

# Multi-Cycle Treasury Programs with HST

## White Paper Review Committee:

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### 1. Introduction

Over the past 17 years, HST has revolutionised diverse fields spanning the gamut of astronomical research. Servicing Mission 4 (SM4) is planned for August 2008, with the prime goal of maximising the scientific return from HST over the next 5 years. With that goal in mind, the STScI Director is considering augmenting the current range of proposal types by adding the new category of Multi-Cycle Treasury Programs (hereafter, MCT Programs). These are envisaged as programs that tackle key scientific issues that **require** large-scale allocations, exceeding 400 orbits.

Following the example of the Chandra Observatory, white papers were solicited from the community as an aid in determining whether the new proposal category is scientifically necessary. Those papers either describe science programs that require multi-cycle scale allocations, or outline alternative strategies for allocating HST time.

Twenty-two submissions were received in response to the call for white papers. Nineteen support the addition of MCT Programs; two white papers outline concerns regarding the addition of a new type of large HST program; and one presents some concerns regarding the time allocation process, should the Director decide to implement the MCT Program.

### 2. Assessment

The white papers were reviewed by our small *ad hoc* committee. Our charge is to determine whether they provide sufficient basis for recommending implementation of MCT Programs. In reviewing these papers, we note that we support the concept of maximising the scientific return after SM4. We also believe that it is important to take advantage of the capabilities offered by HST, an existing facility, even in scientific areas that may be the subject of future space missions.

Of the two white papers that were critical of MCT Programs, one proposed more extensive allocation of time to ultraviolet observations; the second asked for assurances that Solar System science would be protected. We believe that both concerns can be addressed within the context of the standard TAC process.

The detailed scientific programs described in the submitted white papers are confidential. However, the nineteen submissions that support MCT Programs can be grouped under six broad headings:

1. Cosmology and dark energy;
2. The high redshift universe ( $z > 7$ );
3. Galaxy evolution;
4. The ISM and IGM;
5. Stellar populations in nearby galaxies; and
6. Exoplanets.

We take the individual white papers as representative of the potential impact of MCT Programs in their respective areas. In each case, we undertook a two-part assessment; first, we rated the proposed science; second, we made our estimation of whether the proposal required a multi-cycle approach.

Overall, we were all impressed with the strength of the scientific ideas presented in these 19 white papers, despite the relatively restricted format. It is our assessment that there are important scientific questions within each area that can only be addressed through time allocations significantly exceeding 400 orbits. In particular, we believe that MCT Programs can have a considerable impact in probing dark energy, surveying the high redshift universe and completing a legacy survey of galactic stellar populations.

### ***3. Recommendations***

**The committee is unanimous in our assessment that the white papers outline a significant number of large-scale programs that are capable of producing shorter-term, high-impact science and a longer-term scientific legacy for HST. These programs require allocations of observing time that we believe are beyond the scope of the current TAC process. We therefore recommend that the STScI Director explore means of implementing Multi-Cycle Treasury Programs.**

The selection process for MCT Programs will be defined by the Director, working in consultation with the HST Project, NASA Headquarters, the Space Telescope Users' Committee and the broader HST community. However, the present committee has a number of suggestions:

- We believe that MCT Programs should be considered separately from the standard TAC process.
- The Call for MCT Proposals should not be issued until after SM4 is completed, and on-orbit tests have verified the performance of each instrument.
- There should be no restrictions on the type science available to MCT proposals.
- The data from MCT Programs should be made available to the whole community on a fast-track timescale. We therefore encourage maximum cooperation by the community to optimise the MCT Programs proposed in each area.
- STScI may wish to consider a two-stage application process, with initial written proposals reviewed and ranked by an international committee of proven broad expertise. Their deliberations could be assisted by written reviews by additional, external referees, who are specialists in the appropriate fields. PIs of highly ranked programs could be invited to make in-person presentations before the final selection is made.
- Accepted programs must **require** a multi-cycle approach, and the review panel(s) must be prepared to allocate no time if no proposals meet minimum criteria;
- As with the original HDF program, STScI should provide an opportunity for archival programs, contemporaneous with MCT observing program;