

DELTA TechOps

INTRODUCTION AND OVERVIEW



DELTA TechOps

- The third largest MRO in the world. Largest MRO in North America.
- A \$4 billion production center for Delta Air Lines, employing 10,000+ people.
- A fully-integrated global maintenance organization with an Atlanta-based main operation.
- Supported by the largest and most experienced technical operations workforce in the world.
- Continually improving operational efficiency, utilizing 200+ engineers.
- 94 years of experience.



DELTA AIR LINES FLEET



Delta operates: **Multiple aircraft types**

A fleet of **850+** mainline aircraft and
400+ regional jets

Average aircraft age: **17 years**

6,000+ daily flights to **300+** destinations
in **64** countries

Delta TechOps maintains a large breadth and depth of technical knowledge and know-how.

DELTA TechOps LEADERSHIP

Don Mitacek

Sr. Vice President, Technical Operations

Key TechOps Leaders

Mike Moore

Senior Vice President
Maintenance Operations

Jerry Allen

Vice President
Line Maintenance

Richard Uber

Managing Director
Base Maintenance & Airframe Supplier Ops

Gary Hammes

Senior Vice President
Engineering, Quality, Planning

Jack Arehart

Vice President
MRO Services

Dale Brubaker

Managing Director
Inventory & Logistics

WHY WORK WITH US?

EXPERIENCE

Who better to have your back than an airline-aligned MRO? We know what you experience.

- No one understands your operation like Delta.
- Full engineering and operational management capability.
- Competition is everything. If we're not competitive, why do it?
- Flexibility and agility. Unlike other large MROs, we will cater to your specific needs.

INDEPENDENCE

Our independence is your competitive edge. We're a leader in OEM-alternative solutions.

- 94 years of knowledge developing cost-saving processes and procedures.
- We leverage our experience to offer 2,000+ OEM-alternate repairs/parts.
- Investing in the future. We will continue to invest in services for ourselves *and* our customers
- Purchasing power. You benefit from our \$1 billion+ supply chain initiatives.

**WE UNDERSTAND THE IMPORTANCE OF UPTIME.
AND THE COST OF DOWNTIME.**

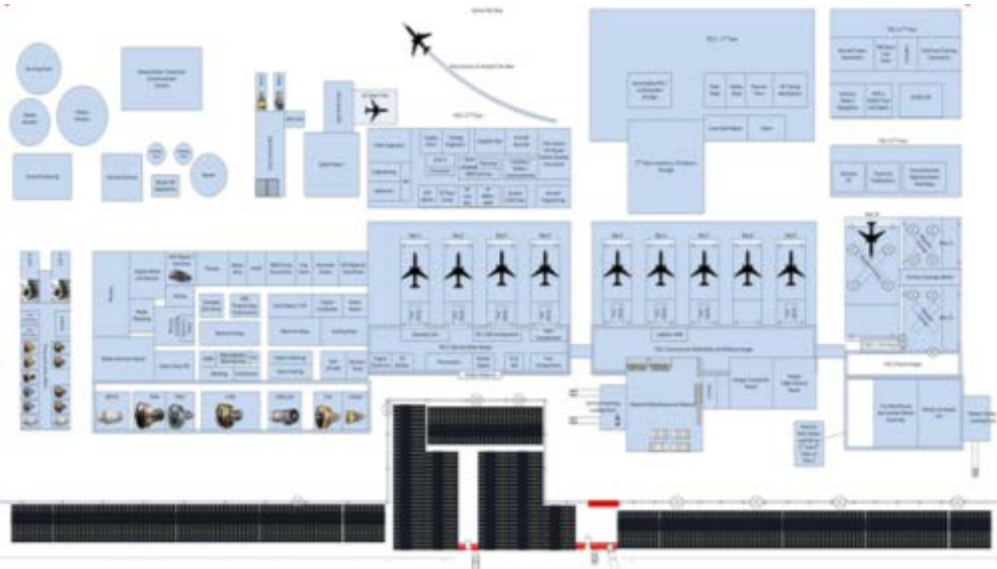
THE BOTTOM LINE

VALUE	SPEED	DEPENDABILITY
<ul style="list-style-type: none">• Alignment with a major airline operation, constantly striving for the highest reliability and lowest cost structure• Flexibility to choose between the OEM, Delta or your own specific programs	<ul style="list-style-type: none">• Extensive back shop capabilities for on-site repairs• Inventory levels for immediate consumption or exchange• Experience for efficiency and effectiveness• Dramatically reduced turn-time	<ul style="list-style-type: none">• We understand you, and we maintain your priorities• Our reliability is world class

FACILITY

Our main base of operation is located in Atlanta, Georgia, U.S.A.

