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Howard and US ATLAS His "Titan Years"

Howard Gordon Fest
Brookhaven National Laboratory
October 2, 2017

Frank E. Taylor
MIT-ATLAS



Proceedings Of The 1982 DPF Summer Study On Elementary Particle Physics And Future Facilities

Of The 1982 DPF Summer ary Particle Physics And F Facilities

Proceedings Of The On Elementary Par F

TESTING THE STANDARD MODEL

H. Gordon, W. Marciano
Brookhaven National Laboratory, Upton, NY
and
H.H. Williams
University of Pennsylvania, Philadelphia, PA

K. Abe, U. Pennsylvania	F. Paige, BNL
M. Chanowitz, U. California-Berkeley	F. Pipkin, Harvard U.
R. Cool, Rockefeller U.	R. Ruchti, Notre Dame U.
M. Derrick, ANL	M. Samuel, Oklahoma State
J. Friedman, MIT	K. Shinsky, U. California-Berkeley
B. Gittelman, Cornell U.	R. Shrock, SUNY-Stony Brook
K. Gottfried, Cornell U.	R. Siemann, Cornell U.
P. Grannis, SUNY-Stony Brook	H. Sticker, Rockefeller U.
I. Hinchliffe, U. California-Berkeley	M. Tannenbaum, BNL
J. Jackson, U. California-Berkeley	F. Taylor, Northern Illinois U.
H. Kagan, Ohio State U.	M. Tuts, SUNY-Stony Brook
P. Lepage, Cornell U.	H. Tye, Cornell U.
A. Melissinos, Rochester U.	G. Tzanakos, Columbia U.
L. Nodulman, ANL	H. Vogel, Max Plank Institute
T. O'Halloran, U. Illinois	D. White, BNL
S. Olsen, Rochester U.	R. Wilson, Columbia U.
	J. Wiss, U. Illinois

HADRON HADRON COLLIDER GROUP*

R. Palmer
Brookhaven National Laboratory, Upton, New York 11973

J. Peoples
Fermi National Accelerator Laboratory, Batavia, Illinois 60510

C. Ankenbrandt, FNAL
C. Baltay, Columbia U.
R. Diebold, ANL
E. Eichten, FNAL
H. Gordon, BNL
P. Grannis, SUNY at Stony Brook
R. Lanou, Brown U.
J. Leveille, U. Michigan
L. Littenberg, BNL
F. Paige, BNL
E. Platner, BNL
H. Sticker, Rockefeller U.
M. Tannenbaum, BNL
H. Williams, U. Penn.
R. Wilson, Columbia U.

HEAVY HIGGS PRODUCTION AND DETECTION

H.A. Gordon, W. Marciano and F.E. Paige
Brookhaven National Laboratory
Upton, NY 11973

P. Grannis
Physics Dept., S.U.N.Y at Stony Brook
Stony Brook, NY 11794

S. Naculich
Physics Dept., Case Western Reserve Univ.
Cleveland, Ohio 44106

H.H. Williams
Physics Dept., Univ. of Pennsylvania
Philadelphia, PA 19104

REASONS EXPERIMENTS CAN BE PERFORMED AT A
pp MACHINE AT $L = 10^{33} \text{ cm}^{-2} \text{ sec}^{-1}$

H.A. Gordon, T. Ludlam, E. Platner, and M.J. Tannenbaum
Brookhaven National Laboratory, Upton, New York 11973

SEARCH FOR NEW HEAVY TECHNIPARTICLES

C. Baltay
Columbia University, New York, NY 10027

H. Gordon
Brookhaven National Laboratory, Upton, NY 11973

W, Z^0 PRODUCTION AT A PP COLLIDER

G. Bunce, H.A. Gordon, T.J. Killian, M.J. Murtagh, F.E. Paige, M.J. Tannenbaum, T.L. Trueman
Brookhaven National Laboratory, Upton, NY 11973

J. Branson
Massachusetts Institute of Technology, Cambridge, MA 02139

F. Eisler
College of Staten Island, Staten Island, NY 11301

P. Grannis
State University of New York at Stony Brook, Stony Brook, NY 11794

June 28-July 16, 1982
Snowmass, Colorado

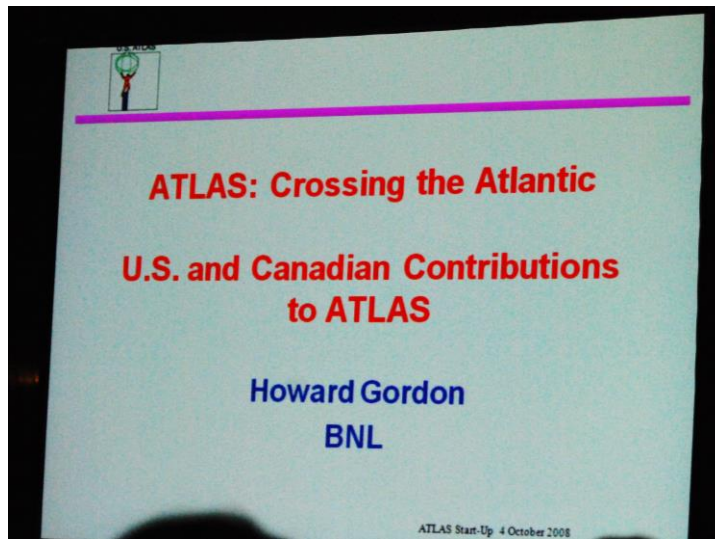
June 28-July 16, 1982
Snowmass, Colorado

June 28-July 16, 1982
Snowmass, Colorado

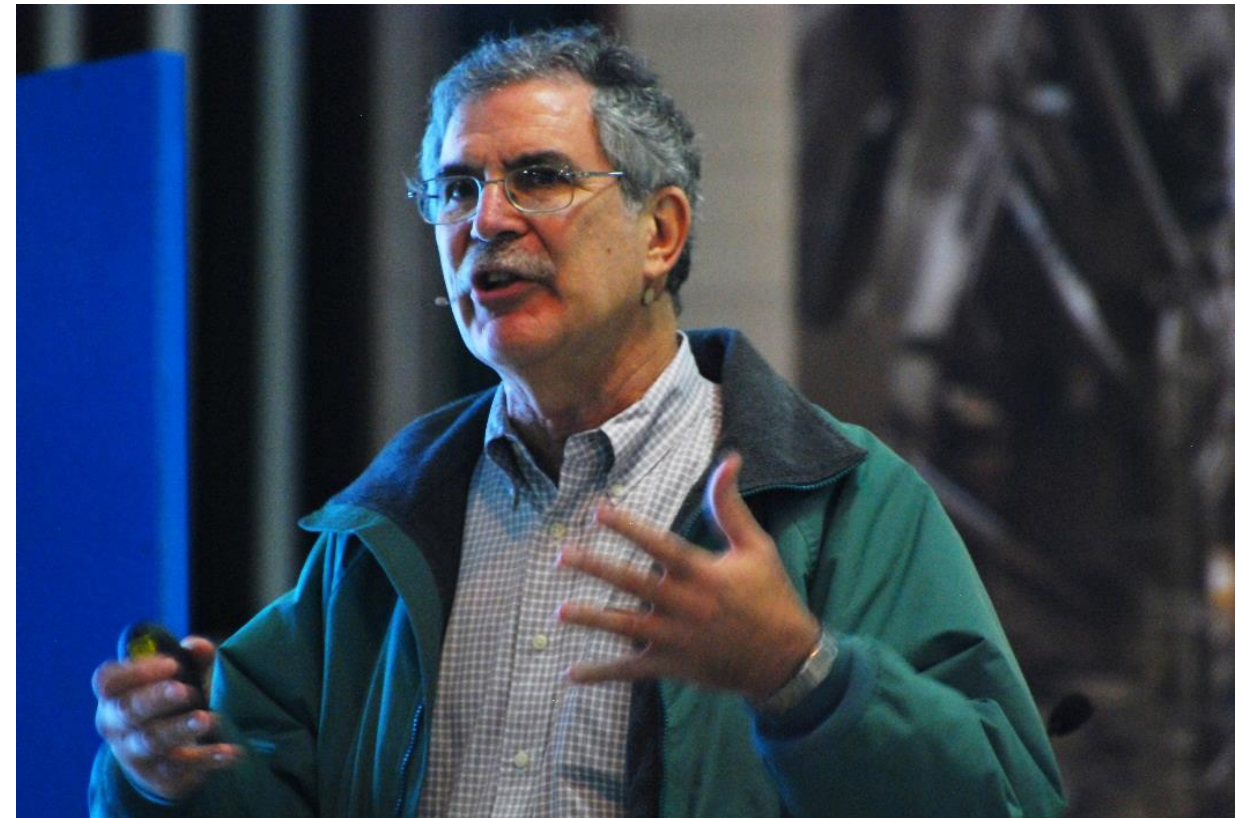
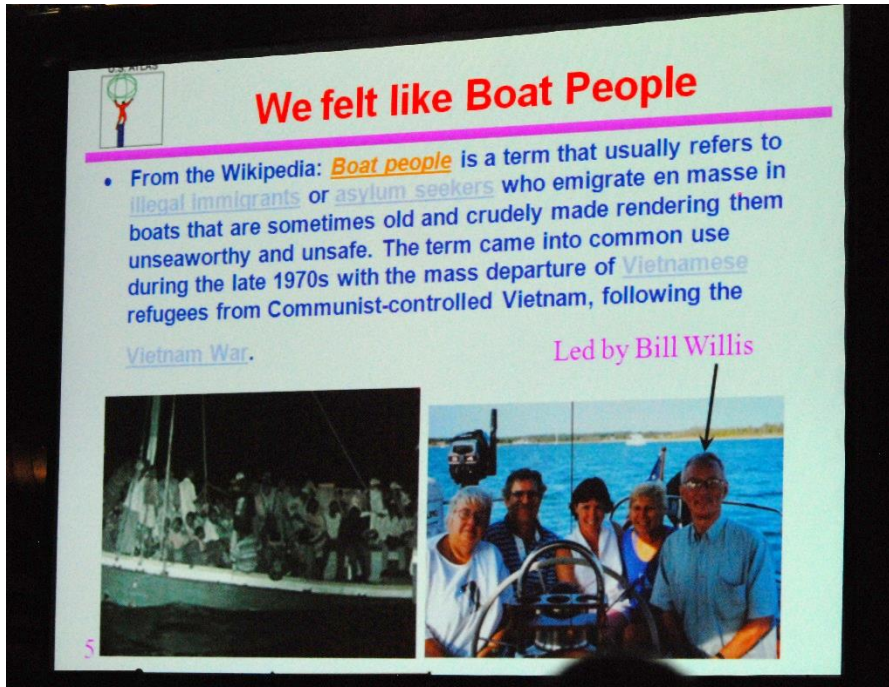


