



Innovation Thrives in Boeing Satellites

**LAEDC
Los Angeles, CA
July 25, 2012**

**Dr. Bruce Chesley
The Boeing Company
Advanced Space & Intelligence Systems**

The Boeing Company Heritage

Boeing Defense, Space & Security

MCDONNELL *Aircraft Corporation*



Hughes Helicopters, Inc.
Hughes Space & Communications

Boeing – Business Mix

BDS N&SS | Space & Intelligence Systems

Defense, Space &
Security
47%



Commercial
Airplanes
53%

2011 Revenue \$68.7B

Balanced Portfolio

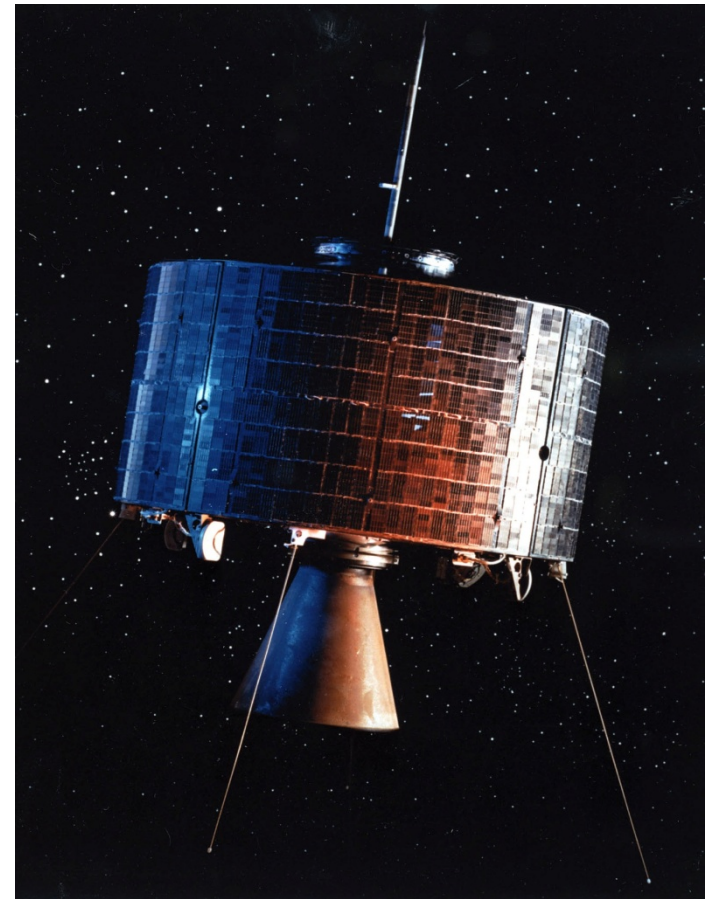
Boeing Space & Intelligence Systems



Mature and Enduring Need for Satellites

