Pixel Overview

November 8, 2001

U.S. Pixel Meeting

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2-Hit System - US Deliverables[1]

- Mechanics(1.1.1.1)
  - Support tube and plugs at end of support tube
  - Overall pixel support structure(frame)
  - Disks
  - Coolant pipes(shared with Europe)
  - Power and other cables(shared with Europe)
  - Tooling for final assembly of system(shared with Europe)
- Sensors(1.1.1.2)
  - About 20% of production procurement and testing
- Electronics(1.1.1.3)
  - About 20% production procurement, 50% of testing of front-end ICs
  - About 50% production procurement and testing of optical ICs
  - Common test systems for all collaboration for front-end ICs, modules
- Hybrids(1.1.1.4)
  - All flex hybrids
  - Optical components and hybrids for disk region
- Modules(1.1.1.5)
  - Thinning, dicing of FE and die sort
  - Assemble and test about 25% of modules
- Test Support(1.1.1.6)
  - About 20% of support for system tests and beam tests at CERN

As shown at baseline review

[1]Assumes release of 600K of management contingency

Management Contingency

- Baseline had two parts to management contingency.
  - About 600K to complete 2-hit system - see below as shown at baseline review. Have not updated. Will do so after ETC02 completed. Pixel sensor decision is soon but later than baseline.
  - Remainder for 3-hit system and some support of installation => has moved to Upgrade and M&O categories(see later).

		Scope-$s	Decision				
WBS	**Description**	**(FY00 $s)**	**Date**	**FY01**	**FY02**	**FY03**	**FY04**
1.1.1.2.3.1.2	Pixels Sensor	92,873	9/30/01		92,873		
1.1.1.2.3.1.3	Pixel Sensor testing (FY02 on)	78,000	7/1/01		39,000	39,000	
1.1.1.4.3.1.1	Bare Flex Hybrid Production	144,075	7/1/02		144,075		
1.1.1.4.3.1.2	Flex Components & Assembly	67,487	7/1/02			67,487	
1.1.1.3.3.1.1.2	FE IBM Production	60,549	3/1/03			60,549	
1.1.1.4.3.3.2	Optical Hybrids	32,621	3/1/03			32,621	
1.1.1.4.3.3.1	Optical Package & Component	13,538	3/1/03			13,538	
1.1.1.3.3.2.1	Optoelectronics Production	26,460	3/1/03			26,460	
1.1.1.3.3.1.2	B-Layer Production	28,345	11/1/03			28,345	
1.1.1.5.3.3	FE IC die sort	58,080	6/1/03			54,000	4,080

Current Cost/Schedule Comparison

Current estimate

	Access	Actuals	TPC	Delta		
ETC00	8256	1005	9261			
ETC01	6382	1910	8291	970	Baseline FY00	
ETC01	6573	0	6573		Baseline FY01	
ETC02	5735	1690	7425	852	FY01 $K	

Assumes simple slippage. Likely optimistic

Major Milestone	US Baseline Date	US Current Date?	US Delta	ATLAS Baseline Date
1st IBM prototype submitted	26-Jul-01	20-Nov-01	117	26-Sep-01
Start IBM Production	13-Mar-03	8-Jul-03	117	2-Apr-03
Start bare module production	22-Oct-03	16-Feb-04	117	10-Dec-03
Disk System at CERN	13-Oct-04	7-Feb-05	117	24-Nov-04
Ready for Installation	16-Mar-05	11-Jul-05	117	25-May-05
ATLAS Need Date for Pilot Run	15-Feb-05	24-Feb-05	9	24-Feb-05

- Was about $2.5M contingency in baseline estimate.
- $0.9M IS TOO MUCH! We need to reduce current ETC02 by about $0.5M!

