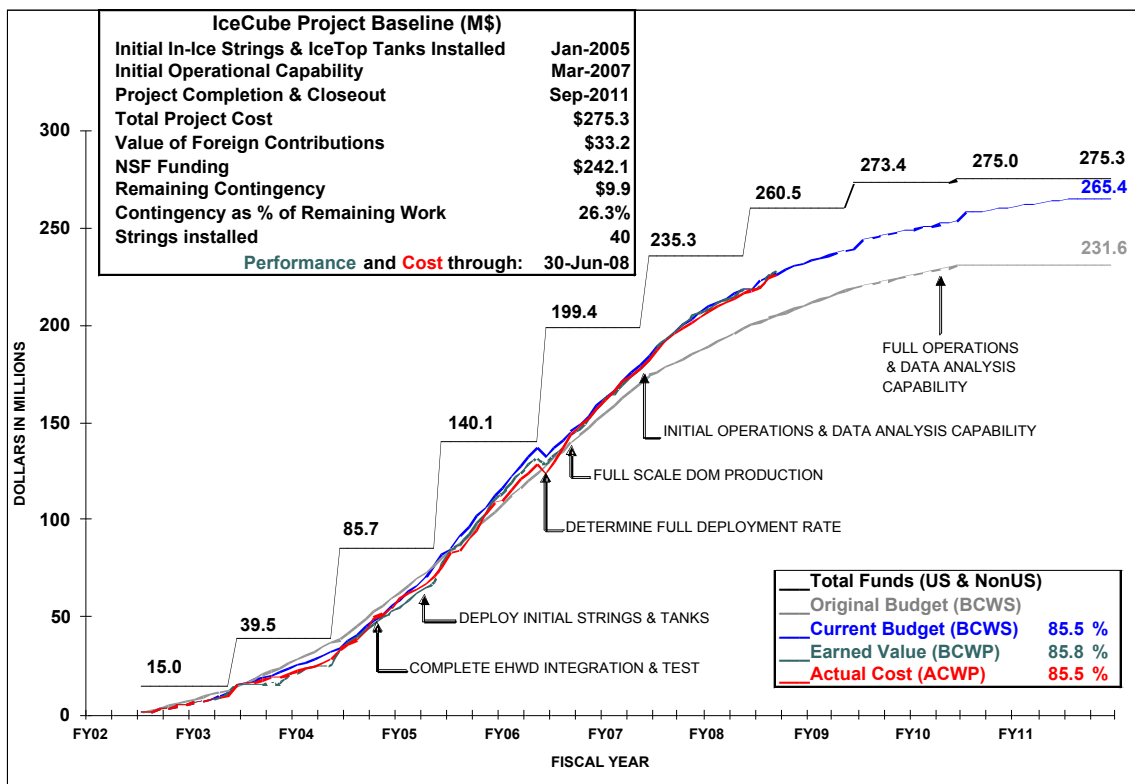


## IceCube Project Monthly Report - July 2008

### Accomplishments

- The Integrated Master Schedule is currently being revised based upon RPSC support, flight changes and station opening constraints. Currently, Drilling begins on December 5<sup>th</sup>, 2008, and provides for the installation of 19 strings and 19 IceTop stations.
- Procurements for spare parts have been made and are ready for shipment to the South Pole. Personnel have been identified and deployment dates have been coordinated.
- Data taking during July 2008 was excellent and we achieved an all-time peak of 98.6% clean runs suitable for physics analysis, with a steady flow of data from the South Pole to the IceCube Data Warehouse.
- Hardware has been purchased for upgrades to the South Pole computing system for the coming season and work is underway integrating and testing in preparations for shipping to the Pole in September.
- Automatic emails are now being sent whenever a DOM goes out of the normal range of its expected behavior. Eventually this system will be incorporated into IceCube Live.
- SafeStart training has started and is planned for all IceCubers deploying during the upcoming season. This training is about the importance of staying focused and teaches concepts on how to recognize your own mindset in order to avoid behaviors that place you in harm's way at the Pole.

**Cost and Schedule Performance** – The project is 85.8% complete versus the plan of 85.5% complete, as measured using earned value techniques. The Remaining Contingency is \$9.9M which is 26.3% of the remaining work.



