

Report of the Space Telescope Users' Committee (STUC) Meeting, October 2002

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The Space Telescope Users Committee (STUC) met on 21st and 22nd October 2002 at the Space Telescope Science Institute.

Attended: Marc Davis, Debra Elmegreen, Martin Elvis, Suzanne Hawley, Holland Ford, Chris Impey, Karen Meech, George Miley (Chair), Peter Nugent, Dave Sanders, Karl Stapelfeldt, John Stocke.

Unable to attend: Dave Axon, James Dunlop, John Kormendy, Lisa Storrie-Lombardi.

1.State of The Project

The HST and its instruments are functioning excellently. Since our last meeting the Service Mission Orbital Verification following SM3B has been completed. Both the ACS and NICMOS are working well and producing exciting new science. We congratulate the Project and the Institute at passing the milestone of completing 500,000 observations successfully.

STUC heard about possible delays in the next servicing mission due to problems with the Shuttle. Consideration is being given to the impact on the Project of 6, 12 and 24 months delay on SM4. From the perspective of the HST community, a substantial slippage in SM4 would be highly undesirable. The two instruments scheduled for installation during SM4 will facilitate new fundamental science. A slippage would bring with it the risk that the scientific goals of these instruments would never be achieved, due to the aging of the HST. If a delay in SM4 does become unavoidable, we would hope and expect that this would have no budgetary consequences for the HST Project.

The STUC was presented with an account of the scheduling and reduction pipeline system. We were impressed with the efficiency with which the schedule was optimized to take account of constraints imposed by the need to carry out many different types of programs and observe diverse targets. Demands on the pipeline and archival retrieval are stretching the capacity of the present hardware, in particular the computing and data storage infrastructure and the software test environment. We support the plan to upgrade the pipeline hardware and its capabilities during the next 12 months.

2.Present Instruments

The quality and performance of the instruments on the post-SM3B HST is impressive. We were delighted to hear about the large attendance at the recent calibration workshop and the success of the program to out-source some calibration tasks to the community, an experiment that we have supported strongly on previous occasions. The two instruments installed during SM3B, the ACS and NICMOS were considered at length.

2.1 ACS. The STUC is delighted at the results being obtained by the Advanced Camera for Surveys, both as disseminated in the press and in the presentations at our meeting. We express our appreciation to the Instrument Definition Team, the STScI ACS group, and the Project for their contributions to this success. ACS will be a key Hubble science instrument for many years to come.

Generally the in-orbit performance of the ACS is as good or better than expected from the ground-based calibration, but minor problems include image low level ghosts with some filters and halos

around bright objects at the longest wavelengths. STUC shares the concerns expressed over the larger than expected growth rate for CCD hot pixels in the WFC, and hope that this effect can be understood. We support the proposal that a group of experts from the ACS GTO Team and the Institute brainstorm about possible ways to deal with this problem.

2.2 NICMOS. The Near-Infrared Camera and Multiobject Spectrograph has been restored to its full science capability since our last meeting. The installation of the NICMOS cryo-cooler (NCS) during SM3B was an impressive achievement. The performance of the NCS appears to be excellent and the NICMOS detectors have reached a stable operating temperature of 77.1K. The optical bench is also stable and all of the NICMOS cameras are in focus and usable. Overall NICMOS performance appears to be somewhat better than before SM3, with higher quantum efficiencies (e.g. ~60% at J) and flatter flat-fields. The early release (May'02) NICMOS science observations were impressive and demonstrate that this important near-infrared capability of HST has been restored. The STUC recommends that the community be made aware of the likely demise of K-band observations and the IR coronagraphic capability after SM4, when NICMOS is scheduled to be supplanted by WFC3.

3. Future Instruments

3.1 WFC3. The STUC was given a progress report on the development of the Wide Field Camera 3. The project is now proceeding on schedule for a shuttle launch in March 2004. The WFC3 will replace WFPC2 in SM4, and will be the first "panchromatic" camera on HST with two channels ranging in wavelength from the near-UV to the near-IR. The UVIS channel, while providing an important backup to ACS, will also provide unique NUV science. The STUC was impressed with the performance yield of 2Kx4K backside illuminated CCDs from Marconi.

In the view of the STUC the most important feature of the WFC3 is the infrared channel. This will provide a wide-field near-IR capability over the wavelength range 0.85 to 1.7 microns, with a performance expected to exceed that of NICMOS out to 1.7 microns. The STUC emphasizes the importance of the wide-field near-infrared scientific drivers for the WFC3, and is concerned that arrays with both high quantum efficiency and good stability have not yet been produced. We urge the Project to make every effort to insure that the best possible infrared detectors be procured in time for launch.