Pixels(WBS 3.1.1) Profile

U.S. ATLAS M&&O Estimate
WBS Profile Estimates

Funding Source: All **Funding Type:** Project 10/18/01 11:28:48 AM

Institutions: All

WBS Number	Description	FY 03 (k$)	FY 04 (k$)	FY 05 (k$)	FY 06 (k$)	FY 07 (k$)	FY 08 (k$)	FY 09 (k$)	FY 10 (k$)	FY 11 (k$)	FY 12 (k$)	Total (k$)
3.1.1	Pixels	166	443	907	891	732	732	498	498	498	498	5863
3.1.1.1	Pre-operations and commissioning	166	443	907	891	0	0	0	0	0	0	2406
3.1.1.1.1	SR Building Facilities	73	95	194	124	0	0	0	0	0	0	487
3.1.1.1.2	In-pit/mechanical support	0	189	308	371	0	0	0	0	0	0	868
3.1.1.1.3	Electrical support	0	66	256	246	0	0	0	0	0	0	568
3.1.1.1.4	Software support	93	93	149	149	0	0	0	0	0	0	484
3.1.1.1.5	Physicist support	0	0	0	0	0	0	0	0	0	0	0
3.1.1.2	Operations	0	0	0	0	422	422	302	302	302	302	2050
3.1.1.2.1	Mechanical Support	0	0	0	0	165	165	101	101	101	101	732
3.1.1.2.2	Electrical Support	0	0	0	0	104	104	48	48	48	48	401
3.1.1.2.3	Software support	0	0	0	0	153	153	153	153	153	153	918
3.1.1.2.4	Physicist support	0	0	0	0	0	0	0	0	0	0	0
3.1.1.3	Maintenance	0	0	0	0	310	310	197	197	197	197	1406
3.1.1.3.1	Mechanical support	0	0	0	0	169	169	123	123	123	123	832
3.1.1.3.2	Electrical support	0	0	0	0	141	141	73	73	73	73	575
3.1.1.3.3	Software support	0	0	0	0	0	0	0	0	0	0	0
3.1.1.3.4	Physicist support	0	0	0	0	0	0	0	0	0	0	0
3.1.1.3.5	Spares	0	0	0	0	0	0	0	0	0	0	0

Pixel Profile(4.1.1)

