TO: ALL HOLDERS OF AUTOTHROTTLE BRAKE PACK ASSEMBLY COMPONENT MAINTENANCE MANUAL 22-32-45.

REVISION NO. 4 DATED NOV 01/05

HIGHLIGHTS

Pages which have been added or revised are outlined below together with the highlights of the revision. Remove and insert the affected pages as listed and enter Revision No. and date on the Record of Revision Sheet.

CHAPTER/SECTION AND PAGE NO.	DESCRIPTION OF CHANGE
101	Updated the Autothrottle Clutch Test Equipment to G22003-134 and -135, which replace -132 and -133, which supersede -107 and -108, respectively
901	

BOEING

COMPONENT
MAINTENANCE MANUAL

AUTOTHROTTLE BRAKE PACK ASSEMBLY

PART NUMBERS 253T7531-1,-2,-3

COMPONENT MAINTENANCE MANUAL
WITH
ILLUSTRATED PARTS LIST

E08986

REVISION RECORD

- Retain this record in front of manual. On receipt of revision, insert revised pages in the manual, and enter revision number, date inserted and initial.

REVISION NUMBER	REVISION DATE	DATE FILED	BY	REVISION NUMBER	REVISION DATE	DATE FILED	BY

TEMPORARY REVISION AND SERVICE BULLETIN RECORD

BOEING SERVICE BULLETIN	BOEING TEMPORARY REVISION	OTHER DIRECTIVE	DATE OF INCORPORATION INTO MANUAL
		PRR B12155	JUN 01/94

PAGE	DATE	CODE
22-32-45		
TITLE PAGE		
1	SEP 01/95	01.1
2	BLANK	
REVISION RECORD		
1	JUN 01/94	01
2	BLANK	
TR & SB RECORD		
1	JUN 01/94	01
2	BLANK	
LIST OF EFFECTIVE PAGES		
*1	NOV 01/05	01
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1	JUN 01/94	01
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1	JUN 01/94	01
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TESTING & TROUBLE SHOOTING		
*101	NOV 01/05	01.1
*102	NOV 01/05	01.101
DISASSEMBLY		
301	JUN 01/94	01
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502	BLANK	
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601	MAR 01/05	01.1
602	BLANK	
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601	JUN 01/94	01
602	MAR 01/05	01.1
REPAIR 2-1		
601	MAR 01/05	01.1
602	MAR 01/05	01.1
REPAIR 3-1		
601	MAR 01/05	01.1
602	BLANK	
REPAIR 4-1		
601	MAR 01/05	01.1
602	MAR 01/05	01.1
ASSEMBLY		
701	MAR 01/05	01.1
702	JUN 01/94	01
703	JUN 01/94	01
704	BLANK	
FITS AND CLEARANCES		
801	SEP 01/95	01.1
802	BLANK	
SPECIAL TOOLS		
*901	NOV 01/05	01.1
902	BLANK	
ILLUSTRATED PARTS LIST		
1001	JUN 01/94	01
1002	MAR 01/05	01.1
1003	MAR 01/05	01.1
1004	JUN 01/94	01

* = REVISED, ADDED OR DELETED

PAGE	DATE	CODE	PAGE	DATE	CODE
ILLUSTRATED PARTS LIST		CONT.			
1005	MAR 01/05	01.1			
1006	MAR 01/05	01.1			

* = REVISED, ADDED OR DELETED

TABLE OF CONTENTS

INTRODUCTION

The instructions in this manual provide the information necessary to perform maintenance functions ranging from simple checks and replacement to complete shop-type repair.

This manual is divided into separate sections:

1. Title Page
2. Record of Revisions
3. Temporary Revision & Service Bulletin Record
4. List of Effective Pages
5. Table of Contents
6. Introduction
7. Procedures & IPL Sections

Refer to the Table of Contents for the page location of applicable sections.

The beginning of the REPAIR section includes a list of the separate repairs and a list of applicable standard Boeing practices.

An explanation of the use of the Illustrated Parts List is provided in the Introduction to that section.

All weights and measurements used in the manual are in English units, unless otherwise stated. When metric equivalents are given they will be in parentheses following the English units.

Design changes, optional parts, configuration differences and Service Bulletin modifications create alternate part numbers. These are identified in the Illustrated Parts List (IPL) by adding an alphabetical character to the basic item number. The resulting item number is called an alpha-variant. Throughout the manual, IPL basic item number references also apply to alpha-variants unless otherwise indicated.

