MITIGATING THE THREAT TO SOLAR SYSTEM SCIENCE IMPOSED BY MCT PROGRAMS.

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A White Paper on HST Multi-Cycle Treasury Programs

Summary: Multi-Cycle Treasury (MCT) programs represent a threat to HST's highly-productive solar system science program, which is characterized by projects with relatively small orbital allocations. The proportion of high-profile solar system science returns is three times greater than the corresponding orbital allocation to the solar system science category, and scheduling challenges faced by solar system programs often result in narrow visibility windows. These two facts lead to two recommendations to accommodate both solar system and MCT programs:

Preserve (or increase) the *number* of solar system science orbits per cycle, rather than the *percent* of solar system science orbits per cycle.

Require MCT programs to be interruptible, in order to facilitate scheduling of solar system programs.

Orbit-efficiency. According to the *STScI Annual Report 2006*, 7% of cycle 15 orbits were devoted to solar system science. But a look at the most highly-recognized HST science results shows a much larger contribution from this science category. Of the ten science articles in *Hubble 2006: Science Year in Review*, two consisted of solar system science, for a solar system contribution of 20%. Of the HubbleSite News Releases in 2007, 21% of science releases (7 of 33) were devoted to solar system science. Thirteen HST programs contributed to the seven news releases in 2007, with a median orbital allocation of only seven orbits per program. (The mean of 19 orbits per program in this set was highly influenced by a single 125-orbit program in support of the International Heliophysical Year; without this program the contributors to 2007 solar system news releases had a mean allocation of only 10 orbits per program.)

These figures suggest that solar system programs produce high-profile science results using fewer orbits than other science categories, so a reduction in the allocation of solar system science orbits would disproportionately impact the science productivity of HST. HST's solar system science program should therefore be carefully preserved.

Unique scheduling challenges. Observations of solar system targets are generally more difficult to schedule than observations in other science categories for several reasons. Objects in the ecliptic plane suffer spend more than four months of every year in the solar exclusion zone. Increased timing constraints apply to observations of features on rotating bodies, of targets in multi-object systems, and of dynamic processes in the solar system. Spatial resolution is typically optimized by requesting time near the closest geocentric approach of a solar system target. These scheduling challenges mean that windows of opportunity for solar system projects are often highly confined.

MCT threat mitigation. Simple steps can be taken to limit the negative impact on solar system science due to MCT programs.

To preserve the efficient output from solar system science programs, a minimum number of solar system orbits should be preserved in each cycle. Because MCT programs will reduce the total available orbits for GO programs in a given cycle, STScI should be prepared to increase the solar system wedge beyond 7% to maintain or expand the level of support for solar system projects. The increased allocation would necessarily result in reductions to allocations to other categories, but this adjustment is justified by the relatively high science productivity of solar system programs as discussed above.

"Interruptibility" should be explicitly required of MCT programs in order to minimize scheduling conflicts with solar system programs. The scheduling limitations of solar system programs can kill entire programs if their scheduling windows coincide with a chunk of consecutive orbits allocated to a large program. STScI should determine a maximum size of non-interruptible orbit allocations, and strictly impose the size limit on MCT programs. MCT programs unable to provide interruptibility should be rejected, since they will have significant negative impacts on the solar system science capability of HST.