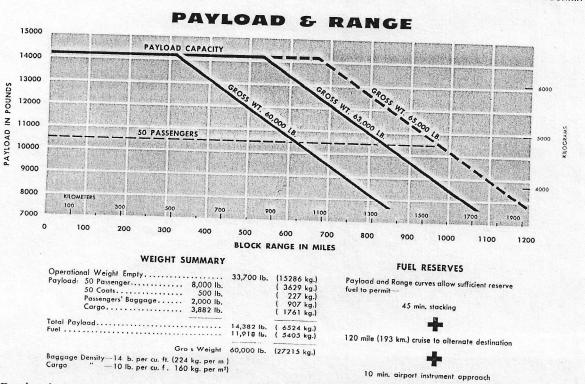
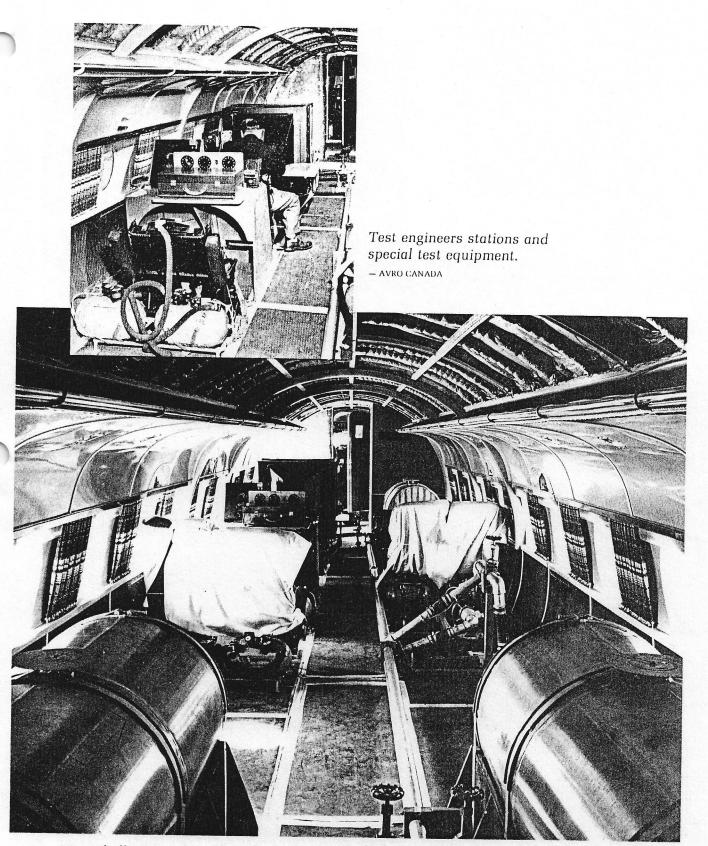


50 passenger arrangement.

- VIA GIL DUNKIN



Payload & Range with 50 passengers and 3,882 lb. cargo & standard fuel reserves.  $_{-\text{VIA}\,\text{GIL}}$ 



Water ballast tank installation to simulate all c.g. variations with passenger distributions. - VIA BOB HALFORD

#### LEADING DIMENSIONS

Wine A	
Wing Span	7 ag ft
Wing Span	/ sq.m.
A	t. 1 in.
rispect Ratio	0.04
Aerofoil	8.31
TIGO D NACA 230	Series
T/C Ratio at Root	40.50
T/C Ratio at Tin	. 16.5%
T/C Ratio at Tip	12%
Incidence of Datum Plane	. 12/0
Dihadral on Datum Di	$2\frac{1}{2}$
Dihedral on Datum Plane	60
Fuselage Length Overall	
Fuedage Diemeter	t. 9 in.
Fuselage Diameter	10 ft
Undercarriage Tr	. 10 11.
1)	ricycle

#### **ENGINE DATA**

A civil version of the standard Rolls-Royce Derwent 5 engine was used and a brief summary of the performance is shown below.

Take-off and climb Maximum continuous power Idling on ground (approx.)	Engine Speed 14,700 rpm 14,100 rpm 3,500 rpm	Time Limit 15 mins. Unrestricted
o o ouita (approx.)	3,300 rpm	

Relighting in the air was possible and numerous relights had been carried out during flight tests.

As the economy of the C102 had been worked out assuming that all engines were operating, relighting would not normally be employed. Each engine consumed less than 90 lb. of fuel in descent from 30,000 ft. at half maximum cruise rpm. If the operator felt, however, that any stacking should be carried out at fairly low altitude, two engines could be closed down to conserve fuel.

# DESIGN COMPARISON WITH ORIGINAL SPECIFICATION

In view of the statements later made by TCA that the Jetliner was not suitable for their routes, it is of interest to compare their original specification, issued in 1946, after a great deal of study had been put into it by their top-level engineers and operations people, with the actual performance of the prototype Jetliner, which they rejected as not being up to their requirements. Their specification was aimed at their estimated requirements for some considerable time in the future..

