

72.113-58/10

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AVRO AIRCRAFT LIMITED
INTER-DEPARTMENTAL MEMORANDUM

Ref: 4398/11/J
Date: 1 October, 1958
To: See Distribution
From: E.F. Burnett - Weights Supervisor
Subject: Arrow 2 Production A/C Weight and C.G. Summary Report 7-0400-34 Issue 24

Attached is a copy of Weight and C.G. Summary Report 7-0400-34 Issue 24 dated October 1, 1958, for your retention.

This report is revised monthly and is issued complete on the 1st of each month.

Classification *confirmed as* ~~cancelled~~ / changed to: UNCLASSIFIED

By authority of: DRDA 7/DARFT 5-8/DAS Eng 6-4-5

Date: 5 Nov 1992

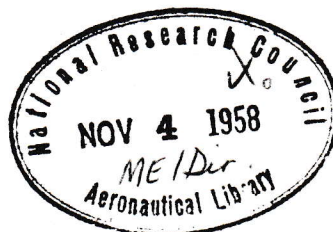
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Unit / Rank / Appointment: DSIS 3, Secretary CRAD HQ DRP

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Aircraft: Arrow 2
Prod. A/C
Date : 1 October, 1958

Report: 7-0400-31
Issue: 24

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I N D E X

<u>Sheet</u>	<u>Content</u>
1-1 to 1-5	Introductory notes and explanation of Weight changes.
2-1 to 2-2	Weight & C.G. Summary
3	Horizontal C.G. Plot showing basic fixed points on flight envelope. The possible variations of C.G. with fuel used has been omitted until such time as fully approved fuel sequencing is established.
4-1 to 4-15	I.B.M. Detail sheet of Weight and C.G.'s

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Introduction & Weight Changes

The following is a Weight and C.G. Summary of the Arrow 2 Production Aircraft serial No. 25237 and subsequent, based on the latest weight estimates available. All weight and C.G. changes are relative to issue 23 of September 1, 1958.

Early Arrow 2 aircraft will not be as this summary designates but will be Flight Test vehicles with Instrumentation. Appropriate Weight Statements for Aircraft Serial Nos. 25206 through 25236 will be issued at a later date.

General:

- a) Orenda PS13 engines comprise the Power Plant (4,500 lbs each, ref. EMS8, excluding Nose Bullet, Inlet Frame and AVRO installed accessories).

Early Arrow 2 Aircraft will be fitted with Orenda PS13 engines weight 4835 lb each excluding the above mentioned components.

- b) A package containing 4 "semi-submerged" Sparrow II missiles (432 lb each) forms the current Armament.
- c) The R.C.A. Astra I Radar system is installed. The unit weights quoted herein are as received from R.C.A. in their weight statement dated June 5th, 1958. This included the Infra Red Tracker system seeker head installed in its Fin Pod location.

(Total Weight of the installed system is 3336lb, including Missile actuation and firing system).

In addition the above, Minneapolis-Honeywell MH64 Damping System is installed.

Arrow 2 Aircraft 25206 to 25208, and some later serial numbers will have the "Astra Minus" system (Navigational and Communication equipment only).

- d) Where actual weights of Arrow I parts that apply to Arrow 2 Aircraft have been obtained, these weights have been recorded in the Arrow 2 records, some weights for Arrow 2 parts have also been obtained.

On I.B.M. sheets in the report, immediately preceeding the item title will be found a number varying from 0 to 100. This is the percentage actual weight recorded in the relevant item.

- e) To increase the long range capabilities of the Aircraft tailcone plugs have been introduced to restrict the exhaust area. Provision for carrying these plugs, which are jettisonable, will be made on all Mk 2 A/C. The plug may be installed for any mission, but would probably be jettisoned prior to combat. It is only recorded in this report for a ferrying mission.
- f) This issue incorporates a Lucas-Rotax Electrical Power System and the Westinghouse components are deleted.

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Structure

Weight lb

a) Wings

Structure Aft of Rear Spar - deletion of shear plates and shear blocks	-	0.36
Dorsal Fairings - incorporation of actual weights	-	1.02
Rib 10 - actual weight obtained	-	0.94
<u>Wing Weight Decreased</u>	-	<u>2.32</u>

b) Fin and Rudder

Deletion of hinge brackets for damper	-	2.03
Additional hardware and brackets	+	1.07
Additional seal for L/E and dorsal fairing brackets	+	1.30
<u>Fin and Rudder Weight Increase</u>	+	<u>0.84</u>

c) Fuselage Fwd Sta. 255 ins

Cockpit Formers - addition of flying controls and electrical pick up brackets	+	1.37
Top Longerons F.F. - addition brackets and hardware	+	2.01
Windscreen - addition fibre glass glare shield	+	1.46
Pilots Canopy - addition of brackets	+	0.53
Navigators Canopy - addition of hardware	+	0.21
<u>Front Fuselage Increase</u>	+	<u>5.58</u>

d) Centre Fuselage Sta 255 - 485 ins

No weight change.

e) Duct Bay Sta 485 - 591.65 ins

Lower Forward Side Panels - addition of clips and hardware	+	0.44
<u>Duct Bay Increase</u>	+	<u>0.44</u>

f) Engine Bay Sta 591.65 - 742.5 ins

No weight change.

g) Rear Fuselage Sta. 742.5 ins aft

Outer Skins - addition of pulley support for para. brake controls, and hardware	+	0.79
Tailcones - addition of skin stiffeners	+	1.43
addition of conduit and clips for electrics	+	1.98
Centre Structure & Stinger - addition of seal and door lock indication	+	0.26

Rear Fuselage Increase 4.46

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h) Fuselage Joints

Weight lb

Joint Duct Bay to Engine Bay - addition of grounding pad and hardware	+ 0.25
Design change addition of heat exchanger mountings previously omitted.	+ 7.05

<u>Fuselage Joints Increase</u>	<u>+ 7.30</u>
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<u>Total Structural Increase</u>	<u>+ 15.80</u>
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2. Landing Gear

Main Gear - Design change heavy wheel assemblies now incorporated	+ 16.00
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<u>Total Landing Gear Increase</u>	<u>+ 16.00</u>
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N.B. Early Arrow 2 A/C will have a heavier Main Gear (approx. + 55.0 lb/side) since existing forgings are to be used. The currently recorded weight for Arrow 2 Production A/C is 675 lb/leg (including drag stay but less wheel assemblies.