Verification:

Testing and Trouble Shooting:
Assembly:

AUTOTHROTTLE BRAKE ASSEMBLY

DESCRIPTION AND OPERATION

1. Description and Operation

   A. The brake assembly consists of three springs, a rotor, stator, cap assembly, disc and a skewed roller assembly all contained in a housing assembly.

   B. The brake assembly is a component of the autothrottle assembly. The brake assembly controls backlash movement of the autothrottle shaft. It also allows one thrust lever to be moved without the other thrust lever following the movements of the first thrust lever.

2. Leading Particulars (approximate)

   Diameter -- 7.0 inches
   Width -- 7.5 inches
   Weight -- 9 pounds

TESTING AND TROUBLE SHOOTING

1. Test Equipment and Materials

NOTE: Equivalent substitutes may be used.

A. Autothrottle Clutch Test Equipment -- G22003-134 or -135

NOTE: G22003-134 replaces G22003-132. G22003-132 supersedes G22003-107, -92, -83, -50, -1.

G22003-135 replaces G22003-133. G22003-133 supersedes G22003-108, -93, -84, -51, -2.

G22003-134 is used with a 60 Hz power source. G22003-135 is used with a 50 Hz power source.

B. 0-50 pound-inch Torque Indicator

2. Brake Assembly Run-In

A. Place brake assembly (1) in a holding fixture, that rigidly retains housing assembly (96) in a stationary position. Rotate rotor and verify that the torque is 35-50 pound-inches in each direction. If the torque does not fall within the acceptable range, reshim per Shimming Instructions and repeat the test.

B. Place brake assembly (1) in the run-in fixture (part of the G22003-134 or -135 autothrottle clutch test equipment), so that it rigidly retains housing (96) in a stationary position while rotating the rotor.

(1) The housing temperature must not exceed 200 degrees F during run-in. A cooling fan may be used to maintain sub 200 degrees F temperature of the unit.

C. Rotate the rotor (80) at 50 to 100 rpm with housing (96) held stationary. Make sure the rotor does not chatter. If chatter does occur, adjust the rpm as needed to prevent chatter. One run-in cycle shall consist of 15 minutes of running continuously in one direction, then 15 minutes of running continuously in the other direction. Total run-in time shall be 90 minutes (three cycles).

D. Disassemble, clean and degrease brake assembly, then relubricate and reassemble per ASSEMBLY.

NOTE: Parts must be reassembled in the same order and orientation to maintain run-in integrity.

3. Acceptance Test

A. After run-in has been completed, each unit shall be acceptance tested per the following procedure.

B. Place unit in fixture to retain housing (96) in stationary position.

C. Ensure that rotor rotates smoothly and continuously without restrictions, irregularities, chattering or sticking.

D. Rotate rotor at 2.0-3.0 rpm and note the direction of rotation. Let the unit run until the running torque stabilizes. Do not let the unit run for more than 5 minutes. Read the torque value for 30 seconds. Check that the running torque is 43-47 pound-inches for brake assembly 253T7531-1 and 41-49 pound-inches for brake assembly 253T7531-2. Repeat this step in the opposite direction of rotation. If the torque does not fall within the acceptable range, reshim per the Shimming Instructions, and retest.

NOTE: No further run-in is required after final adjustment and test.

E. Upon satisfactory completion of this test, check that torque on nut (10), is 100-200 pound-inches, then secure nut with lockwire per 20-50-02.

4. Shimming Instructions

A. Remove nut (10) and replace shim (35, 40, 45, 50) as required per Fig. 101. An increase of 0.005 inch shim thickness results in an increase of approximately 3 pound-inches torque. Likewise, a decrease in shim thickness results in a decrease in torque.

IPL (FIG. 1) ITEM NO.	253T7530	SHIM THICKNESS
35	-1	0.020 0.015
40	-2	0.025 0.020
45	-3	0.030 0.025
50	-4	0.055 0.050

Shim Selection
Figure 101

DISASSEMBLY

NOTE: See Testing and Troubleshooting to establish the condition of the component or most probable cause of its malfunction. This is to determine the extent of disassembly required without completely tearing down and rebuilding the component.

1. Standard industry practices are sufficient for disassembly of this component.

CLEANING

1. Clean all parts except bearings using standard industry practices per 20-30-03.

2. Clean all sealed bearings (20, 105) per manufacturer's instructions.

CHECK

1. Check all parts for defects in accordance with standard industry practices.

2. Magnetic particle check per 20-20-01 -- nut (10), Disc (75), rotor (80).

3. Penetrant check per 20-20-02 -- cap (25, 30), housing (107), link (120).

4. Check spring (55).

   A.

