

The logo for Amphenol Aerospace, featuring the word "Amphenol" in a large, bold, white sans-serif font with a registered trademark symbol (®) to its upper right. Below it, the word "Aerospace" is written in a smaller, white sans-serif font. The background of the slide is a vibrant blue with a complex, futuristic pattern of white lines, dots, and hexagons, suggesting a high-tech or aerospace theme.

Amphenol[®]
Aerospace

ENABLING THE ELECTRONICS REVOLUTION

CQSDI – Mission Assurance in Commercial Space versus Government Space

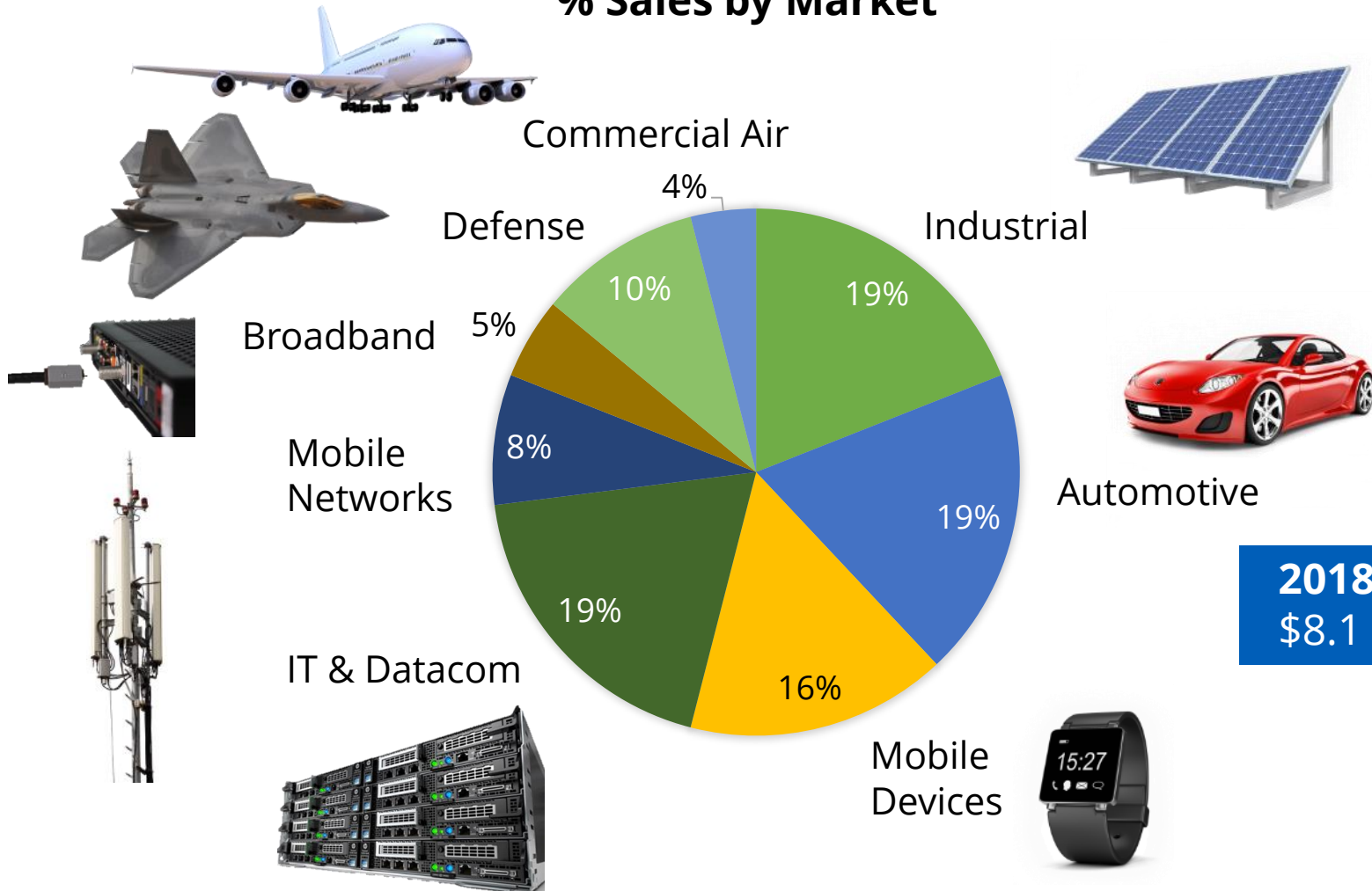
**A Suppliers Perspective
March 11, 2019**

Amphenol By the Numbers

1932	Company founded by Arthur J. Schmitt
\$8.1B	2018 Sales
#403	Fortune 500 Companies
#2	Largest Interconnect and Sensor Supplier
#1	Interconnect Supplier in Military/Aerospace Market
#2	PCB/PCBA Supplier in Military/Aerospace Market
78,000	Employees Worldwide
52	Number of countries with manufacturing facilities
42	Number of acquisitions since 2008

Amphenol Corporation (APH)

% Sales by Market



2018 Sales
\$8.1 Billion

Industry-Leading Diversification

Product Portfolio

AMAO has the **largest interconnect portfolio** in the military and aerospace markets



