

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) Class 2022

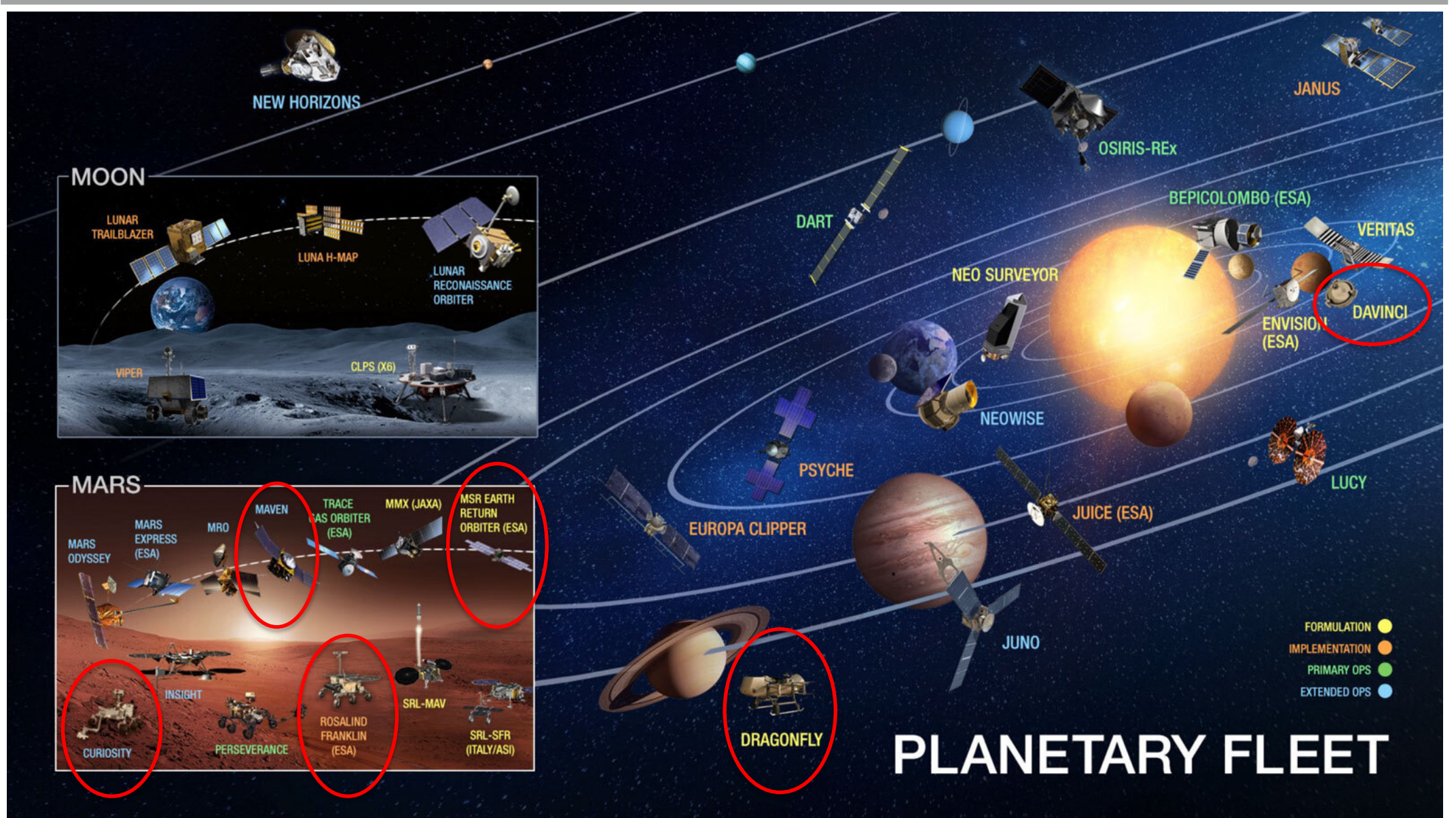
Integration & Testing of Flight Instruments and Observatories