We perform airframe maintenance, engine maintenance and component maintenance under one roof using 6S, Six Sigma, and Lean principles. All areas are connected with an efficient, reliable material transportation system capable of delivering material quickly anywhere within the MRO. This configuration streamlines the repair process and eliminates the risks associated with using outsider vendors.



\$4 BILLION

PRODUCTION CENTER IN ATLANTA, GA

2.7 MILLION

SQUARE FEET UNDER ROOF

10,000+

TECHNICIANS, ENGINEERS, & SUPPORT STAFF

A FULL-SERVICE MRO AND AIRLINE



Engine & APUs



Line Maintenance



Landing Gear



Components



Engineering Services



Training



Composites



Thrust Reversers



Base Maintenance



Military/Public Use

A FULL-SERVICE MRO AND AIRLINE

Engine and Component Overhaul

- 700+ engine & APU shop visits per year.
- 150 customer engines produced per year.
- 200,000+ component repairs.
- 18,000 customer components produced per year.
- 150+ landing gear repairs and overhauls.
- Thrust reverser and composite capabilities.

Line Maintenance and Operational Support

- 58 maintenance stations (36 U.S. Domestic, 22 International).
- 200,000+ overnight checks per year.

Aircraft Maintenance

- 200+ major visits (PSV).
- 260+ hangar overnight visits and letter checks.
- 200+ modification and paint visits.
- Customer checks performed in: ATL, MSP, QRO.

Logistics and Inventory

- \$1.1 billion in active inventory.
- 12,000 part numbers supported.
- 44 line stockrooms in 4 continents.
- 150,000 transactions monthly from our warehouse.

Engineering and Maintenance Control

- Active escalation of Delta's maintenance programs.
- Leader in innovation – WiFi, PED, RFID.
- 200+ engineers focused on cost and reliability.
- Engineering solution database for multiple aircraft fleets.
- Hawaiian A330 Fleet fully deployed with CFS Program.

ENGINE MAINTENANCE



Delta TechOps Capabilities

700+ engine & APU shop visits per year.
More than 30% of overhauls are for MRO customers.



Engines Serviced

CF34-3	<i>FUTURE</i>
CF34-8	Trent 1000
CF6-80A	Trent 7000
CF6-80C2*	Trent XWB
CFM56-5B	PW1100G
CFM56-7B	PW1500G
PW2000	
PW4000-94	
BR 715	

*FADEC & PMC

APU

GTCP 131-9A
GTCP 131-9B
GTCP 331-200

ATL Shop

70+ Engine Bays
3 Engine Hospital Bays
5 Engine, 2 APU Test Cells
150 pieces of Machining

MSP Shop

12 Engine Bays
2 Engine Test Cells

ROLLS-ROYCE SHOP

In October 2015, Delta TechOps announced it would become an authorized maintenance center (AMC) for Rolls-Royce engines.

Engine capabilities include:

- BR715 (current)
- Trent XWB (future)
- Trent 1000 (future)
- Trent 7000 (future)

RR development projects

- Source-Controlled Engine piece-part repairs for BR715
 - OGV case repair awarded and in development
 - Additional repairs under evaluation
- Establishing on wing services for Trent engines
 - Project moving in phases, will start with on-wing services for T1000
- New state-of-the-art engine shop and engine test cell
 - A new 61,000 sq ft test cell, testing engines up to 150,000 lbs of thrust
 - Estimated completion: end of 2018





COMPONENT MAINTENANCE

Delta TechOps Capabilities

Avionics (Level 3 Repair):

- Radios
- Instruments
- ATE
- Electronics
- Electro Mechanical

Mechanical Products:

- Fuel and Oil Components
- Hydraulics
- Pneumatics
- Wheels and Brakes

200,000+ Component Repairs per year
Support repair of 20,000+ different part numbers