3. Power Plant & Services

P.S. 13 Engines

a) Iroquois Engine incorporated at 4,500 lb each ref. EMS8	- 600.00
b) Structure - deletion of engine restrictor flaps	- 2.50
addition of minor brackets and hardware	+ 1.46
c) Inlet Frame & Nose Bullet incorporation of Orenda estimate	- 28.00
d) Power Take-Off Gear Box Previous weight assumed identical	
installation as for J 75 Engines now	- 79.55
only gear box to adapt diagonal drive shaft is required ref. Orenda.	
e) Air Restrictor - Previously considered as an Avro supplied item and included in "Structure" now Orenda supplied.	+ 20.00
f) Pneumatic Starter - Orenda quotes target weight (23.0 lb)	+ 1.00
g) Anti Icing Lines)	
h) Alternator Support) No previous allowances	+ 14.00
j) Alternator Drive shaft)	
k) Tacks Generator) Orenda quotations	+ 8.00
l) L.P. high Temp Tacho.)	
m) Installation Constant Speed Drives - both G.E. and Sundstrand quote 70.0 lb each.	- 7.00
n) Installation CSU Oil Lines - First production dwg. estimate	- 1.15
Accessories Gear Boxes on Fuselage - First production dwg estimate	- 2.06
Starters and Gear Boxes on Engines - see para. (d) above	

<u>Total Power Plant Decrease</u>	<u>- 675.80</u>
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4. Flying Controls Group

Weight lb

Flying Controls Hydraulics I/W - Return lines now steel (CST 162) were alluminum alloy (CST 136)	
Pressure lines increased in wall thickness now CST 136 were CST135 +	17.24
Flying Controls Hydraulics O/W - Arrow 1 filters (steel) now fitted were Arrow 2 alluminum alloy	+ 12.90
Return lines now steel were)	
alluminum alloy)	+ 1.79
Pressure lines increase wall thickness)	
Flying Controls Hydraulics Fin - Filter element retainer now steel +	0.59
was alluminum alloy	
Return lines now steel pressure lines increase in wall thickness +	<u>1.16</u>

The above changes necessitated by Stress requirements ref. Assignment X 74.4063

Total Flying Controls Increase + 33.68

5. Equipment Fixed and Removable

Oxygen System - First production estimate. Quantity gauge duplicated in error already included in Panel E22 - Electrics	
Front Fuselage	- 1.24
Converter actual wt. 12.33 was 16.00 (based on Arrow 1)	- 3.67
Air Conditioning System - Addition of nitrogen pipe assy for I.R. seeker	+ 2.34
Addition of silencers in cockpit	+ 9.91
Utility Hyd. F/Fuselage - incorporation of equipment & piping for the Nose U/C door sequencing	+ 9.76
Nose U/C Door Sequencing Mechanism - this report is now cancelled see above.	- 27.00

The large weight decrease (-17.24 lb) in the two combined reports is due to design refinement and integration into basic utility hydraulic system. Previously an Arrow 1 "lash-up" allowance was carried.

Windscreen Demisting - First prod. estimate - deletion of cable allowance now contained in Electrics Cables	
Electric C/Fuselage - Design change addition of 3 off	+ 5.46
Fire detection control units & resistor to Panel E 5	
Electrics Duct Bay - Decrease in Clipping	- 1.41
Design change - incorporated Lucas-Rotax Power System instead of Westinghouse.	- 32.00
Transformer Rectifier unit 164 lb (Mnfrs quote was 196 lbs (Mnfrs quote)).	
Electrics Engine Bay - Design change addition of 2 off Current Transformers (Lucas-Rotax)	+ 3.50
Electrics Wing - First production estimate	- 0.53
Electrics Rear Fuselage - addition of clipping of cables associated with tailcone plug jettison circuits.	+ 0.40

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	<u>Weight lb</u>
5. Cont'd Electrics Tailcone Plug Jettison - New report incorporates equipment and wiring for actuation and indication circuits for the "explosive bolts.	+ 8.09
<u>Total Equipment Group</u>	<u>- 28.77</u>

6. Trapped Fuel
No weight change.

7. <u>Useful Load</u> Engine & Accessories Gear Box Oil - addition of separate oil system for constant speed units	+ 23.04
<u>Total Useful Load Increase</u>	<u>+ 23.04</u>

SUMMARY

Weight Change - Aircraft Basic Weight

Structure	+ 15.80
Landing Gear	+ 16.00
Power Plant	- 675.80
Flying Controls	+ 33.68
Equipment	<u>- 28.77</u>
Total	<u>- 639.09</u>

Weight Change - Operational Weight Empty (A/C less Usable Fuel)

Operational Load Increase 23.04 lb

Issue 23

47,261.94

Issue 24

46,645.89

-616.05 lb

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Wt. & C.G. Summary Full Astra Installed

