

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety Washington, D.C. 20594

AIRWORTHINESS GROUP FACTUAL REPORT ADDENDUM 2

March 26, 2007

A. ACCIDENT DCA06FA058

Location: Memphis, Tennessee

Date: July 28, 2006

Time: 1125 Central Daylight Time (CDT)

Aircraft: FedEx Express Flight 630, McDonnell-Douglas (Boeing) MD-10-10F,

N391FE

B. AIRWORTHINESS GROUP

Chairman: Clinton R. Crookshanks

National Transportation Safety Board

Denver, Colorado

Member: Jim Fortner

Fortner Engineering and Manufacturing, Inc.

Glendale, California

Member: Neal Gilleran

The Boeing Company Long Beach, California

C. SUMMARY

On July 28, 2006, about 1125 Central Daylight Time, FedEx Express (FedEx) flight 630, a McDonnell-Douglas (Boeing) MD-10-10F (MD-10), N391FE, crashed while landing at Memphis International Airport (MEM), Memphis, Tennessee. The left main landing gear collapsed after touchdown on runway 18R, and the airplane came to rest on the runway. After the gear collapsed, a fire developed on the left side of the airplane. The two flight crewmembers received minor injuries during the evacuation, and one nonrevenue FedEx pilot was not injured. The postcrash fire substantially damaged the airplane's left wing and portions of the left side of the fuselage. Flight 630 departed from Seattle-Tacoma International Airport (SEA), Seattle, Washington, and was operating under the provisions of 14 *Code of Federal Regulations* (CFR)

Part 121 on an instrument flight rules flight plan.

D. <u>DETAILS OF THE INVESTIGATION</u>

The two Dual Brake Control Valves (DBCV) were removed from the accident airplane after the accident and shipped to Crane Aerospace, Hydro-Aire Division, in Burbank, CA. Full anti-skid simulator testing and some basic testing of the DBCV's was performed at Hydro-Aire¹. The DBCV's were then sent to Fortner Engineering and Manufacturing, Inc., for additional acceptance testing. The group met at the Fortner facility in Glendale, CA, on November 6, 2006.

Prior to the testing, the group reviewed the standard acceptance test plan provided by Fortner and elected to perform 19 of the 24 individual tests in an order different from the standard. The test plan and results for each DBCV are included in Appendices 1 and 2. The proof pressure, compensation, and duplicate functional tests were not performed as noted on the test plans. The test numbers below refer to the renumbered test as shown in the test plans. Figures 1 and 2 show simplified schematics of the valve in the non-actuated and actuated positions.

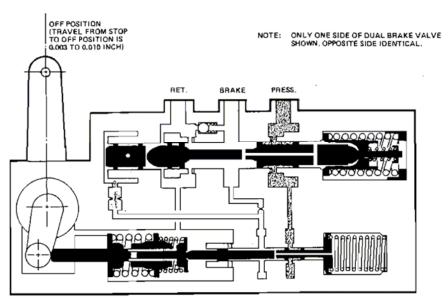


Figure 1 – DBCV Schematic, Non-Actuated Position

Page 2 of 24

¹ See Addendum 1 to the Airworthiness Group Factual Report for the details of this testing.

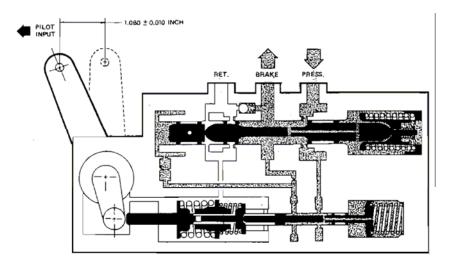


Figure 2 – DBCV Schematic, Actuated Position

DBCV (P/N 35950-505, S/N 438942)

This DBCV was removed from the right side of the aircraft, and operates in hydraulic system three. All of the test results were satisfactory with the exceptions noted below.

- → Test number 1, Functional Operation The input lever travel of the left valve required to obtain pressure at the brake was slightly higher than the limit value for the 70 psi and 250 psi test points.
- Test number 1, Functional Operation The input lever travel of the right valve required to obtain pressure at the brake was slightly lower that the limit value for the 1200 psi and 2500 psi test points.
- → Test number 1, Functional Operation The input force on the right valve was above the limit value at the 2500 psi and 3000 psi test points.
- → Test number 10, Internal Leakage The leakage for the parking test exceeded the allowable limit by 2.1 cc.