Circular Connectors



Rectangular & Board Level Connectors



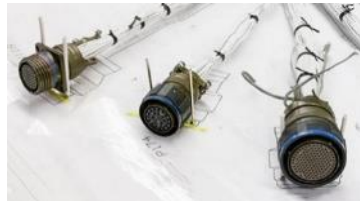
RF Interconnects



High Speed & Fiber Optics



**Junction Modules
Relay Sockets
Terminal Blocks**



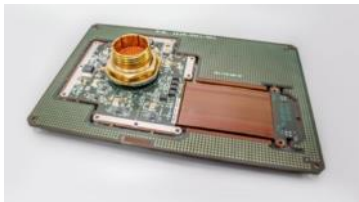
Cabling & Cable Harnesses



Contacts & Termini



Backshells & System Attachments



**Backplanes | PCBs
Flex | Rigid Flex &
Assemblies**



**Media Converters &
Ethernet Switches**



**Complex Systems &
Assemblies**

Amphenol Aerospace

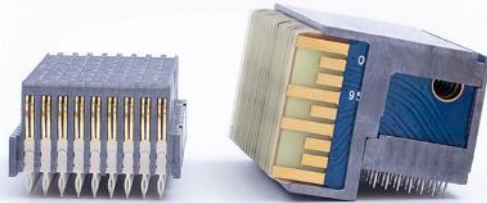


Location: Sidney, NY; Nogales, Mexico

Design and manufacture cylindrical and rectangular, electronic, fiber optic, EMI/EMP filters, and a variety of special applications connectors and interconnect systems

Product Highlights:

- D38999 Connector Series
- LRM Connectors
- Filtered Cylindrical Connectors
- Media Converters
- 2M Connector Series
- High-Speed Copper Connectors
- R-VPX Connectors
- Ruggedized SATA Connectors
- Micro-D Connectors



Amphenol Legacy in Space

Lunar Lander

Amphenol Bendix connectors were used in the original landers on the Apollo project.

ISS

\$15 million developmental contract. 3-year development now results in up to \$4M/year in SSQ 21635 product.

SLS

Worked with Boeing on umbilicals starting in 2013. \$2.5M to date.

1960

1970

1980

1990

2000

2010

2020

Lunar Rover

Original zero-gravity connector design used for video cable. Precursor to our success on the ISS.

Mars Rover

Potted MIL-DTL-26482 Series I derivatives using SSQ 21635 experience.

SpaceX

X38999 connector development for Falcon family of launch vehicles.



Space Grade Connectors

NASA Space Grade Connectors

- Complete connector series designed for critical space station hardware for use in NASA manned space flight.
- Bi-Metal, Aluminum & Stainless Steel with Electroless Nickel Plating
- Manufactured and tested to NASA's SSQ 21635 specifications
- Over 30,000 units sold annually



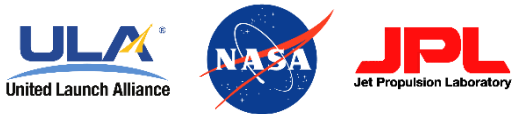
Mil-Spec & Commercial Space Grade Connectors

- Connectors designed to be 'out-gassed' in order to prevent moisture from escaping the connector components and damaging critical system devices.
- MIL-DTL-38999 "G" Class Connectors
- Out-gassing of 4 hrs minimum for Commercial & 48 hrs for Mil-Spec
- Over 20,000 units sold annually



Development Drivers

GOVERNMENT



Key Driver: **PERFORMANCE**

- Heavily Regulated Components
- Long Tail Programs
- Dedicated Program Manager to track milestones and communicate with customer
- Government Source Inspection to ship product (DCMA)
- Slowly Embracing Launch Reusability (ULA Vulcan)

COMMERCIAL

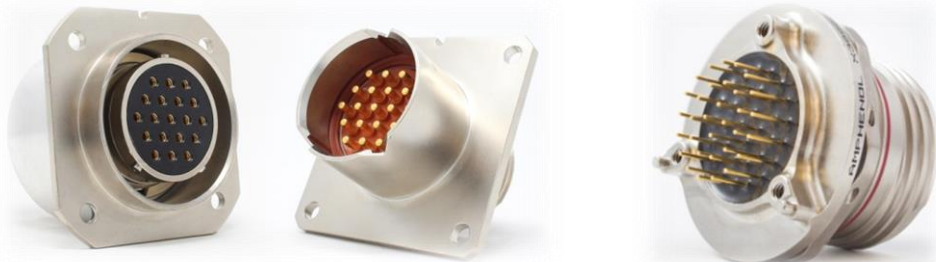


Key Driver: **COST**

- COTS Components
- Launch Turnaround Time
- Ride-Sharing Payloads
- Small Satellites
- Source Inspection not common
- Pushing for Full Reusability

Development Comparison

	GOVERNMENT	COMMERCIAL
APPLICATION	Launch Vehicle (Disposable)	Launch Vehicle (Reusable)
CONNECTOR TYPE	MIL-DTL-38999, RNJ	MIL-DTL-38999
ENGINEERING HOURS	8,000	150
DEVELOPMENT COSTS	\$1,200,000	\$20,000
TIME TO RELEASE PRINTS	1 Year	1 week
DEDICATED PROGRAM MANAGER	Yes	No
LOT CONTROLLED	Yes	No
FAI	100% to component level	Standard
SITE AUDITS	Yes	Yes
DEVELOPMENT REVIEWS	Program Management, Integrated Baseline, Critical Design, Production Readiness, Test Design, Test Readiness, Quality Requirements, Acceptance, etc.	Manufacturing Readiness



Key Takeaways

- Programs with Lot Control requirements add significant cost and time to complete project.
 - Increased Engineering hours – many more drawing releases, etc.
 - Increased FAI requirements – data package for each lot of each component required prior to shipment.
- Leverage Mil-Spec requirements (MIL-790) and AS9100D.
 - Required quality data on file and available if needed.
- Less Development Regulation - fewer reviews at each stage.
 - Let Amphenol be the connector experts
 - Less time and money spent, faster execution.
- Keep sights on later stages of project (first production run plan date, rate ramp up)
 - The more the supplier has control of, the faster problems can be resolved and keep the project on track.

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