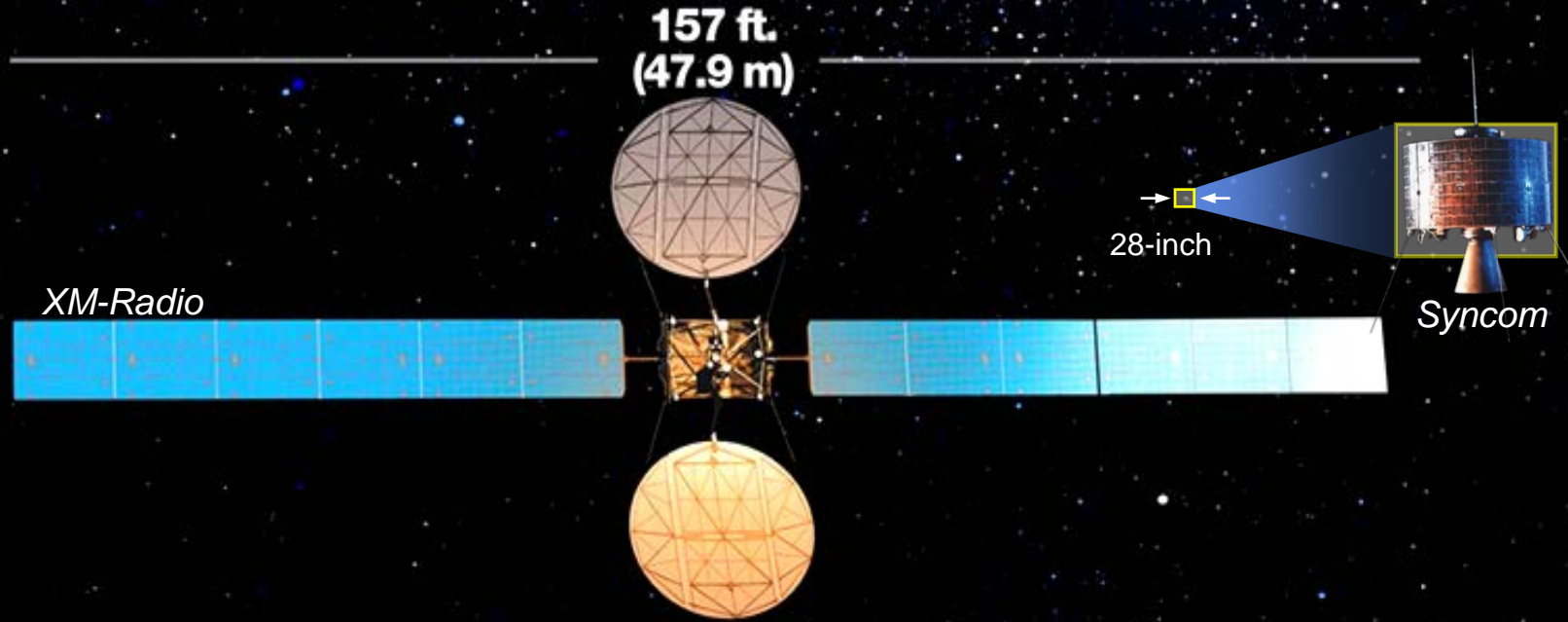
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- **Satellites have been in use for more than 50 years**
 - First U.S. satellite launched in 1958
 - First commercial satellite launched in 1962
- **Over 500 satellites in use today**
- **More than 300 satellites in development or manufacture today**
- **Satellites provide unique abilities...**
 - Ubiquitous global coverage without violating sovereign airspace
 - 24/7/365 operations in almost any condition
 - Ultimate high ground for operations
- **Market for satellites is stable, quantifiable and verified**



How Large is a Satellite?