The valve was disassembled for detail part inspection. There was light scratching/scoring of the first and second stage shuttles consistent with normal operation. There was some contamination noted inside the left second stage sensing assembly and some moderate to heavy scratching/scoring on the plunger. The right second stage sensing assembly exhibited only light scratching/scoring on the plunger. See Figures 3 and 4. There were no other anomalies noted in the detail parts.

DBCV (P/N 35950-505, S/N 444076)

This DBCV was removed from the left side of the aircraft and operates in hydraulic system one. All of the test results were satisfactory with the exceptions noted below.

- → Test number 1, Functional Operation The input lever travel of the left valve required to obtain pressure at the brake was slightly lower than the limit value for the 250 psi, 600 psi, 1200 psi, and 2500 psi test points.
- Test number 1, Functional Operation The input lever travel of the right valve required to obtain pressure at the brake was slightly higher than the limit value for the 70 psi test point.
- → Test number 1, Functional Operation The input lever travel of the right valve required to obtain pressure at the brake was slightly lower than the limit value for the 1200 psi, and 2500

- psi test points.
- Test number 1, Functional Operation The input force on the right valve was above the limit value at the 2500 psi test point.
- Test number 3, Functional Operation The input force on the right valve exceeded the comparison limit to test number 1 at the 1200 psi test point.
- → Test number 9, Internal Leakage The leakage exceeded the allowable limit by 0.5 cc.

The valve was disassembled for detail part inspection. There was light scratching/scoring of the first and second stage shuttles consistent with normal operation. Both the left and right second stage sensing assemblies exhibited moderate to heavy scratching/scoring on the plunger. See Figures 5 and 6. There were no other anomalies noted in the detail parts.



Figure 3 – DBCV (S/N 438942) Left Second Stage Plunger and Guide



Figure 4 – DBCV (S/N 438942) Right Second Stage Plunger and Guide



Figure 5 – DBCV (S/N 444076) Left Second Stage Plunger and Guide



Figure 6 – DBCV (S/N 444076) Right Second Stage Plunger and Guide

APPENDIX 1 Test Plan and Results S/N 438942

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CLASS 1 ACCESSORY RATING
HOLDER OF SFAR 36 AUTHORITY
This assembly was repaired in accordance with
applicable sections of Standard Overhaul Procedures for hydraulic units DC-10 and certifications are on file at this Repair Station.

918 thompson avenue glendale, culifornia 91201-2079 (818) 240-7740 / (213) 245-4591 fax (818) 240-1009

DACO S/N	438942
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Page 1 of B (TS35950A.DWG) Certificate of Compliance and Test Data

Test Fluid - Skydrol 500B Fluid Temp. - 80° to 120°F

F.E. S/N

35950-505 Dual Brake Metering Valve Assembly

Job #

psi

PS1

Model	DC-10	Customer	FEOCK	Chapter	32-44

Revision N/C Revised

Eff. Date 01/30/98 TEST DATA Test For Pressure Test Closed Requirements Results Port # psi Port With levers in the full OFF position apply pressure for (3) minutes. There shall be 75 no external leakage, failure, or permanent OK R/W OK then deformation. Leakage from Return Port 4500 shall not exceed 14.3 cc/minute. Proof With pressure applied, adjust needle valve at Return port to build 1500 psi @ Return port. (There shall be 4500 psi at Brake Pressure SKIPPED 4500 OK R/W Ports). Maintain pressure for (2) minutes. Gages Brake There shall be no external leakage or Pres. or evidence of failure or permanent set. Ports With levers in the full OFF position apply pressure. After a (5) minute wait, leakage 3000 from Return Port shall not exceed 9.5 cc per minute in a (2) minute test. Internal With levers in the full OFF position apply 3000 psi. Move levers to obtain 2200±200 Leakage psi at Brake ports. Reduce input pres-Noted sure to 1800 psi. After a (5) minute wait leakage from Ret. Port shall not exceed 10 4.1 cc/minute in a (2) minute test. Test each side of Valve separately for the following tests. Connect the Brake Port being tested to bench return with needle valve in line. Install a pressure gage between needle valve and Brake Port. Gages® With lever in the full OFF position apply
Brake pressure. Move lever to obtain 2200 psi
Ports at Brake Port. Slowly open needle valve
w/inline to obtain 60cc leakage from Brake Port. Left Right Brake Brake 3000

