

Status Report: 07
Status as of: 30 June 2000

Contract Title:

BOOSTER
APPPLICATIONS
FACILITY



Performing Organization: Brookhaven Science Associates
Location: Brookhaven National Laboratory
Upton, New York 11973-5000

Reporting Period: June 1, 2000 – June 30, 2000

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.

3) Project Head's Summary Assessment:

	Last Month	This Month
Cost:	satisfactory	satisfactory
Schedule	satisfactory	satisfactory
Technical	satisfactory	satisfactory
Overall	satisfactory	satisfactory

Commissioning of the Negative Ion Injector (NII) and the by-pass beam line continued this reporting period.

W.B.S. 1.0 BAF Construction Summary

Conventional construction design was completed this month. Booster Modifications and Beam Line design and fabrication continues.

W.B.S. 1.1 Conventional Construction

The status of conventional construction is as follows:

Task	Design Status	Expected Design Completion Date
1. Experimental Support Building 958	Complete	
2. Target Building & Labyrinth Bldg. 956	Complete	
3. Beam Tunnel Bldg. 956	Complete	
4. Access Alcove	Complete	
5. Power Supply Building 957	Complete	
6. Site Work-Road, Fencing, Ret. Walls	Complete	
7. Site Utilities	Complete	
8. Earth Shielding & Liner	Complete	
9. Design Package out for Comment		7/15/00
10.Design Package to DCP		7/15/00

W.B.S. 1.2 Booster Modifications:

1.2.1 New Extraction Equipment

	<u>% Complete</u>	<u>To Shops</u>
1.2.1.1 Thin Septum		
Engineering	30	
Design	0	
Fabrication	-	09/30/00
1.2.1.2 Thick Septum		
Engineering	100	
Design	100	
Fabrication		
Long lead items	0	03/30/00
Balance	-	07/31/00
1.2.1.3 Foil Stripper Assembly		
Engineering	100	
Design	100	
Fabrication		
Vacuum box	100	01/10/00
Balance	50	

Contracts have been awarded for the fabrication of the coils for the octupole and standard trim magnets. Fabrication of the magnets' steel parts has started in BNL shops.

Refurbishing of the eight 8Q24 quadrupole magnet continued. The coils were tested and the mechanical assembly started.

1.3.2 Power Supplies

Development of the power supply specifications continued this month.

1.3.3 Vacuum System

The detailed layout of the transport line in the Booster tunnel is complete. We are waiting for ring access to verify as built conditions in order to proceed with the design. Components in the beamline are being model with 3D software. A residual gas analyzer was received and tested. Specifications for a gauge controller needed to patch into the existing Booster vacuum control system is being generated.

1.3.4 Instrumentation

Design work continued.

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

1.4.1 Controls

The Booster event link decoder(V297,V296)prototype boards were received and the V296 was assembled. PLD files for the V296 and V297 were being modified prior to testing. The production quantity of event link input modules (V101) was received from the fabricator. Quotes were obtained for various front panels.

Controls personnel participated in preliminary design reviews of beam line power supplies and instrumentation. No significant controls issues were identified in relation to the proposed power supply system. Many details remain to be elucidated concerning instrumentation and closure on controls interfaces will require further discussion.

1.4.2 Personnel Safety System

Detailed design continued.

W.B.S. 1.5. Experimental Area Outfitting

Status of software for dosimetry control system

The demand scaling system is about one-third done.

The chapter on the logical scaling system in the detailed design document has been significantly re-worked, and many of the dependencies of the old system on VMS / Fortran / CAMAC have been addressed. Some more work remains in this area. The conversion process for this chapter is about 75% complete.

Hardware status report

Last month it was decided that the baseline system will have about 80% more dosimetry channels than originally planned. We have confirmed that this is possible and defined the system down to the “packaging” level. With crate, module and connector and cable allocations.

Specific designs of the ion chambers and electronics have been started, with some drafting done. We have been acquiring some parts for the final system and for doing the prototyping of the chamber electronics.

We have had some difficulty collecting a coordinated mix of parts and components, due to changing technology and availability. Lead time for some things seem very long--3 months for some things. Nevertheless, we will have sufficient materials to begin some prototyping of the recycling integrator analog front ends, without much schedule impact.

Conceptual design of other facility components, including the target area bench, is taking shape. We will have the beamline layout around the end of August.

W.B.S. 1.6 Long Term Support Lab

No change.

W.B.S. 1.7 Installation and Services

1.7.1 Electric Power Distribution

No change.

