Safety & Mission Assurance: A NASA Perspective

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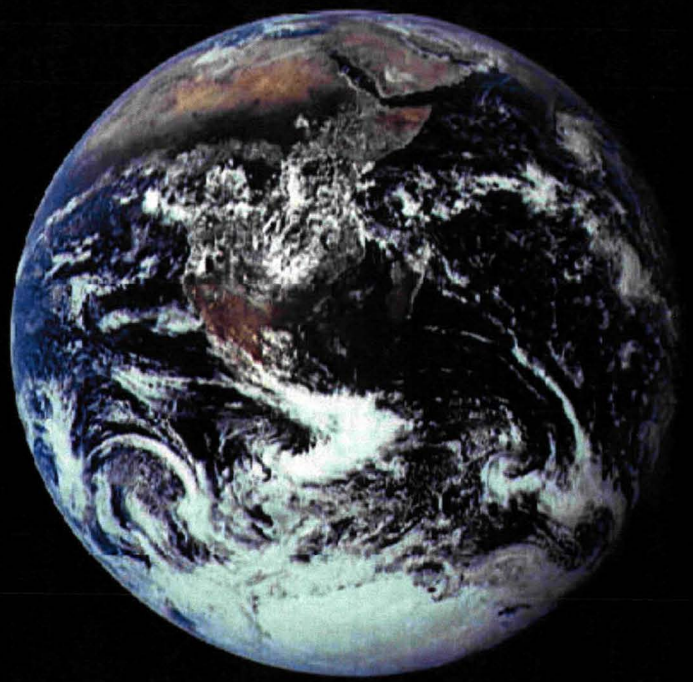
NASA's Vision, Mission, and Values

NASA'S VISION

To reach for new heights and reveal the unknown so that what we do and learn will benefit all humankind.

NASA'S MISSION

Drive advances in science, technology, and exploration to advance knowledge, education, innovation, economic vitality, and stewardship of Earth.



NASA'S VALUES

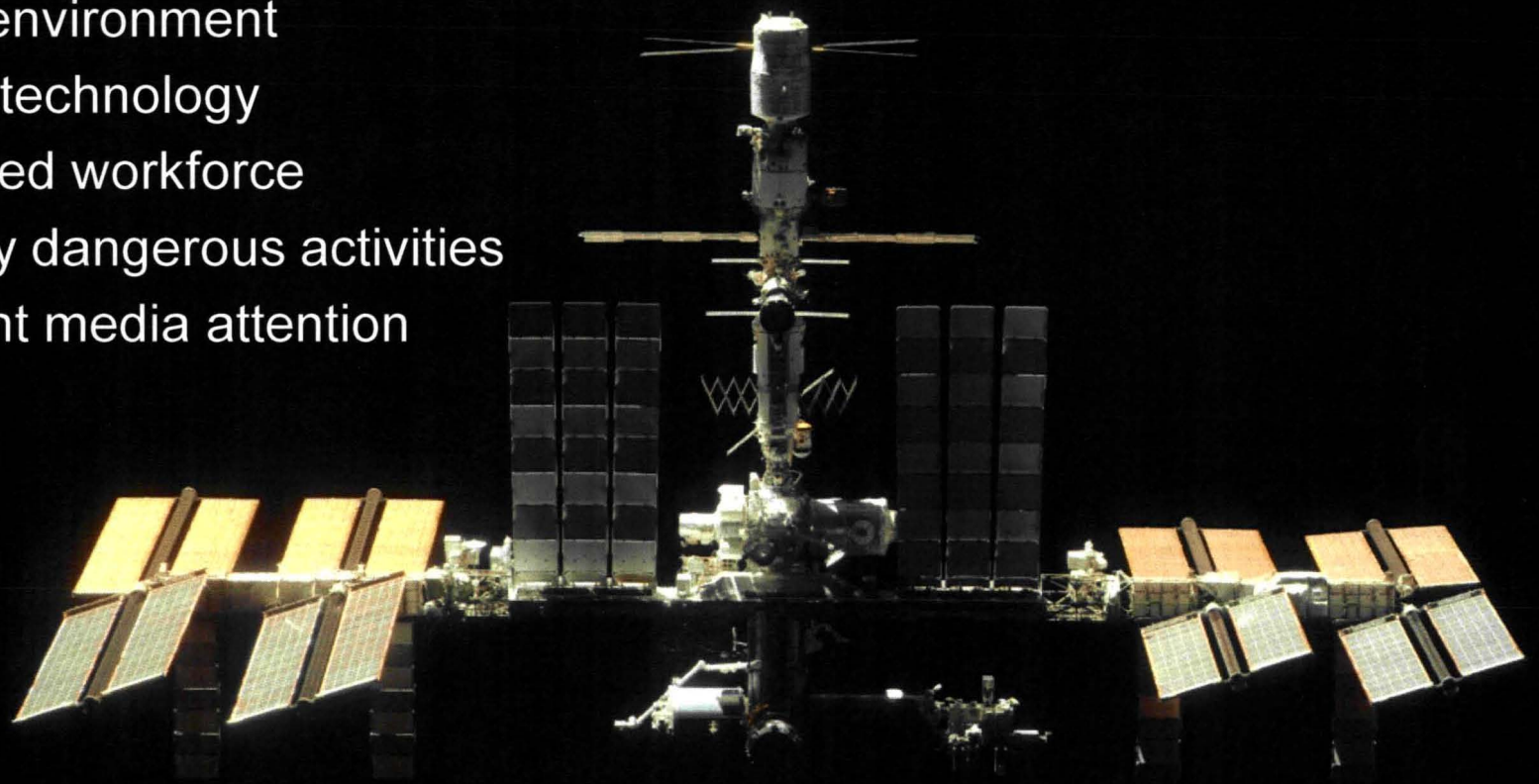
The Agency's four shared core values support NASA's commitment to technical excellence and express the ethics that guide our behavior. These values are the underpinnings of NASA's spirit and resolve.

Safety ***Teamwork***

Integrity ***Excellence***

NASA's Unique Challenges

- Over 300,000,000 "shareholders"
- Very high value flight and ground assets
- National symbol
- Political environment
- Evolving technology
- Specialized workforce
- Inherently dangerous activities
- Significant media attention



