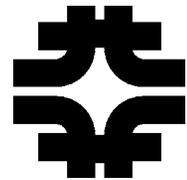




Particle Physics Division



MINOS Experiment Operations and Support

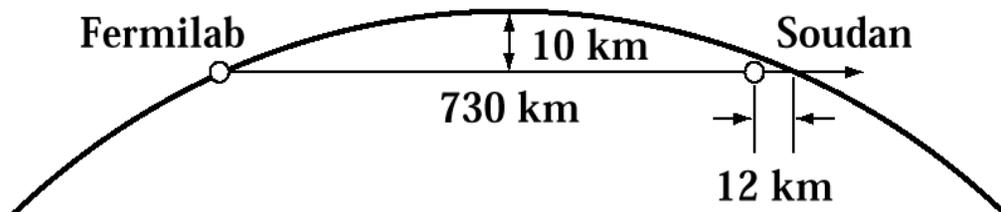
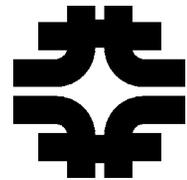
Gina Rameika

Fermilab

March 17, 2004



The MINOS Experiment

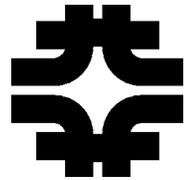


A 2-detector long-baseline
neutrino oscillation experiment
in a beam from Fermilab's
Main Injector

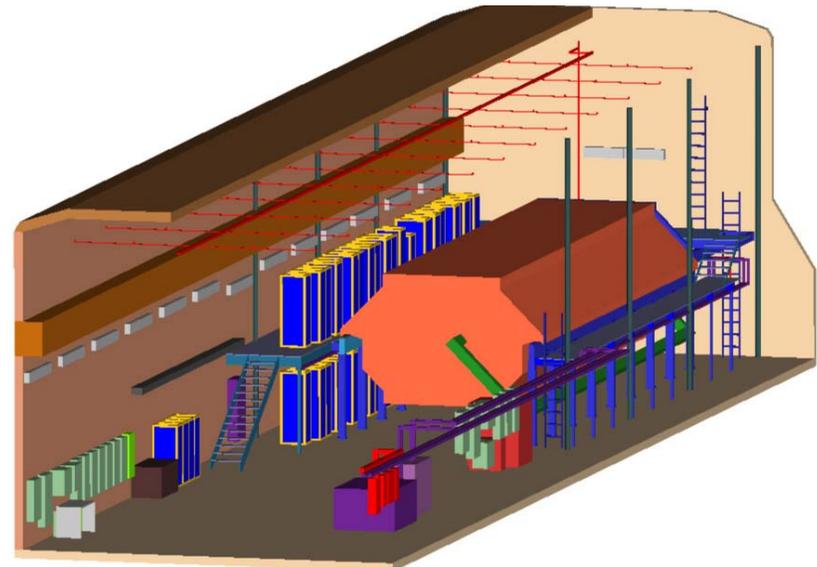
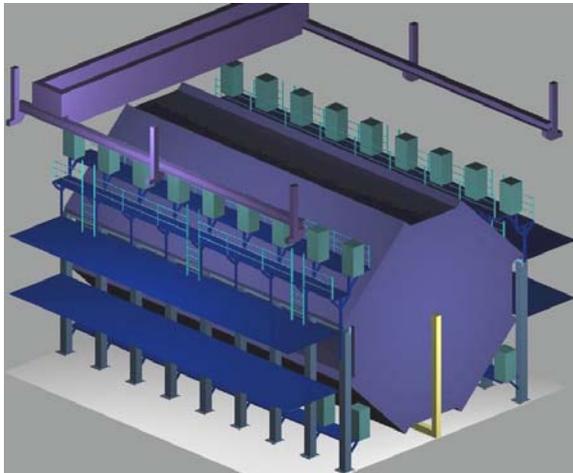
MINOS Proposal Submitted : April 1995
Stage 1 Approval : June 1995
R&D & Conceptual Design Funds: FY97-98
Equipment Funds : FY99-05

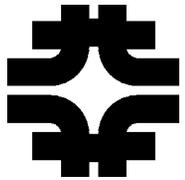


The MINOS Detectors



- Far Detector (Soudan Underground Lab)
 - 8m Octagonal Tracking Calorimeter
 - 2 sections, 15m each
 - 486 planes of steel & scintillator
 - 95,000 scintillator strips
 - **5.4 kT total mass**
- Near Detector (MINOS Hall - FNAL)
 - 3.8 x 4.8m “octagonal” steel & scintillator tracking calorimeter
 - Same basic construction, sampling & response as the far detector
 - 282 planes of steel
 - 153 planes of scintillator
 - **980 ton total mass**