SPRING HEIGHTS (INCHES)	LOAD (LBS)
0.115	0.0
0.100	116-174
0.070	217-326

IPL Fig. 1

5. Check stator (65) and disc (75) for flatness and parallelism, Surfaces of each component must be flat and parallel to each other to 0.0005 inch.

   NOTE: Parts may be restrained by a 5 lb maximum load evenly distributed over entire part when checking for flatness and parallelism.

REPAIR - GENERAL

1. Content

A. Repair, refinish and replacement procedures are included in separate repair sections as follows:

P/N	NAME	REPAIR
253T7532	HOUSING ASSEMBLY	1-1
253T7539	CAP ASSEMBLY	2-1
253T7533	LINK ASSEMBLY	3-1
254N1162	CAP, END	4-1
--	MISC, PARTS REFINISH	5-1

2. Standard Practices

A. Refer to the following standard practices as applicable, for details of procedures in each individual repair.

20-30-02 Stripping of Protective Finishes
20-30-03 General Cleaning Procedure
20-41-01 Decoding Table for Boeing Finish Codes
20-41-02 Application of Chemical and Solvent Resistant Finishes
20-42-05 Bright Cadmium Plating
20-43-01 Chromic Acid Anodizing
20-50-03 Bearing and Bushing Replacement
20-60-02 Finishing Materials
20-60-03 Miscellaneous Materials

3. Materials

NOTE: Equivalent substitutes may be used.

A. Grease -- MIL-PRF-23827 (SOPM 20-60-03)

B. Primer -- BMS 10-11, type 1 (SOPM 20-60-02)

HOUSING ASSEMBLY - REPAIR 1-1

253T7532-1

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may require only restoration of original finish, refer to Refinish instructions (Fig. 601).

1. Bearing (105) Replacement

   A. Remove bearing (105) from housing assembly (96).

   B. Install replacement bearing (105) using either wet BMS 10-11, type 1 primer (F-20.06) or BMS 5-95.

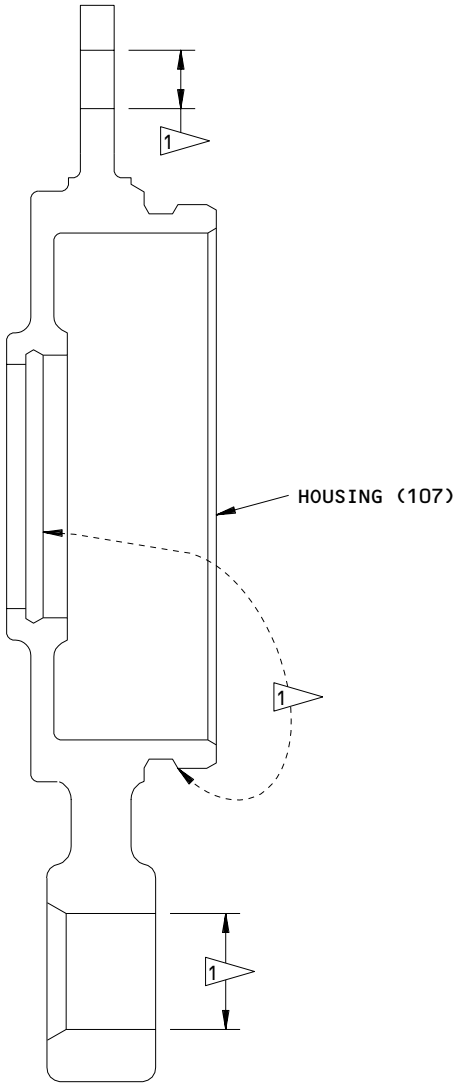
   C. Roller swage in place per 20-50-03.

2. Bearing (100) Replacement

   A. Remove bearing (100) from housing assembly (96).

   B. Install replacement bearing (100) using BMS 5-95 sealant.

   C. Roller swage or anvil swage in place per 20-50-03.



REFINISH

CHROMIC ACID ANODIZE AND APPLY BMS 10-11, TYPE 1 PRIMER (F-18.13) ALL OVER EXCEPT AS NOTED BY 1.