Triumphs

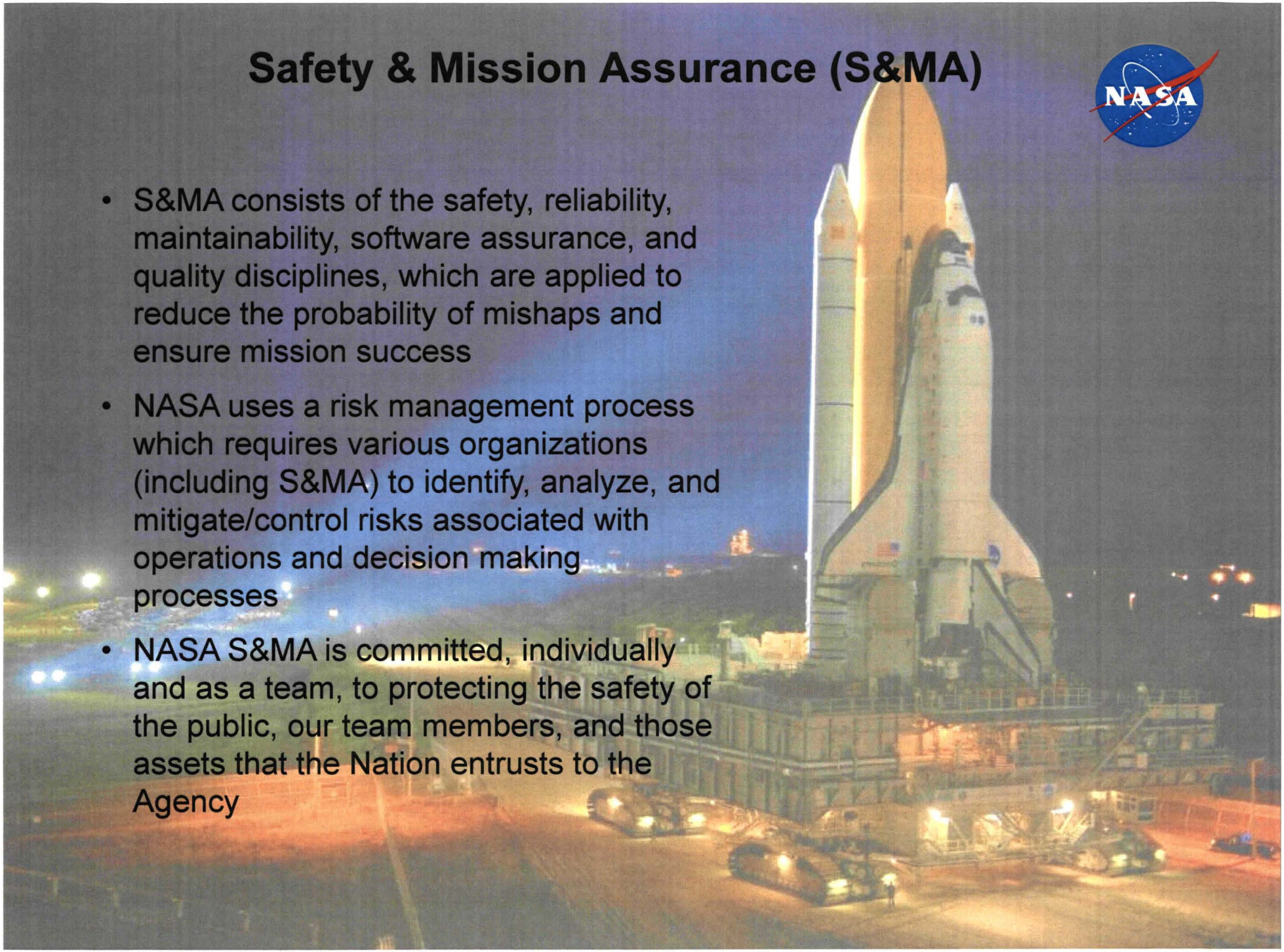
Tragedies


GRISSOM
WHITE
CHAFFEE
APOLLO 1


MCNAIR
ONIZUKA
RESNIK
SCOBEE
SMITH
MCAULIFFE
JARVIS


BROWN
CLARK
CHAWLA
ANDERSON
RAMON
HUSBAND
MCCOOL
STS 107

Safety & Mission Assurance (S&MA)



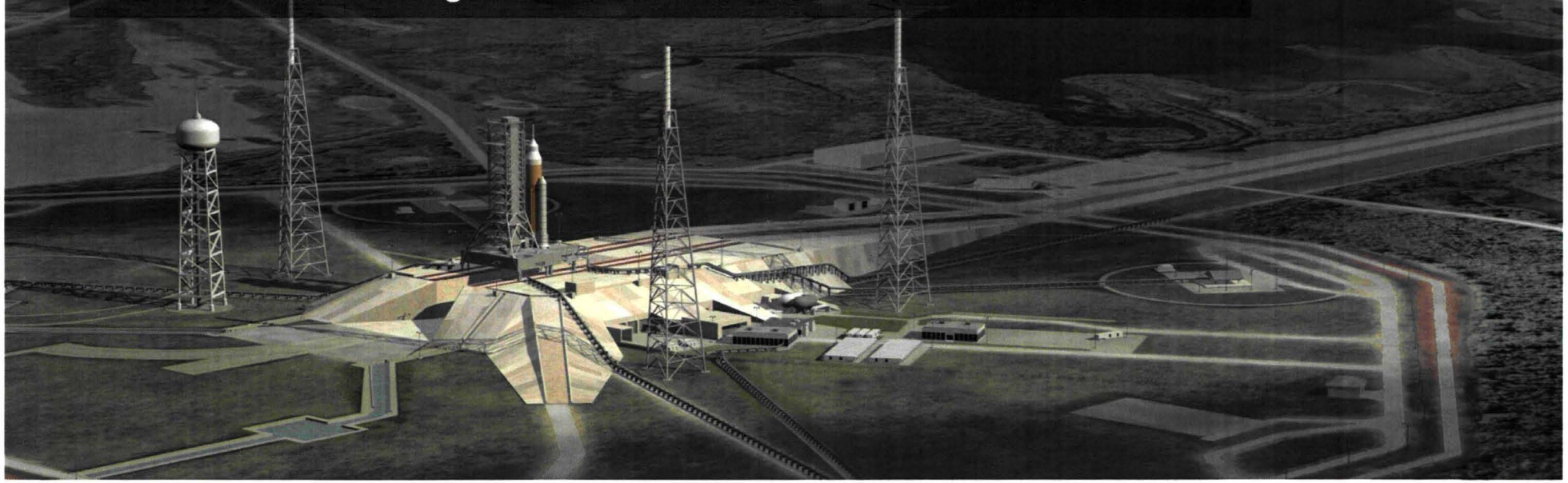
- S&MA consists of the safety, reliability, maintainability, software assurance, and quality disciplines, which are applied to reduce the probability of mishaps and ensure mission success
- NASA uses a risk management process which requires various organizations (including S&MA) to identify, analyze, and mitigate/control risks associated with operations and decision making processes
- NASA S&MA is committed, individually and as a team, to protecting the safety of the public, our team members, and those assets that the Nation entrusts to the Agency

KSC's Primary Missions

- **Space Shuttle Program**
  - Preflight processing and launch
  - Landing and recovery
- **International Space Station (ISS) Program**
  - Assembly, integration, and processing of ISS elements and flight experiments
- **21st Century Ground Systems Programs**
  - Support to Space Launch System (SLS) and Multi-Purpose Crew Vehicle (MPCV)
  - Modernization of launch/landing facilities and infrastructure
- **Commercial Crew Program**
  - Commercial Crew launch service procurement and integration
- **Launch Services Program**
  - Expendable Launch Vehicle (ELV) mission procurement, integration, and launch
- **Institutional Support**
  - Workforce, facilities, equipment, operations

