

National Aeronautics and Space Administration



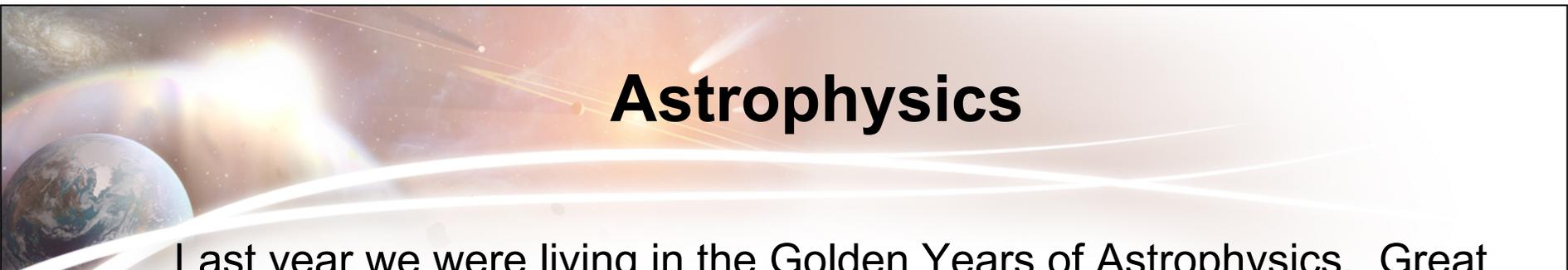
SCIENCE

## NASA Astrophysics and Technology

**Mr. Michael R. Moore**  
Science Mission Directorate  
NASA

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[www.nasa.gov](http://www.nasa.gov)



# Astrophysics

Last year we were living in the Golden Years of Astrophysics. Great Observatories were done, SM-4 was a great success and JWST was on the way.

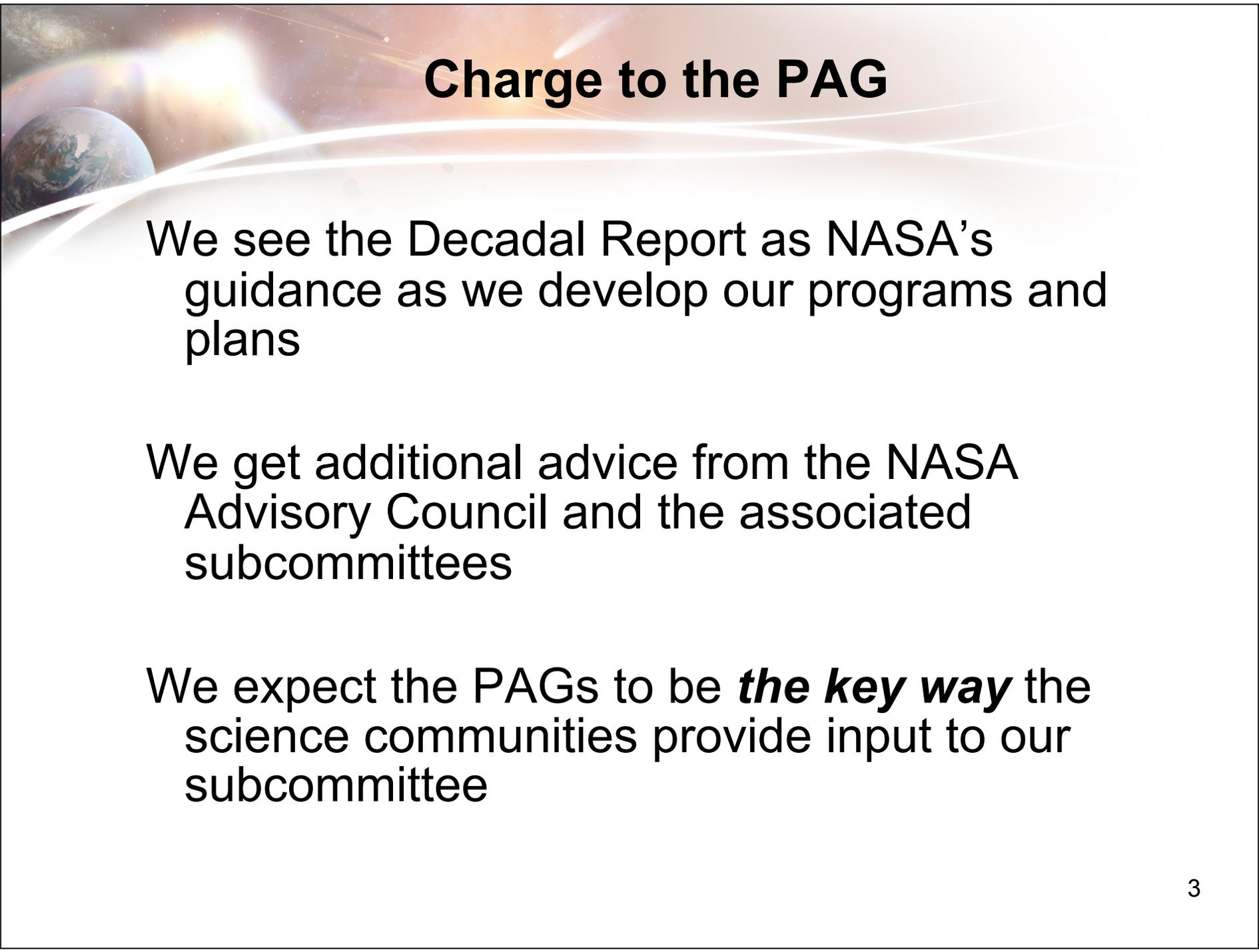
This year things are much the same, with a twist. We still have most of our systems flying and working well. JWST is still making great technical progress. We have our new Decadal to give us guidance for the next 10 years.

