



National Aeronautics and
Space Administration



Flight Projects Development Program (FPDP)

Leadership Training and Development Workshop:

Project Management Insights and Lessons Learned

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Director, Flight Projects

NASA GSFC

September 30, 2020



My Experiences – Applied in Flight Projects



- Preparing for the unexpected – **Mars Pathfinder**
- Creating flexibility in I&T – **MAVEN**
- Teaming for success – **Flight Projects Directorate**





Flight Projects Services



The Flight Projects Directorate is responsible for overall management and implementation of flight, ground, and instrument projects at Goddard Space Flight Center.



IDEA



DESIGN



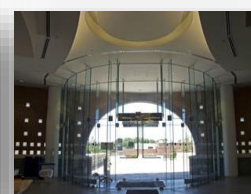
FORMULATION/
INTEGRATION



TEST



LAUNCH



OPERATIONS



DATA ANALYSIS

FUNCTION	DESCRIPTION OF SERVICES
Leadership	Deliver vision, context, and enable performance to achieve customer needs.
Technical Expertise	Direct and train team of technical experts through formulation, implementation, and operations.
Mission Development	Manage mission formulation and implementation for both in- and out-of-house.
Project Control	Provide planning, resource management, risk management, and the latest methods, tools, and practices.
Monitoring & Guidance	Assess performance; guide consistency, effectiveness, timeliness, and accountability.
Advocacy	Liaise with external stakeholders on behalf of flight projects.
Compliance & Control	Execute project activities in accordance with Center, Agency, and Federal standards.
Mission Support	Offer mission support services for Space and Earth Science flight projects/missions.
Knowledge Management	Recognize, collect, represent, and enable the delivery of and adoption of insights and experiences that will improve performance.



GSFC Flight Projects Mission Portfolio

September 21, 2020

Pre-Phase A/ Phase A*	Phase B	Phase C	Phase D	Phase E	Extended Phase E	
LISA ATHENA TSIS-2 Landsat Next IMAP GDC Dorado** SETH** STORM** TRACERS GEO/XO SWFO-L1 MSR/CCRS DAVINCI+**	AWE HERMES PUNCH Dragonfly MS	GUSTO Roman (WFIRST) PACE GeoCarb JPSS-2 JPSS-3 JPSS-4 OSAM-1 LEMNOS/020 ILLUMA-T PACE OCI Landsat 9 EFS	James Webb XRISM Landsat 9 GOES-T GOES-U LUCY LCRD SGSS LCRD Payload Lucy L-Ralph MOMA (ExoMars) XRISM-Resolve Landsat 9 TIRS II	TESS NICER (ISS) GEDI (ISS) Landsat 8 ICESat-2 TSIS-1 PSP SET-1 SOC POES/Met-Op C DSCOVR OSIRIS-REx RITS RRM-3 SAR SN NEN	Fermi Hubble Swift AQUA AURA GPM LAGEOS(2) Landsat 7 SMAP S-NPP TERRA ACE AIM Geotail IBEX	IRIS MMS (4) SDO SOHO Stereo (2) Themis (5) TIMED TWINS (2) WIND LRO MAVEN

Astrophysics

Earth Sciences

Heliophysics/Explorers

Joint Agency Satellite Division

Other

Planetary

Satellite Servicing

Space Communications

Instruments

Program Offices at GSFC:

Earth Systematic Missions

Reimbursable Projects

GOES-R Program

Explorers Program

Living with a Star

Solar Terrestrial Probes

Joint Polar Satellite System

Space Weather Follow-On

HQ Study Offices at GSFC:

Physics of the Cosmos

Cosmic Origins

HQ Technology Offices at GSFC:

Earth Science Technology Office

Recently Ended:

SORCE – Feb 2020

TCTE – Feb 2020

Van Allen (2) – Nov 2019

RHESSI – April 2018

RAVEN (ISS) – Jan 2020

*Does not include competitive AO missions in formulation, unless
Agency-selected for further study