Fleet Type Covered

- Boeing 717 (all series)
- Boeing 737 (all series)
- Boeing 747 (all series)
- Boeing 757 (all series)
- Boeing 767 (all series)
- Boeing 777 (all series)
- A319/320/321
- A330
- MD-11 (all series)
- MD-80 (all series)
- MD-90 (all series)



AIRFRAME MAINTENANCE



Delta TechOps Capabilities

- Major Aircraft Visits (PSV)
- Aircraft Letter & Overnight Checks
- Airframe Modification Visits
- Aircraft Painting
- Disabled Aircraft Recovery Services
- Winglet Installation
- Corrosion prevention and control



200+ Major Visits (PSV) per year
260+ Hangar Overnight Visits & Letter Checks per year
200+ Modification & Paint Visits per year

Airframes Served

Boeing 717
Boeing 737
Boeing 747
Boeing 757
Boeing 767
Boeing 777
Airbus 320 Family
Airbus 330
MD-88
MD-90
MD-11

FAR/EASA 145 TechOps Center

- Capacity for wide body and narrow body aircraft
- About 2.7 million sqf (250k)
- Back shops, material management, administrative support

FAR/EASA 145 Minneapolis-St. Paul TechOps Center

- Capacity for 3 wide body and 7 narrow body aircraft
- About 350k sqf (32k sqm)
- Back shop and administrative support

LANDING GEAR MAINTENANCE



Delta TechOps Capabilities

- Full overhaul of landing gear assemblies and sub-assemblies
- Removal and reapplication of plating, coatings and surface treatments
- A comprehensive Machine Shop
 - Machining and grinding of gear assemblies
 - Bushing fabrication
- Epoxy and Polyurethane painting and stripping

With 150+ gears output per year and typical overhaul turnaround times between 35-45 days, our experienced shop offers efficiency and competitive costs to meet your landing gear service needs.

Landing Gear Serviced

Boeing 737NG
Boeing 757
Boeing 767
MD-88
MD-90



THRUST REVERSER MAINTENANCE



Delta TechOps Capabilities

- OEM approved work
- Money savings alternatives using a wide range of PMA parts as well as Delta's own processes and procedures
- OEM capability for all thrust reverser components including Bench Test, Repair and Overhaul
- All current Airworthiness Directives and Service Bulletins
- Dedicated paint booth
- Capability for all delamination repairs

Delta TechOps' on site composite repair facility is staffed with highly trained and experienced technicians capable of supporting all thrust reverser composite repair requirements.

Thrust Reverser Serviced

Boeing 737NG
Boeing 747 PW4000
Boeing 757 PW2000
Boeing 767 PW4000
Boeing 767 CF6-80C2
A319-100 CFM56-5A
A320-100 CFM56-5A



LINE MAINTENANCE



Delta TechOps Capabilities

- A Checks
- Layover Checks
- ETOPS Pre-Departure Checks
- Overnight Checks
- Defect Rectification
- Tech Assistance
- Borescope
- Avionics Troubleshooting and Repair
- On-Wing Composite Repair
- Engine Change Support
- Flight Control Change and Rigging
- Component Replace and Rigging
- AOG support worldwide, 24/365

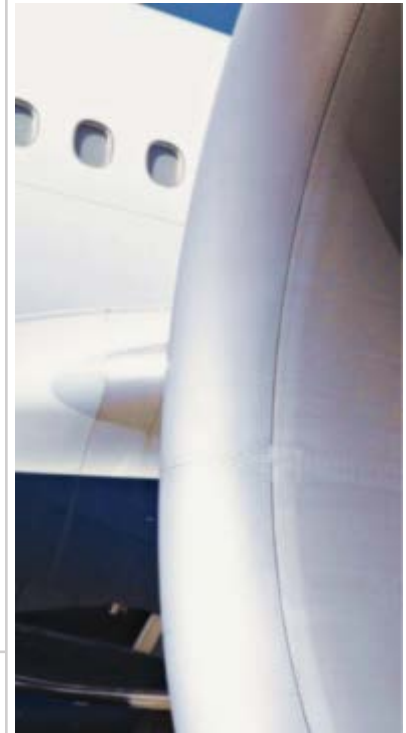
200,000+ Overnight Checks per year
24/7/365 Maintenance Control Center
58 maintenance stations; 36 US-based, 22 international

