

Status Report: 17
Status as of: 31 January 2002

Contract Title:

BOOSTER
APPLICATIONS
FACILITY



Performing Organization:
Location:

Brookhaven Science Associates
Brookhaven National Laboratory
Upton, New York 11973-5000

Reporting Period:

December 1, 2001 – January 31, 2002

1) Project Objective:

The purpose of this project is to provide a new experimental facility and beam line and undertake accelerator modifications required to take advantage of heavy-ion beams from the Brookhaven AGS Booster accelerator for radiation effects studies of importance for the NASA Space Program.

Heavy ions will originate in the Brookhaven MP-6 tandem accelerator and be transported to the Booster synchrotron for acceleration to the required energies.

Concurrent operation of the Booster for space radiation research and other kinds of research applications will be achieved by utilizing independent tandem injectors. The beam species and energy for both applications will be independent. Beams from either Tandem will be switched into the common injection line. At the Booster a new slow extraction system will be implemented which will require extensive accelerator modifications and rearrangements. A new beam line and tunnel enclosure will be built to transport the extracted beam to the experimental facility. Uniform beam intensities will be provided over rectangular areas ranging in size from about 1 cm to about 20 cm.

Other existing on-site facilities, such as the medical Department's extensive animal handling installations will also be utilized. Dosimetry and local access control will be provided through a local facility control room.

The conventional facilities to be constructed for the Booster Applications Facility will provide experimental space and support facilities. A labyrinth connects the experimental area with the laboratory support building. The target room is provided with a concrete beam stop imbedded in the back wall. The entire facility is shielded by 15 feet of earth equivalent shielding over the top of the target rooms and transport lines. The laboratory building contains support laboratories, including temporary biological specimen holding and preparation areas, as well as radiological laboratories for work with cell cultures and tissues. Also included are a dosimetry control room, a mechanical service equipment area and rooms for radioactive storage and miscellaneous items.

Power supplies for the beam transport magnets and various other equipment will be located in a power supply building, a pre-engineered steel frame construction.

The funds requested will also provide for spares and facility commissioning.

2) Technical Approach Changes:

No change.

Project Head's Summary Assessment:

	<u>Last Month</u>	<u>This Month</u>
Cost:	satisfactory	satisfactory
Schedule	satisfactory	satisfactory
Technical	satisfactory	satisfactory
Overall	satisfactory	satisfactory

W.B.S. 1.0 BAF Construction Summary: The conventional construction is virtually complete except for the work that requires the AGS Booster to be shut down. This is about 5% of the conventional effort. The major items for the Booster modification are nearing completion and four of the required power supplies have been delivered and are in place.

Seven of the Beam line power supplies have been delivered and beam line vacuum components are being installed. The project is estimated to be 70 % complete.

W.B.S 1.1 Conventional Construction:

Power Supply Building – Structure complete except for electrical panel box to complete experimental electric work.

Experimental Support Building – 95% complete - in punch list status.

Tunnel – Downstream portion complete and beam line installation in progress.

Site work and utilities – site work 95%; utilities 100% complete. Balance of site work and tunnel work to be completed upon shutdown of Booster at the end of April 2002. Project 95% complete.

W.B.S. 1.2 Booster Modifications: (Critical Path)

1.2.1 New Extraction Equipment: 95 % complete.

1.2.1.1 Thin Septum: Fabrication of the thin septum is in progress at central shops. The magnet core and retainer clips have been completed. The drive assemblies have been assembled and wired to the controls system for testing. The system repeats movement to .0005". The vacuum vessels have been fabricated and are due to ship to BNL. The heating blankets have been received. Linear bearings and silver plated hardware was received. This WBS is 70 % complete.

1.2.1.2 Thick Septum Magnet: The assembly of the first magnet has been completed. The magnet has been powered to full current several times. Field measurement evaluation has been delayed due to problems with power quality of the power supply used for testing.

The assembly of the spare magnet is 90% complete. The vacuum chamber and internal parts have been cleaned and high temperature baked.

1.2.1.3 The final installation of the stripper/collimator/flag will be done after field measurement is completed on the first magnet.

The manufacture of the parts for the spare stripper/collimator is 95% complete.