> Valve below 2000 psi. (Continued on Next Page)

Needle Pressure at Brake Port shall not fall

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CERTIFICATED F.A.A. REPAIR STATION #PUBR776L CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY

Customer <u>fe0ex</u> DACO S/N <u>438942</u> Chapter 32-44-03 F.E. S/N

Revised

918 shompson avenue ylendale, valifornia 91201-2079 (818) 240-7740/ (213) 245-4591

Eff. Date 01/30/98

Page 2 of 8 (TS35950B.DWG)

Certificate of Compliance and Test Data

35950- 505 Dual Brake Metering Valve Assembly

Revision

Job #

TEST DATA Test For Test Pressure Closed Requirements Results Port Port Connect a hand pump to needle valve Left Right of Brake Port under test. With pressure Brake Brake Gages@ applied move lever to obtain 2200 psi Brake at brake port. Open needle valve and Ports apply hand pump pressure. Brake Port pressure must not exceed: psi psi 3000 Pres. 2550 for 35950 & 35950-503 2500 for 35950-501 & 35950-505 Gages With pressure applied fully actuate each Brake lever at least (10) times at rates that Dynamic OK R/W OK Ports range from very slow to very fast. Functional Ret. to There shall be no evidence of binding, Bench sticking, or chattering. Right Right
Brake
& Pres.
Pet to Pressure drop shall not exceed 350 psi. Left g Brake Ret. to (Minus Tare) 12 Bench Noted Brake With levers in the full OFF position & Pressure drop shall not exceed 350 psi. Right 250 psi Ŕ Ret. to (Minus Tare) Pressure Bench Drop Right Brake With pressure applied rapidly actuate & maintain input lever at 0.89 inch travel. Open needle valve at Left Brake to Pressure Drop Ret. to drop (Minus Tare) shall not exceed the OK R/W OK Bench following: 3000 W Pres. Basic & -503: 1200 psi Left Minimum 14 -501 & -505: 100 psi Brake to Inlet Flowmeter Pressure at Pressure Port shall not fall Pressure W/Needle below the following: Valve Basic & -503: 2 OK R/W OK Basic & -503: 2500 psi -501 & -505: 2950 psi Inline

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	Page 3 of TS35950C.	glendote, culifo 818+240-7340 8 DWG)	(N)R) 245-4 (N)R) 240-1	CI 0079 1597 (1809 Cert	napter 32-44-03 F.E. S/N difficate of Compliance and Test Data Metering Valve Assembly Job	
		off. Date		/98	Revision N/C Revised TEST DATA	
'est #	Test For	Pressure psi	Test Port	Closed Port	Requirements	Results
и 15				Right Brake Ret. to Bench Left Brake to Flowmeter W/Inline Needle Valve	Basic & -503: 600 psi -501 & -505: 100 psi	OK R/W OK
je 16	Pressure Drop	3000	Pres.	Left Brake Ret. to Bench Right Brake to	below the following: Basic & -503: 2500 psi	Pressure Drop ØK R/W OK Minimum Inlet Pressure ØK R/W OK
13					With pressure applied rapidly actuate & maintain input lever at 1.08 inch travel. Open needle valve at Right Brake to produce a flow of 16 GPM. The pressure drop (minus tare) shall not exceed the following: Basic & -503: 600 psi -501 & -505: 100 psi	OK R/W OK
34 18		500	Return	Left Brake & Right Brake to Flowmeter	With levers in the Full OFF position apply pressure. Flow from each Brake Port shall be steady and greater than 4.5 GPM with no tendency to block flow.	DK R/W OK Right Brake OK R/W OK

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'est #	Test For	Pressure psi	Test Port	Closed Port		Requirement	s	Re	esults
				Gages ©	removing b bleeder val- to 10-15 ft After a one lever travel	uid from the leeder valves. ves; torque bl t.—lbs. Apply minute wait & input force the following	Replace eeder valves pressure. record input ee vs. gage		
					Ascending Pressure	Lever Travel (Inches)		Left Brake	Right Brake
					70 psi	129179	3.15-7.18	OK R/W	OK R/W
					PEGNT	174	6	OK	OK
	Functional	2000	D	Brake Ports	250	.203254	[D	OK	OK OK
مو	Operation	3000	Pres.	60 psi Relief	250 psi	.203254 .216	5.84-10.36 9	R/W OK	R/W OK
١				Return		394	15	OK	ок
					600 psi	.345400	11.08-16.55	R/W	R/W
						356	15	OK	OK
					1200 psi	.590650	20.06-27.16	OK OK	OK OK
					1200 par	.57/	26	R/W OK	R/W OK
						-770	50	OK	ок
					2500 psi	.766825	39.52-50.16	R/W	R/W
					×	. 745	55,	OK	OK
					.810	(Basic&-503) .833892	.59/60	OK	ок
					3000 psi	380660.	47.00-59.00	R/W	R/W
					1	(-501&-505) .766825	63	OK	OK