Engines Served

CF6
CFM56
GE90
JT 8D/9D
PW2000
PW4000
Trent 800
V2500

Aircraft Served

CRJ/ERJ
Airbus 319
Airbus 320
Airbus 321
Airbus 330
Airbus 340
Boeing 717
Boeing 737
Boeing 747
Boeing 757
Boeing 767
Boeing 777
MD-88
MD-90
MD-11



Hubs: **ATL** Atlanta, GA **DTW** Detroit, MI **MSP** Minneapolis, MN

ENGINEERING SERVICES



Total Engineering Support
 Fleet Engineering
 Operations Support Engineering
 Operational Reliability Teams



Organizational responsibilities and support include:

Provide Engineering Authorization for alterations, repairs and inspections	Develop and approve major repairs and alterations through internal Designated Engineering Representatives (FAA-DER) or Organization Designation Authorization (FAA-ODA) resources	Provide Reliability Engineering, author Engineering Authorizations (EA) to accomplish Service Bulletins, FAA Airworthiness Directives and reliability improvements to aircraft and aircraft components
Provide engineering support to all engine, component and hangar shops		
Provide 24-hour engineering support for all maintenance needs		
Provide Parts Manufacturer Approval PMA Engineering – FAA-PMA Approval and Service Evaluations	Design Aircraft Maintenance Programs, authoring tasks required to ensure the continuing airworthiness of aircraft, including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of an alteration or repair	Support Delta TechOps' emergency response and long-term mechanical performance monitoring program via representation of the department on the Technical Operations Executive Committee (TOEC)
Authoring and administration of all technical manuals publications and procedures		
Provide engineering support to other departments within Delta TechOps regarding modification projects		

TECHNICAL TRAINING



All Delta TechOps Training meets or exceeds Air Transport Association (ATA) 104, Level 3 guidelines.

Delta TechOps is European Aviation Safety Agency (EASA) Part-147 certified.

Delta TechOps offers

System-based Programs

- Systems/Avionics/Powerplant for Line and Base Maintenance
- Aircraft Refresher
- Ramp and Transit
- Auto Pilot
- Engine Run
- Aircraft and Engine Differences
- Troubleshooting

Organizational Programs

- Environmental Training
- Human Factors Training
- Indoctrination Training
- Maintenance Procedure Training
- Safety Training
- SCEPTRE Training

Technical Skills Enhancement

- Avionics
- Advanced Sheet Metal Repair
- Composite & Metal Bond Training
- Ground Support Equipment Training
- Safety/Environmental Training
- Solder Work, Repair, Inspections (IPC)
- Welding

Training Programs by Aircraft type (Engine types)

- B737-200 (JT8D)
- B737-300/400/500 (CFM56-3)
- B737-600/700/800/900 (CFM56-7)
- B747-400 (PW4056)
- B757-200/300 (PW2000)
- B757-200/300 (RR RB211)
- B767-200/300/300ER (PW4060)
- B767-200/300ER/400ER (GE CF6)
- B777-200/300 (RR Trent 800)
- B777-200/300 (GE 90)
- MD88 (PW JT8-219)
- MD90 (V2500)
- DC9 (PW JT8D)
- A319/320 (CFM56-5A)
- A330-200/300 (PW4168)
- A330-200/300 (RR Trent 700)

MILITARY/PUBLIC USE AIRCRAFT



Delta TechOps Capabilities

- Engine/APU Overhaul & On-Wing Services
- Test Cell Services
- Non Destructive Testing
- Engine Condition Monitoring
- Component Maintenance
- Inventory Management

- Major Aircraft Visits (PSV) and Letter Checks
- Airframe Modification Visits and Painting
- Disabled Aircraft Recovery Services
- Landing Gear Maintenance

- Fleet and Operational Support Engineering
- Technical Training
- Compliance and Quality Assurance

Aircraft Serviced

Boeing 737NG [C40, P-8A]

Boeing 757 [C32]

Boeing 767 [KC46, KC767]



COMPLETE FLEET SOLUTIONS



Custom Tailored Programs

We tailor individual services into a comprehensive program that precisely fits your needs.

Long-Term Partnership

We create a long-term view on controlling costs and improving performance.

Comprehensive Coverage

With a unique solution for every fleet and capabilities on most major aircraft types, we customize a solution to meet your MRO needs.



CERTIFICATIONS

Delta TechOps is certified around the world for aircraft maintenance.