3.2 COS Written material was provided to the STUC about the state of the Cosmic Origins Spectrograph. COS is on schedule and within budget, proceeding for a planned launch in March 2004. There are two current minor issues pending. First, there is a question whether to fly the prime far-UV detector or the flight spare. The spare has a higher QE, but it is not fully characterized and might be inferior in some of its other qualities. However, since both detectors exceed specifications this is not a concern. Secondly, two deuterium calibration lamps broke during vibration tests, but the cause has been identified, and new lamps are being manufactured. Fixes are being implemented and are not expected to cause delays. A COS mini-handbook and exposure time calculator are available at <http://www.stsci.edu/instruments/cos>

4. Data Analysis and Software

4.1. The Astronomers Proposal Tool. STUC were presented with an update on the APT and a demonstration of several of its new capabilities. The APT has become a critical part of the Institute's operations, since for Cycle 12 it will be the only way for people to prepare proposals. Few members of the community have used this tool as yet. The STUC is pleased that (at our request) the development of APT is catering for support of this package for the several operating systems operated by most HST users - Linux, Solaris, Windows and Mac OS. Further, we note that the burden on Phase 2 proposers will be lessened, since the APT offers a much more usable and flexible interface than RPS2. However we urge the APT development team to ensure that a Linux version of the Phase 2 tools will be available for use in Cycle 12. STUC members will endeavor to enlist a set of APT testers at their respective home institutes to provide the development team with feedback in the use of the APT well before the Cycle 12 Phase 1 and Phase 2 deadlines.

4.2. SHARE. We were pleased at the responsiveness of the Study of Archive and Reprocessing Enhancements project to previous STUC recommendations on the higher priority to be given to instrument-related enhancements, in particular the creation of associated, CR-cleaned, WFPC2 images. We are also pleased to see that this effort utilized the work of the CADC.

We remain concerned that there are no plans to improve the astrometry of the archived data from the current level of $\sim 1''$. Accurate absolute astrometry is a fundamentally important property of archive products that is becoming even more important, with the advent of the NVO era. Since the use of time-evolving FGS/Science Instrument alignments appears not to be technically possible, we strongly urge that the use of other catalogs (SHARE Enhancement No. 5) to improve astrometry should be a high priority. The accuracy of the CADC associations at $0.3''$ should be an initial aim, but absolute astrometry of $0.1''$ can be obtained from USNO2.0 catalog. The Institute should adopt achieving this accuracy as an eventual goal. A report on progress in improving the absolute HST astrometry would be appreciated for the next STUC meeting.

4.3. THE ARCHIVE, MAST. The STUC considered the situation with the Multimission Archive at STScI (MAST) at some length. We are pleased that during the next few months it is planned to abolish the need for archival users to register and of the adoption of the CXC approach for sending encrypted pathnames to users. The MAST team has commendably sampled the needs of users in several areas, e.g. improvements to the web forms, reasons why users prefer web access to Starview, and the relative popularity of different operating systems.

The inclusion of non-HST archives in the MAST is welcome, but better standards of products, product metadata and documentation need to be negotiated with the other project teams. To prevent too many files being selected inadvertently, we suggest that for each contributing dataset a small set of "primary" products be identified, which would be the most useful for a typical astronomer. (FUSE is an example for which no documentation is available in MAST and where a simple request for a single spectrum results in the production of about 100 files). We also suggest that MAST package the data for download in a directory structure that divides the data first by object and next by observation.

The committee is aware that some users have experienced difficulty in contributing science data products to the MAST archive. The guidelines for contributing data should be agreed upon by the MAST team and implemented uniformly, and the process should not be onerous for contributors.

Regarding future MAST Priorities, we have the following recommendations:

1. Some priorities for turn-around time in delivering data from the archive should be implemented. For example small data sets should take priority over large data sets, proprietary data requests by PIs over generic requests for public data, etc. We also see the need for a flag in the Phase II process that the PI's could select to request very fast turn-around times. Programs such as ToO's or those with scheduled follow-up and/or coordinated observations should be able to retrieve the data as soon as possible. In the NVO era users will more often want to browse images, overlaying several wavelengths quickly. For this application a response time of under a minute would be needed. We would like to hear suggested approaches to this problem from STScI.
2. The percentage of unscheduled downtime of the archive should be based on those at other national facilities (such as the National Energy Research Scientific Computing Center, the San Diego Supercomputing Center, etc.) which are typically less than 10%. However, we strongly suggest that downtimes be kept to an absolute minimum within a month prior to the proposal deadlines as delays during this period produce an adverse effect on the community writing proposals
3. STUC encourages carrying out a user survey to determine what additional features from Starview would be useful on the web-based form.

