



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Washington, D.C. 20594

Maintenance Factual – Federal Express

June 8, 2017

A. ACCIDENT

DCA17MA022

Location: Fort Lauderdale International Airport, Fort Lauderdale, Florida
Date: October 28, 2016
Time: 1751 Local Time
Aircraft: FedEx Flight 910, Boeing MD-10, Registration N370FE

B. GROUP

Group Chairman: Gregory Borsari
National Transportation Safety Board
Washington, D.C.

Member: Patrick Casillo
Manager, Regulatory Compliance/Aircraft Records
FedEx

Member: David Sartin
MD11 Partial Program Manager
Federal Aviation Administration

Member: Stephen Brillaud
ALPA Safety
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Member: Kevin Warren
Service Engineer Systems
The Boeing Company, Seal Beach

Member: Pavan Arise
Program Manager
Hawker Pacific Aerospace, Sun Valley

C. SUMMARY

On October 28, 2016, at about 1751 eastern daylight time (EDT), FedEx flight 910, a McDonnell Douglas MD-10-10F, registration N370FE, experienced left main landing gear collapse and subsequent fire in the left wing after landing on runway 10L at Fort Lauderdale–Hollywood International Airport (KFLA), Fort Lauderdale, Florida. The two flight crew members evacuated the airplane after the airplane came to rest on the side of runway 10L and were not injured. The airplane was substantially damaged. The cargo flight was operating under 14 Code of Federal Regulation Part 121 and originated from Memphis International Airport, Memphis, Tennessee.

On November 1, 2016, the Maintenance Record Group met at the FedEx Air Operations Building in Memphis, TN to document N370FE maintenance program and records.

On January 31, 2017, the Maintenance Record Group met at the Hawker Pacific Aerospace (HPA) facility in Sun Valley, California to review the MLG overhaul records, procedures and processes. HPA was added as a party member to the investigation and was briefed on the initial findings of the investigation. See appendix 1 for HPA investigation details and MLG overhaul process.

D. DETAILS OF INVESTIGATION

1.0 Air Carrier Certificates

Federal Express Corporation d/b/a FedEx is located at 3620 Hacks Cross Rd, Building B, Memphis, TN 38125. A Part 121 operations certificate number, FDEA 140A, was originally issued to FedEx by the Federal Aviation Administration's (FAA) Flight Standards District Office (ACE-200), original on March 7, 1972. Amended October 18, 2010.

See Attachment one for more information – Air Carrier Certificate

The Federal Aviation Administration (FAA) Los Angeles Flight Standards District Office (FSDO) issued an approved Repair Station Certificate (Certificate Number FDER140A, dated

July 16, 2009 to Federal Express, 7401 World Way West, Los Angeles, California 90045 with the following ratings: Airframe: Class 2 & 4, Radio: Class 1, 2, & 3, Instrument: Class 1, 2, 3 & 4, Powerplant: Limited, Non-Destructive Inspection: Limited.

See Attachment two for more information – Repair Station Certificate

2.0 Operations Specifications (OpSpecs)¹

FedEx Certificate FDEA 140A, which includes the standards, terms, conditions, and limitations contained in the FAA approved Operations Specifications was reviewed. Some important facts were noted and listed:

- (a) Section D072 (Continuous Airworthiness Maintenance Program or CAMP) of the OpSpecs authorized FedEx to maintain in accordance with the conditions and limitations specified in each of the approved ops specs. Each aircraft and its component parts, accessories, and appliances are maintained in an airworthy condition in accordance with applicable Federal Aviation Regulations and standards prescribed and approved by the administrator. The MD10-10F CAMP is covered by FedEx Express General Maintenance Manual (GMM) P-00018181, Rev (), and Engineering Reports 98-068 Rev.9.
- (b) Per section D074 of the OpSpecs, FedEx was authorized to use a maintenance reliability program for the entire aircraft per each aircraft type contained in the General Maintenance Manual, Chapter 12 dated August 10, 2016. Time limitations for the overhaul, inspections, and checks of the aircraft and related systems including appliances and components controlled by the program shall be contained in the certificate holder's Engineering reports.
- (c) Section D076 of the OpSpecs authorized FedEx to use short-term escalations of maintenance intervals for check packages, check package individual line items or component time-change/task intervals. Scheduled maintenance are authorized a maximum of 10 percent, not to exceed 500 hours time in service.
- (d) Section D081 of the OpSpecs authorized FedEx to participate in a parts pool agreement subject to conditions and limitations. Only the parts pool participants listed in the OpSpec are eligible to provide parts to the certificate holder.
- (e) Section D085 of the OpSpecs FedEx has 29 A300-B4, 42 A300-F4, 19 A310-200, 14 A310-300, 116 B757-200, 40 B767-300, 27 B777-200, 52 MD10-10F, 16 MD10-30F, 67 MD11-30F aircraft in the fleet. Total of 422 aircraft.

¹ Operations Specifications contains the authorizations, limitations, and certain procedures under which each kind of operation, if applicable, is to be conducted by the certificate holder.

- (f) Section D090 of the OpSpecs authorized FedEx to utilize CASE² as a means of qualifying a vendor for services, parts, and materials to satisfy the requirements of 14 CFR Section 121.373.
- (g) Section D091 of the OpSpecs authorized FedEx to make arrangements with other maintenance providers to accomplish maintenance, preventive maintenance, or alterations for the certificate holder.
- (h) Section D095 of the OpSpecs authorized FedEx to use an FAA approved Minimum Equipment List (MEL) for each fleet type listed in the OpSpec.
- (i) Section D097 of the OpSpecs authorized the FedEx Aging Aircraft Program including, repair assessment, supplemental inspections, electrical wiring interconnection systems (EWIS), fuel tank system maintenance and means of flammability reduction as part of the continuous airworthiness maintenance program for its fleet of airplanes.
- (j) Per section E096 of the OpSpecs, FedEx is authorized for a Weight and Balance Program. FedEx is authorized to use individual aircraft weights outlined in the FedEx empty weight and balance program for each fleet type. Each MD10-10F aircraft weighed every 48 months per the FedEx MD10-10F General Maintenance Manual Chapter 7.

3.0 Type Certificate Data Sheet

The Type Certificate Data Sheet (A22WE) prescribes conditions and limitations under which the product for which the Type Certificate (TC) was issued meets the airworthiness requirements of the Federal Aviation Regulations. According to the document, The Boeing Company is the holder of the TC.

McDonnell Douglas Corporation, Long Beach, California, merged with The Boeing Company effective January 1, 2010. Type certificate A22WE was transferred to The Boeing Company on September 27, 2010.

4.0 Aircraft Information

The McDonnell Douglas Corporation manufactured the airplane March 5, 1972 and it was delivered to United Airlines. FedEx purchased the aircraft on August 21, 1997. The aircraft was

² The Air Carriers section of the Nonprofit Coordinating Agency for Supplier Evaluations (C.A.S.E.) was organized as a means of sharing non-prejudicial supplier quality approval data among the membership airlines. This increases surveillance coverage of suppliers and thereby upgrades their quality programs. It also has an economic impact on each C.A.S.E. member by decreasing the cost of supplier surveillance and making their surveillance programs more effective

first converted from a DC10-10 to a DC10-10F on July 13, 1999. The aircraft was further converted to a MD10-10F on November 2, 2003. FedEx placed into service on July 14, 1999. The airplane had 84,589.05 total flight hours with 35,606 total flight cycles at the time of the accident.

The airplane was equipped with three General Electric CF6-6D engines and a Honeywell TSCP700-4B Auxiliary Power Unit (APU). The engines and APU had accumulated the following operating times at the time of the accident:

Engine and APU Information

	No.1 Engine	No.2 Engine	No.3 Engine	APU
Manufacturer	General Electric	General Electric	General Electric	Honeywell
Part Number	CF6-6D	CF6-6D	CF6-6D	TSCP700-4B
Manufacture Date (installed new date)	1 May 1973	1 June 1975	1 April 1981	01 Jan 1973
Date Installed	15 March 2015	14 October 2016	19 February 2016	21 August 2016
Serial Number	451373	451580	451449	P90153
Time Since Restore (Engine /APU hours)	4,239:26	66:53	6,870:07	N/A
Total Cycles Since Restore (Engine/APU cycles)	2284	33	3,598	N/A
Engine Total Time Hours	67,044:33	65,061:47	68,711:40	46,252:55
Engine Total Cycles	29,878	25,085	30,342	56,107
Location of Engine/APU Installation	Atlanta	Indy	Atlanta	Mobile

	No.1 Engine	No.2 Engine	No.3 Engine	APU
Total Time of Airframe at engine/APU installation (hours)	82,563:33	84,522:12	83,851:38	84,502:55
Total Cycles of Airframe at engine/APU installation	34,526	35,573	35,246	35,557

5.0 Maintenance and Inspection Programs

FedEx aircraft, including engines, systems and appliances, are maintained in a continuous state of airworthiness by a program of preventive and corrective maintenance. Air Operations is responsible for the airworthiness, maintenance, servicing, alteration, and inspection of FedEx aircraft. Air Operations is also responsible for maintenance performed by other agencies when these agencies or persons perform maintenance or alterations on FedEx aircraft.

The following are summaries of each check. Further itemized tasks can be seen in the General Maintenance Manual.

“Service Check” – Accomplished within seven calendar days.

“A” Check - Accomplished every 125 flight hours.

“B” Check – Accomplished every 465 flight hours

“C” Check – Accomplished every 24 Months

Repetitive Special Checks and Services – Repetitive maintenance actions with individual time checks and service limits are specified in the Engineering Maintenance Program Specification (EMPS), Engineering Report 98-068.

Structural Inspection (SI) – The Structural Inspection Program requirements are in section III of the EMPS, Engineering Reports 98-068 and 90-019 for the Airworthiness Limitation Instructions (ALI).

Corrosion Preventative and Control Program – The CPCP is an integral part of the EMPS, Section III, Structural Inspection Program Specification (SIPS) and are identified as EO tasks.

The A-check zeros the service check. The B-check is a segmented check B1 thru B12. Each segmented B-check zeros the A-check and the service check.

The C-check is a heavy check that includes the following EMP tasks.

- (a) Cleaning
- (b) Required component changes

- (c) Structural inspections
- (d) Zonal inspections
- (e) Operational and functional checks
- (f) General visuals inspections
- (g) Detailed inspections
- (h) Special inspections of principal structural elements defined by the Airworthiness Limitations Instructions within Engineering Report 90-019 and non-routine maintenance resulting from the above tasks.
- (i) The following non-program tasks may also be assigned Engineering Orders (EO):
 - Engineering Authorization (EA) follow-ups.

Note: Definitions for EA and EO are contained in section 4 of the GMM.

- Tasks that may also generate non-routine maintenance.
- MEL deferrals.
- (j) The C-Check does not zero the B-Check, but could include a numbered B-Check that is due and work scoped with the C-Check based on criteria determined by Planning and Scheduling. When a B-Check is work scoped with a C-Check, it zeros the A-Check and the Service Check.
- (k) Repetitive special checks, structural inspections, and post maintenance walk-around items do not include any other checks and do not zero out any other checks.
- (l) All items (i.e., hard time, life limited, or calendar-controlled) that are part of the routine maintenance program accomplished during the check are tracked from the release date of the check. The release date of the electronic aircraft maintenance log (EAML) entry is made certifying the check is complete.
- (m) An Airworthiness Release Document (ARD) must be printed, signed, and placed in the Aircraft Maintenance Logbook.

Scheduled Maintenance Work Content

- (a) Work content of the Service Check can be found in the Service Check, FedEx form M-3490.
- (b) Work content of the A-, B-, and C-Checks can be found in the respective work card publications.
- (c) Program Planning retains master copies of the Service, A-, B-, and C-Checks.

CF6 Engine and TSCP700 APU Programs

- (a) FedEx schedules planned engine and auxiliary power unit (APU) removals and maintains historical records of engine life-limited parts. Engines are tracked using this data.
- (b) Work content of the CF6 engine and TSCP700 APU maintenance programs can be found in the respective publications.
- (c) Powerplant Technical Support retain the master copies of the CF6 engine and TSCP700 APU work cards.

The following is the history of N370FE that lists the time limitation for inspection and check procedures:

Check	Date of recent Inspection	Location	Total Time	Total Cycles
Service Check	Oct 25, 2016	IND	84,569.32	35,596
A Check	Oct 25, 2016	IND	84,569.32	35,596
B5 Check	Oct 25, 2016	IND	84,569.32	35,596
C10 Check	Sept 21, 2016	BFM	84,502.55	35,557

The Maintenance Records group reviewed the standalone items assigned to the C10 visit. The list included ALI's (includes PSE and supplemental PSE), standalone EO's and EA's, and individual maintenance cards. Total of 109 items were reviewed by the group. None of the tasks affected the landing gear structure.

FedEx maintenance personnel accomplish "Service", "A", and "B" checks, while heavy checks ("C" checks) can be accomplished by an outside maintenance repair organization. "B" checks due within 30 days of completion of a "C" check can be accomplished by the outside organization in conjunction with the assigned "C" check.

The maintenance group noted that the last main landing gear full shock strut service was accomplished at the C10 visit in Mobile, AL on September 8, 2016.

6.0 Continuing Analysis and Surveillance System (CASS)³ and Reliability Program

To comply with requirements of 14 CFR Part 121.373, FedEx has an approved CASS program, which is a systems approach to assess the performance and effectiveness of the FedEx Continuous Airworthiness Maintenance Program (CAMP).

CASS has two primary job functions:

- (a) The “performance analysis function” includes daily and long-term monitoring, and emergency response related to the performance of affected airplane systems, including airplane engines and components. In concert with the FedEx CASS portion of the program executed as described in the FAA approved FedEx Aircraft Reliability Program covered in the General Maintenance Manual chapters 12 (Reliability) & 14 (CASS). This function includes, but is not limited to, the monitoring of:
 - Mechanical problems for affected airplanes. (daily and long-term monitoring)
 - Deferred Maintenance Items, including repetitive items. (daily and long-term monitoring)
 - Pilot Reports. (long-term monitoring)
 - Mechanical Interruption Summary Reports (MIS). (long-term monitoring)
 - Critical failures. (emergency response)

- (b) The “audit function” provides for continuous surveillance of the FedEx maintenance operation, including the maintenance departments, maintenance vendors, and component vendors for compliance with the FedEx General Maintenance Manual, FARs, manufacturer’s manuals, and other approved manuals that affect FedEx maintenance operations. This function includes, but is not limited to, the auditing of:
 - Accuracy, completeness, currency, and adherence to required records, manuals, and publications.
 - Procedures for performance of maintenance, turnover/carryover items, deferred maintenance, required inspection, and airworthiness release execution.
 - Requirements for training programs.
 - Vendors for proper authorization, qualification, training, staffing, and equipment to perform their contracted functions.

Several CASS meeting minutes and Monthly Reliability reports were reviewed for 2016 with no issues noted with the landing gear structure; however, they validated the existence of an actively managed program.