TCA 1946 SPECIFICATION Still air range 1,200 miles	ACTUAL PROTOTYPE 1,400 miles
Payload capacity 10,000 lb.  Number of passengers 30  Cruising speed 400 mph  Field length to take-off 4,000 ft. ICAN	(2,000 miles with auxiliary tanks) 12,700 lb. 40 to 50 (capacity) 427 to 450 mph 3,100 ft. ICAN

It can be seen that even the prototype C102 met all of the specified TCA requirements around which the 1946 specification was written, so far as performance was concerned. The specification contained other general conditions, such as good controlability in all speed ranges. The DOT flight assessment report confirms the excellent flight characteristics of the aircraft. Serviceability was another concern expressed in the TCA spec. With the unique low profile of the aircraft on the ground, with almost all services within reach of the ground crews at standing height, the C102 was described by the National Airlines ground crews as a "dream to maintain."

The following is a brief summary of the first prototype performance.

# C102 JET TRANSPORT — FIRST PROTOTYPE

Four Derwent 5 Turbo-jet Engines
Total Static Thrust at Sea Level (ICAN Conditions)
widxinium Gross Weight
Normal Gross Weight
Maximum Landing Weight 52 500 lb
on Air Kange (with auxiliary tanks)
Still Air Range (normal tankage)
Cruising Speed at 30,000 ft. and
60,000 lb. gross weight
Payload (maximum)
Number of passengers (capacity)
Payload for 1,000 mile range with full ATA allowances
at 65,000 lb. T.O. gross weight
Payload for 500 mile range with full ATA allowances
at 60,000 lb. T.O. gross weight
Four Engine take-off over 50 ft. obstacle at
60,000 lb. (ICAN conditions sea-level)
Three Engine take-off with above conditions
Distance to Accelerate to Critical Engine Failure Speed
and Stop-ft. (C.A.R. 04B.1221):
60,000 lb. Gross Weight at sea-level
ICAN conditions
"Hot Day"
Landing Distance from Height of 50 ft.
Sea level (ICAN)
3,500 ft. (ICAN)
Stalling Speed at landing weight of 50,000 lb.
with flaps in landing position
Stalling Speed at landing weight of 40,000 lb.
with flaps in landing position
mph

#### **SECTION 5**

# **APPENDICES**

#### APPENDIX 1:

Extracts from Brochure Issue 2- for 30 seat Jet Transport for TCA- Around which original TCA letter of intent to purchase was written on April 9th. 1946.

# SUMMARY OF PERFORMANCE & DIMENSIONS

Wing	3 10	ading	(1b	.8q.f	t.)			. 40	0.0
Powe	er L	oading	(T	.0.16	./1b.th	rust)			1.
ALT	TUD	E FT.			10.0	000	20,000	30.0	000
Max	mun	Level	Sp	bee	455 1	IPH .	20,000 465 MPH	470 1	m
		Cruisi	ng	11	400 h	(PH	416 MPH	426 1	PI
Crui	sin	g at 7	,00	O RPM	347 M	LPH	359 MPH	357 N	P
Rate	of	Climb			232011	/min	1635ft/min	955ft/n	nin
Rate	of	Climb	at	SL			2980ft/min		
Time	to	Climb	to	30,00	00 ft		16.65 min		
Land	ing	over	50 1	ft. s	reen s	" 4,000 t Sea Le	evel (concrete)	2470 3). 3115	ft
SING	LE	ENGINE	PK	PORMA	UNCE	t Sea Le	wel (concrete	). 3115	ft
SING	LE	ENGINE	PK	rt. so	NCE Power	t Sea Le	vel (concrete	a). 3115 8	£t
SING	LE of	ENGINE Climb	PM at	T.O.	NCE Power	ft./min	wel (concrete	8	£t
SING	LE of	ENGINE Climb	PK at	T.O.	NCE Power	(ft./min	/min.)	a). 3115	80
SING	LE of	ENGINE Climb	PM at	T.O.	NCE Power Power	(ft./min SL (ft. at 5,00	/min.) O ft.(ft./min	6 8 6 6	80
SING	LE of	ENGINE Climb	PM at	T.O.	NCE Power Power	(ft./min SL (ft. at 5,00	/min.)	6 8 6 6	80
SING	LE of	ENGINE Climb	PE at "	T.O. Climb	Power	(ft./min SL (ft. at 5,00 " 10,00	/min.) O ft.(ft./min O ft.(ft./min O ft.(ft./min	6 8 6 6	80
SING	LE of	ENGINE Climb	PE at "	T.O. Climb	Power	(ft./min SL (ft. at 5,00	/min.) O ft.(ft./min O ft.(ft./min O ft.(ft./min	6 8 6 6	80
SING	LE :	CRUIS:	PK	T.O. Climb	Power Power	(ft./min SL (ft. at 5,00 " 10,00 " 15,00	.)/min.) O ft.(ft./min O ft.(ft./min O ft.(ft./min	8 6 6 ) 5	1 to 180 is 60 is
SING Rate	of "	CRUIS:	PE at " " " " " " " " " " " " " " " " " "	T.O. Clima	Power Power Power	(ft./min SL (ft. at 5,00 " 10,00 " 15,00	/min.) O ft.(ft./min O ft.(ft./min O ft.(ft./min	8 6 6 ) 5 ) 5	1 to 180 is 60 is

