



THE VALUE OF PERFORMANCE.
NORTHROP GRUMMAN

Northrop Grumman Overview

UCSB Affiliates Meeting

March 19, 2014

Gregory Chao

Director of Electronics and Sensors

Research and Technology Homeroom

Aerospace Sector

 <p>Unmanned Systems</p> <p>In sea, land, air and space, Northrop Grumman Corporation is the recognized leader in unmanned systems.</p>	 <p>Cyber</p> <p>Outpacing the rapidly evolving cyber threat spectrum demands constant innovation. We understand its complexity.</p>	 <p>C4ISR</p> <p>Our breadth, depth and ability provides first responders, intelligence gatherers and others with tools to act with confidence.</p>	 <p>Logistics</p> <p>Northrop Grumman offers a full-spectrum of logistics support and services to meet any mission requirement.</p>
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Vision - *Our vision is to be the most trusted provider of systems and technologies that ensure the security and freedom of our nation and its allies. As the technology leader, we will define the future of defense - from undersea to outer space, and in cyberspace.*

- Leading global security company
- Net sales in FY2013 were \$24.7 billion
- \$37 billion total backlog at the end of 2013
- 65,000 employees

Heritage

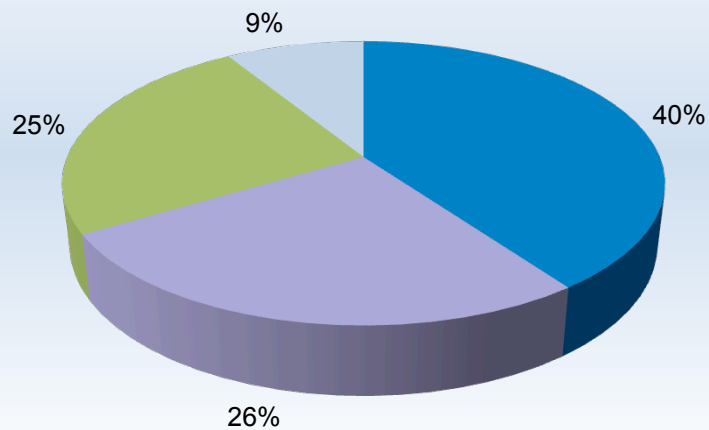


Northrop Grumman Corporation represents the successful integration of nearly 20 marquee companies into an enterprise that covers the entire battlespace spectrum, from undersea to outer space and into cyberspace. The companies that became part of today's Northrop Grumman achieved historic accomplishments, from transporting Charles Lindbergh across the Atlantic to carrying astronauts to the moon's surface and back.

NOC – Business Portfolio

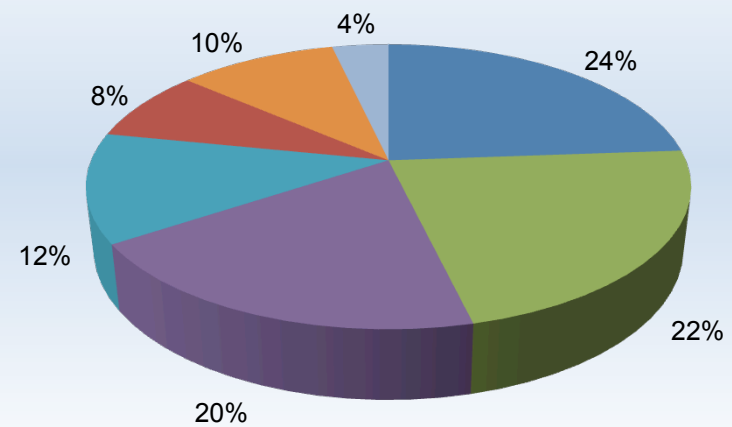


By Segment



- Aerospace Systems
- Electronic Systems
- Information Systems
- Technical Services

By Customer



- Air Force
- US Navy
- Restricted
- Other US Govt.
- Army
- Int'l/ FMS
- Comm'l/ S&L

