National Aeronautics and Space Administration
Jet Propulsion Laboratory
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Exoplanet Exploration Program

"New Worlds" Plans and Risk Mitigation

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Purpose of this Briefing

- The budget landscape has changed dramatically since the formulation of the last Decadal Report
  - The budget may not be available within the Astrophysics Division to support a exoplanet flagship mission implementation during the 2020s.
  - ExEP needs to plan to mitigate this risk.

- We will describe our plans for activities responding to NWNH:
  - Technology development leading to flagship direct detection mission.
  - Planning for off-ramp to smaller mission concepts as risk mitigation.

- We request APS endorsement of tasking ExoPAG to support the Program in developing some analyses for a smaller exoplanet mission

New Worlds, New Horizons:

- One of the fastest-growing and most exciting fields in astrophysics is the study of planets beyond our solar system. …
  - committee recommends a program to lay the technical and scientific foundations for a future space imaging and spectroscopy mission.
  - NASA should support competed technology development to advance multiple possible technologies for a next-decade planet imager,
  - a technology down-select should be made and the level of support increased to enable a mission capable of studying nearby Earth-like planets to be mature for consideration by the 2020 decadal survey, with a view to a start early in the 2020 decade.

ExEP Plans to Implement NWNH Recommendation

- Continue competed technology program (TDEM).
- Continue precursor science: Kepler, LBTI
- Develop NW mission concepts for leading technologies (2-3).
  - Solicit RFIs or ISWGs – mid-2012; select – late 2012.
  - ISWGs work with Program to develop science requirements, missions concepts, figures of merit.
- Mature NW mission concept(s) for 2020 Decadal Review.
- Parallel activities:
  - Continue work with Cosmic Origins for potential joint UVO mission.
  - Possible precursor science may be done with small competed missions and ground observing.

Biggest Risk Element

- Availability of funding for a New Worlds flagship mission in 2020's.
  - Overall national budget priorities.
  - Competing budget demands within the Astrophysics Division budget
- Many factors may make a flagship impossible in the next decade.
- Another 10+ year delay in significant NASA Exoplanet science advancement will have negative impacts on health of the community and the field.

Proposed Mitigation Action

- Initiate activities to develop “off-ramp” mission concepts in the $350M-1B and $1-2B cost categories in preparation for the 2020 Decadal (while still maturing flagship mission concepts and technologies as articulated in the NWNH decadal.)

- Follow a path similar to that called out in RFI for future PCOS missions:
  - Issue RFI for instrument and mission concepts.
  - Convene Community Science Team(s) to work with Program to develop concepts for 2020 Decadal.

Steps in developing Probe Class Exoplanet Missions.

- Task ExoPAG to create a SAG for probe class size missions similar to what has been established for flagship missions (SAG 5).
  - Identify compelling science that can be done at the life cycle cost break points of $350M- $1B and $1-2B.
  - Concepts not restricted to imaging/spectroscopy direct detection.
  - Charter similar to SAG 5 to develop for each type of concept,
    - Science Questions
    - Measurements required
    - Key performance requirements

- NASA issue RFI for a minimum number of concepts to cover the possible science – by Fall 2012.

- Solicit and select Community Science Teams (CST) for each concept type to work with the scientific community and the Program in reviewing the RFI responses and developing mission concepts at the various cost points.

- Reevaluate the status mid-decade for developing plans for the second half of the decade

- Mature concepts for 2020 Decadal as off-ramp option.

ExoPAG Role in Probe-class Roadmap

- Continue on-going work of existing SAGs to completion, including Flagship Requirements and Characteristics analysis.

- Charter a SAG to:
  - analyze what science would be compelling yet achievable at the $350 – 650M and $1 – 2B price categories.
  - Develop for questions, measurements and performance characteristics for each type of concept. Measurement types not limited to imaging and direct spectroscopy, but may include transits, transit spectroscopy, astrometry, etc.

- Draft charter
  - This group will analyze science questions that would be compelling in the 2020's, to develop a set of measurements and performance requirements that would be affordable at specified price points. NASA's progress in this work will be presented to the Decadal Survey Implementation Advisory Committee (DSIAC) in 2015, and eventually will be presented to the Astrophysics Decadal Survey in 2020. The SAG will assemble science requirements from the Exoplanet Exploration Program will add a list of technical and programmatic criteria which should be considered in the decision. The report will contain the elements which are deemed relevant to a robust decision between the various architecture families in the future.

Summary

- Continue efforts to execute the NWNH #1 priority medium scale activity: preparation for New Worlds imaging flagship.
  - Develop technology aimed at eventual NW flagship, identifying off-ramps for Probe-scale fall-back.

- As a mitigation of ExEP program risk due to uncertain funding for 2020 flagship, prepare portfolio of less expensive missions:
  - Execute process to develop best set of Probe concepts offering compelling science and technology demonstration potential.
  - Task ExoPAG to perform key analyses to support NASA decisions in this process.