time
 - Verify bench thermal stability
 - Collimator flexure compensation performance

September QR Response

ITEM	STATUS	COMMENT
Flexure testing	Not Complete	Will be done in Cycle 1
Two cold cycles (Diagnostic + Cycle 1)	Not Complete	Diagnostic cycle complete; Cycle 1 in process
Manual outlines	Complete	
Final manuals to Gemini for review	Not Complete	Will be sent to Gemini mid-December
Deliver design documentation	Complete	
Shipping container fabrication	Not Complete	Will complete in mid-December
Deliver design documentation	Complete	
Shipping container design	Complete	
Mechanical parts rework	Complete	
Short Red Camera rework and test	Complete	
Verify dewar vacuum integrity	Complete	
Verify cooldown time	Complete	
Verify bench thermal stability	Complete	
Verify collimator flexure compensation performance	Not Complete	Will be done in Cycle 1

Focus of Last Quarter of Work

- Fabrication
 - Shipping container
- Procurement
 - Misc mechanical piece parts
- Integration
 - Radiation shield fitting and rework
 - Mirror rework (Collimator and OIWFS gimbal mirror)
 - OIWFS mechanism rework by IFA
 - Camera installation
 - Bench and dewar wiring and assembly
 - Warm testing with Mux

WBS Report - % Complete since MFR June '01

WBS Element	Jun	Oct	Jan	May	Sept	Dec
5.0 Overall Project	66%	80%	86%	91%	92%	94%
5.1 Mgmt & Reporting	61%	71%	80%	89%	88%	92%
5.2 Systems Engineering	100%	100%	100%	100%	100%	100%
5.3 Mechanical	70%	87%	94%	94%	96%	96%
5.3.1 Mechanisms	84%	92%	97%	98%	100%	100%
5.3.2 Benches	70%	100%	96%	100%	100%	100%
5.3.3 Fixed Assemblies	36%	62%	84%	91%	93%	94%
5.4 Electronics	59%	86%	71%	76%	87%	100%
5.5 Software	63%	85%	86%	100%	100%	100%
5.6 Integration	0%	2%	23%	39%	57%	66%
5.7 Deliverables	0%	0%	45%	48%	54%	71%
5.8 Procurement	67%	77%	86%	99%	97%	98%

Budget and Expenditures

Baseline Estimate (Jan '99 to Completion)						
Labor	\$3,391,232					
Capital	\$836,462					
Total	\$4,227,694					
Current Forecast (Jan '99 to Completion)						
	Jun '01	Oct '01	Jan '02	May '02	Sep '02	Dec '02
Labor	\$3,002,938	\$2,957,389	\$2,986,915	\$2,956,461	\$2,998,245	\$3,116,204
Capital	\$1,181,900	\$1,138,285	\$1,384,670	\$1,486,726	\$1,502,306	\$1,563,106
Total	\$4,184,838	\$4,095,674	\$4,371,585	\$4,443,187	\$4,500,551	\$4,679,310
Performance Ratios						
	Jun '01	Oct '01	Jan '02	May '02	Sep '02	Nov '02
BCWS	\$2,863,855	\$3,085,811	\$3,263,216	\$3,462,160	\$3,572,138	\$3,572,138
BCWP	\$2,011,383	\$2,526,319	\$2,899,362	\$3,035,216	\$3,186,692	\$3,254,387
ACWP	\$2,113,212	\$2,762,963	\$3,339,222	\$3,756,257	\$4,137,200	\$4,370,562
CPI	0.95	0.91	0.89	0.88	0.89	0.91
SPI	0.70	0.82	0.87	0.81	0.77	0.74

Project Status – WBS 5.3 Mechanical

<u>Mechanism</u>	<u>%</u>
Camera	100
Detector Focus	100
Environ Cover	100
Acquisition Mirror	100
Slit	100
Decker	100
Filter Wheel	100
Grating Turret	100
Gratings	100
Prism Turret	100
Prisms	100
Motor Drives	100
<u>Bench</u>	<u>%</u>
Post-Slit	100
OIWFS	100
Collimator	100
POM/Offner	100

<u>Fixed Assembly</u>	<u>%</u>
Entrance Window	100
Cryo-cooler	100
Molecular Sieve	100
Thermal Dist.	100
LN ₂ Pre-Cool	100
Opt Bench Mount	100
Environ Cover Filter	100
Bulkhead	100
Passive Rad Shield	100
Active Rad Shield	100
Front Dewar Shell	100
Rear dewar Shell	100
Vert Inst Frame	100
Horiz Inst Frame	100
Dewar Mount Truss	100
TE Mount Truss	100
Shipping Container	95
Handling Fixture	100
Ballast Weights	100