Description	Weight lb	H. Arm ins	V. Arm ins
Structure	19,227.90	566.61	137.31
Wings	10,038.79	642.93	142.18
Fin and Rudder	1,041.69	754.71	209.51
Fuselage Fwd Sta. 255 ins	2,604.20	184.54	128.61
Sta. 255 - 485 ins	1,715.13	375.75	129.90
Sta. 485 - 591.65 ins	1,160.68	538.42	105.64
Sta. 591.65 - 742.5 ins	1,576.20	659.72	110.61
Sta. 742.5 in aft	1,041.27	806.98	129.18
"Marry - Up"	49.94	483.56	107.06
Landing Gear - Retracted	2,697.98	489.31	135.08
Main Landing Gear	2,048.67	538.68	141.00
Main Gear Doors & Fairings	287.98	538.52	138.40
Nose Landing Gear	333.81	170.81	99.70
Nose Gear Door & Fairing	27.52	162.22	88.66
Power Plant & Services	10,770.92	671.51	121.74
Engines Bare PS 13	9,000.00	689.94	121.25
Engine Accessories (Inlet Frame etc)	388.05	617.84	118.34
Engine Controls	32.32	379.90	117.49
Gear Boxes & Drives on Fuselage	291.87	608.57	103.28
Gear Boxes & Starters on Engine	146.45	601.97	113.57
Fire Extinguisher System	73.58	686.35	131.21
Engine Mountings	75.39	671.91	141.52
Fuel System	763.26	529.78	135.19
Flying Controls Group	1,965.94	652.84	138.24
Mechanical Flying Controls	958.44	677.70	147.62
Hydraulic Flying Controls	1,007.50	629.19	129.32
Equipment Fixed & Removable	9,081.96	331.58	114.33
Instruments	34.61	167.52	138.92
Probe	15.25	-23.71	108.00
Cockpit Pressure Sealing	5.00	186.00	130.00
Cabin Consoles	17.28	174.66	124.33
Oxygen System	21.16	259.40	156.88
Cockpit Equipment	6.00	187.50	145.00
Ejector Seats	342.94	204.50	134.11
Air Conditioning System	888.56	345.34	136.28
Cockpit Insulation	14.31	187.48	132.00
Hydraulics Utilities System	641.33	498.85	118.15
Mech. Door Stops Main U/C Doors	3.02	516.00	120.00
Anti Skid Controls System	37.68	480.00	113.97
Drag Chute	91.07	786.68	143.19
Electrical System	1,235.29	433.94	113.07
Low Pressure Pneumatics	50.08	394.66	126.02
Surface Finish	100.00	591.52	140.20
Intake De-icing Boots	88.00	195.82	118.00
Canopy Actuation	64.92	221.99	154.35
Radar Door Actuation	10.00	268.00	95.00
Radio & Radar Removable	2,110.48	212.15	108.76
Radio & Radar Fixed	880.04	216.54	114.59
MH 64 Damping System	186.42	462.33	134.70
Sparrow Pack Structure	906.31	383.90	98.72

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Description	Weight lb	H. Arm ins	V. Arm ins	M.A.C. %
Sparrow Pack Mechanisms	557.32	372.64	99.11	
Sparrow Pack Hydraulics	369.70	378.00	104.00	
Sparrow Pack Elec. & Electronics Fixed	188.73	336.09	110.00	
Sparrow Pack Air Conditioning	5.21	305.50	102.50	
Sparrow Pack L.P. Pneumatics	24.45	386.92	103.50	
Sparrow Pack Electronics Removable	186.80	326.19	100.00	
Trapped Fuel	213.80	548.26	141.79	
U/C Up		542.78	128.67	
Aircraft Basic Weight	43,958.50			
U/C Down		545.13	124.79	
Useful Load (less usable fuel)	2,687.39	365.65	101.90	
Crew	390.00	194.00	186.50	
Engine Fire Ext. Fluid	25.00	730.00	129.00	
Oil	162.00	638.31	110.89	
Oxygen Charge	13.39	259.69	159.91	
Water for Air Conditioning	285.00	267.91	131.56	
Missiles	1,728.00	289.29	88.30	
Missile Coccons	84.00	390.40	85.80	
U/C Up		532.57	127.13	26.68
Operational Weight Empty	46,645.89			
U/C Down		534.79	123.47	27.29
Normal Combat Mission Fuel ϕ (200 Nav. miles 2267 gals @ 7.8 lb/gal)	17,684.00			
Normal Gross Weight	64,329.89			
Half Combat Mission Fuel (1134 gal @ 7.8 lbs/gal)	8,842.00			
Combat Weight ($\frac{1}{2}$ mission fuel)	55,487.89			
Max. Int. Fuel (2491 gal @ 7.8 lb/gal)	19,433.00	541.85	144.16	
U/C Up		535.30	132.14	27.43
Gross Weight (Max. Int. Fuel)	66,078.89			
U/C Down		536.87	129.55	27.87
Max. External Fuel (500 gal. @ 7.8 lb/gal + drop tank)	4,242.36	520.32	60.79	
Tailcone Plugs *	252.00	857.07	128.60	
U/C Up		535.55	127.84	27.50
Max. Gross Wt. (Internal + Ext. Fuel)	70,573.25			
U/C Down		537.01	125.42	27.90

* Ref. Note e) in Introduction

ϕ Fuel weights in accordance with latest data issued by Performance group dated February 17, 1958 issue 13. Centres of Gravity have temporarily been omitted until a fuel sequencing system is finally established.