³ As established by 14 CFR Part 121.373, each certificate holder shall establish and maintain a system for the continuing analysis and surveillance of the performance and effectiveness of its inspection program and the program covering other maintenance, preventative maintenance and alterations and for the correction of any deficiency in those programs, regardless of whether those programs are carried out by the certificate holder or by another person.

7.0 Minimum Equipment List (MEL)⁴

FedEx was authorized to use an approved MEL on its airplanes per its OpSpecs. MEL items were reviewed from May 1, 2016 to October 28, 2016. At the time of the accident, there were six open MEL items. None affect the landing gear or landing gear system.

8.0 Supplemental Type Certificates (STC)⁵

Supplemental Type Certificates (STCs), supplied by air carrier, were reviewed. A total of 28 STCs were documented and installed by the operator. There were no STCs that affected the landing gear structure and/or braking systems.

9.0 Airworthiness Directives (AD)⁶ and Service Bulletins (SB)

FedEx provided an AD summary for review. The AD summary contained the applicable Service Bulletins. A review of Airworthiness Directive status lists for the airplane, powerplants and appliances were conducted. No discrepancies were found during the review of the listing. There was one AD applicable to the landing gear structure, see section 19.0 for details. There is one SB for the main landing gear forward upper and lower attach bolts. FedEx incorporated the repetitive inspection every 24 months rather than terminate. Last inspection for both the left and right main landing gear attach bolts was accomplished September 21, 2016 with no findings.

10.0 Aircraft Flight Logs

Electronic Aircraft Flight Logs were reviewed from April 1, 2016 thru October 28, 2016. The review focused on the main landing gear and any special inspections and discrepancies on the incident airplane. No discrepancies for the landing gear structure or wing attach points noted.

11.0 Weight and Balance Summary

FedEx uses a weight and balance program to ensure compliance with applicable airworthiness requirements and aircraft operation limitations. Air Operations weighs all aircraft on a scheduled basis to ensure accuracy of published basic operating weight data.

MD10-10F aircraft must be weighed every 48 calendar months. The last weight and balance for N370FE was performed on July 28, 2016 and was accomplished at New Iberia, LA.

⁴ The FAA approved Minimum Equipment List contains a list of equipment and instruments that may be inoperative on a specific aircraft for continuing flight beyond a terminal point.

⁵ The FAA issues Supplement Type Certificates, which authorize a major change or alteration to an aircraft, engine or component that has been built under an approved Type Certificate.

⁶ Airworthiness Directive (AD) is a regulatory notice sent out by the FAA informing the operator of an action that must be taken for the aircraft to maintain its airworthiness status.

Basic Operating Weight:	218,336.04	pounds
Arm:	1,386.96	inches
Moment:	302,822,740.09*	lb-inches

Per the FedEx approved Weight and Balance program for the MD10-10F if the MAC is within +/- ¼% MAC or the weight is within +/- 900 pounds from the previous weigh than the previous BOW would remain in effect. If not, a new BOW would be published.

* Weight and Balance calculation form provided by FedEx. Maintenance record group calculated the moment to be 302,823,354.04

See Attachment three for more information – Weight and Balance

12.0 Service Difficulty Reports (SDR)⁷ and Mechanical Interruption Summary Report (MISR)⁸

The Maintenance Records Group analyzed the Service Difficulty Reports for the accident aircraft for the date range April 2016 to October 2016. There was one SDR and two MISR on file. None of which affected the MLG.

13.0 Major Repairs and Alterations

Major repairs and alterations were documented and reviewed. The review concentrated on the main landing gear. Two major repairs were accomplished on N370FE main landing gear. One being the MLG pivot bolt. The second major repair was for the right MLG piston (inner cylinder) assembly. Two major alterations were found for N370FE affecting the landing gear. One upgraded the MLG to carbon brakes and the other replaced the MLG down lock target.

14.0 Time Limit Components

Time Limit component status for the airplane, the three installed powerplants and the APU were reviewed. The review included time limited rotatable components installed on N370FE. Components are tracked by the manufacturer part and serial number. In addition, FedEx assigns a company part and may assign serial number for non-controlled items for inventory planning

⁷ As required under 14 CFR 121.703, each scheduled operator is to report the occurrence or detection of each failure, malfunction or defect concerning (a) fires during flight, (b) false fire warning during flight, (c) engine exhaust system that causes damage during flight, (e) an aircraft component that causes accumulation or circulation of smoke, vapor, or toxic or noxious fumes during flight, (f) engine shutdown during flight, (g) a propeller feathering, (h) aircraft structure requiring major repairs, (i) cracks, corrosion, (j) other safety critical issues as stated in the FAR part. These occurrences must be reported within 72 hours of the event.

⁸ Each scheduled operator is required under 14 CFR Part 121.705 to submit a summary of any (a) interruption to flight, (b) unscheduled change of aircraft en route, or unscheduled stop or diversion from a route caused by known or suspected mechanical difficulties or malfunctions that are not required to be reported as service difficulty reports.

and part effectivity control. The company part number may include multiple manufacturer part numbers that are interchangeable. The system tracks the manufacturer part and serial number.

15.0 Vendors

The Maintenance Group reviewed the Approved Vendor List provided by FedEx. FedEx accomplished audits of their essential maintenance providers and critical vendors on an annual basis or on a more frequent schedule based on findings. All other vendors are audited on a risk based assessment frequency with a maximum 84-month period. Additionally, per OpSpec, FedEx is also authorized to utilize CASE as a means for qualifying vendors. All essential maintenance and component vendors were listed in the operator's Approved Maintenance Provider List. There were no discrepancies in the listing. The maintenance group also reviewed the last two Hawker Pacific, Sun Valley facility audits conducted in 2014 and 2015. 2014 audit score did not meet FedEx desired compliance requirements. Corrective action was documented and taken. The 2015 audit score met FedEx desired requirements.

16.0 Method of Record Keeping

FedEx Air Carrier Manuals and Record keeping system maintains aircraft, engine, and component records using an electronic system "Optix" for retention and work flow. At times paper records are sent and converted to electronic format and placed in Optix. Historical paper records are retained in a safe, fire and water resistance facility. The Optix retention system includes the "dirty fingers" task cards both routine and non-routine tasks. This includes everything required by 14 CFR 121.380 and 14 CFR 121.380A.

17.0 Flight Recorder Parameter Verification

The flight recorder parameter verification is a yearly task on the MD10-10F fleet. The review process verifies that each parameter is being recorded correctly and if not, corrective action is taken. The parameter verification reviews both the FAA mandatory parameters and non-mandatory parameters. In addition, while accomplishing the parameter verification if an issue is observed with a parameter the technician notifies maintenance control for corrective action. The last check was completed October 4, 2016 at Mobile. The flight recorder data was downloaded and electronically transmitted to the avionics shop for the parameter verification. The Avionics shop reviewed the data on October 6, 2016. All parameters passed the verification check, both mandatory and non-mandatory.

18.0 Manuals

- (a) Air Carrier Manual - The FedEx Express Air Carrier Manual (ACM) provides a central reference to the regulatory-related aspects of FedEx Express, a Federal Aviation Administration Air Carrier Certificate holder. In this manual, the name of the air carrier, FedEx Express, is referred to as "the Company." The ACM describes

the connections among multiple operational units, their respective manuals, and the principles of system safety.

- (b) General Maintenance Manual (GMM) – This section provides FedEx Express Air Operations an overview of how the policies, procedures, and documents in its manual system ensure compliance with the Federal Aviation Administration's (FAA) regulatory requirement for a Continued Airworthiness Maintenance Program (CAMP) as authorized in FAA issued Operation Specifications.
- (c) Aircraft Reliability Program – This manual contained in the GMM section 12 describes the FedEx Express Aircraft Reliability Program, its operation, ambitions, and authority to function as an effective system to identify and establish proper maintenance processes.
- (d) Illustrated Parts Catalog (IPC) – The IPC is intended for use in provisioning, requisitioning, storing, and issuing replaceable aircraft/engine parts and units, and identifying these parts. It is also used to list and illustrate assemblies and detailed parts, which are utilized for the aircraft/engines operated by FedEx. The part number content of the IPC arrangement and breakdown sequence of items is compatible with Air Transport Association (ATA) No. 100.
- (e) Maintenance Manuals (MM) – The Maintenance Manual contains the information necessary to service, troubleshoot, functionally check, repair and/or replace components installed on the aircraft/engines operated by FedEx. The manual identifies limits and tests for the associated components or systems.
- (f) Minimum Equipment List (MEL), Configuration Deviation List, and Dispatch Deviation Procedures - This manual provides information pertaining to the dispatch of aircraft with inoperative system(s)/configuration deviation and also references maintenance procedures relating to inoperative MEL items.
- (g) Overhaul Manual (OHM) – Provides technical data required to overhaul the various components installed on the aircraft. This data contains descriptive, disassembly, cleaning, check, repair, assembly, functional test, special tools, and illustrated parts information. The Overhaul Manual does not contain information relative to work normally performed on the flight line or in the aircraft maintenance operation.
- (h) Structural Repair Manual (SRM) – This manual contains material identifications for structure, subject to repairs generally applicable to structural components of the aircraft that are most likely to be damaged. Structural damage criteria fastener

installation and procedures that must be performed concurrently with structural repair are identified.

- (i) Wiring Diagram Manual (WDM) – The WDM Manual contains combined electrical and electronic wiring diagrams and schematics, an electrical and electronics list, and electrical and electronic charts. The equipment list, contained within the WDM, is an approved source for obtaining correct part numbers for aircraft, engines or components.

19.0 Main Landing Gear

The maintenance group reviewed the records associated with the main landing gear (MLG) installed on N370FE at time of the accident. The right and left MLG are tracked separately. The right MLG was overhauled February 29, 2012 and installed on N370FE January 24, 2013. The primary focus was centered on the left MLG and the work completed during the most recent left MLG overhaul, dated February 28, 2008 and any reported hard landings. The left main landing gear was installed on N370FE March 31, 2008. Aircraft time at installation was 74,340.02 and 29,953 total cycles at install. Time since install 10,249.03, cycles since install 5653 and days since install 3133. Time remaining in days (most restrictive) 152 days as of October 28, 2016 (date of accident). Main landing overhaul limit for FedEx is nine years or 30,000 flight hours, whichever occurs first. The Boeing Maintenance Planning Document recommends the restoration of the main landing gear assembly every eight years or 7500 flight cycles, whichever occurs first.

On May 3, 2000, the FAA CMO for FedEx approved the MSG-3 conversion from MSG-2 which had previously escalated overhaul of the MLG assembly to nine years or 30,000 hours as part of the MD10-10F maintenance program.

Main landing gear assembly part number D10-32-001-11 serial number CPT00081 was overhauled by Hawker Pacific Aerospace Repair Station No. RJ3R817L located at Sun Valley, CA.

The MLG assembly at overhaul had 33,422 cycles since new. The outer cylinder had 26,867 cycles since new. The piston (inner cylinder) had 33,422 cycles since new.

The following is a list of Airworthiness Directives either identified as previously complied with (PCW) or accomplished during this visit (CWTO).

Airworthiness Number	Title	Action
94-03-08	Inspect for ladder cracks & replace bearings	PCW
92-27-18	Rebound check valve	PCW
96-16-01	Fwd Trunnion bolt strip & replace	PCW
99-06-08	Fwd Trunnion spacer	PCW
95-14-06	A/S manifold shield & pipe shield	CWTO

Airworthiness Number	Title	Action
98-24-17	FWD Trunnion Bolt	PCW
84-03-06	LDG part & serial number verification	CWTO
75-09-11	Steering collar life limited tracking	CWTO

The following is a list of Service Bulletins either identified as previously complied with (PCW) or accomplished during this visit (CWTO) or not accomplished (NA).

Service Bulletin	Title	Action
32-030 R2	Modify single chamber to dual chamber	PCW
32-060 R6	Rebound check valve	PCW
32-110	Upper bearing (replace per SB 32-191)	PCW
32-116	Cylinder lube fittings	NA
32-147	Lower bearing housing	PCW
32-161 R1	Inspect for ladder cracks and replace bearings	PCW
32-182 R1	Retainer bolt	CWTO
32-191 R1	Replace upper bearing	PCW
32-227 R2	Rebound check valve	PCW
32-241	Fwd trunnion bolt strip & replate	PCW
32-248 R2	Fwd trunnion spacer	PCW
32-254	New shock strut seals & lower bearing modification	CWTO
32-118	Axle sleeve	CWTO
32A137 R5	Truck beam	CWTO
32-204	Axle bushing retainer	PCW
32-215	Brake link	CWTO
32-228 R1	Truck beam lube passage	CWTO
32-004	Relocate brake hose	CWTO
32-027	Modify gland	PCW
32-050 R1	Modify brake hose	PCW
32-113 R1	Trim cylinder	CWTO
32-134 R1	Anti-skid manifold shield (partial)	CWTO
32-143 R1	Pipe shield see SB 32-163	CWTO
32-163	Replace support bracket	PCW
32-174	Remove brake return accumulator	PCW
32-045 R1	Trim cylinder replace	PCW
32-127	Trim cylinder	PCW
32-005 R1	Reroute A/S wiring	CWTO
32-034	Conduit chafe guard	CWTO
32-063	Conduit chaffing	CWTO
32-138	Relocate clamps	PCW
32-153	Conduit replace	PCW
32-077	MLG bumper pad	PCW
32-188	Trunnion spacer	PCW

Service Bulletin	Title	Action
57-078 R1	Forward trunnion bolt (see SB 32-241)	PCW
32A259*	Terminated SB DC10-32A259 by repair of the fill valve bore	CWTO

* During the investigation, the work associated with Alert Service Bulletin (ASB) 32A259 for the air fill port was identified by the structures group for additional research by the maintenance group.

The maintenance group reviewed the Hawker Pacific work cards for the MLG overhaul. The records indicated ASB DC10-32A259 for the rework of the air fill valve bore on the outer cylinder was performed during this overhaul, with a final inspection date of February 6, 2008. The work was completed prior to the effective date of the airworthiness directive, AD 2008-09-17, dated June 6, 2008. The AD mandated the completion of the alert ASB. Accomplishment of the ASB during overhaul meets the requirements of the AD.

The Hawker Pacific operations and work cards generated from the ASB provide work flow for completing the rework. During the initial inspection, no nickel or chrome was found in the fill valve bore, but corrosion was found. The corrosion was removed per ASB instructions. All dimensions related to the fill valve bore rework was documented in the work cards, indicating the fill valve bore was oversized per the ASB instructions and all recorded dimensions were within manufacturer limits with one exception. The ASB states that the radius of the air fill valve bore at both the inner diameter wall and thread junction be maintained at 0.015 – 0.030 inch during rework and to record the findings. After rework, the thread junction radius was recorded as 0.030 inch and the inner diameter wall was recorded as 0.090 inch. No additional records found that addressed the exception.