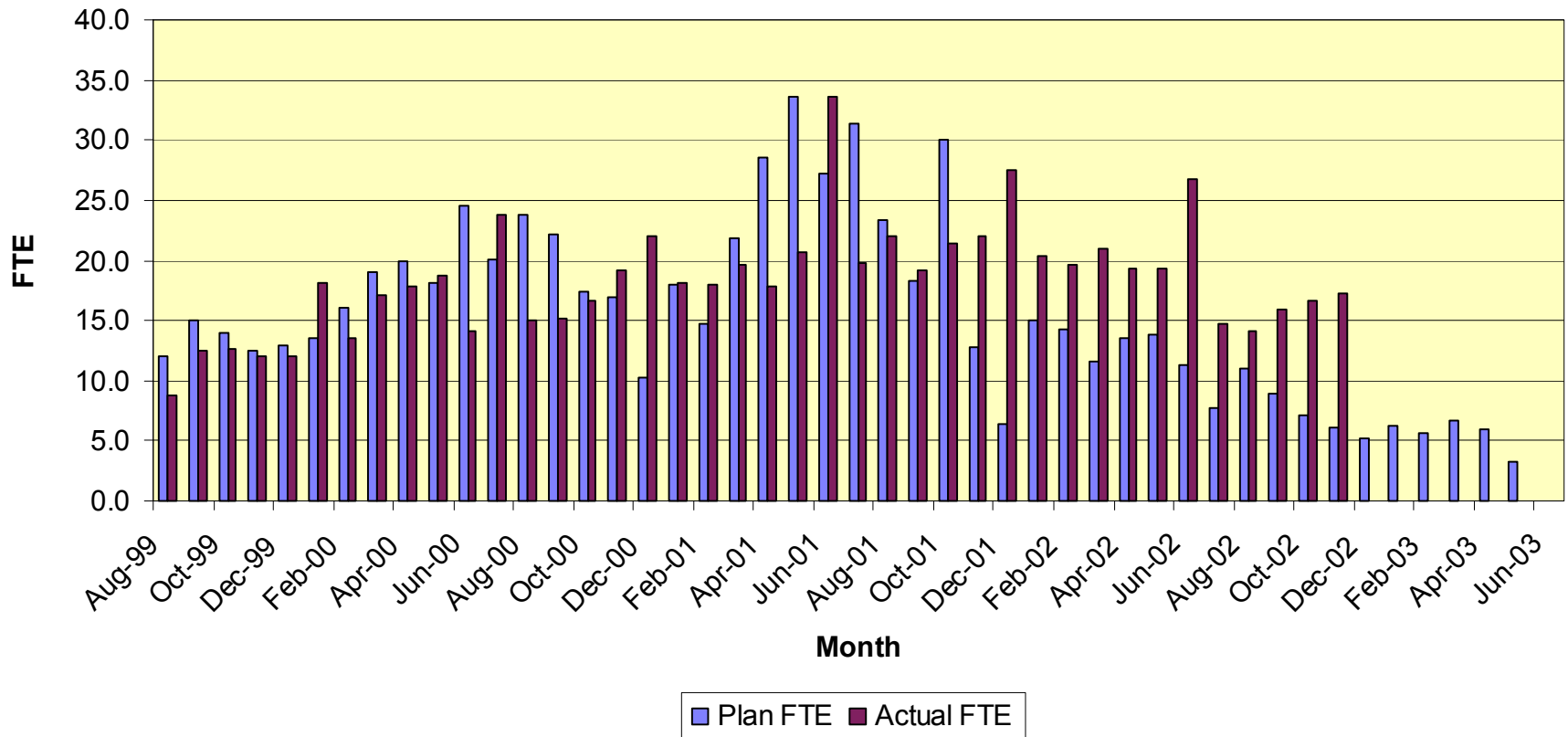
Project Status

- WBS 5.2 Systems Engineering
 - Activities over this quarter
 - OIWFS testing and integration
 - Mechanism testing
 - Warm testing
 - Manuals
 - Work left
 - Oversee instrument integration
 - Flexure testing
 - Cold testing
 - User's Manual

