Attachment 4
To
Airworthiness Group Factual Report Addendum 1

Anti-Skid Manifold (S/N 113) Test Results

CRANE AEROSPACE & ELECTRONICS
HYDRO-AIRE P.L. PORTER A Crane Co. Company
3000 Winona Avenue, P.O. Box 7722, Burbank, CA 91510-7722
(818) 526-2600 FAX (818) 842-6117 TELEX 677694
FORM # 1834-C (6/93)

RETURNED MATERIALS REPAIR ORDER AND DISPOSITION REPORT

SERVICE REQ# 152713 JOB ORDER # 9076170 PROD LINE HYTROL VLV **REPAIR STATION #QD3R785L**

PART NO BEFORE MODIFICATION	PART DESCRIPTION	UNIT SERIAL NO	NEW PART NUMBER	NEW SERIAL NUMBER
33-177	ANTISKID MANIFOLD ASSY	113	N/A	

CUSTOMER NAME	LOCATION	PURCHASE ORDER NO	SALES ORDER NUMBER	DATE RECEIVED	SHIP DUE DATE
6398 FEDERAL EXPRESS CORPO	MEMPHIS TN	TBD		15-AUG-06	
		STATUS: NORMAL	RMA NUMBER: 188156		SHIP DATE

CUSTOMER REASON FOR RETURN CODE

NTSB ACCIDENT INVESTIGATION

CUSTOMER REJ NO | QUANTITY: 1 | A/C TAIL NO

RETURN CATEGORY

1. [ ] OVERHAUL
2. [ ] REPAIR
3. [ ] WARRANTY
4. [ ] REJECTION
5. [ ] MODIFY
6. [X] OTHER

GOVT: [ ] YES [X] NO

FAILURE ANALYSIS REQUIRED

VERIFICATION TEST RESULTS CODE:

[ ] VALID [ ] INVALID [ ] NOT APPLICABLE

VISUAL DESCRIPTION

FUSE C & D FITTINGS ARE BROKE.

FINDINGS

Fuses A and B, leakage over max of 1557 at 0.25 GPM (actual: A: 1600, B: 1640)

RESOLUTION CODE T.P. 33-177 Rev B 9-16-04

TESTED BY Jeff Hopper

DATE 8-16-06 TEST AREA 117

INSPECTED BY CALHOUN, KANDY DATE: 15-AUG-06

MFG DATE: 01-MAR-2005 PRIOR RETURN

OVERHAUL DATE:

SPECIAL QUALITY ASSURANCE INSTRUCTIONS FOR TESTING

Q.A. ENG

SUMMARY CODE: CORRECTIVE ACTION [ ] APPLICABLE [ ] NOT APPLICABLE WARRANTY HONORED **PENDING**

MAINTENANCE PERFORMED IAW SPEC, REV, DATE

TSN: TSO: CSN: CSO: Q.A. ENG DATE CONTAINER:

CUSTOMER P/N:

Jobs From S876178 To S876178
Sort By Job

Job: S876178

Assembly: 33-177
ANTISKID MANIFOLD ASSY
Status: Released

Serial Number:

Job Mass Loaded on 15-AUG-2005 09
Scheduled Start: 15-AUG-06 00:00
Scheduled Complete: 05-SEP-06 00:00
Routing Revision: 02 15-AUG-06 09:49
Total S/U Time: 2
Total Run time: 8
Routing Reference: REPAIR MECHANICAL

Start Quantity: 1
Lot Size: 0
Sketches:
PART:
DES DOC:
STANDARD REPAIR ROUTING FOR MECHANICAL

Set-Up	Dept	Dept Name	Que	PCS/Hr	S/U Insp.	Comp.Date	Acpt.	Rjct.	1st Artc.	Inspt.	NCMR	Op Seq:
0	087	Issue & Release	.0417	0		AUG 15 2006	1			130		800
0	103	Lab - Engineering Test	0	0								801
0	224	Engineering Hold	0	0								802
0	181	Verification Test	.0417	1		8/16/06	0	1		HA 115 T		810
0	191	Teardown & Evaluate	.0417	1								820
0	235	WARRANTY DISPOSITION	0	0								822

QUEUE RUN TO MOVE REJECT

CRANE HYDRO-AIRE
A SUBSIDIARY OF CRANE CO.