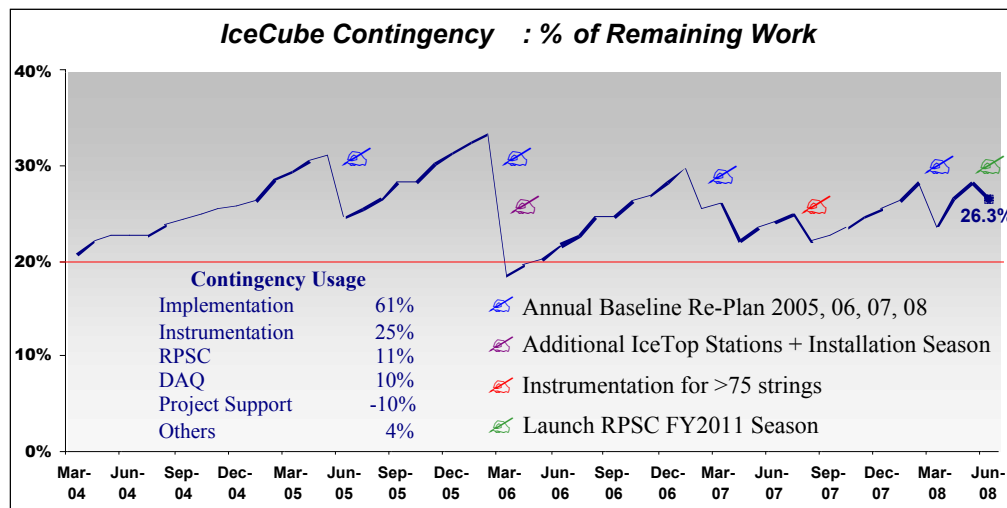
IceCube Neutrino Observatory Cost Schedule Status Report Reporting Period Ending: 6/30/2008											
Cumulative (AY K\$)								At Completion Note 4		Complete (%)	
OBS Structure L2	Budgeted Cost <sup>2</sup>		Actual Cost of Work Performed	Variance		Risk Contingency		Budgeted AY \$s	Sched	Perf	Actl Cost
	Work Scheduled	Work Performed		Schedule	Cost	Assigned	% ETC				
Project Support	23,018.2	23,018.2	22,968.7	0.0	49.5	129.8	3.4%	26,832.6	85.8%	85.8%	85.6%
Implementation	35,089.9	35,089.9	34,828.5	0.0	261.4	1,679.5	13.9%	46,939.7	74.8%	74.8%	74.2%
Instrumentation	66,691.0	67,651.2	67,492.3	960.1	158.9	298.1	7.4%	71,498.0	93.3%	94.6%	94.4%
Data Acquisition	33,278.6	33,278.6	33,245.8	0.0	32.7	77.7	14.1%	33,798.3	98.5%	98.5%	98.4%
Data Systems	23,276.9	23,276.9	23,356.2	0.0	-79.4	80.7	2.4%	26,666.6	87.3%	87.3%	87.6%
Detector Comm. & Verification	18,746.6	18,746.6	18,785.8	0.0	-39.2	178.9	9.1%	20,754.5	90.3%	90.3%	90.5%
Pre Operations	613.5	613.5	545.1	0.0	68.4	0.0	0.0%	966.2	63.5%	63.5%	56.4%
Subtotal	200,714.6	201,674.8	201,222.4	960.1	452.4	2,444.7	9.3%	227,456.0	88.2%	88.7%	88.5%
RPSC SUPPORT	25,255.5	25,249.8	24,747.8	-5.7	502.0	680.8	5.7%	36,672.2	68.9%	68.9%	67.5%
NSF	861.6	861.6	861.6	0.0	0.0	24.1	6.0%	1,263.0	68.2%	68.2%	68.2%
Total	226,831.7	227,786.2	226,831.8	954.5	954.4	3,149.5	8.2%	265,391.2	85.5%	85.8%	85.5%
CONTINGENCY								9,902.3			
<b>IceCube Total</b>	<b>226,831.7</b>	<b>227,786.2</b>	<b>226,831.8</b>	<b>954.5</b>	<b>954.4</b>	<b>3,149.5</b>	<b>8.2%</b>	<b>275,293.5</b>	<b>85.5%</b>	<b>85.8%</b>	<b>85.5%</b>