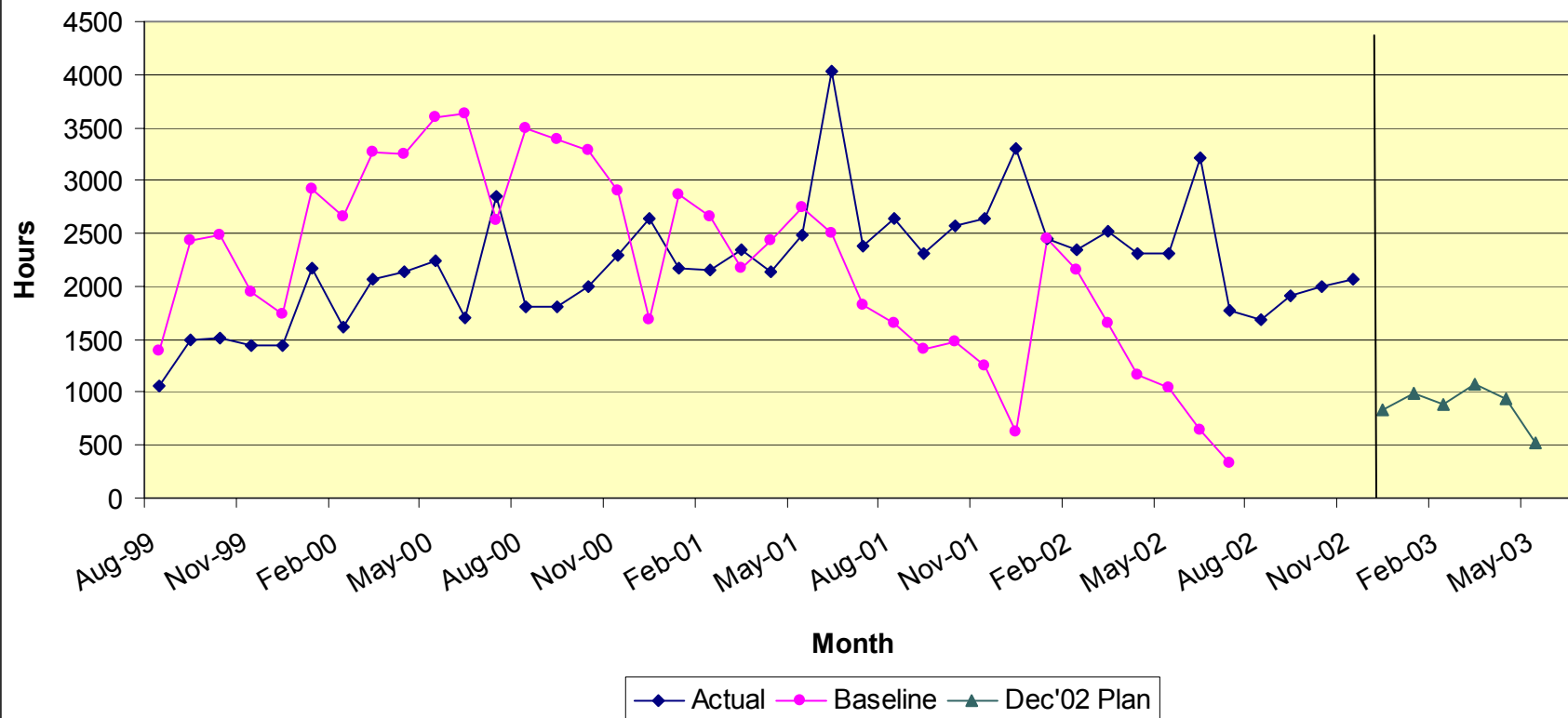
Project Status

- WBS 5.3 Mechanical
 - Complete shipping container
- WBS 5.4 Electrical
 - Assist in instrument assembly and checkout
- WBS 5.5 Software
 - Participate in instrument assembly and checkout
 - Finalize code
- WBS 5.8 Procurement
 - Miscellaneous mechanical items