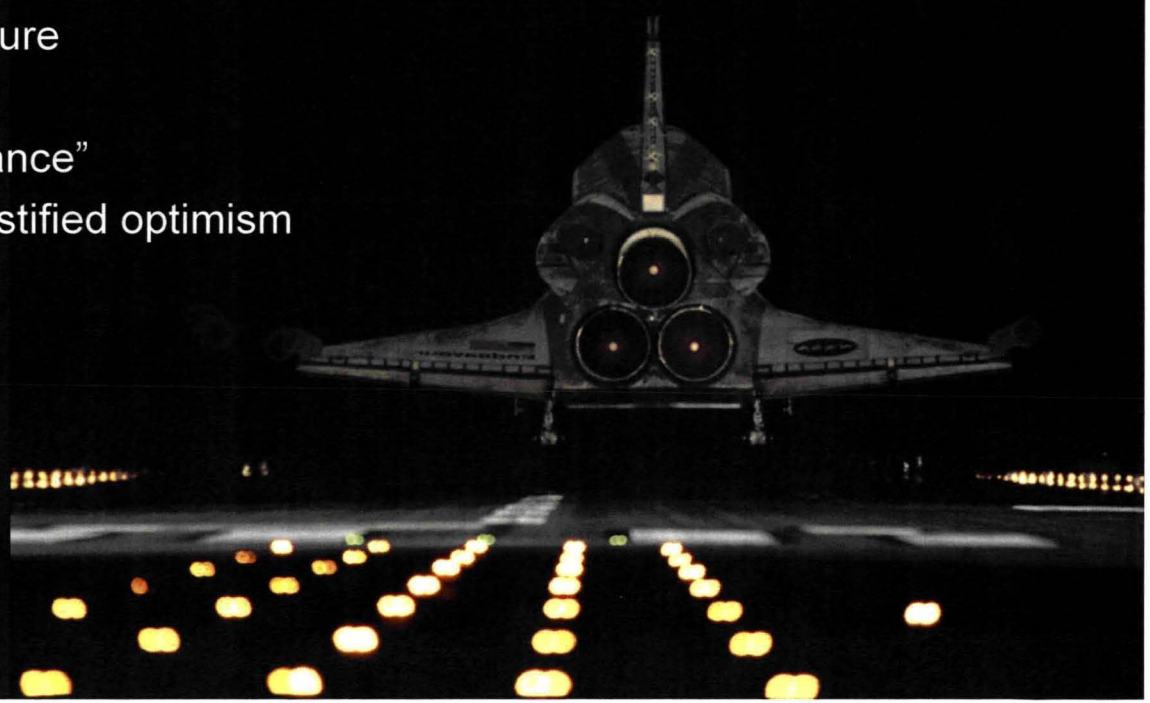
KSC Environment

- ~144,000 acres (~58,300 hectares)
- ~13,000 employees (of which ~2100 are NASA)
- Hazards include: Cranes, Heavy Equipment, Lasers, RF Radiation, Ionizing Radiation, High Voltage, Cryogenic Propellants, Hypergolic Propellants, Solid Propellants, Pyrotechnics, Asphyxiants, Chemicals, Heights, Compressed Gas, Pressure Vessels, Trains, Ships, Lightning, Hurricanes, Wildlife, Stress,…Tourists!....etc.
- Survival and success requires a layered defense that focuses on Culture, Training, and Process



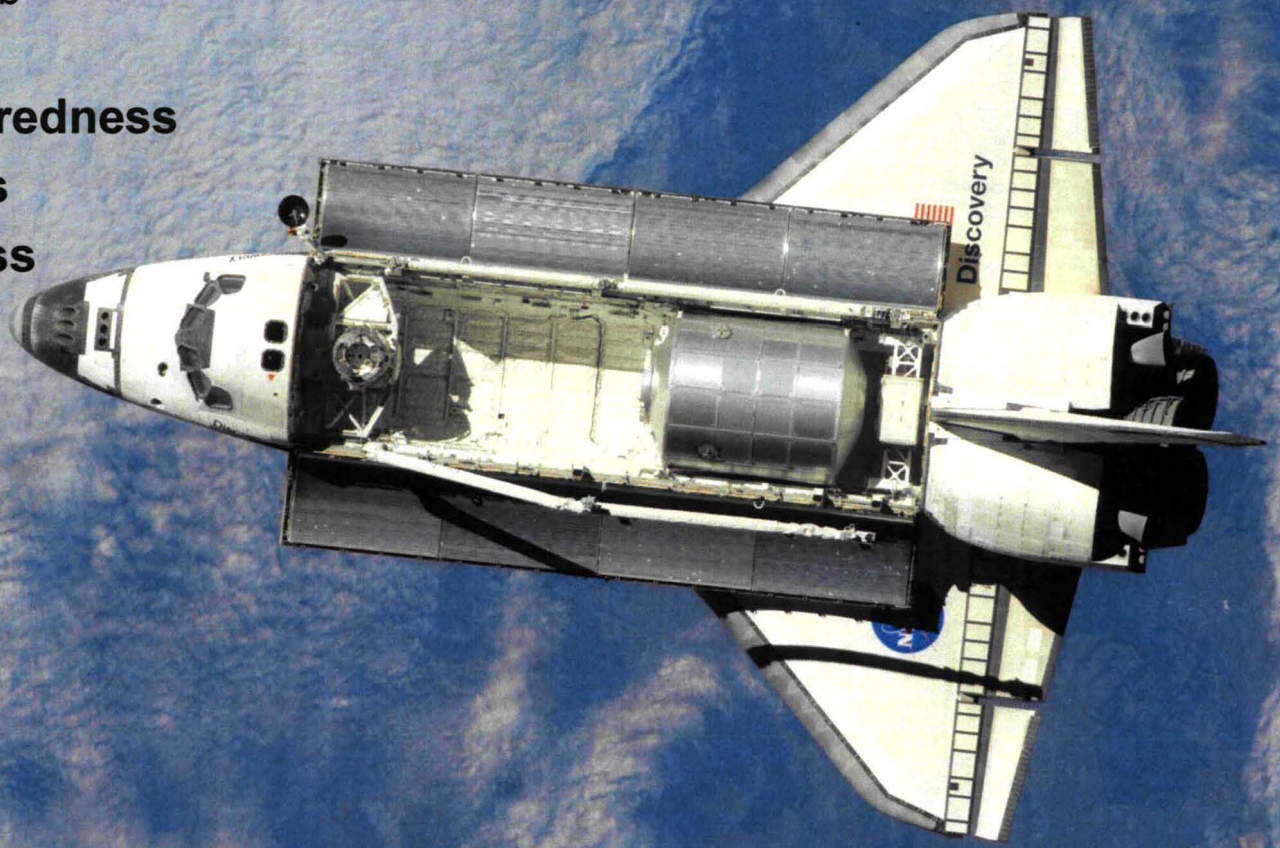
Keys to Success: Culture

- **Effective and open up, down, and lateral communication**
- **Leadership commitment and example**
- **Learning from success and failure**
- **Universal authority to say "Time Out" and stop task**
- **Exercise engineering curiosity**
- **Constantly challenge assumptions, models, and analyses**
- **Avoidance of…**
  - Schedule/budget pressure
  - Oversimplification
  - "Normalization of Deviance"
  - Complacency and unjustified optimism



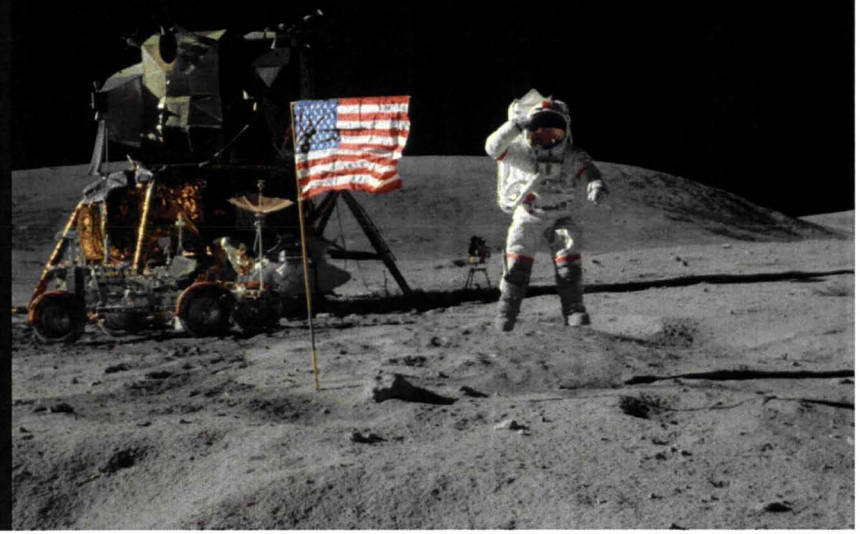
Keys to Success: Training

- **Simulation / drill**
- **Technical skills**
  - Classroom or lab
  - On-the-job
- **Emergency preparedness**
- **Hazard awareness**
- **Process awareness**
- **Leadership**