1.7.2 Equipment Cooling Water

All design drawings are complete.

1.7.3 Installation

No change

W.B.S. 1.8 Project Services

1.8.1 Project Management

A DOE Review of the project was held on June 27, 2000 at BNL. The project status was presented along with an updated cost and schedule profile. In addition, projected operating and decommissioning costs were addressed.

A change is required in the project technical scope to provide for improved beam steering in the extraction beam line. Two steering magnets will be added in the portion of the beam line located in the Booster tunnel. The total estimated costs for the magnets with the required power supplies and control is estimated to

approximately \$50,000. Appropriate change control procedures will be implemented to track this change.

1.8.2 Fiscal

As requested by the DOE/NASA Review Committee, Tables II and III have been re-forecasted to \$AY and include all burdens and overheads.

An additional \$1,250,000 was received at the end of June. Table II reflects this increase in budget authority.

1.8.3 Quality Assurance

No change.

1.8.4 Environment, Safety and Health

No change.

4) Open Items:

All open action items were addressed during the June 27th review with the exception of an improved reporting process to monitor planned and actual accomplishments. It is expected we will have this last item in place by the end of August, 2000.

5) Summary Status Assessment and Forecast

a) Financial Status

A total of \$5,959,152 was expensed or obligated of the \$12,700,000 available. Costs represented \$4,313,311 and open commitments stood at \$1,645,841. The Project Total Estimated Cost (TEC) is \$30,507,000. The Total Project Cost (TPC) is at \$33,100,000.

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

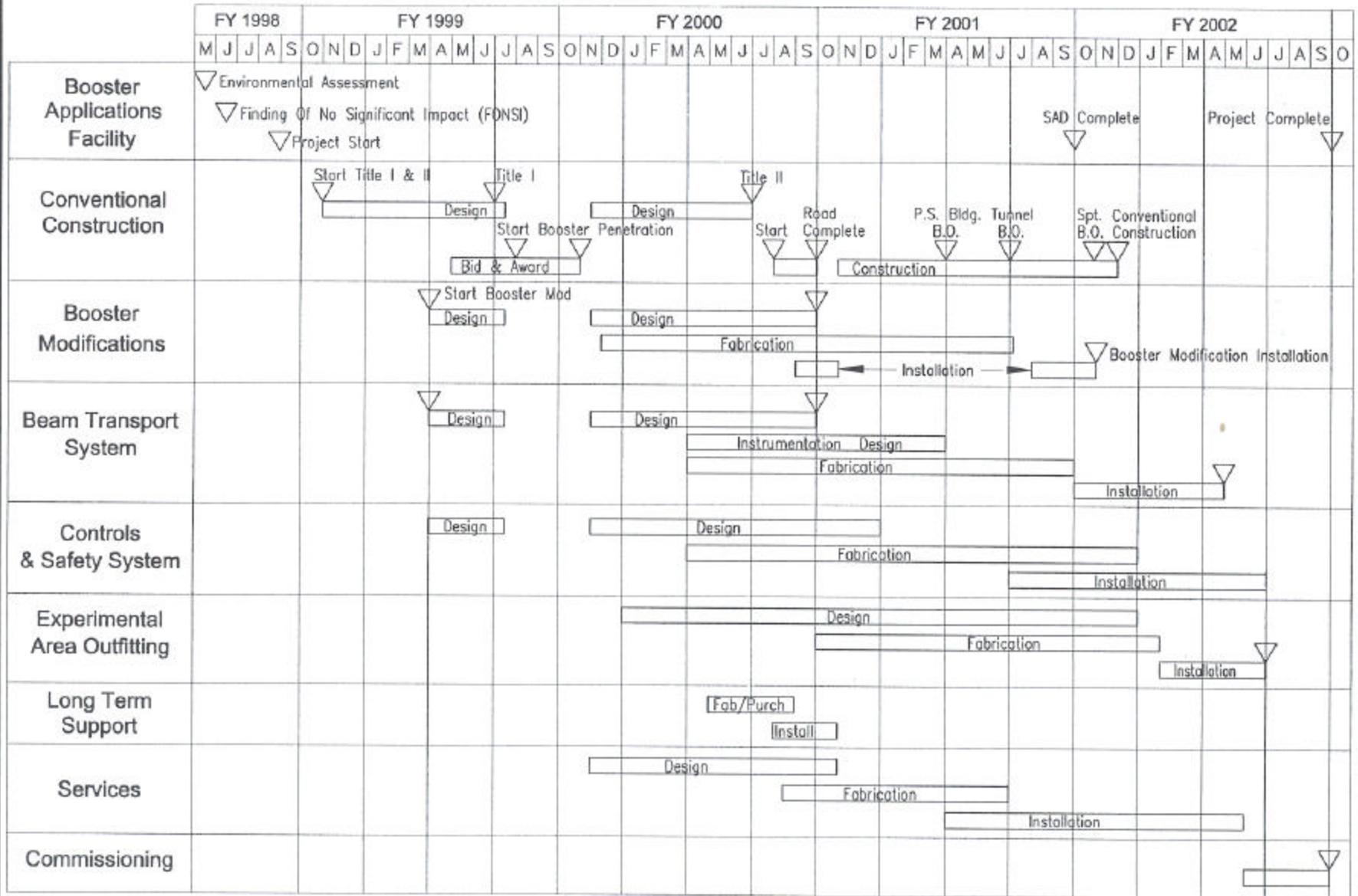
<u>Milestones Upcoming</u>	<u>Baseline</u>	<u>Forecast</u>
Booster Mod. Design-Complete	06/30/00	09/30/00
Beam Transport Sys. Design-Complete	09/30/00	09/30/00