GNIRS Staffing FTE by Month

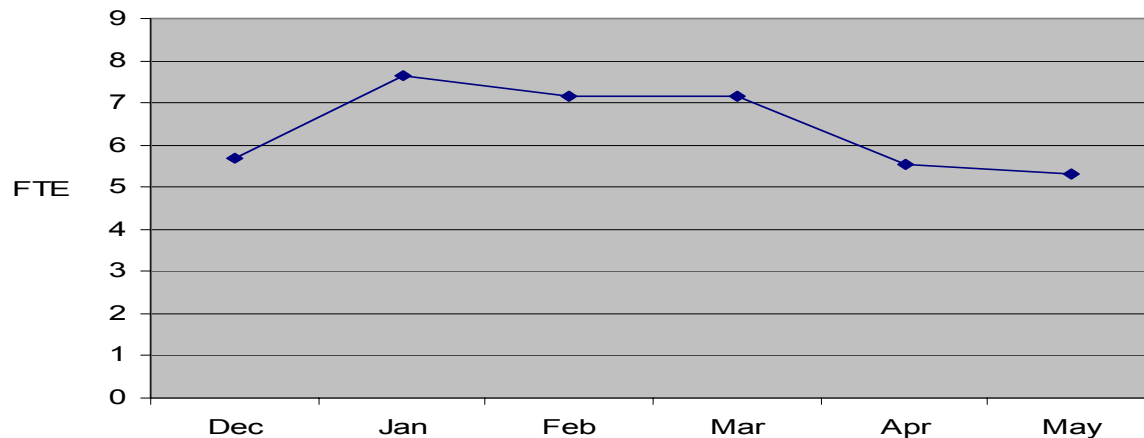


GNIRS Work by Month

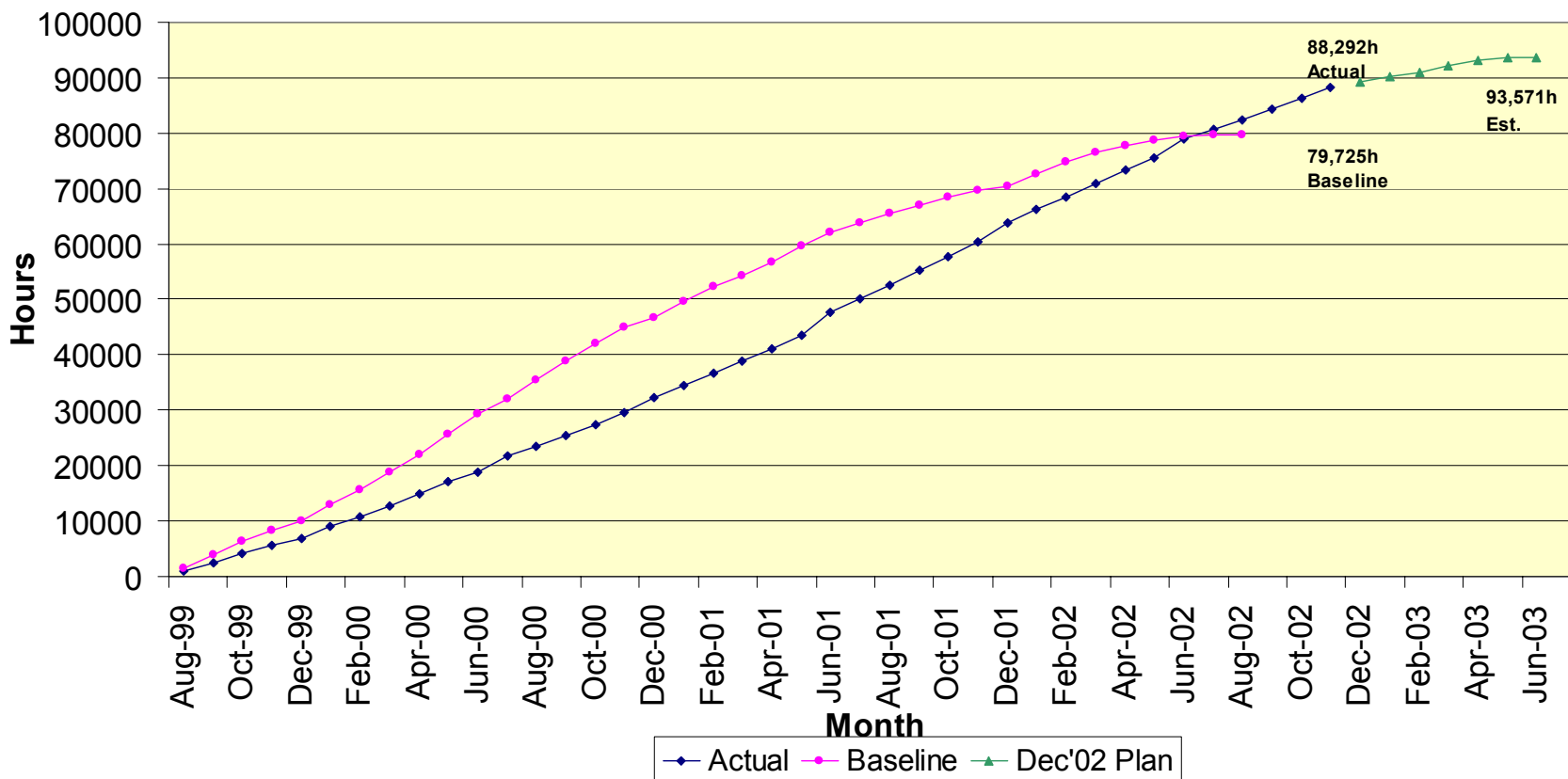


FTE Projection

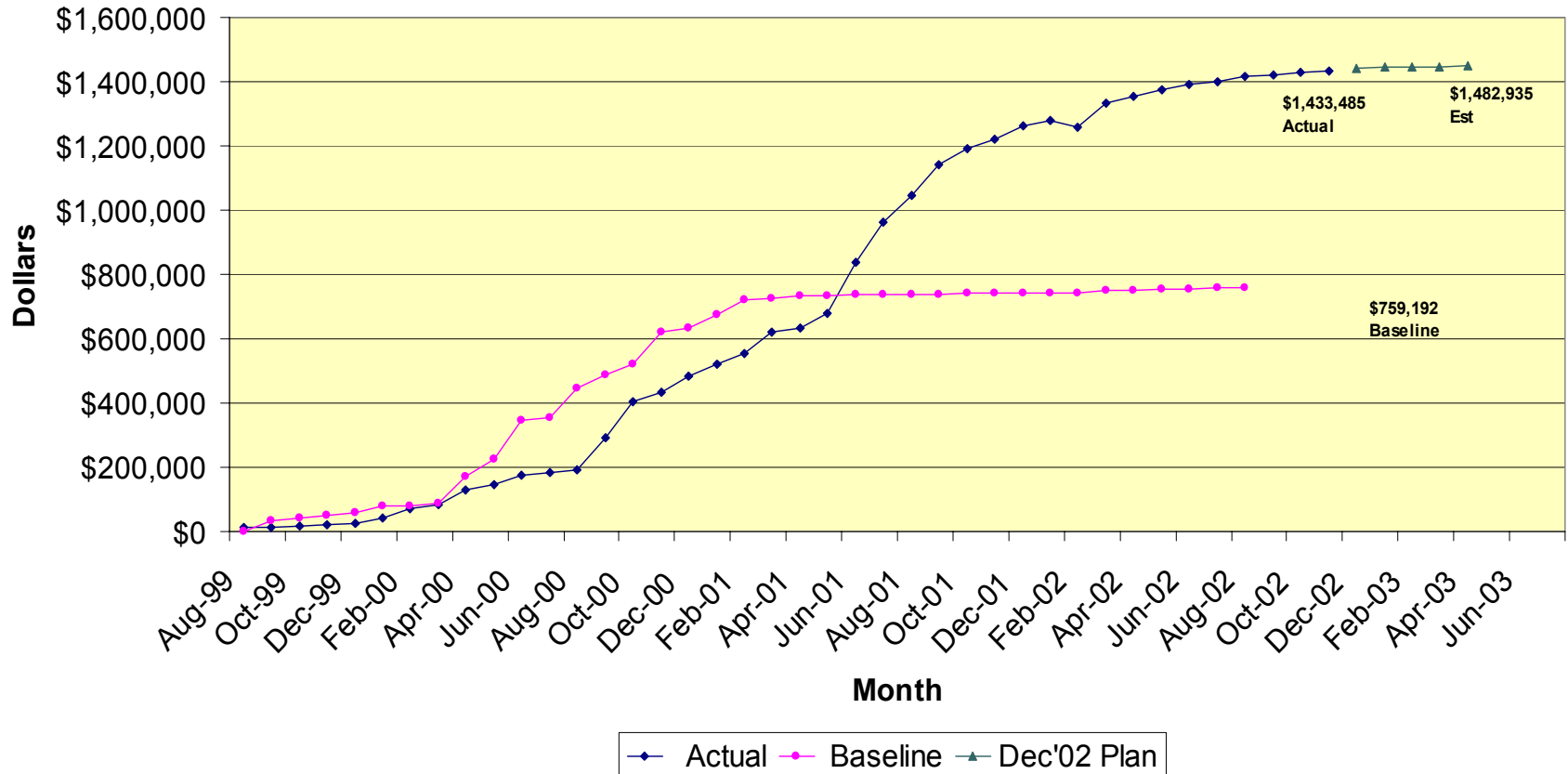
		Dec	Jan	Feb	Mar	Apr	May
FTE Type	Name						
ME	Muller	0.5	0.5	0.5	0.5	0.5	0.5
MD	Andrew	0.5	0.5	0.25	0.25	0.25	
EE	Penegor	0.1	0.1	0.1	0.1		
ET	Don	0.25	0.1				
ET	Schmitt	0.25	0.25	0.25	0.25		
ET	George	0.5	1	1	1	1	1
Eng	Distsler	0.1	0.1	0.1	0.1	0.1	
Opt	Poczulp		0.25	0.25			
IM	Stein	0.5	0.5	0.5	0.5		
P	Ruckle	0.5	1	1	1	1	1
OE	Ming		0.25				
GT	Pina/Sillman	0.5	0.5	0.5	0.5		
PA	Eklund	0.1	0.25	0.25	0.25	0.25	0.25
AA	Bowersock	0.5	0.5	0.5	0.5	0.5	0.5
PS	Elias	0.5	0.75	0.75	0.75	0.75	0.75
PSS	Joyce	0.5	0.5	0.5	0.5	0.5	0.5
PM	Gaughan	0.5	0.8	0.8	0.8	0.8	0.8
	Monthly FTE	5.8	7.85	7.25	7	5.65	5.3
	Monthly hours	928	1256	1160	1120	904	848
	Spend Rate (\$/mo)	\$34,224	\$46,688	\$43,040	\$41,520	\$33,312	\$31,184
	Total to go	\$229,968	6216				



GNIRS Cumulative Work



GNIRS Capital Spend Plan



Project Milestones by Quarter

Calendar Year	Quarter	Number of Milestones Due	Running Total	Number of Milestones Comp	Running Total
1999	4th	1	1	1	1
2000	1st	15	16	15	16
2000	2nd	13	29	13	29
2000	3rd	8	37	8	37
2000	4th	18	55	18	55