REPAIR

MATERIAL: ALUMINUM ALLOY

ITEM NUMBERS REFER TO IPL FIG. 1

1 NO PRIMER ALLOWED

253T7532-1

Housing Refinish
Figure 601

E09130

CAP ASSEMBLY - REPAIR 2-1

253T7539-1 -3

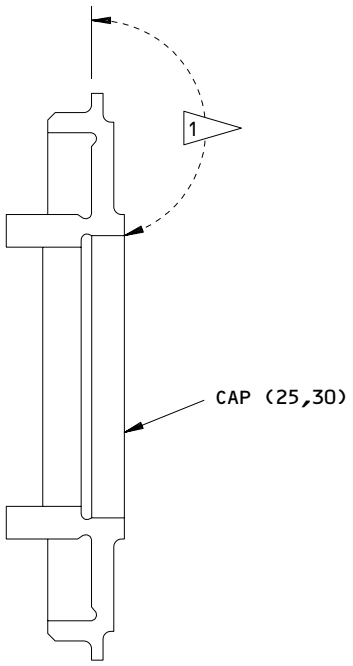
NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may require only restoration of original finish, refer to Refinish instructions (Fig. 601).

1. Bearing (20) Replacement

   A. Remove bearing (20) from cap assembly (15).

   B. Install replacement bearing (20) using wet BMS 10-11, type 1 primer (F-20.06).

   C. Roller swage bearing in place per 20-50-03.



REFINISH

CHROMIC ACID ANODIZE ALL OVER AND APPLY BMS 10-11, TYPE 1 PRIMER (F-18.13) AS SHOWN BY 1.

REPAIR

MATERIAL: ALUMINUM ALLOY

ITEM NUMBERS REFER TO IPL FIG. 1

1 APPLY PRIMER TO THIS AREA ONLY.

253T7539-1,-3

Cap Refinish
Figure 601

LINK ASSEMBLY - REPAIR 3-1

253T7533-1

NOTE: Refer to REPAIR-GEN for list of applicable standard practices. For repair of surfaces which may require only restoration of original finish, refer to Refinish instructions.

1. Bearing (115) Replacement

   A. Remove bearing (115) from link assembly (110).

   B. Install replacement bearing (115) using either wet BMS 10-11, type 1 primer (F-20.06) or BMS 5-95.

   C. Roller swage bearing in place per 20-50-03.

2. Link (120) Refinish

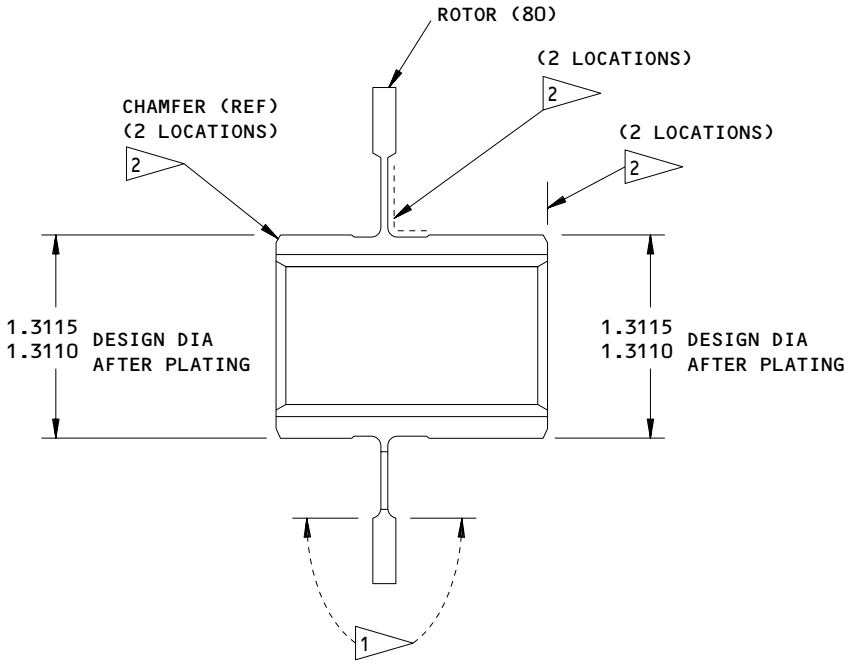
   A. Chromic acid anodize and apply BMS 10-11, type 1 primer (F-18.13) all over, except no primer allowed in holes. Material: Aluminum alloy.

MISCELLANEOUS PARTS REFINISH - REPAIR 4-1

1. Repair of parts listed in Fig. 601 consists of restoration of original finish (Ref IPL Fig. 1).

IPL FIG. & ITEM	MATERIAL	FINISH
IPL FIG. 1		
Nut (10)	15-5PH CRES 180-200 ksi	Cadmium plate (F-15.06)
Shim (35, 40, 45, 50)	17-7PH CRES 180 ksi	Passivate (F-17.25, which replaces F-17.09)
Spring (55)	302 or 301 CRES Full hard; or 17-7PH CRES 180-200 ksi	Passivate (F-17.25, which replaces F-17.09)
Rotor (80)	9310 Steel 150-190 ksi; or 5160H Steel 150-170 ksi or HRC 34-41	Cadmium plate (15.06) as shown in Fig. 601.