1.2.2 Power Supplies: 80 % complete

- 1.2.2.1 Thin Septum Supply: The Power supply is in the process of being tested. Equal current sharing between all the transistors has been confirmed while the power supply was operated at its maximum specified current of 2000 amperes. The tests were performed with the control loop open. Final development of the control interface is in progress. 95 % complete. The fabrication of the buss work for installation is complete.
- 1.2.2.2 Ejection Septum Supply; The power supply is complete and in test. Final development of the control interface is in progress. 95 % complete. The fabrication of the buss work for installation is complete.
- 1.2.2.3 Tune Quads: Received and put in position at Linac upper equipment bay. 100 % complete. Installation cable order complete.
- 1.2.2.4 Sextupoles: Supplies have been received and put in place in LINAC. Installation cable order complete.
- 1.2.2.5 Bumps: Two of five units received and put in place in Linac. Manufacture and test: 80 % complete. Installation cable order complete.

1.2.3 Equipment Modifications: 55% complete.

- 1.2.3.1 D4 and D6: Parts complete. Welding in process. 70 % complete.
- 1.2.3.2 D6 Beam Dump and Wall Current Monitor: Ready for installation.
- 1.2.3.3 D3 IPM and Beam Dump Kicker: There are no changes in these areas. The design is complete and awaiting installation.
- 1.2.3.4 Vacuum System Modifications: All heating blankets have been received. The security valve blanket drawing is being released. This WBS is 45% complete.

W.B.S. 1.3 Beam Transport System

1.3.1 Magnets: All beam line magnets are complete.

1.3.2 Power Supplies: Manufacture and test 80 % complete.

Eight of the twenty-one beam line power supplies have arrived from Danfysik.

Arrangements have been made to set up one of the 2500 Amp units in the test areas of our Operations Support Group. This testing will measure the power supply's characteristics, as well as to train the support group in the maintenance of the new equipment.

1.3.3 Vacuum System: 65 % complete.

- 1.3.3.1 Beam Tubes, Bellow and Valves: The magnet spool pipes after D1 and D2 have all been welded in the tunnel and leak checked. The pump tee stands have been set in rough locations in the tunnel and await survey for final locations. Central shops is fabricating beam

tube stands, Neg pipes, and support brackets. All remaining spool pipes have been welded and leak checked. All welded pipes have been vacuum processed with a high temperature bake in the 975 furnace. This WBS is 50% complete.

1.3.3.2 Pumps, Power Supplies and Gauges: The turbo roughing pumps stations have been assembled and are now being tested after the control systems have been wired. 85% complete.

1.3.3.3 Instrumentation and Controls: The development PLC was set up. Pirani gauge cable and connectors were received. Work on the Vacuum system to Controls system interfaces continued. One each of the BAF ion pump and gauge controllers with documentation were provided to Controls for driver development. This WBS is 54% complete.

1.3.3.4 Transport Line Bake-out System: All blankets on order have been received and have been tested. Two valve blanket drawing have been checked and are being released. All parts for the bake-out cart have been received and assembly is in progress. This WBS is 60% complete.

1.3.4 Instrumentation: 75 % complete.

1.3.4.1 Flags and Cameras: We have received shipment of the Personal Computer, which will be dedicated as a video frame grabber, and the Sony CCD camera, which has IEEE 1394, and external trigger capabilities. The controls group has configured the PC for standard C-AD interface and data transfer. We are in the process of testing the system with the CCD camera connected via the 1394 interface.

All Flag chambers and support stands have been completed by the Central Shops. Flag actuators and hardware are also complete. Assembly and test will begin shortly.

Design of stand and adjustable mirror mounts are complete. Camera cubby with adjustable sliding support also complete and parts have been fabricated. Assembly and test will begin shortly.

1.3.4.2 Collimators: Design of stand and vacuum box complete. All actuator hardware has been received. Central shops has just begun fabrication. Completed parts and welded assemblies are due in mid April.