Wingspan: 787 Dreamliner vs Satellite



XM-Radio

**157 ft.
(47.9 m)**

28-inch

Syncom

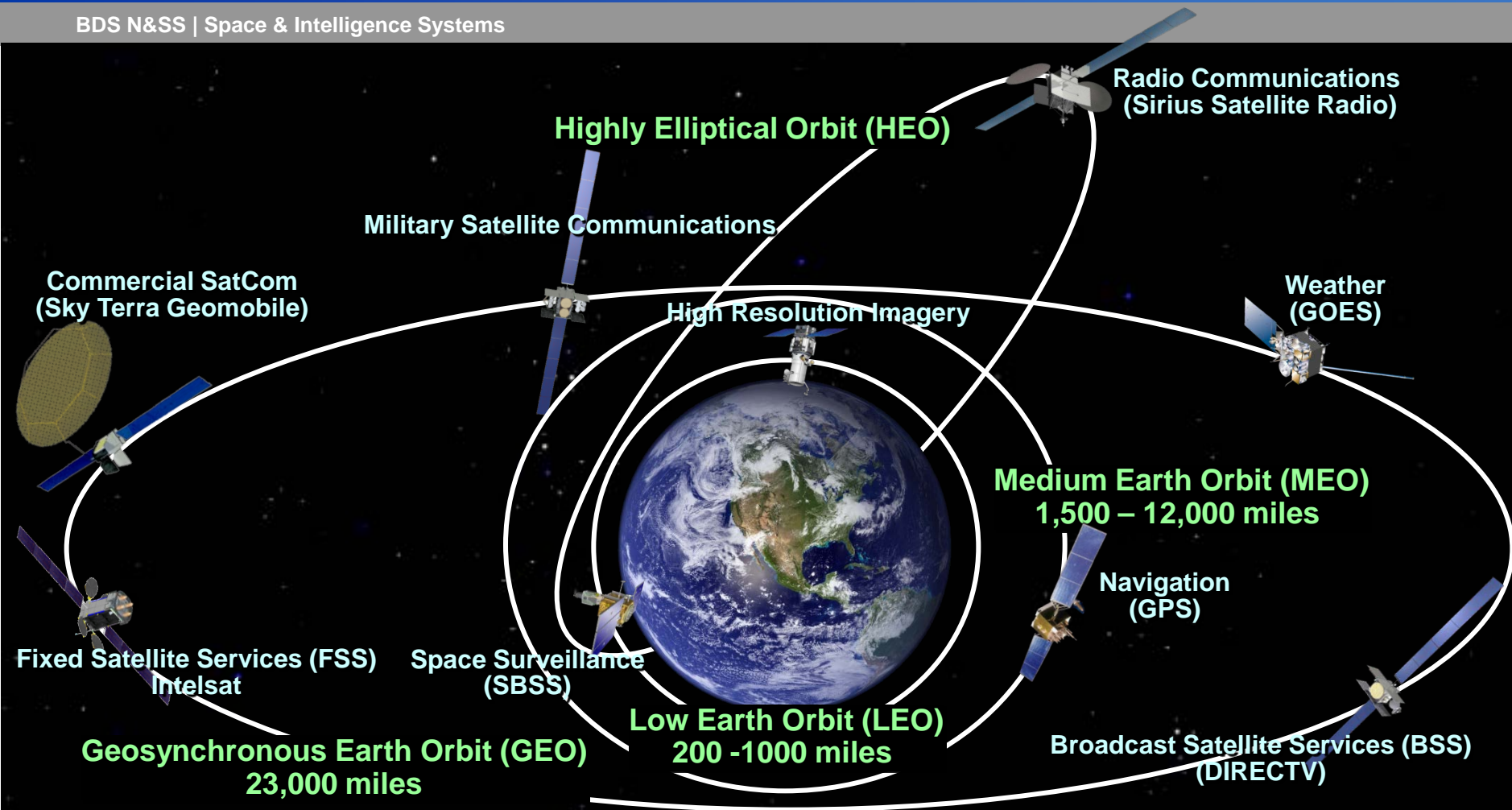
**197 ft.
(60 m)**



How Far Away are Satellites?

Satellite Orbit Positions

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Survivability Challenges in Space