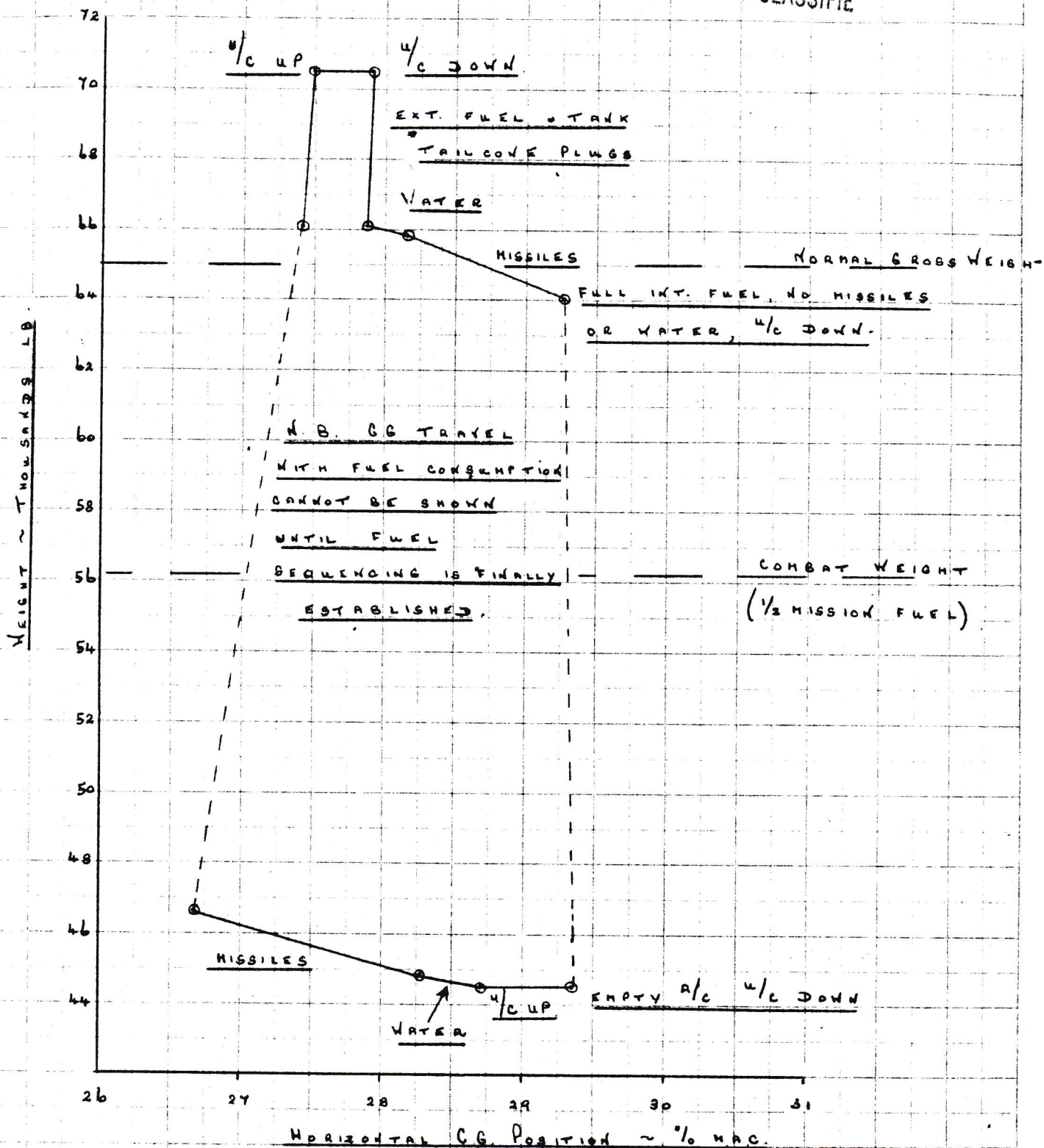
DATE Oct. 1st 1968

SHEET 3

BY P. L. French

HORIZONTAL C.G. PLOT OF
FIXED POINTS ON ARROW 2
FLIGHT ENVELOPE

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DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
TOTAL WING GROUP	10000000						
OUTER WING SKINS	10100000						
100 OUTER WING SKINS	10100001	64	92910	70646	13597	65637199	12632973
100 POSTS AND INTERCOSTALS	10100002	64	24367	73207	13410	17833323	3266668
100 OUTER WING SPARS	10100003	64	39258	70608	13579	27719289	5330844
100 OUTER WING RIBS	10100004	64	13456	69506	13650	93527227	1836744
100 AILERON CONTROL BOX	10100006	64	37920	77409	13508	29353493	5122234
100 RIB 12	10100007	64	76266	64873	13832	49472215	1054828
100 O W AILERON JACK FITTING	10100009	64	10446	72791	13670	7613394	1422988
100 AILERON JOINTS AND FAIRING	10100010		32933	78726	13224	2392447	435466
			197945			142147087	26882745
100 AILERON	10200007	4	33600	79213	13556	26615568	4554816
			33600			26615568	4554816
20 ELEVATOR HARRY UP	10300000	82	44638	75618	14260	33754363	6365379
20 ELEVATOR HARRY UP	10300001		15977	73810	14260	11787746	227732
			46235			34933109	6593111
INNER WING	10400000						
70 MAIN UC STRUCTURE	10400001	62	33315	57743	113983	192337080	4656436
16 INNER WING SPARS	10400002	62	41112	58060	114318	23869627	5886416
5 I W STRUCTURE F S TO M S	10400007	62	10973	30499	22411	54781605	15791244
I W STRUCTURE M S TO R S	10400008	62	15130	60868	114563	9209328	2203382
STRUCT AFT OF REAR SPAR	10400009	62	31603	72041	114887	22767117	4704739
40 ELEVATOR CONTROL BOX I W	10400010	62	42838	72470	114328	31044699	6137829
25 TRANSF JOINT HARRY UP	10400011		70656	63624	113876	44948224	9803339
38 CENTRE LINE JOINTS	10400012	62	59083	66241	115030	39137170	8880175
INNER WING SKINS	10400013	62	22510	76272	114469	41202868	32570732
17 STRUT PICK UP FITTINGS	10400014	62	12740	61711	114584	7861981	18588002
8 RIBS 1 TO 9 INNER WING	10400016	62	48618	61173	114513	29741029	7055930
DORSAL FAIRING I W	10400017	62	11134	82701	116150	54545	18250
100 RIB 10	10400018	62	10706	63683	113835	6817902	1481175
49 FUSELAGE HINGE JOINT I W	10400019	62	12628	61688	113790	7789961	17441401
25 TRANSF JOINT	10400020	62	12942	63071	113710	8162649	1774348
49 FUSELAGE HINGE JOINT	10400021		39355	32341	114364	2094758	565223
DORSAL FAIRING C A	10400023		5913	56740	115963	3355036	943892
SHUT OFF VALVE OPERAT MECH	10400024	62	5135	49651	14180	281970	72743
LEADING EDGE I W	10400025	62	22138	46841	114423	10369661	3192964
			695229			422273870	100517220
LEADING EDGE O W	10500000	65	30870	63013	113561	19452113	4186281
			30870			19452113	4186281