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	Page 5 of	8	818) 240-11		tificate of C	ompliance an	d Test Data		
(TS35950E.		5 Dua	Brake	Metering Va	lve Assembly	J	ob #	
	E	ff. Date_	01/30	/98	Revision	The second second	Revised		
est	Test For	Pressure	Test	Closed	TEST				
#	lest For	psi	Port	Port		Requirement	LS	- Re	esults
16					lever travel Adjust and	ver force at must be 1.0 lock the Full On allow leve	070/1.090 in. 1 On screw.	OK R/	W OK
			Pres.	Gages@ Brake Ports 60 psi Relief	to give not data with the Hysteresis values. Declining	Compare in Test #15. eed noted	Left Brake	Right Brake	
					Pressure CETT 2500 psi LtGHT	(Inches) 740//// Within ± 100 of Test 15	(Pounds) Within 11.30 of Test 15	OK R/W OK	OK R/W OK
ŕ	Functional Operation				RIGHT	(000) Within ±.100 of Test 15	Within ±6.88 of Test 15	OK R/W OK	OK R/W OK
					600 psi	Within £.100 of Test 15 .350	Within ±4.84 of Test 15	OK R/W OK	OK R/W OK
					250 psi	Within ± 100 of Test 15	Within ±3.65 of Test 15	OK R/W OK	OK R/W OK
					70 psi	Within ± .100 of Test 15	Within ±3.03 of Test 15	OK R/W OK	OK R/W OK

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(TS35950F	DWG) 35950- <i>5</i> 4	Dua			lve Assembly		ob #	
		ff. Date_			Revision	N/C	Revised		
_					TEST	DATA			
est #	Test For	Pressure psi	Test Port	Closed Port		Requirement	s	Re	sults
				Gages® Brake Ports 60 psi Relief ©Return	bleeder value to 10-15 ft WITHOUT was travel & in at the follo	removing bleeder valves. Replace bleeder valves; torque bleeder valves to 10-15 ftlbs. Apply pressure. WITHOUT waiting, record input lever travel & input force vs. gage pres. at the following pressures:			
					Ascending Pressure	Lever Travel (Inches)	Input Force (Pounds)	Left Brake	Right Brake
		3000	Pres.		70 psi	.129179	3.15-7.18	OK R/W OK	OK R/W OK
18	Functional Operation					.203254	5.84-10.36	OK R/W OK	OK R/W OK
	SVIER				• Return	600 psi	600 psi .345400 11.08-16.55	OK R/W OK	OK R/W OK
	2,				1200 psi	.590650	20.06-27.16	OK R/W OK	OK R/W OK
					2500 psi	.766825	39.52-50.16	OK R/W OK	OK R/W OK
					3000 psi	(Basic&-503) .833892 (-501&-505) .766825	47.00-59.00	OK R/W OK	OK R/W

	Page 7 of TS35950G	lendale, californ 18) 240-2740 / / B /as (DWG) 35950— 50	(213) 245-45 (818) 240-40 (818) Dual	Cume Cr 1779 1891 1899 Cert	certificate of C	FED F.A.A. REPAIR CLASS 1 ACCESSO PLDER OF SFAR 3	DACO S/N F.E. S/N d Test Date	43694 ob #	4)
	,	Eff. Date	01/30/	90	TEST		Revised (01/26/00	
Test #	Test For	Pressure psi	Test Port	Closed Port		Requirement	.s	Re	sults
					to give not data with t	On allow lever ed pressures. hat recorded shall not exce Lever Travel (Inches) Within ±.100 of Test 15	Compare in Test #15. eed noted Input Force (Pounds)	Left Brake OK R/W	Right Brake OK R/W
19	Functional Operation	3000	Pres.	Gages® Brake Ports 60 psi Relief	1200 psi	Within ±.100 of Test 15 Within ±.100 of Test 15	Within ±6.88 of Test 15 Within ±4.84 of Test 15	OK R/W OK OK R/W	OK R/W OK OK
	۵,			@Return	250 psi	Within ±.100 of Test 15	Within ±3.65 of Test 15	OK R/W	OK R/W OK
						of Test 15 o obtain 3500 PS	Within ±3.03 of Test 15	OK R/W OK	OK R/W OK
120 51	Binding	3500		"T" to	Lap assembli by normal le	levers towards ies shall return eakage at Retu to obtain 3000	n as indicated	R/W OK	R/W OK
5 21				Return Between	Brake Port. S position. Lap	slowly move level assemblies shall	ers towards Off	R/V	R/W OK