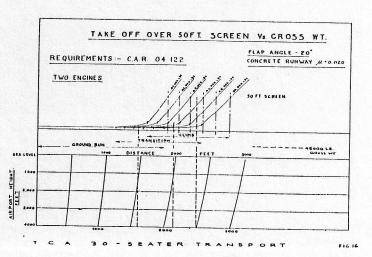
				NGLE - 60"	
		REQUIRE	MENTS:- C.A.R. C	A 124	
	24			<u> </u>	
	. SOFL PERSE	<b>4</b>			
				111	
	1		iliii .	iii	111
	GLIDE	TRANSITION	BRAKED	RUN	
		1000 LANI	 		-44-00 To 60-1
EN LIVEL		I EAR	/ 1	1 3000	<del></del>
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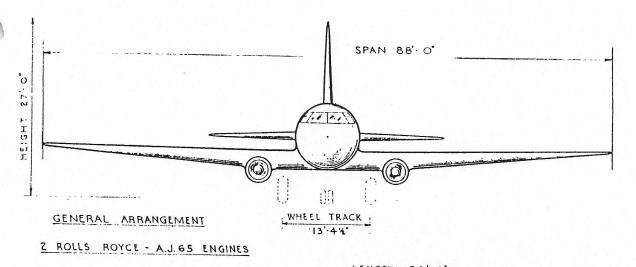
#### DIMENSI ONS

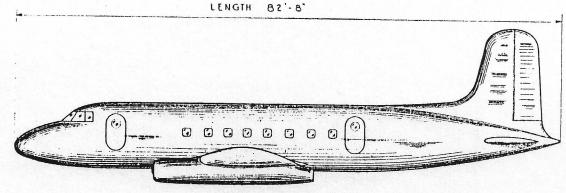
Wing Area	1110 sc.ft.
Wing Area	970 sq.ft.
" Span	88 ft.
Aspect Ratio	7
Aerofoil Section	230 series
T/C at Root	16.6%
T/C at Tip	9%
Geometric Mean Chord	151 in.
Incidence of Datum Plane	40
Dihedral on " "	410
Sweepback at .25 chord	410 50

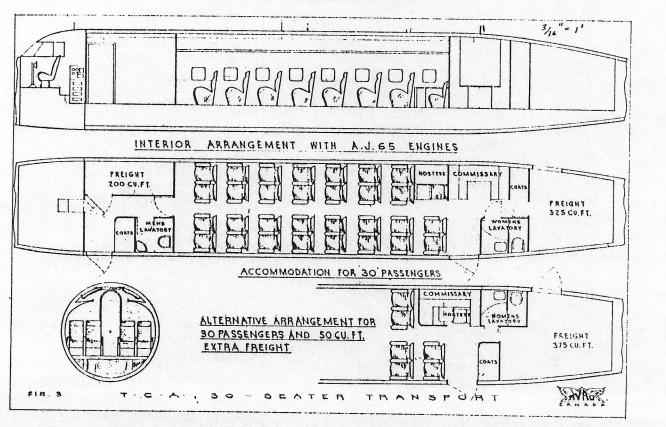
#### CONTROL AREAS

Aileron	77	sq.ft.
Tail Plane	125	sq. ft.
Elevator	80	sq.ft.
Pin	96	sq.ft.
Rudder	48	sq.ft.
Landing Flaps		sq.ft.
Overall Length 82	ft.	8 in.
Height	ft.	0 in.
Wheel track	ft.	4% in.
Wheel size: Main 49 in.	x 17.	25 in.
Nose	x 8.	05 in.









#### APPENDIX 2:

NOTE: As the design and testing program proceeded, the basic C102 design evolved — the high tail, engines central on the wing profile and increased span being the more obvious external changes. Brochure No. 3 also indicated seating for up to 50 pax. (with reduced freight) and other improvements not specified in the original TCA specifications, since TCA were at that time openly discussing their withdrawal from the project and Avro were considering the possible requirements of other airlines. (Note that there is no mention of TCA in this brochure.)