2013 Revenues \$24.7B

Northrop Grumman Organization



Wes Bush
Chairman,
Chief Executive Officer
& President

Operations



Tom Vice
President,
Aerospace
Systems



Gloria Flach
President,
Electronic
Systems



Kathy Warden
President,
Information
Systems



Chris Jones
President,
Technical
Services



Mark Caylor
President,
Enterprise
Shared Services



Dave Perry
Chief Global
Business
Development
Officer

Corporate



Jim Palmer
Chief Financial
Officer



Linda Mills
Corporate Vice
President,
Operations



Sheila Cheston
General Counsel



Denise Peppard
Chief Human
Resources Officer



Sid Ashworth
Corporate Vice
President,
Government
Relations



Darryl Fraser
Corporate Vice
President,
Communications

Four Operating Sectors at a Glance

Aerospace Systems



**Airborne Grd Surveillance / C2
C4ISR**

**Directed Energy Systems
Electronic Combat Operations
Environmental & Space
Science Satellite Systems
Global / Theater Strike Systems
ISR Satellite Systems
Large Scale Systems Integ.
MILSATCOM Systems
Missile Defense Sat. Systems
Naval BMC2
Strategic Space Systems
Unmanned Systems**

Electronic Systems



**Air Defense Systems
C4ISR Networked Systems
EO/IR Targeting & Surveillance
Marine & Undersea Systems
Navigation & Positioning Systems
Propulsion & Power Generation
Radar Sensors & Systems
RF/IR Countermeasures
Space Sensors**

Information Systems



**Command & Control Systems
Communications
Cyber
Enterprise Systems
and Security
Federal, State/Local
& Commercial
Health IT
Homeland Security
Intelligence
Intelligence, Surveillance &
Reconnaissance Systems
IT/Network Outsourcing**

Technical Services



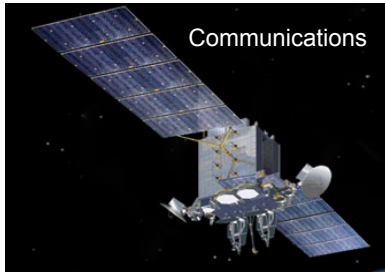
**Aircraft Subsystem/Component
Sustainment & Modernization
Aircraft System/Platform
Sustainment & Modernization
Defense & Government Services
Ground Vehicle Reconstitution
Integrated Logistics &
Modernization
Irregular Warfare/Quick Reaction
Capability
Live, Virtual & Constructive
Domains
Nuclear Security Services
Technical and
Operational Training Support
Training Solutions**

Aerospace Systems is a premier developer, integrator, and producer of manned and unmanned aircraft, space systems and advanced technologies critical to our nation's security.