Notes: 1 Incorporates approved baseline changes.  
2 Total Budget at Completion includes non-US contributions 3,522 K over the amount in the post Hartill III baseline.  
3 Budgeted contingency is: 26.3% of the Budgeted cost of work remaining.  
4 The BAC (Budget At Completion), reflects PY7-10 detailed planning Baseline Re-Plan.  
5 Contingency is assigned based on the ETC, a bottom-up risk assessment, management judgement, and cost constraints.

IceCube's Schedule Variance at the end of June 2008 is \$955K. This favorable variance is driven entirely by Instrumentation Production.

IceCube's Cost Variance at the end of June 2008 is \$954K. RPSC's favorable \$502K variance is mostly due to lower than planned FY08 labor and On-Ice support charges. The \$261K favorable variance in Implementation is due to lagging invoices for Capital Equipment and M&S purchases and ramping down of Senior Engineers ahead of schedule.

### Contingency Status and plans



During June 2008, the contingency percentage of remaining work has been decreased from 28.3% to 26.3% as a result of a baseline change request for Launching RPSC FY2011 Season.

6/30/08

**Change Log - IceCube Total Project Budget Baseline (\$K)**

No.	Description	Date Approved	Total Baseline	Allocated Budget	Allocated Budget Change	Contingency Budget	Budgeted Cost of Work Remaining	Contingency % of Remaining Work
NA	Status as of May 2008		275,293	264,423	0	10,871	38,403	<b>28.3%</b>
CR126	Launch RPSC FY2011 Season	06/11/08	275,293	265,349	926	9,944	37,605	<b>26.3%</b>
CR125	Additional UW SC effort for DOM MB Software	07/16/08	275,293	265,391	42	9,902		
NA	Status as of June 2008		275,293	265,391	0	9,902		

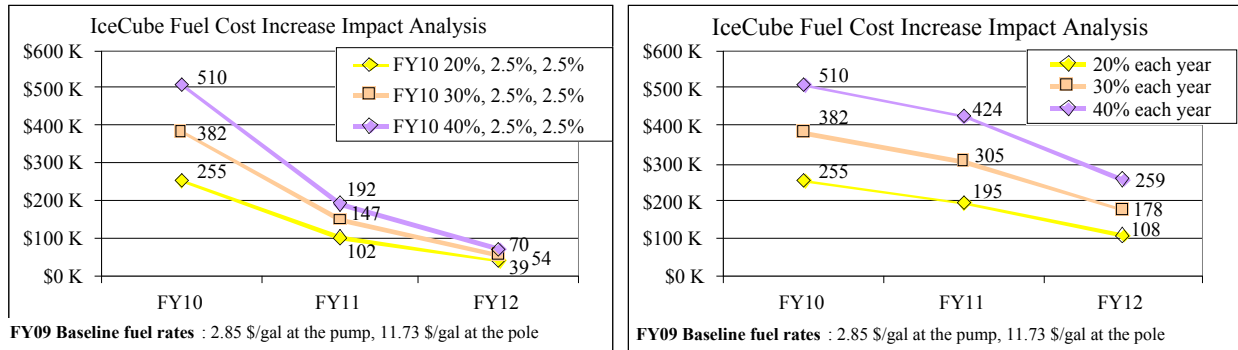
**Risk Assessment & Potential Contingency Adjustments**

