

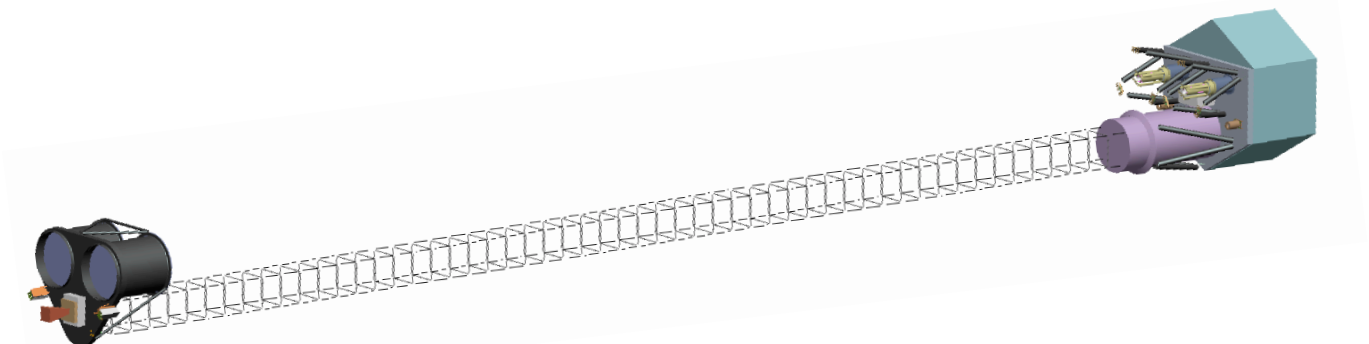
**From the project office:**

F. Harrison and Y. Kim

**Status Report.** NuSTAR continues to be on track for a successful launch in August 2011. The project is now fully staffed and making rapid progress; the mission requirements have been baselined through level 3, and the instrument teams are completing their preliminary designs.

As many of you may have heard, the FY09 federal budget process has not been without hiccoughs. As of this time, the full FY09 request for NuSTAR has been approved by the House, and while the Senate number is 25% lower, we expect a favorable resolution with full funding once congress passes a final budget. The challenge for NASA (and, by extension, NuSTAR) is that a federal budget resolution is extremely unlikely until after inauguration of the next President, meaning the agency must operate at last year's budget levels until then. We know that NASA is working hard not to impact the NuSTAR schedule. However, the agency is operating under difficult constraints and must balance risk across its programs. We have been working closely with Headquarters to develop plans that will enable us to minimize the effect of a (relatively small) budget rephasing should it be necessary. We expect final determination of the NuSTAR FY09 budget situation by December.

**Reviews.** On the 9th and 10th of July, we had two Phase B reviews, the NASA-mandated System Requirements Review (SRR) and the JPL-mandated Preliminary Mission and Systems Review (PMSR). The NuSTAR independent review board gave us very high marks for both. Over the Summer and into the Fall, we are completing the subsystem Preliminary Design Reviews (PDRs): focal plane (7/23), optics (7/30 & 31), structure (8/7), and metrology (10/21). The current plan is to have the project PDR in early June 2009 and the Key Decision Point C (KDP-C) review in August 2009.



