



Boeing Defense, Space & Security
PhantomWorks

Phantom Eye



***Transformational Endurance
for Wildfire Detection and Response from the Stratosphere***

Wildfire Operational Needs

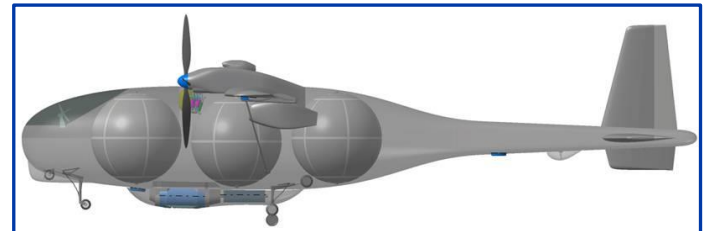
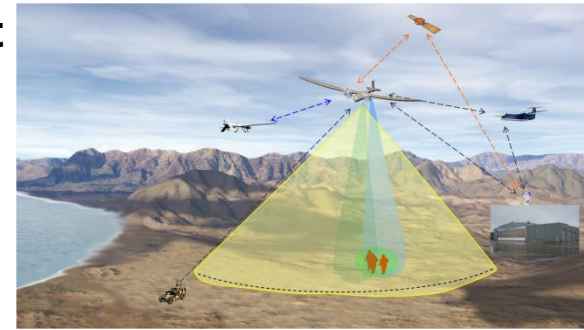
Remote Sensing and Communications from the Stratosphere

MISSION NEEDS

- **Remote sensing platform** that is **persistent**, **flexible**, and **affordable** to support wildfire forecasts, fire detection (FUEGO), initial attack, fire crew insertion, retardant drops, assess rehabilitation & restoration
- **Provide “overwatch”** during initial & extended attack to protect firefighter / public safety, assess wildfire complexity, progression & suppression effectiveness
- **Communications enabler** for firefighters, the Incident Commander, and other response forces and command & control elements

ENABLING TECHNOLOGIES

- Hydrogen internal combustion engines
- Lightweight cryogenic fuel storage
- Modular mission system design
- Advanced autonomous system guidance



Boeing Phantom Eye

Objective System

- Provides “Geo-stationary satellite” functionality in the Stratosphere
- Provides affordable 24/7 operations designed to support a wide variety of missions, including ISR, communications, PNT and missile defense
- Designed for multi-day reliability--up to 10 days endurance
- 1,000 to 10,000 lbs payload
- Cruises at 60-65kft altitude, 150 kts, 1 NM diameter loiter

Demonstrator Status

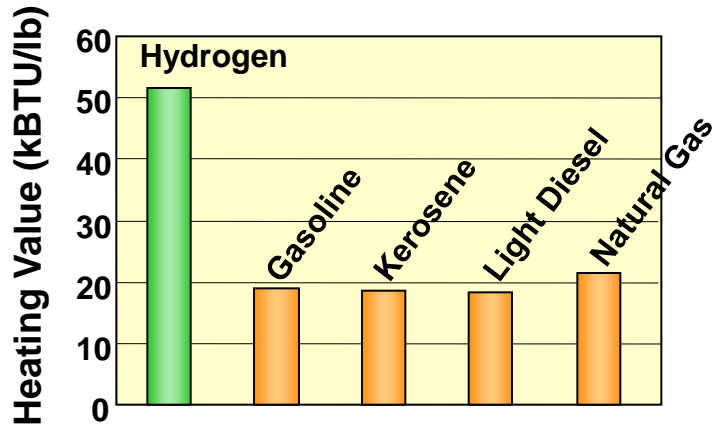
- Flight testing on-going



Transformational Loitering Endurance in the Stratosphere

Hydrogen Propulsion Enables Extreme Persistence

Hydrogen Is a Superior Fuel



Hydrogen Engines are Ready for Use



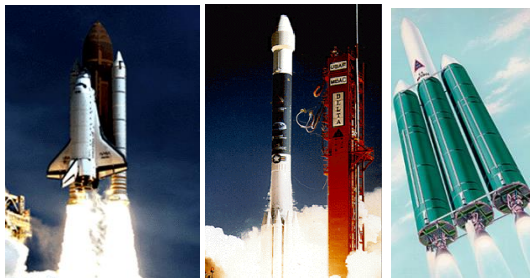
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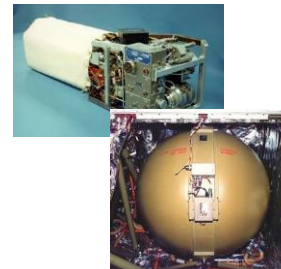
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Boeing Cryogenic Hydrogen Technology and Operations



