National Aeronautics and Space Administration

Headquarters
Washington, DC 20546-0001

Reply to Attn of: SMD/Astrophysics Division

DEC 23 2013

TO: Kevin Grady
AFTA Study Office Manager
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Exoplanet Exploration Program Office Manager
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FROM: Director
Astrophysics Division

SUBJECT: Coronagraph Technologies to be Continued as Directed Technology Development Efforts for AFTA

Since Fall 2012, NASA has been studying potential uses of the 2.4m telescope assets that were made available to the Agency. The studies included both (1) whether the telescope assets could be used to realize a mission that responds to the number one recommendation of the Astrophysics Decadal Survey for a wide field infrared survey telescope (WFIRST) and (2) an assessment of possible applications to other NASA objectives in science, technology, and human space flight. Following a presentation of the results to the NASA Administrator and other senior officials across the Agency on May 30, 2013, the Administrator directed the Science Mission Directorate to continue pre-formulation activities for a mission using the 2.4m telescope assets to prepare for a later decision as to whether a WFIRST mission would be undertaken with these optics. This concept, termed AFTA (Astrophysics Focused Telescope Assets), was to include a coronagraph instrument in the baseline mission concept. However, the coronagraph was not allowed to impose driving level one requirements on the mission concept.

In order to maximize the return on technology investment and maintain a potential start date for AFTA Phase A as early as FY17, should funding become available, the AFTA Study Office and the Exoplanet Exploration Program Office were directed to develop a joint recommendation for primary and backup coronagraph architectures in order to focus design and technology investments leading to a potential new mission start.

To gather broad community input the following process was implemented to develop the AFTA Study Office and Exoplanet Exploration Program Office joint recommendation.

An AFTA Coronagraph Working Group (ACWG) was chartered in June 2013 to assist in the down-select process through a series of workshops and telecons. The working group was comprised of 27 members formed from the representatives of the coronagraph technologists, the Exoplanet Exploration Program Office, the AFTA Study Office and the AFTA Science Definition team (SDT). The charter for the ACWG is attached for reference (Enclosure 1).

In a series of intensive multi-day workshops between July and December 2013, the ACWG (supported by engineering and science teams performing offline simulations and design studies), established a comprehensive recommendation matrix summarizing the strengths and weaknesses of the analyzed coronagraph designs relative to scientific performance, compliance with interface requirements, ability to develop the necessary technology on the desired schedule and budget, and ability to support long term mission goals beyond AFTA.

In parallel an independent Technology Analysis Committee (TAC) of non-conflicted technology experts in the field of coronagraphs was chartered to follow the ACWG process and review its products. The committee provided its final input to the AFTA Study Office, the Exoplanet Exploration Program Office, and the Astrophysics Division in a detailed presentation on December 9, 2013.

Based upon the inputs from the ACWG and the TAC, the AFTA Study Office and the Exoplanet Exploration Program Office recommended to the Astrophysics Division Director on December 15, 2013, that the primary internal coronagraph architecture for further AFTA study be an Occulting Mask Coronagraph (OMC); this hybrid design incorporates a single optical design with both Hybrid Lyot (HL) and Shaped Pupil (SP) occulting masks. In a single optical design, this solution provides the AFTA mission with a low risk/simple/robust path, along with a higher risk/higher science yield path. Numerous descope options are inherent in the OMC architecture for possible future programmatic, technical or scientific reasons. The back-up architecture recommended by the AFTA Study Office and the Exoplanet Exploration Program Office was the Phased Induced Amplitude Apodization Complex Mask Coronagraph (PIAACMC). PIAACMC provides greater potential science return however with greater risk and potential requirements growth. An ITAR-cleared version of the presentation made on December 15 is attached (Enclosure 2).

Based upon the AWCG study, the TAC report, and the recommendations made by the AFTA Study Office and the Exoplanet Exploration Program Office, I am selecting the OMC as the primary AFTA coronagraph architecture and PIAACMC as the backup AFTA coronagraph architecture.

Effective immediately, the AFTA Study Office is directed to proceed with maturing the technologies for the OMC and PIAACMC architectures and work with the PIs of the relevant Technology Demonstration for Exoplanet Missions (TDEM) proposals to identify the new scope of work consistent for the AFTA specific technology and establish funding vehicles for the work to be done. The new tasks and awards should be in place

by the end of January 2014. Funding for this activity will be held in the AFTA Study Office budget and managed by the AFTA Study Office.

As in the past, all TDEM results have been made publicly available. This practice should continue with the AFTA coronagraph technologies. The AFTA Study Office is to ensure that the coronagraph technologies funded by AFTA will be made available to all who wish to propose to a potential future AFTA AO for a coronagraph instrument. A plan for ensuring this is to be submitted to the Astrophysics Division AFTA PE no later than January 30, 2014 for review and approval.

The AFTA Study Office is to submit technology milestones for the coronagraph for review and approval by the Astrophysics Division AFTA PE no later than January 30, 2014. If you have any questions about the plan forward, you may contact the AFTA PE, Ms. Lia LaPiana, for further guidance. Ms. LaPiana can be reached by email at lia.s.lapiana@nasa.gov, or by phone at 202-358-0346.

The AFTA Study Office and Exoplanet Exploration Program Office are commended for a well thought out recommendation which incorporated input from many technical experts.

Paul L. Hertz

2 Enclosures

cc:
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