Refinish Details
Figure 601



REFINISH

253T7535-1,-2:

CADMIUM PLATE (F-15.06) 3 ALL OVER EXCEPT AS NOTED BY 1.

253T7535-3,-4:

CADMIUM PLATE (F-15.06) 3 THE INTERNAL SPLINES ONLY, EXCEPT PLATING IS OPTIONAL ON THE SURFACES NOTED BY 2.

1 NO PLATING ON THESE SURFACES (253T7535-1,-2)

2 PLATING IS OPTIONAL ON THESE SURFACES (253T7535-3,-4)

3 FOR 253T7535-2,-4 POST PLATE BAKE AT 250-300 DEGREES FAHRENHEIT

REPAIR

MATERIAL:

253T7535-1,-3 -- 9310 STEEL, CORE STRENGTH 150-190 KSI; CASE HARDENED ROTOR RING, A80 MIN

253T7535-2,-4 -- 5160H STEEL, CORE STRENGTH 150-190 KSI (-2) OR HRC 34-41 (-4); CASE HARDENED ROTOR RING, A80 MIN

ITEM NUMBERS REFER TO IPL FIG. 1

ALL DIMENSIONS ARE IN INCHES

253T7535-1 THRU -4

Rotor Refinish
Figure 601

E09123

ASSEMBLY

1. Materials

NOTE: Equivalent substitutes may be used.

A. Grease -- MIL-PRF-23827 (SOPM 20-60-03)

2. Equipment

NOTE: Equivalent substitutes may be used.

A. Rigging Equipment -- A22008-17

3. Assembly (IPL, Fig. 1)

CAUTION: THIS ASSEMBLY IS OF INSTRUMENT QUALITY. IT MUST BE HANDLED WITH MAXIMUM CARE AND ASSEMBLED IN A CLEAN AREA.

(1) Generously lubricate both sides of skewed roller assemblies (70) and the sides of the stator (65) and disc (75) which contact the skewed roller assembly with grease.

NOTE: The rollers of the two skewed roller assemblies must be installed to spiral in the opposite direction with respect to each other.

(2) Coat all mating surfaces of housing assembly (96) with grease.

(3) Insert disc (75) into housing assembly (96) followed by one skewed roller assembly (70).

(4) Install rotor (80) in center of housing assembly (96).

(5) Install the other skewed roller assembly (70).

NOTE: The rollers of the two skewed roller assemblies (70) must be assembled to spiral in the opposite direction with respect to each other.

(6) Install stator (65) on top of skewed roller assembly (70).

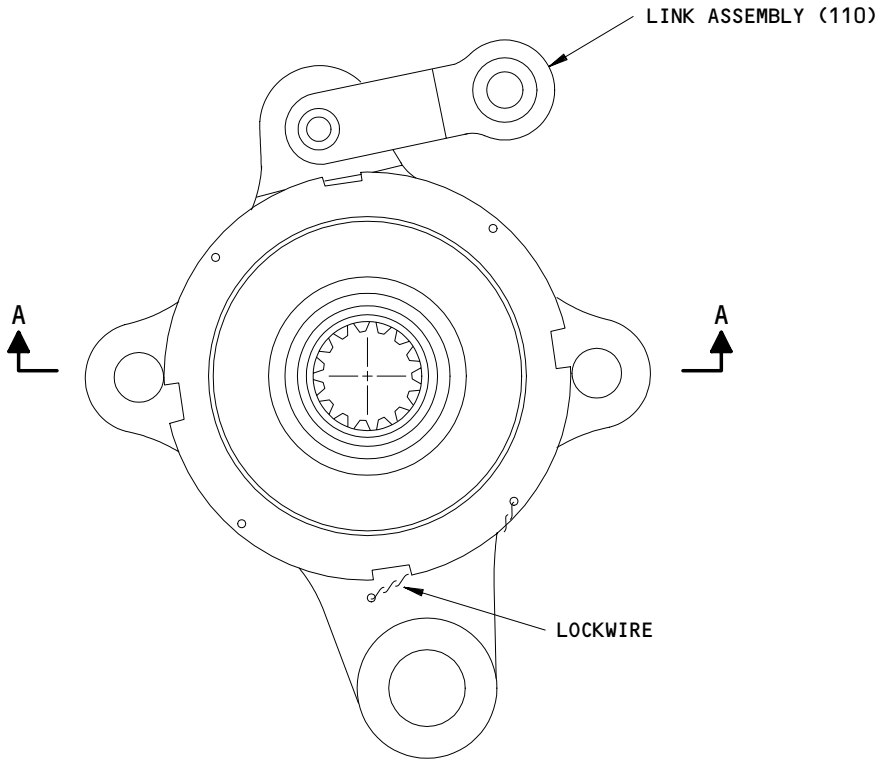
(7) Place shims (35, 40, 45, 50) in end cap assembly (15) then install springs (55) with convex sides facing each other as shown in Fig. 701.