Aerospace Systems Sector

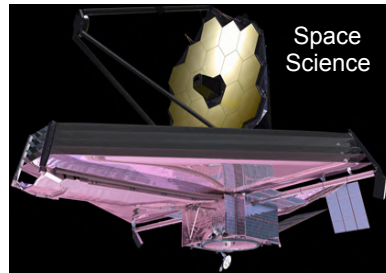


Space



Communications

AEHF Payload
Assured, Protected, Survivable



Space Science

James Webb Telescope
Observing Cosmic History



Defense Observing

Defense Support Prog
NORAD Tactical Warning



Weather

Earth Observing - Aqua
Global change monitoring

Unmanned



High Altitude

Global Hawk/Triton
High Altitude Endurance



Vertical Take off

Fire Scout
Vertical Takeoff & Land



Affordable

BAT Aircraft
Med. Altitude, Affordable



Carrier based

X-47B UCAS
Carrier based strike fighter

Manned



Stealth Fighter

F-35 Lightning
Stealth, Supersonics fighter



Awareness

E-2D Adv. Hawkeye
Battlespace awareness



Stealth Bomber

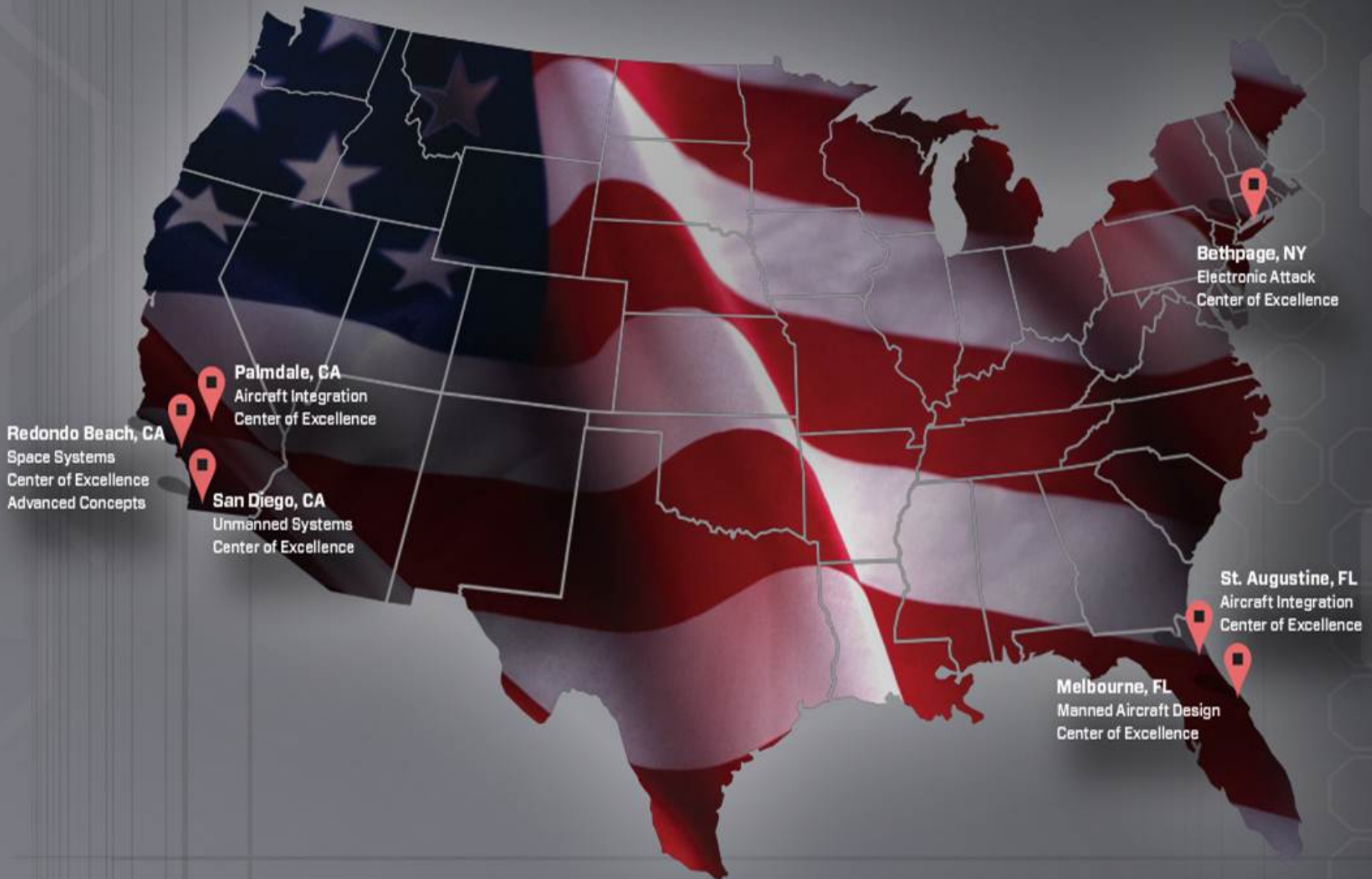
B-2 Stealth Bomber
Long range bomber



Carrier Fighter

F-18 E/F Super Hornet
Carrier based strike fighter

Centers of Excellence



Leadership Team



TOM VICE
PRESIDENT



DUKE DUFRESNE
OPERATIONS

CORE BUSINESSES

FUNCTIONS



JANIS PAMILJANS
UNMANNED SYSTEMS



KEN BEDINGFIELD
BUSINESS
MANAGEMENT &
CFO



PEGGY NELSON
ENGINEERING &
GLOBAL PRODUCT
DEVELOPMENT



MARC LINDSLEY
TRAINER X CAPTURE



PAT MCMAHON
MILITARY AIRCRAFT
SYSTEMS



HEIDI HENDRIX
HUMAN
RESOURCES



LISA KOHL
GLOBAL SUPPLY
CHAIN



DOUG NORTON
INFORMATION
TECHNOLOGY & CIO



JEFF GRANT
SPACE SYSTEMS



DALE BURTON
RESEARCH &
TECHNOLOGY



TOMMY TOMLINSON
GLOBAL
MANUFACTURING



CYNTHIA CURIEL
COMMUNICATIONS



STEVE SULLIVAN
STRATEGIC SYSTEMS



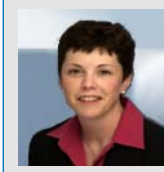
BOB BURKE
BUSINESS &
ADVANCED SYSTEMS
DEVELOPMENT



JIM ZORTMAN
GLOBAL LOGISTICS
& OPERATIONAL
SUPPORT



WAYNE WATANABE
INTERNAL AUDIT



MARY PETRYZYN
INTERNATIONAL



ART LOFTON
GLOBAL QUALITY



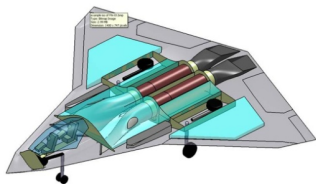
WALTER PAGE
SECTOR COUNSEL

Northrop Grumman Aerospace Systems Research & Technology Overview