Item	Estimate (\$K)
1. Assign contingency to mitigate technical, cost and schedule risks associated with the defined scope of work. Risk applied at WBS-Level 4 to assess appropriate contingency as a percent of the cost of work remaining.	\$3,150K
2. Pre-Operations Exposure for Upgrading Data Storage - 1st phase: upgrade the Data Storage and South Pole Systems to meet the collaboration's needs.	\$870K
3. Pre-Operations Exposure for Upgrading Data Storage - 2nd phase: upgrade the Data Storage to meet the collaboration's needs.	\$700K
4. Instrumentation critical path materials for up to 86 strings (Purchase 5 Surface to DOM cables, build ~100 DOMs)	\$1,350K
5. Current RPSC estimate of base cost to support the installation of 6 strings during the 2010/11 drilling season.	\$1,340K
6. The cost to retro IceCube equipment/materials from the South Pole at the end of the project in FY12, was not included in the baseline budget.	\$825K
7. Potential cost exposure to additional fuel price increases beyond normal inflation and to transferring the installation of 4 strings from FY09 to FY11.	\$600K
8. Potential cost exposure should a full FY11 drilling season be required resulting in the need to send UW personnel to the South Pole in FY12 to dismantle the drill equipment/materials and prepare the equipment for retro out of South Pole.	\$450K
9. Potential cost to implement a retention plan to secure the continued services of the experienced and highly trained U.S drillers in the final two drilling seasons, FY10 and FY11.	\$250K
10. Potential cost of restoring Basler flights and original drilling start date of December 1, 2008.	\$300K
Total	<b>\$9,885K</b>
<b>Available Contingency as of Jun 30, 2008</b>	<b>\$9,902K</b>

**Fuel Cost Increase Impact Analysis** - IceCube actual costs are sensitive to increasing energy prices. The Antarctic Program's "pump price" paid for fuel that will be used during the FY2009 season was \$2.85 per gallon. The price is expected to substantially increase for FY2010 and beyond. The project is evaluating the potential impact of higher fuel costs in the last two drilling seasons (FY2010 and FY2011) and for subsequent retro cargo transport (FY2012). This includes fuel for drilling, cargo transport, personnel at Pole, and heavy equipment use.

The project includes \$150K for potential fuel cost increases in the WBS-Level 4 baseline risk assessment. We also includes an additional \$600K potential contingency adjustment, for the extraordinary current pricing.

The graphs below show the total cost exposure as a result of potential fuel cost increase. The right graph shows the impact of a 20 – 40% increase each year and the left graph shows a one time increase in FY2010 of up to 40% and additional 2.5% inflation in FY2011 and FY2012.

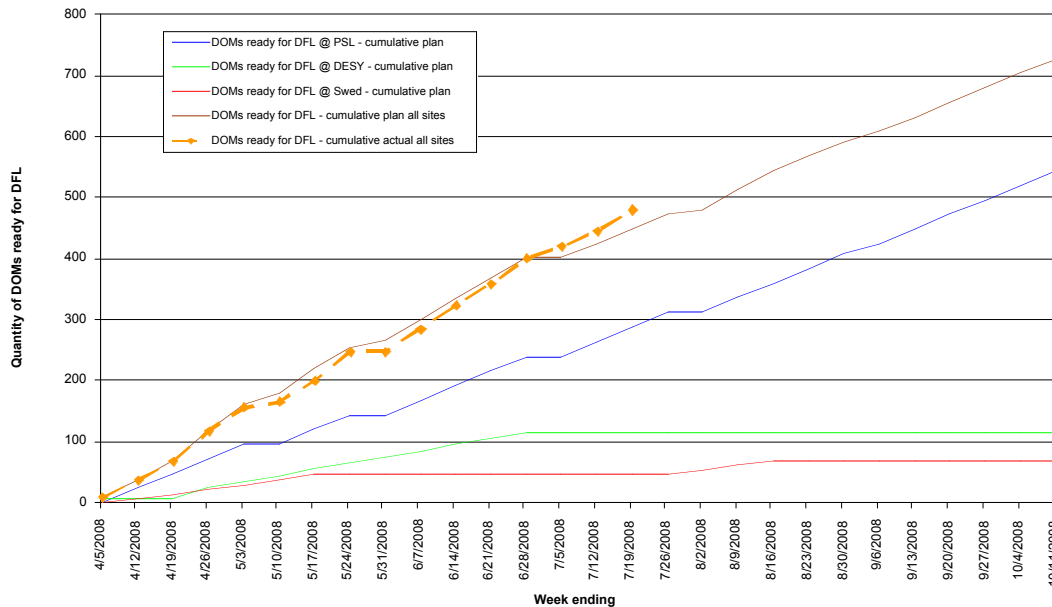


**Drill Operation and Installation** – The Integrated Master Schedule is currently being revised based upon RPSC support, flight changes and station opening constraints. Shipping activities are scheduled to begin this month. Off-ice activities for drilling including repairs, procurements, upgrades and spares are approximately 60% complete.