1.3.4.3 and 1.3.4.4 Ion Chamber, Scintillators and SWICS:

- Effort continues on the assembly of SWIC electronics. The SWIC electronics scanner euro-card (with remote control gain) design was completed and ten the printed circuit boards have been fabricated. We received shipment of all the discrete components. One full module is being built by our technicians for testing. Once complete, the remaining assemblies will be fabricated by an off-site vendor.
- Continue development of signal transfer interface between the Accelerator control system and the dosimetry area. The C-AD Controls group has accepted responsibility for providing the necessary logic and timing requirements using existing boards designs, thereby making the majority of the system standard Controls components. A demo mock-up has been assembled and testing is underway. A BAF/C-AD Patch Panel is being designed to ensure grounding integrity and connector compatibility.

- Discussions about the high level Controls application requirements for data analysis and display continue.
- We shipped back the Bira High Voltage VME pods and VME boards at the request of the vendor. Bira wants to upgrade the VME chassis (low voltage) power supplies, and in doing so would like to test the complete system at their location before shipment.
- Conduit for the signals cables has been installed throughout the tunnel and to the electronics racks. Junction boxes have been mounted at the required locations. The racks for building 957 have been installed; we await line power before installing instrumentation electronics.

Design of vacuum components and motion system is complete. "Surveyable" stands and vacuum boxes have been completed by Central shops. The first thin-window vacuum chamber was tested to two atmospheres. Pre-conditioning of all six chambers will begin shortly (pressurize to permanently deform window to prevent "oil-canning" thus eliminating fatigue issues). Full assembly and installation into the BAF tunnel will begin next month. A new, larger "foil stretcher" for HV planes has been designed and production is in progress. Detailed design of SWIC, Ion Chamber and Scintillator in progress.

W.B.S. 1.4 Controls and Personnel Safety System

1.4.1 Controls: 70 % complete.

1.4.1.1 Distributed systems: The documentation of the permit monitor board has been signed off and boards were ordered at the end of January.

1.4.1.2 Central Services: Software development is underway for power supply and vacuum system interfaces. Software planning is underway for instrumentation systems and application level software.

1.4.1.3 Process Controls: A Test chassis to develop the Power Supply Control(PSC)Board code and test the Power supply interface(PSI)chassis and the PSC has been setup and testing is underway. A test chassis to develop and test the V115 waveform generator to PSI code and hardware has also been setup and testing is also underway. The BAF vacuum group has supplied us with the necessary documentation to start the code development of the RS232 interface to the vacuum gauge controllers and the ion pump controllers.

1.4.2 Personnel Safety System: The construction of the sub-systems hardware is over 85% completed. Plant engineering electricians has started the installation of the CCTV and card reader system. Installation of hardware in the tunnel has started. All design and procurement activities are completed.

W.B.S. 1.5.Experimental Area Outfitting:

1.5.1 Dosimetry Control: Target Room design is underway. The main elements are: Cable tray routing, optical bench design, and overhead crane parameters. We are taking the overall design approach in which we incorporate all the elements in the room, to ensure clear and safe passage to and from different areas of the room, and avoid future "regrets".

Design of a system of scintillator based dosimetry connectors has started. A test of the basic concept will be carried out within the next two months.

Software: Work continues on the channels for the new ring / quad ionization chambers and for the 16 by 16 ion chamber.

The dosimetry calibration procedure is 95% done.

The sample irradiation procedure is 95% done.

The displays for the beam tune, dosimetry calibration and sample irradiation are being refined.

Work has started on the conversion of the range program (which calculates the differential energy loss and residual range at isocenter and various other points along the beam line (*e.g.* at the location of the three quad ionization chambers)).

Work continues on the document defining the procedure to calibrate the 16-channel recycling integrator VME cards for the new ring/quad ion chambers and for the 16 by 16 ion chamber.

Hardware: The Binary Filter Driver chassis is being fabricated.

The High Voltage system has been fabricated and documented.

All Cables are in fabrication.

The custom VME crates are complete.

The recycling integrator module is still in board layout.

W.B.S. 1.5.2.to 4. Support Rooms: Several large items of equipment have been ordered, and their delivery arranged (at no cost) upon our notification of the vendor that BAF is ready to receive such equipment securely. Items for cell growth & handling include: large "roll-in" incubators for cultured cells, small (tabletop) incubators for cell growth, laminar flow hoods.

W.B.S. 1.6 Long Term Support Lab: 90 % complete.