PROJECT

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
SKIN D H	3040000156	56	622753483	11227	3330386	699105	
FORMERS D B	304000256	56	733553530	11438	3926426	838977	
5 TOP LONGERONS	304000356	56	498553899	13550	268417	67479	
MTG BRKTS SIDE PANEL	304000456	56	190551866	13066	98545	24825	
72 LOWER LONGERONS	304000556	56	103015223	9914	5380830	1021241	
MAIN FRAME STA 538 77	304000656	56	598055387	10383	3221845	620903	
ACCESS PANELS	304000756	56	387454281	9976	2048169	386470	
LOWER PANEL ASSY	304000856	56	217554557	8901	118389	193315	
20 DROP TANK MTG STRUCTURE	304000956	56	841558554	8847	4924359	74403	
LOWER SIDE PANELS FWD	304001056	56	107561508	9269	5469856	996974	
LOWER CENTRE PANEL FWD	304001156	56	279151322	8886	1432397	248008	
LOWER SIDE PANELS AFT	304001256	56	669856934	8863	3813439	593644	
LOWER CENTRE PANEL AFT	304001356	56	260956600	8794	1476694	229435	
FLOATING DUCT D H	304001456	56	455555536	11713	2522061	5335857	
			103872		56296447	11156636	
ENGINE BAY	3050000058	58	674667781	13921	450084	93828	
100 TOP LONGERONS	305000158	58	843265911	9971	5557616	640755	
84 BOTTOM LONGERONS	305000258	58	136046404	9057	8712002	1232114	
ENGINE ACCESS DOORS	305000358	58	613246562	12110	40242035	7426336	
71 ENGINE TUNNEL	305000458	58	290668763	11364	1998253	3302338	
ENGINE RAILS ATTACH TO FORM	305000558	58	111176502	9254	7228385	1028767	
PANELS AT ENG ACCESS DOORS	305000658	58	461061780	8915	2848052	410982	
BOTTOM CTR PANEL FWD	305000758	58	412067078	9239	2763614	380647	
BOTTOM CTR PANEL CENTRE	305000858	58	766672063	9554	5524350	732410	
BOTTOM CTR PANEL AFT	305000958	58	860561609	11693	5301454	1006183	
5 SIDE PANEL FRONT	305001058	58	747467063	11922	5012289	891050	
5 SIDE PANEL CENTRE	305001158	58	745372146	12188	5377041	908372	
32 SIDE PANEL AFT	305001258	58	196356605	10967	12970488	2153370	
41 HEAVY FORMERS	305001358	58	157620		103985669	17435052	
REAR FUSELAGE	3060000059	59	565877270	13708	4371937	775599	
OUTER SKINS FIXED	306000159	59	105097799	13734	6195969	1443306	
FORMERS FIXED R F	306000259	59	125197715	13810	1943635	322684	
LONGERONS FIXED R F	306000359	59	109947755	13814	8528067	1452747	
TUNNEL FIXED R DOORS R F	306000459	59	902377505	9859	6993276	1889578	
ENGINE ACCESS DOORS R F	306000559	59	283978214	15590	2220495	442600	
FAIRING UNDER RUDDER FIXED	306000659	59	516508260	12785	42665483	6603453	
REMOV TAILCONES	306000759	59	109358332	13910	9111589	1521059	
CENTRE STRUC AND STING REM	306000859	59	104127		84028451	13451026	
DIVE BRAKES	307000172	72	117905088	9049	5999224	1066877	
D B JOINT TO FUSELAGE	3070002		40648794	9374	198104	38058	
			12196		6197328	1104935	