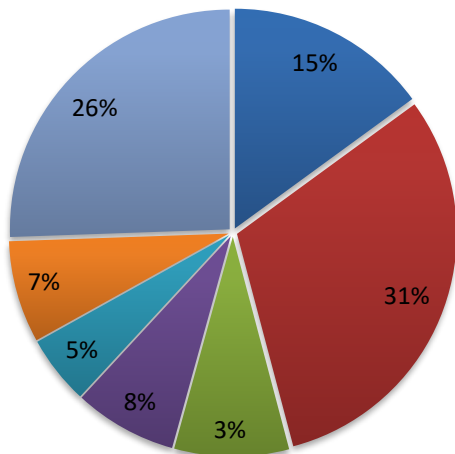
**Missions selected for Pre-Phase A/Phase A competitive AO studies



Flight Projects FY2020 Annual Portfolio



FY20 NOAs



FPD WORKFORCE (FY 2020)

- 372 Civil Service Employees*
- 2,536 Contractors
- 2,908 Total Employees

*Includes 118 CFO employees

● **Earth Science**
Reimbursable – 26%
FY20 NOA: \$1,068M
Missions in Development: 6
Total in Operations: 2

● **Astrophysics – 31%**
FY20 NOA: \$1291.8M
Missions in Development: 7
Total in Operations: 6

● **Heliophysics – 8%**
FY20 NOA: \$352.3M
Missions in Development: 9
Total in Operations: 16

● **Cross-cutting Technologies – 5%**
FY20 NOA: \$211.2M
Missions in Development: 1
Total in Operations: 3

● **Earth Science – 15%**
FY20 NOA \$625.5M
Missions in Development: 4
Total in Operations: 16

● **Communications & Navigation – 8%**
FY20 NOA: \$313.9M
Missions in Development: 4
Total in Operations: 3

● **Planetary – 8%**
FY20 NOA: \$316.7M
Missions in Development: 3
Total in Operations: 3

**Funded \$4.2B annual
New Obligation Authority
(NOA)**



FPD Portfolio Major Champions

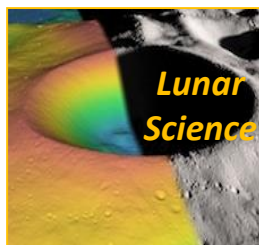


NASA Internal

Science Mission Directorate (SMD)



Human Exploration and Operations Mission Directorate (HEOMD)



Science Technology Mission Directorate (STMD)



External





GSFC: A Diverse Mission Portfolio

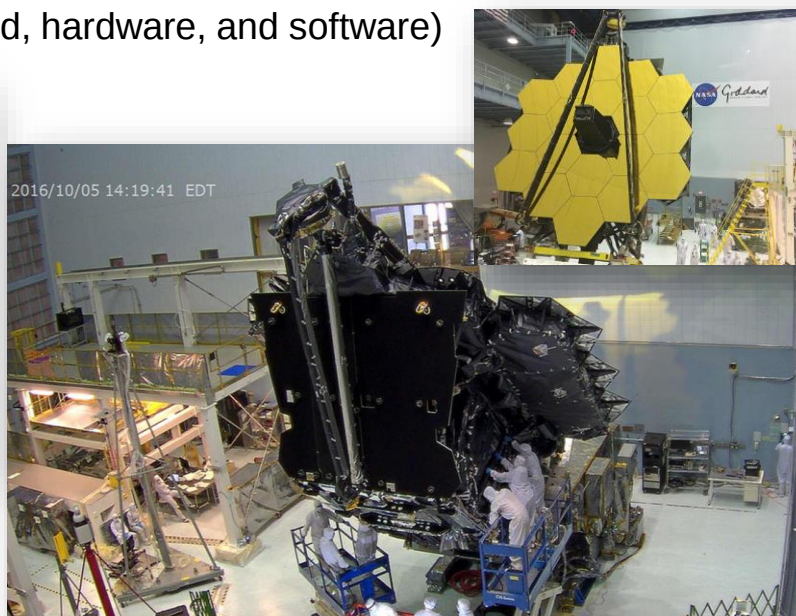


Challenges in Managing Flight Projects

- Problems and challenges can arise on the most well planned projects.
- Technical reserves and design margins need to be managed.
- Common challenges:
 - Budgets
 - Schedule (meeting planetary windows)
 - Changing requirements
 - Heritage hardware, systems designs, and people
 - Complex design (flight, ground, hardware, and software)