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- **Average design life**

- 15 yr

- **Temperature**

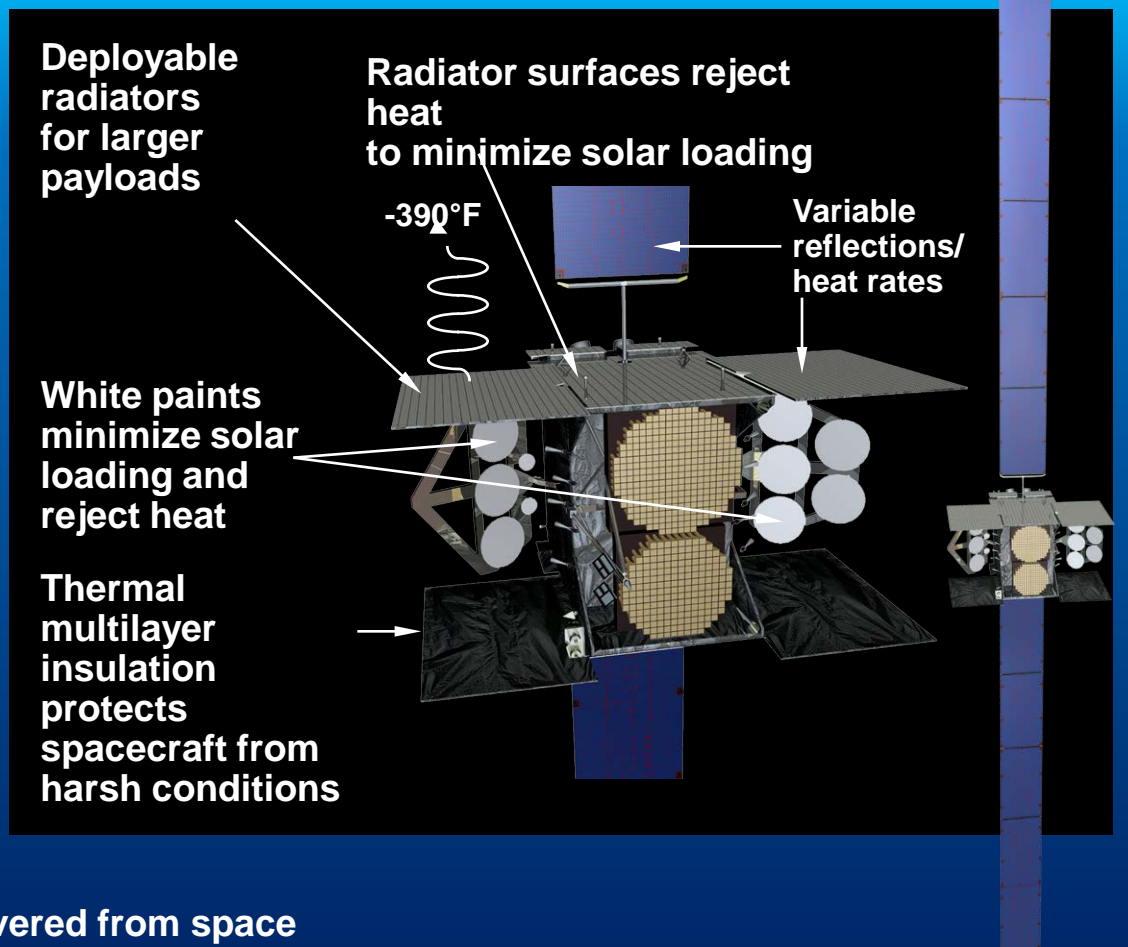
- External temp between
 - Cold: -390°F
 - Hot: $+390^{\circ}\text{F}$
 - Spacecraft maintains room temperature