MUST BE PRINTED ON PINK PAPER

SHEET	1 OF 1
DATE	8/15/06
ENGINEER	C. Valent
MFR. ENGR.	
Q. A. ENGR.	

PRODUCT ANALYSIS TRAVELER

******THIS DOCUMENT TO ACCOMPANY PART AT ALL TIMES ******

PROBLEM: Gear collapse investigation

PART NO.	33-177
SERIAL NO.	113
N. C. M. R. REF.	
WORK ORDER NO.	8076178
PROGRAM	MD10 mod
CUSTOMER	FedEx

STEP NO.	ENGINEERING DIRECTION	ASSIGNED TO	BY	STEP	RESULTS	INSP/OPER.
1	remove the brake "C" and brake "D" fuse and replace with supplied				NOTE: "C" & "D" fuses damaged replacement req'd for testing	
2	Obtain oil Sample				Fuse S/N (C) = 0012	
3	perform current vs pressure test				Fuse S/N (D) = 0008	
4	Perform acceptance test. per TP — brake C & D not to run fuse test					

NOTE: AFTER COMPLETION OF EACH STEP THE COGNIZANT ENGINEER SHALL BE NOTIFIED BEFORE PROCEEDING TO NEXT STEP.

CRANE | HYDRO-AIRE DIVISION P/N: 33-197

PARTICLE COUNT DATA SHEET

FLUID	SAMPLE NUMBER	SOURCE	VOLUME	MO./DAY/YR.	COLLECTED BY	COUNTED BY
SKYDROL	113	RETURN	100ML	08/15/06		DegoV

MAG. X	AREA PER FIELD (A)	PARTICLE SIZE RANGE	FIELDS COUNTED (B)	TOTAL PARTICLES COUNTED (C)	PARTICLES IN SAMPLE (B x C)	PARTICLES PER ☐ Liter ☐ 100 mL ☐ cu. ft.	REMARKS
35	✓	250 M	ALL		13		
35		250 100	ALL		57		
35		100 50	ALL		210		
100		50 25	10		4000		
100		25 15	10		19,500		
100		15 5	10		41,500		

COMMENTS: W/O: 5876198 RMA: 188156 CLASS 9

FLUID	SAMPLE NUMBER	SOURCE	VOLUME	MO./DAY/YR.	COLLECTED BY	COUNTED BY
SKYDROL	113	A	100ML	08/16/06		DegoV

MAG. X	AREA PER FIELD (A)	PARTICLE SIZE RANGE	FIELDS COUNTED (B)	TOTAL PARTICLES COUNTED (C)	PARTICLES IN SAMPLE (B x C)	PARTICLES PER ☐ Liter ☐ 100 mL ☐ cu. ft.	REMARKS
35	✓	250 M	ALL		5		
35		250 100	ALL		10		
35		100 50	ALL		77		
100		50 25	10		1000		
100		25 15	10		5500		
100		15 5	10		32,000		

COMMENTS: SAME AS ABOVE CLASS 7

FLUID	SAMPLE NUMBER	SOURCE	VOLUME	MO./DAY/YR.	COLLECTED BY	COUNTED BY
SKYDROL	113	D	100ML	08/16/06		DegoV

MAG. X	AREA PER FIELD (A)	PARTICLE SIZE RANGE	FIELDS COUNTED (B)	TOTAL PARTICLES COUNTED (C)	PARTICLES IN SAMPLE (B x C)	PARTICLES PER ☐ Liter ☐ 100 mL ☐ cu. ft.	REMARKS
35	✓	250 M	ALL		7		
35		250 100	ALL		14		
35		100 50	ALL		103		
100		50 25	10		1700		
100		25 15	10		7,300		
100		15 5	10		33,200		

COMMENTS: SAME AS ABOVE CLASS 8

CRANE HYDRO-AIRE DIVISION

PARTICLE COUNT DATA SHEET

FLUID	SAMPLE NUMBER	SOURCE	VOLUME	MO./DAY/YR.	COLLECTED BY	COUNTED BY
SKYDROL	113	C	100ML	08/16/06		Reggie L.