All off-ice Installation activities have been completed and this area is prepared for the season. Procedure and Hazard Analysis reviews and revisions are complete. Procurements for spare parts have been made and are ready for shipment to the South Pole. Personnel have been identified and deployment dates have been coordinated with the current schedule.

**Digital Optical Module and Cable Production Status and Plans** - DOM production is in progress at all 3 sites and is progressing smoothly. Surface to DOM cable production is on track. Procurement plans have been developed for instrumentation (primarily DOM hardware and cables) to restore IceCube to the originally planned 80 string configuration. This will include 15 surface cables and 6 surface-to-DOM cables, and associated breakouts and connectors.

**IceCube DOM Integration PY7 (April, 2008 to October, 2008) - Plan vs. Actual**  
 Plan to IC75+ with existing materials on hand with exceptions 4/18/08 (see Jonathan's email)



**Detector Commissioning and Verification** – Verification continues to run since the start of IC40 data collection. The verification web page is now up and running and automatic emails are being sent to a small group of people whenever a DOM goes out of the normal range of its expected behavior. As before, minor problems have been found, although now the discovery time is shorter due to the webpage and emails. Eventually this system will be incorporated into IceCube Live, the detector control and monitoring system currently under development.

The “Bad DOM list,” a compilation of DOMs deemed problematic or non-functioning by the DAQ team or by the Run Coordinator, will be used in official IC40 offline processing. Likewise, a “Bad Run List” has also been compiled and is being used as the starting point for selecting good runs for analysis purposes. (Working Groups are then expected to refine the basic criteria according to the specific needs of their analyses.)

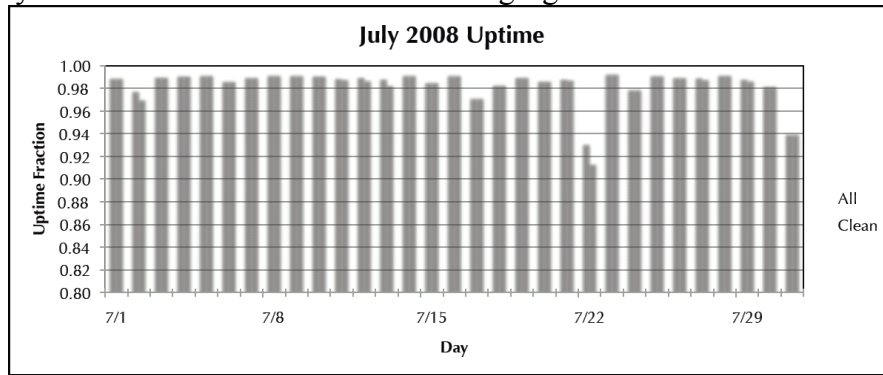
**Calibration and Monitoring** - A regular phone call has been established to focus on calibration issues, primarily on ice properties and the differences observed between simulation and data. Some effort has also been dedicated to understanding DOM-specific calibrations.

**Data Acquisition Software** –

In July the DAQ S/W group cleared the path for a new release of DAQ software called BayWolf. This release will include a fix for the subthreshold bug #2 (loss of 0.1% of triggers due to sorting problem in the trigger system) and includes a feature enhancement for IceTop that will allow tank calibration information to be extracted from the physics data stream instead of requiring special calibration runs every month. Finally, the DAQ control infrastructure was instrumented with the ability to be controlled from either the existing experimental control infrastructure, anvil, or the new IceCube Live Web-2.0 framework currently under active development and slated for release spring 2009.

The performance of the Aqua release was quite good during July. The monthly-averaged livetime reached an all-time peak of 98.6% clean runs suitable for physics analysis.