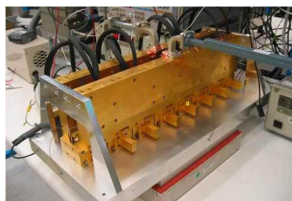
*Develop Innovative and Affordable Technologies to Support NGAS Programs & Pursuits
Pursue Disruptive Technologies to Help NGAS to Solve the Nation's Hardest Problems*

Vehicle Technologies	Electronics & Sensors Technologies	Information & Network Technologies	Survivability Technologies
<ul style="list-style-type: none"> • Autonomy • Aerodynamic Efficiency • Propulsion Integration • Integrated Power & Thermal Management • Structures, Materials • Affordable Manufacturing 	<ul style="list-style-type: none"> • Microelectronics & RF Materials • RF Electronics • Antennas • Comm. Demonstrations • MASINT Sensors <p style="text-align: center;">Greg Chao <i>Director of E&ST</i></p>	<ul style="list-style-type: none"> • Restricted • Metamaterials • NextGen Assurance Technologies • Fusion & Communication 	<ul style="list-style-type: none"> • Material Development & Scale Up • Demonstrations • Survivable Apertures • Analysis & Tools • Operational Support

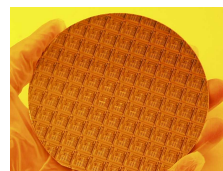
Leverage Internal Investment, Government Investment, Business Partners, and University Research to Develop Capabilities for NGAS



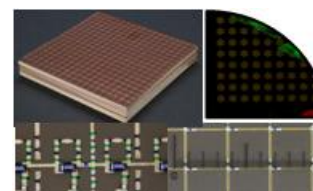
Variable Cycle Advanced Technologies



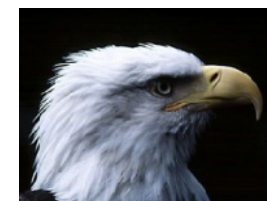
High powered GaN SSPAs



100mm GaN Reduces Cost per Chip



RF and Optical Metamaterials



Classified Applications

Microelectronics Products and Services



► Our integrated circuits allow satellites to:

- See farther
- Listen better
- Last longer

Microelectronics at-a-glance

- Integrated production, engineering and research operation
- Approx. 300 engineers and technicians
 - More than 40 PhDs
- 60,000 sq. ft. of laboratory space
 - 13,000 sq. ft. of clean rooms
- Many World records and first capabilities demonstrated