W.B.S. 1.7 Installation and Services:

1.7.1 Electric Power Distribution: 95 % complete.

1.7.2 Equipment Cooling Water: 90 % complete.

1. Pump alignment in process estimated at 50% complete.
2. Awaiting full electrical power to turn on all pumps and check system operations for the tower system, power supply system and the magnet system.
3. Installation and check out of PLC system. The unit has been 100% fabricated off location. The PLC is awaiting electrical power and the installation cables between

transducers to be installed in the Pump Room before commencing with a PLC and system check out.

4. All the piping in the completed tunnel is now 100% complete. Only the BAF/Booster tunnel connection to the Booster Ring remains to be completed. This second Phase is expected to start May 02.
5. Completion of Power Supply Piping in Bldg #930, which is expected to start May 02. Only the underground connect to Bldg #930 is installed and tested. In addition, the piping contractor is set to proceed with the PS piping within Bldg #957 in the next few weeks.
6. The piping contractor is set to proceed in the next few weeks with the following:
 - a. sump drains to holding tank
 - b. location and installation of holding tank
 - c. air lines from compressor to tunnel and within tunnel
 - d. compressor installation
 - e. air filter and oil separator installation to air compressor
 - f. connection of c, d, and e above

- 1.7.3 Installation: Cable tray & conduit installation is 70% complete.
Magnet survey is 80% complete. Overall: 60 % complete.

W.B.S. 1.8 Project Services

- 1.8.1 Project Management: In consultation with the DOE Project Manager \$200,000 was assigned from contingency. This leaves a balance of \$1,716,000 on \$7,400,442 remaining to be expensed and committed. The details of these actions are outlined section 3 (f) and Table IV.
- 1.8.2 Fiscal: Fiscal year funding in the amount of \$ 5,795,193 was received during this reporting period. This brings the cumulative funding to date to \$31,104,765
- 1.8.3 Quality Assurance: No issues.
- 1.8.4 Environment, Safety and Health: Open Items:

3) Summary Status Assessment and Forecast

a) Financial Status

A total of \$24,988,588 was expensed or obligated of the \$31,105,000 available. Costs represented \$22,244,000 and open commitments stood at \$2,744,558. The Project Total Estimated Cost (TEC) is \$31,207,000. The Total Project Cost (TPC) is at \$33,900,000.

- b) Table II shows detailed expenses and commitments.
- c) Table III shows the projected project spending profile.

d) Schedule Status

<u>Milestones completed</u>	<u>Baseline</u>	<u>Actual</u>
Title I Start	11/01/98	11/01/98
Booster Modification Start	04/01/99	04/01/99
Title II Start	04/01/99	04/01/99
Title I Complete	06/31/99	06/31/99
Conventional Construction-Start	08/15/99	08/15/99
Booster Penetration Complete	10/15/99	10/29/99
Title II Complete	06/30/00	06/30/00
Beam Transport Design-Complete	09/30/00	09/30/00
Booster Mod. Design-Complete	06/30/01	06/30/01
Safety Analysis Document (SAD) Complete	09/30/01	06/15/01
<u>Milestones Upcoming</u>	<u>Baseline</u>	<u>Forecast</u>
Conventional Construction Complete	06/30/02	06/30/02

- e) The critical path for the Project is indicated in Figure 1. The crucial parts of the critical path are items in WBS 1.2. The items in this WBS can only be installed when the Booster is in a scheduled shutdown. If the appropriate window of opportunity is missed the Project completion will be delayed. The projected schedule now provides a schedule contingency of 3 months between being ready for installation of Booster modification and start of the shutdown presently scheduled for May 1, 2002. Financial contingency will be maintained to assure this critical effort is completed during the shutdown.
- f) Baseline Change Proposals – During this reporting period, the budgets for the following WBS's were augmented/ decreased with transfer of funds to and from contingency. The justification for the modifications are given in Table IV. There is no change in scope or total project cost.