#### INTRODUCTION

The aircraft described in this brochure is designed to take advantage of the latest methods of propulsion and to provide a medium range passenger transport which can operate at speeds and altitudes appreciably greater than those at present obtained on internal airlines in any part of the world. In this way, operating costs can be reduced much below those for slower aircraft with the present forms of propulsion.

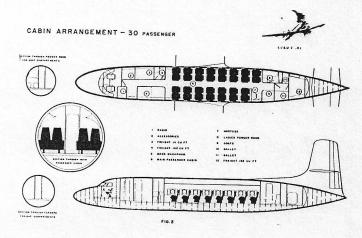
This aircraft cruises at 350 to 400 M.P.H., at 30,000 ft., or even 35,000 ft., and, with 30 passengers and a maximum of 4300 lbs., of freight, has a range of 1200 still air miles.

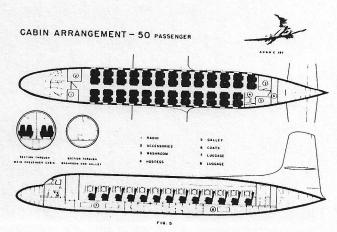
The above cargo load of 4300 lbs., is quoted for a 1200 mile range, and is restricted by the gross weight of 47,000 lbs. This, in turn, is restricted by the fact that runways of less than 5,000 ft. appertain in Canada at the present time, and the 47,000 lbs. is the restricted gross weight for this length of runway under extreme temperature conditions and all allowances.

Where runways were larger than 5,000 ft., and maximum temperature conditions were below 100°F, larger freight loads could be carried for the 1200 mile range, or greater range could be given for the same pay load. The maximum cargo load with the 30-passenger version would be 5,840 lbs. with the present arrangement.

The cabin layout suggested in this brochure is suitable for the operator who has a demand for liberal freight space in addition to moderate passenger facilities. There is, however, no difficulty in providing a cabin layout to accommodate an increased number of passengers with reduced cargo capacity. For instance, 44 passengers can be easily accommodated. Alternative interior arrangement and weight summaries for 46, 48 and 50 passenger versions are shown.

The proposed aircraft is considered as representing the most practical layout for the immediate future, having regard to speed, balance and stability, pressurization, and in general, the advisability of introducing a minimum of untried features and at the same time providing an aircraft whose performance and functional efficiency is not likely to be surpassed for some years.







# SUMMARY OF PERFORMANCE AND DIMENSIONS

#### PERFORMANCE

Fully loaded Weight	
Wing loading (lb.sq.ft.)	) Tp.
Power loading (TO 15/15 4)	42.7
Power loading (T.O.lb/lb.thrust)	4.28
ALTITUDE FT.	
Marimum Lawel 30,000 20,000 30,0	000
Maximum Cruising Speed 404 MPH 417 MPH 417 MPH 417 MPH	<b>IPH</b>
Gruising et 7 000 Priv 256 MPH 417 MPH 417 MPH	
Cruising at 7,000 RPM 356 MPH 366 MPH 363 M	IPH .
Rate of Climb 2163 ft/min 1555ft/min 922ft/	min.
Rate of Climb at SLassans 2800ft/min	
Time to Climb to 30.000 ft 17 1 min	
Celling (R/C = 500 ft/min)	
Take-off 50 ft. screen at sea level(concrete) 247	
Take-off 50 ft. screen at 4,000 ft.(concrete)265	2 14
Isoding 50 ft games -t C. (concrete), 265	0 ft
Landing 50 ft. screen at Sea Level (concrete) 324	0 ft
SINGLE ENGINE PERFORMANCE	
Rate of Climb at T.O. Power (ft./min.)	880
Rate of Climb at Climb Power SI. (ft. /min )	640
	- CA.
Rate of Climb at Climb Down at 30 000 It. (It/min)	495
Rate of Climb at Climb Power at 10,000 ft.(ft/min)	355
Rate of Climb at Climb Power at 15,000 ft.(ft/min)	210

 Sea Level.
 264 MPH

 10,000 ft.
 264 MPH

 18,000 ft.
 248 MPH

#### DIMENSIONS

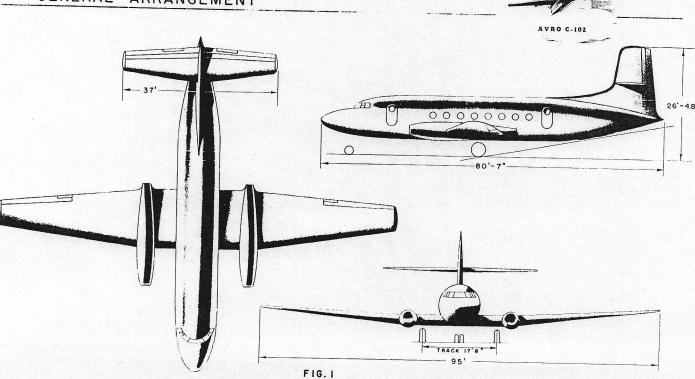
Wing Area, Gross.,,,	1100 Sq.ft.
Wing Area	
Wing Span	970 Sq.ft.
Wing Span	95 ft.
Aspect Ratio	8.2
Aeroroll Section	230 series
1/O at Root	16.5%
T/C at Tip	12%
Geometric Mean Chord	139 in.
Incidence of Datum Plane	210
Dihedral on Datum Plane	420