MAG. X	AREA PER FIELD (A)	PARTICLE SIZE RANGE	FIELDS COUNTED (B)	TOTAL PARTICLES COUNTED (C)	PARTICLES IN SAMPLE (B x C)	PARTICLES PER ☐ Liter ☐ 100 mL ☐ cu. ft.	REMARKS
35	>	250 M	ALL		5		
35		250 100	ALL		8		
35		100 50	ALL		43		
100		50 25	10		2000		
100		25 15	10		19,300		
100		15 5	10		37,400		

COMMENTS: SAME AS ABOVE CLASS 8

CRANE HYDRO-AIRE DIVISION

PARTICLE COUNT DATA SHEET

FLUID	SAMPLE NUMBER	SOURCE	VOLUME	MO./DAY/YR.	COLLECTED BY	COUNTED BY
SKYDROL	113	D	100ML	08/16/06		Reggie L.

MAG. X	AREA PER FIELD (A)	PARTICLE SIZE RANGE	FIELDS COUNTED (B)	TOTAL PARTICLES COUNTED (C)	PARTICLES IN SAMPLE (B x C)	PARTICLES PER ☐ Liter ☐ 100 mL ☐ cu. ft.	REMARKS
35	>	250 M	ALL		7		
35		250 100	ALL		19		
35		100 50	ALL		111		
100		50 25	10		1200		
100		25 15	10		10,500		
100		15 5	10		27,700		

COMMENTS: SAME AS ABOVE CLASS 8

Form No. 1614 Rev.

TEST RECORD

As Recieved

DATE: 8/16/06
TITLE: Manifold Assy, Antiskid, MLG
SERIAL #: 113
OPERATOR: Jeff Hopper

Page 1 of 5
P/N: 33-177 Rev F
WO/RMDR#: 5876178
TYPE FLUID: Skydrol IV

QC Accept

Para.	Test	Test Requirements	Test Data
3.5	Examination of Product	No visual discrepancies	Pass (Fail)
4.1	Pre-Dielectric Insulation Resistance	200 megohms minimum	A 1000 megohms B 750 megohms C 1000 megohms D 1000 megohms
4.2	High Potential Dielectric Test	0.5 mA max. leakage and no damage at 1200 VAC 60 Hz	A Ø mA B Ø mA C Ø mA D Ø mA at 1200 VAC
4.3	Post-Dielectric Insulation Resistance	200 megohms minimum	A 1000 megohms B 750 megohms C 1000 megohms D 1000 megohms
4.4	Electrical Resistance Test	180 to 195 ohms	A 189 ohms B 189 ohms C 189 ohms D 190 ohms
4.5	Electrical Bonding	0.030 ohms maximum	A 0.0018 ohms B 0.0013 ohms C 0.0013 ohms D 0.0013 ohms

TEST RECORD

DATE: 8/16/06 Page 2 of 5

TITLE: Manifold Assy, Antiskid, MLG P/N: 33-177 Rev F

SERIAL #: 113 WO/RMDR#: S876178

OPERATOR: Jeff Hopper TYPE FLUID Skydrol IV

QC Accept

Para.	Test	Test Requirements	Test Data
5.2	Proof Pressure Test	No external leakage, weepage, permanent set, or other indications of damage	(Pass) / Fail
5.3	Antiskid Pressure Gain	Within Figure 6-2 Envelope @ 3000 psig supply and hysteresis less than 1.65 mA between 2800 and 200 psig brake pressure	A (Pass) / Fail 1.3 mA B (Pass) / Fail 1.1 mA C (Pass) / Fail 0.5 mA D (Pass) / Fail 1.0 mA
5.3.5	Droop Test	Above Droop Gate of Figure 6-2 @ 1000 psig supply and hysteresis less than 1.65 mA between 800 to 200 psig brake pressure	A (Pass) / Fail 0.5 mA B (Pass) / Fail 0.5 mA C (Pass) / Fail 0.5 mA D (Pass) / Fail 0.5 mA
5.4	Stability Test	No instability	A (Pass) / Fail B (Pass) / Fail C (Pass) / Fail D (Pass) / Fail