The day-by-day breakdown is shown in the following figure:



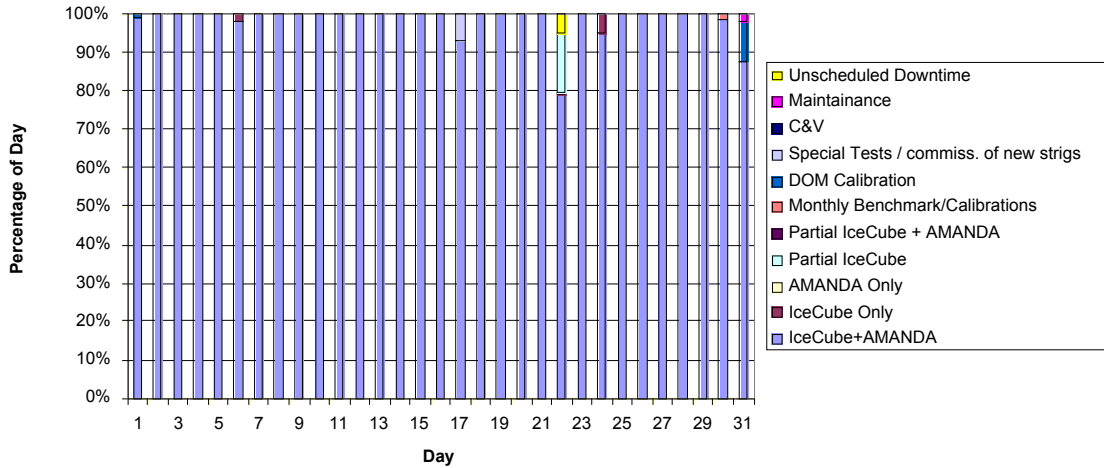
DAQ S/W has received 3 new computing hosts to be installed in the ICL during the 2008/2009 season. These new machines will replace the 5 existing server-class computing hosts currently used by the DAQ and is made possible by improvements in computing hardware and the continual performance tweaks in the DAQ software.

In addition a few of the DAQ developers were invited to present an IceCube talk at the 2008 Open Source Software Conference in Portland, OR (OSCON-08). This talk is posted at [http://gallery.icecube.wisc.edu/internal/v/graphics/Neutrinos\\_and\\_Open\\_Source.mov.html](http://gallery.icecube.wisc.edu/internal/v/graphics/Neutrinos_and_Open_Source.mov.html)

## IceCube Maintenance and Operations

Detector Up Time	98.6%
IceCube Clean Run Up-Time not including AMANDA Array	98.1%
Unscheduled Downtime	0.2%
Events from DAQ	3.35 billion

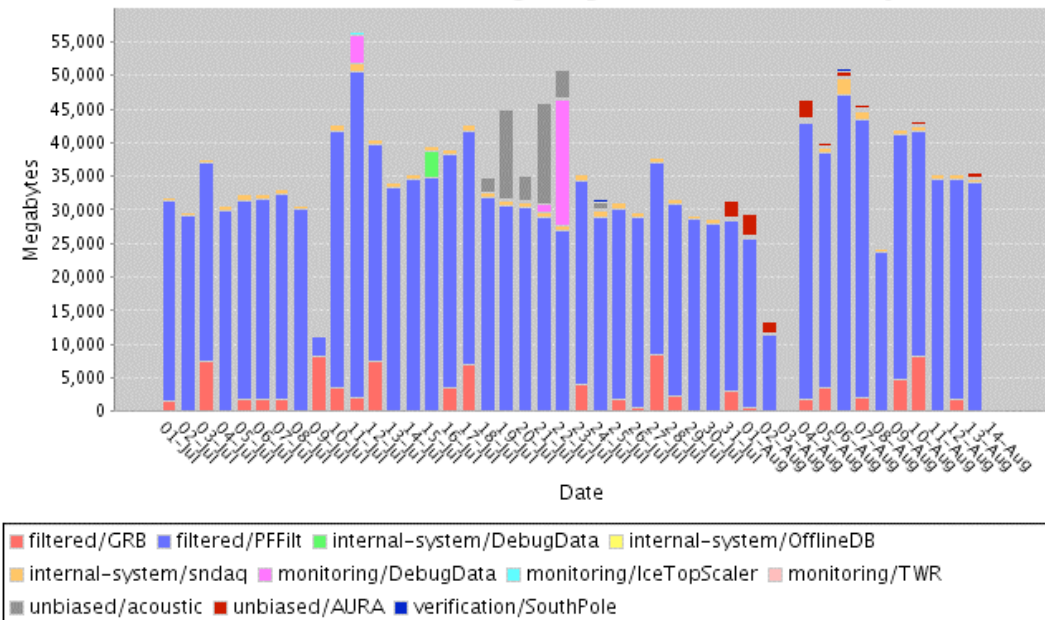
**IceCube Detector Operation for July 2008**