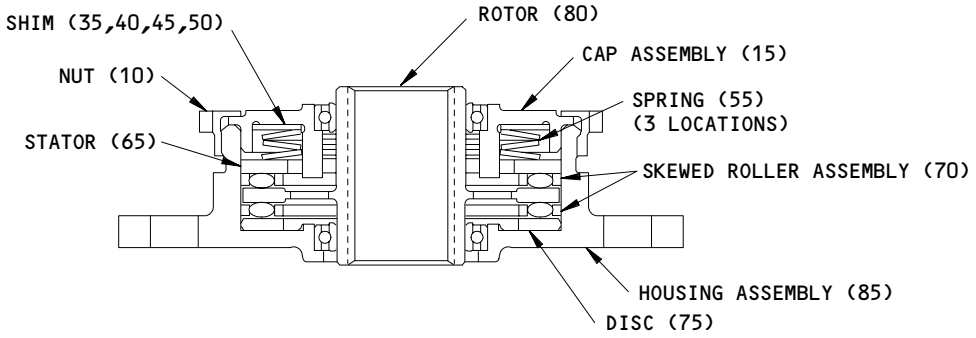
(8) Assemble end cap components and housing components using the A22008-17 rigging equipment. Compress the springs by clamping cap assembly (15) and housing (96) together, ensuring positive contact between cap and housing.

(9) Install nut (10) and tighten nut to 100-200 pound-inches.

(10) Perform run-in procedure and check running torque per TESTING AND TROUBLESHOOTING.

4. Prepare and store component according to standard industry practices.





A-A

ITEM NUMBERS REFER TO IPL FIG. 1

253T7531-1

Autothrottle Brake Assembly
Figure 701

EO3572

FITS AND CLEARANCES

FOR TORQUE VALUES OF STANDARD FASTENERS, REFER TO 20-50-01			
ITEM NO. IPL FIG. 1	NAME	TORQUE	
		POUND-INCHES	POUND-FEET
10	NUT	100-200	

Torque Table
Figure 801

E09131

SPECIAL TOOLS, FIXTURES, EQUIPMENT

NOTE: Equivalent substitutes may be used.

1. Autothrottle Clutch Test Equipment -- G22003-134 or -135

   NOTE: G22003-134 replaces G22003-132. G22003-132 supersedes G22003-107, -92, -83, -50, -1.

   G22003-135 replaces G22003-133. G22003-133 supersedes G22003-108, -93, -84, -51, -2.

   G22003-134 is used with a 60 Hz power source. G22003-135 is used with a 50 Hz power source.

2. 0-50 pound-inch Torque Indicator

3. Rigging Equipment -- A22008-17

ILLUSTRATED PARTS LIST

1. This section lists and illustrates replaceable or repairable component parts. The Illustrated Parts Catalog contains a complete explanation of the Boeing part numbering system.

2. Indentures show parts relationships as follows:

    Assembly
      Detail Parts for Assembly
      Subassembly
      Attaching Parts for Subassembly
        Detail Parts for Subassembly

    Detail Installation Parts (Included only if installation parts may be returned to shop as part of assembly)

3. One use code letter (A, B, C, etc.) is assigned in the EFF CODE column for each variation of top assembly. All listed parts are used on all top assemblies except when limitations are shown by use code letter opposite individual part entries.

4. Letter suffixes (alpha-variants) are added to item numbers for optional parts, Service Bulletin modification parts, configuration differences (Except left- and right-hand parts), product improvement parts, and parts added between two sequential item numbers. The alpha-variant is not shown on illustrations when appearance and location of all variants of the part is the same.

5. Service Bulletin modifications are shown by the notations PRE SB XXXX and POST SB XXXX.

    A. When a new top assembly part number is assigned by Service Bulletin, the notations appear at the top assembly level only. The configuration differences at detail part level are then shown by use code letter.