#### CONTROL AREAS

Aileron 52.4 Sq.ft.	
Tail Plane	•
Flevetor	2
Elevator	
FIL (DOTSAL)	
Rudder 38.8 Sq ft	
Landing Flaps	,
Orogania Ingant	;
Overall Length	
Height	
Wheel Track	•
Wheel gize: Wain	
Wheel size: Main	n
Nose (Duo)	n

# GENERAL ARRANGEMENT

MAXIMUM CRUISING SPEEDS ON ONE ENGINE

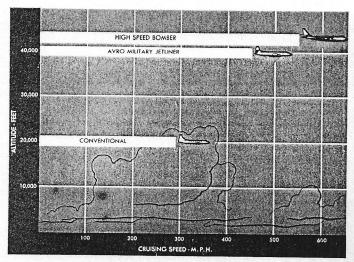


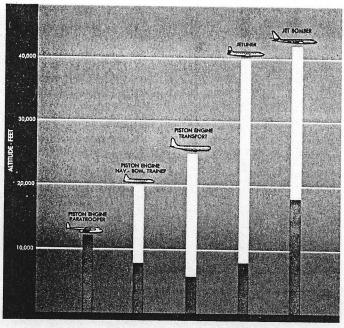
#### **APPENDIX 3:**

#### EXTRACTS FROM MILITARY BROCHURES

#### CRUISING SPEED

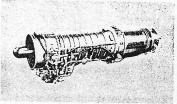
#### CRUISING ALTITUDE



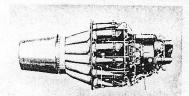


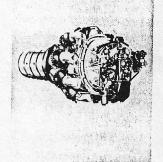
HEIGHT OF SHADED COLUMN INDICATES CABIN PRESSURE ALTITUDE IN RELATION TO THE AIRCRAFT CRUISING ALTITUDE

DERWENT Y



WESTINGHOUSE J-46





ALLISON J-33

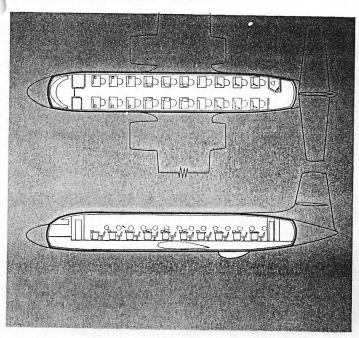


GENERAL ELECTRIC J-47

BIGINES .	ROLLS ROYCE DERWENT 5	PRATT & WHITNEY J-42	PRATT & WHITNEY J-48	T-33	WESTING HOUSE J-46	GENERAL ELECTRIC J-47
MAX: GROSS WHIGHT	70,000 LB	80,000 LB.	80,000 LB	80,000 LB.		
MAX, CANDING WEIGHT	60,000 18	70,000 LB	70,000 LB	70,000 LB		
WEIGHT EMPTY	33,000 LB.	37,000 LB.	38,000 LB	37,000 18		
MAX MILITARY LOAD	15,000 LB.	15,000 LB	15,000 LB	15,000 LB.		
CRUISING SPEED	425 MPH	450 MPH	450 MPH	450 MPH		
A ENG. T. G. DIST. (CAR)	4630 FT.	4080 FT.	3600 FT.	3900 FT.		
3 ENG. T. O. DIST. (CAR)	5550 FT.	4820 FT,	4200 FT.	4600 FT.		
LANDING DISTANCE (CAR)	2930 FT.	3250 FT.	3250 FT.	3250 FT,		
TIGHT TIME FOR 500 MILES	1 Hr. 27 Min	1 Hr. 20 Min	His 14 Min.	Hr. 23 Min.		
PUGHICTIME FOR TODO AMESTIC	9 No 39 Mil	2 Hr. 29 Min	ZHoZIMin	Hr. 32 Min		
Asid: With Tut-Dynoxib	975 M	1240 Mr	810 MI	1050 At		
LANGE WITH BOOK IS PAYYOAD	1560 MI	1700 M	1220 MI	1550 MI		

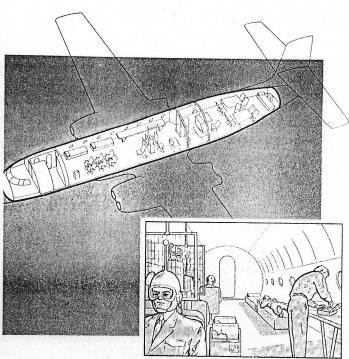
\* RESERVE FUEL FOR 200 MILES PLUS 45 MIN.