4.4. Multi-Platform Support. In the past we have urged the STScI to make more efforts to ensure that software developed by the Institute runs on all platforms used extensively by the User community. We note that Linux is rapidly gaining ground and becoming the most popular operating system for astronomical data reduction. In order to provide software that runs on Linux, it is desirable that the developers are familiar with this operating system. We are therefore glad that the STScI has at last begun supporting Linux on the computers of Institute staff.

5. Proposal Selection

The committee noted that the recent TAC review commissioned by STIC is in general agreement with our conclusions presented in the April 2002 STUC report, that the Cycle 11 TAC was fair and unbiased. We were also gratified that many of the STIC committee recommendations (e.g. ensuring the involvement of experts in judging each proposal, limiting the Large and Treasury programs to 1/3 of the total observing time and improving the comments to the proposers), echoed our previous comments. Although we support the provision of useful written feedback to the proposers and the requirement on each Panel Chair to write a summary of the rationale for the Panel decisions, we reiterate that evaluations are often based on subjective criteria that cannot be stated explicitly. In addition, we believe that special care should be taken to ensure that no funding is allocated for archival and theory proposals already funded through another source.

6. Go Funding Procedure

Over the years the funding provided for HST data has been responsible for stimulating an enormous amount of excellent fundamental science. STUC appreciated receiving a detailed description of the mechanism for awarding GO and AR funds. The process appears to be fair in providing necessary funding to reduce analyze and disseminate data. We were pleased to learn that there were relatively few appeals following the decisions of the Financial Review Committee and that these were invariably resolved. Several STUC members remarked about the helpfulness of the Budget office in providing individual assistance for problems in entering their data into the Grants software handling system. We are concerned about the apparent underutilization by the community of the funding earmarked for education and public outreach and suggest that this issue be pursued at a future meeting.

7. The Future of Hubble

At both our last two meetings the STUC discussed the desirability of NASA conducting a reevaluation of the strategy for maintaining the HST over the next decade. In our reports and in a letter to the Director of the Astronomy and Astrophysics Division of NASA, we have suggested that serious consideration should be given to the cost effectiveness of taking proactive measures to ensure that the performance of the HST is kept up to modern technological standards, at least until such time as the NGST is likely to be scientifically productive, that may well be several years later than the presently planned date of 2010. We pointed out that the strong likelihood of a substantial lag between the cessation of HST operations and the launch and scientific exploitation of the NGST.

A new instrument fitted to the HST during a SM5 mission on the 2007 and 2008 timescale would facilitate a large amount of exciting new and fundamental science for several years. For example, by detecting and studying a large sample of supernovae at redshifts >1 , a new wide field camera on the HST could establish the large-scale geometry of the Universe to a substantially greater precision than ever before, one of NASA's highest priority goals. Alternatively, a coronagraphic camera would tackle another of NASA's highest priority goals, the discovery of Jupiter-like planets around nearby stars. Finding and characterizing these so-called "safe harbors" would provide important impetus and information needed for NASA's long-term search for earth-like planets. These are only 2 of many potential scientific drivers for extending the mission.

The huge scientific gains of extending the lifetime of the HST and possibly reequipping it with modern instruments, is an incremental investment in space science whose cost effectiveness should be balanced against all other NASA activities. We encourage the Institute and/or the Project to instigate an independent study by a committee distinguished scientists to consider the rationale and possibilities for extending the lifetime of the telescope. The issue is an extremely important one, with wide national and international implications for the progress of science and its visibility amongst the general public. In view of the likely ramping down of expertise that is scheduled to occur in the course of the next 2 years, urgent action is required.

Further, the committee urges the Director of the STScI to open the discussion of the future of HST and its scientific justification to the general community. Two possible opportunities are to solicit feedback at the Treasury program workshop in November 2002, and to convene a May workshop in 2003 focused on this topic.

8. Next Meeting

The next STUC meeting will be held during April 2003. Possible items for consideration at this meeting include (i) the state of WFC3 (ii) education and public outreach and the under-subscription of existing E/PO programs (iii) an update on the possibility of an additional shuttle mission to extend the life of the HST (iv) PYRAF and STSDAS and (v) the progress in refining the astrometry of HST archival data. We suggest that a web site be set up where STUC can read/ download the Powerpoint presentations for the meeting and that these be supplied to the website beforehand.

George Miley, who is leaving the committee after 4 years as its Chairman, thanked the other members of the committee for working together constructively, the STScI for their input and responsiveness to the recommendations of the committee. The new Chair will be Debra Elmegreen.