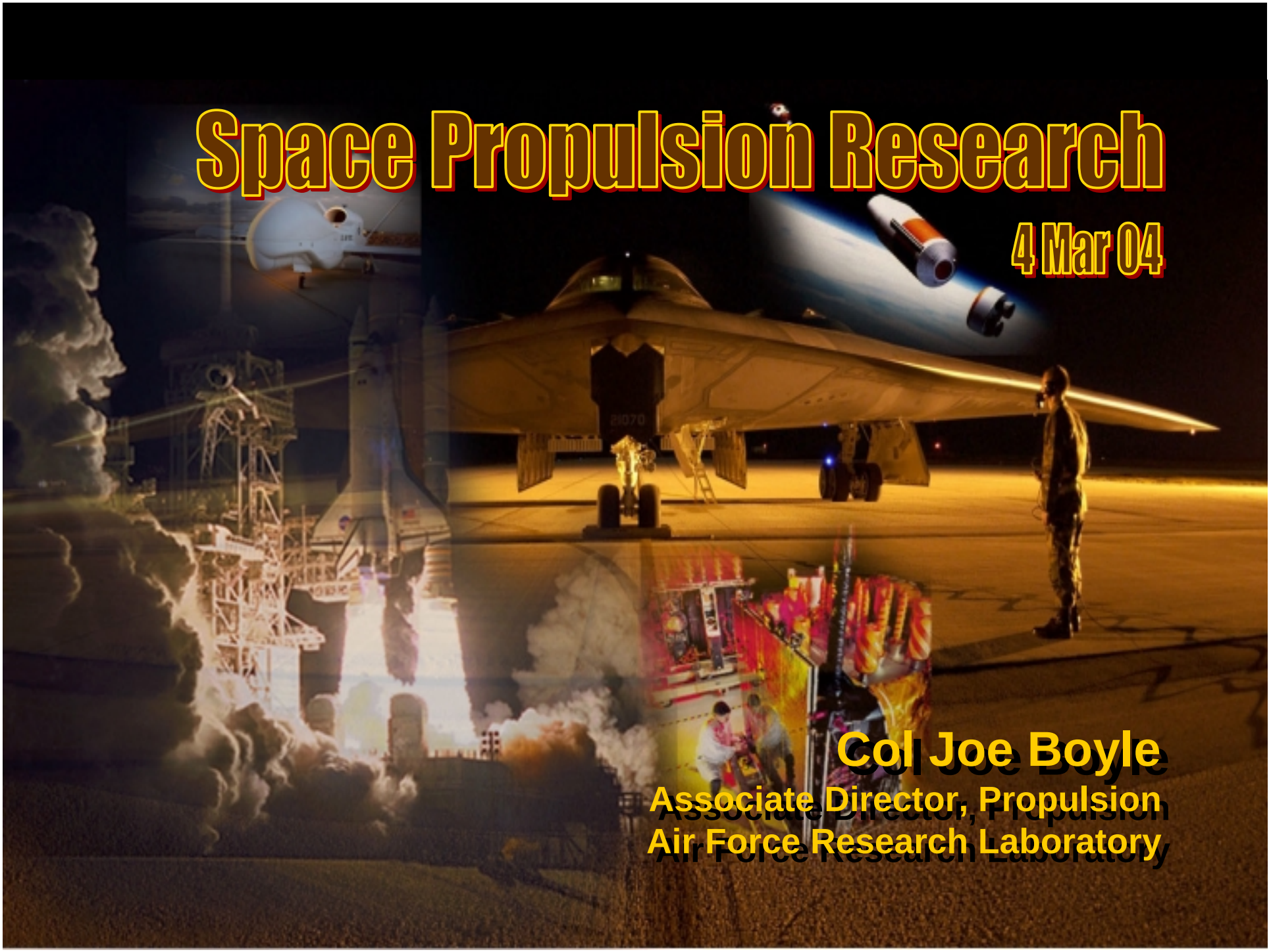

Space Propulsion Research
4 Mar 04
Col Joe Boyle
Associate Director, Propulsion
Air Force Research Laboratory

Agenda

- NASA Collaboration
  - NRPTA
  - IHPRPT
- Test Stand Legacy
- Reusable Booster Engines
- Orbit Transfer Propulsion
- Power