(Continued on Next Page)

	Page B of (TS35950H	lendale, califori (18) 240-7740 / (B fax (LDWG)	(213) 24; (818) 240	rvenue 1-2079 5-4591 0-1009	CERTIFICATED F.A.A. REPAIR STATION #PUBR?: CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY Customer FEOCY DACO S/N Chapter 32-44-03 F.E. S/N Certificate of Compliance and Test Data	438942		
		35950- <i>54</i> Eff. Date			te metering varve Assembly	1/26/00		
					TEST DATA			
Test #	Test For	Pressure psi	Test Port	Closed Port	Requirements	Results		
22	Lever Travel	None		None	Open bleed valves on 1st stage end caps and with zero inlet pressure, actuate levers from Full Off to Full On. Lever travel shall be 0.99±.010, and force required shall not exceed 9.0 lbs. at each lever.	Left Brake OK R/W OK Right Brake OK R/W OK		
	NOTE:	The follo	wing	tests a	re a re-test of Tests #5&6.			
23 7	25 7			Gages e Brake Ports	With lever in the full OFF position apply pressure. Move lever to obtain 2200 psi at Brake Port. Slowly open needle valve to obtain 60cc leakage from Brake Port. Pressure at Brake Port shall not fall below 2000 psi.	Left Brake 2750 2150 psi psi		
8			Pres.	w/inline	Connect a hand pump to needle valve of Brake Port under test. With pressure applied move lever to obtain 2200 psi at brake port. Open needle valve and apply hand pump pressure. Brake Port pressure must not exceed: 2550 for 35950 & 35950-503 2500 for 35950-501 & 35950-505	Left Brake Brake 2450 2450 psi psi		
	3555	Brake La 5-35068	Lap		Right Brake Lap Assys. 35555-35068 Lap Assy. L/A S/N			
		N				. ale		
	L/A S/	6905 N	Lap	Assy.		08/08		
т			e: N	dot all	testing done Part not ready for	(FE)		

APPENDIX 2 Test Plan and Results S/N 444076

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CLASS 1 ACCESSORY RATING
HOLDER OF SFAR 36 AUTHORITY
This assembly was repaired in accordance with applicable sections of Standard Overhaul Procedures for hydraulic units DC-10 and certifications are on file at this Repair Station.

918 thompson avenue glendale, california 91201-2079 (818) 240-7740 / (213) 245-4591 fax (818) 240-1009

DACO	S/N	444076	

Page 1 of 8	G		GV		m	D-4-
(TS35950A.DWG)	Certificate	OI	Compliance	and	Test	Data

Test Fluid - Skydrol 500B Fluid Temp. - 80 to 120F

F.E. S/N ____

35950-505	Dual	Brake	Metering	Valve	Assembly
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Job #

Model DC-10	Customer Foo Ex	Chapter 32-44-03
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Eff. Date 01/30/98 Revision N/C Revised

					TEST DATA	
Test #	Test For	Pressure psi	Test Port	Closed Port	Requirements	Results
1	Syll PER Proof	75 then 4500			With levers in the full OFF position apply pressure for (3) minutes. There shall be no external leakage, failure, or permanent deformation. Leakage from Return Port shall not exceed 14.3 cc/minute.	OK R/W OK
2	SXXPED	4500	Pres.		With pressure applied, adjust needle valve at Return port to build 1500 psi @ Return port. (There shall be 4500 psi at Brake Ports). Maintain pressure for (2) minutes. There shall be no external leakage or or evidence of failure or permanent set.	OK R/W OK
Zg Zg		3000			With levers in the full OFF position apply pressure. After a (5) minute wait, leakage from Return Port shall not exceed 9.5 cc per minute in a (2) minute test.	10 00
10	Internal Leakage	Noted			With levers in the full OFF position apply 3000 psi. Move levers to obtain 2200±200 psi at Brake ports. Reduce input pressure to 1800 psi. After a (5) minute wait leakage from Ret. Port shall not exceed 4.1 cc/minute in a (2) minute test.	<u>2</u> cc

Test each side of Valve separately for the following tests. Connect the Brake Port being tested to bench return with needle valve in line. Install a pressure gage between needle valve and Brake Port.