WBS	Description	New Budget
1.1	Conventional Construction	\$6,600,000
1.2	Booster Modifications	No change
1.2.1	New Extraction Equipment	\$1,522,000
1.2.3	Equipment Modification	\$1,347,000
1.3	Beam Transport System	No change
1.3.1	Magnets	\$1,224,000
1.3.2	Power Supplies	\$ 963,000
1.3.3	Vacuum System	\$1,720,000
1.4	Controls and Personnel Safety	\$1,657,000
1.4.2	Personnel Safety System	\$ 586,000

- g) Cost Performance: Figure 2 provides a measure of project performance relating the planned budget profile versus expenses and commitments. Obligations and expenses were \$187,000 lower than predicted, and expenses were \$391,000 lower than forecast. The lower than expected expense result is due to delays in vendor submission of invoices.

Table I
BAF Project Milestones

	<u>Projected</u>
Project Start	10/01/98
Title I Start (Preliminary Design)	11/01/98
Booster Modification Design Start	04/01/99
Title II Start (Final Design)	04/01/99
Title I Complete	06/31/99
Conventional Construction Start	08/15/99
Booster Penetration Complete	10/15/99
Title II Complete	06/30/00
Booster Modifications Design Complete	06/30/01
Beam Transport System Design Complete	09/30/00
Safety Analysis document (SAD) Complete	09/30/01
Conventional Construction Complete	06/30/02
Booster Modifications Installation Complete	08/31/02
Beam Transportation System Installation Complete	12/30/02
Experimental Equipment Installation Complete	03/31/03
Project Complete	06/30/03