2001	1st	19	74	19	74
2001	2nd	34	108	34	108
2001	3rd	29	137	29	137
2001	4th	28	165	28	165
2002	1st	25	190	25	190
2002	2nd	17	207	16	206
2002	3rd	7	214	7	213
2002	4th	4	218	2	215
2003	1st	4	222	0	215
2003	2nd	5	227	0	215
	TOTAL	227		215	

As of
12/04/02

Deliverables Projection

- | | |
|-------------------------------|-------------------------------|
| • Documentation | <u>Final</u> |
| – Hardware Maintenance Manual | Dec |
| – Operations Manual | Dec |
| – As-Built Drawings | Dec |
| • Testing | <u>Approx Scheduled Dates</u> |
| – Pre-ship AT | March 2003 |
| – Instrument Hardware Ship | March 2003 |
| – Post –Ship AT | April 2003 |
| – Final AT | April 2003 |
| – Commissioning | April – May 2003 |

Gemini Payments Summary – Current Work Scope

<u>Milestone</u>	<u>Payment</u>	<u>Date</u>	
		<u>Original</u>	<u>New</u>
Test Plans Delivered	\$50,000*	Mar-01	Mar-02
Parts Fabrication Complete	25,000	Jun-01	Dec-02
Manuals Complete	75,000	Aug-01	Dec-02
Warm Tests Complete	25,000	Dec-01	Dec-02
Cold Cycle Testing Complete	25,000	Mar-02	Apr-03
Pre-Ship Acceptance	80,000	Jun-02	Apr-03
Final Acceptance	<u>300,857</u>	Sep-02	May-03
Total	\$580,000		
Change order outstanding			
- CO #11 - Chile Delivery	\$176,925		

