

Air Force Materiel Command



Depot Manufacturing in the 21st Century

Donald L. Lucht

Deputy Chief, Depot Operations Division
Directorate of Logistics

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Integrity ★ Service ★ Excellence



Purpose

Provide Overview of Depot Manufacturing Strategy, Capabilities, Examples, Challenges and Way Ahead





Strategy

**AF Depot Manufacturing must support
fleet-wide strategies**

to

generate enterprise-level efficiencies

to

**meet AF-wide and DoD sustainment
needs**

**OUR INDUSTRIAL CAPABILITIES HAVE BEEN SHARPENED BY
MODERNIZING FACILITIES, ACQUIRING NEW EQUIPMENT, REFINING
PROCESSES AND FOCUSING ON OUR CUSTOMERS**



Manufacturing Role



Organic Manufacturing

*Supports Production Lines,
Area Base Manufacturing,
Last Source, Emerging
Issues, Rapid Response*



Partnerships between industry and depots

*Using existing
capability to support
the warfighter*



Focus on value-added work

*Depots mitigate supplier
exit from markets, vanishing
vendors, and support older
technologies*



Harness enterprise efficiencies and technologies

*Better utilize our
resources ...
Rethink processes
to utilize 21st century
technologies*

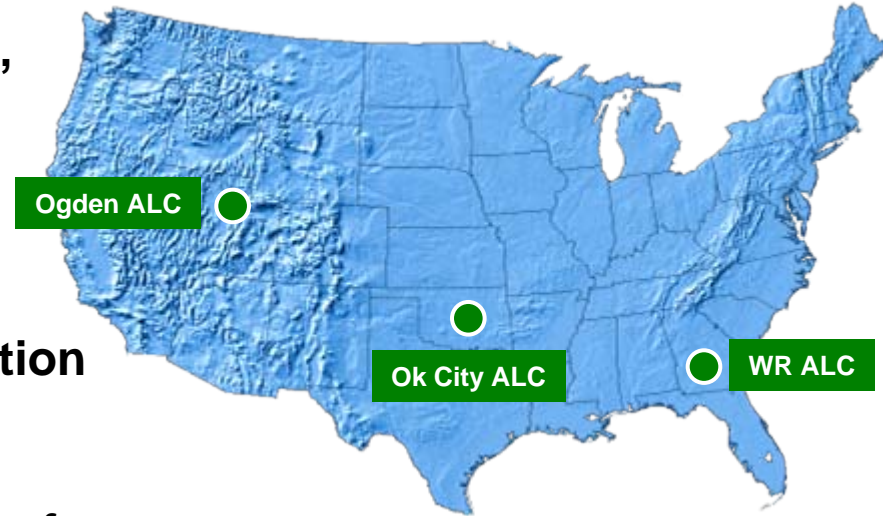
AIR FORCE MANUFACTURING CAPABILITIES DO NOT COMPETE WITH INDUSTRY



Current State--Capabilities



- **Repair: diagnostics, refurbishment, overhaul and rebuild**



- **Manufacturing: fabrication of parts, assembly of components, and final assembly and painting of end-use items**

- **Technical services: testing and analysis, repair-process design, and in-service engineering**

		
Oklahoma City ALC Tinker AFB, OK	Ogden ALC Hill AFB, UT	Warner Robins ALC Robins AFB, GA
B-1 B-2 B-52 KC-10 C/KC-135 E-3 E-4 Cruise Missiles	F-16 F-22 A-10 T-37/T-38 C-130 ICBMs Landing Gear Composites AMARG	C-5 C-17 C-130 U-2 F-15 Helicopters Electronic Warfare





OC-ALC Capabilities

- **Non Destructive Inspections (NDI):**

- Eddy Current
- Fluorescent Penetrant
- Magnetic Particle
- Ultrasonic
- X-Ray

- **Forming**

- Sheetmetal
- Shears, Brakes, Presses

- **Metal Build-up**

- Welding, Plasma Spray, Plating

- **Manufacturing:**

- ISO 9001 registered-- fabrication of parts, assembly of components, and final assembly and painting of end-use items—all materials, all aircraft....
- Hoses, Tubes, Mechanical Cables/Harnesses
- Precision Component Machining Capabilities -- all metals/aircraft parts
 - Laser machining
 - Computer Numerically Controlled (CNC) machining

- **Technical Services:**

- Complete Test Program Set (TPS) Development & Sustainment
- Interface Test Adapter (ITA) design & manufacturing
- Turn-Key Solutions & Prototype Test Development
- System/Software Engineering/ Reverse Engineering
- Verification and Validation
- Laboratory Operations