Launch Vehicles



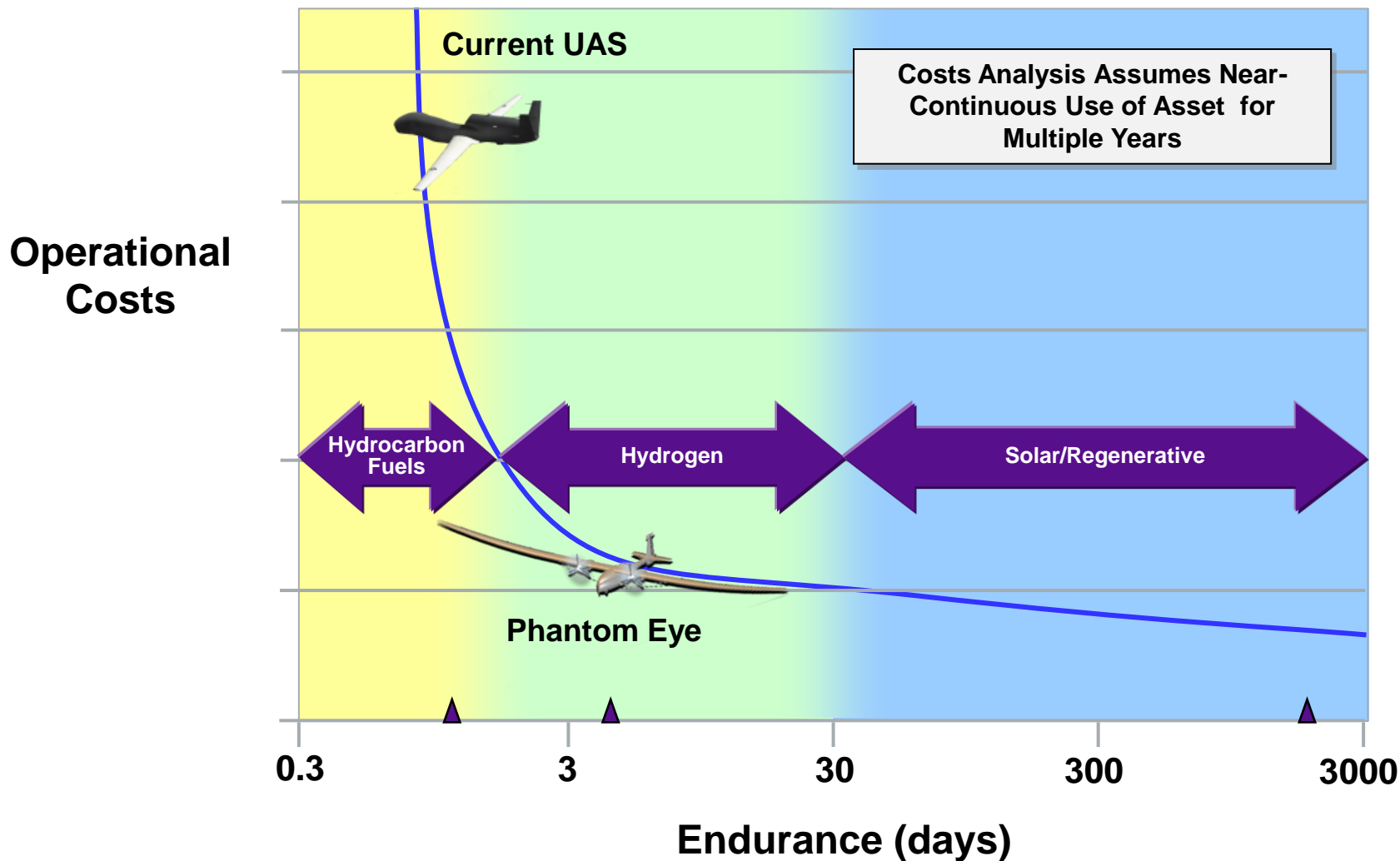
Space Shuttle Fuel Cell



Cryogenic Test
Facilities