August 2, 2022

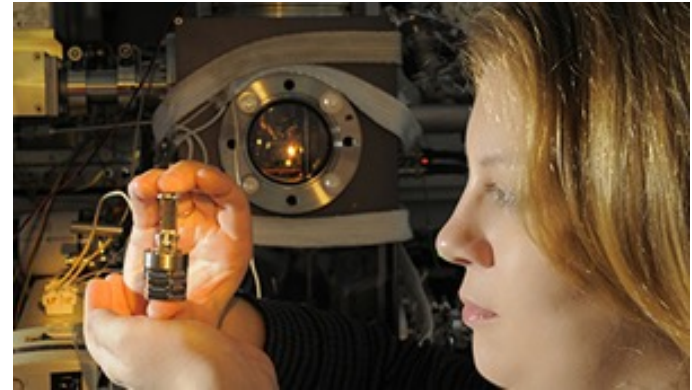


NASA Missions Supported—Hey Earth is a planet!





Many roles of Engineering at NASA



Integration & Test

(as its name implies...)

is all about

- Integrating spacecraft and instrument components into larger overall system
- Designing and performing system-level tests
- Performing environmental testing
- Getting the team to launch day!



Integration involves MANY engineering disciplines





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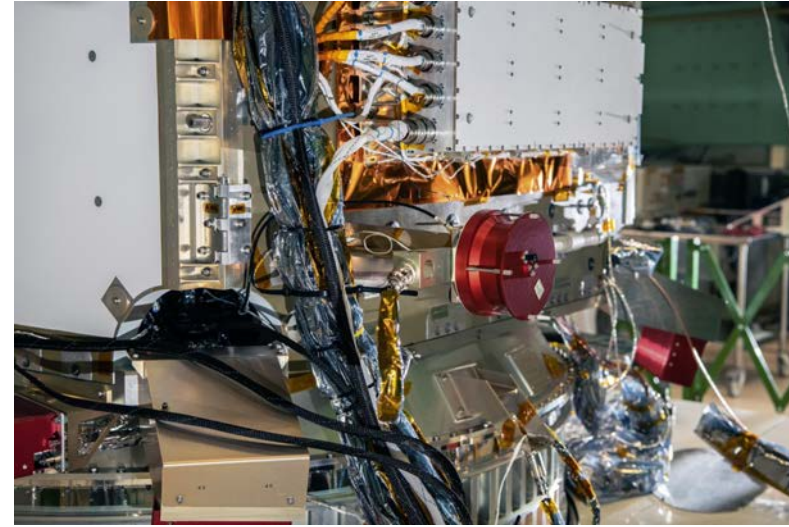


*Mechanical & Electrical
Ground Support Equip (GSE)*





At each step of integration, you also have to test!





Environmental Testing



Test as you fly...Fly as you test!

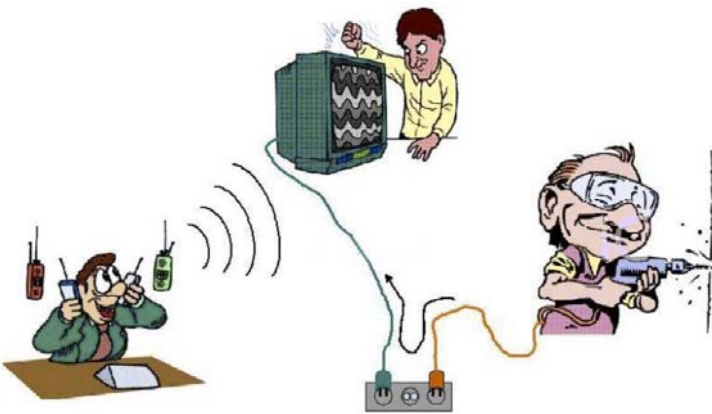
- Goal of environmental testing is to ensure the flight hardware you just spent all that time integrating and functionally testing will survive the launch and operations in space!
- It also verifies:
 - Analyses (things that were previously just calculations)
 - Workmanship (things that vary from one person's handiwork to another)
 - Performance & Calibration (that need the flight-like conditions)