The Nonfulfillment of Snowmass Plans

- SSC funding authorized January 1987
- Two General Detectors
 - GEM (B. Barish and W. Willis, et al.)
 - Howard was the BNL Representative & worked on calorimetry
 - SDC (G. Trilling, et al.)
- SSC Killed 21 October 1993
 - This was a horrible shock to the US HEP Program



CERN Party 04-Oct-2008
Howard said it beautifully





US Delegation Visits CERN

- In 1993 when the SSC was terminated, Willis & Kirk part of the U.S. delegation which visited CERN to possibly join LHC experiments
 - It was natural to think about ATLAS since some of our work in GEM was with accordion LAr calorimetry in collaboration with Daniel Fournier (Orsay).
 - **ATLAS said the U.S. was welcome to join but don't expect to change anything!**
 - Bill Willis very effectively recruited from GEM & SDC to ATLAS
 - US CMS equally successful in recruiting physicists from GEM & SDC

We are forever grateful !

Slide from HG/Willis Symposium

Don't Expect to Change Anything !

- GEM (SSC) LAr Module:

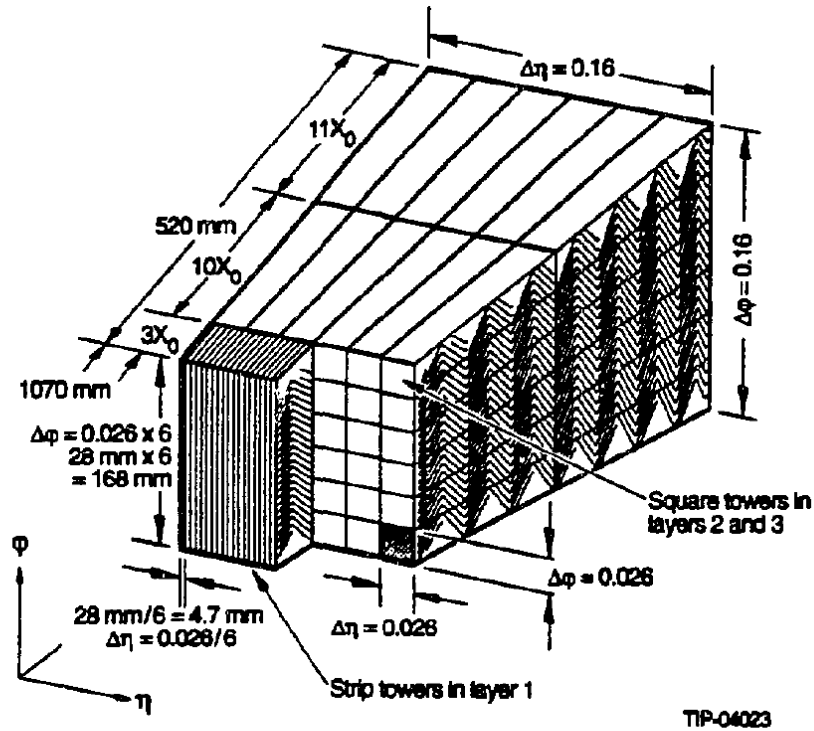
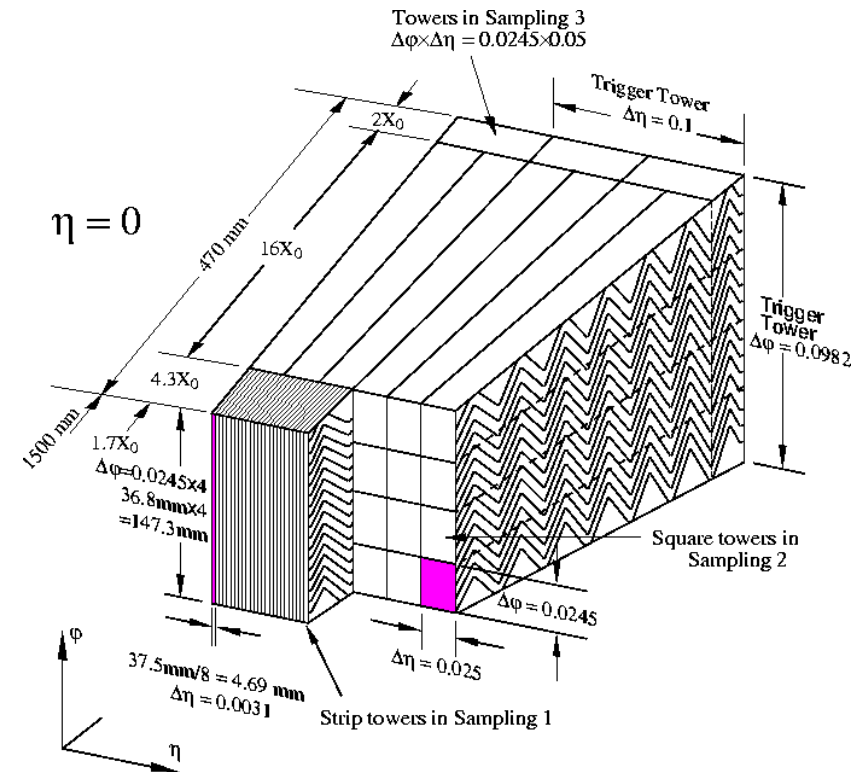


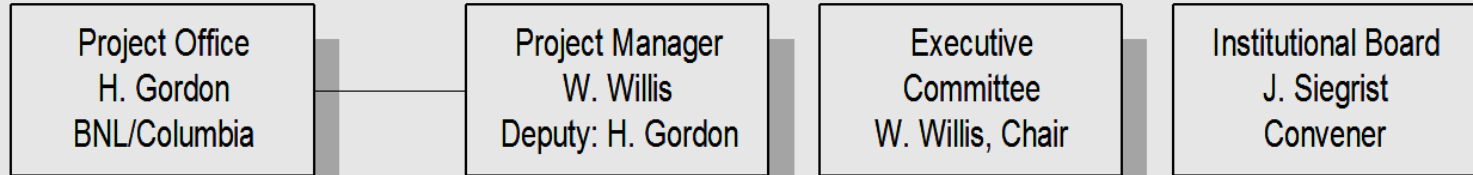
FIG. 5-4. Transverse and longitudinal segmentation of the Inner Barrel EM Calorimeter.

