TDM
Technology Demonstrations Missions Program
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TDM Program Executive
NASA Headquarters

NASA TECHNOLOGY DAYS 2012
Cleveland, Ohio
Space Technology Programs

- Game Changing Development Program
- Technology Demonstration Missions Program
- Small Spacecraft Technologies Program
- Space Technology Research Grant Program
- NASA Innovative Advanced Concepts (NIAC) Program
- Center Innovation Fund Program
- Centennial Challenges Prize Program
- Small Business Innovation Research & Small Business Technology Transfer (SBIR/STTR) Program
- Flight Opportunities Program
Why TDM?

Infusing Revolutionary, Crosscutting Technologies to Benefit NASA and the Nation
### Technology Areas

#### ETD: TDM
- Human Exploration Telerobotics (HET)
- Cryogenic Propellant Storage and Transfer (CPST)
- Materials ISS Experiment-X (MISSE-X)
- Green Propellant Infusion Mission
- MSL EDL Instrument (MEDLI)

#### CSTD: TDM
- Low Density Supersonic Decelerators (LDSD)
- Laser Communications Relay Demonstration (LCRD)
- Deep Space Atomic Clock (DSAC)
- Solar Sail Demonstration (SSD)

### Technology Areas (TA)
- TA.1. Launch Propulsion
- TA.2. In-Space Propulsion
- TA.3. Space Power/Storage
- TA.4. Robotics
- TA.5. Comm./Navigation
- TA.6. Human Health
- TA.8. Sci. Instr./Sensors
- TA.9. EDL
- TA.10. Nanotechnology
- TA.11. Modeling/Simulation
- TA.12. Materials/Structures
- TA.13. Ground/Launch
- TA.14. Thermal
- Technology Readiness Levels (TRL)
Timeline of Major Activities

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<td>MISSE-X</td>
<td>Hardware Testing</td>
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<td>HET</td>
<td>Grid conducts ISS survey</td>
<td>Crew Off Sim EVA Inspection</td>
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<td>Crew Conducts Sim EVA Repair</td>
<td>Grid Tests R2 IVA &amp; EVA interfaces</td>
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<td>H/W Performance Report</td>
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Curiosity

[video]
Obtaining Needed Atmospheric Entry Data at Mars
Enabling New Entry Systems
Decelerator Inflation
Decelerator Inflation Test

[video]
Rocket Sled Development

[video]
Sled Track Testing

[video]
Robotic Operations with Humans
Telerobotic Systems

Robonaut 2 (R2)

- Humanoid robot (42 DOF, human-scale/safe)
- Perform dexterous IVA/EVA manipulation tasks
- Share astronaut tools and workspaces

Smart SPHERES

- Free-flying robot (6 axis, cold-gas propulsion)
- Perform IVA/EVA remote mobile sensor tasks
- Improve ground control situation awareness

Surface Telerobotics

- Mobile robot on surface (Moon, asteroid, Mars)
- Perform surface activities before/support/after crew
- Crew centric operations from inside flight vehicle
Surface Telerobotics

[video]
Enabling Future Extended In-Space Missions

NASA is undertaking a demonstration mission to advance cryogenic propellant storage and transfer technologies that will enable exploration beyond Low-Earth Orbit.

- Passive Storage Demo
  - Check-out
  - 1 month

- Active Storage Demo
  - 5 months

- Controlled Re-Entry
  - 6 months

Launch 2018 (TBR)

- Demonstrate long duration storage
- Demonstrate in-space transfer
- Demonstrate in-space, accurate gauging
CPST Testing

Liquid Hydrogen Active Cooling Test

Penetration Heat Leak Test

Mass Gauge Low-g Aircraft Test

Composite Tank Strut Structural Test Configuration
Composite Strut Structural Test
• NASA plans to develop payload

• Looking for industry partners for the spacecraft bus, integration, and operations (~March 2013)

• Developing a plan for technology transfer to openly share data

• **CPST Project manager will present strategy tomorrow during TDM open session (10:30am)**
[video]
Solar Sailing
Deep Space Atomic Clock (DSAC)

Green Propellant Infusion Mission (GPIM)

22N Engineering Model Thrust Chamber

MISSE-X

22N Thruster post firing
Get Involved

• Goal to have annual solicitation for new demos
  – 2011 & 2012 – selected 4 demonstrations
  – 2013 – Plan uncertain anticipating extended CR
• Follow TDM during the year (http://www.nasa.gov/tdm)
• Contact: Randy Lillard/HQ (randy.lillard-1@nasa.gov) or John McDougal/MSFC (john.m.mcDougal@nasa.gov)
More TDM at Tech Days

• Please sign up one-on-one time with TDM management...

• Second session tomorrow, open session to answer questions

• Please see TDM projects exhibiting at Tech Days this week:
  – Laser Comm booth #601
  – Solar Sail booth #602
  – MISSE-X booth #603