* Billed and received

Conclusions

- The current project status - 94% complete
- We are in the integration phase
- The next issue is flexure testing
- The estimated cost of GNIRS is \$ 4,679,310
- There is no schedule contingency left

Milestones for Next Review

- The next Quarterly Review will be held in the March 2004 timeframe
- Flexure testing will be complete
- Two cold test cycles will have completed
- All manuals will be complete
- Shipping container will be complete

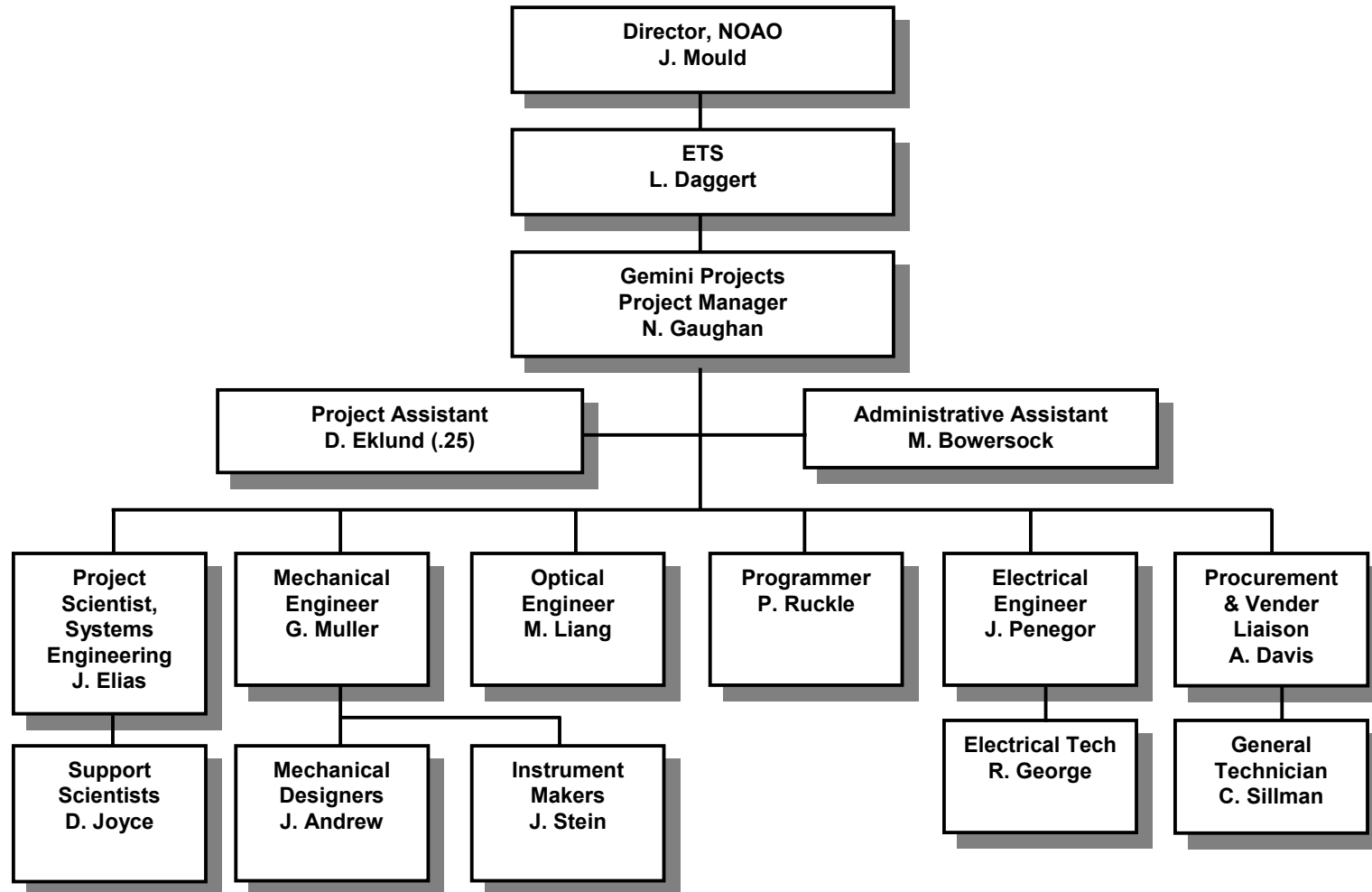
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Appendix A

Organization Chart

Milestones

WBS Chart



Milestones since MFR (3/01)