- ATLAS LHC LAr Module:

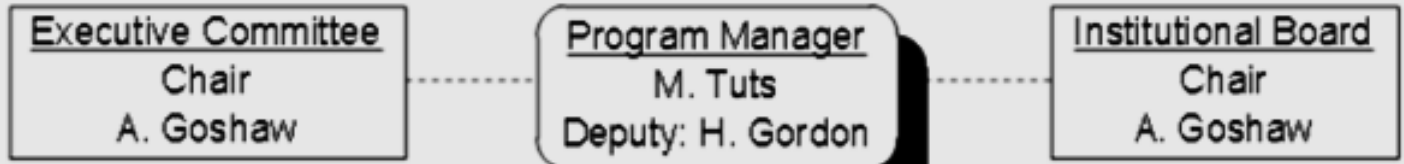
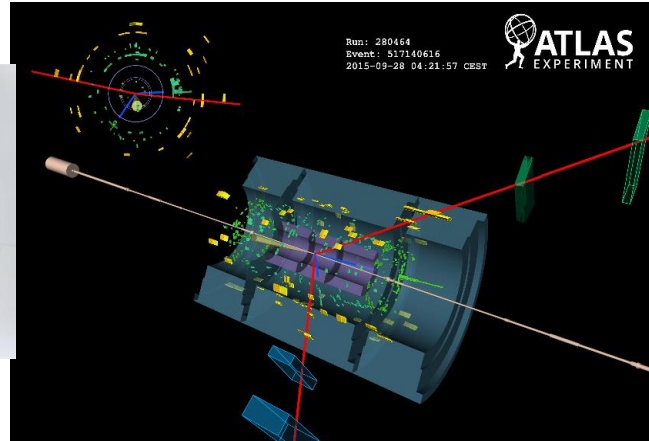




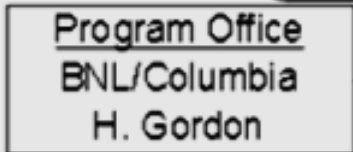
US ATLAS Management / Howard's Years



Construction
Project
1994-2005



Operations
Program
2003-2013





The Early US ATLAS Years 1994-1998

- Collaboration Building
- Construction Scope & List of Deliverables
- Subsystems and their Management
- Howard's role
 - US Project office at BNL
 - Budgets, Milestones and Project Management
 - Interpreting Bill's sometimes oblique language



The Construction Project Defined 1998

<p>U.S. ATLAS 99-20</p> <p><i>Revised</i></p> <p>U.S. ATLAS Construction Project Management Plan</p> <p>Originally Approved March 1998</p> <p>U.S. ATLAS Project Management Plan – November 1999 1</p>	<p>Submission and Approvals</p> <p>This is a Revision of the U.S. ATLAS Project Management which was approved jointly by the U.S. Department of Energy and the National Science Foundation.</p> <table border="0"> <tr> <td>Submitted by:</td> <td>Approved by the DOE/NSF Joint Oversight Group:</td> </tr> <tr> <td>William F. Willis U.S. ATLAS Project Manager Columbia University</td> <td>John W. Lightbody Executive Officer, Physics Division National Science Foundation</td> </tr> <tr> <td>Thomas B. W. Kirk Associate Director Brookhaven National Laboratory</td> <td>John R. O'Fallon Director, Division of High Energy Physics Department of Energy</td> </tr> <tr> <td>James H. Yeck U.S. LHC Project Manager Department of Energy</td> <td></td> </tr> <tr> <td>Marvin Goldberg Associate U.S. LHC Program Manager National Science Foundation</td> <td></td> </tr> <tr> <td>Timothy Toohig U.S. LHC Program Manager Department of Energy</td> <td></td> </tr> </table> <p>U.S. ATLAS Project Management Plan – November 1999 2</p>	Submitted by:	Approved by the DOE/NSF Joint Oversight Group:	William F. Willis U.S. ATLAS Project Manager Columbia University	John W. Lightbody Executive Officer, Physics Division National Science Foundation	Thomas B. W. Kirk Associate Director Brookhaven National Laboratory	John R. O'Fallon Director, Division of High Energy Physics Department of Energy	James H. Yeck U.S. LHC Project Manager Department of Energy		Marvin Goldberg Associate U.S. LHC Program Manager National Science Foundation		Timothy Toohig U.S. LHC Program Manager Department of Energy	
Submitted by:	Approved by the DOE/NSF Joint Oversight Group:												
William F. Willis U.S. ATLAS Project Manager Columbia University	John W. Lightbody Executive Officer, Physics Division National Science Foundation												
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Marvin Goldberg Associate U.S. LHC Program Manager National Science Foundation													
Timothy Toohig U.S. LHC Program Manager Department of Energy													

US ATLAS Construction Project Management Plan March 1998

ATLAS COLLABORATION RRB-D 98-44 rev.

Memorandum of Understanding

for: Collaboration in the Construction of the ATLAS Detector

between

The EUROPEAN ORGANISATION FOR NUCLEAR RESEARCH,
hereinafter referred to as CERN, Geneva, as the Host Laboratory

on the one hand

and

an Institution/Funding Agency of the ATLAS Collaboration

on the other hand.

Preamble

- (a) A group of Institutes from CERN Member and non-Member States, and CERN, has agreed to collaborate to form the ATLAS Collaboration (**Annex 1**). This Collaboration has proposed to CERN an experiment to study particle interactions at the highest possible energies and luminosities to be reached with the Large Hadron Collider (LHC). These Institutes have secured the support of their Funding Agencies to enable them to participate in the ATLAS Collaboration.
- (b) Agreement to this Collaboration is effected through identical Memoranda of Understanding (MoU) between each Funding Agency or Institute, as appropriate, in the Collaboration and CERN, as the Host Laboratory. These MoUs collectively define the Collaboration and its objectives, and the rights and obligations of the collaborating Institutes.
- (c) On the basis of a Technical Proposal submitted in December 1994 (CERN/LHCC/94-43) and a detailed review of the scientific merits, the technological feasibility and estimates of the needed resources, the LHC Committee (LHCC) recommended approval of the experiment to the CERN Research Board, subject to a set of milestones to be met by the experiment in its initial phase (CERN/LHCC 95-76).
- (d) Based on the recommendation by the LHCC and in agreement with the list of milestones, the Research Board recommended to the Director General of CERN to approve the project, together with plans, including milestones, leading to the sub-system/detector Technical Design Reports.

28 April, 1998 Page 1 ATLAS-MoU

ATLAS COLLABORATION

The European Organization for Nuclear Research (CERN)

and

declare that they agree on the present Memorandum of Understanding for the ATLAS Experiment.