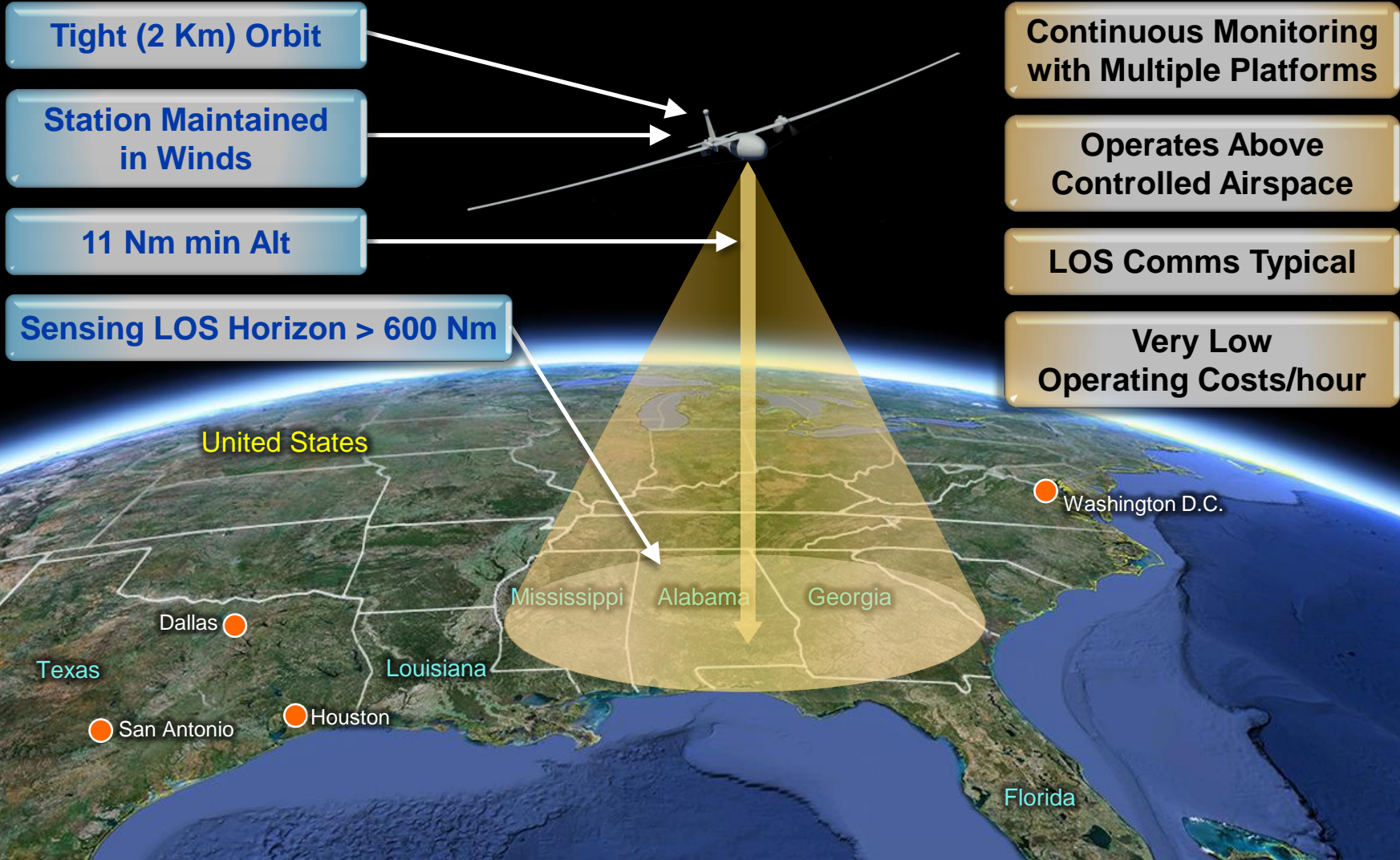
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Endurance Enables Affordable Operations