But, JWST is costing us more than we expected and will take longer than we hoped

The Decadal survey was a bit optimistic about potential budget outcomes

We are still trying to come to a solution to their desires that will allow something like the desired WFIRST to be done within a decade of their report

The results of the ongoing budget process for the FY 11 budget, the FY 12 Presidents budget, and the Congressional response to that will be key to our ability to meet the decadal goals.



## Charge to the PAG

We see the Decadal Report as NASA's guidance as we develop our programs and plans

We get additional advice from the NASA Advisory Council and the associated subcommittees

We expect the PAGs to be ***the key way*** the science communities provide input to our subcommittee



# Decadal Emphasis

**Do a flagship Mission (Wide Field Infrared Survey Telescope (WFIRST) with *minimum new technology***

**Do more small missions (Explorers) (*no new technology*)**

**Do a Gravity Wave detection mission (after Technology demonstration in space succeeds)**

**Do technology to get ready for the next Survey**

*IXO, LISA and the HST follow-on in UVIS become technology activities*



# **Astrophysics Technology**

**A key element in the future of the Division this decade**

**Approximately \$100M (TBC) potential yearly expenditure**

**Executed through many different elements from grants to directed NASA Center Activities**

**Our recently completed Decadal has given us new guidance for the next 10 years**

**Much of the guidance was directed at Technology investments**

# Astrophysics Division - Science Mission Directorate

## Technology Structure

**Director**  
Jon Morse  
**Deputy Director**  
Geoff Yoder

*Asst Dir for Innovation & Technology: Michael Moore (acting)*  
*Asst Dir for Policy & Planning: Stephen Merkowitz (acting)*

### Astrophysics Research

*Program Manager: Linda Sparke*

Astrophysics Data Analysis:  
Astrophysics Theory:  
Cosmic Ray:  
Gamma Ray/X-ray:  
IR/Submillimeter/Radio:  
Astrobiology/Optical/UV:  
ADCAR/Archives:  
Balloons Program:  
Total:

- + Member of the Mgmt & Policy Division
- \* Detailee, IPA, or contractor
- \*\* Member of the SMD Front Office
- \*\*\* Member of the Heliophysics Division