See Attachment four for more information – Work Order Traveler

In addition, the maintenance group reviewed aircraft log write ups from October 1, 2006 (prior to the gear being replaced) to the date of the accident. One pilot report was found dated February 6, 2014 indicating a hard landing occurred at Newark, NJ (EWR). Maintenance downloaded and reviewed DFDR data and performed the structural inspections in accordance with AMM 05-51-04-06 for structural inspections. Inspections were completed with no defects noted and no additional work required.

Appendix 1 – Hawker Pacific Aerospace

A.1 HPA Repair Station Certificate

The Federal Aviation Administration (FAA) Van Nuys Flight Standards District Office (FSDO) issued an approved Repair Station Certificate (Certificate Number RJ3R817L), original date April 24, 1987 to Hawker Pacific Aerospace located at 11240 Sherman Way, Sun Valley, California 91352 with the following ratings: Accessories, Limited Accessories (August 5, 2015), Limited Landing Gear.

See Attachment five for more information – Repair Station Certificate

A.2 HPA Operations Specifications (OpSpecs)⁹

Hawker Pacific Aerospace Certificate RJ3R817L, which includes the standards, terms, conditions, and limitations contained in the FAA approved Operations Specifications was reviewed. Some important facts noted and listed below:

Per section A003 of the OpSpecs authorized the following ratings and limitations to HPA.

Accessory Class 1: Mechanical Accessories.

Accessory Class 2: Electrical Accessories.

Accessory Class 3: Electronic Accessories.

Limitations – Per the Ops Spec HPA is authorized to perform work on landing gear manufactured by Airbus, Boeing, Empresa Brasileira de Aeronautica S.A. (EMBRAER), Eurocopter France, and Gulfstream. Limitations for The Boeing Company models; B-717, B-737, B-747, B-757, B-767, B-777, DC-10, MD-10, MD-11, MD-90 series of airplanes are as follows:

Inspect, Repair, Overhaul, Modify, and Test in accordance with Manufacturer's Maintenance Instructions, Air Carrier's Data, FAA Accepted and/or FAA Approved Data.

Accomplish the following processes in accordance with the listed specifications (as revised):

Nital Etch: In accordance with BAC 5436, DPS 4.715, Boeing SOPM 20-10-02, Boeing SOPM 20-10-06.

Eddy Current Inspection: In accordance with BAC 5661, Boeing NDTSPM 06-00-00 Part 06, BSS 7351, DPS 1.05-8, DPS 4.75

⁹ Operations Specifications contains the authorizations, limitations, and certain procedures under which each kind of operation, if applicable, is to be conducted by the certificate holder.

Ultrasonic Inspection: In accordance with DPS 4.713

NDT Magnetic Particle Inspection: In accordance with ASTM-E-1444, BAC 5424, Boeing NDTSPM 07-00-00 Part 7, DPS 4.704

Fluorescent Penetrant Inspection: In accordance with ASTM-E-1417, BAC 5423, Boeing NDTSPM 08-00-00 Part 08, BSS 7939, DPS 4.707

Cadmium Plating: In accordance with BAC 5718, DPS 9.74, Boeing SOPM 20-10-06, Boeing SOPM 20-10-28, Boeing SOPM 20-42-01

Hard Chrome Plating: In accordance with BAC 5709, Boeing SOPM 20-42-03, Boeing SOPM 20-10-06, DPS 9.71

Chrome Anodizing: In accordance with BAC 5019, Boeing SOPM 20-43-01

Chrome Conversion Coating: In accordance with Boeing SOPM 20-43-03, MIL-C-5541

Nickel Plating: In accordance with Boeing SOPM 20-10-01, Boeing SOPM 20-10-08, Boeing SOPM 20-42-08, Boeing 20-42-09, BAC 5728, BAC 5746, DPS 9.76-1

Passivation: In accordance with BAC 5625, BAC 5751

Hardness: In accordance with ASTM-E-18

Barkhausen: In accordance with BAC 5653

Shot Peen: In accordance with BAC 5730, BAC 5730-2, Boeing SOPM 20-10-03, Boeing SOPM 20-10-10, Boeing SOPM 20-11-01, DPS 4.999

Per section A004 of the OpSpecs summary of special authorizations and limitations HPA is authorized to use an approved electronic recordkeeping system, electronic/digital signature, and/or electronic media as contained in OpsSpec A025.

A.3 HPA Vendors

The Maintenance Group reviewed the Approved Vendor List provided by HPA. On-site audits of non-certificated vendors occur every two years, with follow-on mail-in audits the following year. Certificated vendor audits occur by mail-in every year. More frequent audits may be performed based upon ongoing risk assessment.

A.4 HPA Method of Record Keeping

HPA Manual and Record keeping systems maintain component records and are shown below comparing 2007 and current methods.

- (a) 2007: Maintenance records were based on the work order traveler, which referenced the SOPMs for back-shop maintenance and CMMs for assembly/disassembly areas. Each operation, task, and procedure is documented on the work order traveler. The work order traveler includes items such as critical dimensions, limitations, process requirements, and areas for the employee- and inspector-stamps, as required. Original hard-copy records were physically archived on site in a secure and environmentally controlled record's storage facility. Hard copies of these records were also provided to the customer (FedEx, etc.) and are listed below:
- FAA Form 8130-3 Authorized Release Certificate (original with product)
 - Tear-down reports
 - Life-limited parts report
 - Service Bulletin and Airworthiness Directive report
 - Discrepancy reports along with Engineering Authorization (if applicable)
 - Specification policy sheets (Customer requirements)
 - Purchase Order documents
 - Vendor records
 - Bill of Material (BOM)
 - Work order travelers (Record of Maintenance)
- (b) Current system: The method of record keeping has remained considerably identical from 2007, with the following differences:
- Electronically-generated Job Cards have been added which contain the applicable processes and procedures from CMMs, SOPMs and other applicable specifications and requirements.
 - The documents listed in (a) are now provided electronically.

A.5 HPA Manuals

- (a) Repair Station Manual and Quality Control Manual (RSM/QCM) - The HPA RSM/QCM is prepared in accordance with 14 CFR 145 requirements and HPA policies. The repair, overhaul, or alterations are performed in accordance with the current CFRs, manufacturer's data, drawings, specifications, service bulletins, or other technical data acceptable by the administrator for the particular ratings or limited rating listed in the OpsSpec issued by the FAA. Specialized services are performed in accordance with requirements listed in the OpsSpec.
- (b) Component Maintenance Manuals (CMM) – The Component Maintenance Manual contains the information necessary to service, check, repair and/or replace sub components installed on the higher assembly repaired by HPA. The manual identifies limits, repair processes, detailed break-down and tests for the associated components. The CMM includes an Illustrated Parts Catalog (IPC) which contains a detailed breakdown of the parts. Heritage aircraft previously used the term Overhaul Manuals (OHM).

- (c) Standard Operation Procedure Manual (SOPM) – These contain Boeing’s general procedures for performing specific tasks and reference the applicable specification or standard for detailed requirements.

A.6 Left Main Landing Gear

The maintenance group reviewed the records with HPA associated with the left main landing gear installed on N370FE at the time of accident. See section **19.0** above for details.

A.7 Non-Destructive Testing (NDT) and Brush Cadmium Low Hydrogen Embrittlement Process (LHE)

The Maintenance Group reviewed the work order traveler for the Left MLG Outer Cylinder overhaul with HPA. The maintenance records group witnessed the NDT fill valve bore inspection process as well as a demonstration of LHE application on an outer cylinder at HPA.

- (a) NDT - Eddy Current inspection of fill valve bore non-threaded area:

The eddy current inspection is a type of NDT using electromagnetic induction to inspect for flaws, cracks, and defects in conductive materials. The equipment was configured to inspect the fill valve bore non-threaded area on a large landing gear. The equipment utilized a rotating probe with a specific probe thickness designed to have an interference fit with the fill valve bore. The probe was calibrated using a reference standard with a 0.001" surface flaw. The instrument was operated at a frequency of 500 kHz, which exhibits higher precision for surface defects, but has lower penetration depth. The technician calibrated the equipment to a 60% full-scale deflection.

The ASNT Level III certified technician referred to the applicable procedure during the entire calibration. The bore was cleaned prior to inspection. The technician noted that surface roughness will indicate interference, and would usually require additional polishing. Since the 60% deflection would correspond to a 0.001" flaw, as calibrated, the amplitude of the eddy current return translates to the crack depth, while the probe location corresponds to the position of the flaw. The technician then rotates the probe to determine the clock location of the flaw. With the fill valve bore configuration, the eddy current deflection would become inconsistent and inconclusive at the inner diameter radius of the valve bore due to edge effect. The technician demonstrated that at the inner diameter radius, the probe exhibited poor contact which produced a crack indication. The technician further stated that magnetic particle inspection would be the most effective detection method at the inner diameter radius, but would still require the technician to observe the region from the inner surface using a mirror.

Other NDT techniques, such as fluorescent penetrant, would likely also be ineffective.

(b) Plating Shop - LHE Process:

The LHE process is a manual process designed to plate a low hydrogen embrittlement cadmium coating locally which is difficult to bath plate. In this case, the LHE process was performed in the fill valve bore of the outer cylinder. This included the threaded and non-threaded portion of the bore. To first prepare the bore surface and radius, the surfaces were flapper polished using a small square of emery paper attached to a long metal holder. The paper is rotated using a compressed air tool with a limit of 2400 RPM. The operator stated that they can use infrared guns to measure the surface temperatures, but typically the temperature stays below 125°F. In this case, the temperature remained below 90°F and could be touched by hand.

After polishing, the bore was swabbed with an acetone rinse, then swabbed dry. The operator then inspected the bore using a manual hand borescope. After inspection, the bore was prepared using an aluminum oxide (Al_2O_3) air-powered blast. After blasting, the entire bore and inner surface of the outer cylinder was cleaned with compressed air.

The plating process began with the operator applying a grounding cable to an outer cylinder surface lug. The brush with LHE solution was attached to the opposite electrode so the plating reaction would occur locally when the brush contacted the prepared valve bore surface. The operator then inserted the brush with the plating solution into the bore, pulling the brush back and forth while continuously rotating. While manually moving the brush, the operator was monitoring the current, charge, and voltage on the power source. The charge, measured in Amp-hour, could be indirectly correlated with the coating thickness. Starting at 0.00 Amp-hour, the operator would continue the manual brushing process until the meter indicates 0.56, meaning the target plating thickness had been achieved. The operator would change the voltage settings as needed to get the correct plating rate, using a generally low current, to reduce the risk of electric arcing. This process generally takes about 10-15 minutes depending on applied current. At the conclusion of the plating, the operator would blast the bore with compressed air, and then borescope inspect. The LHE plating visually appeared as a dull white color. The plating thickness would likely be less in the radius, since there would be less contact with the brush. However, in this case, the white LHE plating was visible on the inner diameter radius. The operator stated the LHE brush solution is certified to a 1-year shelf life, but likely would be consumed long before this date occurred.

(c) During review by the maintenance record group it was discovered the process flow had changed from:

- 1) Chrome Plate followed by initial bake
- 2) Electroless Nickel Plate followed by 2nd bake
- 3) Bushing installation
- 4) Cadmium Plate (tank) followed by 3rd bake
- 5) Stylus Cadmium plate valve bores
- 6) Borescope check valve bores
- 7) Magnetic Particle Inspect

To:

- 1) Polish Chrome followed by bake
- 2) Magnetic Particle Inspect
- 3) Stylus Brush Cadmium Plating
- 4) Aluminum Oxide blast
- 5) Cadmium Plate (tank) followed by bake

The procedure performed in 2007 directed the stylus cadmium plating after the outer cylinder had been tank-plated and baked; whereas the current procedure directs brush cadmium plating prior to tank-plating and baking.

The work flow changed in July 2015 as a result of the implementation of the Material Resource and Planning (MRP) program, called Systems Applications and Products (SAP). The SAP system incorporates the new electronic Job Cards for work flow as well as the process and procedures from the Boeing SOPMs, CMMs, and applicable source documents.

A.8 Training

HPA's training program is approved by the FAA and consists of initial and recurring training. The training program meets the requirements of 14 CFR Part 145.163, 145.165, and 145.209e. The Training Manual that governs the program is found in, and accessed through the IQ Move System.

This training program contains both the policies and procedures HPA uses to determine training requirements, as well as develop and maintain its training program. This plan also provides procedures to identify training needs in a systematic manner, identify appropriate existing training, select the best training methods, develop training, provide training, record training, and measure the effectiveness of the training.

The procedures in the plan enable HPA to revise an existing training program to help ensure it continues to meet external and internal needs.

While the recurrent training requirement is two years, HPA schedules recurrent training twice a year and Human Factors training each year. In addition, HPA performs random testing of its technicians, conducted by Managers, Supervisors, Leads, or their delegates. Internal auditors evaluate the technical proficiency of the technicians as well.

The maintenance record group reviewed the training records of the technician(s) who performed the work on the subject outer cylinder. The records reviewed were current at the time of overhaul.

A.9 HPA Quality Assurance (QA)

The QA Auditor is responsible for scheduling and conducting internal and external audits. These audits ensure compliance with customer specifications, FAA, and other applicable regulatory agencies. Internal audits are scheduled annually. Each department/process is selected for audit determined by risk-based assessment. HPA utilizes the AS9110 and C.A.S.E 1-A standards for their audits.

The maintenance record group reviewed an audit for machining and grinding parts from 11/01/2016 to 11/08/2016. The audit consisted of nine attributes, which resulted in one finding and a positive observation. The finding was related to several gaps in the turn-over log. The positive observation made note of the above average “clean as you go” philosophy and ensuring all parts are protected.

Attachment 1

Air Carrier Certificate - FedEx



U.S. Department
of Transportation
**Federal Aviation
Administration**

Air Carrier Certificate

This certifies that
Federal Express Corporation
d/b/a FedEx Express
3620 Hacks Cross Road
Building B, Third Floor
Memphis, TN 38125

has met the requirements of the Federal Aviation Act of 1958, as amended, and the rules, regulations, and standards prescribed thereunder for the issuance of this certificate and is hereby authorized to operate as an air carrier and conduct common carriage operations in accordance with said Act and the rules, regulations, and standards prescribed thereunder and the terms, conditions, and limitations contained in the approved operations specifications.

This certificate is not transferable and, unless sooner surrendered, suspended, or revoked, shall continue in effect indefinitely.

By Direction of the Administrator.