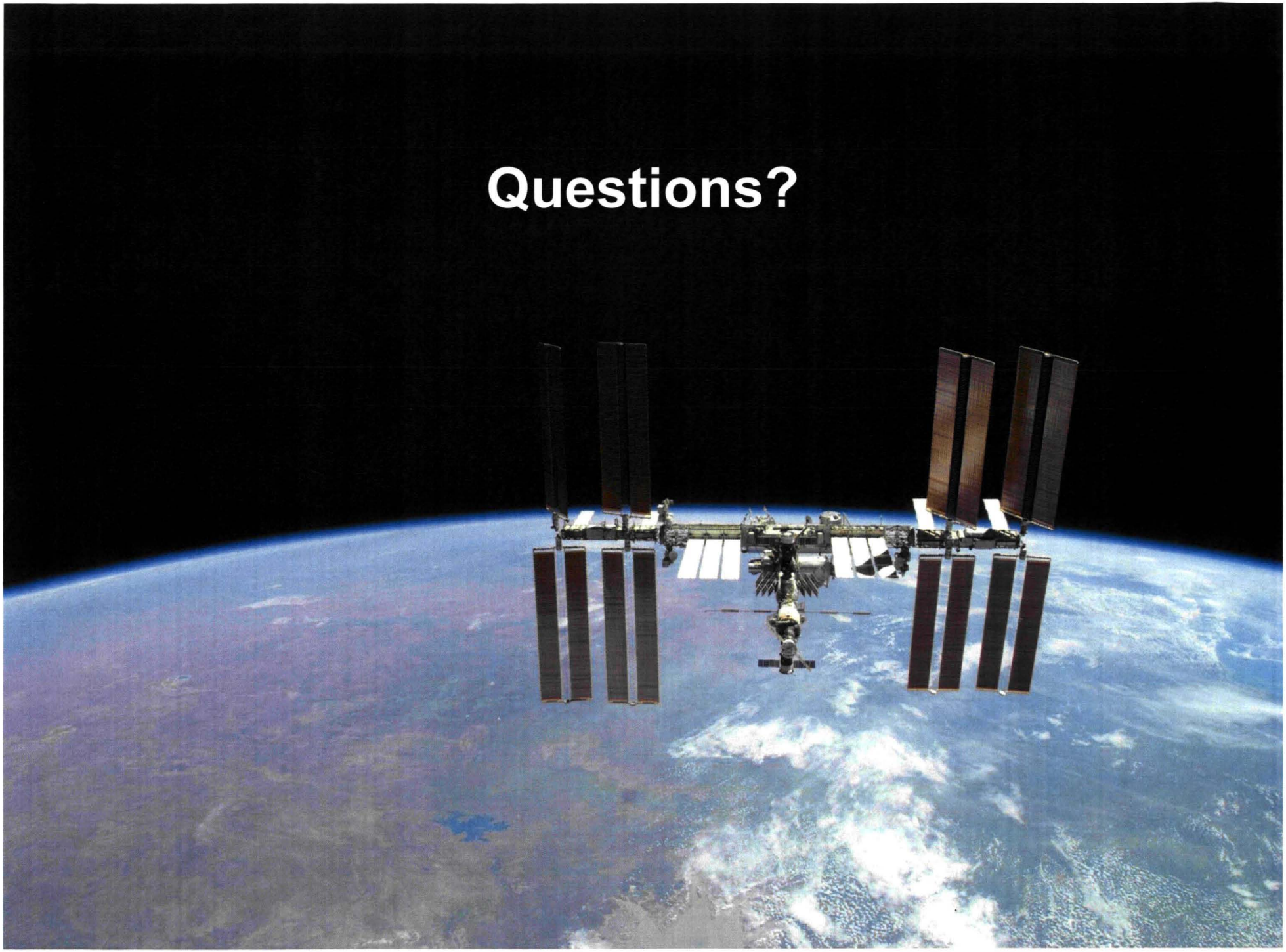


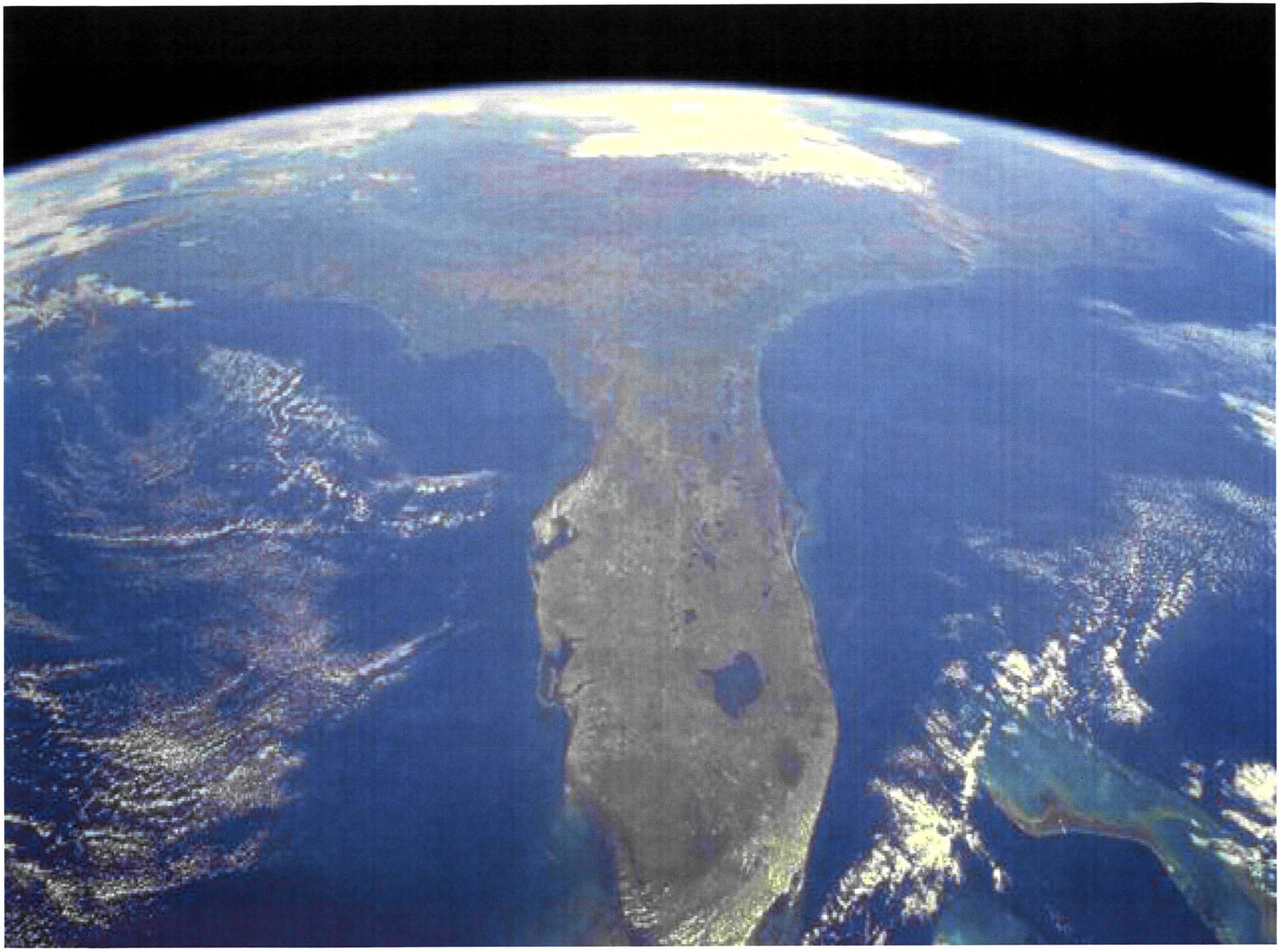
Keys to Success: Process

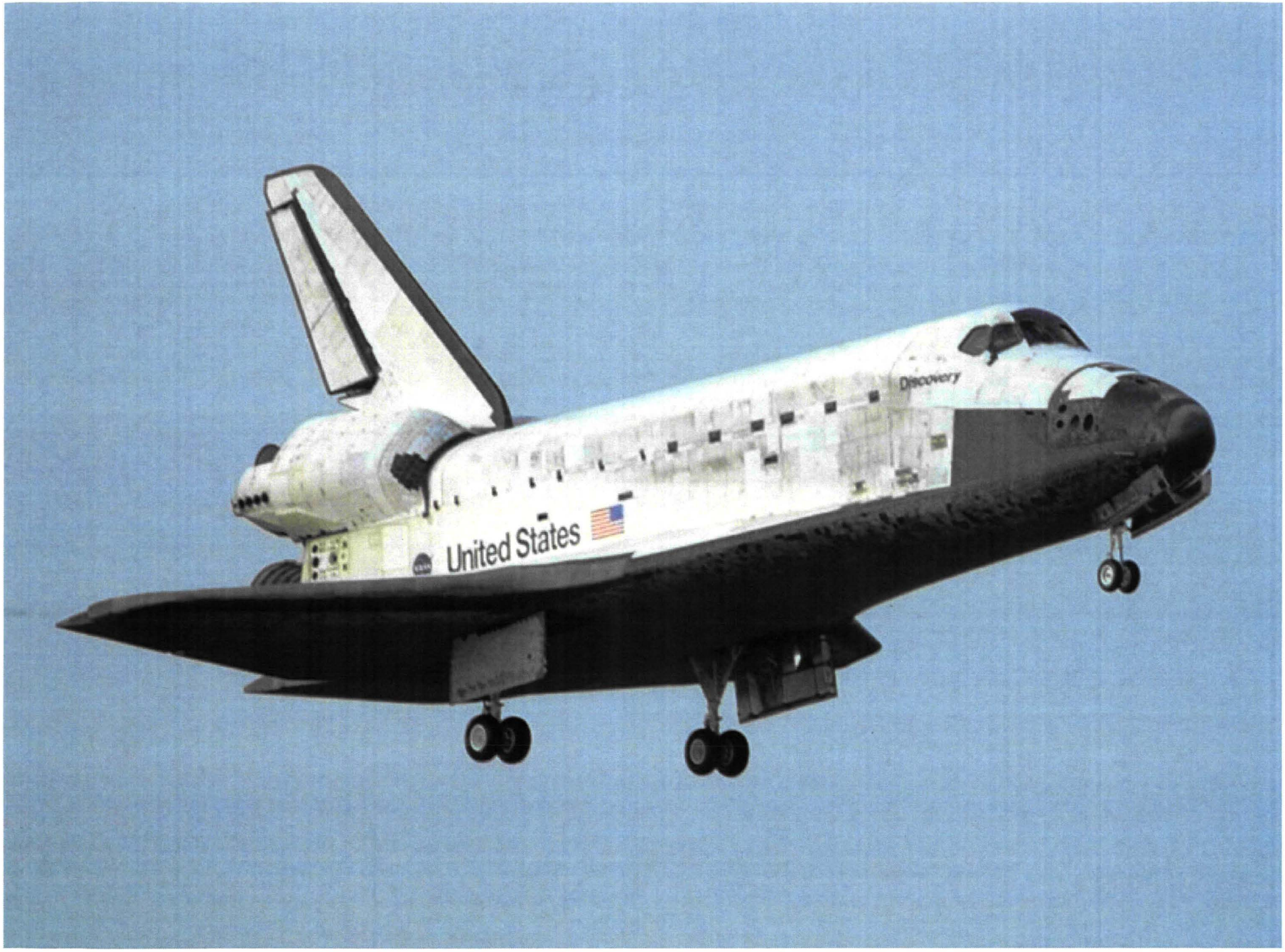
- Organization structure that provides for independent technical, authorities in Engineering, S&MA, and Health/Medical
- Written procedures with embedded quality assurance and safety assurance surveillance
- Closed loop non-conformance/corrective action system
- Mishap investigation and corrective action plan process
- Lessons learned knowledge capture system
- Technical requirement documentation and closed loop requirement satisfaction tracking system
- Risk identification, analysis, and control system
- Residual risk acceptance process
- Design standards
- Emergency action plans