### Programs / Missions

#### Exoplanet Exploration (EXEP)

**Doug Hudgins** *Program Scientist*  
**Lia LaPiana** *Program Executive*

Keck, Kepler, LBTI, NExSci, SIM, WFIRST

#### Cosmic Origins (COR)

**Eric Smith** *Program Scientist*  
**Michael Moore** *Program Executive*

Herschel, HST Ops, **JWST**, SOFIA, Spitzer

Tech Program:

#### Physics of the Cosmos (PCOS)

**Rita Sambruna** *Program Scientist*  
**Jaya Bajpayee** *Program Executive*

Chandra, Euclid, Fermi, INTEGRAL, IXO, LISA, Planck,  
ST-7/LPF, XMM-Newton

Tech Program:

#### Astrophysics Explorers (APEX)

**Wilt Sanders** \* *Program Scientist*  
**(Willis Jenkins\*\*\*)** *Program Executive*

Astro-H, GALEX, GEMS, NuSTAR, RXTE, Suzaku, Swift,  
WISE, WMAP



## How do we relate to OCT

They work to develop technologies that address a broad range of Agency needs in exploration, science and aeronautics.

SMD is a member of a management group that determines *joint* investment plans

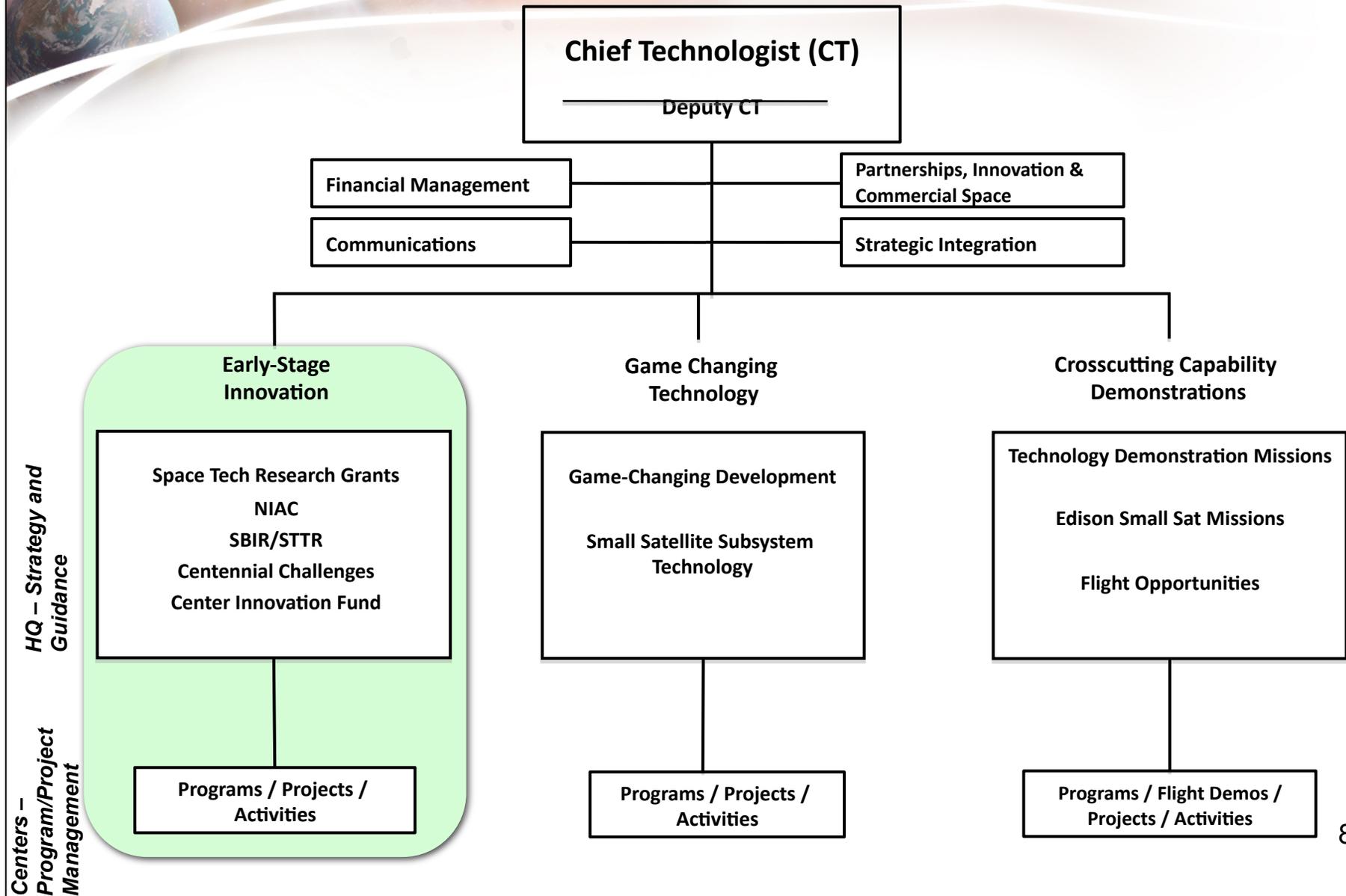
We help with development and maintenance of the *Agency road maps*