#### NAVIGATIONAL-BOMBARDIER TRAINER



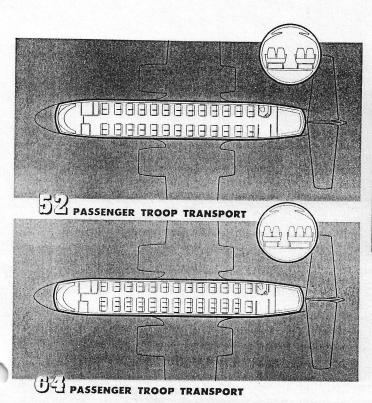
#### JETLINER FLYING CLASSROOM

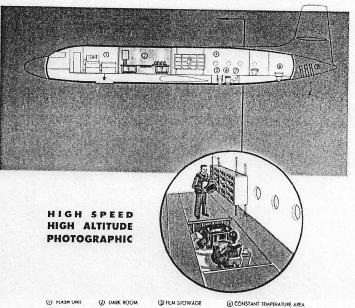
- TIBRATION FREE AND QUIET
- HIGHLY PRESSURIZED
- ACCOMMODATES UP TO 20 STUDENTS AND INSTRUCTORS
- COMPLETE RADIO, RADAR AND NAVIGATION FACILITIES

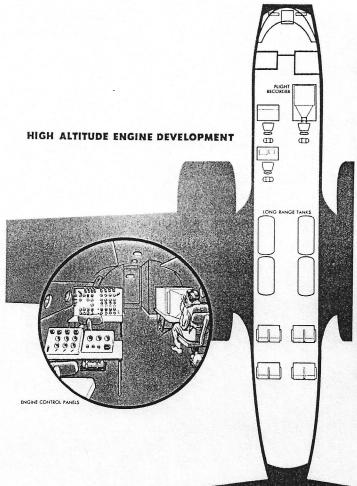


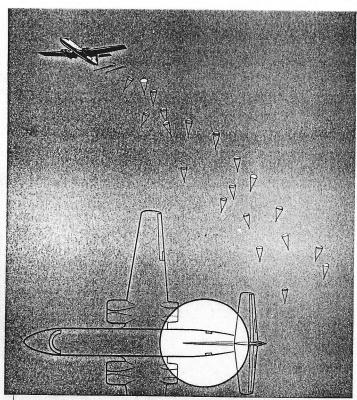
#### HIGH ALTITUDE MEDICAL RESEARCH LAB

THE COMBINATION OF HIGH ALTITUDE FLYING, AND MANUAL OR AUTOMATIC, CONTROL OF CABIN PRESSURE MAKES THIS VERSION OF THE JETLINER VALUABLE AS A PLYING LABORATORY FOR AERO MEDICAL RESEARCH





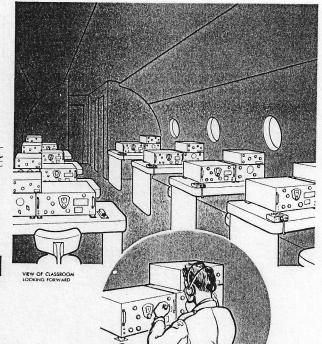




PARATROOP CARRIER AND SUPPLY AIRCRAFT

RADIO TRAINER

# HIGH PRIORITY CARGO TRANSPORT



#### APPENDIX 4

# TYPICAL FLIGHT LOG REPORTS





#### AVRO JETLINER FLIGHT LOG.

# Jetliner Flight Testing Highlights

Date of first test flight

- Aug. 10, 1949

Hours flown to Jan. 26, 1951

- 202

No. of flights to Jan. 26, 1951

Maximum altitude reached

- 39,800 ft.

Maximum speed attained

- Mach . 73

(500 m.p.h. at 20,000 ft.)

Between Nov. 18, 1950 and Jan. 26, 1951, the Avro Jetliner carried out a number of Canadian and U.S. intercity flights to confirm the aircraft's operating characteristics over representative medium range routes. Comparative operating data obtained from these flights are presented in the following pages of this brochure.