TEST RECORD

DATE: 8/16/06 Page 3 of 5

TITLE: Manifold Assy, Antiskid, MLG P/N: 33-177 Rev F

SERIAL #: 113 WO/RMDR#: 5876178

OPERATOR: Jeff Hopper TYPE FLUID: Skydrol IV

QC Accept

Para.	Test	Test Requirements	Test Data
5.5	Step Input Response Test	Pressure Reduction within 0.020 sec. of signal application	A 0.015 seconds B 0.013 seconds C 0.013 seconds D 0.014 seconds
5.6	Internal Leakage Test	Between 800 and 286 cc/min. @ 1500 psig brake pressure	Blocked Port 45 cc/min Tare 35 cc/min A 685 cc/min B 605 cc/min C 550 cc/min D 610 cc/min
5.7	Pressure Sag	130 psid max @ 1500 psig	A 20 psid B 30 psid C 55 psid D 48 psid
	Droop Leakage	900 cc/min max @ 1500 psig	560 cc/min
5.8	Pressure Drop — Pressure To Brake	650 psid max at 5.0 GPM w/ 0 mA	Tare 55 psid A 290 psid B 255 psid C 255 psid D 220 psid

TEST RECORD

DATE: 8/16/06
TITLE: Manifold Assy, Antiskid, MLG
SERIAL #: 113
OPERATOR: Jeff Hopper

Page 4 of 5
P/N: 33-177 Rev F
WO/RMDR#: S876178
TYPE FLUID Skydrol IV

QC Accept

Para.	Test	Test Requirements	Test Data
5.9	Pressure Drop - Brake To Return	500 psid max at 10 GPM w/ 55 mA	Tare 220 psid A 380 psid B 370 psid C 380 psid D 365 psid
5.10	Fuse Flow Test	655-1310 cc at shutoff (40-80 in^3) @6 GPM	A 1260 cc B 1320 cc C N/A cc D N/A cc
		Flow in bypass 3.0 GPM minimum	A 7.1 GPM B 7.5 GPM C N/A GPM D N/A GPM
		655-1557 at shutoff (40-95 in^3) @ 0.25 GPM	A 1600 cc B 1640 cc C N/A cc D N/A cc
5.11	Fuse Reset Procedures	Within 5 sec @ 5 psid max will not @ 20 psid or greater	A ACC B ACC C N/A D N/A