We coordinate with them on their investments

To date, we are working on EDL and Optical Communications technologies together

Future cooperative investment mechanisms are being developed

# OCT Organization





# Grand Challenges

[http://www.nasa.gov/pdf/503466main\\_space\\_tech\\_grand\\_challenges\\_12\\_02\\_10.pdf](http://www.nasa.gov/pdf/503466main_space_tech_grand_challenges_12_02_10.pdf)

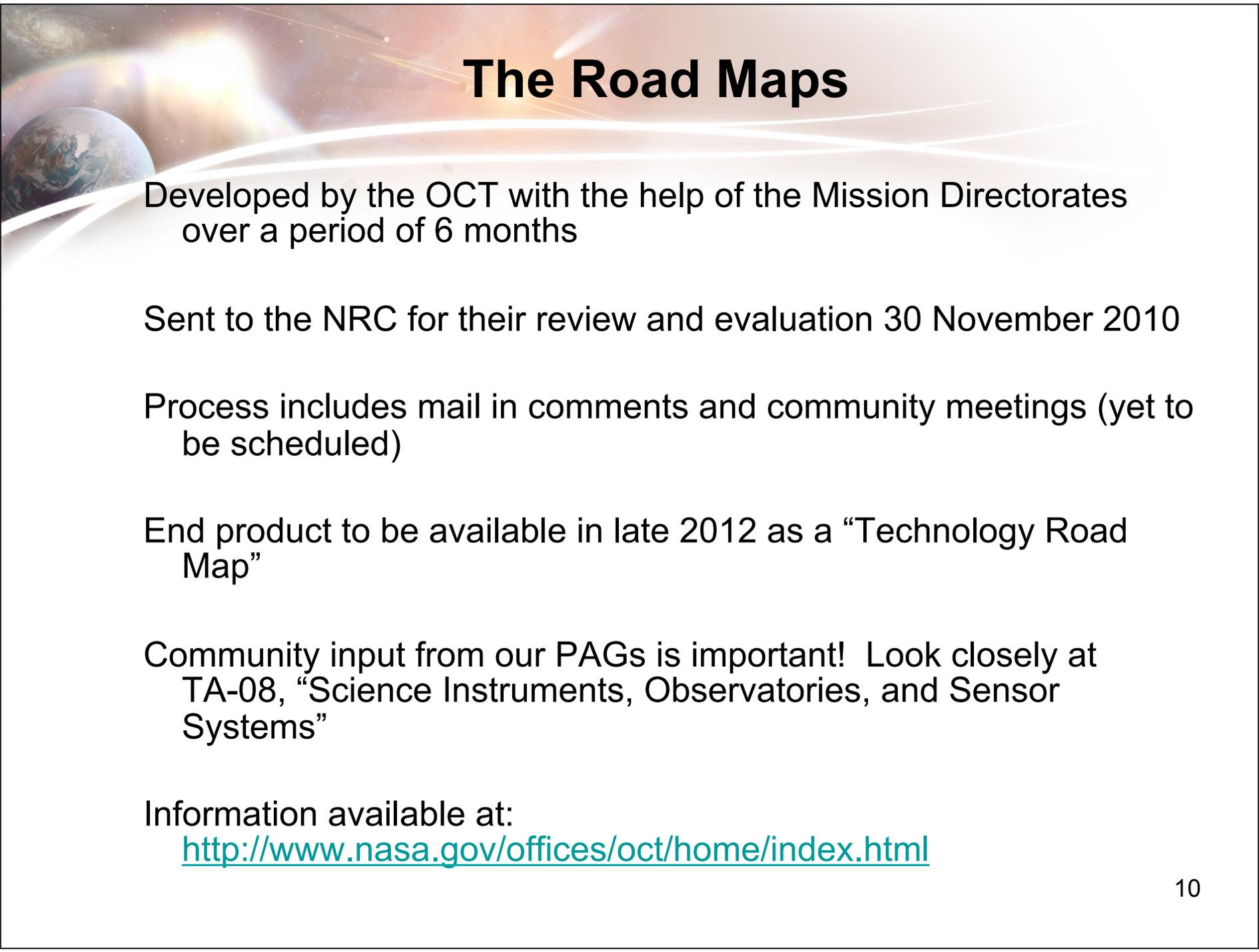
The Space Technology Grand Challenges are an open call for cutting-edge technological solutions that solve important space-related problems, radically improve existing capabilities or deliver new space capabilities altogether.