- **Radiation**

- Daily exposure of 100M rads
 - Equivalent to 220M chest x-rays everyday

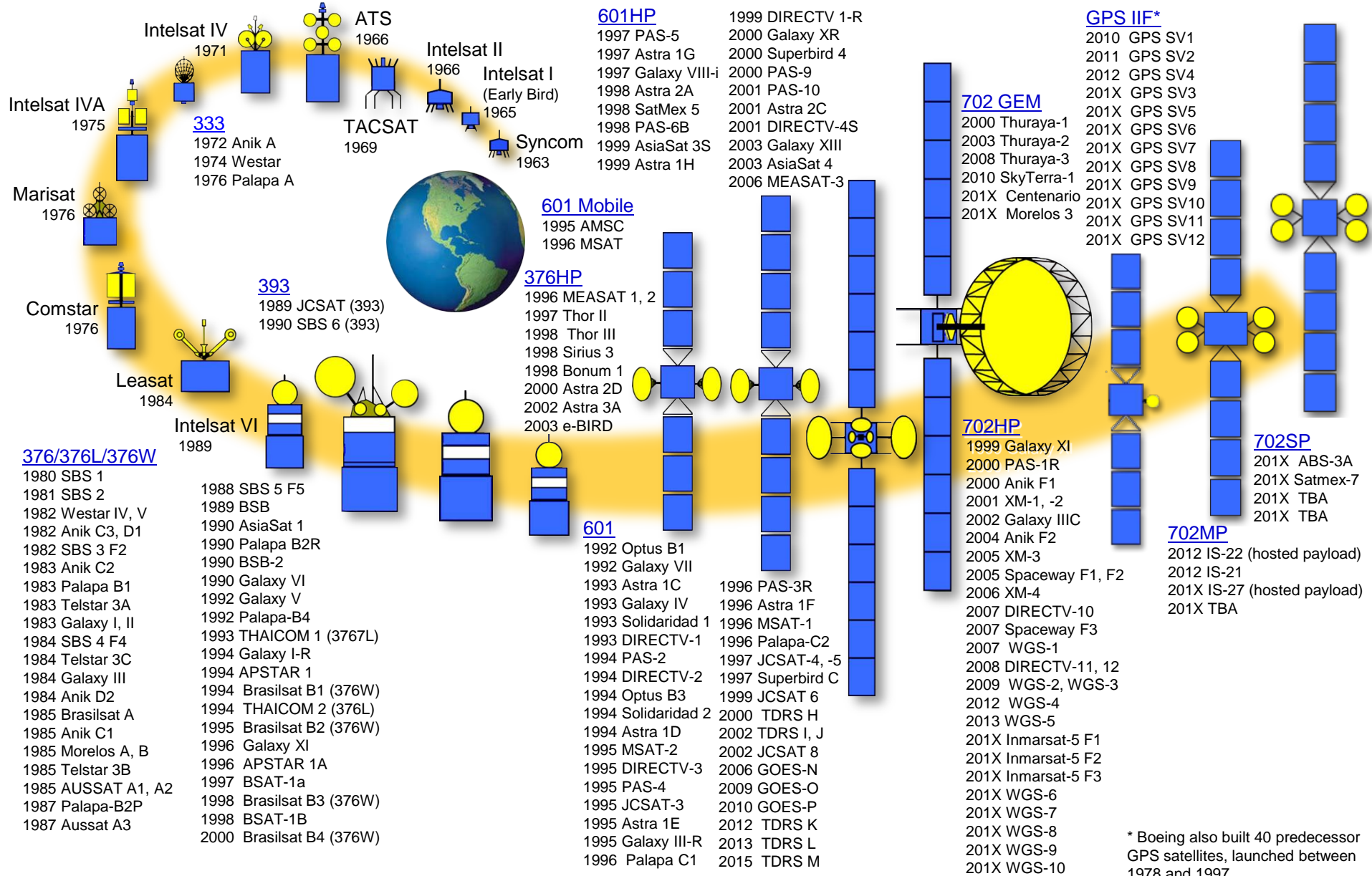
- **Micro meteorites**

- In 1984 two Boeing satellites recovered from space showed millions of strikes from micro meteorites