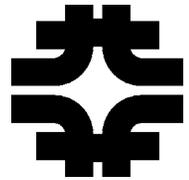


The NuMI Project

- 1.0 The NuMI Facility
 - 1.1 Technical Components
 - 1.2 Civil Construction 
 - 1.3 Project Management
- 2.0 The MINOS Detectors
 - 2.1 Steel and Coils 
 - 2.2 Scintillator Systems 
 - 2.3 Electronics, Trigger and DAQ 
 - 2.4 Far Detector Installation 
 - 2.5 Near Detector Installation
 - 2.6 Project Management
- 3.0 Other Project costs
 - 3.1 Detector R&D 
 - 3.2 Conceptual Design 
 - 3.3 Cavern Construction 
 - 3.4 Project Support 
- CD-1 Approval of Mission Need
 - 3/17/1997
- CD-3a Start Limited Construction
 - 2/15/1999
- CD-2 Approve Baselines
 - 2/17/1999
- CD-3b Continue Construction
 - 5/21/1999
- CD-4 Start Operations
 - **2/4/2005**



MINOS Detector Construction



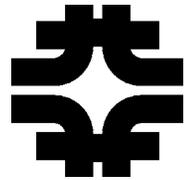
WBS	Description	Baseline Cost	DOE		UK
			FNAL	Sub-Contract	
2.1	Magnet : Steel & Coils	7,540	7,441	99	
2.2	Scintillator Detector Fabrication	19,540	4,637	12,446	2,457
2.3	Electronics, DAQ & Database	9,222	3,476	2,931	2,815
2.4	Far Detector Installation	5,077	324	4,753	
2.5	Near Detector Installation *	4,753	4,671	82	
2.6	MINOS Project Management	1,546	1,448	98	
	Total	47,678	21,997	20,409	5,272
	* RBI SB&O		2,590		

MINOS Project is a very successful model of collaborative effort between the Laboratory and University sub-contractors.

As of January 31, 2004 MINOS Construction Project was 98% costed with \$677K estimate to complete and \$3767K contingency



The MINOS Collaboration



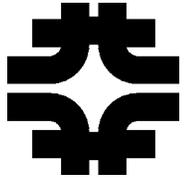
190 physicists; 29 institutions



Argonne • Athens • Brookhaven • Caltech • Cambridge • Campinas • Fermilab
College de France • Harvard • IIT • Indiana • ITEP-Moscow • Lebedev • Livermore • Minnesota-Twin Cities
• Minnesota-Duluth • Oxford • Pittsburgh •
Protvino • Rutherford • Sao Paulo • South Carolina • Stanford • Sussex • Texas A&M
Texas-Austin • Tufts • UCL • Western Washington • Wisconsin



PPD MINOS Department



(NuMI PROJECT)

(G. Bock, Project Mgr. AD)

R. Plunkett, Deputy Project Mgr.

(D. Pushka, Proj. Eng.)

MINOS

R. Rameika, Dept Head, MINOS Detector Manager

D. Boehnlein

V. Makehev, guest scientist

N. Saoulidou, RA

P. Shanahan

(R. Bernstein)

(B. Baller, AD)

(L. Buckley, CD)

(S. Childress, AD)

(D. Bogert, AD)

(N. Grossman, AD)

(R. Hatcher, CD)

(J. Hylan, AD)

(C. James, AD)

(D. Jensen, AD)

(P. Lucas, AD)

(A. Marchioni, AD)

(J. Morfin, AD)

(A. Para, CD)

(A. Read, AD)

(W. Smart, AD)

(A. Wehmann, AD)

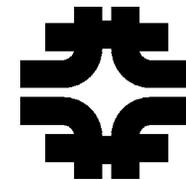
(D. Harris, AD)