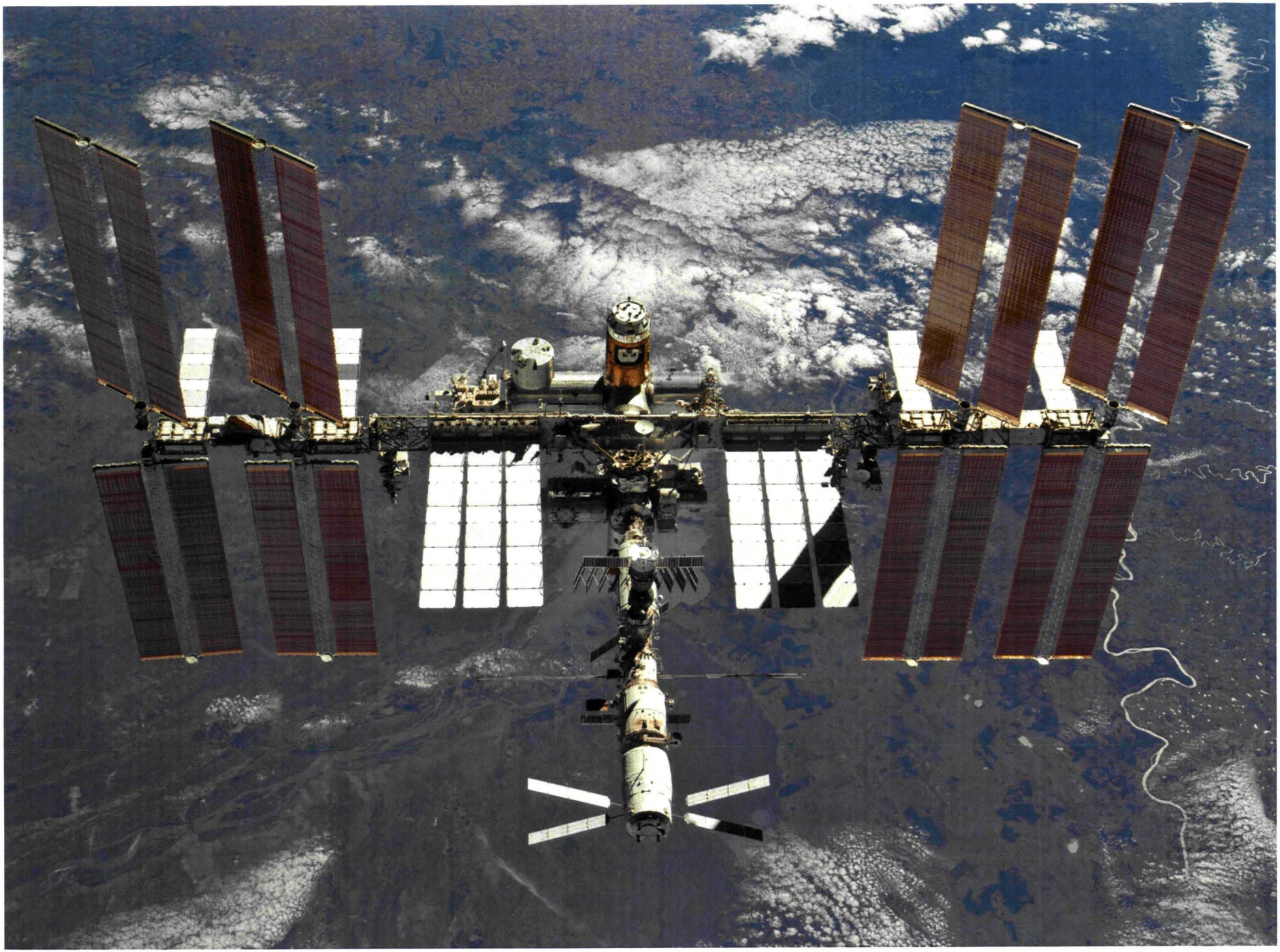


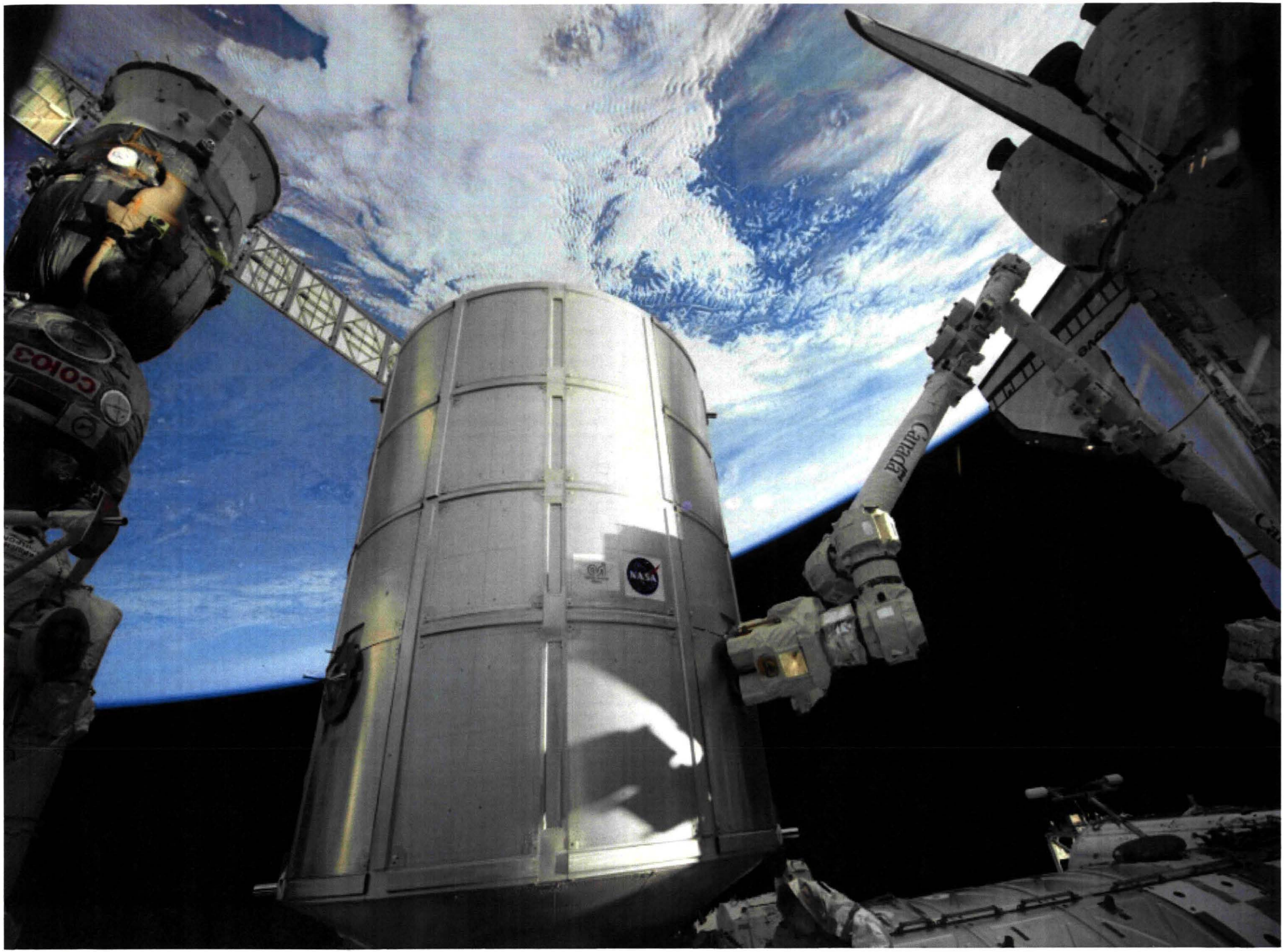
Questions?