EMI / EMC



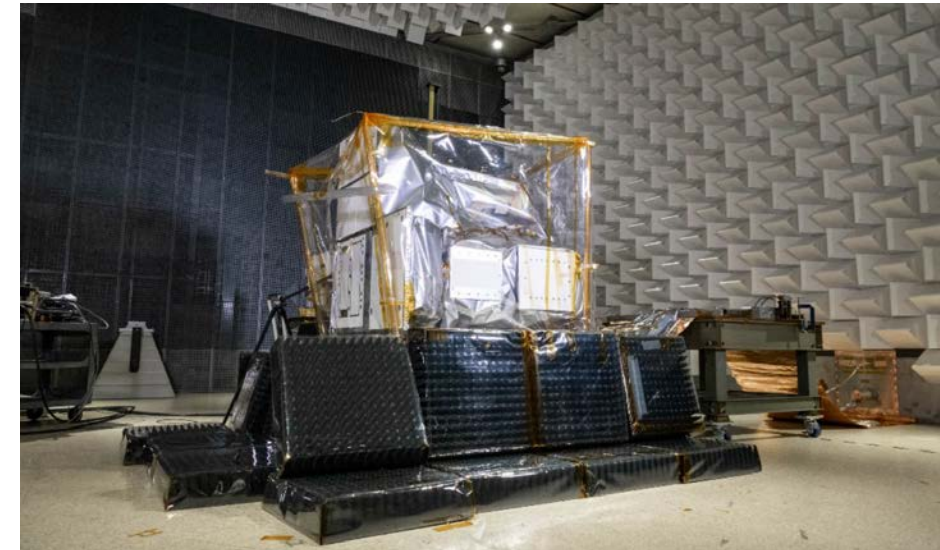
- Electromagnetic interference & Electromagnetic Compatibility
- Checks radiated and conducted susceptibilities of your sensitive flight hardware and ensures your spacecraft all is compatible