# Summary of Flights Showing Comparative Airline Data -

#### FLIGHT TIMES

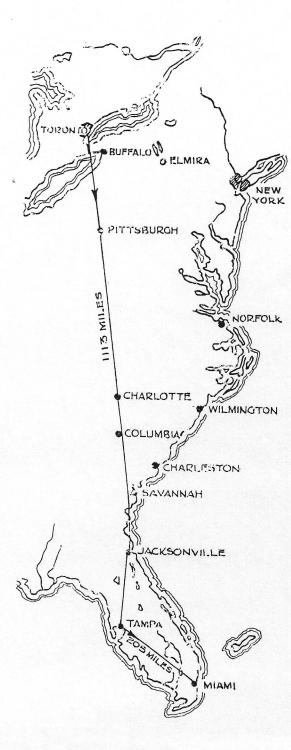
		Flight Data						
		Jetliner	Same date - approximate			ately same tir	ly same time of day	
Flight	Distance (Miles)	T.O. to Landing Flt. Time (HrMin.)	Airline	Equip't	Flt. No.	Scheduled T.O. to Landing Flt. Time (HrMin.)	Actual T.O. to Landing Flt. Time (HrMin.	
Tor Tampa	1113	2:58	TCA	N/Star	616	5:00	5:10	
Miami - N.Y.	1100	A 2:29	(NAL (EAL	*DC-6 #Connie	400 602	3:50 3:50	3:16 3.24	
Tor Wpg.	961	2.39	TCA	N/Star	5	4:40	4:48	
Wpg Tor.	961	2:33	TCA	N/Star	40	3:50	4.32	
Chi N.Y.	725	A 1:49	AAL TWA UAL	DC-6 Connie DC-6	14 472 622	2:40 2:40 2:40	2:30 2:37 2:34	
Tor Chi.	457	1:31	TCA	N/Star	303	2:20	2:45	
Chi Tor. (3 eng. flight)	457	1:40	TCA	N/Star	300	2:00	2:10	
N.Y Tor.	361	1:07	TCA	N/Star	321	1:50	2:09	
Tampa - Miami	205	:39	NAL	DC-4	71	1:00	2.07	

A Adjusted to account for standard airline practices - see flight summary sheets for details.

<sup>\*</sup> Cruising altitude 19,000'.

<sup>#</sup> Cruising altitude 15,000'.





#### JETLINER FLIGHT SUMMARY

Toronto - Tampa 1113 miles, 22 Jan. 1951. Tampa - Miami 205 miles, 22 Jan. 1951.

Though an ambient air temperature as low as -77°F. was experienced at 34,500 ft. over Savannah, the air conditioning maintained a constant 70°F. cabin temperature throughout the flight. Tailwinds initially encountered, changed later to headwinds of a minor order.

Flight	Distance Miles	Flight Time Take-Off to Touchdown	Total Fuel Cons'd.
Tor Tampa	1113	2hr. 58½ min.	17, 240 lb.

Initial gross weight 63,445 lb. Average speed 'off' to 'on' 375 mph. Block speed 357 mph.

For the short flight from Tampa to Miami the initial gross weight was of the order of 61,000 lb. The Jetliner ascended to 20,000 ft. and for a while dodged local cloud before descending to 4,000-5,000 ft. to complete the trip. Several demonstration passes were made at the Miami beach area and at the airport prior to landing. Details of this flight were not recorded.



#### AVRO JETLINER FLIGHT SUMMARY

Miamı - New York 1101 miles 25 Jan. 1951. New York - Toronto 361 miles 26 Jan. 1951.

Owing to the lower specific gravity of the kerosene obtained in Miami the fuel load was only 22, 200 lb. instead of the usual maximum of 23,400 lb. At the cruising altitude of 34,000 ft. the Jetliner was intermittently flying through the tops of a solid layer of high cirrus clouds.

The elapsed time from 'off' at Miami to 'over' Idlewilde at 20,000 ft. was 2 hr. 23 min. Adjusting the flight plan to an airline standard gives approximately 2 hr. 29 min. for 'off' at Miami to on' at Idlewilde. The aircraft actually landed at La Guardia after maneuvering in the New York area.

		Flight Time	
iami - New York	1101	21 2/1 :	

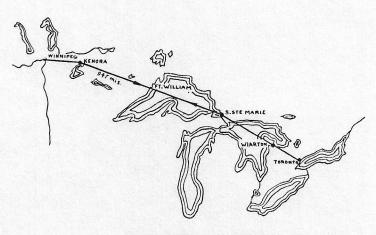
Miami - New York 1101 2hr  $36\frac{1}{2}$  min. 15,200 lb.

Initial gross weight 62, 250 lb. Average speed 'off' to 'on' 422 mph. Block speed 392 mph.

The tanks were not completely filled for the New York-Toronto flight, the fuel load being 19,000 lb. The cruising altitude was 24,500 ft. and the flight was without incident.

Flight	Distance Miles	Flight Time 'Off' to 'On'	
N.Y TOR.	361	lhr 12½ min.	8. 040 lb

Initial gross weight 58,400 lb.
Average speed 'off' to 'on' 299 mph.
Block speed 260 mph.