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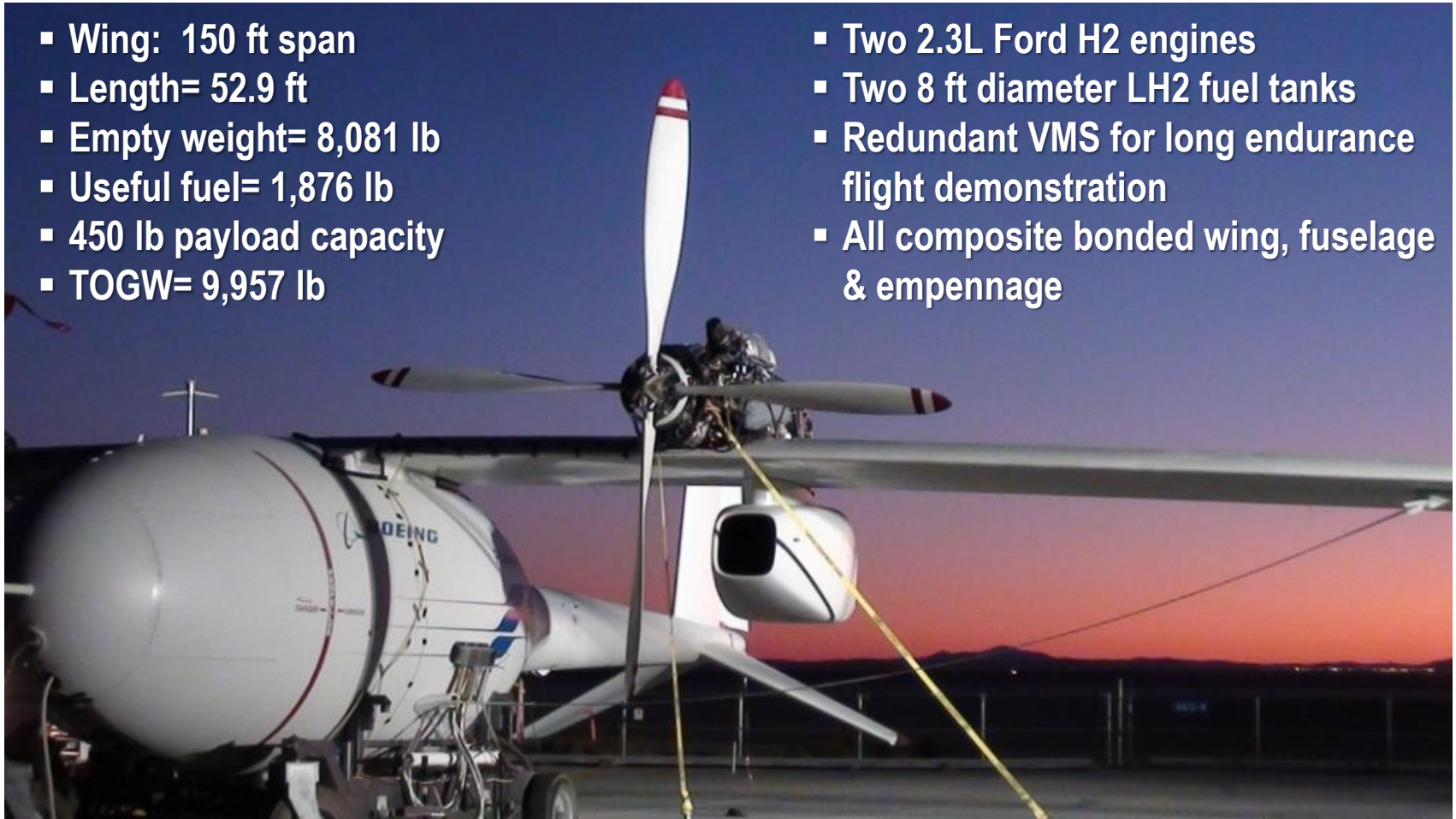
Phantom Eye Geo-Stationary Orbit



Phantom Eye Demonstrator

Objective: Prove the technical readiness of the hydrogen propulsion system for operational development