WBS	TASK	Baseline Plan	Est. Plan	Act. Finish
5.8.1.1.1	RMI Optics Acceptance	6/16/00	3/1/01	3/1/01
5.2.5.5	Design Axis 2 Wiring Diagram	NA	3/12/01	3/12/01
5.2.5.6	Fab/Test Axis 2 Wiring Harness	NA	3/12/01	3/12/01
5.2.5.8	Mechanism Test Set Complete	9/29/00	3/12/01	3/12/01
5.3.3.1.3.5	Entrance Window Assembly Fabrication Complete	6/8/01	3/12/01	3/12/01
5.3.3.16.1.4	Dewar Mount Truss Assembly Design Complete	1/5/01	3/13/01	3/13/01
5.4.1.2.5	Motor Drive / Cryohead Control Chassis Complete	8/29/00	4/9/01	4/9/01
5.3.1.8.2.6	Grating Turret Drafting Complete	6/7/00	4/10/01	4/10/01
5.3.3.9.1.5	Bulkhead Assembly Design Complete	9/26/00	4/10/01	4/10/01
5.3.1.2.2.2.4	Long Red Camera Drafting Complete	10/4/00	4/13/01	4/13/01
5.3.1.104.5	Motor Drive Assembly Complete	8/2/00	4/16/01	4/16/01
5.3.1.2.3.1.3	Long Blue Camera Design Complete	5/31/00	4/17/01	4/17/01
5.5.4.1	Channel Access	NA	4/18/01	4/18/01
5.3.2.4.2.3.3	Offner Assembly Fabrication Complete	9/11/00	4/24/01	4/24/01
5.3.3.14.1.4	Vertical Installation Frame Assembly Design Complete	12/4/00	4/27/01	4/27/01
5.3.3.15.1.5	Horizontal Installation Frame Assembly Design Complete	12/5/00	4/27/01	4/27/01
5.3.3.17.1.5	Thermal Enclosure Mount Assembly Design Complete	1/23/01	4/30/01	4/30/01
5.3.3.19.4	Handling Fixtures Complete	NA	5/18/01	5/18/01
5.3.2.3.2.3.4	Collimator Compensating Mount Design Complete	NA	5/23/01	5/23/01
5.5.4.2	Instrument Coordination	NA	5/24/01	5/24/01
5.3.2.3.2.1.5	Collimator Cover Box Design Complete	5/5/00	5/30/01	5/30/01
5.3.3.13.1.5	Rear Dewar Shell Design Complete	3/29/01	5/31/01	5/31/01
5.3.3.9.2.6	Bulkhead Assembly/Drafting Complete	2/21/01	6/1/01	6/1/01
5.3.1.8.6.4	Grating Fabrication Complete	11/28/00	6/1/01	6/1/01
5.3.3.12.1.5	Front Dewar Shell Design Complete	2/26/01	6/1/01	6/1/01
5.3.3.6.1.3	LN2 Pre-Cool Assembly Design Complete	11/16/00	6/6/01	6/6/01
5.3.1.2.3.2.4	Long Blue Camera Drafting Complete	11/27/00	6/6/01	6/6/01
5.3.3.17.2.6	Thermal Enclosure Mount Assembly Drafting Complete	3/14/01	6/8/01	6/8/01
5.3.2.3.2.2.4	Collimator Cover Box Drafting Complete	8/7/00	6/11/01	6/11/01
5.3.1.7.3.2	Filter Wheel Assembly Fabrication Complete	1/10/01	6/11/01	6/11/01
5.3.3.3.1.4	Cryo Cooler Design Complete	9/26/00	6/12/01	6/12/01
5.3.3.2.2.4	Detector Mount Assembly Drafting Complete	1/4/01	6/15/01	6/15/01
5.3.3.12.2.6	Front Dewar Shell Drafting Complete	3/16/01	6/19/01	6/19/01
5.3.2.1.8.3.2	Bottom Camera Cover Fabrication Complete	7/21/00	6/25/01	6/25/01
5.3.2.1.8.4.4	Bottom Camera Cover Complete	7/26/00	6/28/01	6/28/01
5.3.3.13.2.6	Rear Dewar Shell Drafting Complete	NA	6/28/01	6/28/01
5.3.2.2.3.1	Receive and Inspect IFA WFS electronics	9/5/00	6/29/01	7/3/01
5.3.1.6.5.3.2	Slit/Decker Assembly Fabrication Complete	3/5/01	6/29/01	6/29/01
5.3.2.1.6.3.2	LCFMH Fabrication Complete	8/1/00	6/29/01	6/29/01
5.8.1.3.1	Flat Mirrors Acceptance	6/2/00	6/29/01	6/29/01
5.3.1.3.2.4	Detector Focus Assembly Drafting Complete	1/26/01	7/2/01	7/2/01
5.3.1.2.6.3.4	Camera Hub Fabrication Complete	12/4/00	7/5/01	7/5/01
5.3.2.1.6.4.4	LCFMH Complete	8/4/00	7/5/01	7/5/01
5.3.2.4.2.4.4	Offner Assembly Complete	9/22/00	7/16/01	7/16/01
5.3.2.3.3.3.4	Collimator Compensating Mount Drafting Complete	NA	7/19/01	7/19/01
5.3.3.3.2.4	Cryo Cooler Drafting Complete	11/21/00	7/23/01	7/23/01