Certificate number: FDEA 140A

Effective date: March 7, 1972
Amended Date: October 18, 2010

Issued at: Memphis, Tennessee

Larry Richards
(Signature)

Division Manager
(Title)

ACE-200
(Region/Office)

Attachment 2

Repair Station Certificate - FedEx

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Air Agency Certificate

Number FDER140A

This certificate is issued to

FEDEX EXPRESS

whose business address is
**7401 WORLD WAY WEST
LOS ANGELES, CALIFORNIA 90045**

*upon finding that its organization complies in all respects
with the requirements of the Federal Aviation Regulations
relating to the establishment of an Air Agency, and is
empowered to operate an approved* **REPAIR STATION**

with the following ratings:

**AIRFRAME: CLASS 2 & 4
RADIO: CLASS 1, 2 & 3
INSTRUMENT: CLASS 1, 2, 3 & 4
POWERPLANT: LIMITED
NONDESTRUCTIVE INSPECTION: LIMITED**

*This certificate, unless canceled, suspended, or revoked,
shall continue in effect* **INDEFINITELY**

By direction of the Administrator

Date issued:

JULY 16, 2009

for

**RICHARD A. FALCON
MANAGER, LAX-FSDO**

**This Certificate is not Transferable, AND ANY MAJOR CHANGE IN THE BASIC FACILITIES, OR IN THE LOCATION THEREOF,
SHALL BE IMMEDIATELY REPORTED TO THE APPROPRIATE REGIONAL OFFICE OF THE FEDERAL AVIATION ADMINISTRATION**

Any alienation of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both

Attachment 3

Weight and Balance – N370FE

Attachment 4

Air Valve Fill Port Maintenance Card

L07793-007











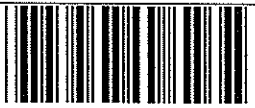


WORKORDER TRAVELER | Title : CYLINDER, OUTER | LANDING GEAR COMPONENTS | DATE: 11/10/07 | PAGE : 1

PN ARG7002-RTR | O/H SEC: See Below | JOB NO: L07793-007

CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

DAC OHM: *32-1104* REV #25 DATED *15 SEP 07* 
 MATERIAL: 300M
 FINAL H.T.(REF): 275-300 KPSI
 COMMENTS: ARG7041-1-12-HPM & ARG7087-503-*DEC 09 2007*

OPERATION BARCODE	OP #	DESCRIPTION	DATE	QTY	STAMP
	1000 NORM	IDENTIFY-VIBRO ENGRAVE IDENTIFY VIBRO ETCH W/O # ON A NON-FUNCTIONAL AREA OF PART ***CAUTION***: MARKINGS MUST NOT RUN INTO FILLET RADII, OVER EDGES, OR BE LOCATED ON MACHINED OR "HIGH STRESS" SURFACES REMOVE ALL BUSHINGS, BEARINGS, SLEEVES & LUBE FITTINGS *****NOTE: USE PROPER TOOLING TO PREVENT DAMAGE TO MACHINED SURFACES*****	<i>11-17-07</i>	1	
	1020 NORM	REMOVE PAINT & CADMIUM PLATE PAINT REMOVAL B5 REMOVE PAINT AND CADMIUM PLATING PER OHM CHAPTER 20-10-02 (DRY ABRASIVE BLAST) ***CAUTION***: PROTECT ALL CHROME AND NICKEL PLATED SURFACES	<i>11/28/07</i>	1	
	1040 NORM	DEBURR POLISH PLATING FOR INSP * POLISH CHROME PACKING BORE TO IMPROVE SURFACES FINISH <i>ok</i> ** POLISH LONG BORE AND I/D SEAL TO IMPROVE SURFACES FINISH. <i>ok</i> *** POLISH BOSS O/D TO IMPROVE SURFACES FINISH. <i>ok</i> **** CLEAN ALL HOLES AND THREADS TO IMPROVE FINISH. <i>corr</i> ***** POLISH UPPER VALVE BORE HOLE TO IMPROVE FINISH. <i>corr</i> ***** CONTACT PLANNING FOR DISPOSITION ***** STAMP 	<i>11-28-07</i>	1	
	1060 NORM	MANUFACTURING PLANNING PLANNING/DISPOSITION EVALUATE PART FOR REPAIR AND OVERHAUL-DETERMINE COMPONENT ASSY NUMBER CHECK CUSTOMER'S PO REQMT'S; INSTRUCTIONS;--COMPLETE COST ADVISE (AS REQD) NOTIFY SALES OF ANY DISCREPANCIES BETWEEN REPAIR ORDER CALLOUTS ie; P/N, S/N MODIFY SHOP ROUTER AS REQUIRED TO EFFECT REPAIRS ***NOTE***: THIS A LIFE LIMITED/TIME CONTROLLED PART! VERIFY TIME/CYCLES ***** MANDATORY VALVE BORE INSPECT AND RECORD FINIDINGS *****	<i>DEC 09 2007</i>	1	 

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CYLINDER, OUTER

LANDING GEAR COMPONENTS | DATE: 12/09/2007

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PN ARG7002-RTR

O/H SEC: See Below

JOB NO: L07793-007

S/N: CPT0137HT

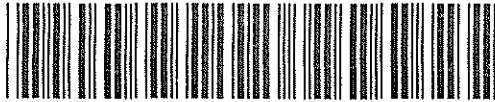
CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

DAC OHM: 32-11-04 REV #25 DATED 15SEP07
 MATERIAL: 300M
 FINAL H.T.(REF): 275-300 KPSI
 COMMENTS: ARG7041-1-12-HPM & ARG7087-503-12-HPM

OPERATION BARCODE	OP #	DESCRIPTION	DATE	QTY	STAMP
	1995 IDR 10670	MACHINE SHOP LATHE ***BUILD 1*** MACHINE THREADS 3/16 O/S WITHIN LIMITS NOTED.***(13.5625-6AM NAT FORM SPCL)*** ROOT RADIUS .025"-.030" RECORD: <u>.028</u> >>>THR RELIEF: 13.5675-13.5975 MAJOR DIAMETER 13.5384-13.5581 RECORD: <u>13.548</u> >>>RECORD: <u>13.595</u> PITCH DIAMETER 13.4542-13.4638 RECORD: <u>13.460</u> MINOR DIAMETER 13.3821-13.3921 RECORD: <u>13.385</u> THR REL RAD .180	12/10/07	1	
	1996 NORM	ROLL ROOT RADII LATHE ***BUILD 1*** BURNISH ROOT RADII AND THREADS RELIEF PER DPS 4.507	12/10/07	1	
	2095 NORM	BORE HOLES BORING MILL MACHINE MACHINE UPPER VALVE BORE IN ACCORDANCE WITH DRAFT S/B DC10-32A259 MACHINE IN ACCORDANCE WITH SOPM 20-10-01 AND 20-10-02 ***START WITH SMALLEST TOOLING SIZE FIRST: 1 = 0.500, 2 = 0.515, 3 = 0.520. O/S DIA: 0.494-0.524 RECORD: <u>.522</u> MAINTAIN RADIUS OF BORE AT I/D WALL AND THREAD JUNCTION 0.015-0.030 RECORD (I/D WALL): <u>.090</u> RECORD (THREAD JUNCT): <u>.030</u> **ENSURE SURFACE FINISH OF 63 MICRO-INCHES RMS	DEC 12 2007	1	

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CYLINDER, OUTER

LANDING GEAR COMPONENTS | DATE: 12/11/2007

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O/H SEC: See Below

JOB NO: L07793-007

S/N: CPT0137HT

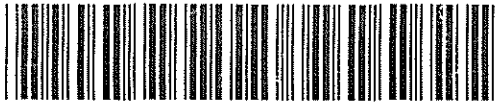
CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

DAC OHM: REV # DATED
 MATERIAL: 300M
 FINAL H.T.(REF): 275-300 KPSI
 COMMENTS: ARG7041-1-12-HPM & ARG7087-503-12-HPM

OPERATION BARCODE	OP #	DESCRIPTION	DATE	ACC	REJ	STAMP
	2098 NORM	EDDY CURRENT INSPECT NOT EDDY CURRENT EDDY CURRENT INSPECT UPPER FILL VALVE BORE IN ACCORDANCE WITH S/B DC10-32A259, USE TOOLING STANDARD TR-32-178-HPM. USE FREQUENCY OF 500KHz, AND ENSURE 3:1 SIGNAL TO NOISE RATIO WITH A MINIMUM OF 60% OF FULL SCALE DEFLECTION FROM REFERENCE STANDARD NOTCHES.	DEC 12 2007	/	Q	
	2200 NORM	DEBURR HAND FINISHING BREAK ALL SHARP EDGES-HAND WORK ALL SURFACES AS NECESSARY TO MEET REQUIRED FINISH ***BLEND ALL "CUSPS" AT MACHINED SURFACES TO A SMOOTH TRANSITION*** ALL HAND FINISHING TO BE DONE IN ACCORDANCE WITH OHM CHAPTER 20-11-02 * * * * ENSURE 0.015-0.030 RADIUS AT EDGE OF VALVE PORT BORE * * * *	DEC 12 2007			

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CYLINDER, OUTER

LANDING GEAR COMPONENTS | DATE: 12/11/2007

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PN ARG7002-RTR

O/H SEC: See Below

JOB NO: L07793-007

S/N: CPT0137HT

CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

DAC OHM: REV # DATED
 MATERIAL: 300M
 FINAL H.T.(REF): 275-300 KPSI
 COMMENTS: ARG7041-1-12-HPM & ARG7087-503-12-HPM

OPERATION BARCODE	OP #	DESCRIPTION	DATE	QTY	STAMP
	2399 NORM	AMMONIA PERSULFATE INSPECT ETCH INSPECT AMMONIUM PERSULFATE ETCH INSPECT IN ACCORDANCE WITH SOPM 20-10-02 ***ETCH INSPECT UPPER FILL VALVE BORE***	12-13-07	1	HPI
	2400 NORM	MAGNETIC PARTICLE INSPECT MAG PARTICLE INSPECTION MAGNETIC PARTICLE INSPECT IN ACCORDANCE WITH OHM CHAPTER 20-30-01 DEGREASE PART FOLLOWING NDT INSPECTION AND PROTECT AGAINST CORROSION	DEC 14 2007	1	
	2499 IDR 10670	DISCREPANT MATERIAL REVIEW DISCREPANT MATL REVIEW SUBMIT ON IDR: BOSS THREADS RCVD 1/8 UNDERSIZE GLAND THREADS MACHINED TO 3/16 O/S DIMENSIONS P/N ARG7002-505 S/N CPT0137HT PS 32-10-102 CAP 2	NOT REQUIRED 14 DEC 07	1	MFG
	2500 NORM	MANUFACTURING PLANNING PLANNING/DISPOSITION VERIFY COMPLETION OF REPAIR OPERATIONS	14 DEC 07	1	
	2525 NORM	IDENTIFY-VIBRO ENGRAVE IDENTIFY VIBRO ETCH THE FOLLOWING IN AREA NEXT TO PART NUMBER: "1/8 U/S BOSS THREADS" "3/16 O/S GLAND THREADS"	12-17-07	1	



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LANDING GEAR COMPONENTS | DATE: 12/11/2007

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O/H SEC: See Below

JOB NO: L07793-007

S/N: CPT0137HT

CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

OPERATION BARCODE	OP #	DESCRIPTION	DATE	STAMP
	2526 NORM	IDENTIFY-ELECTRO CHEM ETCH IDENTIFY PERMANENTLY IDENTIFY PART BY ADDING SB PART NUMBER ADJACENT TO EXISTING ARG7002 PART NUMBER, TO INDICATE THAT THE AIR FILLER BORE HAS BEEN OVERSIZED CHEMICAL ETCH "SB10320259-3" ON THE RAISED PORTION OF THE PART NUMBER FIELD	12-17-07	QTY 1 OPER
	4395 NORM	CHROME PLATE ETCH INSPECT CHROME PLATE AREAS NOTED IN ACCORDANCE WITH OHM CHAPTER 20-11-02 CHROME PLATE: 1) ID SEAL ***.0020-.0030 THICK*** ***** VERIFY DESIGN 12.2264-12.2300 RECORD: _____ ***** MANDATORY OPERATION PRIOR TO CHROME PLATING OF ID SEAL ***** ****MASK OFF AND PROTECT FILL VALVE BORES	NOT REQD 12-20-07	QTY 1
	4396 NORM	BAKE AS NOTED POST PROCESS BAKE (OVEN) POST PLATING BAKE 4 HRS BAKE 4 HRS @ 350-400F RECORD OVEN LOG: _____	NOT REQD 12-20-07	QTY 1
	4397 NORM	ELECTROLESS NICKEL PLATE ELECTROLESS NICKEL PLATE ELECTROLESS NICKEL PLATE CYLINDER PACKING THREADS 0.0003-0.0006 INCH THICK ***** MANDATORY OPERATION ONLY IF GLAND THREADS MACHINED *****	12-20-07	QTY 1
	4399 NORM	INSTALL BEARING/BUSHING BUSHING INSTALLATION SIZE FOR BUSHINGS AS REQUIRED	12-26-07	QTY 1

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CYLINDER, OUTER

| LANDING GEAR COMPONENTS | DATE: 12/11/2007

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| PN ARG7002-RTR

| O/H SEC: See Below

| JOB NO: L07793-007

| S/N: CPT0137HT

CUSTOMER : FEDERAL EXPRESS CORP.

| P.O./R.O #: MR1740311

OPERATION BARCODE	OP #	DESCRIPTION	DATE	STAMP
	4400 NORM	CADMIUM PLATE CADMIUM PLATE CADMIUM PLATE ALL SURFACES (EXCEPT AS NOTED) IN ACCORDANCE WITH OHM CHAPTER 20-10-2 (LOW HYDROGEN EMBRITTLEMENT PLATING) ***CAUTION***: INTERRUPTION OF BAKE CYCLE NOT PERMITTED RECORD TANK #: 10 RECORD CAD THICKNESS: 10003 -0007 ****MASK OFF AND PROTECT FILL VALVE BORES	12-22-07	QTY 1
	4401 NORM	CADMIUM PLATE POST PROCESS BAKE (OVEN) BAKE 23 HOURS @ 350F-400F (\$\$) RECORD OVEN LOG#: 1325	DEC 22 2007 DEC 23 2007	QTY 1
	4402 NORM	STYLUS (BRUSH) CADMIUM PLATE ETCH INSPECT BRUSH CAD PLATE VALVE BORES IN ACCORDANCE WITH SOPM 20-10-02 ****BRUSH PLATE BORE AND THREADS****	12/27/07	QTY 1
	4450 NORM	MANUFACTURING PLANNING PLANNING/DISPOSITION USE BORESCOPE CHECK VALVE HOLE BORES FOR DEFECTS. *****MANDATORY OPERATION*****	12-29-07	QTY 1
	4500 NORM	MAGNETIC PARTICLE INSPECT MAG PARTICLE INSPECTION MAGNETIC PARTICLE INSPECT IN ACCORDANCE WITH OHM CHAPTER 20-30-01 DEGREASE PART FOLLOWING NDT INSPECTION AND PROTECT AGAINST CORROSION	JAN 02 2008	ACC 1 REJ 1