Done in Geneva Done in _____

on _____ on _____

For CERN For _____

Lorenzo Foà
Director of Research

ATLAS Memorandum of Understanding with CERN
April 1998

28 April, 1998 Page 9 ATLAS-MoU



US ATLAS Contributed to Many Subsystems ~ 20% ATLAS Total

29 Universities
3 National Labs.
SLAC joined later.

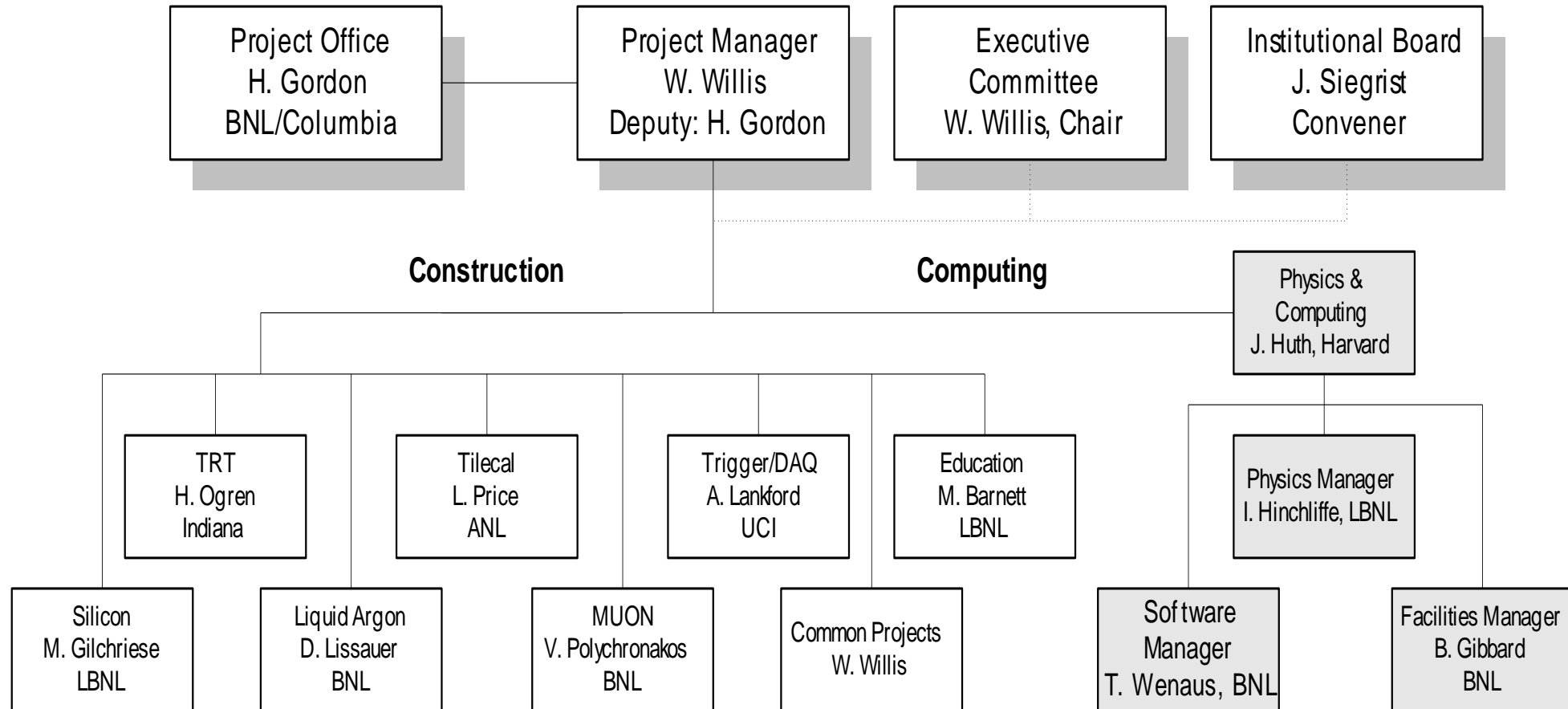
Subsystem	Institutions
Silicon	UC-Berkeley/LBNL, UC-Irvine, UC-Santa Cruz, Iowa State, New Mexico, Ohio State, Oklahoma, SUNY-Albany, Wisconsin
TRT	Duke, Hampton, Indiana, Michigan, Pennsylvania
Liquid Argon Calorimeter	Arizona, BNL, Columbia, Pittsburgh, Rochester, Southern Methodist U., SUNY-Stony Brook
Tile Calorimeter	ANL, Chicago, Illinois-Champaign/Urbana, Michigan State, UT-Arlington
Muon Spectrometer	Boston, BNL, Brandeis, Harvard, MIT, Michigan Northern Illinois, SUNY-Stony Brook, Tufts, UC-Irvine, Washington
Trigger and DAQ	ANL, UC-Irvine, Michigan State, Wisconsin
Common Projects	All institutions



U.S. ATLAS Organization Chart c. 1999

Appendix 7-1: U.S. ATLAS Organization

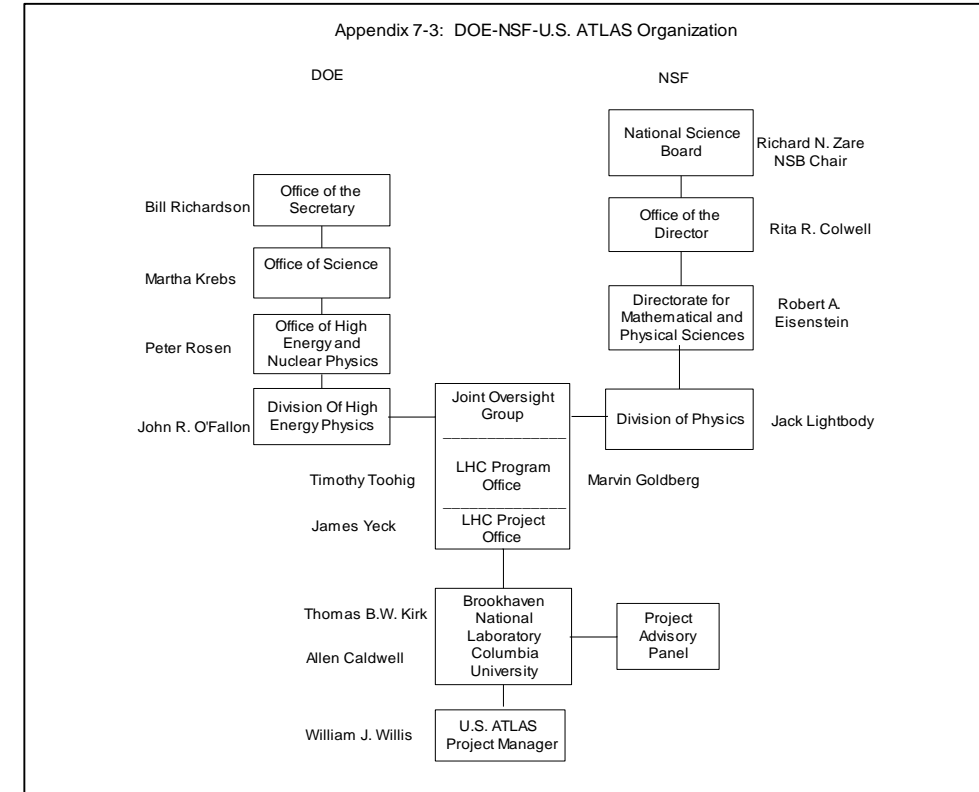
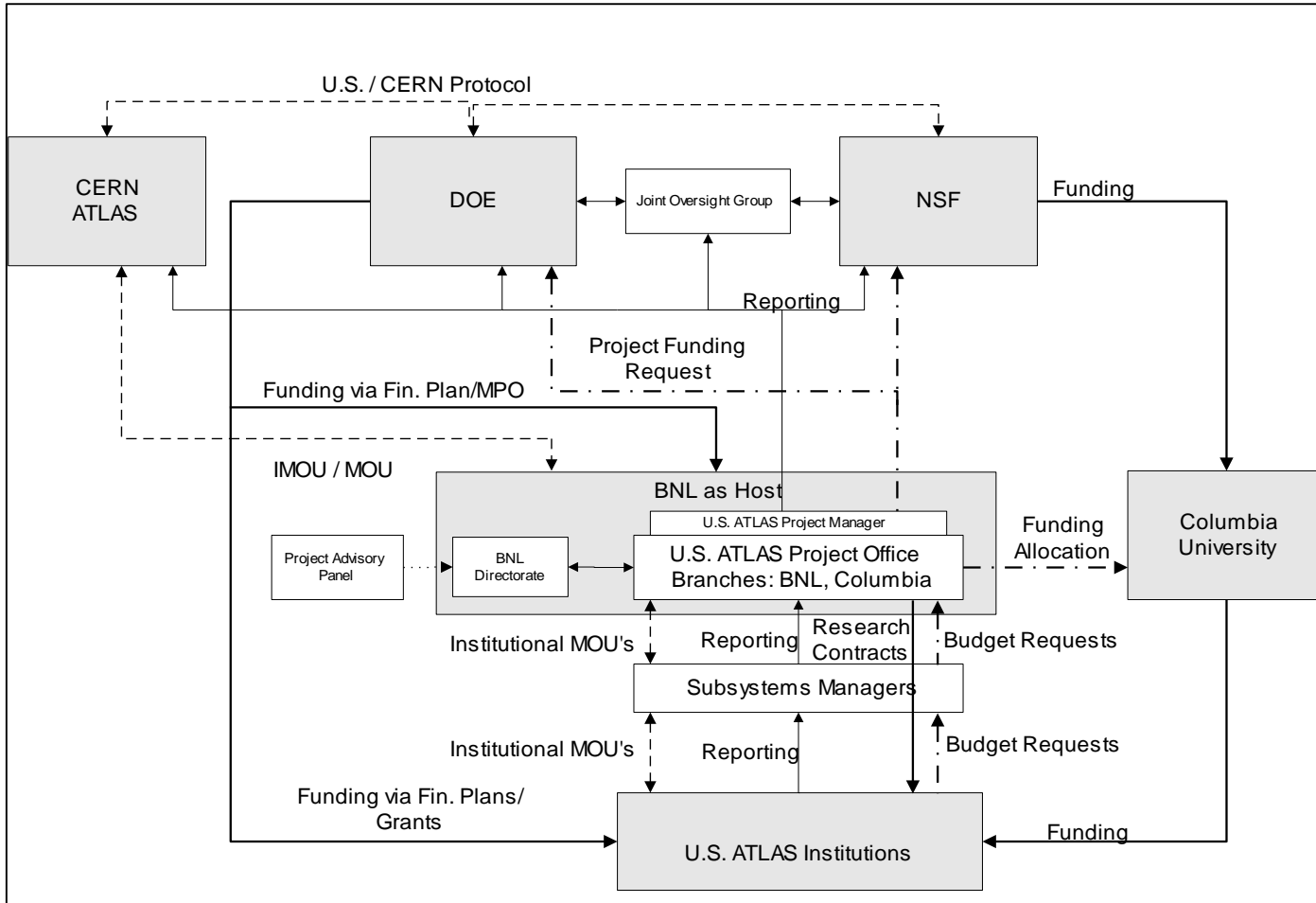
Project Management Plan