TEST RECORD

DATE: 8/16/06 Page 5 of 5

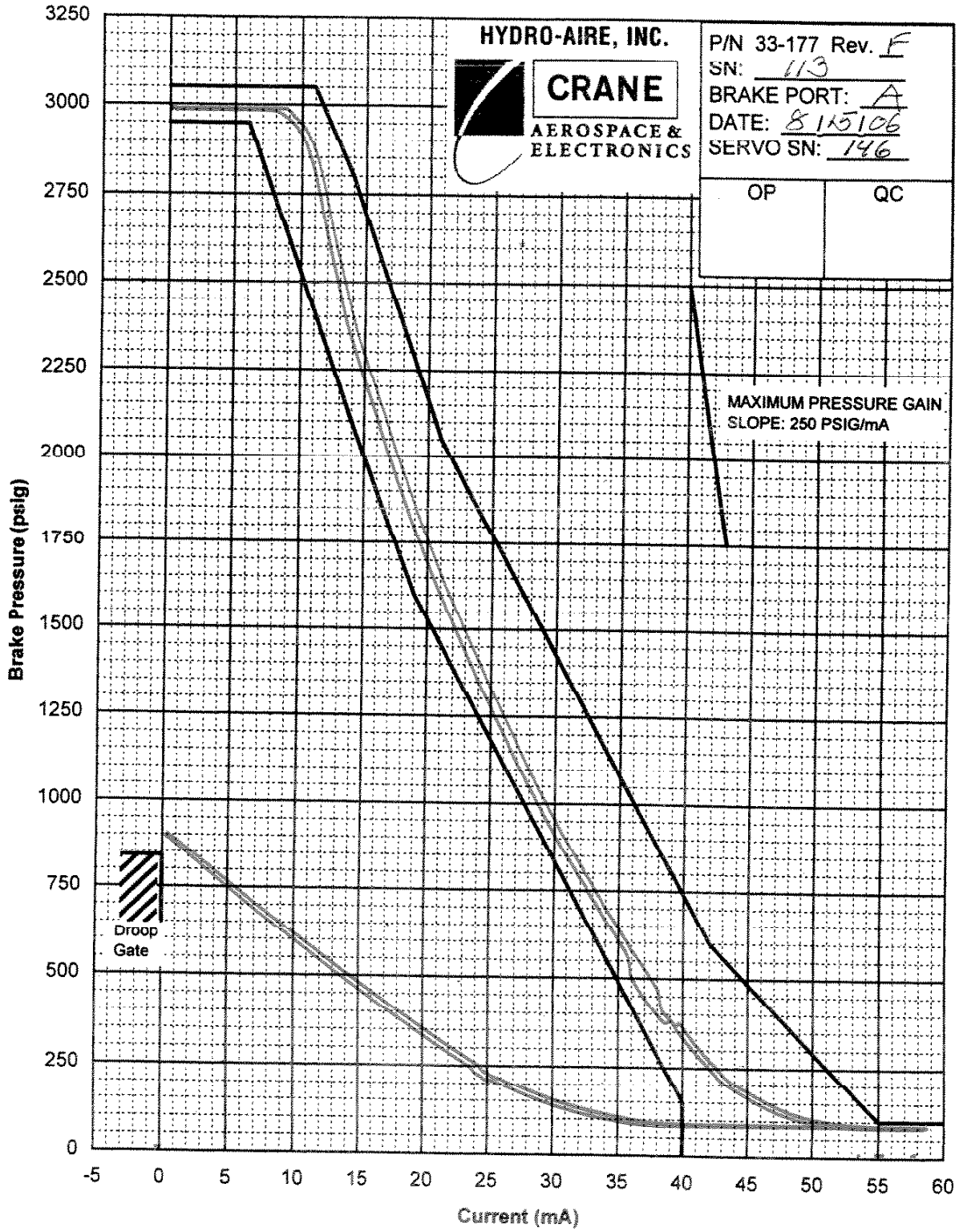
TITLE: Manifold Assy, Antiskid, MLG P/N: 33-177 Rev F