    B. When the top assembly part number is not changed by the Service Bulletin, the notations appear at the detail part level.

6. Parts Interchangeability

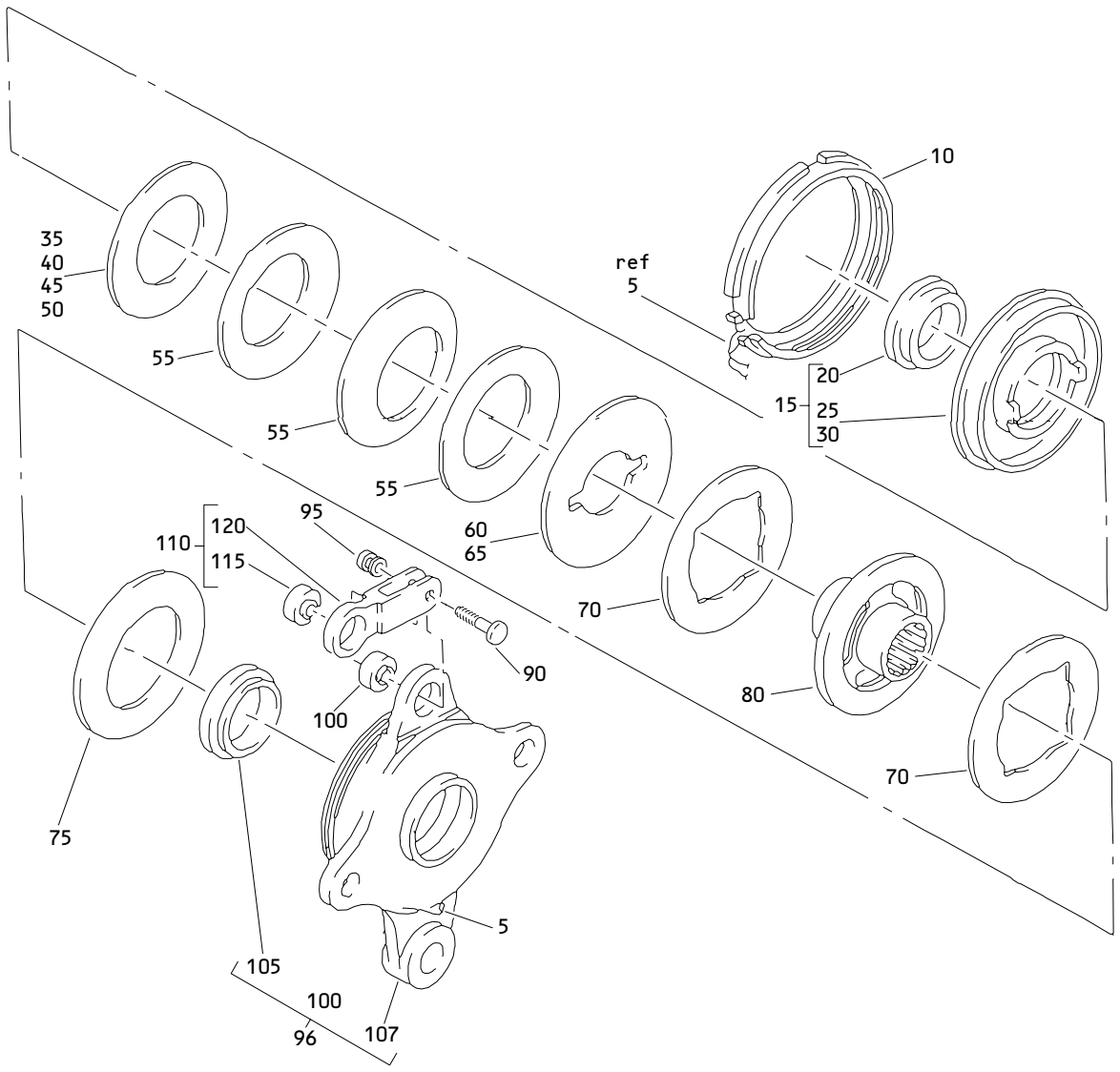
Optional (OPT)	The parts are optional to and interchangeable with other parts having the same item number.
Supersedes, Superseded By (SUPSDS, SUPSD BY)	The part supersedes and is not interchangeable with the original part.
Replaces, Replaced By (REPLS, REPLD BY)	The part replaces and is interchangeable with, or is an alternate to, the original part.