ExoMars MOMA in small EMI chamber



OCI in large (RFI) EMI chamber

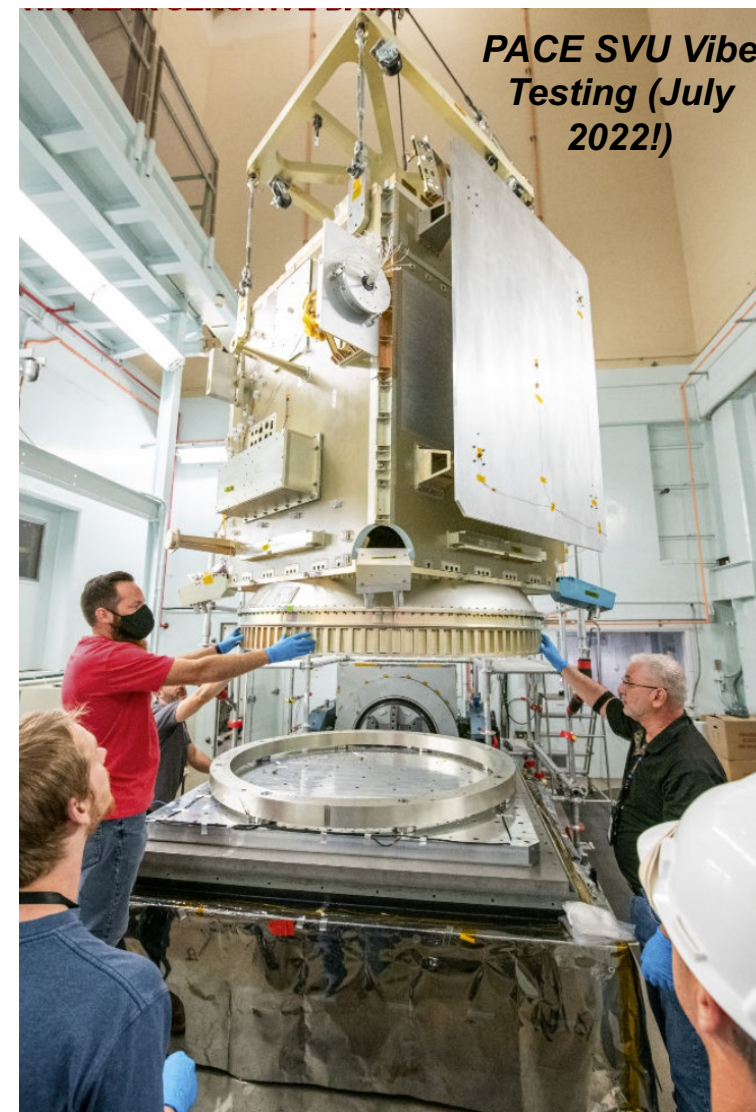




Mechanical Environments



- Mechanical tests simulate the launch environments
 - 3-axis Vibration
 - Acoustics
 - Shock
 - Induced from launch vehicle interfaces
 - Self-induced from releasing launch locks and other mechanisms

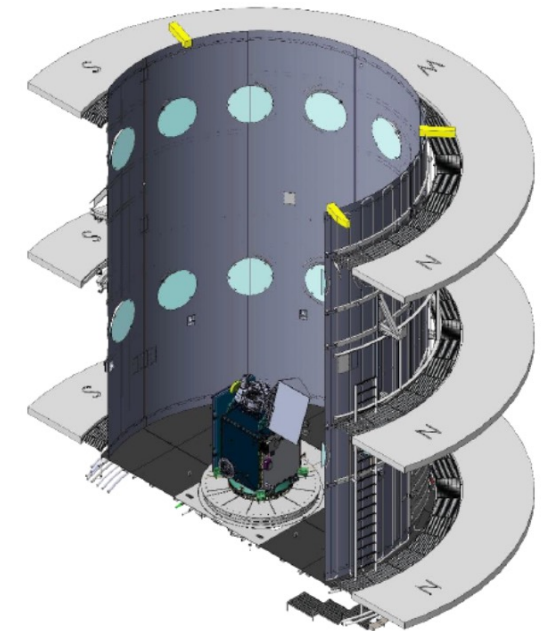
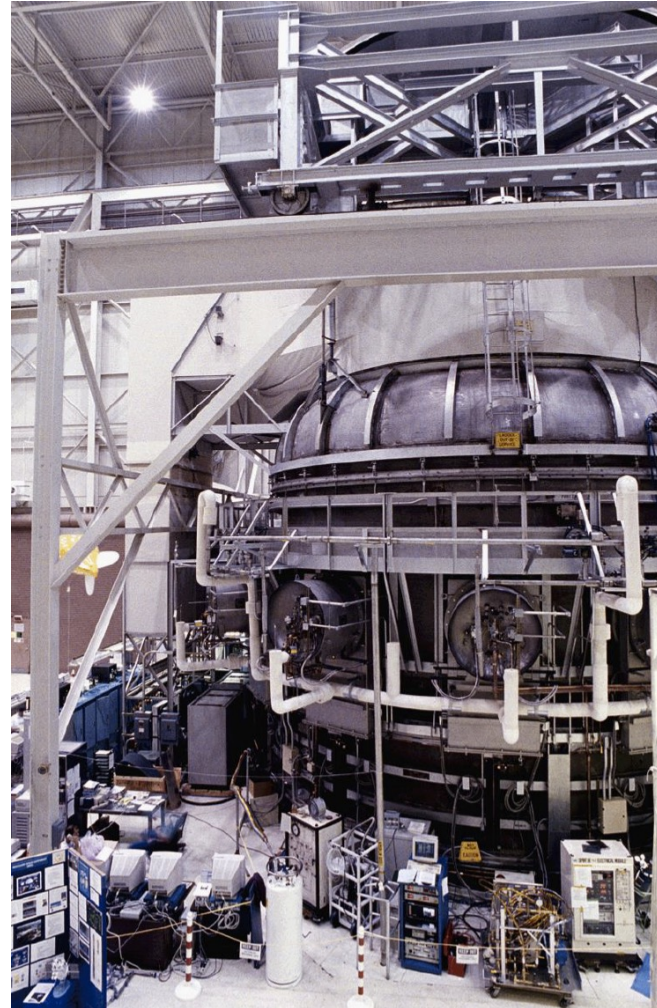