- Wing: 150 ft span
- Length= 52.9 ft
- Empty weight= 8,081 lb
- Useful fuel= 1,876 lb
- 450 lb payload capacity
- TOGW= 9,957 lb
- Two 2.3L Ford H2 engines
- Two 8 ft diameter LH2 fuel tanks
- Redundant VMS for long endurance flight demonstration
- All composite bonded wing, fuselage & empennage

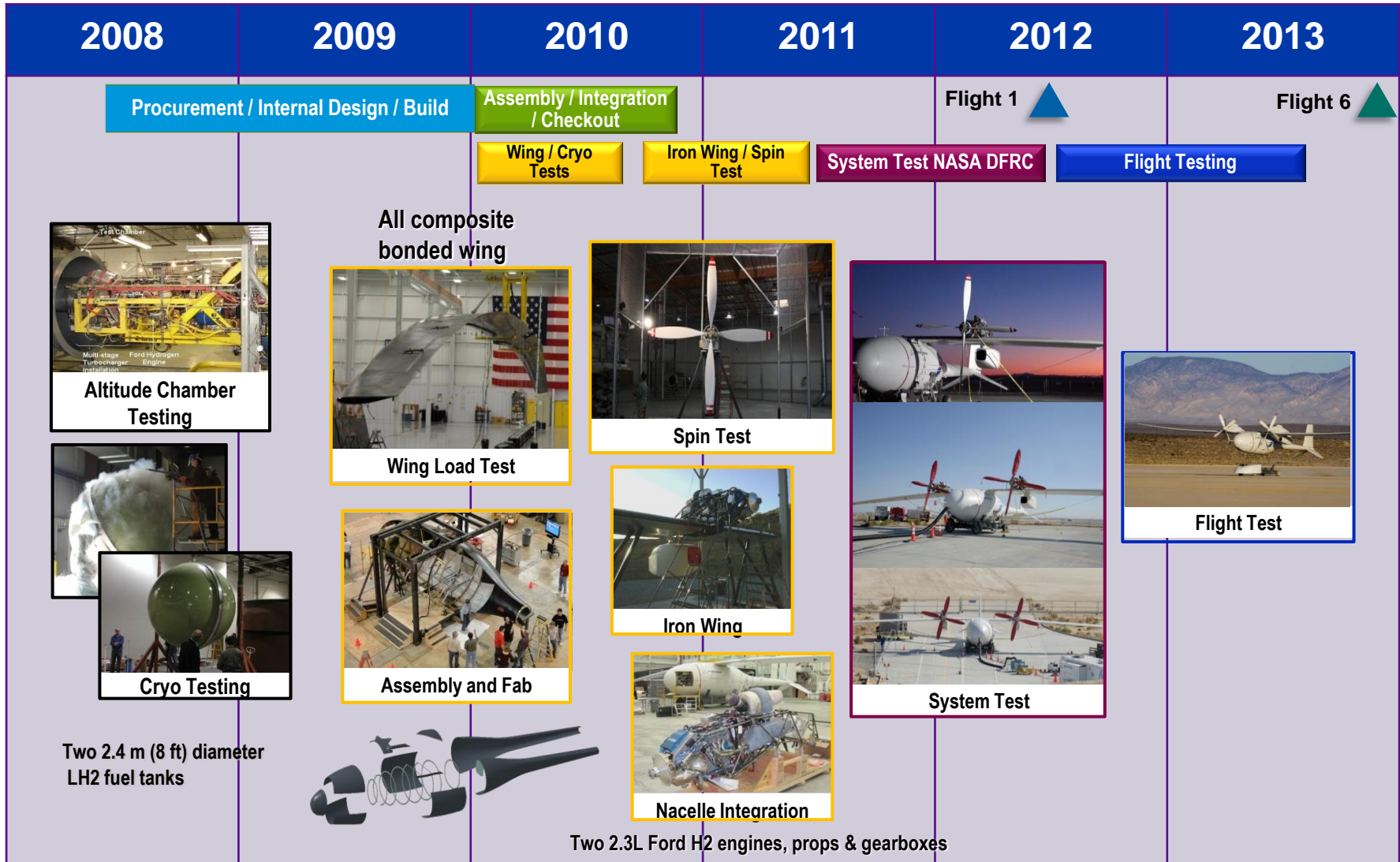


Flight Testing On going

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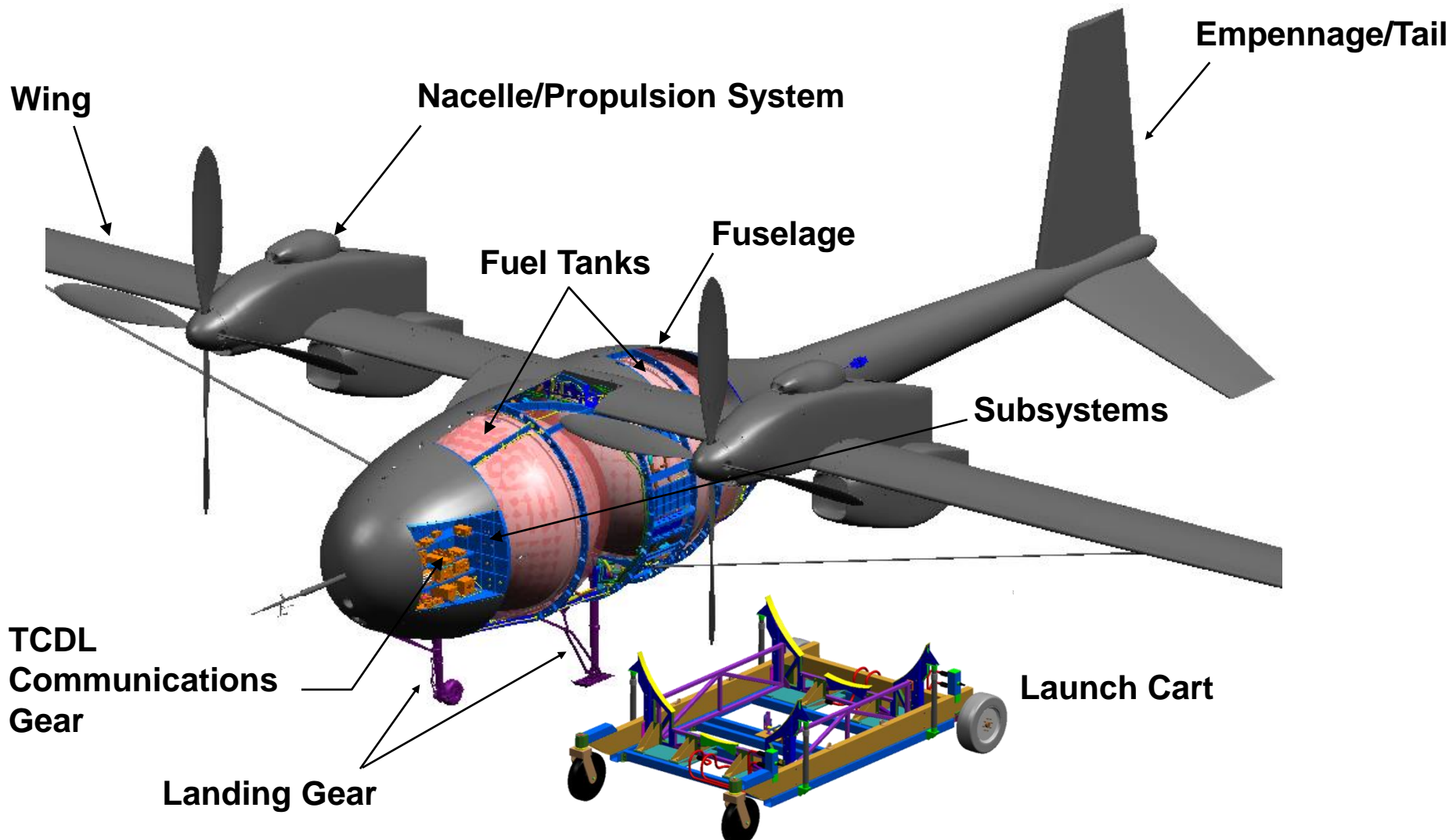
Phantom Eye Demonstrator