USA	FAA - 145 Certified Repair Station (ATL) No. DALR026A FAA - 145 Certified Repair Station (MSP) No. DAL2026A
EU	EASA - 145 Certified Repair Station (ATL) No. EASA.145.4380 EASA – 145 Certified Repair Station (MSP) No. EASA.145.6599
Argentina	DNA – 145 Approved Maintenance Organization No. 1-B-318
Bahrain	145 Approved Maintenance Organization ALD/AIR/8/5.135
Bermuda	BDCA – Approved Maintenance Organization No. BDA/AMO/187
Brazil	ANAC - 145 Approved Maintenance Organization 0604-04/ANAC
Canada	TCCA/FAA - 145 Approved Maintenance Organization No. DALR026A
Chile	DGAC – 145 Approved Maintenance Organization No. E-110
Mexico	DGAC – 145 Approved Maintenance Organization No. CO-138/16
China (PR)	CAAC – 145 Approved Maintenance Organization No. F00100401
Japan	JCAB - 145 Approved Maintenance Organization No. 192
Korea (Rep. of)	KCASA - 145 Approved Maintenance Organization No. 2005AMOF06
Trinidad & Tobago	TTCAA – 145 Approved Maintenance Organization No. TTAR/011
Turkmenistan	145 Approved Maintenance Organization No. 041/MRO
ISO 9001:	Component, Engine and Landing Gear Maintenance, No. CERT-0094521



JOINT VENTURES

Since Delta's current joint venture with Air France-KLM in 2009 and Alitalia in 2010, Delta has accelerated its partnership strategy.

- 2012: Virgin Australia became a JV partner.
- 2013: Delta purchased a 49 percent stake and established a JV with Virgin Atlantic.
- 2015: Delta acquired a 3.5 percent stake in China Eastern and launched a partnership with AeroMexico, including a 49 percent equity stake.
- 2017: Delta and Korean Air announced a JV.
- 2017: Delta acquired 10 percent stake in Air France-KLM and seat on the board. Delta, Air France-KLM, Virgin Atlantic and Alitalia will launch a combined, trans-Atlantic joint venture partnership.
- 2017: Delta and WestJet announced a JV.
- Also, Delta owns 9.5 percent of the outstanding shares in its Brazilian partner GOL.



DELTA MATERIAL SERVICES



DMS is a wholly owned subsidiary of Delta Air Lines formed to maximize the value derived from surplus aircraft, engines and parts.

Services include:

- Buy/Sell Surplus Parts
- Sell Consigned Surplus Parts, Engines & Airframes
- Buy/Sell Green Time Engines
- Buy/Sell Run Out Engines
- Buy Aircraft for Part-Out
- Part-Out Aircraft Management
- Parts Repair Management & Pooling



DMS 400,000 sq ft warehouse

Accreditations

- ASA-100 accreditation (July 2016)
- AFRA accredited
- AS9120 certification audit completed (Jan 2017)
- Expect AS9120 accreditation (2017)

ASSETS – BUYING & SELLING

PW4000	B747-400
PW2000	B757-200
JT8D-219	MD-80/90
CF6-80C2	B767
CFM56-7B	B737-700/800
V2500-D5	B717
CF34-3/8	CRJ-200/7-900
Trent-800	777-200

MATERIAL SALES

737NG
757-200
767-300
747-400
A320 family
A330
MD-80
E190

DELTA FLIGHT PRODUCTS

Delta Flight Products, LLC was established as a Delta subsidiary in 2016 to design, integrate, manufacture and certify aircraft components and modifications



Engineering Capabilities

- Mechanical & electrical design
- Substantiation (struc, mech, elec, interiors)
- Certification
- Technical Publications



Warehouse Capabilities

- Inventory management (project)
- Kit assembly
- Shipping & receiving

In-Flight Entertainment Capabilities

- Tablet processing and ATP
- Rack room and media center (future)

Manufacturing Capabilities

- Machine shop
- Structural fabrication (S/M)
- Composite panel fabrication
- Assembly
- Paint shop
- Electrical fabrication
- Part marking shop
- QA lab
- Flammability lab



OUR CUSTOMERS

Delta TechOps is proud to be the MRO for the following companies:



A hand holding a paper airplane against a background of paper clouds and rays of light.

THANK YOU.

Please contact:
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Sales Executive
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Email: randy.porter@delta.com

 DELTA
TechOps