OSIRIS-REx completing environmental testing



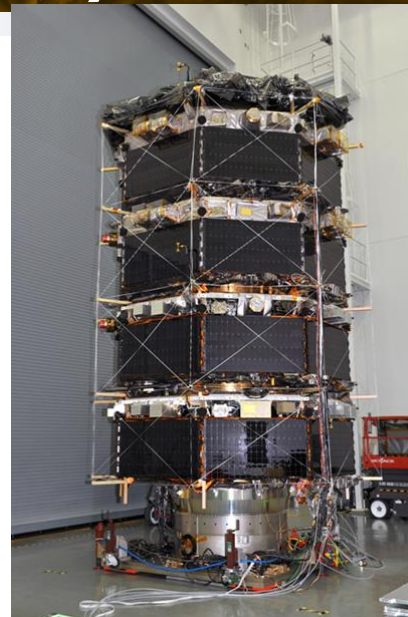
James Webb Space Telescope (JWST)



Thermal Infrared Sensor (TIRS)
instrument drove schedule

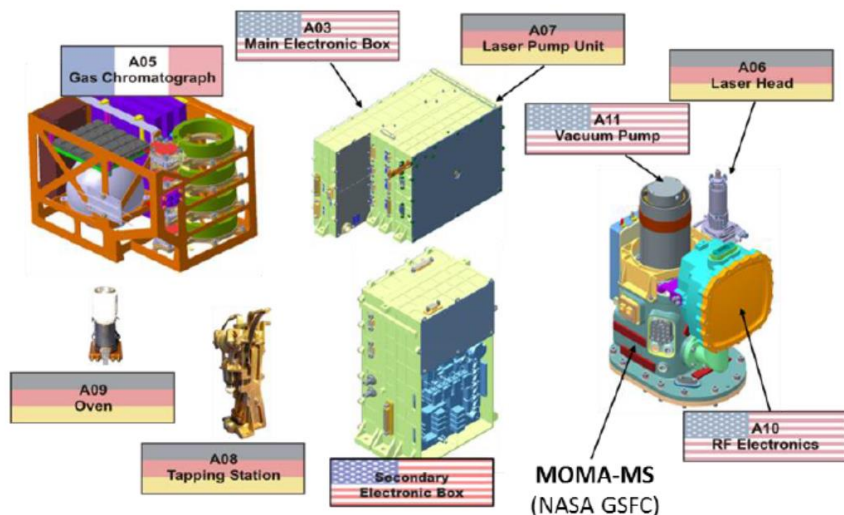
Challenges in Managing Flight Projects (Continued)

- Common challenges (continued):
 - Unique facilities and facility conflicts
 - Technical and hardware issues
 - Procurement delays
 - Stakeholders
 - Outside partnerships
 - Launch vehicle schedule
 - Mishaps and on-orbit events