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CYLINDER, OUTER

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O/H SEC: See Below

JOB NO: L07793-007

S/N: CPT0137HT

CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

OPERATION BARCODE	OP #	DESCRIPTION	DATE	QTY	STAMP
	4600 NORM	INSTALL BEARING/BUSHING BUSHING INSTALLATION INSTALL BUSHINGS, SLEEVES USING TEMPERATURE DIFFERENTIAL METHOD NOTE: APPLY ONE COAT FR PRIMER TO BORES AND LUG FACES PRIOR TO BUSHING INSTALLATION-INSTALL WET: 3456-1658 (2) 3456-1662 (2) 3456-1663 (2) 3456-1664 (2) 3456-1665 (2) 3456-1666 (4) 3456-2565 (1) 3456-2513 (2) 3456-2512 (6) 3456-2511 (4) 3456-2477 (2)	Jan/16/08	1	
	4700 NORM	BORE AND FACE BUSHINGS BORING MILL MACHINE BORE BUSHINGS (1 & 2) TO DIAMETER AND FINISH NOTED MACHINE BUSHING FACES TO DIMENSION AND FINISH NOTED RE-EST BUSINGS CHAMFER AS NOTED ON BUSHING SKETCHES. DESIGN DIA: 4.375/4.376 RECORD: <u>4.376</u> DESIGN DIM: INNER FACES-28.308/28.332--OUTER-35.656/35.705	Jan/16/08	1	
	4710 NORM	BORE AND FACE BUSHINGS BORING MILL MACHINE BORE BUSHINGS AND FACES TO DESIGN DIMENSION AS NOTED. RE-EST BUSINGS CHAMFER AS NOTED ON BUSHING SKETCHES. DESIGN #7: 3.812-3.813 RECORD: <u>3.813</u> DESIGN #10: 11.921-11.929 RECORD: <u>11.929</u>	Jan/16/08	1	
	4850 NORM	DEBURR CLEAN-UP FOR FINAL INSP BREAK SHARP EDGES-CLEAN PART AS REQUIRED	1-17-08	1	 OPEN
	4890 NORM	PRIME AND PAINT (ASSY) ASSEMBLY-PAINT MASK AREAS ON RAISED BOSS AND AROUND HOLES FOR ANTI-SKID MANIFOLD ATTACH.	1-19-08	1	

L07793-007

CYLINDER, OUTER

| LANDING GEAR COMPONENTS | DATE: 12/11/2007

| PAGE : 5



| PN ARG7002-RTR

| O/H SEC: See Below

| JOB NO: L07793-007

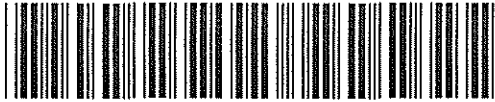
| S/N:CPT0137HT

CUSTOMER : FEDERAL EXPRESS CORP.

| P.O./R.O #: MR1740311

OPERATION BARCODE	OP #	DESCRIPTION	DATE	QTY	STAMP
	4900 NORM	PRIME AND PAINT (ASSY) ASSEMBLY-PAINT PRIME AND PAINT PER DPS 4.50-62 SEAL ALL BUSHINGS WITH PR 1422 PRIOR TO APPLICATION OF PRIMER AND ENAMEL APPLY TWO COATS IMPACT RESISTANT PRIMER FOLLOWED BY ONE COAT IMPACT RESISTANT TOPCOAT ENAMEL. *****POST PRIME, MASK P/N, S/N, & WO#, THEN TOPCOAT*****	01-19-08	1	
	4901 NORM	BAKE AS NOTED POST PROCESS BAKE (OVEN) BAKE AFTER PAINT	01-19-08	1	
	4902 NORM	PRIME AND PAINT (ASSY) ASSEMBLY-PAINT REMOVE ALL MASKING TAPE AS REQUIRED	01-19-08	1	
	4905 NORM	PRIME AND PAINT (ASSY) ASSEMBLY-PAINT *****FOR ID PACKING THREADS REPAIR ONLY***** PAINT A 1.0 INCH YELLOW BAND ON THE LOWER END OF THE CYLINDER IN LIP AREA BETWEEN TORSION LUG FACES. STENCIL IN BLACK LETTERS (SIZE OPTIONAL) THE FOLLOWING: "SPCL 1/8 IN. O/S NUT"	1-21-08	1	
	4910 NORM	PRIME AND PAINT (ASSY) ASSEMBLY-PAINT *****FOR BOSS THREAD REPAIR ONLY (1/8 U/S)***** MARK CYLINDER WITH A YELLOW BAND NEXT TO BOSS AND STENCIL THE FOLLOWING WITH BLACK LETTERS (SIZE OF BAND AND LETTERS IS OPTIONAL): *****"SPL 1/8 INCH U/S SD-BRC NUT"*****	1-21-08	1	

L07793-007



CYLINDER, OUTER

LANDING GEAR COMPONENTS | DATE: 12/11/2007

PAGE : 6

PN ARG7002-RTR

O/H SEC: See Below

JOB NO: L07793-007

S/N: CPT0137HT

CUSTOMER : FEDERAL EXPRESS CORP.

P.O./R.O #: MR1740311

OPERATION BARCODE	OP #	DESCRIPTION	DATE	QTY	STAMP
	4960 NORM	ASSEMBLY INSTALL LUBE FITTINGS AS REQUIRED PER OHM. APPLY GREASE THRU LUBE FITTINGS AFTER ASSEMBLY TO BE SURE THAT VOIDS ARE COMPLETELY FILLED WITH GREASE.	FEB 06 2008	/	
	5000 NORM	FINAL INSPECTION FINAL INSPECT FINAL INSPECT, DETERMINE TYPE OF IDENTIFICATION APPLICATION AND PROCEED WITH I/D USING P-TOUCH METHOD FOR EXTERNAL COMPONENTS AND INDELIBLE INK METHOD FOR INTERNAL COMPONENTS WHILE PAYING SPECIAL ATTENTION TO LIFE LIMITED COMPONENTS. P/N ARG7002-505 S/N CPT0137HT	FEB 06 2008	/	
	5710 NORM	INTERNAL REWORK IRO INTERNAL REWORK MINOR IRO INTERNAL RE-WORK OPERATION. PLEASE LIST REPAIR INSTRUCTIONS / DEFECTS BELOW. NOT REQUIRED	FEB 06 2008	/	
	6000 NORM	FINAL INSPECTION FINAL INSPECT FORWARD TO SHIPPING	FEB 06 2008	/	
	6001 NORM	FINAL INSPECTION FINAL INSPECT SEND PART TO FINAL ASSY STAGING AREA	FEB 06 2008	/	

CONTRACTOR
TRAVELLER
KEEP WITH PARTS AT ALL TIMES

PART NO. AE67002-13	SERIAL NO
PART NAME CYLINDER	
PIT 1 OF	DWG CHG
QUAN	PLAN CHG
LQ7793-007	

COVER SHEET MANUAL	MATERIAL	MATERIAL SPEC	FINAL HT (REF)
32-11-04	STEEL		
PROGRAM	TC-10	ISSUE DATE	DUPLICATE
CURT			

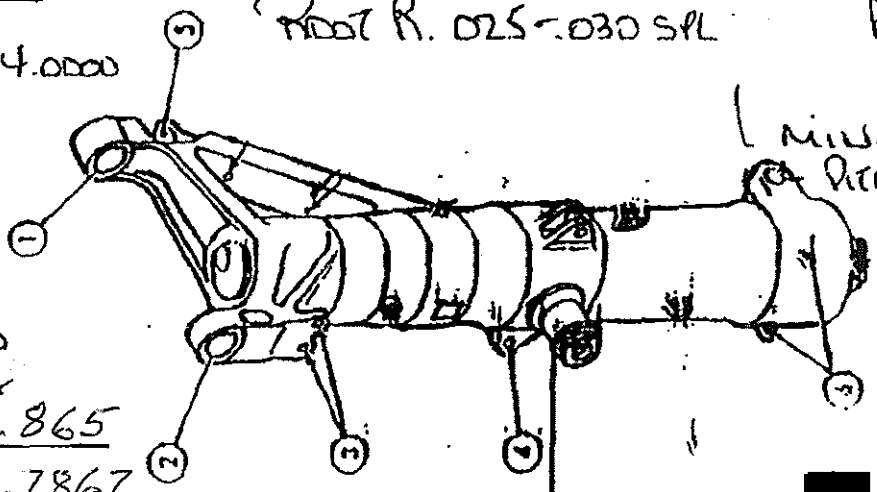
1050

INSPECT & RECORD CPT 0137-HT DEC 01 2007
 -1026 13.375-6 AM NAT FORM SPECIAL

PACKING THREADS
 MINOR DIA: 13.326
 PITCH DIA: 13.3976

MAJOR DESIGN: 3.9850-4.0000

DEC 01 2007
 MINOR DESIGN 13.1946-13.2046
 PITCH DESIGN 13.2668-13.2764



BOSS THREADS
 4.000-8UNF-3A
 RECORD MAJOR 3.865
 RECORD PITCH 3.7867

4.7475
 RECORD BOSS O.D.

DEC 01 2007

DEC 01 2007

ALL DIMENSIONS ARE IN INCHES

	1	1 LUG	2	2 LUG	3	3 LUG	4	4 LUG	5	6	6 LUG
DESIGN	4.4955 4.4975	3.990 4.010	4.4955 4.4975	2.998 3.003	1.437 1.4385	.995	2.1205 2.1225	.862	.4991 .500	.250 .254	.970
AS REC'D	4.497	4.000	4.496	3.004	1.441	.994	2.122	.875	.504	.255	1.002
REWORK	4.5605	3.930	4.5605	2.933	1.4985	.935	2.1855	.770	.520	.2140	.910

DEC 01 2007

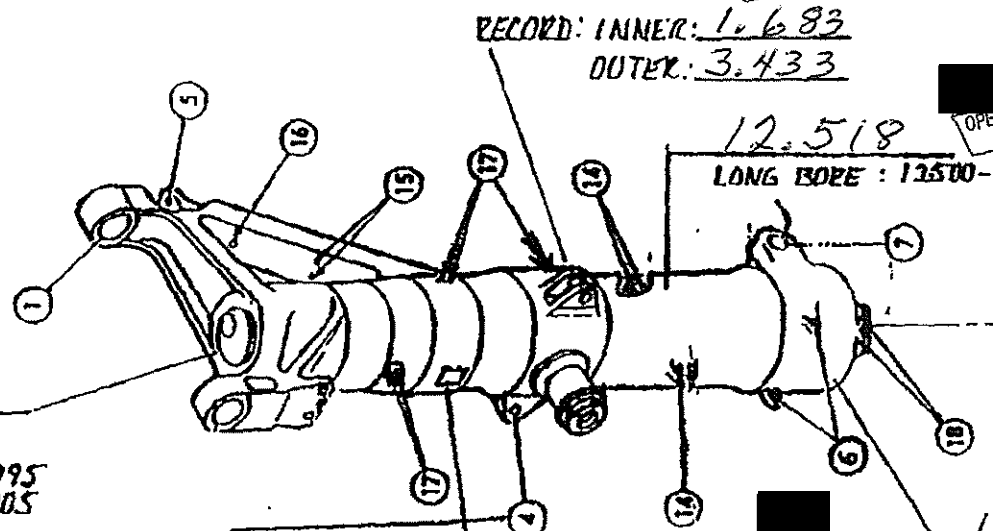
DEC 01 2007

HAUL

HAVELER
KEEP WITH PARTS
AT ALL TIMES

PART NO. AR67002	SERIAL NO.
PART NAME CYLINDER	
SHEET 1 OF 1	DWG NO. 107793
QUAN. 1	PLAN CHG. 007

OVERHAUL MANUAL 32-11-04	MATL STEEL	MATL SPEC	FINAL HT (REF)
PROGRAM & CUSTOMER DC-10 MLG	ISSUE DATE	DUE DATE	
OPER NO 1050	INSPECT & RECORD		



ALL DIMENSIONS ARE IN INCHES

	7	7 LUG	14	14 LUG	15	15 LUG	16	16 LUG	17	17 LUG	18	18 LUG
DESIGN	3.9955 3.9975	11.735 11.741	.375 .379	.770	.342 .354	.700	.529 .541	.700	.326 .346	.730	.377 .381	.650
AS REC'D	3.9915	11.740	.382	.771 .735	.348 .351	.740	.542	.713	.345 .401	.754 .741	.384 .382	.660
REWK.	4.0605	11.670	.456	.710	.428	.660	.614	.660	.500	.600	.452	

DEC 01 2007

DEC 01 2007

HAWKER PACIFIC, INC.

'Right The First Time'

HAUL

TRAVELLER

KEEP WITH PARTS
AT ALL TIMES

PART NO	AR67002	SERIAL NO	
PART NAME	CYLINDER		
SHT 1 OF		DWG CHG	
QUAN	1	ISSUE NO	407793-007

OPER NO.	PROGRAM & CUSTOMER	ISSUE DATE	DUE DATE
3000			

OVERHAUL MANUAL

32-11-04

MATL

STEEL

MATL SPEC.

FINAL HT (REF)

275-300 KSI

SHT 1 OF

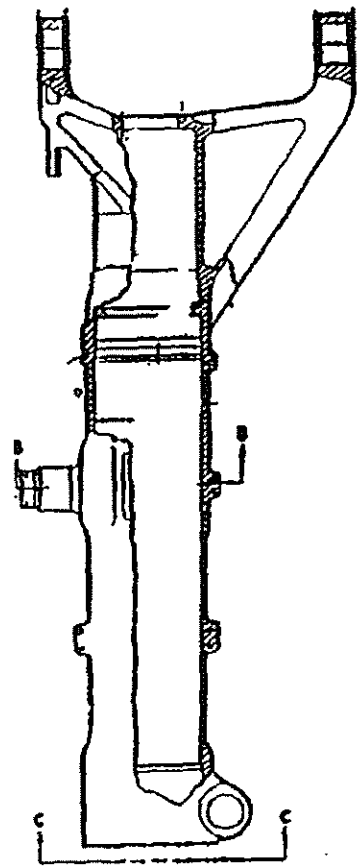
DWG CHG

PLAN CHG

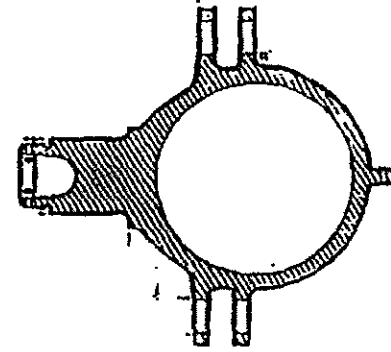
SHOT PEEN PER DPS 4.999
 SHOT SIZE 230-330
 INTENSITY .008-.012 A2

PROTECT ALL CHROME PLATED
 SURFACES & THREADS.