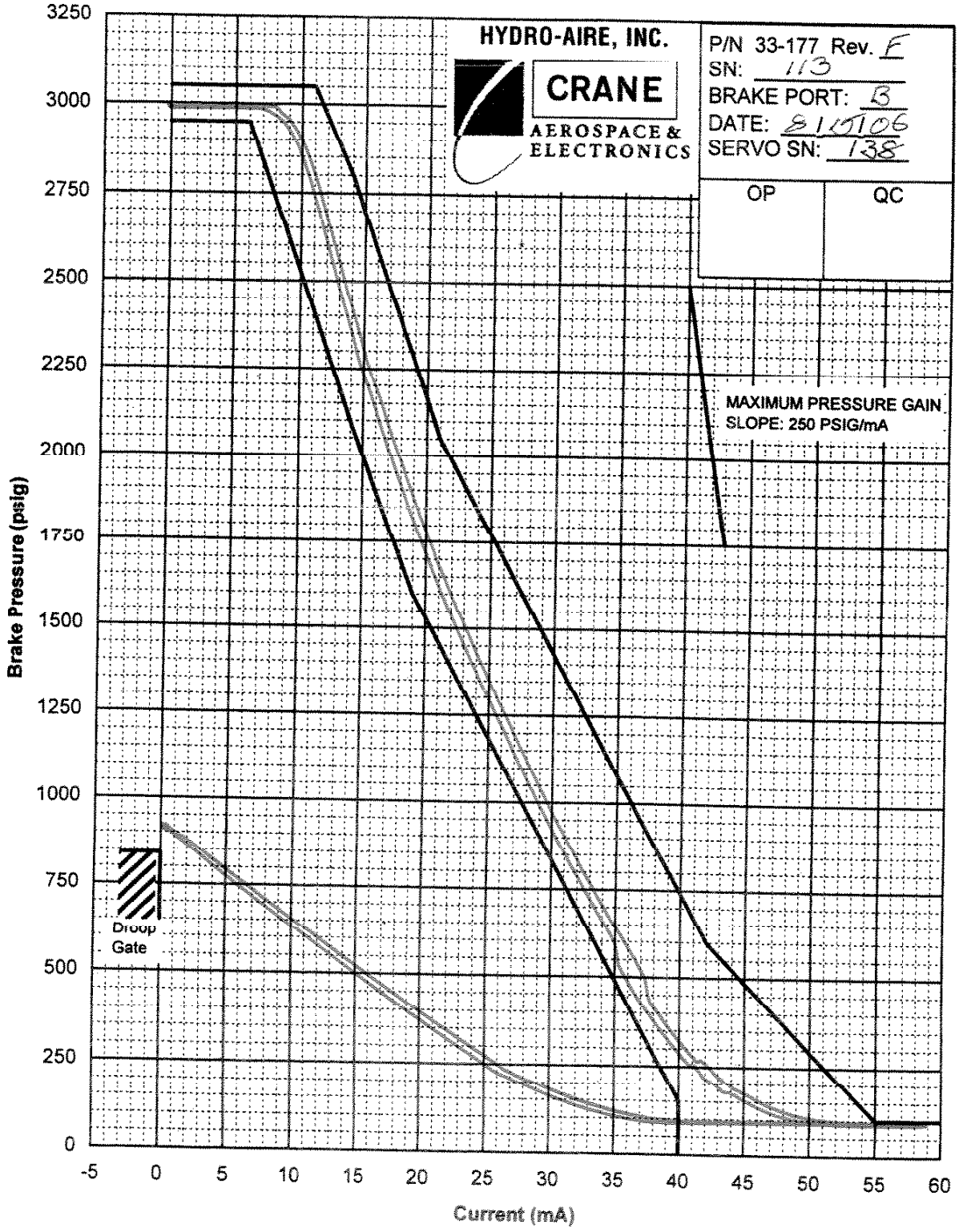
SERIAL #: 113 WO/RMDR#: 5876178