Reporting

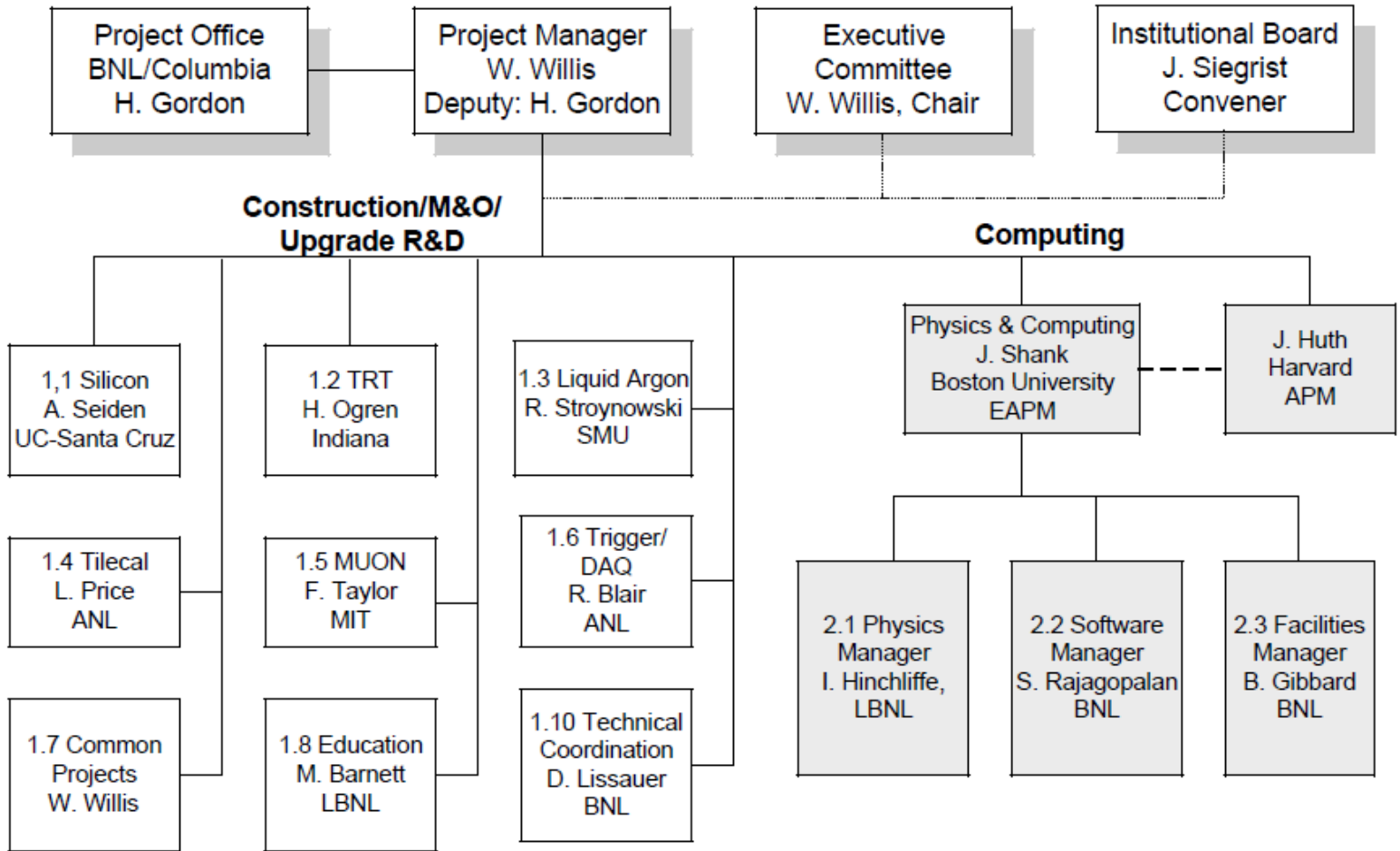
A lot of work for a lot of people to spend a lot of money - responsibly



As complicated as Trigger/DAQ!



Organization Chart Evolves May 2003



Added
 Attention given to M&O and Upgrade R&D as well as construction and physics/computing

Technical Coordination (Lissauer works with Nessi)

Note that Education remains as a Level 2 Activity
 Howard a strong supporter



Under Perpetual Review - I

US ATLAS Management of US Group

- Annual Guidance from Funding Agencies
 - Meetings with subsystem managers
- US ATLAS Budget Scrubbing
 - Cost estimates were scrubbed with subsystem managers
- US Management Meetings of Baseline Change Proposals
 - The whole management team would hear the argument from a subsystem for more funding. Here is where the Management Reserve was sometimes used.
- Budget Tracking
 - Subsystems spending according to plan
 - Cost and Schedule variance
 - Technical Progress
- MOUs with participating institutions
 - Review & signing
- Howard and Bill or Howard and Mike Travel to various sites
 - Useful in meeting all the players & seeing the actual work



Under Perpetual Review – II

- DOE/NSF (Lehman) Reviews
 - Annually
 - First Review was difficult – not enough contingency – invented “**Management Reserve**”
 - Crucial process in aligning project with funding & big motivator to meet milestones
- Project Manager’s Reviews (Project Advisory Panel – internal BNL)
 - Held before DOE/NSF Reviews as preparation
 - Were very tough
 - Covered Construction Project initially then expanded to Operations & Computer & Upgrades
- Joint Oversight Group (JOG)
 - Opportunity for DOE and NSF to review construction, operations and upgrades
 - Agencies needed to coordinate
- MEG (M&O Evaluation Group) Reviews
 - Annual reviews to assess progress in startup of experiments
- Operation Status (OPS)
 - During operation phone meeting bi-weekly with DOE and NSF and ATLAS and CMS
 - Meetings were quite useful in reviewing status and providing an early warning to the agencies of our problems

**US ATLAS Management
with Funding Agencies**



Some of the DOE/NSF Reviews

- April 4, 2012, JOG 29
[Agenda](#)
NSF, Arlington, VA
- March 6-7, 2012, DOE/NSF Evaluation of U.S. LHC Operations
[Agenda](#)
[DOE/NSF Review Report](#)
SLAC, Menlo Park, CA
- September 26, 2011, JOG 28
[Agenda](#)
NSF, Arlington, VA
- April 4, 2011, JOG 27
[Agenda](#)
NSF, Arlington, VA
- March 10-11, 2011, DOE/NSF Evaluation of U.S. LHC Operations
[Agenda](#)
[DOE/NSF Review Report](#)
[Reviewers Reports](#)
Rice University, Houston, TX
- September 28, 2010, JOG 26
[Agenda](#)
NSF, Arlington, VA
- May 11-12, 2010, DOE/NSF Evaluation of U.S. ATLAS Operations
[Agenda](#)
ANL, Argonne, IL
- April 8, 2010, JOG 25
[Agenda](#)
NSF, Arlington, VA
- September 29, 2009, JOG 24
[Agenda](#)
NSF, Arlington, VA
- April 16, 2009, JOG 23
[Agenda](#)
URA, Washington, DC
- February 9-12, 2009, DOE/NSF Evaluation of U.S. LHC Operation
[Agenda](#)
Princeton University
- October 31, 2008, JOG 22
[Agenda](#)
URA, Washington, DC
- August 8, 2008, Internal Evaluation of U.S. LHC Operations
[Agenda](#)
URA, Washington, DC
- April 2, 2008, JOG 21
[Agenda](#)
URA, Washington, DC
- February 4-7, 2008 DOE/NSF Evaluation of U.S. LHC Research Program
[Agenda](#)
University of California at Irvine
- December 19, 2007 DOE/NSF Review of the U.S. LHC Project
[Agenda](#)
- October 16, 2007, JOG 20
[Agenda](#)
URA, Washington, DC
- August 9, 2007 DOE/NSF Mini-Review of the U.S. LHC Research Program
[Agenda](#)
URA, Washington, DC
- May 24, 2007 DOE/NSF Mini-Review of the U.S. LHC Project
[Agenda](#)
- April 12, 2007, JOG 19
[Agenda](#)
URA, Washington, DC
- February 13-16, 2007 U.S. LHC Detector M&O Evaluation Group
[Agenda](#)
Fermi National Accelerator Laboratory
- January 17-19, 2007 U.S. LHC Software and Computing Review
[Agenda](#)
UTA
- December 21, 2006 DOE/NSF Review of the U.S. LHC Project
[Agenda](#)
- October 11, 2006, JOG 18 [Agenda](#) (htm)