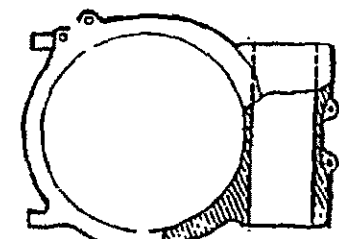
100%



CYLINDER (150)



B-B



C-C

ALL DIMENSIONS
 ARE IN INCHES

TRAVELLER

TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

PART NO AR67002		SERIAL NO
PART NAME CYLINDER		
SHEET 1 OF	DWG CHG	PLAT CHG
QUAN 1		

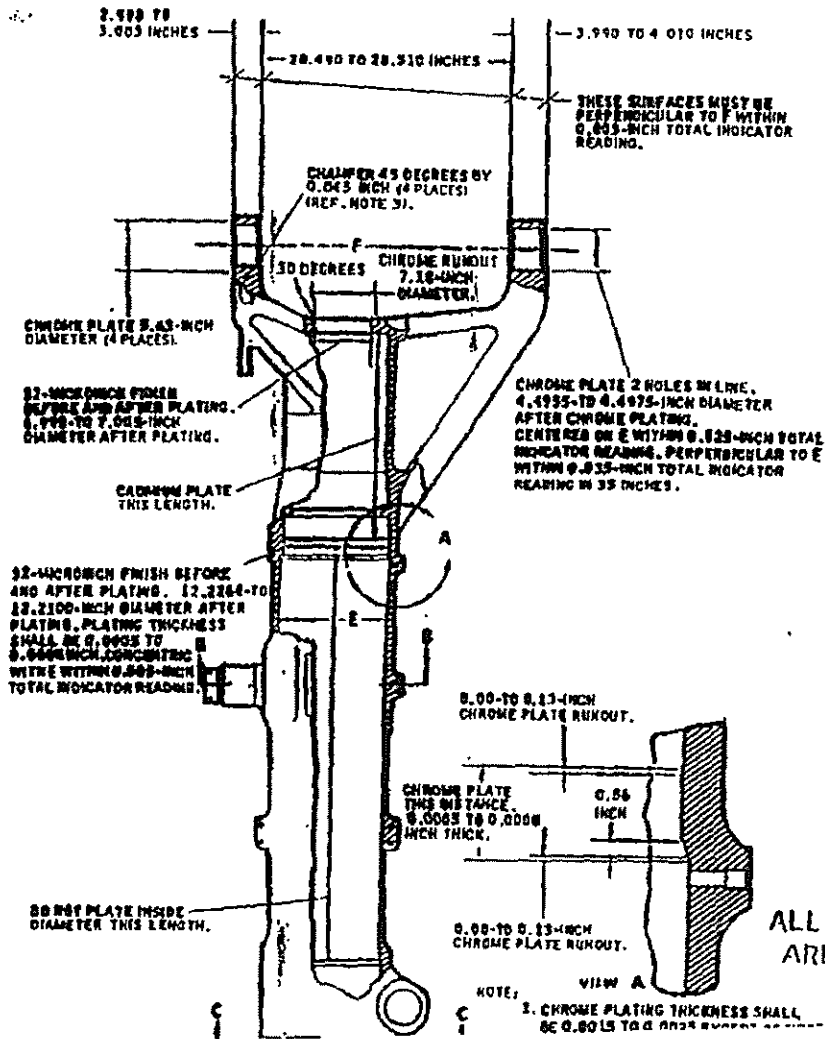
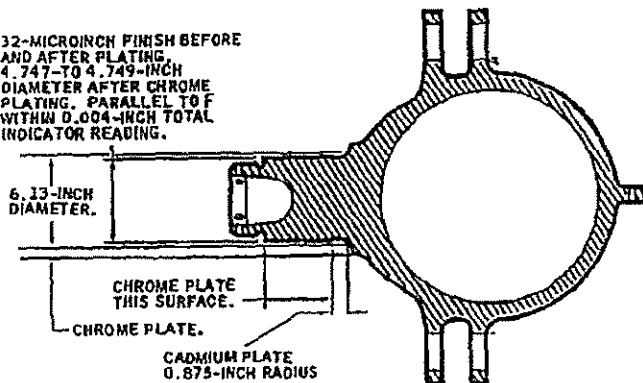
DESIGNER 33-11-04	MATERIAL STEEL	MATERIAL SPEC	FINAL H T (REF)
PHILIPPA & CUSTINER	DATE 02-10 MLG	ISSUE DATE	DUE DATE

L07793-007

4010

CHROME PLATE AS NOTED

32-MICROINCH FINISH BEFORE AND AFTER PLATING. 4.747-TO 4.749-INCH DIAMETER AFTER CHROME PLATING. PARALLEL TO F WITHIN 0.004-INCH TOTAL INDICATOR READING.



ALL DIMENSIONS ARE IN INCHES

CAUL

HAVELLER
KEEP WITH PARTS
AT ALL TIMES

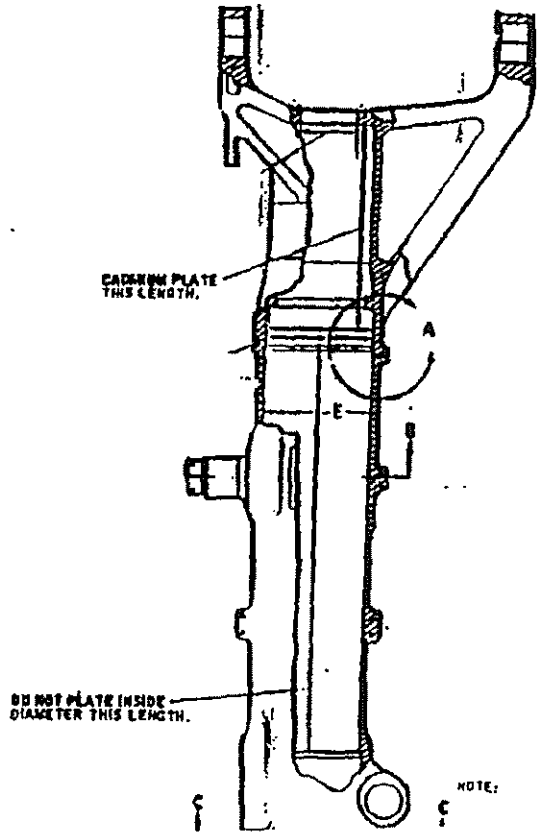
PART NO	ARG7002	SERIAL NO	
PART NAME	CYLINDER		
SIZE 1 OF		DWG CNO	PLAN CNR
QUAN	1	L07793-007	

ISSUED MANUAL	DATE	MATL SPEC	FINAL HT (REF)
32-11-04	STEEL		
PROG/HTA	DC-10 MLG	ISSUE DATE	DUE DATE
CUSTOMER			

ENTR
NO

4400

CAD PLATE PER SKETCH



ALL DIMENSIONS
ARE IN INCHES

TRAVELLER

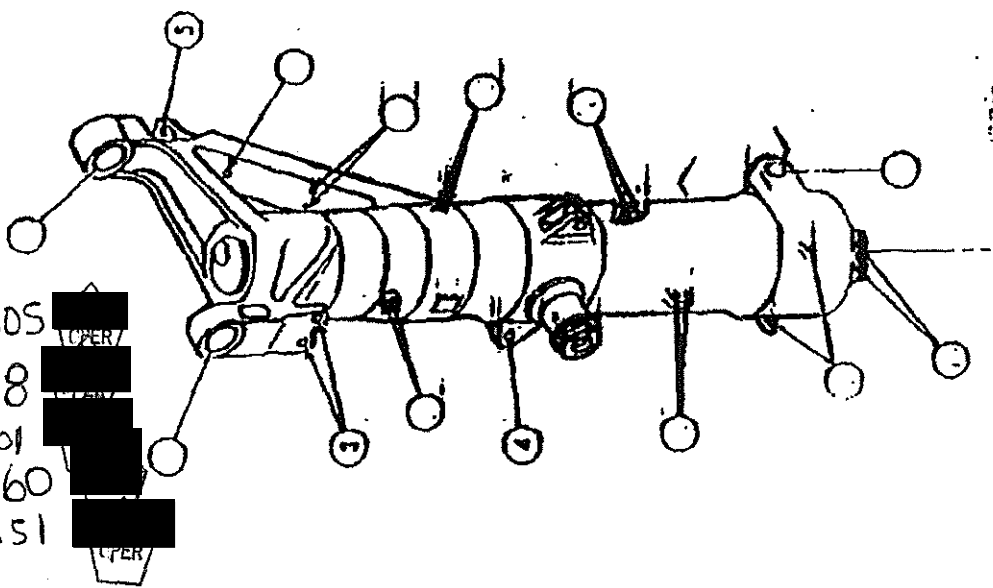
TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

PART NO.	ARG 7002	SERIAL NO.	
PART NAME	CYLINDER		
SHEET 1 OF	DWG CHG	PLAN CHG	
QUAN	1 E07793-007		

OVERHAUL MANUAL	MATL	MATL SPEC	FINAL HT (REF)
32-11-04	STEEL		
PROGRAM	DC-10	ISSUE DATE	DUE DATE
CUSTOMER	MLG		

OPEN NO
4600

HDNE BUSHINGS TO DESIGN DIMENSION



DESIGN
HOLES: 1.2495 - 1.2505
FIL. FACES: 1.114 - 1.121
HOLES: 2.000 - 2.001
FIL. FACES: 1.556 - 1.564
FIL. FACES: 3.544 - 3.556
HOLES: .440 - .441

ALL DIMENSIONS
ARE IN INCHES



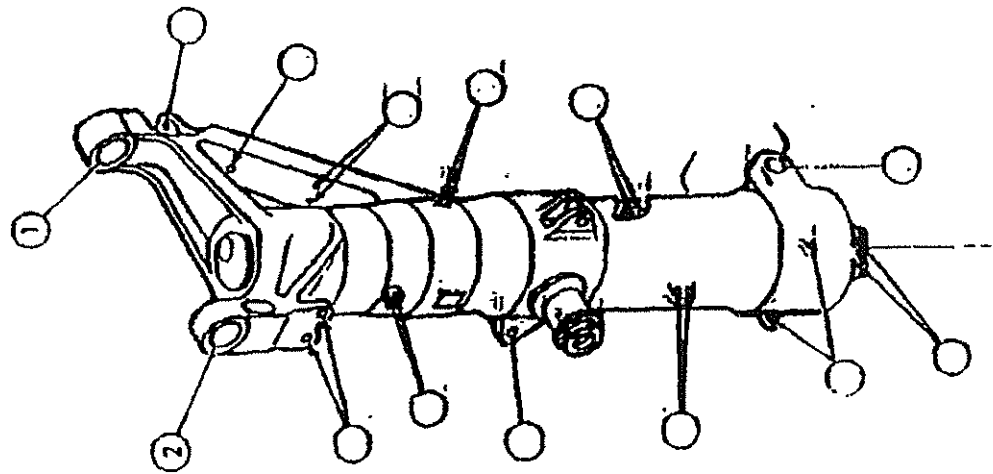
TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

PART NO. AR67002		SERIAL NO
PART NAME CYLINDER		
SIZ I OF	DWG CHG	PLAN CHG
QUAN 107793=007		

OPER NO	OVERHAUL MANUAL 32-11-04	MATL STEEL	MATL SPEC	FINAL HT (REF)
PROGRAM & CUSTOMER	DC-10	MLG	ISSUE DATE	DUE DATE

4700

MACHINE BUSHING #1, #2 TO 4.375 - 4.376 **4.376**
MACHINE BUSHING LUGS TO INNER: 28.308 - 28.332 OUTER: 35.656 - 35.705



ALL DIMENSIONS
ARE IN INCHES

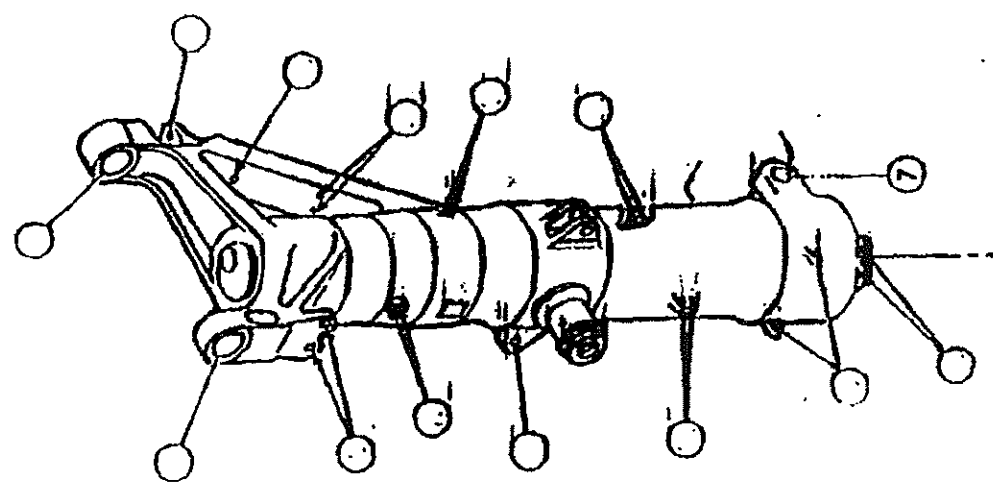
CALIFORNIA
TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

DATE 32-11-04	MATL STEEL	MATL SPEC	FINAL HT (REF)
PROGRAM & CUSTOMER DC-10 MLG	ISSUE DATE	DUE DATE	

PART NO. ARG 7002	SERIAL NO.
PART NAME CYLINDER	
SHEET NO. OF	DWG CHG
PLAN CHG	
QUAN 107793-007	

OPR NO
4710

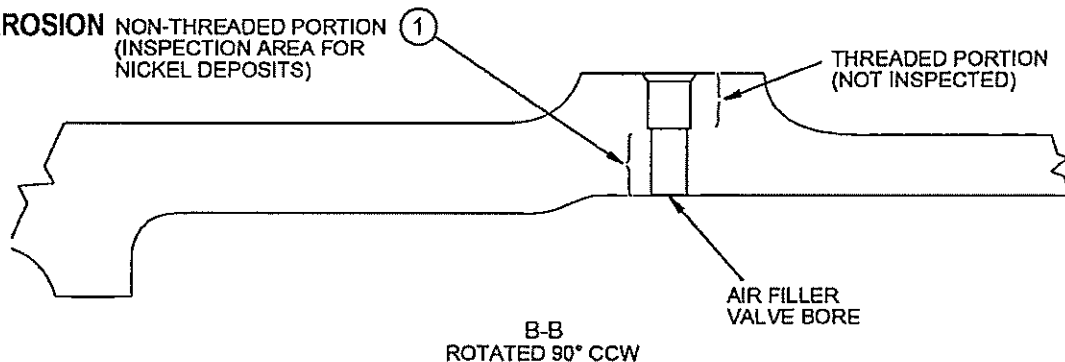
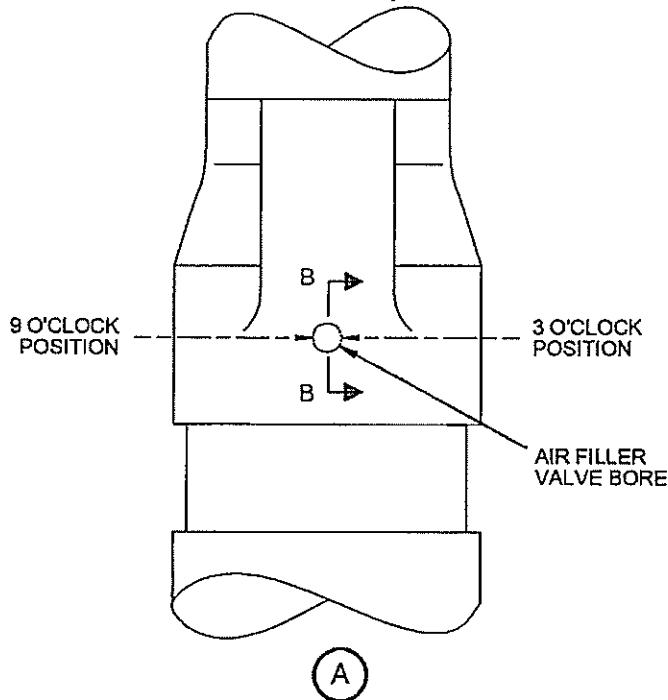
MACHINE BUSHING # 7 TO 3.812 - 3.813
MACHINE BUSHING FACES TO 11.921 - 11.929