Currently in Flight Test



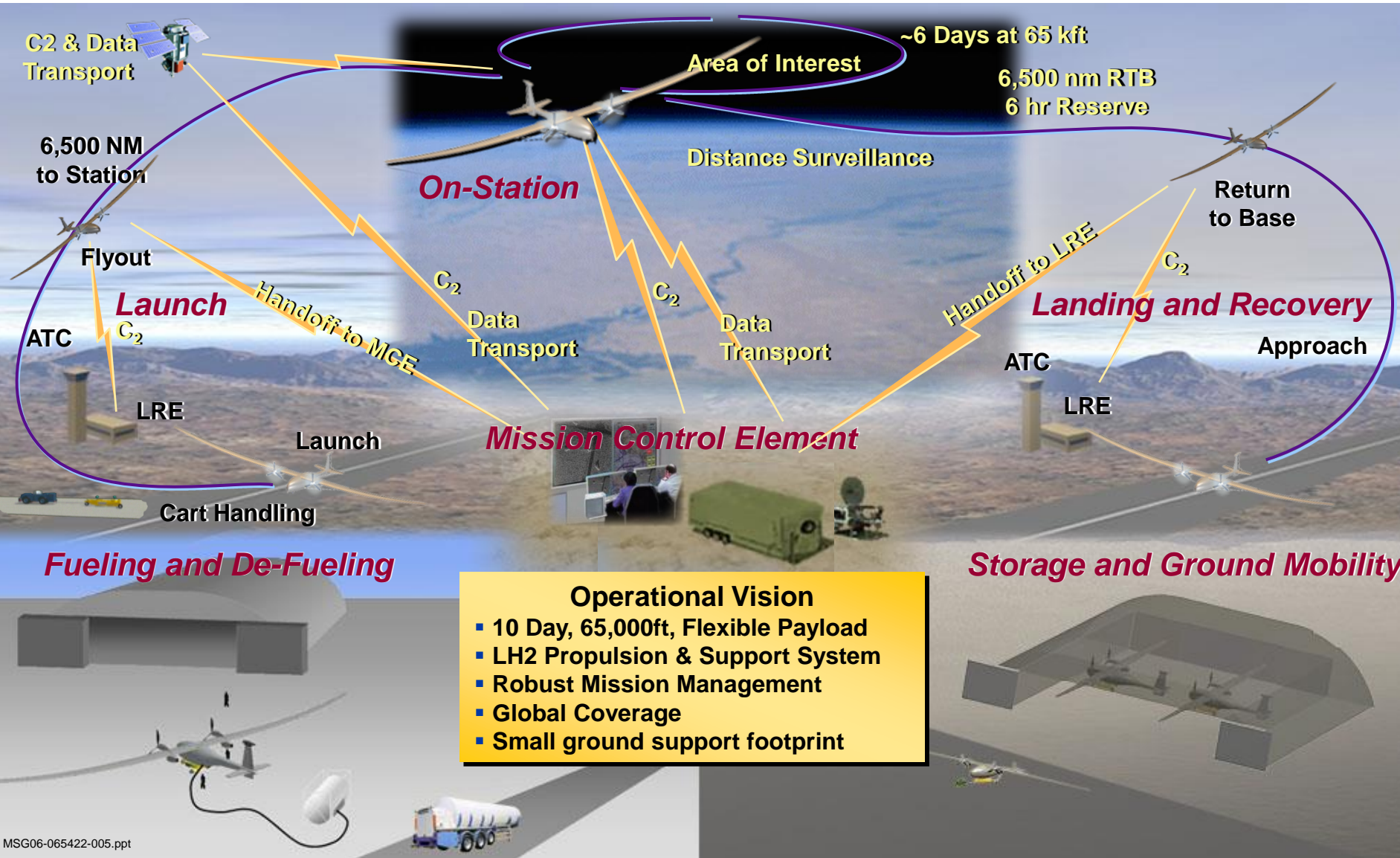
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Phantom Eye Demonstrator Configuration



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Operational Concept



- Operational Vision**
- 10 Day, 65,000ft, Flexible Payload
 - LH2 Propulsion & Support System
 - Robust Mission Management
 - Global Coverage
 - Small ground support footprint

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FUEGO and Phantom Eye:
“Game Changing” technologies to
address wildfire disaster
management.