Thermal Vacuum Testing

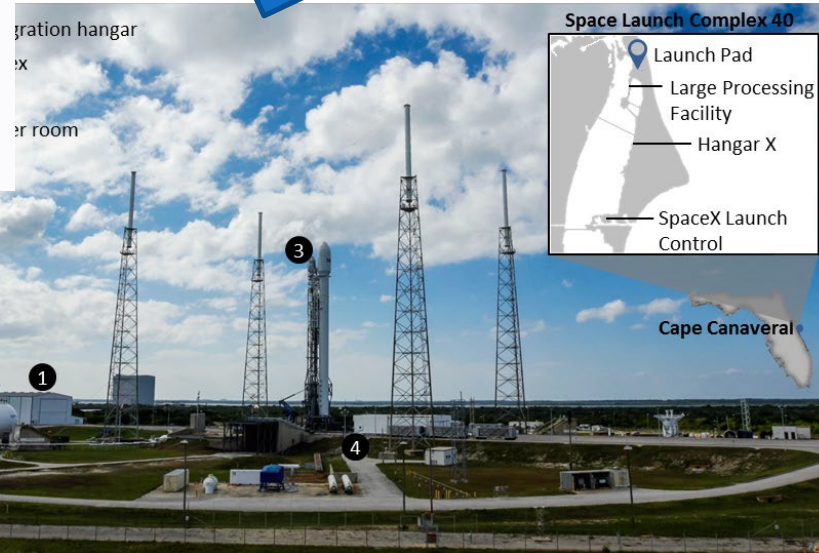
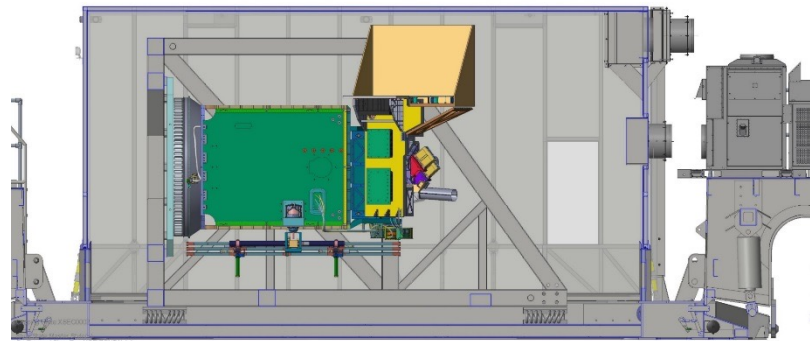
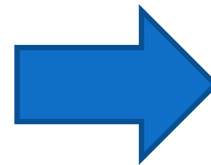


- Simulates the vacuum of space (unless your mission is to somewhere WITH an atmosphere, then you have to do that too!)
- Simulates the hot and cold cycles of orbits which cause stress to parts
- Validates all the thermal modeling
- Verifies workmanship after mechanical environments
- Allows for cleanliness bakeouts