Lifetime Number of
Reviews Estimate:

177 Reviews in 12 years

+

at least 12 more Reviews 1994 to
2000

Σ Howard's Reviews ≥ 200



Howard at DOE/NSF Review May 11-12, 2010



U.S. ATLAS Management: Resources, Planning, and Priorities

Howard Gordon
BNL

DOE/NSF Evaluation of the U.S. ATLAS Operations Program May 11-12, 2010 ANL



How we obtained our Priorities

- Scrub cost estimates for FY11-12
- Prioritize within each level 2 area of tasks
- Establish an overall priority list with the U.S. ATLAS Management Board
- Obtain endorsement from the U.S. ATLAS Executive Committee – elected members from the Collaboration
- Obtain input from ATLAS Management
- End up with one list of priorities
- Iterate as conditions change and periodically
- We are in the process of doing this and have a DRAFT list of priorities – which we call Requests Beyond the Target (RBT)

DOE/NSF Evaluation of the U.S. ATLAS Operations Program May 11-12, 2010 ANL



Outline

- Summary of current U.S. priorities and how they are determined/maintained
- Allocation of Management Reserve
- Cost of running program offices
- Operating needs of M&O and S&C for FY10 through FY16
- Overall priorities in light of possible budgetary constraints
- Management reserve and contingency (and carry over)
- Spending breakdown (using the standardized functional spreadsheet)



Three Budget Scenarios

Low Guidance			Nominal Guidance			High Guidance		
	FY11	FY12		FY11	FY12		FY11	FY12
Computing Equipment	3,000	3,250	Computing Equipm	3,000	3,250	Computing Equipm	3,000	3,250
Computing Operating	15,748	15,673	Computing Operati	16,148	16,673	Computing Operati	16,648	17,273
M&O	6,664	7,172	M&O	6,664	7,172	M&O	6,664	7,172
Common Funds	5,584	5,374	Common Funds	5,584	5,374	Common Funds	5,584	5,374
R&D	1,874	1,631	R&D	2,124	1,631	R&D	2,306	2,318
U.S. ATLAS OP Subtotal	32,871	33,100	U.S. ATLAS OP Sul	33,521	34,100	U.S. ATLAS OP Sul	34,203	35,388
MR %	0.06	0.06	MR %	0.08	0.08	MR %	0.09	0.11
MR	2,108	2,292	MR	2,825	3,155	MR	3,510	4,180
U.S. ATLAS OP Total	34,979	35,392	U.S. ATLAS OP Tot	36,346	37,255	U.S. ATLAS OP Tot	37,713	39,568
DOE guidance	25,979	26,842	DOE guidance	27,346	28,255	DOE guidance	28,713	29,668
NSF guidance	9,000	8,550	NSF guidance	9,000	9,000	NSF guidance	9,000	9,900
Total guidance	34,979	35,392	Total guidance	36,346	37,255	Total guidance	37,713	39,568

DOE/NSF Evaluation of the U.S. ATLAS Operations Program May 11-12, 2010 ANL

Managing Budget Guidance from Funding Agencies that was usually only a range and changed year-to-year.

Setting priorities for Requests Beyond Budget to address technical issues.

Obtaining concurrence of plan with US ATLAS and International ATLAS and DOE/NSF.



CD-4A Report Construction 97% Complete

U.S. Large Hadron Collider (LHC) Project Critical Decision- 4A (CD-4A) Closure Report	
1) Project Title: U.S. ATLAS	2) Project Host Laboratory: Brookhaven National Laboratory
3) DOE Reference Number: XX-SC-XXX-1	
4) Project Purpose and Scope (include WBS to Level 2, and see attachments for more detail): The U.S. ATLAS Project consists of the activities to design, supply and install the U.S. portion of the ATLAS detector. The detector will become part of the Large Hadron Collider (LHC) at CERN, the European Laboratory for Particle Physics. The ATLAS detector is being designed to understand the dynamics of electroweak symmetry breaking, with the capability of reconstructing the momenta and directions of quarks (hadronic jets, tagged by their flavors where possible), electrons, muons, taus, and photons, and sensitivity to energy carried off by weakly interacting particles such as neutrinos that cannot be directly detected. The Work Breakdown Structure (WBS) is:	
1.1 Silicon Subsystem	1.6 Trigger/DAQ Subsystem
1.2 TRT Subsystem	1.7 Common Projects
1.3 LAr Calorimeter Subsystem	1.8 Education Outreach
1.4 Tile Calorimeter Subsystem	1.9 Project Management
1.5 Muon Spectrometer Subsystem	1.10 Technical Coordination
5) Project Completion Baseline through CD-4A	
Project WBS Item	Budgeted Cost of Work Performed (through CD-4A)
1.1 Silicon Subsystem	\$23,937.9k
1.2 TRT Subsystem	\$11,878.3k
1.3 LAr Calorimeter Subsystem	\$47,522.3k
1.4 Tile Calorimeter Subsystem	\$11,552.3k
1.5 Muon Spectrometer Subsystem	\$30,185.7k
1.6 Trigger/DAQ Subsystem	\$5,170.6k
1.7 Common Projects	\$15,313.5k
1.8 Education Outreach	\$135.2k
1.9 Project Management	\$8,380.2k
1.10 Technical Coordination	\$3,095.3k
TOTAL U.S. ATLAS Project	\$157,171.3k
Completion Date (Actual): 9/30/2005	
6) Overview of work remaining through CD-4B, if any: The work remaining for CD-4B includes Pixel Mechanics Production, completion of Silicon service panel components, Trigger/DAQ Production and Software Development, remaining installation of some systems, and completion of CD-4A punch-list items (see section 9 below).	
7) Status of Project Turnover/Acceptance (including for Maintenance & Operations of detectors):	
8) Key Learning Points and Recommendations: <ul style="list-style-type: none"> Specifically define a list of Deliverables in MOUs. Definitions in terms of percentages or levels of effort can keep increasing in cost, as we saw in this project. Management Contingency concept worked to keep cost increases down and allowed for optimal management of scope to maximize the U.S. contribution to the detector. Do not rely on sole source procurements if possible. We never made a visit to a collaborator or a vendor which was not productive -- make more trips. System engineering (aka Technical Coordination in ATLAS) is critical early in a large Project and should not be underestimated. Reviews are useful. 	
9) CD-4A Punch-list Items, Actions Assigned, if any: <ul style="list-style-type: none"> Complete installation of LAr WBS 1.3.6.4 Power Supplies and WBS 1.3.7.1 Front-End Boards. Although installation has started this FY, the completion will slip into FY06, but should complete by Jan 2006. There will be no impact on the international ATLAS schedule. Complete production of Muon WBS 1.5.11.5, 1.5.11.6, 1.5.11.10 (ROD's, Support Electronics and Transition Modules); holding weekly meetings with subsystem managers to insure that design, layout and prototype are completed by September 2005, with production planned for completion in February 2006. There will be no impact on the international ATLAS schedule. 	

10) Certification that Project is physically completed as described in attachments, and Maintenance & Operations planning/transition is sufficient for this stage of completion:

WBS 1.1 Silicon Strips and RODs are in pre-operations and being commissioned. The pixels will be installed later in FY06 and then begin pre-operations and commissioning. WBS 1.2 Transition Radiation Tracker is installed and in pre-operations and commissioning. WBS 1.3 Most of the Liquid Argon Calorimeter is installed and all components are in pre-operations and commissioning. The rest of the Front-End Boards and Low Voltage Power Supplies will be installed in early FY06. WBS 1.4 Tile Calorimeter will finish installation in FY06 but all components are already in pre-operations and commissioning. WBS 1.5 All components of the Muon System are in pre-operations and commissioning, with installation continuing into FY06. WBS 1.6 has work already for the Trigger/DAQ subsystem in pre-operations and commissioning. There are no deliverables for WBS 1.7 Common Fund and WBS 1.8 Education Outreach. WBS 1.9 U.S. ATLAS Project Office has transitioned to the U.S. ATLAS Program Office. WBS 1.10 Technical Coordination has transitioned to the U.S. ATLAS Research Program.