WBS	TASK	Baseline Plan	Est. Plan	Act. Finish
5.3.3.9.3.2	Bulkhead Assembly Fabrication Complete	5/4/01	10/17/01	10/17/01
5.4.1.5.4	Ancillary Control Chassis Complete	11/27/00	10/17/01	10/17/01
5.3.3.16.2.6	Dewar Mount Truss Assembly Drafting Complete	3/6/01	10/19/01	10/19/01
5.3.1.6.3.4.5	IFU Interface Check Complete	3/30/01	10/23/01	10/23/01
5.3.3.4.2.4	Thermal Distribution Connector Assembly Drafting Complete	3/13/01	10/25/01	10/25/01
5.3.3.9.4.4	Bulkhead Assembly Complete	6/5/01	10/25/01	10/25/01
5.4.1.3.6	Thermal Enclosure Internal Cabling & Connections Complete	1/16/01	10/31/01	10/31/01
5.3.3.12.3.2	Front Dewar Shell Fabrication Complete	7/10/01	11/2/01	11/2/01
5.3.3.17.3.2	Thermal Enclosure Mount Assembly Fabrication Complete	4/13/01	11/2/01	11/2/01
5.3.3.17.4.4	Thermal Enclosure Mount Assembly/Test Complete	4/18/01	11/8/01	11/8/01
5.3.3.12.4.4	Front Dewar Shell Assembly/Test Complete	7/16/01	11/9/01	11/9/01
5.3.3.13.3.2	Rear Dewar Shell Fabrication Complete	8/6/01	11/9/01	11/9/01
5.3.3.15.3.3	Horizontal Installation Frame Assembly Fabrication Complete	5/2/01	11/15/01	11/15/01
5.3.3.13.4.3	Rear Dewar Shell Assembly/Test Complete	8/9/01	11/15/01	11/15/01
5.3.3.15.4.4	Horizontal Installation Frame Assembly Testing Complete	5/8/01	11/20/01	11/20/01
5.3.3.5.1.3	Bulkhead Radiation Shield Assembly Design Complete	12/6/00	11/27/01	11/27/01
5.3.1.7.4.5	Filter Wheel Assembly Complete	3/22/01	11/29/01	11/29/01
5.3.1.8.3.6	Grating Turret Fabrication Complete	10/18/00	12/4/01	12/4/01
5.3.3.9.5.2	Bulkhead Final Assembly Complete	7/25/01	12/4/01	12/4/01
5.6.2.1	Receive Dewar Shell from Bechdon	NA	12/4/01	12/4/01
5.4.1.4.4	Bench Thermal Control Chassis Complete	2/8/01	12/5/01	12/5/01
5.3.3.14.4.4	Vertical Installation Frame Assembly Assembly/Test Complete	4/26/01	12/6/01	12/6/01
5.3.2.3.3.4.2	Collimator Compensating Mount Fabrication Complete	NA	12/7/01	12/7/01
5.3.3.5.2.4	Bulkhead Radiation Shield Assembly Drafting Complete	4/24/01	12/11/01	12/11/01
5.3.1.2.2.3.5	Long Red Camera Barrel Complete	12/13/00	1/11/02	1/11/02
5.3.1.2.3.3.6	Long Blue Camera Barrel Complete	3/9/01	1/11/02	1/11/02
5.3.3.10.1.4	Front Radiation Shield Assembly Design Complete	2/19/01	1/14/02	1/14/02
5.3.3.5.3.3	Bulkhead Radiation Shield Assembly Fabrication Complete	5/30/01	1/15/02	1/15/02
5.3.1.2.7.5	Camera Hub Final Assembly Complete	4/23/01	1/22/02	1/22/02
5.3.3.4.3.2	Thermal Distribution Connector Assembly Fabrication Complete	4/26/01	1/22/02	1/22/02
5.3.1.6.3.4.6	Slit/Decker Final Assembly Complete	4/5/01	1/30/02	1/30/02
5.5.2.7	Initial Component Controller Software Complete	NA	1/31/02	1/31/02
5.5.2.8	Component Controller Software Complete	6/30/00	1/31/02	1/31/02
5.3.1.5.3.6	Acquisition Mirror Assembly Fabrication Complete	10/11/00	2/5/02	2/5/02
5.3.3.11.1.4	Active Shield Assembly Design Complete	3/19/01	2/12/02	2/12/02
5.5.6.9	System Component Complete	NA	2/15/02	2/15/02
5.3.3.16.3.2	Dewar Mount Truss Assembly Fabrication Complete	4/10/01	2/15/02	2/15/02
5.3.1.4.4.2	Environmental Cover Assembly Testing Complete	8/7/00	2/18/02	2/18/02
5.4.3.5	Dewar Warm-up Controller Complete	4/10/01	2/19/02	2/19/02
5.3.3.10.2.6	Front Radiation Shield Assembly Drafting Complete	4/6/01	2/21/02	2/21/02
5.3.3.16.4.4	Dewar Mount Truss Final Assembly Complete	4/17/01	2/25/02	2/25/02
5.3.1.9.3.6	Prism Turret Fabrication Complete	4/13/01	2/26/02	2/26/02
5.3.3.11.2.6	Active Shield Assembly Drafting Complete	5/21/01	3/4/02	3/4/02
5.3.1.2.8.8	Camera Assembly Complete	5/25/01	3/5/02	3/5/02
5.3.1.8.5.8	Grating Turret Testing Complete	12/11/00	3/8/02	3/8/02
5.3.1.9.4.7	Prism Turret Testing Complete	4/25/01	3/19/02	3/19/02

WBS - Total Project