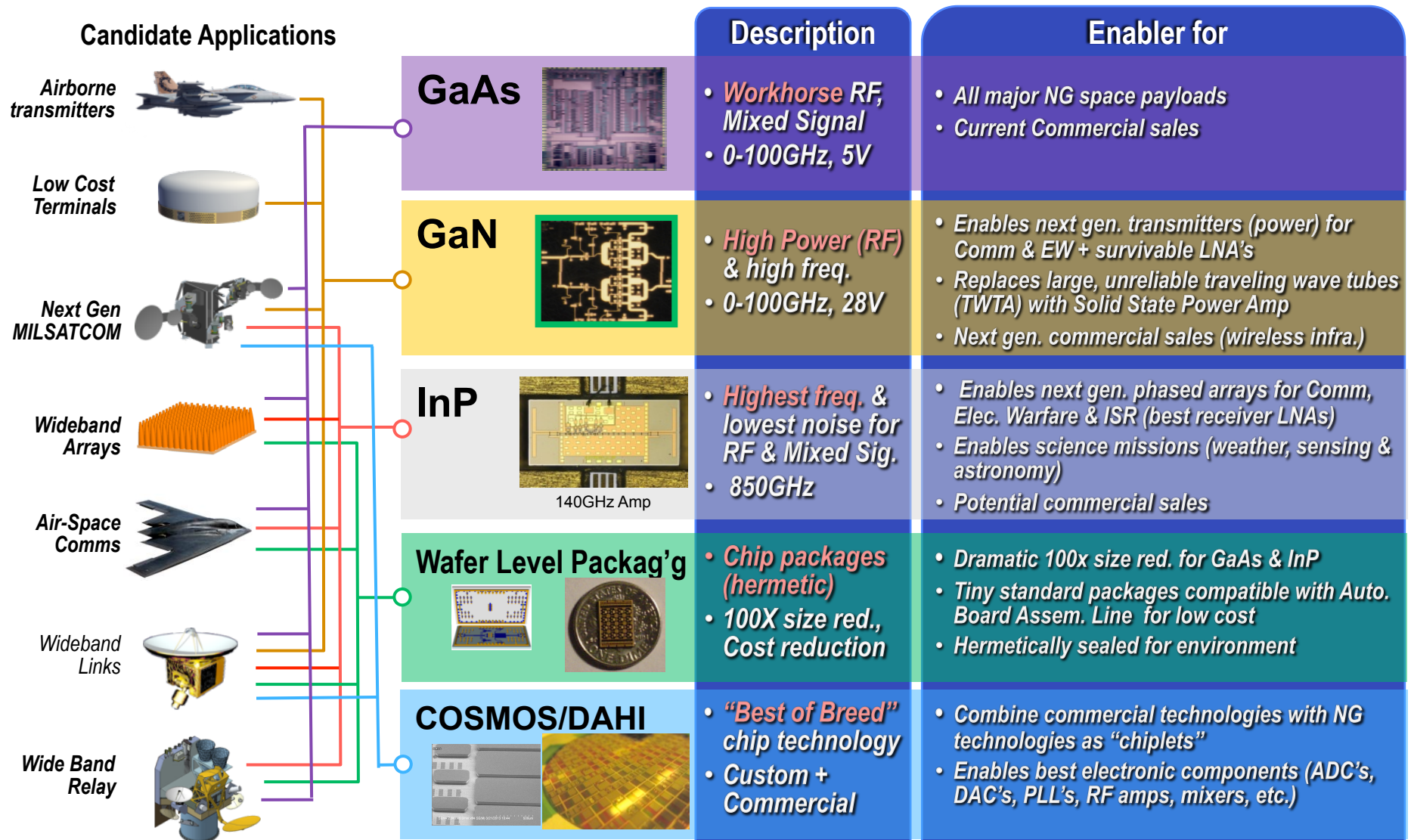


Commercial Sales

Microelectronics
Microelectronics Products Services produces high-speed components for cellular and broadband wireless systems and aerospace applications...

Microelectronics capability viewed as a national asset

Electronics & Sensors – Advancing Cross-Cutting Microelectronics & Electronics



Partnership with Universities

- “Insertable” Technologies - Northrop Grumman Aerospace Systems aggressively pursues and develops cutting edge technical capabilities to meet the needs of our U.S. Government customers
 - Electronics & Sensors
 - Information & Networking
 - Vehicle Technologies
- Fundamental Research - We partner with leading research universities through
 - IR&D Grants
 - Industrial Affiliates Program memberships
 - Contract Teams (e.g., subcontracts to University partners)
- We have had great success with UCSB
 - UCSB has a world class compound semiconductor facility
 - 6 great PHD engineers in compound semiconductors
- We look forward to collaborating with you in the future

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