AFRL-Edwards Test Stands


Test Stand 1D


Test Stand 2A

Test Stand 1-32 – SR-19 Firing


Test Stand 1A – RS-68 Engine

- 20 Rocket Test Complexes with 51 Test Cells
- 60% of the Nation's Million-lb class engine stands
- Three recently refurbished Apollo-era stands
- Legacy includes development and production testing of upper-stage & booster-class liquid and solid rockets

Reusable Boost

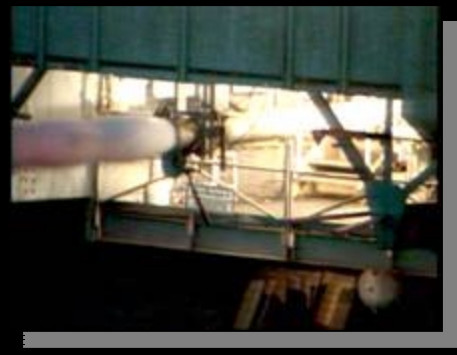
- Capabilities
  - Full Flow Cycle,
    - Enables 10 times engine life & reliability
  - Hydrostatic Bearings
  - Oxygen Rich Compatible Materials
  - Integrated Vehicle Health Monitoring
  - Advanced Engine Cooling

IPD Hydrogen Pump Test

IPD Oxygen Pump Test

IPD Hydrogen Preburner Test

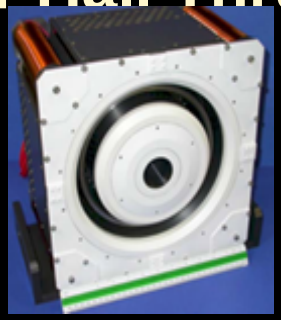
Rocketdyne RS-27



IPD Oxygen Preburner Test

Orbit Transfer Propulsion

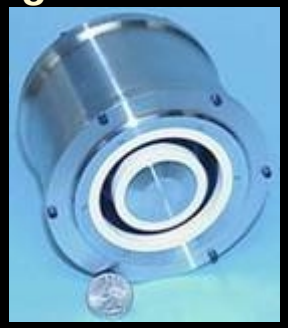
AFRL Developing High Power Hall Thrusters



20 kW High Performance Hall Thruster

…and Clustered Hall Thruster Technologies

Cluster of four 200 W Hall thrusters



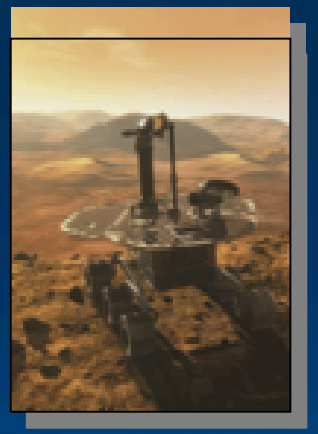
600 W Hall thruster for clustered operation

Combine for Scalable Propulsion System for Orbit Transfer Applications

- Enables High Priority Missions
  - Cargo Transport for Manned Exploration
  - LEO-GEO Orbit Transfer
  - Satellite Rescue & Servicing

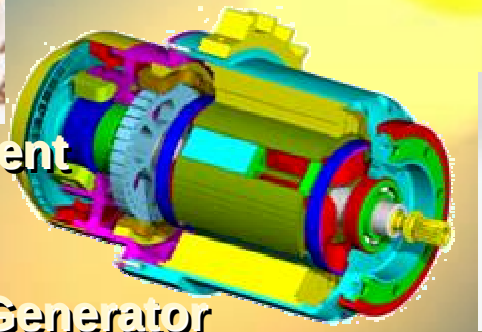
Space Power

- Enables Responsive Access-To-Space For On-Demand Delivery of Mission Assets To Low Earth Orbit
- Affordable Spacelift Enabling New Space Ops
- Eliminate Central Hydraulics - Decrease System Complexity
- Fault Tolerant "Smart" Power Improves Reliability



Advanced Energy Storage Devices (Lithium Ion Battery)

Thermal Management



Turbo Generator

Variable Speed Drives

Fuel Cells


Our Mission
Create & Transition
Propulsion and Power
Technology for Military
Dominance of Air and Space