AVRO JETLINER FLIGHT SUMMARY TORONTO - WINNIPEG - TORONTO.

On January 12th 1951, after completing the Toronto, Chicago, New York triangular flight, the Jetliner continued its routine test programme by flying from Toronto to Winnipeg and returning the same day. Details of these flights are recorded on the attached sheets, and a summary is given below:-

Flight	Distance	Flight Time Take-Off to Touchdown	Total Fuel Consumed
TORWIN.	947 miles	2 hr 39 min.	15220 lb.
WINTOR.	947 miles	2 hr 33 min.	16400 1ъ.

The trip to Winnipeg was carried out at a cruising altitude of 35,000, where the ambient air temperature was - 880F. Owing to the existing isobar pattern there was a beam wind on both the outward and return trips, resulting in effective head winds of approximately 20 mph.

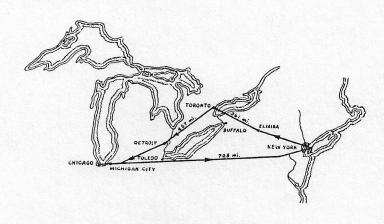


#### AVRO JETLINER FLIGHT SUMMARY TORONTO - QUEBEC - TORONTO (NON-STOP)

Continuing the winter schedule of flight tests, the Jetliner satisfactorily completed the non-stop return journey between Toronto and Quebec City. A summary of the flight is given below and full details are shown on the attached sheets.

Flight	Distance	Flight Time Take-Off to Touchdown	Total Fuel Consumed
TORQUETO	R. 921 miles	3 hr. 2 f min.	18990 lb.
(without the 28m	in stand-off	2 hr 34 1 min	16770 16

The total fuel consumed as determined by weighing was 770 lb. less than the 18990 lb. shown by the flow meters. The reason for the discrepancy has not yet been ascertained.



#### AVRO JETLINER FLIGHT SUMMARY

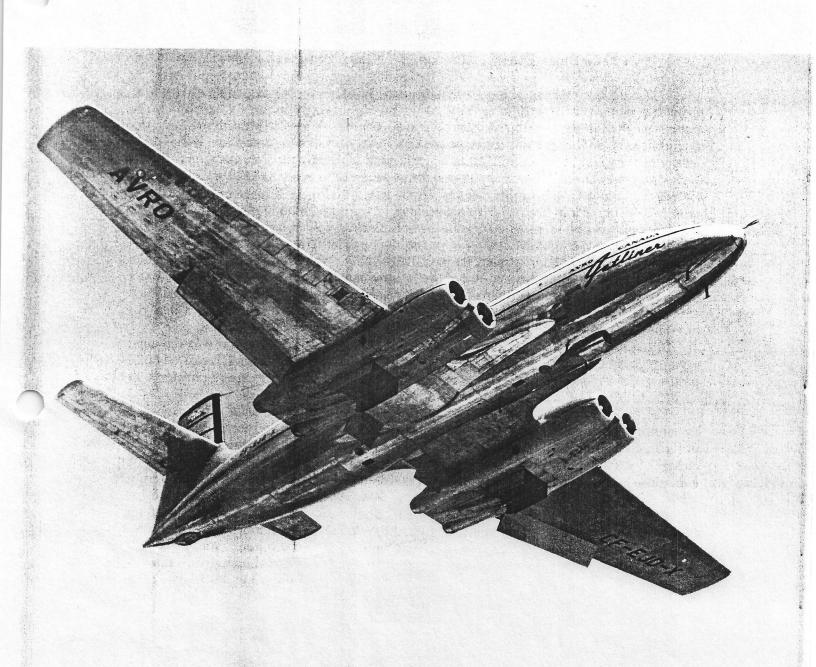
TORONTO - CHICAGO - NEW YORK - TORONTO.

On January 10th 1951, during the course of routine flight testing, the Avro Jetliner prototype completed a triangular flight between Toronto, Chicago and New York, details of which are summarized below and enlarged upon in the following pages.

Flight	Distance Miles	Flight Time Take-Off to Touchdown	Total Fuel Consumed
TOR CHI.	457	1 hr. 31 min.	10, 330 lb.
CHI N.Y. (excluding far maneuvering	725 niliarization	l hr. 56 min. l hr. 49 min.	12, 135 lb. 11, 335 lb.)
N.Y TOR.	361	l hr. 07 min.	8,550 lb.

In view of the conspicuous absence of published flight information on civil jet aircraft, these facts, which substantiate the Jetliner's commercial potentialities.

Flight Log



Jetliner coming in for one of last landings — flaps down — main landing gear doors open. Last flight was November 23rd 1956. — AVRO CANADA

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