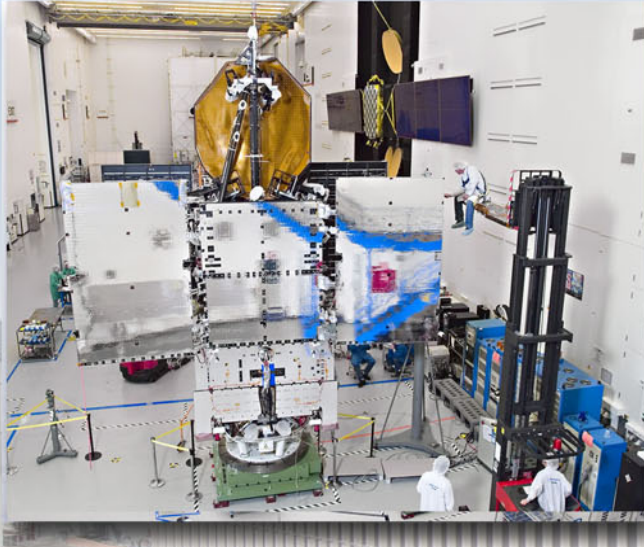


Boeing Space & Intelligence Systems

Celebrating 50 years of satellite innovation



Boeing Satellite Factory and Mission Control Center in El Segundo



- World's largest dedicated spacecraft facility
- Over 1 million square feet
- \$1.2B in capital equipment
- Mission Control Center conducts flight operations



Where Boeing Satellites are Built

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Nash factory built in 1948

In 1955, Hughes purchased the 500,000-square-foot facility for \$3M and began its evolution from an automobile manufacturing plant to today's Boeing Satellite Factory

Factory Now – Over a Dozen Satellites in Production at any time

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Commercial & Government Customers – Worldwide

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Boeing Space & Intelligence Satellite Programs

Government Programs

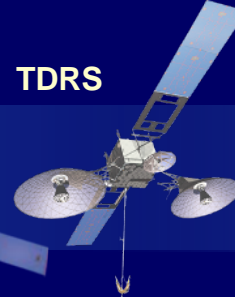


GPS IIF



MUOS PL

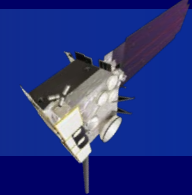
TDRS



WGS

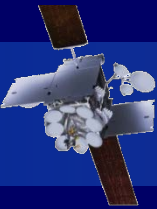


GOES-N,O,P

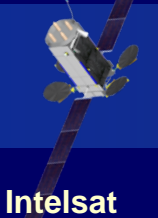


Hosted Payloads

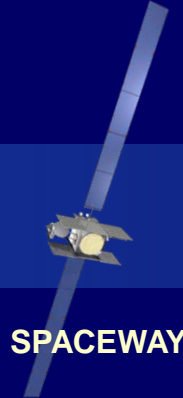
Commercial Programs



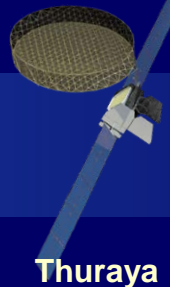
Inmarsat



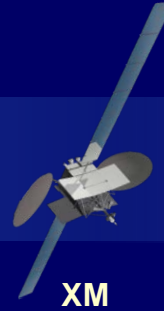
Intelsat



SPACEWAY



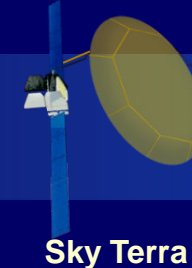
Thuraya



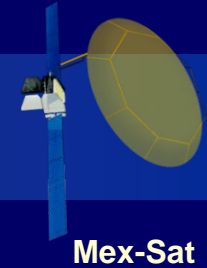
XM



DIRECTV



Sky Terra



Mex-Sat

National Programs

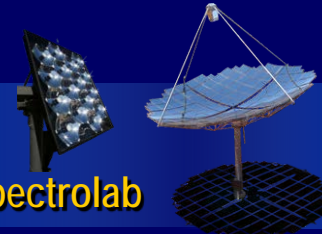


Space Superiority



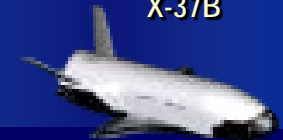
SBSS

Spectrolab



Classified

X-37B



Integrated Ground Systems



Boeing Satellite Product Line

Expanded offerings to excel in a competitive marketplace

- **Supports all space missions – Communications, Navigation, Earth Observation, Government Use**
- **Scalable payloads from 3kW to >12kW**
- **Technology roadmap focused on cost reduction and long-term competitive advantage**



Payload Power (kW)	3-7	6-10	10-12	>12	8-10