The challenges are centered on three key themes:

Expand human presence in space,

Manage in-space resources, and

Enable transformational space exploration and scientific discovery.



# The Road Maps

Developed by the OCT with the help of the Mission Directorates over a period of 6 months

Sent to the NRC for their review and evaluation 30 November 2010

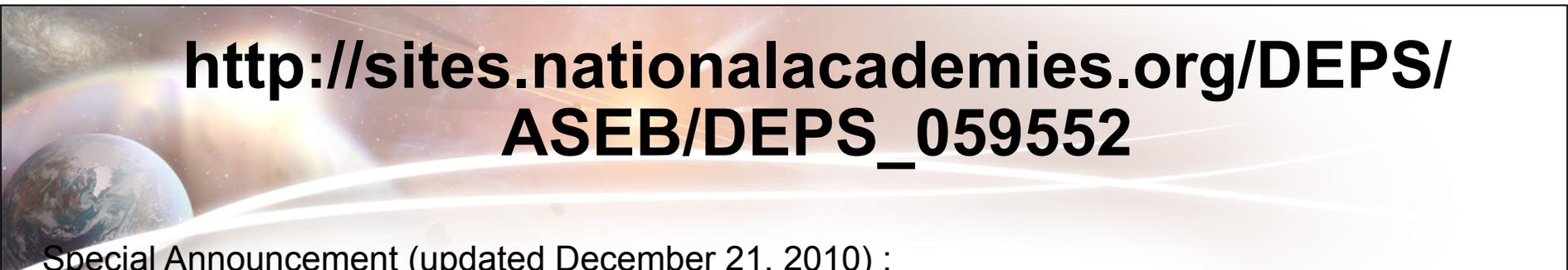
Process includes mail in comments and community meetings (yet to be scheduled)

End product to be available in late 2012 as a “Technology Road Map”

Community input from our PAGs is important! Look closely at TA-08, “Science Instruments, Observatories, and Sensor Systems”

Information available at:

<http://www.nasa.gov/offices/oct/home/index.html>

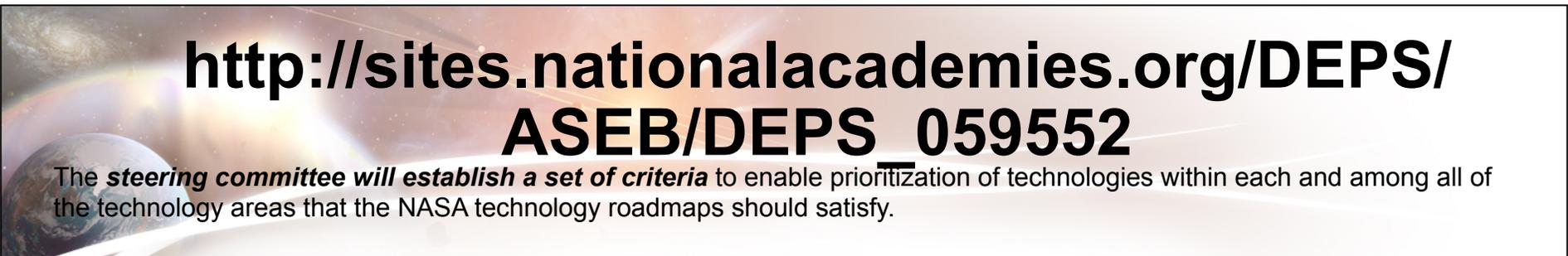


# [http://sites.nationalacademies.org/DEPS/ASEB/DEPS\\_059552](http://sites.nationalacademies.org/DEPS/ASEB/DEPS_059552)

Special Announcement (updated December 21, 2010) :

While the committee and panels for this activity are yet to be appointed, the ASEB welcomes community input on the statement of task for this study (see below) and the draft NASA technology roadmaps. If you would like to provide such input then email the ASEB at [roadmaps@nas.edu](mailto:roadmaps@nas.edu). Please note that all input will be placed on the NRC Public Access File for this activity. A more comprehensive set of questions for the community may be posted once the committee for this study has been appointed and has met. Please return to this page for future updates in this regard.

The NRC will appoint a steering committee and six panels to solicit external inputs to and evaluate the 14 draft technology roadmaps that NASA has developed as a point of departure. The study committee will also provide recommendations that identify and prioritize key technologies. The scope of the technologies to be considered includes those that address the needs of NASA's exploration systems, Earth and space science, and space operations mission areas, as well as those that contribute to critical national and commercial needs in space technology. (This study will not consider aeronautics technologies except to the extent that they are needed to achieve NASA and national needs in space; guidance on the development of core aeronautics technologies is already available in the National Aeronautics Research and Development Plan



# [http://sites.nationalacademies.org/DEPS/ASEB/DEPS\\_059552](http://sites.nationalacademies.org/DEPS/ASEB/DEPS_059552)

The **steering committee will establish a set of criteria** to enable prioritization of technologies within each and among all of the technology areas that the NASA technology roadmaps should satisfy.

Each **panel will conduct a workshop** focused on one or more roadmaps, as assigned, to solicit feedback and commentary from industry and academia on the 14 draft roadmaps provided by NASA at the initiation of the study.

Interim Report

Based on the results of the community input and its own deliberations, the **steering committee will prepare a brief interim report** that addresses high-level issues associated with the roadmaps, such as the advisability of modifying the number or technical focus of the draft NASA roadmaps.

## **Final Report**

Each panel will meet individually to suggest improvements to the roadmaps in areas such as:

- the identification of technology gaps,
- the identification of technologies not covered in the draft roadmaps,
- development and schedule changes of the technologies covered,
- a sense of the value (such as potential to reduce mass and/or volume, number of missions it could support, new science enabled, facility to operate, terrestrial benefit) for key technologies,
- the risk, or reasonableness, of the technology line items in the NASA technology roadmaps, and
- the prioritization of the technologies within each roadmap by groups such as high, medium, or low priority;

this prioritization should be accomplished, in part, via application of relevant criteria described above in a uniform manner across panels.