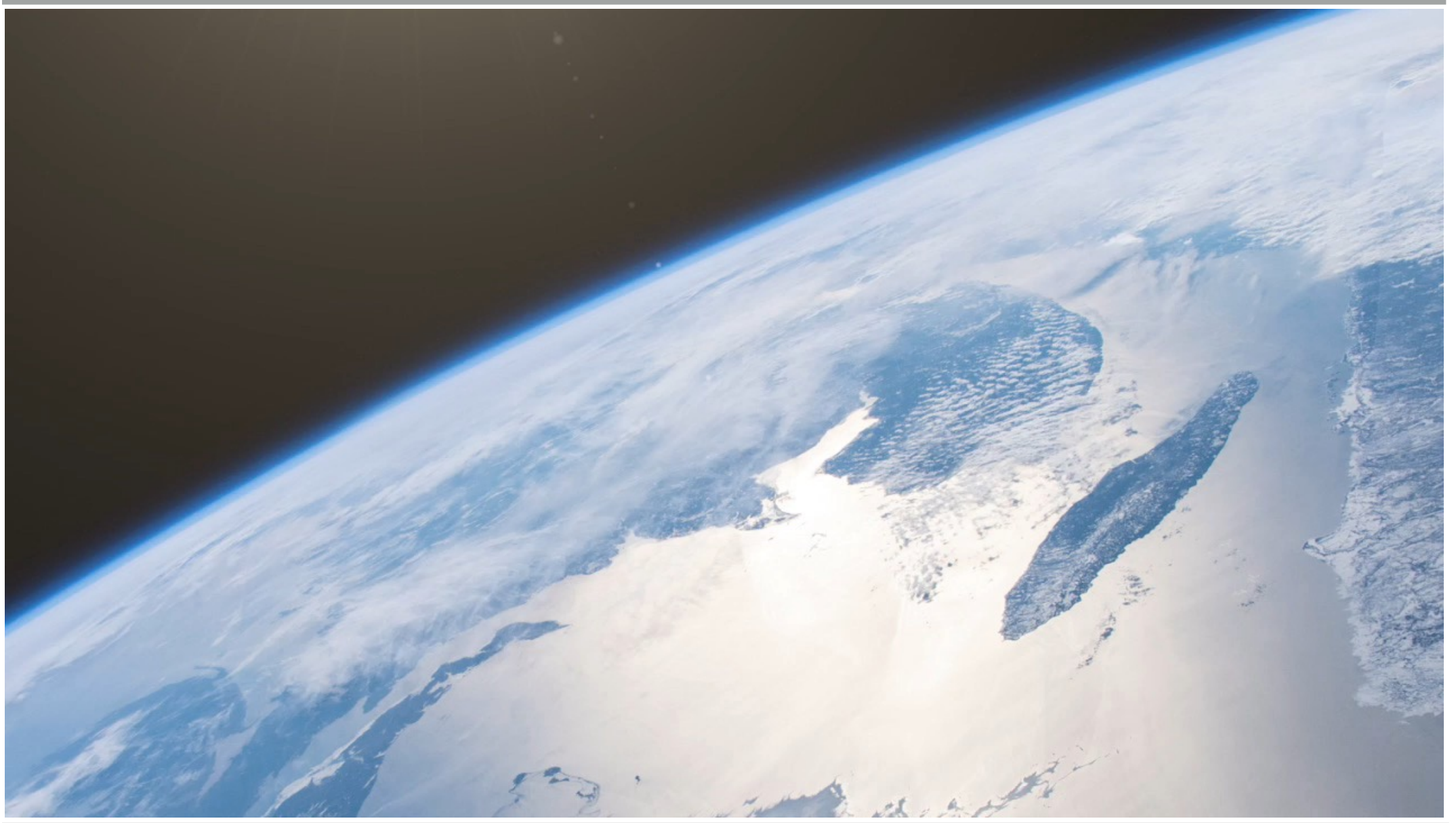


Pack it, ship it, launch it!





Any Questions?





Introduction