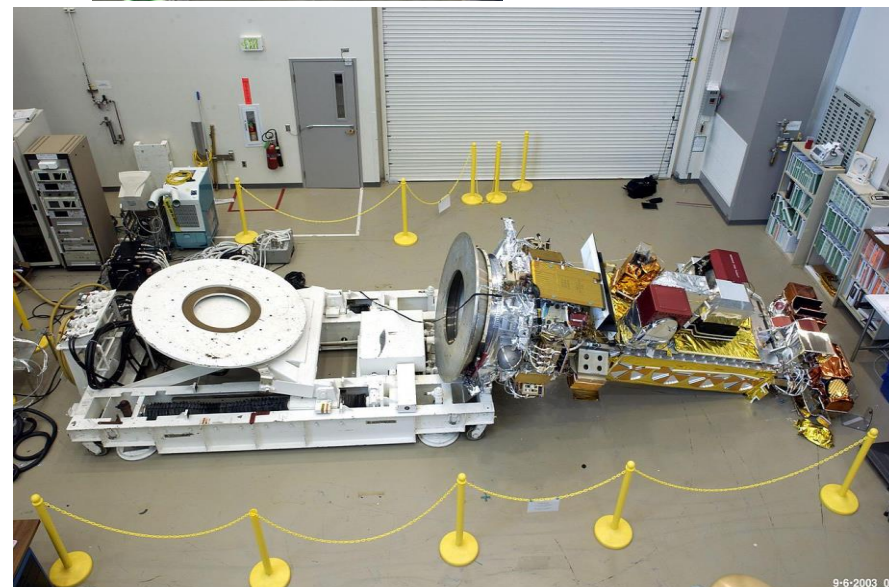


The environmental test schedule of the Magnetospheric Multiscale (MMS) conflicted with JWST, requiring MMS to go to Naval Research Laboratory for thermal vacuum testing.

Facility conflicts also drove MMS to build their own cleanroom facility.



GSFC contribution to European ExoMars mission:
Mars Organic Molecule Analyzer-Mass Spectrometer (MOMA-MS)



Spacecraft mishap during integration

Key Project Management Take-Aways

- Stability of leadership through the project lifecycle is critical.
- Push to get front line managers in the project office that have strong hardware development experience.
- Maintain a sense of urgency throughout the project lifecycle even if your mission does not have a constrained planetary launch date. Time really is money.
- Communicate, communicate, communicate with the project office, the principal investigator, partner institutions, program office and NASA Headquarters; regular face-to-face interactions are critical. You/your team have to be road warriors.
- Transparency and openness with your team is critical. You want to hear about concerns early, not days before or after launch.

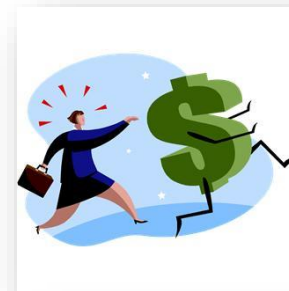


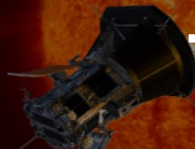


Key Project Management Take-Aways (Continued)



- Fight for sufficient cost reserves at the outset of the mission – they will be needed to address many of the unknowns during development.
- Anticipate and expect problems; understand impacts and design workarounds. Move forward with Plan B.
- Rigorous tracking of metrics (cost, schedule, technical) is critical to keeping leadership aware of negative trends in order to react early.
- Establish clear roles and responsibilities; be sure they are communicated clearly to the entire team.
- Resist requirements creep, both in the science and engineering areas.
- Find opportunities to team build at frequent intervals and schedule in lessons learned opportunities during every phase of development.





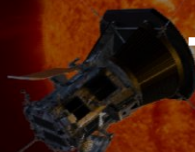
Teamwork



✓ Team Build during every phase of the mission:



MAVEN team photo from the Phase C to D transition meeting. We did these gatherings during every phase transition.



Teamwork



MARS ORBIT INSERTION NIGHT (SEPTEMBER 21, 2014)