OO-ALC Capabilities

- **Non-Destructive Inspection (NDI):**

- Ultrasound
- Eddy Current
- Magnetic particle
- Fluorescent Penetrant
- Radiography
- Shearography
- Thermography

- **Traditional Inspection:**

- Large Coordinate Measuring Machine (CMM) capable of inspecting a part 60 inches wide by 60 inches long by 24”

tall

- **Manufacturing:**

- Tooling, fixturing, molds and dies
- Machined parts from simple to high-end aerospace
- Bushings
- Full-up casting to complete machined part
- Machined from billet to aircraft structural parts

- **Capabilities:**

- 3, 4 and 5 axis CNC milling
- Electronic Discharge Machines (EDM)
- Foundry

- **Technical Services:**

- Reverse engineering and rapid prototyping
- Full MIL-SPEC inspection and layout capabilities
- Tomography layout facility

- **Other Services:**

- On-site: plating, painting and thermal spray coating
- Infrastructure/processes
- Centralized grind/plate/grind for MRO and/or new manufacture



WR-ALC Capabilities

- **Non Destructive Inspections (NDI):**
 - Magnetic Particle, Dye Penetrant, Eddy Current, Ultrasonic, Standard and Real-time X-Ray
- **Abrasive Blasting of Metals & Composites**
- **Unique Capability:**
 - Largest Fluid Cell Press in North America, forms identical parts simultaneously
 - Electronics & Avionics Reengineering & Mfg

- **Manufacturing:**
 - Skins, Ribs, Spars, Panels, Supports, Tubing, Cables Brackets, Fittings
 - Back Shop Support-Plating, Heat Treat, Paint / Depaint / Wet Clean
 - Welding, Grinding, Blasting
- **Metal Finishing Operations:**
 - From Aluminum chemical milling to Zinc phosphating
- **Sheet Metal Mfg:**
 - USAF's largest, most modern sheet metal mfg facility

- **Process Finishing:**
 - Largest Aerospace Electroplating Facility in SouthEast
- **Technical Services:**
 - CAD/CAM System Support
 - 3-5 Axis, V5 – 5 Axis N/C Programming
 - Solid-works Modeling
 - AutoCad Mechanical
 - In-house reverse engineering and tool fabrication support
- **Laboratory Analytical Functions**
 - Microscopic Analysis of Materials
 - Microanalysis of Metals



Manufacturing Success Stories

T-38 Aileron Lever Rapid Response

20 Jul 08- 4 Aug 08

- 20 Jul 08- Special inspection of T-38 critical components, TCTO
 - Required 1,600 replacement aileron levers (100% R/H & L/H)
- OO-ALC, Defense Supply Center Richmond (DSCR) other ALC's and SPO coordinated production efforts
- 4 Aug 08 - 309 CMXG R/H lever first article passes
 - L/H lever first article in production
 - OO-ALC teamed with WR- ALC to manufacture right levers
 - OC-ALC to manufacture 800 left levers
 - Delivered 50 left levers by 18 Aug 08

T-38 Aileron Lever



Tinker AFB--Numerical control programmer and machinist discuss the T-38 project while a milling machine behind them precisely carves a T-38 left aileron actuator lever from raw material. (Air Force photo by Margo Wright)

Rapid Inspection and Manufacturing Capabilities



Success Stories

Interservice

- **OC-ALC Supports Corpus Christi Army Depot Tooling**
 - Local manufacture to support Black Hawk Helicopter
 - 4 Items--Turn Table/Holding Fixture/Rack (Spiral Bevel) Strip/Oil Rack
- **Timeline: 18 Jul 07 – 14 Apr 08**
 - 18 Jul 07 76th CMXG Quality Assistance Trip to CCAD
 - 17 Sep 07 CCAD requested estimate and provided drawings
 - 24 Oct 07 Estimate released to CCAD
 - 13 Feb 08 Work began
 - 14 Apr 08 Last item delivery

CCAD Tooling





Success Stories

Partnered Manufacturing

•OC-ALC Supports Kelly Aviation Center (KAC) Four F118 gearboxes and nozzles

- Worked performed under Direct Sales Partnering

•Timeline

- May 07 Work Identified
- 4 Oct 07 SOW received
- 16 Nov 07 Cost estimate released to KAC
- 12 Dec 07 Work began