Purpose of the Department

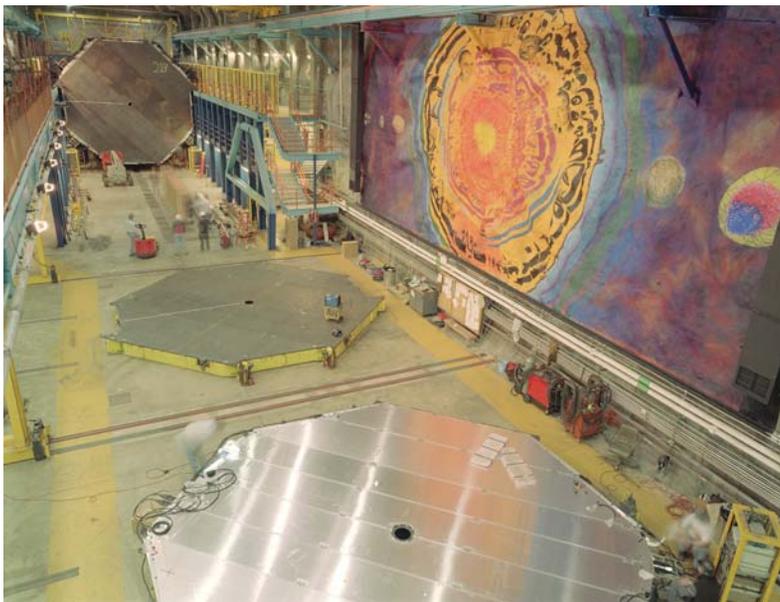
- Manage the MINOS Construction Project
- Support the Detector Installations
- Support the MINOS Collaboration
- Support Fermilab Staff for efforts on the MINOS Experiment
- Support Experiment Operations
- Manage Experiment construction and operations budgets



MINOS Far Detector Construction



Building a ship in a bottle



Installation begins July 2001



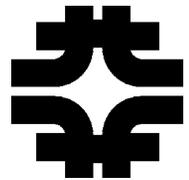
Construction completes July 2003

Minecrew : ramps up from 8 to 30 at peak of construction

Collaborators : 2-4 on site throughout construction



MINOS Near Detector Construction

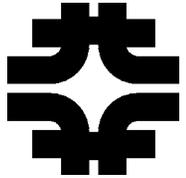


- All components ready for installation
 - Planes & electronics (New Muon)
 - Magnet Coil (D0)

Installation : April 2004 - December 2004



MINOS Transition to Operations

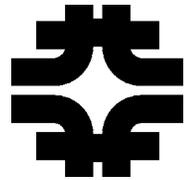


- **Soudan Laboratory**
 - Funding
 - Begin ramp up in FY01
 - All support from operating budget in FY04
 - Operations
 - Minecrew + visiting physicists underground Monday-Friday 7:30 am - 5:30 pm
 - Surface Building for evenings and weekends
 - Shift leaders house for evenings and weekends
 - 24/7 on-call for access (driven by CDMS need)
- **Fermilab**
 - Funding
 - Begin ramp up in FY04
 - All equipment funds expended by Q1 of FY05
 - Operations
 - Wilson Hall 12th floor control room (no control room at Exp Hall)
 - Monitors and controls Far Detector (evenings and weekends)
 - Commission and Operate Near Detector
- **Remote Operation**
 - DAQ, trigger, light injection control and development from Rutherford Lab and U of Sussex