Lockheed Martin/Denver Ops Center



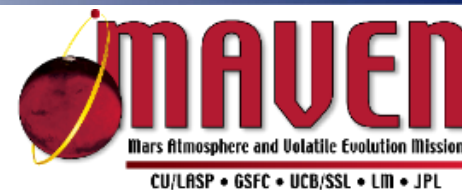
Goddard Visitors Center



U. of Colorado-LASP



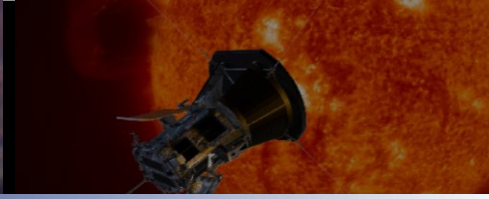
U. of California-Berkeley



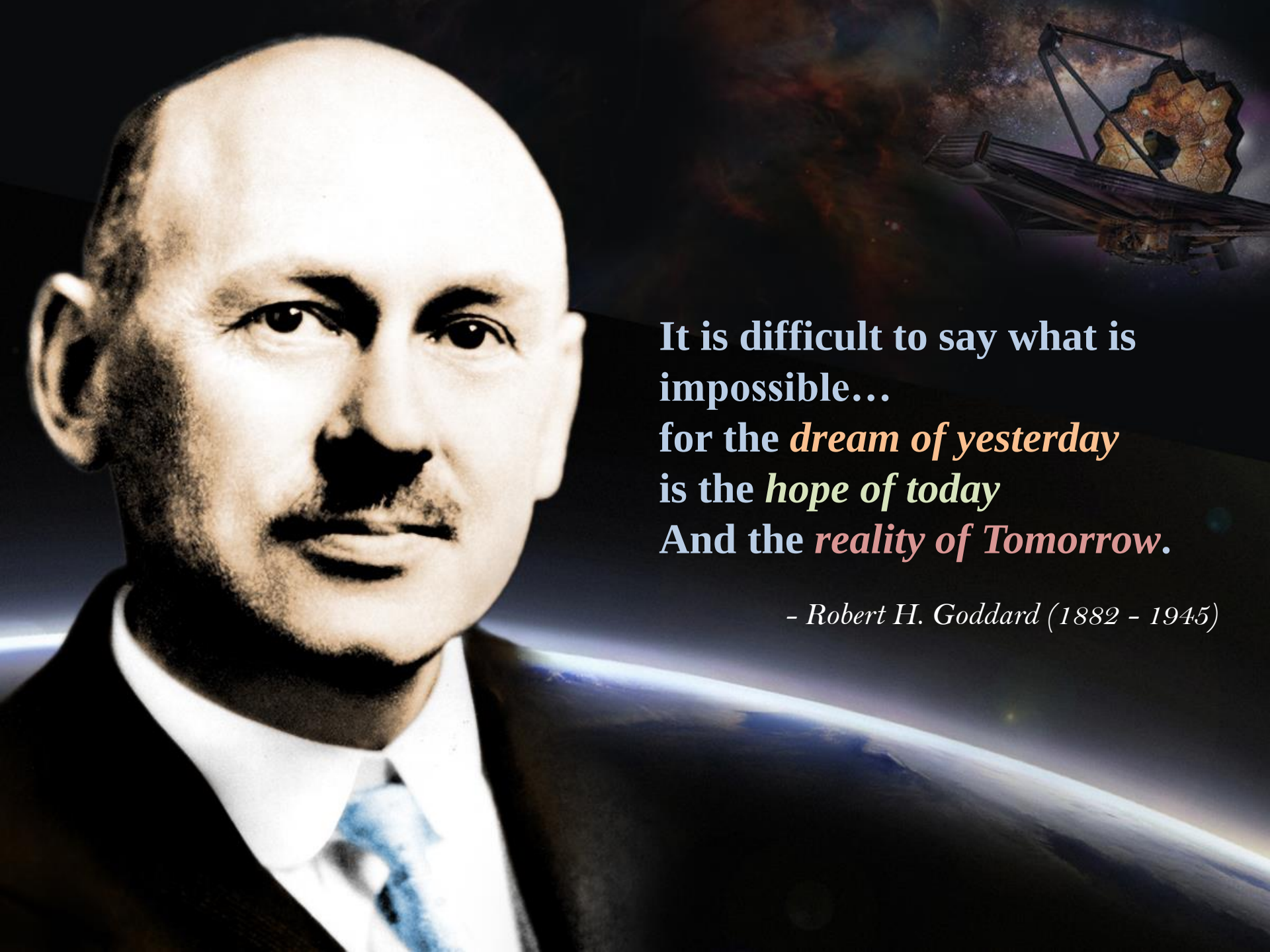
Navigation Ops at JPL



Backup Ops Center at NASA Goddard



Q&A and Discussion



It is difficult to say what is
impossible...
for the *dream of yesterday*
is the *hope of today*
And the *reality of Tomorrow.*

- Robert H. Goddard (1882 - 1945)