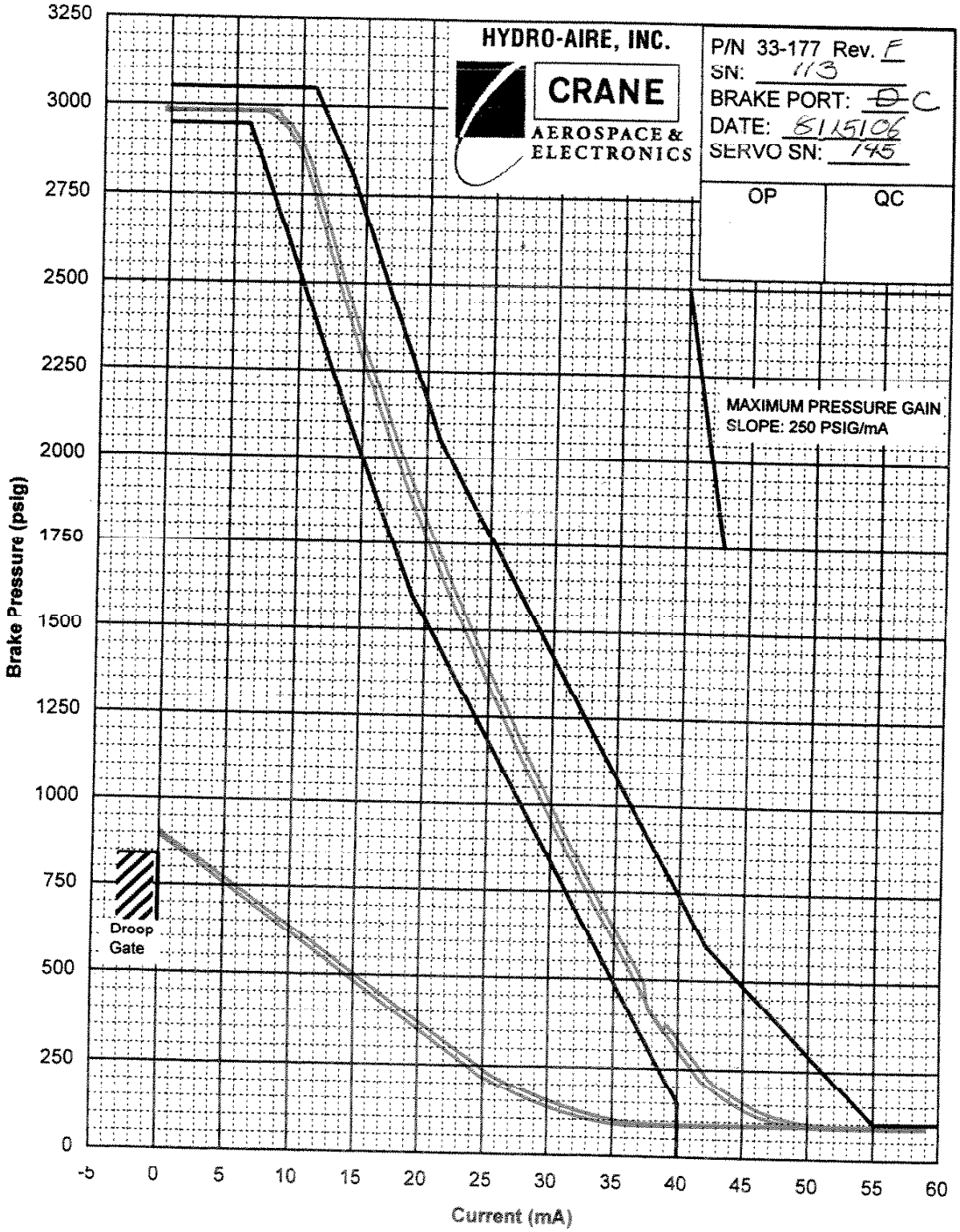
OPERATOR: Jeff Hopper TYPE FLUID Skydrol IV