e) Baseline Change proposals – None.

Table I
BAF Project Milestones

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	09/30/00
Beam Transport System Design Complete	09/30/00
Safety Analysis document (SAD) Complete	09/30/01
Conventional Construction Complete	11/30/01
Booster Modifications Installation Complete	10/30/01
Beam Transportation System Installation Complete	04/30/02
Experimental Equipment Installation Complete	06/03/02
Project Complete	09/30/02

Booster Applications Facility Master Milestone Schedule



* Milestones are for task completion unless otherwise noted.

TABLE II
BOOSTER APPLICATIONS FACILITY (BAF)
EXPENSE and COMMITMENTS
As of June 30, 2000

	Budget	Salary & Wage	EXPENSES Other Labor	Material & Contracts	Overhead	TOTAL EXPENSES	COMMIT.	TOTAL EXP. & COMMIT	BALANCE AVAILABLE
.1 Conventional Construction	3,635,000	79,918	312,478	321,673	157,492	871,561	92,362	963,923	2,671,077
.2 Booster Modifications	2,530,000	590,513	128,015	110,628	172,626	1,001,782	106,633	1,108,415	1,421,585
.3 Beam Transport System	1,810,000	396,410	14,645	86,690	82,817	580,562	112,278	692,840	1,117,160
.4 Controls & Personnel Safety System	547,000	200,468	0	61,268	52,472	314,208	23,854	338,062	208,938
.5 Exp. Area Outfitting	1,159,000	0	0	182,885	6,053	188,938	1,007,115	1,196,053	(37,053)
.6 Long Term Support Lab	383,000	0	1,595	76,865	15,172	93,632	194,153	287,785	95,215
.7 Installation & Services	488,000	258,240	0	22,557	52,305	333,102	65,945	399,047	88,953
.8 Project Services	1,413,000	408,745	0	37,690	483,091	929,526	21,087	950,613	462,387
CONTINGECY	585,000					0		0	585,000
SPARES	150,000					0	22,414	22,414	127,586
BAF Construction	12,700,000	1,934,294	456,733	900,256	1,022,028	4,313,311	1,645,841	5,959,152	6,740,848

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

	TOTAL	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
1.1 Conventional Construction	4,673	248	80	3,308	1,037	0
1.2 Booster Modifications	4,851		282	2,248	1,825	494
1.3 Beam Transport System	5,638		56	1,754	2,624	1,204
1.4 Controls & Personnel Safety System	1,557		8	539	677	333
1.5 Exp. Area Outfitting	3,068		0	1,159	1,346	564
1.6 Long Term Support Lab	455		0	383	73	0
1.7 Installation & Services	2,171		9	479	736	947
1.8 Project Services	3,258	9	165	1,241	1,172	671
	25,668	257	600	11,106	9,490	4,213
Contingency	4,840	42	0	543	2,814	1,440
1 (TEC) BAF Construction (BA AY \$)	30,507	300	600	11,650	12,304	5,653
Spares	1,294			150	296	848
Commissioning	1,299					1,299
1 (TPC) Total Project Cost (BA AY \$)	33,100	300	600	11,800	12,600	7,800
1 (TPC) BAF Construction (BO AY \$)	33,100	300	600	6,000	16,000	10,200