	шьса	m a bree		gage between needle varte and make 1 or c.	
<i>5</i> ′	Compensation	3000	Pres.	Gages With lever in the full OFF position apply Brake Ports at Brake Port. Slowly open needle valve w/inline to obtain 60cc leakage from Brake Port. Needle Pressure at Brake Port shall not fall Valve below 2000 psi.	Right Brake ZOOO psi
				(Continued on New Days)	

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CERTIFICATED F.A.A. REPAIR STATION #PU3R776L CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY

Customer	Fen Ex	_ DACO	s/n <u>444076</u>
Chapter _	32-44-03	F.E.	S/N

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Page 2 of 8 (TS35950B.DWG)

Certificate of Compliance and Test Data

35950-505 Dual Brake Metering Valve Assembly

Job #____

	1	off. Date_	01/30	/98	Revision N/C Revised		
Test #	Test For	Pressure psi	Test Port	Closed Port	Requirements	Res	ults
pg' 12	Compensation	3000	Pres.	Gages@ Brake Ports	Connect a hand pump to needle valve of Brake Port under test. With pressure applied move lever to obtain 2200 psi at brake port. Open needle valve and apply hand pump pressure. Brake Port pressure must not exceed: 2550 for 35950 & 35950-503 2500 for 35950-501 & 35950-505	Left Brake Z4400 psi	
* 13	Dynamic Functional			Brake Ports Ret. to	With pressure applied fully actuate each lever at least (10) times at rates that range from very slow to very fast. There shall be no evidence of binding, sticking, or chattering.	OK R,	/w ok
ø 14		Valad	Left Brake	Right Brake & Pres. Ret. to Bench	With levers in the full OFF position apply pressure to produce (8) GPM. Pressure drop shall not exceed 350 psi. (Minus Tare)	350	ps
,8 15	Pressure Drop	Noted	Right Brake	Left Brake & Pres. Ret. to Bench	With levers in the full OFF position apply pressure to produce (8) GPM. Pressure drop shall not exceed 350 psi. (Minus Tare)	250) ps
1,€ ↓		3000	Pres.	Right Brake Ret. to Bench Left Brake to	following: Basic & -503: 1200 psi -501 & -505: 100 psi Pressure at Pressure Port shall not fall	ØK R	sure op /W OK mum let
				w/Needle Valve Inline	below the following:	øk R,	

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(TS35950C.DWG)

fortner engineering and manufacturing, inc.

HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CERTIFICATED F.A.A. REPAIR STATION #PU3R776L CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY

DACO S/N 444076 Customer FEDEX Chapter 32-44-03 F.E. S/N __

Revised

918 thompson avenue glendale, california 91201-2079

(818) 240-7740 / (213) 245-4591 fox (818) 240-1009 Page 3 of 8

Eff. Date 01/30/98

Certificate of Compliance and Test Data

N/C

35950-505 Dual Brake Metering Valve Assembly

Revision

Job #

			01/00/		TEST DATA	
Test #	Test For	Pressure psi	Test Port	Closed Port	Requirements	Results
и 17				Ret. to Bench	Basic & -503: 600 psi	OK R/W OK
1é 18	Pressure Drop	3000	Pres.	Left Brake Ret. to Bench Right Brake to	Pressure at Pressure Port shall not fall below the following: Basic & -503: 2500 psi -501 & -505: 2950 psi	Pressure Drop OK R/W OK Minimum Inlet Pressure OK R/W OK
25 19				Flowmeter	With pressure applied rapidly actuate & maintain input lever at 1.08 inch travel. Open needle valve at Right Brake to produce a flow of 16 GPM. The pressure drop (minus tare) shall not exceed the following: Basic & -503: 600 psi -501 & -505: 100 psi	OK R/W OK
10		500	Return	Left Brake & Right Brake to	With levers in the Full OFF position apply pressure. Flow from each Brake Port shall be steady and greater than 4.5 GPM with no tendency to block flow.	Left Brake OK R/W OK Right Brake OK R/W OK