Figure 1

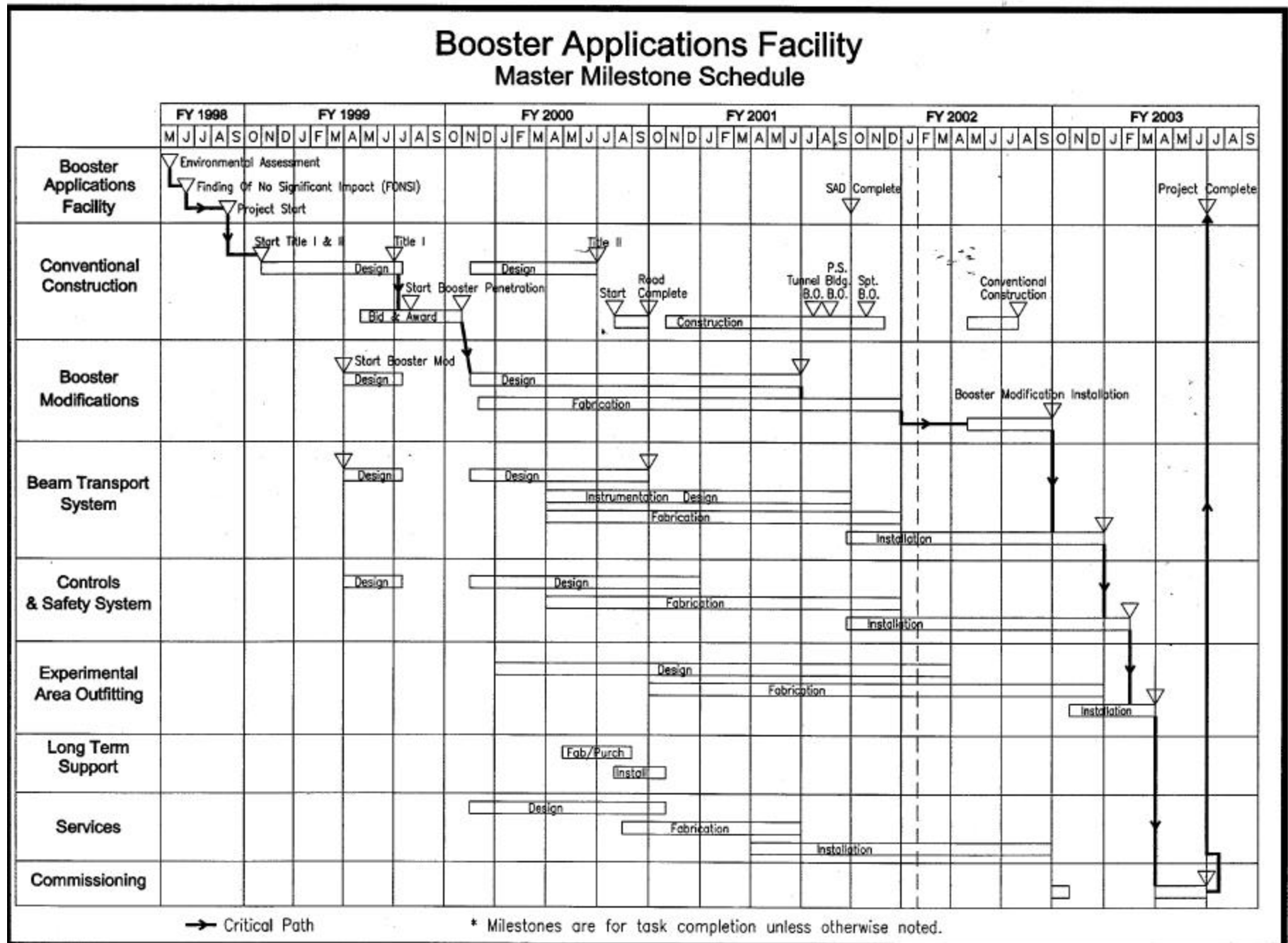


Figure 2

BAF Performance Measurement

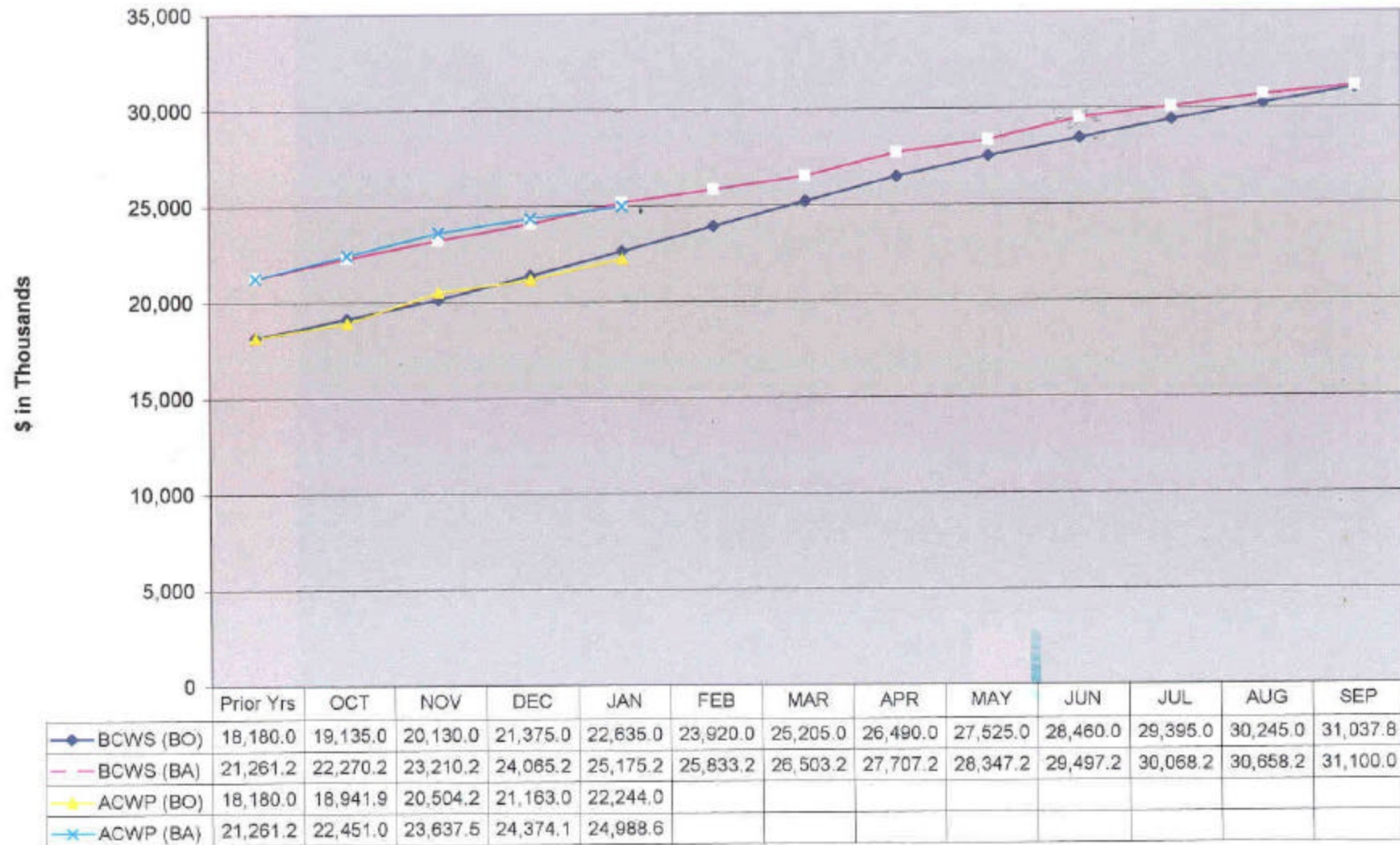


TABLE II
BOOSTER APPLICATIONS FACILITY (BAF)
EXPENSE and COMMITMENTS
As of January 31, 2002

	Budget	Salary & Wage	EXPENSES Other Labor	Material & Contracts	Overhead	TOTAL EXPENSES	COMMIT.	TOTAL EXP. & COMMIT	BALANCE AVAILABLE
1.1 Conventional Construction	6,600,000	129,276	925,172	4,458,567	526,916	6,039,931	395,168	6,435,099	164,901
1.2 Booster Modifications	5,351,000	1,659,782	410,270	1,305,770	682,496	4,058,318	804,264	4,862,582	488,418
1.3 Beam Transport System	5,764,000	1,547,260	267,966	1,274,703	591,734	3,681,663	831,290	4,512,953	1,251,047
1.4 Controls & Personnel Safety System	1,657,000	447,919	74,097	498,179	211,401	1,231,596	12,254	1,243,850	413,150
1.5 Exp. Area Outfitting	2,944,000	19,874	0	1,714,564	144,938	1,879,376	349,191	2,228,567	715,433
1.6 Long Term Support Lab	456,000	0	2,095	301,595	48,776	352,466	342	352,808	103,192
1.7 Installation & Services	3,096,000	728,170	93,204	1,496,312	328,088	2,645,774	237,851	2,883,625	212,375
1.8 Project Services	2,849,000	831,287	339	65,219	1,201,760	2,098,605	5,745	2,104,350	744,650