 Program Manager 10/12/05 Date	 Project Manager 12 Oct. 2005 Date	 Federal Project Director 10-18-05 Date
---	---	--

11) Acceptance by the user organization of the Project deliverables as described in attached project baseline documents

 User Organization representative 18 Oct 2005 Date	 Date
---	----------

12) Listing of Attachments (one set with further breakdown for each Level 2 WBS item):

- ATTACHMENT USATLAS 1.1 – Silicon Subsystem (Parts 1 and 2)
- ATTACHMENT USATLAS 1.2 – Transition Radiation Tracker Subsystem (Parts 1 and 2)
- ATTACHMENT USATLAS 1.3 – Liquid Argon Calorimeter Subsystem (Parts 1, 2 and 3)
- ATTACHMENT USATLAS 1.4 – Tile Calorimeter Subsystem (Parts 1 and 2)
- ATTACHMENT USATLAS 1.5 – Muon Subsystem (Parts 1 and 2)
- ATTACHMENT USATLAS 1.6 – Trigger/Data Acquisition Subsystem
- ATTACHMENT USATLAS 1.7-9 – Common Funds/Education Outreach/Project Management Subsystems
- ATTACHMENT USATLAS 1.10 – Technical Coordination Subsystem

Oct. 2005: CD-4A 97% US Deliverables @ CERN shipping dock.
 Sep. 2007: CD-4B 100% Complete \$165.5 M
 (DOE/NSF: \$104.7M/\$60.8M)



Key Learning Points and Recommendations – CD4A

- Specifically define a list of Deliverables in MOUs. Definitions in terms of percentages or levels of effort can keep increasing in cost, as we saw in this project.
- Management Reserve (Contingency) concept worked to keep cost increases down and allowed for optimal management of scope to maximize the U.S. contribution to the detector.
- Do not rely on sole-source procurements if possible.
- We (US Management) never made a visit to a collaborator or a vendor which was not productive – make more trips.
- System engineering (aka Technical Coordination in ATLAS) is critical early in a large Project and should not be underestimated.
- Reviews are useful.

Willis & Gordon



Installation & Commissioning at CERN \geq 2003

- Mike Tuts becomes US Operations Manager (2003)
 - Replaced Willis as PI of NSF Operations Grant 13-May-2005
- Howard Gordon continues as Deputy Manager
- The Operations Program covered Maintenance and Operations, Physics Support and Computing and Upgrade R&D
 - Total Budget \approx \$35 M/year
- Integration with ATLAS International
 - Melding of US Groups with ATLAS partners
 - Assembling of US Teams to install and commission the detector
 - Moving Students, Postdocs, Engineers, Technicians and Physicists to CERN
 - US Technical Coordination (Lissauer) with Nessi (ATLAS TC) crucial



Celebration of the Completion of ATLAS Detector



VIP Visit to LHC Tunnel
21-October-2008
(Columbia ATLAS website)

The LHC Magnet Incident in
September 2008 gave us more
time to commission the detector



US ATLAS Moves into Operation

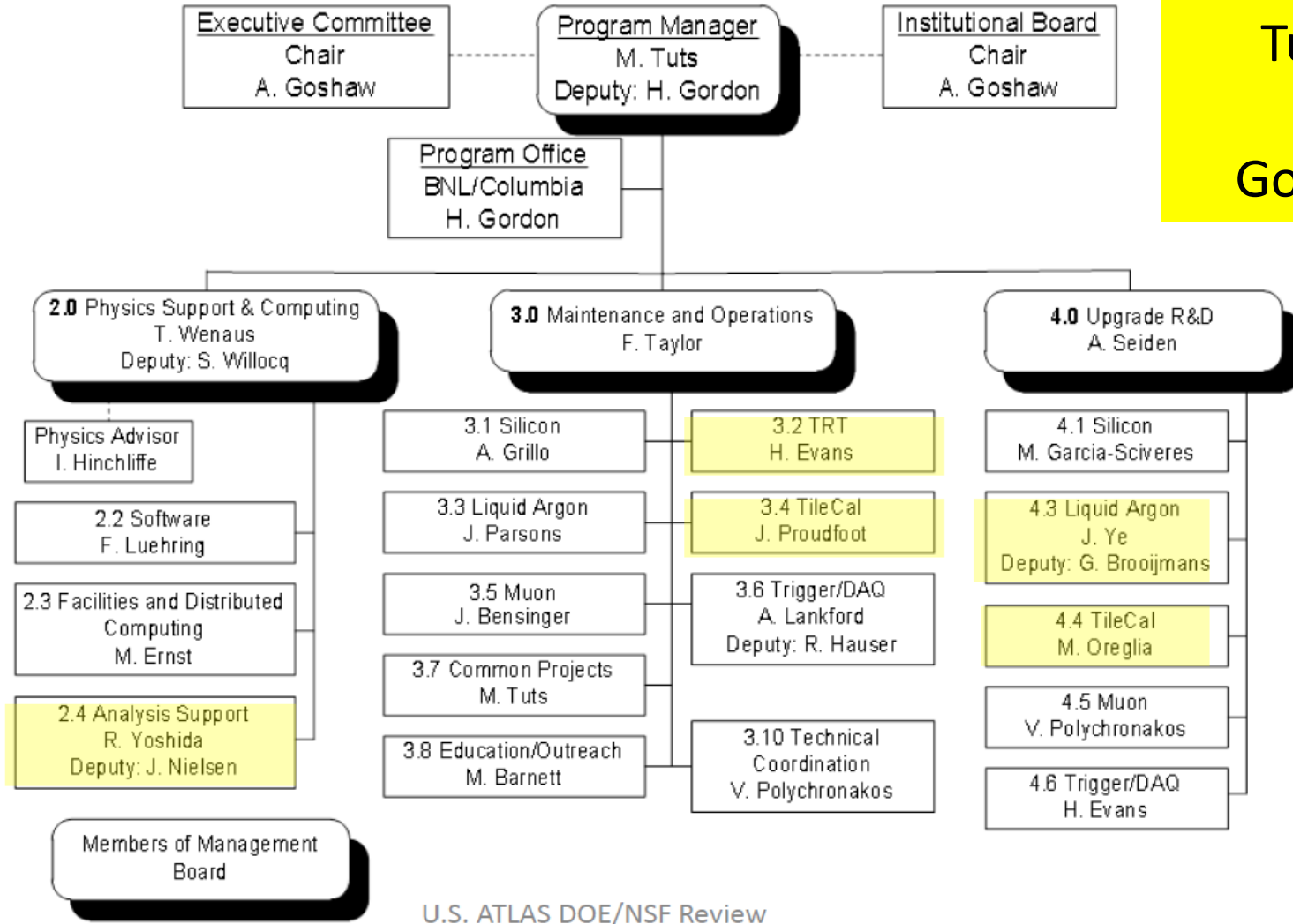
- Mike and Howard
 - Tuning the Organization Chart
 - Operations Manager & Computing
- Some equipment fixes needed
 - VCSELS Pixels
 - LAR LV power supplies
 - Muon CSC RODs
 - TileCal LV supplies (non-US) and Drawer Reliability



U.S. ATLAS Operations Program Organization as of March 1, 2012

**Tuts Program
Manager
Gordon Deputy**

**New
appointments
since last
review – for
more details
see backup
slides**



March 6, 2012

U.S. ATLAS DOE/NSF Review

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Operations Meetings & Institute Board Meetings

