



Date: June 14, 2018

To: B. Scott Gaudi/OSU and Sara Seager/MIT, Co-Chairs, HabEx STDT  
Debra Fischer/Yale and Bradley Peterson/OSU, Co-Chairs, LUVOIR STDT  
Asantha Cooray/UC Irvine and Margaret Meixner/STScI, Co-Chairs, OST STDT  
Feryal Ozel/U Arizona and Alexey Vikhlinin/SAO, Co-Chairs, Lynx STDT

From: Paul Hertz/Director, Astrophysics Division, Science Mission Directorate

A handwritten signature in blue ink, appearing to read "PH", located to the right of the "From:" line.

Re: NASA's Large Mission Concept Studies

My memorandum of June 1 requires clarification and, in some cases, correction and explanation. I am withdrawing my June 1 memorandum in its entirety and issuing this new one.

NASA's highest priority for the 2020 Decadal Survey of Astronomy and Astrophysics is that it be ambitious and forward looking. The Decadal Survey is charged with identifying the highest priority and most compelling science questions, and with recommending the capabilities that we require to answer those questions. The questions that drive astrophysics today are far-reaching, and they will not be easy to answer. How did the universe begin and what is its destiny? What is the origin of today's structured universe of galaxies, stars, and planets? Are we alone? In setting priorities for the upcoming decade, the Decadal Survey will set bold and ambitious goals for astronomy and astrophysics and push the limits of human ambition.

Lessons learned from previous Decadal Surveys have shown that Decadal Surveys are best served when they have a range of options to consider. The 2017 National Academies study "Powering Science" recommends that

"In preparation for the decadal surveys, large strategic mission proposal teams should consider describing ranges of scientific scope for their recommended large strategic missions, such as minimum science goals and maximum budgets, as well as identifying what science goals are most desirable at different budget levels. This approach may allow the scientific community and NASA to develop less expensive implementation strategies for mission concepts that do not exceed current budget limitations."

Each of the four large mission concept Science and Technology Definition Teams (STDTs) recently submitted its interim report to NASA. In the interim reports, exciting science missions are described that address the compelling science objectives identified by your STDTs through extensive interactions with the science community. Every one of these missions is compelling and would advance the boundaries of our knowledge about the universe.

All of the STDTs are commended for their hard work to date and for submitting the interim reports of their mission concept studies.

All of you are planning to consider a second architecture during the next year that is less costly than your first architecture. This is responsive to Decadal Survey best practices of providing a range of scientific scope for large mission concepts considered by Decadal Survey Committees. The work to date, culminating in the interim reports, was Phase 1. The purpose of this memorandum is to acknowledge your plans and to provide some guidance in the development of your second architecture during Phase 2.

The challenge for each of the STDTs in developing a less costly, second architecture is to carefully consider the trade between cost and capability, and put forward a second architecture where the cost savings exceed the capability reductions, i.e., consider “bang-for-the-buck” as one of your criteria.

The LUVOIR team has already determined that its second architecture will have a mirror ~50% as large (in diameter) as the architecture in their interim report. For the other three mission concepts (HabEx, Lynx, OST), a goal of  $\leq$ \$5B is set for the estimated cost of your second architecture.

Both of the architectures that you study should be submitted to the Decadal Survey for their consideration. This will provide a range of science scope (across the four mission concepts) and capability scope (across the two architectures) for the Decadal Survey to consider.

NASA is not interested in a conservative Decadal Survey process. Rather the goal of these mission concept studies, including both architectures for each mission concept, is to provide the Decadal Survey with a range of possibilities to inform their recommendations of a compelling astrophysics program for the next decade.

Given this guidance, the Decadal Studies Management Team of the NASA Astrophysics Division will be considering whether some of the dates, deliverables, and constraints on the final report might need to be adjusted; if so, these will be communicated through updates to the Management Plan. Since the scope of the work has been changed, other adjustments may be necessary for the Teams. Please work with your Study Scientist and Study Manager, and with your Program Scientist at NASA Headquarters, to redirect resources as appropriate.