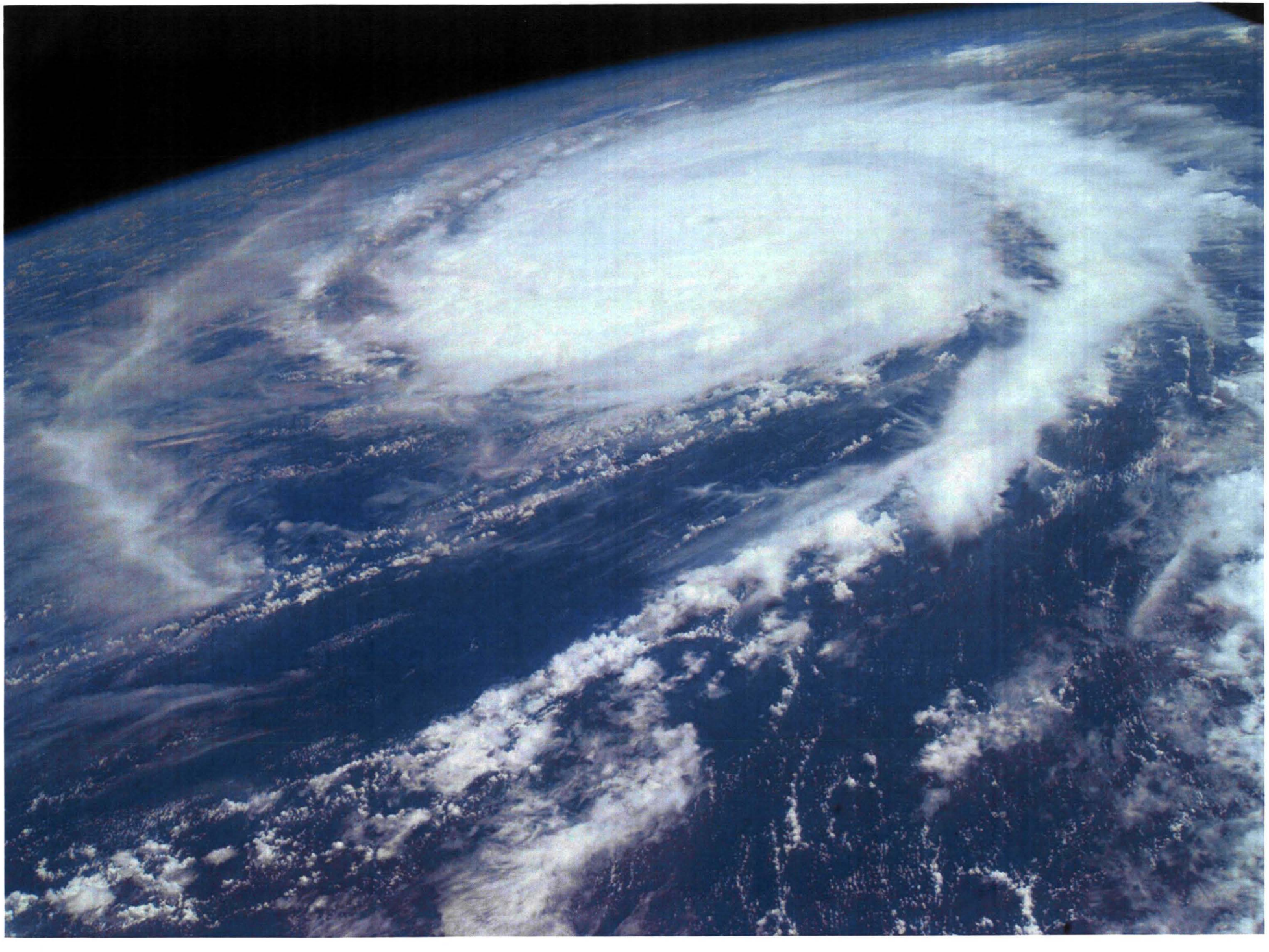


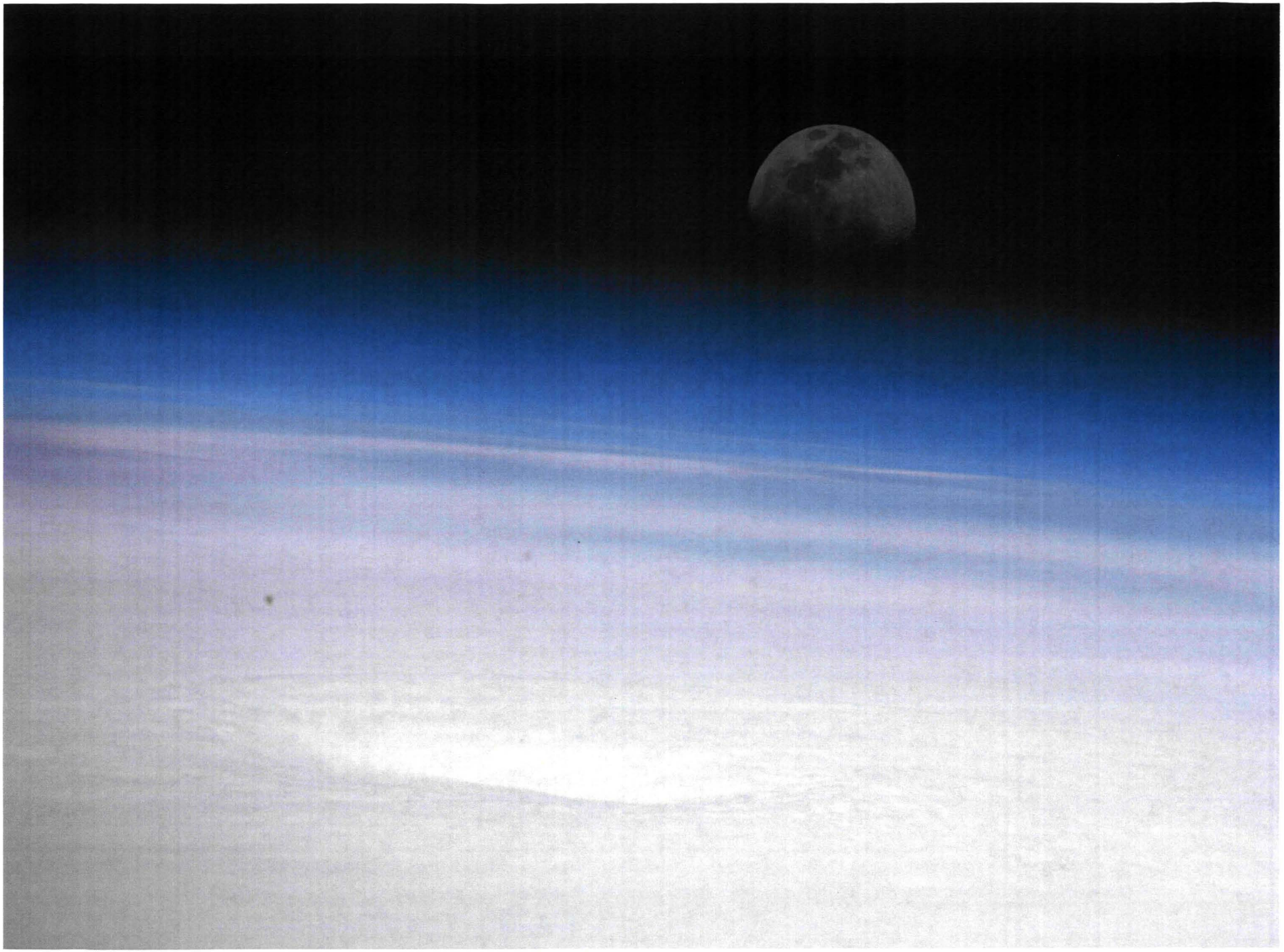


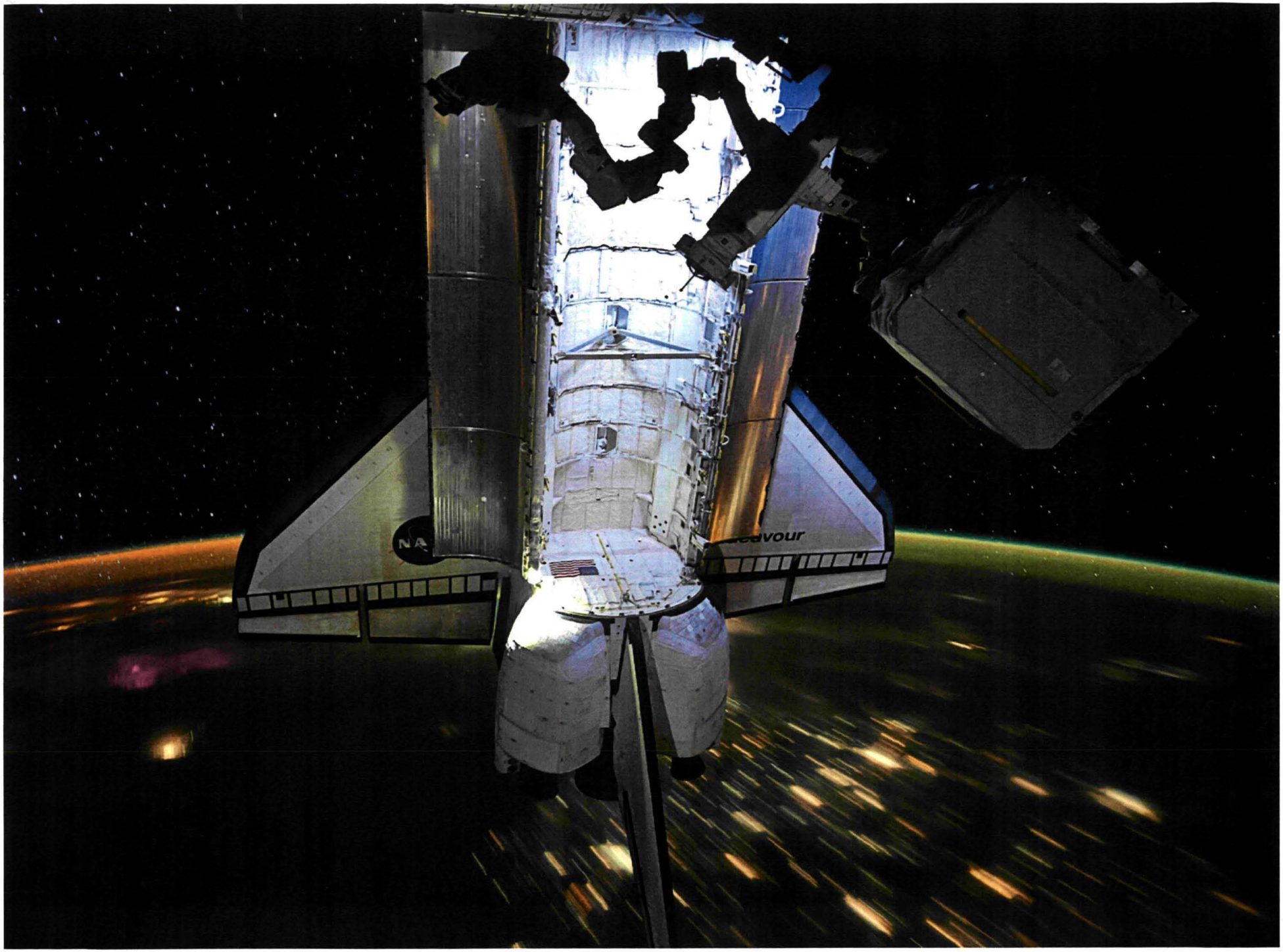

Discovery
United States