Soudan Laboratory Operations

PPD WBS 40.17.02



4.1 Laboratory Operations

4.1.1 Minecrew Staff

4.1.2 DRN

Hoisting, Electricity, Staff, Lease

4.1.3 M & S

phone/network

vehicles

surface building

shifters house

chiller/air handling

computer and office supplies

facility maintenance

safety equipment and supplies

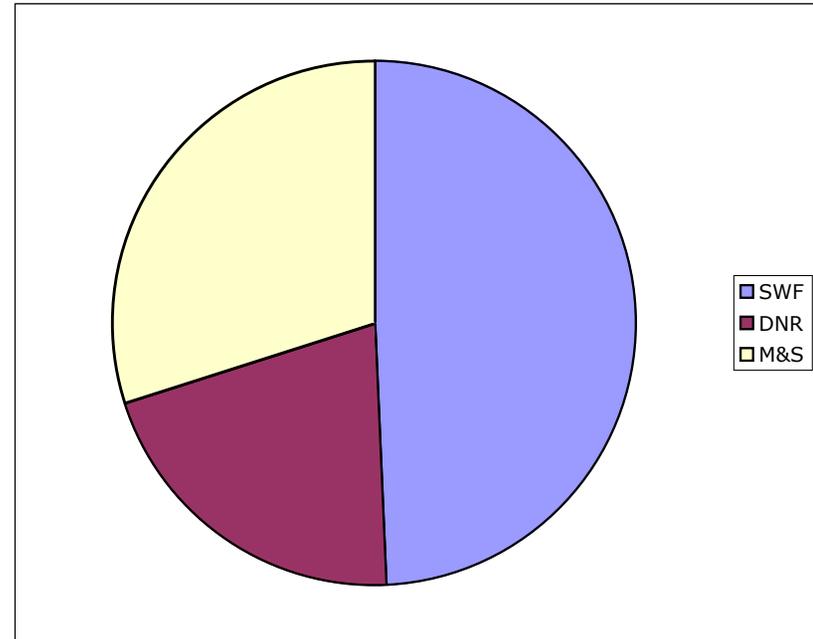
laboratory supplies

travel

shipping

4.2 Laboratory Infrastructure

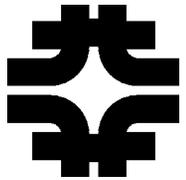
4.2.1 Network Upgrades



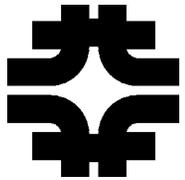
FY04 total : \$1355K
(includes 26% overhead on most items)



Far Detector Operations 2003 - 2004



- Atmospheric Neutrino data
 - SM1 only : 131 days; Sept 02 - May 03
 - SM1 + SM2 : 92 live days; July 03 - Nov 03
 - SM1 + SM2 ; Dec 03 - Mar 03 weekly up time increasing from mid-80% to ~95%



Overview of Budgets

- MINOS Project
 - 430.2.n MINOS Capital Equipment
 - 430.3.n MINOS Project Support
- PPD MINOS
 - 40.17.01 Base Program Support
 - 40.17.02 Soudan Laboratory Operations
 - 40.17.03 Soudan Laboratory Infrastructure
 - 40.17.05 MINOS Guests and Visitors
 - 40.17.06 Soudan/MINOS Management
 - 40.17.07 MINOS Near Detector Operations
 - 40.17.08 MINOS Far Detector Operations



FY04 Budgets

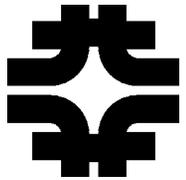
	Request	Assigned	Allocation
Soudan Operations and Infrastructure	1,500,000	1,381,837	1,300,000*
MINOS Base Program Support (M&S)	50,000	45,250	50,000
MINOS Experiment Operations	290,000	228,440	290,000
MINOS Guests and Visitors	75,000	62,000	75,000
Total	1,915,000	1,717,527	1,715,000

MINOS FY04 & FY05 Equipment : \$2500K

* Reserve held in Director's Office



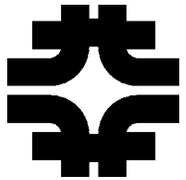
FY05 and beyond Budget Planning



- Soudan
 - Review current year need for on-call and computer system administration
 - Compare planned with actual M&S expenses
 - Determine any known cost increases
 - i.e. small increase in cavern lease from DNR
 - Modification to network service anticipated
- Fermilab
 - Carefully track operating type expenses through installation phase