## Mission and science payload update:

J. Willis and W. Craig

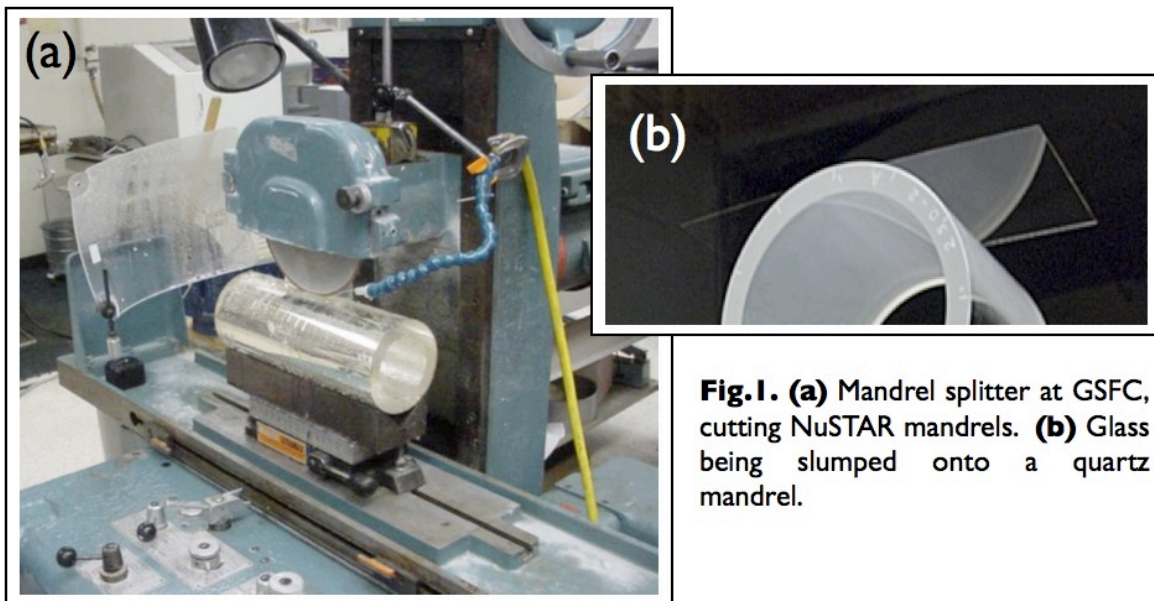
*Optics.* This newsletter highlights the NuSTAR optics design and status; future newsletters will highlight other aspects of the payload. The NuSTAR optics, composed of 130 concentric shells of grazing incidence optics, is similar to the Chandra and XMM/Newton designs, albeit optimized for higher energy photons. The NuSTAR optics production has four primary steps:

1. *Quartz Mandrel Production:* Highly-polished quartz mandrels are being provided by Rodriguez Precision Optics in Louisiana to shape the NuSTAR glass. In total, 75 half-circle mandrels of increasing radius will be produced. As of mid-September 2008, 62 mandrels have been delivered. The final mandrel delivery will happen within a month.

2. *Glass Slumping:* Borosilicate glass, identical to that used for laptop screens, will be slumped onto the quartz mandrels at Goddard Space Flight Center. The ovens are all in place and, as of mid-September, prototype glass is being slumped.

3. *Multilayer Coatings:* After the glass is shaped, it is shipped to the Danish Technical University, DTU-Space in Copenhagen, Denmark to be coated. The multilayer coating recipe, with up to 700 layer pairs per optics element, is currently being finalized.

4. *Optics Assembly:* After the glass is coated, it is shipped to Columbia University for assembly. The flight assembly machines have been ordered, and the epoxy selection has been baselined.



**Fig. 1. (a)** Mandrel splitter at GSFC, cutting NuSTAR mandrels. **(b)** Glass being slumped onto a quartz mandrel.

## **Science update:**

D. Stern and F. Harrison

*Release of Background and Response Matrices.* As of May (with small updates on June 4th), and thanks to the efforts of Kristin Madsen, the NuSTAR background and response files are completed and available to the full collaboration. They are posted to the NuSTAR google group and can also be obtained by contacting D. Stern ([daniel.k.stern@jpl.nasa.gov](mailto:daniel.k.stern@jpl.nasa.gov)). Two launch scenarios have been calculated for the background files: (i) the current plan of a 27 degree inclination orbit, as provided by a launch from Kennedy Space Flight Center, and (ii) a lower background, 5 degree inclination orbit, as would be possible if we were to launch from Kwajalein in the South Pacific. The decision on launch vehicle and site will be made this December.

*Refining the Baseline Mission.* The original NuSTAR proposal called for a three year baseline mission and outlined four primary science goals: (i) obtaining a census of extragalactic black holes, (ii) studying historical supernova remnants in our Galaxy, (iii) obtaining coordinated observations of nature's most powerful particle accelerators, blazars, with Fermi (formerly known as GLAST) and ground-based TeV observatories, and (iv) having the ability to rapidly respond to any new supernova in the nearby Universe. Since the original proposal, significant advances have occurred in the field of high energy astrophysics, including low energy X-ray observations by Chandra and XMM-Newton, and high energy observations with INTEGRAL. With the successful launch of Fermi on June 11th, further changes in the high energy scientific landscape are expected prior to the NuSTAR launch. Furthermore, the reinstatement of NuSTAR limited our baseline mission to two years. We are currently outlining a new baseline observing plan, refining the allocations for the original primary science goals as well as considering other observations ranging from Solar observations to exploring high energy diffuse emission from distant galaxy clusters.

*Science Team Meeting in Early 2009.* We are planning to have a two-day science team meeting in early 2009. The meeting will be in Pasadena, with dates still to be determined. Most likely, it will immediately follow the Winter AAS meeting in Long Beach, in January 2009.