CONTINGECY	1,285,000					0		0	1,285,000
SPARES	1,103,000	10,176	68,083	135,725	42,287	256,271	108,453	364,724	738,276
1 BAF Construction	31,105,000	5,373,744	1,841,226	11,250,634	3,778,396	22,244,000	2,744,558	24,988,558	6,116,442

TABLE III
BOOSTER APPLICATIONS FACILITY (BAF)
COST ESTIMATE
Spending Profile
(\$ in Thousands)

		TOTAL	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
1.1	Conventional Construction	6,600	290	80	4,628	989	613	0
1.2	Booster Modifications	5,351		282	1,747	1,886	1,436	0
1.3	Beam Transport System	5,764		56	961	2,547	2,200	0
1.4	Controls & Personnel Safety System	1,657		8	497	579	573	0
1.5	Exp. Area Outfitting	3,068		0	1,200	679	1,065	124
1.6	Long Term Support Lab	456		0	343	0	113	0
1.7	Installation & Services	3,096		9	1,237	1,117	733	0
1.8	Project Services	3,499	10	165	985	650	1,039	650
		29,941	300	600	11,598	8,447	8,217	774
	Contingency	1,716	0	0	0	0	1,285	431
1 (TEC)	BAF Construction (BA AY \$)	31,207	300	600	11,598	8,447	9,057	1,205
	Spares	1,294			50	266	787	191
	Commissioning	1,399					0	1,399
1 (TPC)	Total Project Cost (BA AY \$)	33,900	300	600	11,648	8,713	9,844	2,795
1 (TPC)	BAF Construction (BO AY \$)	33,900	300	600	5,348	11,932	12,858	2,862