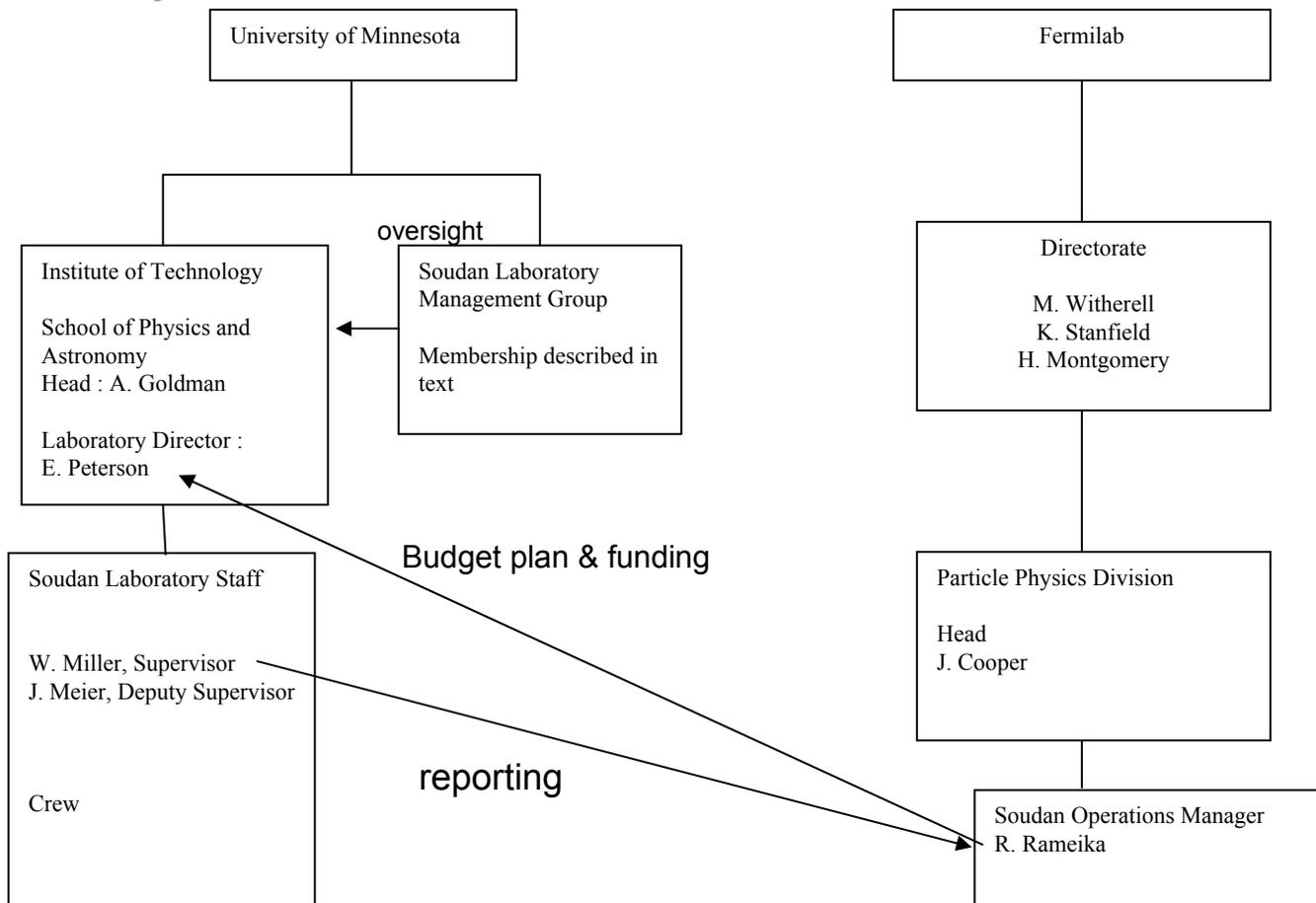
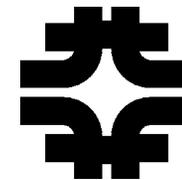
Oversight and Communication

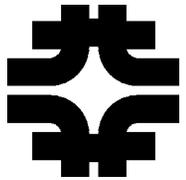


- Project Oversight
 - PMGs for cost and schedule change control (monthly)
 - Directors Reviews for Installation and Operations planning (semi-annual)
 - DOE Reviews (semi-annual)
- Communication
 - Meeting with PPD Division Head (bi-weekly)
 - MINOS Operations Board (MOB) (tri-weekly)
 - MINOS Collaboration Meeting (quarterly)
 - University of Minnesota PMG (~semi-annual)



Soudan Lab management





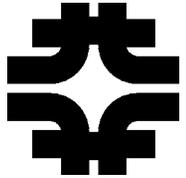
Risks and Mitigations

- Soudan Laboratory

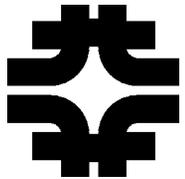
- Staffing : strikes/work actions by DNR or University
 - Mitigation : negotiation with relevant parties to maintain access
- Infrastructure : hoist, electrical, network
 - Mitigation : contingency/ reserve funds approved by FNAL Directorate

- Fermilab

- Underground facility : sump pump failure
 - Funds anticipated for 24/7 on-site response beginning in FY05
- Experiment : Electronics failures
 - Documentation and training so repairs can be made by PREP (both Near and Far electronics)



-
- **Fermilab**
 - Principles of Integrated Safety Management (ISM)
 - Work Planning Meetings
 - Job Hazard Analyses
 - Joint AD/PPD Safety review Committee for all installations
 - Safety Assessment Document
 - Operational Readiness Clearance for equipment operation
 - **Soudan Lab**
 - Responsibility of University of Minnesota
 - Oversight for construction, operation
 - Fermilab consultation



Conclusions

- **Goals for FY04-FY06**
 - Complete NuMI/MINOS construction and commissioning
 - Begin data taking with NuMI beam and get first physics results
 - Establish high efficiency, quality operations for both Near and Far Detectors centered at Fermilab
 - Reduce operations staff at Soudan by at least one FTE
- **Challenges**
 - Complete construction safely
 - Regular physicist visits to Soudan to complete documentation and procedures
 - post-docs move on
 - Soudan is remote
 - Staffing for a long-term construction/operating project
 - CD4 is just the beginning...