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CERTIFICATED F.A.A. REPAIR STATION #PU3R776L CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY

DACO S/N 444676 Customer Feb Ex Chapter 32-44-03 F.E. S/N _____

Revised

glendale, california 91201-2079 (818) 240-7740 / (213) 245-4591

fax (818) 240-1009 Page 4 of 8 (TS35950D.DWG)

Certificate of Compliance and Test Data

Job # 35950-505 Dual Brake Metering Valve Assembly Eff. Date 01/30/98 Revision N/C

TEST DATA Test For Pressure Test Closed Requirements Results psiPort Port Drain all fluid from the end caps by removing bleeder valves. Replace bleeder valves; torque bleeder valves to 10-15 ft.-lbs. Apply pressure.

After a one minute wait record input lever travel & input force vs. gage pressure at the following pressures: Left Right Ascending Lever Travel Input Force Brake Brake Pressure (Inches) (Pounds) LEFT 145 5 OK oĸ 70 psi .129 - .1793.15 - 7.18R/W R/W 181 K164+ 5 OK OK Gages@ Brake 195 OK 7 OK Ports Functional .203-.254 5.84 - 10.36R/W R/W 3000 250 psi Pres. 60 psi Operation 8 0K OK Relief Z43 @Return 12 340 OK OK .345-.400 11.08-16.55 600 psi R/W R/W 367 15 OK OK 528 23 OK OK 1200 psi .590-.650 20.06-27.16 R/W R/W OK OK 26 560 ,720 46 OK OK 2500 psi .766 - .82539.52-50.16 R/W R/W 5Z -743 OK OK 57 47.00-59.00 (Basic&-503) OK OK .833-.892 3000 psi R/W R/₩ (-501&-505) .766-.825 OK .776 OK

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	(8	lendale, califori 18) 240-7740 / fax		C) 1079 591		2-44-03	F.E. S/N		
		B .DWG)	5 Dual	Cert Brake				оъ #	
Test #	Test For	Pressure psi	Test Port	Closed Port		Requirement	ts	Re	sults
2					lever travel Adjust and From Full to give not data with t	ed pressures.	770/1.090 in. 1 On screw. rs to retract Compare in Test #15.	OK R/	W OK
			Pres.	Gages@ Brake Ports 60 psi Relief @Return	Declining Pressure 2500 psi	(Inches) 770 Within ±.100 of Test 15	of Test 15 タス	Left Brake OK R/W OK	Right Brake OK R/W
<i>y</i> *3	Functional Operation				1200 psi	Within ± 100 of Test 15 . 560	Within ±6.88 of Test 15 /7.5	R/W OK	OK R/W OK
					600 psi	Within ±.100 of Test 15	Within ±4.84 of Test 15	OK R/W OK	OK R/W OK
					250 psi	Within ±.100 of Test 15	Within ±3.65 of Test 15	OK R/W OK	OK R/W OK
					70 psi	Within ±.100 of Test 15	Within ±3.03 of Test 15	OK R/W OK	OK R/W OK

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CERTIFICATED F.A.A. REPAIR STATION #PU3R776L CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY

Customer_	FEDEX	DACO	S/N	444076
Chapter	32-44-03	FE	S/N	

918 thompson avenue glendale, colifornia 91201-2079 (818) 240-7740 / (213) 245-4591

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Functional

Operation

3000

Certificate of Compliance and Test Data

35950-505 Dual Brake Metering Valve Assembly Job #

Eff. Date 01/30/98 Revision N/C Revised TEST DATA Test For Pressure Test Test Closed Requirements Results psi Port Port Drain all fluid from the end caps by removing bleeder valves. Replace bleeder valves; torque bleeder valves to 10-15 ft.-lbs. Apply pressure. WITHOUT waiting, record input lever

	travel & in	put force vs.	gage pres.		
	Ascending Pressure	Lever Travel (Inches)		Left Brake	Right Brake
Gages®	70 psi	.129179	3.15-7.18	OK R/W OK	OK R/W OK
Ports 60 psi Relief	250 psi	.203254	5.84-10.36	OK R/W OK	OK R/W OK
GRECUIT	600 psi	.345400	11.08-16.55	OK R/W OK	OK R/W OK
	1200 psi	.590650	20.06-27.16	OK R/W OK	OK R/W OK
	2500 psi	.766825	39.52-50.16	OK R/W OK	OK R/W OK
	3000 psi	(Basic&-503) .833892 (-501&-505) .766825	47.00-59.00	OK R/W OK	OK R/W OK