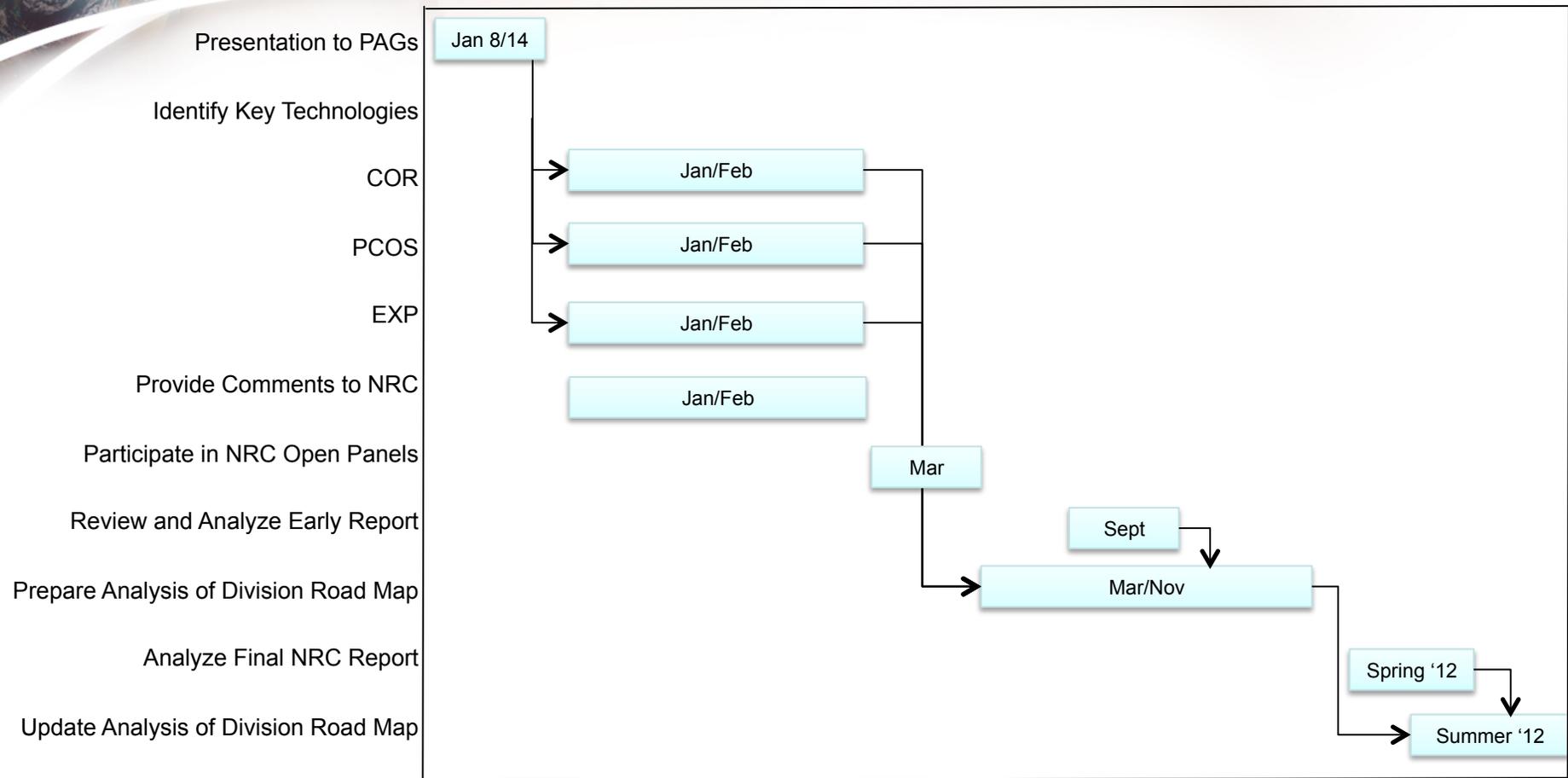
Each panel will prepare a written summary of the above for the steering committee

The steering committee will subsequently develop a comprehensive final report that;

- Summarizes findings and recommendations for each of the 14 roadmaps
- Integrates the outputs from the workshops and panels to identify key common threads and issues

**Prioritizes, by group, the highest priority technologies from all 14 roadmaps**

# What Is Our Schedule





# Message

**With the assumed budget, any new large mission will start no later than mid-decade**

**The community recommendation for WFIRST does not drive new technology (though there might be some technologies available make it better)**

**BIG new observatories will have to wait till the 20's at least.**

**Technologies for the future need careful analyses now to stay on track.**

**The PAGs are essential to our cooperative vision**