Data collection during July 2008 was very smooth and hit an overall 98.6% uptime. The in-ice clean run uptime was 98.1%.

**Data Handling** – Routine data operations have continued since IC40 operations began in April. Operations have continued smoothly with a very high up time of the detector and steady flow of data from the South Pole to the IceCube Data Warehouse. The figure shows the data transferred over the TDRS SPTR system from July 1 to present.

**TDRS Transfers Starting 01 Jul 2008 For 45 Days**



Hardware has been purchased for upgrades at South Pole for the coming season and work is underway integrating and testing on the South Pole Test System in preparations for shipping to the South Pole in September.

The Data Warehouse storage upgrade is close to finalized with the final components to be ordered before the end of August, with expected time to installation and move to operations by late October.

***Filtering, Software & Database*** - Filtering of IC40 data began on April 14, 2008 representing the full transition from IC-22 to IC-40. The Joint-Event Builder and Processing and Filter server (JEB/PnF) merging of IceCube-40 and Amanda TWR data streams continues at South Pole sending filtered data sets of about 35 GB/day over the satellite. Work continued on upgrading the PnF server with higher data throughput, which will accommodate the full 80 plus string detector when completed.

***Simulation*** - Mass simulation production with IceSim Version 2.2 to produce large background and signal Monte Carlo datasets for the physics working groups to prepare for IC-40 physics analysis continued in July.

***Education and Outreach*** – Professor Jim Madsen and high school teacher Steve Stevenoski made the keynote address at the annual meeting of the Knowles Science Teaching Foundation (KSTF) on July 25 in Philadelphia. The Knowles Science Teaching Foundation supports individuals and programs designed to encourage and sustain young scientists and mathematicians as they dedicate their lives to teaching other young people and to becoming leaders in the field of education. KSTF Teaching Fellows are young men and women who have received a bachelor's or advanced degree in science, engineering or mathematics and are committed to teaching high school science and/or mathematics in U.S. schools. The fellowship supports them professionally and financially for up to five years through a teacher preparation program to eligibility for tenure. Following the presentation by Madsen and Stevenoski, the KSTF has agreed to support the preparation of one or two of their Teaching Fellows to go to the South Pole with IceCube during the 2009-2010 season (or 2010-2011) as well as to involve all of their 120 teaching fellows with IceCube in some way.

***Quality Assurance and Safety*** – The Non-Conforming Material (NCM) process has been expanded to include the EHWD and the Winter Over equipment at the South Pole in addition to the analysis of failures or issues with DOM verification, test equipment, DOM components and production articles. All EHWD Hazard Analyses (HAs), have been finalized this summer and presented for Driller/Deployer training, in an effort to incorporate the seasons “lessons learned.”

SafeStart training, being taught by NANA Systems, is planned for all IceCubers, deploying during the upcoming season. The training is about the importance of staying focused and teaches concepts on how to recognize your own mindset in order to avoid behaviors that place you in harm's way at the Pole.

We now have 10 certified IceCube SafeStart Trainers that will train everyone at the Pole. In addition, the vast majority of the drillers received training and are certified to all five modules of the SafeStart Program. In addition to the regular CPR/AED & First Aid, and the OSHA based



training, the drillers were taught job specific procedures, basic electricity, basic plumbing/fittings, and rigging training.

The monthly reports are posted at [IceCube Monthly Reports](#).

**Meetings and Events**

International Oversight & Financial Group Meeting  
Fall Collaboration Meeting @ Utrecht, Netherlands

TBD, September 2008  
September 15-19, 2008