TABLE IV
BAF CHANGE CONTROL
\$1000's

Date	Change No.	W.B.S.		Base Line	Change	Adjusted Base Line	Contingency Increase (Decrease)	Contingency Balance	Description
06/30/00	1	1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8		3,803 3,742 4,478 1,236 2,710 851 1,708 1,129	870 1,109 1,160 321 358 104 463 2,129	4,673 4,851 5,638 1,557 3,068 455 2,171 3,258			Modified WBS elements to include overhead, escalation and FCR.
			Contingency Overhead	3,796	1,037	4,833	4,833	4,833	
			Escalation	4,649	0	0			
			FCR	1,912	0	0			
				993	0	0			
08/31/00	2	1.1		4,673	425	5,098	(425)	4,408	Vendor bid exceeded estimate
08/31/00	3	1.7		2,171	68	2,239	(68)	4,340	Vendor bid exceeded estimate
11/30/00	4	1.0		31,100	800	31,900	200	4,540	Modified spending profile to coincide with NASA operating plan
11/30/00	5	1.0		Changed Project Completion Date from 09/30/02 to 06/30/03					Modified schedule to match spending profile
11/30/00	6	1.3		Changed Completion Date from 04/31/02 to 09/30/02					Modified schedule to match spending profile
11/30/00	7	1.4		Changed Completion Date from 05/30/02 to 03/31/03					Modified schedule to match spending profile
11/30/00	8	1.5		Changed Completion Date from 06/30/02 to 03/31/03					Modified schedule to match spending profile
11/30/00	9	Commissioning		Changed Completion Date from 09/30/02 to 06/30/03					Modified schedule to match spending profile
11/30/00	10	1.1		5,098	600	5,698	(600)	3,940	Vendor Change orders to cover soil conditions, upgrading water line under beam tunnel & Plant Engineering oversight
11/30/00	11	1.2.1		1,322	200	1,522	(200)	3,740	Design effort exceeded estimate
11/30/00	12	1.2.2		1,982	200	2,182	(200)	3,540	Vendor bid exceeded estimate
11/30/00	13	1.7.1		353	200	553	(200)	3,340	Substation reconditioning more extensive than estimated

TABLE IV
BAF CHANGE CONTROL
\$1000's
(continued)

Date	Change No.	W.B.S.		Base Line	Change	Adjusted Base Line	Contingency Increase (Decrease)	Contingency Balance	Description
11/30/00	14	1.7.2		641	300	941	(300)	3,040	Detailed design increased cost
12/30/00	15	1.3.2		1,513	(250)	1,263	250	3,290	Vendor bids lower than estimate
12/30/00	16	1.3.4		2,007	(150)	1,857	150	3,440	Detailed design resulted in lower device costs
12/30/00	17	1.3.1		599	400	999	(400)	3,040	Vendor bids exceeded estimate, design effort exceeded estimate
12/30/00	18	1.2		Booster Modification Completion Date changed from 10/31/01 to 08/31/02					RHIC operating schedule modified, eliminating FY01 summer shutdown
01/20/01	19	1.2		Design complete extended from 12/31/00 to 06/30/01					Design effort extended due to loss of personnel
09/30/01	20	1.8		3,659	160	3,499	160	3,200	Reduced budget due to projected lower project burden and fiscal and FS&H expenses.
09/30/01	21	1.1		5,698	(200)	5,898	(200)	3,000	Increase engineering design effort for electrical distribution & building modifications
09/30/01	22	1.7		2,739	(160)	2,899	(160)	2,840	Increased budget required for higher than expected vendor bids
11/30/01	23	1.1		5,698	602	6,500	(602)	2,238	Increase required for HVAC controls, doors and canopy at alcove, HVAC duct work, structural steel work, berm liner, engineering and inspection and overhead costs increases.
11/30/01	24	1.2		5,251	100	5,351	(100)	2,138	Increase required for D3 septum development and buss work fabrication for D3 and D6 power supply installation.
11/30/01	25	1.3.1		999	25	1,024	(25)	2,113	Increase required for magnet monitoring system and octupoles.
11/30/01	26	1.7		2,899	197	3,096	(197)	1,916	Increase required for electrical distribution system transformer rework and cooling system changes for power supplies.
01/31/02	27	1.1		6,300	300	6,600	(300)	1,616	Increased cost for engineering oversight.

TABLE IV
BAF CHANGE CONTROL
\$1000's
(continued)

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