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HYDRAULICS / PNEUMATICS / ELECTRO MECHANICAL ASSEMBLIES

CERTIFICATED F.A.A. REPAIR STATION #PU3R776L CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY

Customer_	FED EX	DACO	S/N	444076
Chapter	32-44-03	FE	S/N	

Job #

918 thompson avenue glendale, california 91201-2079 (818) 240-7740 / (213) 245-4591

Page 7 of 8 fax (818) 240-1009 (TS35950G.DWG)

Certificate of Compliance and Test Data

35950-505 Dual Brake Metering Valve Assembly

	İ	Eff. Date	01/30/	/98	Revision TEST		Revised	01/26/00)
Test #	Test For	Pressure psi	Test Port	Closed Port		Requirement	s	Re	esults
					to give not data with	On allow lever ded pressures. that recorded shall not excel [Lever Travel (Inches)	Compare in Test #15.	Left Brake	Right Brake
					2500 psi	Within ±.100 of Test 15	Within±11.30 of Test 15	OK R/W OK	OK R/W OK
19	Functiona Operation	3401010		Gages® Brake Ports	1200 psi	Within ±.100 of Test 15	Within ±6.88 of Test 15	OK R/W OK	OK R/W OK
	SKIP	D	Pres.	60 psi Relief	600 psi	Within ±.100 of Test 15	Within ±4.84 of Test 15	OK R/W OK	OK R/W OK
					250 psi	Within ±.100 of Test 15	Within ±3.65 of Test 15	OK R/W OK	OK R/W OK
					70 psi	Within ±.100 of Test 15	Within ±3.03 of Test 15	OK R/W OK	OK R/W OK
36 4	Pinding	3500			Slowly move Lap assemble by normal le	levers towards ies shall return eakage at Retu	n as indicated rn Ports.	OK R/W OK	OK R/W OK
2 /	Binding	3500		Between	Brake Port. S position. Lap	Slowly move level assemblies shall	PSI @16 GPM at ers towards Off Il return as at Return Ports.	R/W	OK R/W OK

					CERTIFICATED F.A.A. REPAIR STATION #PUBRAZE CLASS 1 ACCESSORY RATING HOLDER OF SFAR 36 AUTHORITY CUSTOMER FOR EX. DACO S/N	444076	
	-	lendale, califor 18) 240-7740 / B fax		1-2079 5-4591 0-1009	Chapter 32-44-03 F.E. S/N		
					ac metering varie hasemony	ob #	
	1	Eff. Date	01/3	30/98		1/26/00	
Test #	Test For	Pressure psi	Test	Closed	TEST DATA Requirements	Results	
3€	Lever Travel	None	None None		Open bleed valves on 1st stage end caps and with zero inlet pressure, actuate levers from Full Off to Full On. Lever	OK R/W OK	
6					travel shall be 0.99±.010, and force required shall not exceed 9.0 lbs. at each lever.	OK R/W OK	
	NOTE:	The follo	wing	tests a	re a re-test of Tests #5&6.		
zs 7				Gages® Brake	With lever in the full OFF position apply pressure. Move lever to obtain 2200 psi at Brake Port. Slowly open needle valve to obtain 60cc leakage from Brake Port. Pressure at Brake Port shall not fall below 2000 psi.	Left Brake Brake	
34	Compensation 3000	ensation 3000 Pres.	w/inline	Connect a hand pump to needle valve	Left Right Brake Brake		
8					pressure must not exceed: 2550 for 35950 & 35950-503 2500 for 35950-501 & 35950-505	psi psi	
	35555		Lap	Assy.	Right Brake Lap Assys. 35555-35068 Lap Assy.		
	L/A S/	N			L/A S/N	1	
		8905 N			36905	6/06	
To	est Opera	tor <u>"10"</u>	1/). 	Inspector, M J. 1. Il Kesting was accomprished. Fready for installation		
		Nο	le: 1	Not a nit not	Il Kyting was accomprished.		