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
TOTAL FUSELAGE GROUP	3000000						
RADAR NOSE STRUCTURE	3010000						
RADOME	3010001	51	15958	39921	11070	637043	1766551
RADAR NOSE STRUCTURE C A	3010002		2701	12000	11200	32400	30240
RADAR NOSE STRUCTURE R N	3010003	51	17032	95831	11325	1632177	1928874
			33260			2301620	3725665
FRONT FUSELAGE STRUCTURE	3020000						
SKIN F FORMERS	3020001	52	82641	19296	12301	1594621	1016555
COCKPIT FORMERS	3020002	52	10563	18259	12043	1928696	1272102
LOWER LONGERONS F	3020003	52	68371	18460	9045	1262110	618407
TOP LONGERONS F	3020004	52	18947	19430	14763	3681402	2797146
NOSE U C SUPPORT STRUCT	3020005	52	33433	21049	9186	703668	307088
CREW BULKHEADS	3020006	52	13063	20558	12385	2685492	1617853
BULKHEAD STA 120	3020007	52	31101	12000	11477	373200	356935
BULKHEAD STA 255	3020008	52	10921	12350	11927	2784855	1302548
COCKPIT FLOOR BELOW NAV ARCH	3020009	52	58811	17695	11569	1040643	680373
SHEAR PANEL BELOW NAV ARCH	3020010	52	20262	25697	11535	520621	311032
MISC STRUCTURE F	3020011	52	10661	18455	12434	196730	132546
LOWER SHEAR PANEL	3020012	52	31412	3423	8900	735716	279549
CANOPY ARCHER	3020013	52	8553	22859	16023	1932465	1370447
WIND SCREEN	3020014	52	13285	13628	11500	1837050	1992750
			109000			21277271	14055331
CENTRE FUSELAGE STRUCTURE	3030000						
SKIN C F	3030001	54	22112	36736	14420	8123064	3188550
FORMERS C F	3030002	54	28749	37520	13317	10786625	3828504
BULKHEAD STA 485	3030003	54	12815	48500	10337	6215275	1324587
LONGERONS C F	3030004	54	14453	41038	12144	5931222	1755172
STR BELOW LOWER LONGERONS	3030005	54	48362	27455	9298	1327724	449651
RADAR ACCESS DOOR	3030006	54	24182	27908	9016	674815	218007
FWD DORSAL FAIRING	3030008	54	29692	28927	16400	858843	486916
DEFLECTOR SHIELD	3030009	54	20453	37391	16400	689963	335380
DORSAL OVER FUEL TANK	3030010	54	41384	41310	14206	1709408	587844
PACK MTG STRUCTURE	3030011	54	22802	29289	10286	667789	234384
SEALING MISSILE BAY	3030012	54	55922	29616	11074	165553	61904
MISC ITEMS C F	3030013	54	12163	37000	11250	449920	152000
ARMAMENT BAY ROOF	3030014	54	12432	38370	11428	4770158	1420729
FUSELAGE FUEL TANK	3030015	54	22665	39429	14539	8936583	3295264
DUCT C F	3030016	54	31867	35898	12969	11439616	4132831
EQUIPMENT BAY STRUCTURE	3030017	54	59592	28506	13549	1698673	807385
			171513			64445231	22279208
DUCT BAY STRUCTURE	3040000						

AVRO AIRCRAFT LTD.
MALTON, ONT.

REPORT NO. _____
FUNCTIONAL GROUP _____
WEIGHT AND C. OF G BY COMPONENT _____
UNCLASSIFIED / NON CLASSIFIED

REPORT NO.

SHEET

PROJECT		DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
		AIR INTAKES	308000155		770392113211827			16279881	9111403
					77039			16279881	9111403
		FUSELAGE JOINTS	30900000		66322000012000			145860	79560
		JOINT AIR INTAKES TO F	30900001		10282571112250			264309	125930
		JOINT F TO C F	30900002		4284794011590			205183	49605
		JOINT D B TO C F	30900003		14465895419150			852475	132309
		JOINT D B TO E H	30900004		72247425011500			537570	83260
		JOINT AT STA 742 50	30900005		70557950			408548	64014
		JOINT D B TO E H DUCT BAY	3090000656						
					4994			2413945	534678
		CANOPLES	31000000						
		PILOTS CANOPY	3100000153		244841769315915			4331954	3896629
		NAVIGATORS CANOPY	3100000253		166372324816256			3867770	2704511
					41121			8199724	6601140

DESCRIPTION		REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
ENGINE GROUP		50000000						
PS 13 ENGINES C A		50100000		938500	68697	12114	644721345	113689890
PS 13 ENGINES C A		50100002		30565853	10306		200852	31433
				938805			644922197	113721323
ACC GEAR BOX ON FUS D B		5020000156		367657768	9442		2123552	347088
ACC GEAR BOX ON FUS E B		5020000253		2353361295	10307		14424552	2425546
ACC GEAR BOX ON FUS C A		50200003		80061550	9700		492400	77600
ACC GEAR BOX ON FUS I W		5020000462		117861270	13950		721761	164331
				29187			17762265	3014565
ENGINE CONTROLS F F		50300000						
ENGINE CONTROLS C F		5030000152		157616723	12368		263554	194920
ENGINE CONTROLS E B		5030000254		109226444	11800		28624	12862
ENGINE CONTROLS I W		5030000458		88956633	9904		592367	88047
		5030000562		65852142	12751		343094	83902
				3232			1227839	379731
STARTER AND GEARBOX ENG		50400000						
STARTER AND GEARBOX ENG		50400001		1464560197	11357		8815851	1663233
				14645			8815851	1663233
FIRE EXT SYSTEM E B		50600000						
ENG FIRE EXT SYSTEM D B		5060000158		598571074	13583		4253779	812943
ENG FIRE EXT SYSTEM ENG		5060000256		123156856	11237		699897	138327
		50600003		14267960	9970		96503	14157
				7358			5050179	965427
ENGINE MTS AND BRACKETS		50700000						
ENGINE MOUNTS		50700001		753967191	14152		5065529	1066919
				7539			5065529	1066919
FUEL SYSTEM C F		50800000						
17 FUEL SYSTEM D B		5080000154		11280339995	14090		4511436	1589353
18 FUEL SYSTEM F B		5080000256		1573355373	810957		8455674	1724084
4 FUEL SYSTEM I W		5080000358		1833661392	11024		1127157	202401
39 FUEL SYSTEM C A		5080000462		47280555432	14346		26203250	6782789
		50800005		19568630	9920		1333829	193444
				76326			40436346	10317970

PROJECT

DESCRIPTION

REFERENCE NO.

COMP. NO.