ALL DIMENSIONS
ARE IN INCHES

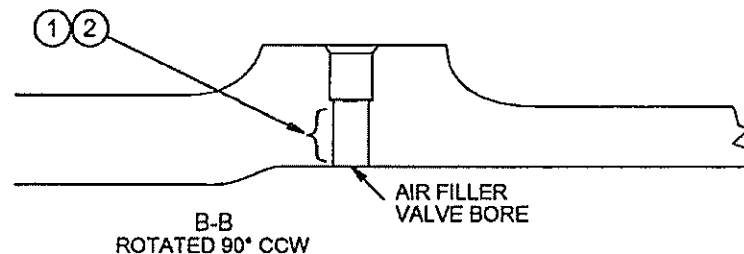
PART NUMBER		ARG7002-RTR	
PART NAME		CYLINDER	
A/C TYPE	OVERHAUL MANUAL	MATERIAL	MATL SPEC
DC10-10	32-11-01/-04	STEEL	
FINAL HT	SHEET OF	FIGURE#	ITEM#

INSPECTION FOR STRAY NICKEL, CHROME PLATE OR CORROSION



STEP	TASK	NAME	IDENTIFICATION	QTY	MORE DATA
1	Inspect	Valve bore hole	-	1	(a)

(a) Inspect the non-threaded portion of the valve bore hole for evidence of stray nickel or chrome plating deposits at the 3 o'clock position plus or minus 45 degrees, and the 9 o'clock position plus or minus 45 degrees as viewed from aft side of MLG cylinder looking forward.



STEP	TASK	NAME	IDENTIFICATION	QTY	MORE DATA
1	Inspect	Valve hole bore		1	(a)
2	Remove	Corrosion		1	(b) (c)

(a) Inspect valve hole bore interior for evidence of corrosion.
 (b) Remove all corrosion from non-threaded surfaces of hole using abrasive nylon web (Scotch-Brite) pad installed in drill motor at 4,200 RPM maximum speed. Stop and allow metal to cool after 2 minutes. Repeat process until all corrosion is removed.
 (c) Scotch-Brite debris resulting from clean-up is likely. Debris entering strut is acceptable, but attempt to minimize.

RECORD VALVE BORE FINDINGS:

DESIGN DIA: 0.4460-0.4537
 RECORD DIA: 0.453

STRAY NICKEL: (Y) _____ (N)

CHROME PLATING: (Y) _____ (N)

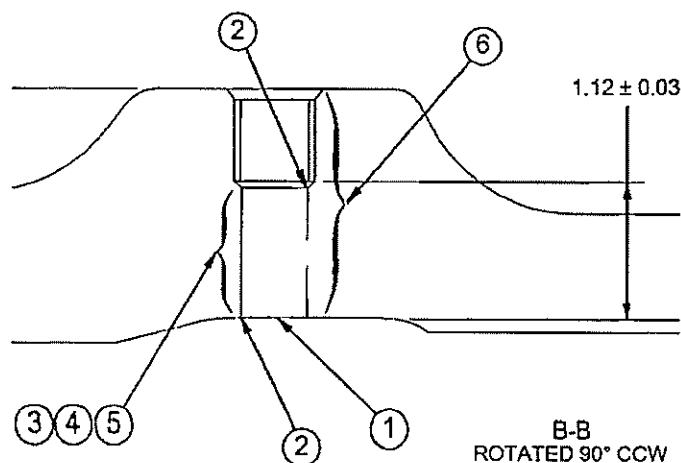
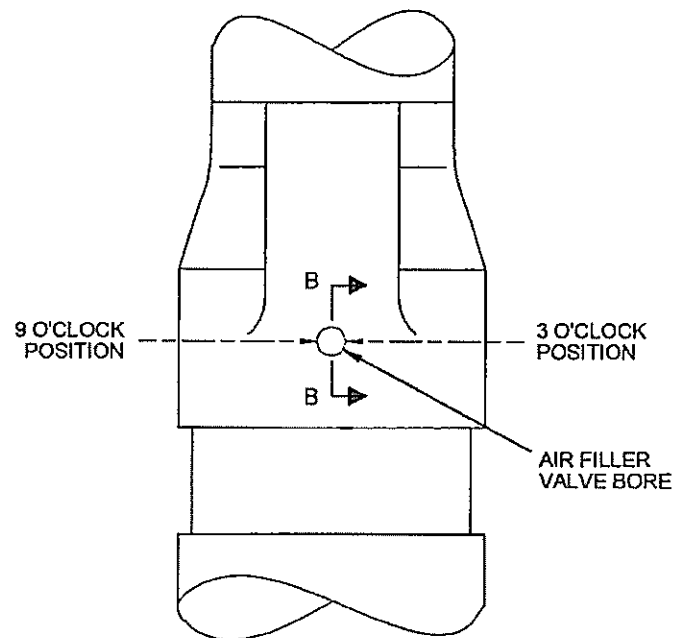
CORROSION: (Y) (N) _____

10 DEC 07

PART NUMBER		ARG7002-RTR	
PART NAME		CYLINDER	
FINAL HT	SHEET	FIGURE#	ITEM#
	OF	L07793	-007

A/C TYPE	OVERHAUL MANUAL	MATERIAL	MATL SPEC
DC10-10	32-11-01/04	STEEL	

AIR FILLER VALVE BORE-REPAIR



STEP	TASK	NAME	IDENTIFICATION	QTY	MORE DATA
1	Machine	Valve bore	-	1	0.494/0.524 Inch Diameter (a) (b)
2	Radius	Valve bore/inner cylinder wall junction, and Valve bore/thread junction	-	1	0.015/0.030 Inch (c)
3	Inspect, Etch	Valve bore	-	1	(d)
4	Inspect, Eddy Current	Valve bore	-	1	Eddy Current Inspect per Appendix B. (e)
5	Surface finish	Valve bore	-	1	(f)
6	Plate	Valve bore and threaded portion	-		Brush cadmium plate. (g)
7	Identify	MLG Cylinder Assembly	SB10320259-3	1	(h)

(a) Machine bore as given in SOPM 20-10-01 and SOPM 20-10-02.

(b) Grinding after machine permissible as given in SOPM 20-10-02.

(c) Make radius as given in SOPM 20-10-02.

(d) Etch inspect as given in SOPM 20-10-02 - Ammonium Persulfate Method.

(e) If Eddy Current inspection detects any cracks, stop repair procedure and remove cylinder assembly from service.

(f) Hole surface finish 63 micro-inches RMS.

(g) Brush cadmium plate filler valve bore and threaded portion as given in SOPM 20-10-02.

(h) Permanently identify by adding SB part number adjacent to existing ARG7002 part number using electro-chemical etch method to indicate this MLG cylinder has had its air filler valve bore oversized and that closing action has been accomplished.

ALL DIMENSIONS ARE IN INCHES

Flight Accessory Services
 a Division of
 Hawker Pacific, Inc.

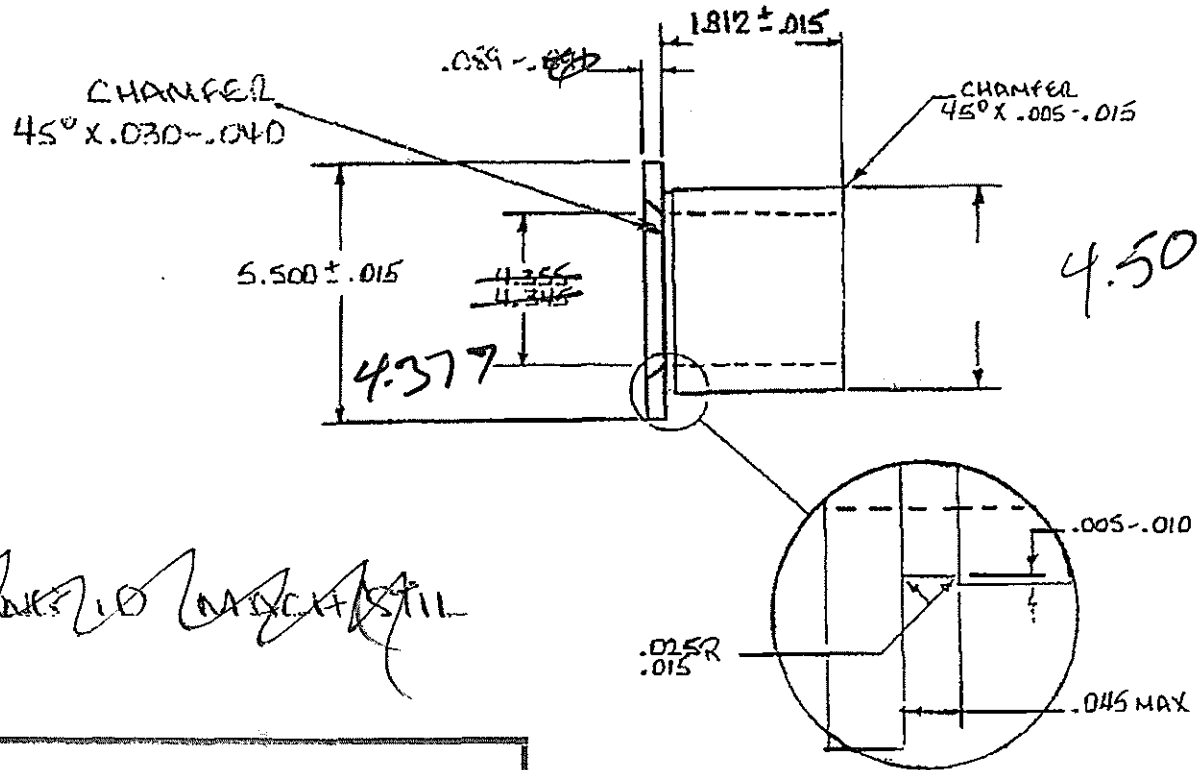
OVERHAUL

TRAVELLER
 KEEP WITH PARTS
 AT ALL TIMES

PART NO	3456-1662	SERIAL NO.	
PART NAME	BUSHING		
SHT 1 OF	DWG CHG	PLAN CHG	
QUAN	2	JOB NO	
		107793-007	

OPER NO	PROGRAM & CUSTOMER	MATL	MATL SPEC	FINAL HT (REF)
		AL-3003ZE	AMS4880	
		ISSUE DATE	QUE DATE	

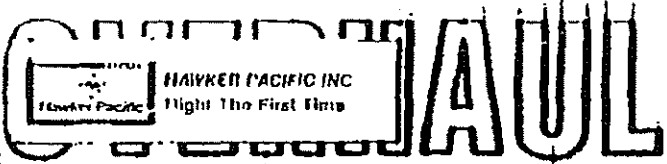
SIMILAR TO PART 1040-527
 DIA ①



BUSHING TO MATCH STILL

MATL #	7741 AL-NI-BRZ
OPER #	DEC 26 2007
	DATE

ALL DIMENSIONS
 ARE IN INCHES



HAWKER PACIFIC INC
Flight The First Time

TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

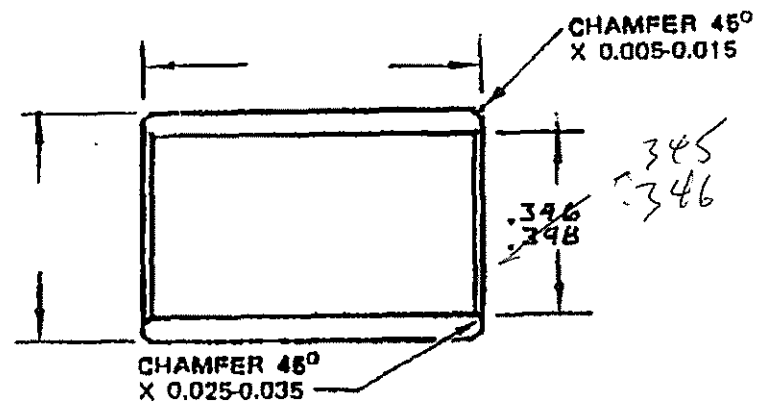
PART NO 3456-2477		SERIAL NO
PART NAME REPAIR SLEEVE		
SHT 1 OF	DWG CHG	PLAN CHG
QUAN 1	L07793-007	

OVERHAUL MANUAL 33-11-11	MATL AL-NI-1/2	MATL SPEC. 4815 4880	FINAL HT (REF)
PROGRAM & CUSTOMER DC-10 M LG	ISSUE DATE	DUE DATE	

OPTN NO

NHR: A267311-
HOLE # 15
17

408
406



ALL DIMENSIONS
ARE IN INCHES

MATL # 7382 AL-NI-1/2

OPER # [REDACTED] DATE DEC 26 2007

Flight Accessory Services
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OVERHAUL

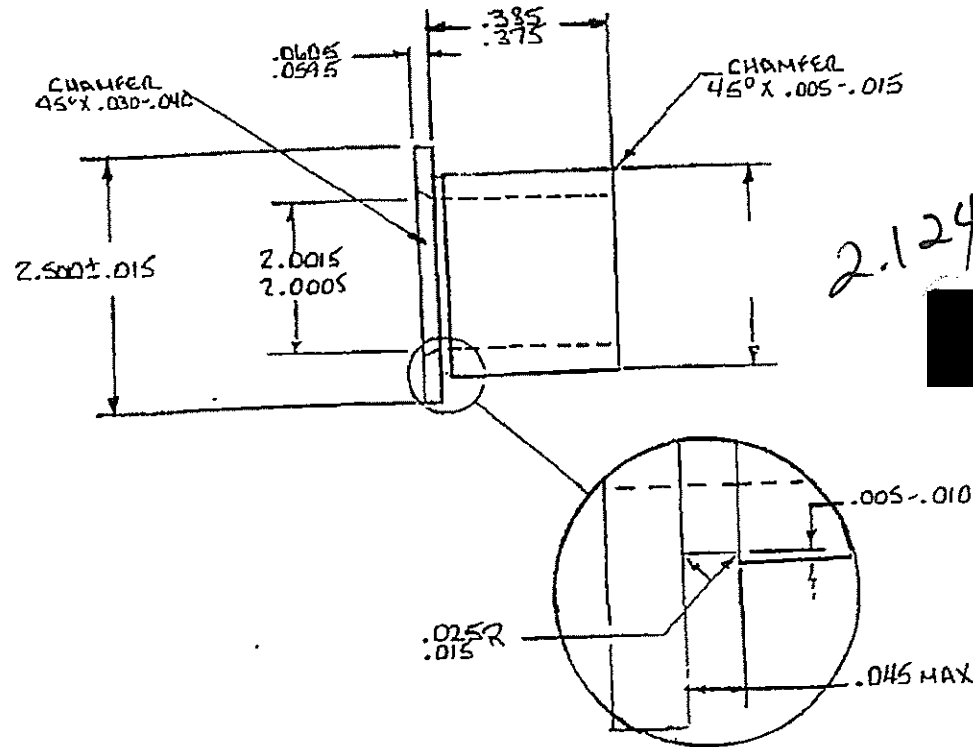
TRAVELLER
 KEEP WITH PARTS
 AT ALL TIMES