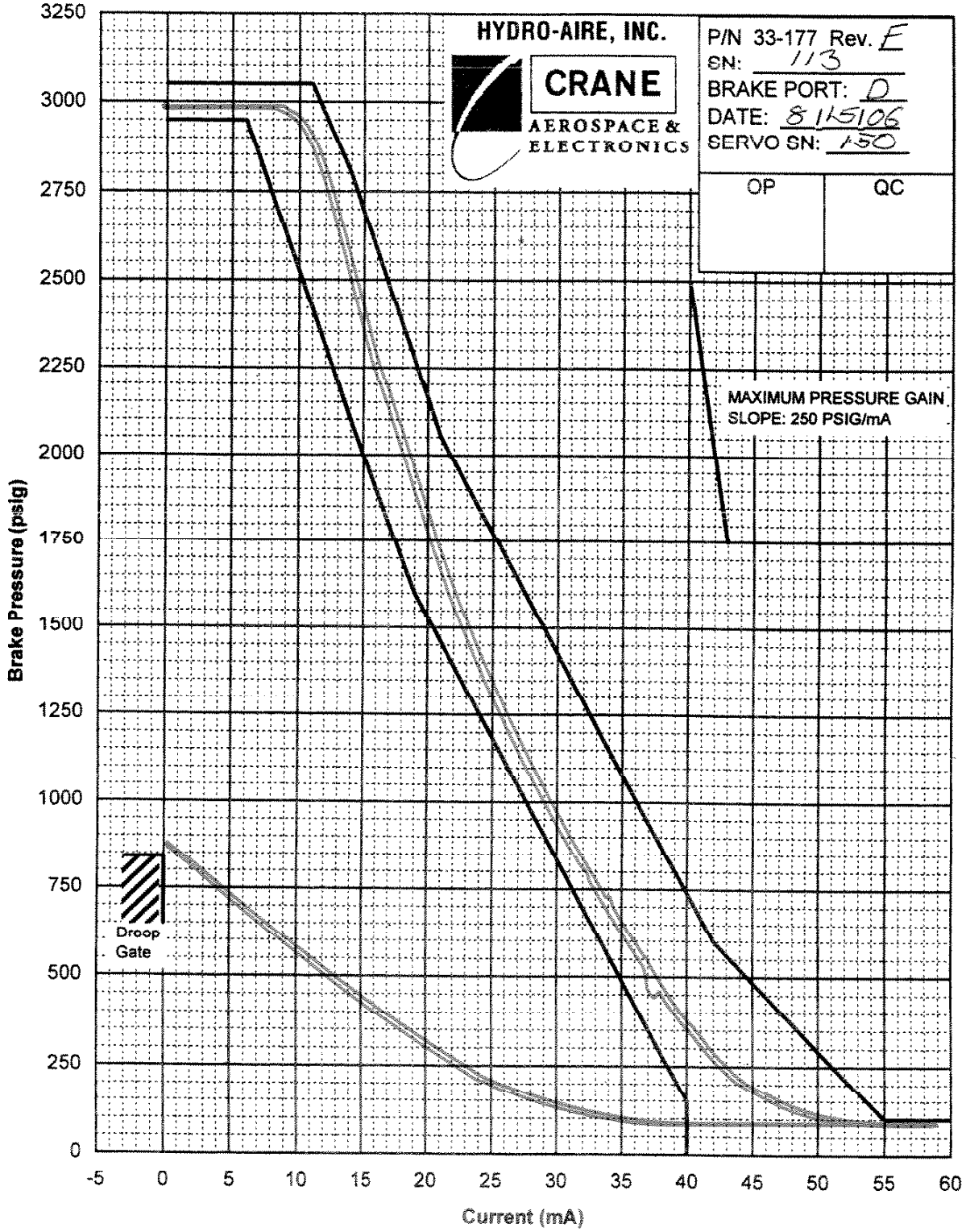
QC Accept

Para.	Test	Test Requirements	Test Data
6	Serial Number	Antiskid Control Valve P/N ~~39-883~~ 39-887	A 146 B 138 C 145 D 150
		Fuse P/N 38-969	A 0069 B 0085 C 0012 D 0008


HYDRO-AIRE, INC.
CRANE
AEROSPACE & ELECTRONICS
P/N 33-177 Rev. F
SN: 113
BRAKE PORT: A
DATE: 8/25/06
SERVO SN: 146
OP
QC
MAXIMUM PRESSURE GAIN
SLOPE: 250 PSIG/mA
Droop Gate
Brake Pressure (psig)
Current (mA)
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
-5
0
5
10
15
20
25
30
35
40
45
50
55
60


HYDRO-AIRE, INC.
CRANE
AEROSPACE & ELECTRONICS
P/N 33-177 Rev. E
SN: 113
BRAKE PORT: B
DATE: 8/10/06
SERVO SN: 138
OP
QC
MAXIMUM PRESSURE GAIN
SLOPE: 250 PSIG/mA
Droop Gate
Brake Pressure (psig)
Current (mA)
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
-5
0
5
10
15
20
25
30
35
40
45
50
55
60


HYDRO-AIRE, INC.
CRANE
AEROSPACE & ELECTRONICS
P/N 33-177 Rev. F
SN: 113
BRAKE PORT: D C
DATE: 8/15/06
SERVO SN: 195
OP
QC
MAXIMUM PRESSURE GAIN
SLOPE: 250 PSIG/mA
Droop Gate
Brake Pressure (psig)
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
-5
0
5
10
15
20
25
30
35
40
45
50
55
60
Current (mA)


HYDRO-AIRE, INC.
CRANE
AEROSPACE & ELECTRONICS
P/N 33-177 Rev. E
SN: 113
BRAKE PORT: D
DATE: 8/15/06
SERVO SN: 150
OP
QC
MAXIMUM PRESSURE GAIN
SLOPE: 250 PSIG/mA
Droop
Gate
Brake Pressure (psig)
3250
3000
2750
2500
2250
2000
1750
1500
1250
1000
750
500
250
0
-5
0
5
10
15
20
25
30
35
40
45
50
55
60
Current (mA)