WEIGHT

H. ARM

V. ARM

H. MOMENT

V. MOMENT

FLYING CONTROLS GROUP

60000000

MECHANICAL CONTROLS F F
60 MECHANICAL CONTROLS C F
70 MECHANICAL CONTROLS F W
71 MECHANICAL CONTROLS I W
80 MECHANICAL CONTROLS O W
MECHANICAL CONTROLS C A

60100000
60100001
60100002
60100003
60100004
60100005
60100006
60100007
60100008

1069416454111411
1290339654111727
124437881922157
402347180014382
305207705313561
66370984114338

1759591
511537
9807448
28888012
23516576
470624

1220292
151278
2756996
5786454
4138817
95061

95844

64953788

14148898

FLYING CONTROLS HYDRAULICS
FLYING CONT HYDRAULICS D B
FLYING CONT HYDRAULICS E B
FLYING CONT HYDRAULICS R F
FLYING CONT HYDRAULICS I W
73 FLYING CONT HYDRAULICS O W
66 FLYING CONT HYDRAULICS F W
63 FLYING CONT HYDRAULICS R F
FLYING CONT HYDRAULICS F F
FLYING CONT HYDRAULICS C F

60200000
60200001
60200002
60200003
60200004
60200005
60200006
60200007
60200008
60200009

31845663010114
398538478811161
398487587510824
2798877036914716
1317707403413586
55817600820795
350011309110513
55061692811000
19203732911000

1803099
25819962
36420
19694876
9750278
4242006
395815
932056
716717

322030
4447993
5196
4118714
1789276
1160569
1160555
605660
211200
13028593

100750

63391229

13028593

DESCRIPTION		REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
FIXED EQUIPMENT GROUP		70000000						
INSTRUMENTS		70100000						
INSTRUMENTS		70100001	52	3261164301	13947		535782	454812
NAVIG TABLE AND STORAGE		70100004	52	2002200001	13000		44000	26000
				3461			579782	480812
COCKPIT SEALING		70200000	52	500186001	13000		93000	65000
				500			93000	65000
OXYGEN SYSTEM		70300000						
OXYGEN SYSTEM		70300001	52	2116259401	15688		548890	331958
				2116			548890	331958
AIR CONDITIONING SYSTEM		70400000						
AIR CONDITIONING F F		70400001	52	4106177981	11308		730786	464306
AIR CONDITIONING C F		70400002	54	5241028838	13567		15113996	7110465
AIR CONDITIONING O H		70400003	56	1034517621	13798		535219	129167
AIR CONDITIONING C A		70400005		2832643447	13798		12306797	3908421
AIR CONDITIONING E W		70400006		1453367100	114000		974963	203420
AIR CONDITIONING I W		70400007	62	305641791	15611		195746	47614
AIR CONDITIONING F I		70400008	83	122267795	20129		828455	245976
				88856			30685962	12109369
HYDRAULICS MAIN SYSTEM		70500000						
HYDRAULICS F F		70500001	52	9602202411	10816		1943541	1038552
HYDRAULICS C F		70500002	54	4362430031	10395		1875791	4534330
HYDRAULICS D H		70500003	56	2179554920	10950		11969814	2386553
HYDRAULICS E H		70500004	58	1083960754	11157		6585126	12089307
HYDRAULICS I W		70500005	62	1444155240	14254		7977206	2058420
HYDR NOSE U C		70500006	91	11418860	9320		21500	10625
HYDR MAIN U C		70500007	92	2980543251	14100		1618885	420180
ANTI SKID SYSTEM C F		70500008	54	3134472001	10800		1479248	338472
ANTI SKID SYSTEM MUC		70500009	92	634515001	14000		326510	80760
				67901			33797623	8004299
MUC DOOR STOPS		70600000	56	302516001	12000		155832	36240
				302			155832	36240
CABIN INSULATION		70700000	52	1431187481	13200		268284	188892
				1431			268284	188892

DESCRIPTION		REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT		V. MOMENT
RADIO AND RAIRAR	FIXED R N	7140000151		24160	9040	100000	2184064		24160000
RADIO AND RADAR	FIXED F F	7140000252		22901	18696	11227	4281571		2571095
RADIO AND RADAR	FIXED C F	7140000354		15255	27593	9885	4209312		1507957
RADIO AND RADAR	FIXED D H	7140000456		720	555237	14000	3977706		100800
RADIO AND RADAR	FIXED F I N	7140000583		3200	76180	24600	2437760		787200
RADIO AND RADAR	FIXED C A	71400006		19540	22161	12000	4330259		2344800
RADIO AND RADAR	FIXED I W	7140000762		2228	54570	16000	1215820		356480
				88004			19056492		10084332
29 CANOPY ACTUATION		7160000052		6492	228199	15435	1441159		1002040
				6492			1441159		1002040
CABIN CONSOLES		7170000052		1728	17466	12433	301812		214842
				1728			301812		214842
RADAR DOOR ACTUATION		7180000054		1000	26800	9500	268000		95000
				1000			268000		95000
SURFACE FINISH F F	CANOPY	7190000152		3631	8744	112200	68041		44286
SURFACE FINISH F F		7190000253		642	20218	15900	12940		10176
SURFACE FINISH C F	SN TAKER	7190000354		1400	37197	12455	520758		174370
SURFACE FINISH C F		7190000455		408	22798	12020	93016		49042
SURFACE FINISH D B		7190000556		377	53828	11200	202932		42224
SURFACE FINISH E B		7190000658		443	66701	11200	295485		49616
SURFACE FINISH F F		7190000759		648	80362	13175	520746		85374
SURFACE FINISH I W		7190000862		315	16014	4414400	1895137		453744
SURFACE FINISH O W	L EDGE	7190000964		106	7706	50135590	753836		145005
SURFACE FINISH O W		7190001065		319	63948	13526	203994		43148
SURFACE FINISH A L E V A T O R		7190001174		353	79190	13556	279541		47853
SURFACE FINISH E L E V A T O R		7190001282		566	75523	14260	427460		80712
SURFACE FINISH F I N		7190001383		639	74663	20837	477097		133148
SURFACE FINISH R U D D E R		7190001484		202	81279	21431	164184		43291
				10000			5915167		1401989