PART NO.	3456-1664	SERIAL NO.	
PART NAME	BUSHING		
SHT 1 OF	DWG CHG	PLAN CHG	
QUAN	8 L07793-007		

OVERHAUL MANUAL	MATL	MATL SPEC.	FINAL HT (REF)
DC10-32-11-04	AL-BRONZE	IAMS 4830	
PROGRAM & CUSTOMER	ISSUE DATE	DUE DATE	

OPER NO	
---------	--

SIMILAR AIR 7040-531
 DIA (4)



ALL DIMENSIONS
 ARE IN INCHES

MATL #	7339 AL-NI-BR-2
OPER #	DEC 26 2007
DATE	

OVERHAUL

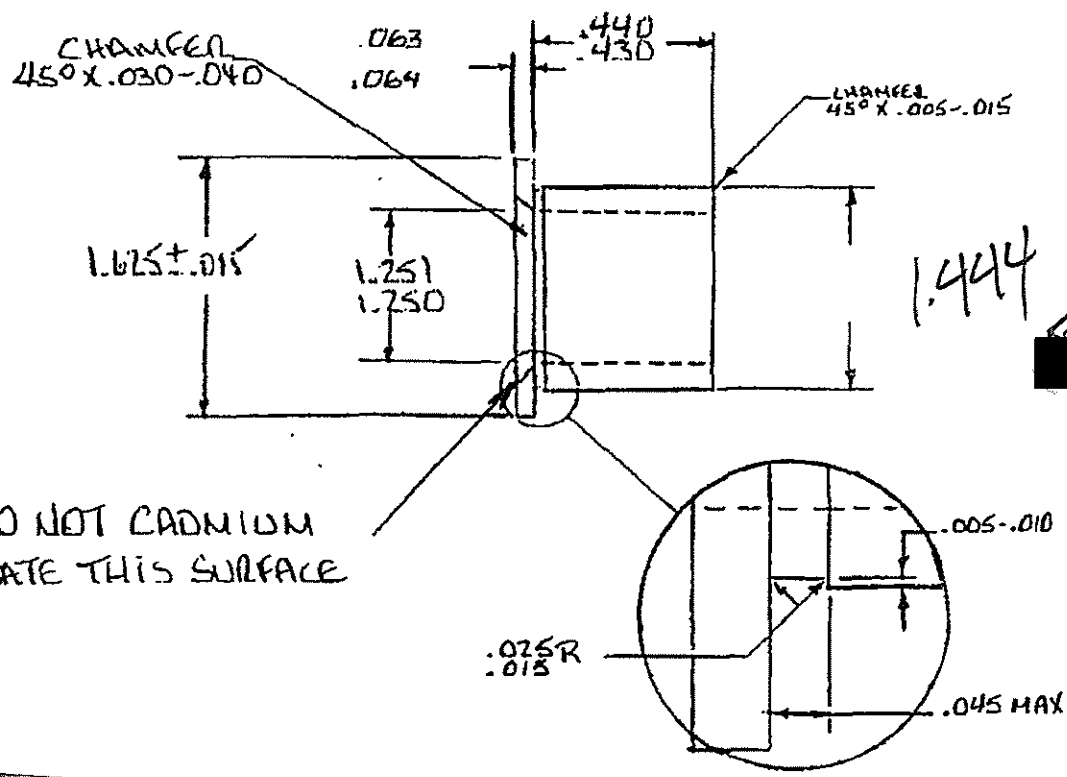
Flight Accessory Services
a Division of
Hawker Pacific, Inc.

TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

PART NO	3456-1666	SERIAL NO.	
PART NAME	BUSHINGS		
SHT 1 OF		DWG CHG	
PLAN CHG			
QUAN	4 407793-007		

OVERHAUL MANUAL	MATL	MATL SPEC	FINAL HT (REF)
DC10-32-11-04	AL-BRONZE	AMS 4880	
PROGRAM & CUSTOMER		ISSUE DATE	DUE DATE

SIMILAR TO A067040-525
DIA (3)



ALL DIMENSIONS
ARE IN INCHES

MATL #	6560	AL-NI-BRZ
OPER #		DEC 26 2007
		DATE

Flight Accessory Services
a Division of
Hawker Pacific, Inc.

PAUL

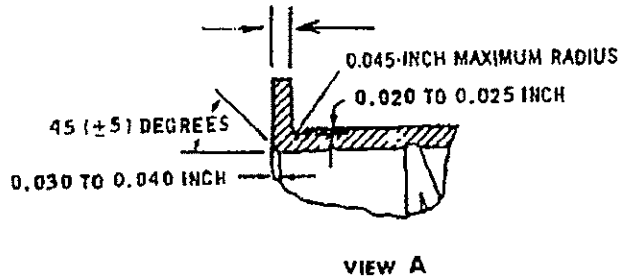
TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

PART NO	3456-1658	SERIAL NO	
PART NAME	BUSHING		
SHT 1 OF		DWG CHG	PLAN CHG
QUAN	2 L07793-007		

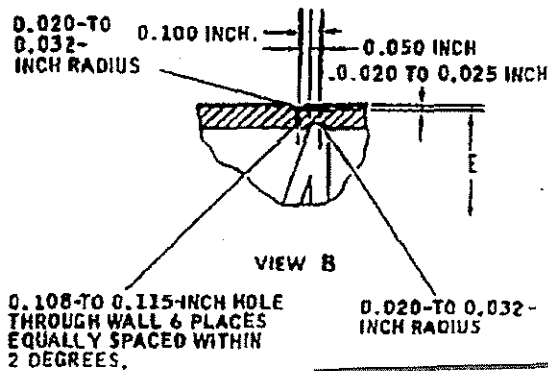
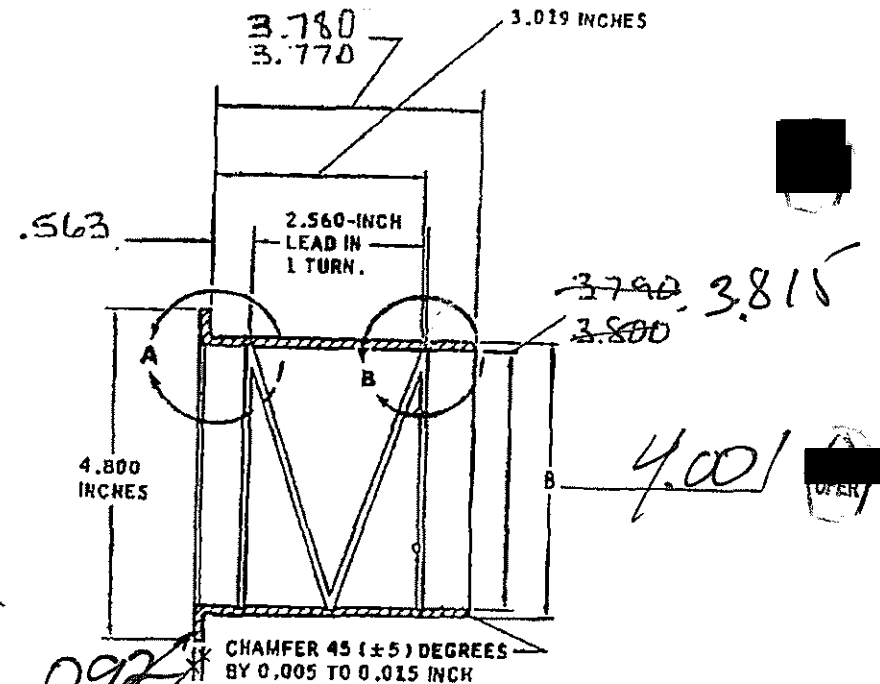
OVERHAUL MANUAL	MATL	MATL SPEC	FINAL HT (REF)
DC10-32-11-84	AL-NI-BRONZE	Ams 4640	~
PROGRAM & CUSTOMER		ISSUE DATE	DUE DATE

OPEN NO	
---------	--

SIMILAR TO DRG 7157-503
DIA Ⓣ



BUSHING ID & FLANGE IDEAL STATE



DO NOT PLATE THIS SURFACE

THESE SURFACES TO BE PERPENDICULAR TO B WITHIN 0.005-INCH TOTAL INDICATOR READING.

ALL DIMENSIONS ARE IN INCHES

MATL #	7808 AL-Ni-Bn
OPER #	DEC 26 2007
	DATE

OVERHAUL

Flight Accessory Services
a Division of
Hawker Pacific, Inc.

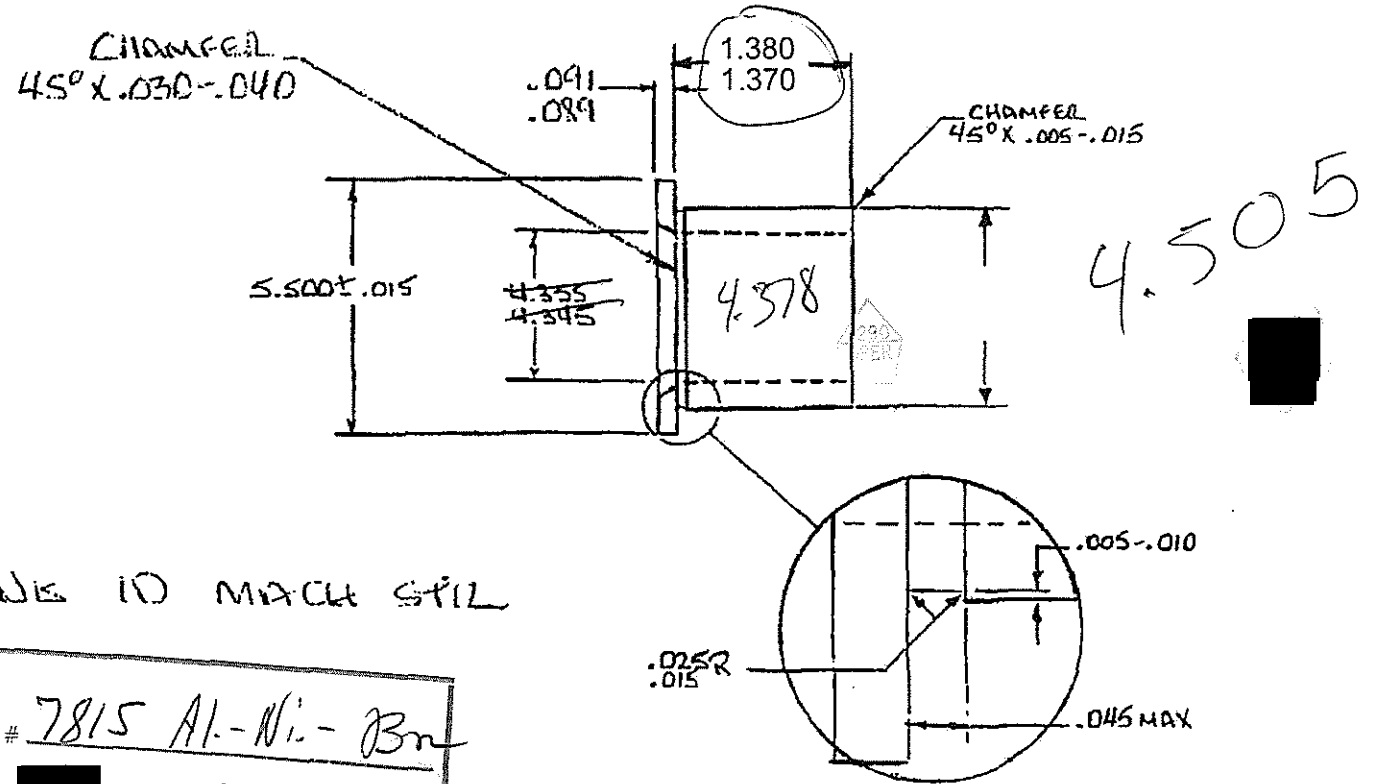
TRAVELLER
KEEP WITH PARTS
AT ALL TIMES

401

PART NO	3456-11623	SERIAL NO	
PART NAME	BUSHING		
SHT 1 OF		DWG CHG	
QUAN	2	JOB NO	107793-007

OPER NO	PROGRAM & CUSTOMER	MATL	MATL SPEC.	FINAL HT (REF)
		AL-BRONZE	IAMS 4830	
		ISSUE DATE	DUE DATE	

SIMILAR TO AGE-704D-529
DIA (2)



BUSHING TO MATCH SPIL

MATL #	7815 Al.-Ni.-Br
OPER #	[REDACTED]
DATE	JAN 31 2000

JAN 31 2000

ALL DIMENSIONS
ARE IN INCHES

** NOTE: AFTER INSTALLATION, VERIFY GAP BETWEEN BUSHINGS IS 0.250±0.015 **

Attachment 5

Repair Station Certificate - HPA

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Air Agency Certificate

Number RJ3R817L

This certificate is issued to

HAWKER PACIFIC AEROSPACE

whose business address is

**11240 SHERMAN WAY
SUN VALLEY, CALIFORNIA 91352**

*upon finding that its organization complies in all respects
with the requirements of the Federal Aviation Regulations
relating to the establishment of an Air Agency, and is
empowered to operate an approved* **REPAIR STATION**

with the following ratings:

**ACCESSORIES
LIMITED ACCESSORIES (August 5, 2015)
LIMITED LANDING GEAR**

*This certificate, unless canceled, suspended, or revoked,
shall continue in effect* **INDEFINITELY.**

Date issued:

**APRIL 24, 1987
REISSUED: AUGUST 5, 2015**

By direction of the Administrator

**RICHARD SWANSON, MANAGER
VAN NUYS FSDO, WESTERN-PACIFIC REGION**

**This Certificate is not Transferable, AND ANY MAJOR CHANGE IN THE BASIC FACILITIES, OR IN THE LOCATION THEREOF,
SHALL BE IMMEDIATELY REPORTED TO THE APPROPRIATE REGIONAL OFFICE OF THE FEDERAL AVIATION ADMINISTRATION**

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both