VENDORS

00462 GOODRICH CORPORATION (TRW)
1550 S VALLEY VISTA DR
DIAMOND BAR CA 91765

82402 GEAR SYSTEMS, INC.
PO BOX 680910
6125 SILVER CREEK DR
PARK CITY UT 84068 USA
FORMERLY LUCAS AEROSPACE, GEARED SYSTEMS DIVISION

PART NUMBER	AIRLINE PART NO.	FIG.	ITEM	TTL REQ
BACB10AG4MC		1	100	1
		1	115	1
BACB10AS21		1	20	1
		1	105	1
BACB30VT8K8		1	90	1
BACC30BL8		1	95	1
MS20995C32		1	5	1
253T7530-1		1	35	1
253T7530-2		1	40	1
253T7530-3		1	45	1
253T7530-4		1	50	1
253T7531-1		1	1	RF
253T7531-2		1	1A	RF
253T7531-3		1	1B	RF
253T7532-1		1	96	1
253T7532-2		1	107	1
253T7533-1		1	110	1
253T7533-2		1	120	1
253T7535-1		1	80	1
		1	80C	1
253T7535-2		1	80A	1
		1	80C	1
253T7535-3		1	80D	1
253T7535-4		1	80B	1
253T7536-1		1	60	1
253T7536-2		1	65	1
253T7536-3		1	65A	1
253T7537-1		1	55	3
253T7539-1		1	15	1
253T7539-2		1	25	1
253T7539-3		1	15A	1
253T7539-4		1	30	1
254N1161-1		1	55A	3
254N1166-1		1	75	1
254N1166-2		1	75A	1
254N1183-1		1	10	1
90650		1	70A	2
90656		1	70	2



Autothrottle Brake Assembly
Figure 1

EO9888

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
-1	253T7531-1		BRAKE ASSY (REF CMM 22-32-22)	A	RF
-1A	253T7531-2		BRAKE ASSY (REF CMM 22-32-22)	B	RF
-1B	253T7531-3		BRAKE ASSY (REF CMM 22-32-22)	C	RF
5	MS20995C32		.LOCKWIRE		1
10	254N1183-1		.NUT		1
15	253T7539-1		.CAP ASSY	A	1
-15A	253T7539-3		.CAP ASSY	B,C	1
20	BACB10AS21		..BEARING		1
25	253T7539-2		..CAP	A	1
30	253T7539-4		..CAP	B,C	1
35	253T7530-1		.SHIM		1
40	253T7530-2		.SHIM		1
45	253T7530-3		.SHIM		1
50	253T7530-4		.SHIM		1
55	253T7537-1		.SPRING- (253T7537-1 MAY REPLACE OR BE REPLACED BY 254N1161-1 IN SHIPSETS OF 3 ONLY) (OPT ITEM 55A)		3
-55A	254N1161-1		.SPRING- (253T7537-1 MAY REPLACE OR BE REPLACED BY 254N1161-1 IN SHIPSETS OF 3 ONLY) (OPT ITEM 55)		3
60	253T7536-1		.STATOR	A	1
65	253T7536-2		.STATOR	B	1
-65A	253T7536-3		.STATOR	C	1
70	90656		.ROLLER ASSY-SKEWED (V00462) (OPT ITEM 70A)		2
-70A	90650		.ROLLER ASSY-SKEWED (V82402) (OPT ITEM 70)		2
75	254N1166-1		.DISK	A,B	1
-75A	254N1166-2		.DISK	C	1

FIG. & ITEM	PART NO.	AIRLINE PART NUMBER	NOMENCLATURE 1234567	EFF CODE	QTY PER ASSY
01-					
80	253T7535-1		.ROTOR	A	1
-80A	253T7535-2		.ROTOR (OPT ITEM 80B)	C	1
-80B	253T7535-4		.ROTOR (OPT ITEM 80A)	C	1
-80C	253T7535-1		.ROTOR (OPT ITEM 80D)	B	1
-80D	253T7535-3		.ROTOR (OPT ITEM 80C)	B	1
85	253T7532-1		DELETED		
90	BACB30VT8K8		.BOLT		1
95	BACC30BL8		.COLLAR		1
96	253T7532-1		.HOUSING ASSY		1
100	BACB10AG4MC		..BEARING		1
105	BACB10AS21		..BEARING		1
107	253T7532-2		..HOUSING		1
110	253T7533-1		.LINK ASSY		1
115	BACB10AG4MC		..BEARING		1
120	253T7533-2		..LINK		1
125	253T7532-2		DELETED		