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
BRAKE PARACHUTE F F	70800000						
BRAKE PARACHUTE F F	708000152		45516913	12869		76954	58554
BRAKE PARACHUTE R F	708000359		852882205	14394		7010442	1227520
BRAKE PARACHUTE I W	708000662		124620221	14500		76907	17980
			9107			7164303	1304054
ELECTRICAL SYSTEM	70900000						
ELECTRICAL WIRING R N	709000151		129	928512000		11978	15480
ELECTRICAL WIRING F F	709000352		296619977	11200		592518	332192
ELECTRICAL WIRING C F	709000354		235439703	11000		934609	258940
ELECTRICAL WIRING A I	709000455		127421984	12000		280076	152880
ELECTRICAL WIRING D B	709000556		901552769	9921		4757125	894378
ELECTRICAL WIRING E B	709000658		6459500	9200		38080	5888
ELECTRICAL WIRING I W	709000862		923653995	13900		4986978	1283804
ELECTRICAL WIRING F I N	709000983		35279754	30000		280734	105600
ELECTRICAL WIRING NUC	709001091		33018600	9800		61380	32340
ELECTRICAL WIRING ENG A	7090011		200260683	10000		1214874	200200
ELECTRICAL WIRING C A	7090012		137463347	11234		4601199	1544226
ELECTRICAL F F	709001352		152401576	311308		2402586	1723339
ELECTRICAL C F	709001454		787745178	10188		3558671	1802509
ELECTRICAL E H	709001558		102064774	11465		660695	116943
ELECTRICAL ENG	7090016		187725891	311521		11059148	2162722
ELECTRICAL C A	7090017		71861350	12000		440493	86160
ELECTRICAL F I N	709001883		4489050	28840		39182	12690
ELECTRICAL I W	709001962		227562053	14500		1417706	329875
ELECTRICAL C A W	7090020		12067488	13661		80986	16393
ELECTRICAL MUC	709002192		7451600	13700		38184	10138
ELECTRICAL A I	709002255		490022079	13954		1081871	683746
ELECTRICAL D H	709002356		267105173	110235		13818151	2733769
ELECTRICAL R F	709002459		17680759	11687		142136	20569
WINDSCREEN DEMISTING	709002552		332619965	110638		664036	353820
ELECTRICAL TAILC PLUG JETT	7090026		80955200	11000		446568	88990
			123529			53603964	13967591
L P PNEUMATICS F F	71000000						
L P PNEUMATICS F F	710000152		199319586	12809		390349	243325
L P PNEUMATICS C F	710000254		79632397	11010		257880	92416
L P PNEUMATICS F I N	710000583		41474966	25234		310359	104469
L P PNEUMATICS R N	710000651		1997067	9261		14063	18429
L P PNEUMATICS ENG	7100008		140363897	9987		896475	140118
L P PNEUMATICS I W	710000962		20352880	15930		1073346	32338
			5008			1976472	631095
INTAKE DE ICING	712000055		880019582	11800		1723216	1038400
			8800			1723216	1038400
RADIO AND RADAR FIXED	7140000						

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
REMOVABLE EQUIPMENT GROUP	80000000						
94 EJECTOR SEATS	801010052		34294	20450	13411	7013123	4599168
			34294			7013123	4599168
RADAR REMOVABLE	8020100						
RADAR REMOVABLE	802010151		101895	90177	10100	9187872	10291395
RADAR REMOVABLE	802010252		20755	18689	12434	3878902	2580677
RADAR REMOVABLE	802010354		68745	27664	10090	19017617	6936371
RADAR REMOVABLE	802010456		5550	5511	413500	3058827	7492350
RADAR REMOVABLE	802010583		3700	74757	23900	2766009	958300
RADAR REMOVABLE	8020106		3833	55288	16000	2119189	6133280
RADAR REMOVABLE	802010758		6400	73050	12500	4675200	800000
RADAR REMOVABLE	802010862		1704	1500	14800	70550	25160
			211048			44774166	22954433
DAMPING SYSTEM	8030000						
DAMPING SYSTEM	803010152		7841	7201	112047	134856	94448
DAMPING SYSTEM	803010254		2473	31766	10860	785573	268568
DAMPING SYSTEM	803010358		3696	3242	13432	233363	49564
DAMPING SYSTEM	803010462		6070	53781	115720	3264507	954204
DAMPING SYSTEM	803010564		957	74855	14000	711112	13300
DAMPING SYSTEM	803010651		287	7350	9340	21095	26806
DAMPING SYSTEM	8030107		8564	4797	212893	4108322	1104157
			18642			8618828	2511047
SPARROW PACK	8050000						
SPARROW PACK STRUCTURE	805010094		90631	36390	9872	34793241	8947092
			90631			34793241	8947092
SPARROW PACK MECHANISMS	805020094		55732	37264	9911	20767972	5523599
			55732			20767972	5523599
21 SPARROW PACK HYDRAULICS	805030094		36970	37800	10400	13974660	3844880
			36970			13974660	3844880
SP PACK ELECTRONICS FIXED	805040094		18873	33609	11000	6343027	2076030
			18873			6343027	2076030

COMPONENT UNCLASSIFIED / NON CLASSIFIED

PROJECT

DESCRIPTION	REFERENCE NO.	COMP. NO.	WEIGHT	H. ARM	V. ARM	H. MOMENT	V. MOMENT
SP PACK ELECTRONICS REMOV	805050094		18680	32619	10000	6093229	1868000
SPARROW PACK PNEUMATICS	805060094		18680			6093229	1868000
			2445	38692	10350	946019	253058
			2445			946019	253058
MISSILE AIRCONDITIONING	807000094		521	30550	10250	159166	53403
			521			159166	53403
COCKPIT EQUIPMENT	808000052		600	18750	14500	112500	87000
			600			112500	87000