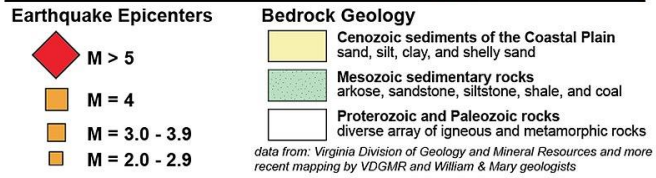
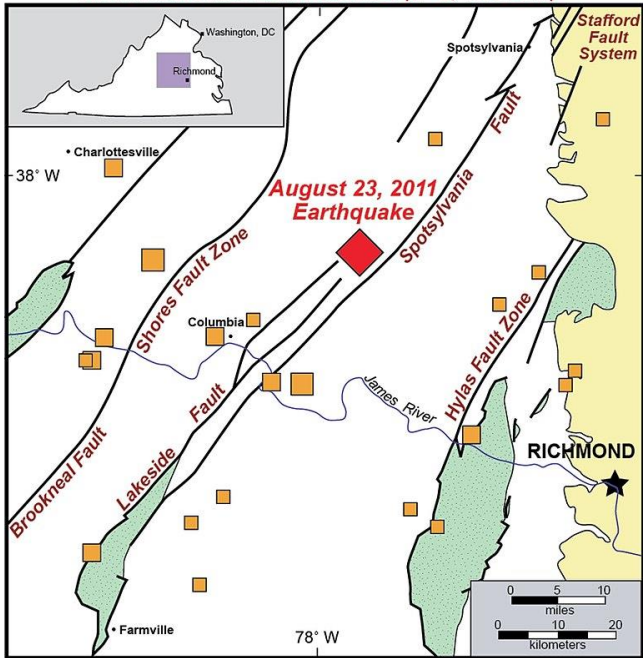
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OPS-04-Oct-10	3/8/2011 5:00 PM	File folder
OPS-07-Feb-11	3/8/2011 5:00 PM	File folder
OPS-12-Jul-11	8/2/2011 12:53 PM	File folder
OPS-13-Dec-10	3/8/2011 4:59 PM	File folder
OPS-13-Sep-11	9/13/2011 1:25 PM	File folder
OPS-14-Jun-11	8/2/2011 12:53 PM	File folder
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OPS-16-May-11	5/6/2011 12:18 PM	File folder
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OPS-23-Aug-11	8/23/2011 1:05 PM	File folder
OPS-24-Jan-11	3/8/2011 4:59 PM	File folder
OPS-25-Apr-11	5/6/2011 12:18 PM	File folder
OPS-28-Jun-11	8/2/2011 12:53 PM	File folder
OPS-29-Nov-10	3/8/2011 4:59 PM	File folder
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US ATLAS IB 09-Dec-10	3/8/2011 4:59 PM	File folder
US ATLAS IB 13-Apr-11	5/6/2011 12:18 PM	File folder
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US ATLAS IB 15-Jul-11	8/2/2011 12:52 PM	File folder
US ATLAS IB 16-Feb-11	3/8/2011 4:59 PM	File folder
US ATLAS IB 16-Sep-11	11/12/2011 11:48 ...	File folder
US ATLAS IB 22-Jun-11	8/2/2011 12:52 PM	File folder
US ATLAS IB 25-Mar-11	5/6/2011 12:18 PM	File folder
US ATLAS Meeting 15-Aug-11	9/16/2011 6:56 AM	File folder

- During commissioning and data taking the DOE and NSF wanted frequent progress reports (\approx every fortnight)
 - On the phone from funding agencies:
 - Moishe Pripstein – NSF, Amber Boehnlein – DOE, Saul Gonzalez – DOE/NSF, et al.
 - On the phone from experiments:
 - ATLAS & CMS Levels 1, 2 and 3 Managers
 - We discussed operations and upgrade work
- The IB Meetings were to inform US ATLAS Collaborators of progress & problems



Not all OPS Meetings were Predictable

GENERALIZED GEOLOGIC MAP OF THE CENTRAL VIRGINIA PIEDMONT WITH FAULTS AND EARTHQUAKES (M > 2, 1973-2011)



data from: Virginia Tech Seismological Observatory and USGS National Earthquake Information Center

C. M. Bailey, College of William & Mary

23-Aug-2011 Earthquake Magnitude 5.8 on Richter Scale

Recorded the following in my logbook:

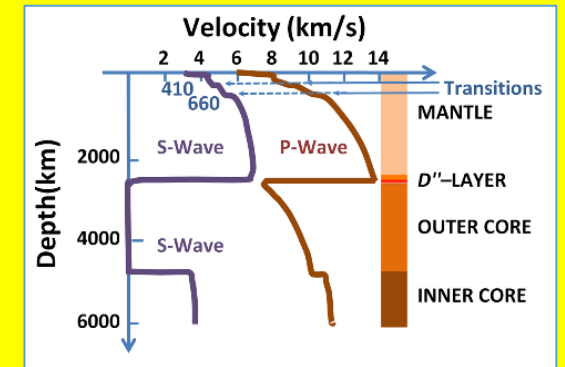
Rattled the NSF Arlington, VA: 1:51 PM EDT

Felt at Princeton

Felt at Brookhaven

Felt at MIT Cambridge, MA: 1:54 PM EDT

$$v = 717 \text{ km} / 180 \text{ sec} \approx 4 \text{ km/sec}$$





Transition to the New Management Team

DOE/NSF Review
March 6, 2012
Mike Tuts' Presentation



Program Management Plan

- Program Management Plan (PMP)
 - Complete and awaiting signoff by agencies (next slide)
- Working under the new PMP
 - At Operation Program Manager (OPM)/DOPM level
 - Srinji Rajagopalan (shadow) replaces Howard Gordon in Sept 2012 (comes in as DOPM)
 - New university person replaces Mike Tuts in Sept 2013 comes in as DOPM with 1 shadow year starting 9/12 **Jim Cochran**
 - Numerous other appointments
 - Aligning/extend the terms of appointments to allow new incoming management to provide input (to Sept 2012)

March 6, 2012

U.S. ATLAS DOE/NSF Review

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The Key to Success

- US ATLAS and US CMS, ATLAS and CMS Experiments and the LHC are GRAND SUCCESSES:
 - US ATLAS was the effort of many people but the project/program would not have succeeded without the leadership of Bill, Howard and Mike.
 - Those who had the privilege of working on the projects are universally proud.
- It's hard to define exactly what makes for good leadership but here are a few points that Bill, Howard and Mike practiced:
 - Frequent and forthright two-way communications of the Big Picture
 - Resilience and optimism in facing and solving problems
 - Supportive guidance at a nuanced technical and financial level without undermining responsibility



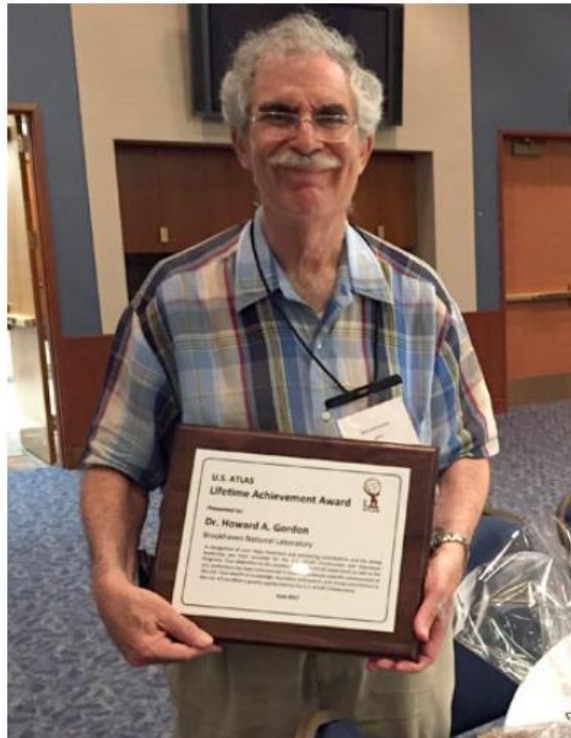
Howard Gordon Garners U.S. ATLAS Lifetime Achievement Award

Recognition for scientific contributions and leadership throughout construction and operation of world-class particle physics experiment

July 13, 2015

The discovery of the [Higgs boson](#), the last predicted particle of the Standard Model of particle physics, and the recounting of the quest for that discovery in the award-winning movie *Particle Fever* brought tears to his eyes. But an award recognizing his contributions to one of the key Higgs-nabbing experiments had physicist Howard Gordon positively beaming.

Gordon, who works at the U.S. Department of Energy's Brookhaven National Laboratory, has played pivotal roles in the construction and operation of the ATLAS experiment, one of two large particle detectors that discovered signs of the Higgs boson through careful analysis of energetic proton collisions at the Large Hadron Collider (LHC) at Europe's CERN laboratory. On June 25, the U.S. ATLAS Collaboration honored Gordon with a U.S. ATLAS Lifetime Achievement Award at their annual workshop.



Howard Gordon

BNL News

Congratulations & Many Thanks Howard!
You Kept the Project on Track!

The nice thing about retiring as a manager is that you no longer have to manage physicists !

Now you have time to chase that 1982 Snowmass Physics of the **Heavy Higgs** and to search for **(New) Heavy Techniparticles!**