KAC Gearboxes



•Characteristics

- 157 Days from requirement identification to SOW
- 43 Days from SOW to ALC bid

PRIOR AGREEMENT FACILITATED TIMELY RESPONSE



Success Stories

Services

- **WR-ALC Supports ALQ-184 Technology Insertion**
 - Supports F-16; 1st Mentoring relationship
 - Redesigned D/A and AOA circuit cards
 - Depot developed test procedures & VHDL code
 - Performed environmental qualification testing



D/A CCA

Legacy



Retargeted



AOA CCA

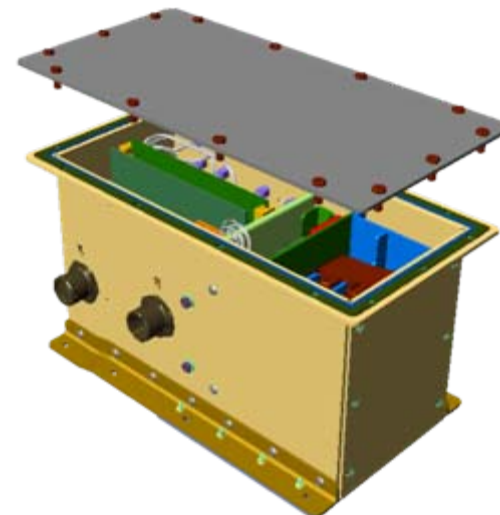




Success Stories

Services

- **WR-ALC Supports E-3 Antenna Control Unit Redesign**
 - Complete LRU re-design to eliminate obsolete components and increase reliability
 - Convert wire harness “rat nest” to backplane
 - Replace most logic chips with programmable logic device (PLD)





Challenges and Opportunities

- **Parts Manufacturing Approval**
 - PMA parts have become more and more accepted, and safety record has continued to be seen as excellent
 - PMA suppliers must demonstrate to the FAA through identity or test and computation (reverse engineering) that *“the part is at least equal to the approved original part”*

EXPANSION OF QUALIFIED COMMERCIAL MANUFACTURING SOURCES



Challenges and Opportunities

- **Joint Source Approval Request (SAR) Policy**
 - Public Law requires Aviation Critical Safety Items (CSIs) be procured only from, and repaired or overhauled only by, sources approved by the military Service Engineering Support Activity (ESA)
- **Joint Policy would allow approval obtained under one Service to apply to all Services**
 - **For:**
 - Cat I Same Part
 - Cat II Similar Part
 - Cat III New Manufacturing Capability for Same or Similar Part
 - Cat IV Alternate Source—where new design is proposed
- **Would cover critical, non-critical, PMA parts**



PILOT TEST UNDERWAY--ECD FOR POLICY IS NOV 09



Way Ahead

- **Reality--aging aircraft, emerging issues, and diminishing manufacturing sources**
- **Expect AFMC to better utilize its manufacturing capabilities**
- **Not in competition with private sector**
- **Opportunities for partnerships utilizing organic depot maintenance manufacturing**
- **Apply organic manufacturing as an enterprise**





Authorities

- **Manufacturing**
 - **10 USC 2460 Definition of Depot Mx**
 - **10 USC 2208 Working-capital funds**
- **Manufacturing and Partnering**
 - **10 USC 2208(j): Sales**
 - Sale of manufacturing, remanufacturing & engineering services by working capital fund industrial facility
 - **10 USC 2563: Sales**
 - Sale of articles & services by working capital fund industrial facilities not commercially available
 - Conditions Apply
 - **10 USC 2474: Designated Centers of Industrial and Technical Excellence (CITEs)**

AIR FORCE MATERIEL COMMAND COMMITTED TO STRONG AND MUTUALLY BENEFICIAL WORKING RELATIONSHIPS WITH INDUSTRY PARTNERS



Other Authorities

- **10 USC 2539b – Services for testing of materials, equipment, models, computer software and other items**
- **22 USC 2754 – Sales or lease of articles or services to friendly countries under certain conditions**
- **22 USC 2770 – Sales of articles and services to US companies for incorporation in end items to be sold to a friendly country or international organization under certain conditions**



Benefits to Partnering

- **For Industry**

- Economical manufacturing and repair capabilities
- Motivated, skilled workforce with extensive repair, maintenance, and manufacturing process expertise
- Low risk – not for profit, don't strike, won't go out of business
- Laboratories, centers, ranges, etc. for the testing of materials, equipment, models, computer software, etc.
- Process permits (e.g. coating removal, plating, etc.) for facilities already covered by hazardous materials licenses

- **For Organic Depots**

- Lower cost of production by spreading the overhead across a broader base
- Preserve labor base
- Access to commercial expertise and management methods
- Improved technical support and training
- Access to OEM technical support