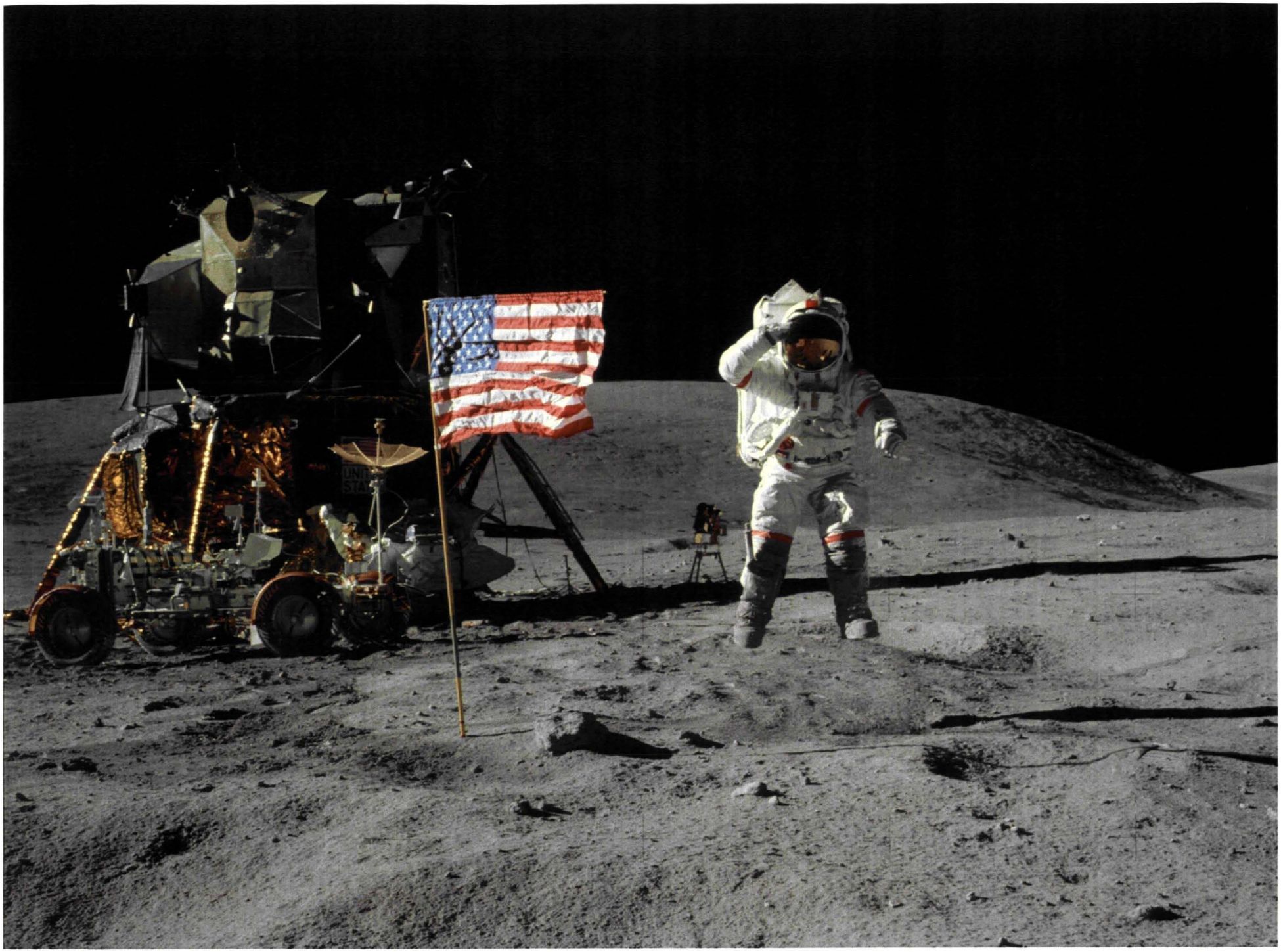


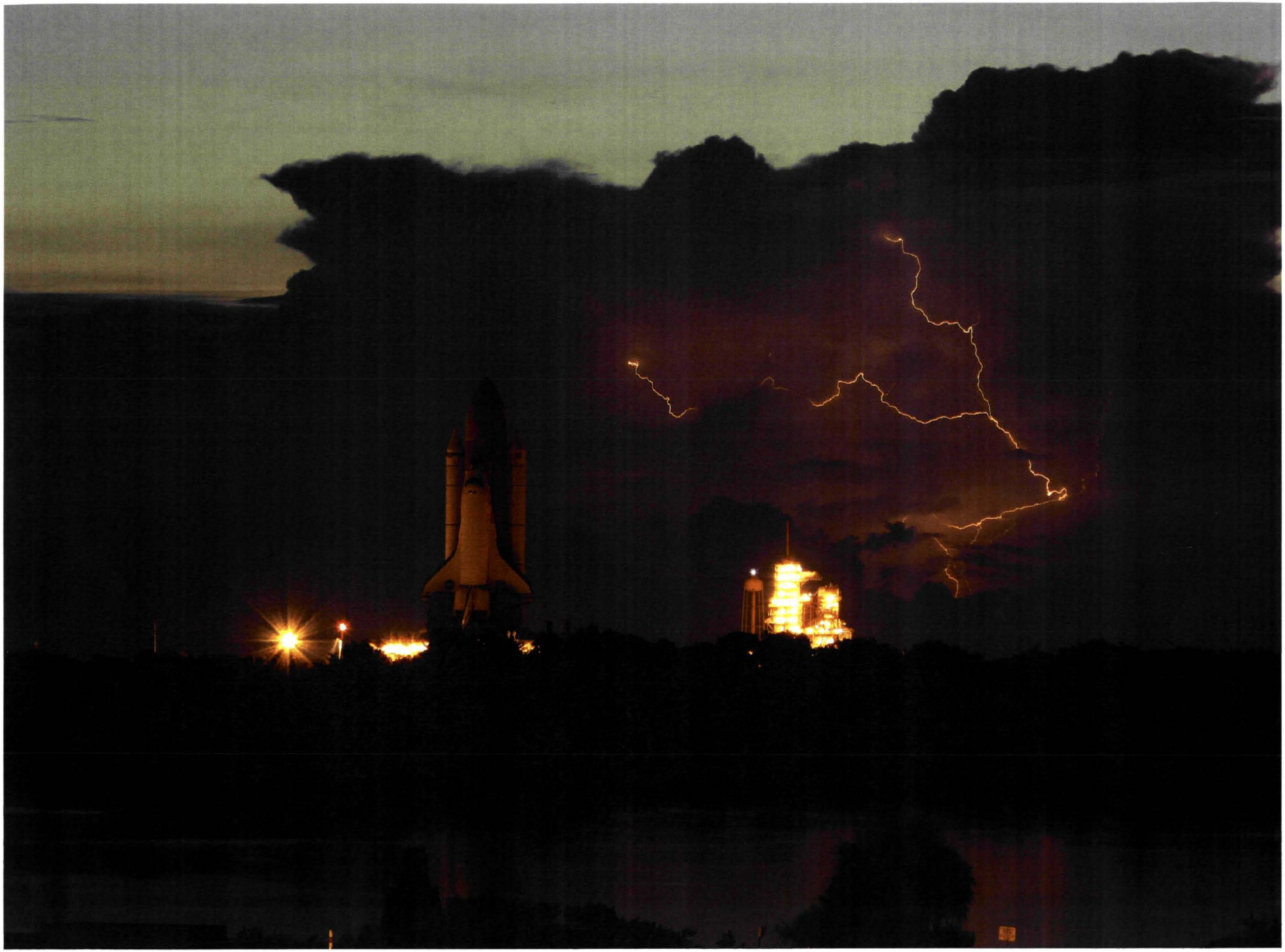

NASA
Canada









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