Upgrades to U.S. ATLAS
WBS Profile Estimates

Funding Source: All **Funding Type:** Project 10/18/01 9:10:06 AM

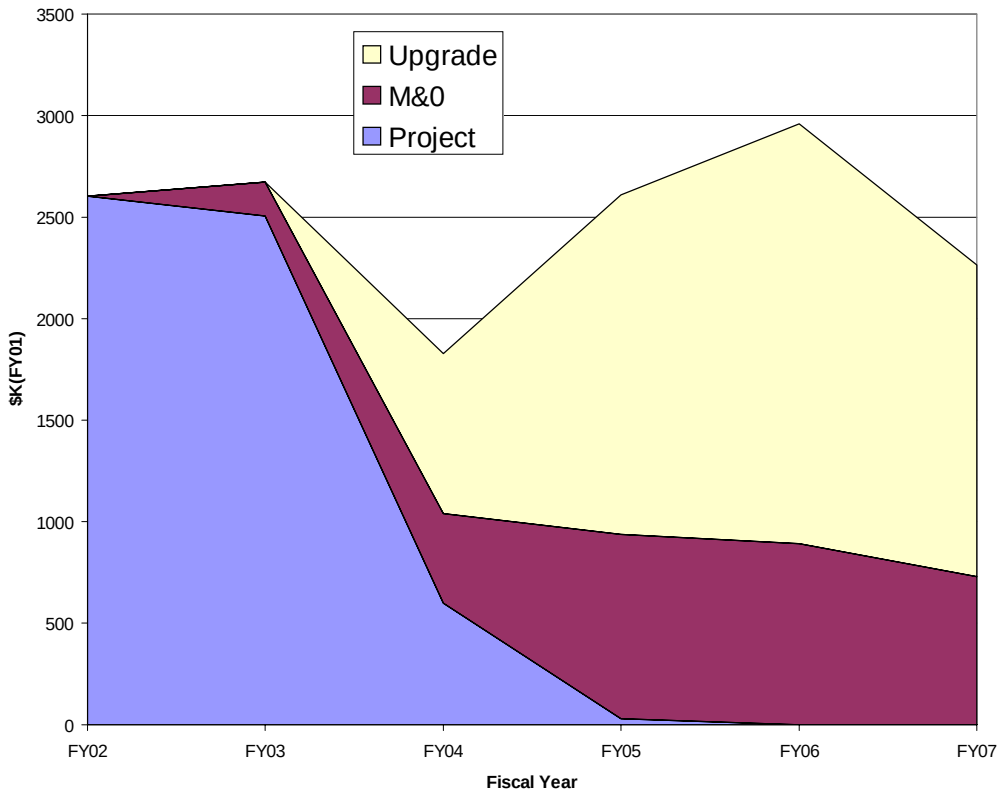
Institutions: All

WBS Number	Description	FY 03 (k$)	FY 04 (k$)	FY 05 (k$)	FY 06 (k$)	FY 07 (k$)	FY 08 (k$)	FY 09 (k$)	FY 10 (k$)	FY 11 (k$)	FY 12 (k$)	Total (k$)
4.1.1	Pixels	0	790	1676	2068	1532	1968	1444	366	0	0	9843
4.1.1.1	Upgrade R&D	0	517	676	1331	0	0	0	0	0	0	2524
4.1.1.1.1	Mechanics/Services	0	78	103	103	0	0	0	0	0	0	285
4.1.1.1.2	Sensors	0	74	69	114	0	0	0	0	0	0	257
4.1.1.1.3	Electronics	0	340	349	667	0	0	0	0	0	0	1356
4.1.1.1.4	Hybrids	0	0	86	203	0	0	0	0	0	0	289
4.1.1.1.5	Module assembly	0	26	57	220	0	0	0	0	0	0	303
4.1.1.1.6	Test beam support	0	0	11	23	0	0	0	0	0	0	34
4.1.1.2	Third hit upgrade	0	272	1000	736	241	0	0	0	0	0	2250
4.1.1.2.1	Mechanics	0	0	347	254	182	0	0	0	0	0	782
4.1.1.2.2	Sensors	0	164	0	0	0	0	0	0	0	0	164
4.1.1.2.3	Electronics	0	0	208	58	0	0	0	0	0	0	266
4.1.1.2.4	Flex Hybrids/Optical Hybrids	0	0	315	254	0	0	0	0	0	0	569
4.1.1.2.5	Module assembly/Test	0	108	131	170	60	0	0	0	0	0	469
4.1.1.3	B-layer replacement	0	0	0	0	1291	1968	1444	366	0	0	5069
4.1.1.3.1	Mechanics/Services	0	0	0	0	339	501	630	366	0	0	1836
4.1.1.3.2	Sensors	0	0	0	0	104	204	0	0	0	0	308
4.1.1.3.3	Electronics	0	0	0	0	512	596	304	0	0	0	1412
4.1.1.3.4	Hybrids	0	0	0	0	192	283	186	0	0	0	661
4.1.1.3.5	Modules	0	0	0	0	143	384	324	0	0	0	851

Pixel Requests - Contingency Not Included

	FY02	FY03	FY04	FY05	FY06	FY07
Project	2604	2507	595	29		←
M&0		166	443	907	891	732
Upgrade			790	1676	2068	1532
TOTAL	2604	2673	1828	2612	2959	2264

Must be reduced!



Critical Technical Issues

- Critical path for pixels remains through integrated circuits(ALL of them - FE, MCC and optical).
- Next on the path is module assembly and operation.
  - Failure or significant delay in bump bonding - need experience
  - Systems issues - ditto
- We are responsible for the pixel support tube(PST) in its entirety.
  - Must be integrated with SCT barrel(nominally by March 2004)
  - Supports ATLAS beam pipe - this is added scope since baseline. How to handle cost increase?
  - Slippage could put the PST on the overall ATLAS and LHC critical path, or close to it. Not comfortable position.

Cost and Schedule Issues

- Significant call on cash contingency will be made. Will require justification and defense. In our interest to be tough on ourselves in next two days. WE MUST MAKE CUTS FROM CURRENT ESTIMATE!
- How to handle scope increase from beam pipe support?
- Current US schedule and most recent ATLAS baseline (September this year) NOT consistent with installation before pilot run(nominally in April 2006).
- Must plan for installation before first physics run ie. in summer of 2006.
- But project funding ends by September 30, 2005(at present). M&O funding required to fill this gap.
- FY04-05 funds not sufficient to complete project even if all of management contingency granted. Cash contingency and M&O solution?