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REPORT NO. 6 (PRELIMINARY)

PERSO[illegible] ARROW

WEAPON [illegible] AT COLD LAKE

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Canada Institute for Scientific and Technical Information
J.H. Parkin Branch

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Arrow Weapon System Co-ordinating Contractor

Report No. 6

PRELIMINARY

Personnel Requirements for Arrow Weapon System Programs at Cold Lake

Classification cancelled/changed to.....

By authority of.....(date).....

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Issued : William R. Stephens

Arrow Weapon System
Co-ordinator

Approved: _____

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PERSONNEL REQUIREMENTS FOR ARROW WEAPON SYSTEM PROGRAMS AT COLD LAKE

1. Summary

1.1 This report details estimated Associate Contractors' personnel requirements to support Arrow Weapon System programs at RCAF Cold Lake during 1960 and 1961. These programs are:

(a) Contractors' Sparrow 2 development.

(b) Contractors' demonstration of the Arrow Weapon System.

(c) RCAF evaluation Phases 4, 5 and 7.

1.2 These requirements are based on certain assumptions, stated in the body of this report, as to the responsibilities of the RCAF and the Associate Contractors, the numbers and degree of participation of trained RCAF personnel, and the living accommodation available for contractors' personnel. Changes in these terms of reference may very significantly affect the personnel requirements.

1.3 This report assumes greater RCAF participation than that stated in Avro Preliminary Report No. 72/GEQ/4-1 issued in April 1958; consequently the contractors' personnel requirements are not as great.

1.4 Avro Aircraft Limited participation in these programs is not covered in all cases in the existing Arrow Program Statement of Work (Brochure AD-51); items requiring additional coverage are noted in this report.

1.5 It is concluded that provision of the stated requirements will ensure adequate support to the relevant programs provided the schedule is rigidly maintained. Any prolongation or unanticipated overlap of these programs will raise an additional requirement for contractor personnel which will be extremely difficult to satisfy because of the limited family accommodation presently planned for Cold Lake.

1.6 The provision of 40 family dwelling units as presently planned by the Government is wholly inadequate. At least 130 units will be required to house contractors' personnel who cannot be replaced by RCAF personnel during the program. It is recommended that the decision to provide only 40 units be reconsidered.

2. Assumptions

The following assumptions have been made in estimating the number of people required.

2.1 Canadair Limited will have prime responsibility for the Sparrow 2 program, receiving airframe, engine and electronic system support from the other Associate Contractors concerned.

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2.1 Cont'd

The AWS Co-ordinating Contractor and the Associate Contractors will be responsible for the Arrow Weapon System demonstration program. Assistance with both programs will be given by a number of RCAF tradesmen who will be attached to CEPE for administrative purposes, and who will be gradually integrated to replace contractor maintenance personnel.

2.2 The maintenance and operation of aircraft involved in Phases 4, 5 and 7 of the RCAF evaluation program will be the responsibility of the RCAF, supported by a minimum number of contractor personnel. Contractor-supplied tradesmen and their supervision will be withdrawn from Cold Lake at the end of December 1960, leaving only engineering and technical representative support.

This assumes greater RCAF participation than that stated in Avro Preliminary Report No. 72/GEQ/4-1 "Base Facilities at RCAF Cold Lake Arrow 2 Development and Demonstration Program" issued April 1958. It is considered realistic in view of the Avro-managed RCAF training program now under consideration.

2.3 Avro Aircraft Limited will be awarded a contract for the training of RCAF personnel in the Arrow Weapon System in sufficient time to provide an adequate number of trained men commencing in early 1960.

2.4 130 family dwelling units will be available for housing contractors' personnel and their families. The Government has advised Avro that only 40 units will be provided but, since this is wholly inadequate, it is recommended that this decision be reconsidered. Provision of additional RCAF maintenance personnel will not resolve this problem, since the family units are allocated to service representatives, engineers, etc. who must remain at Cold Lake over six months, and cannot be directly replaced by RCAF people.

The limited accommodation available will necessarily restrict contractor operation to one shift and overtime.

Bachelor officers' quarters and sergeants' quarters will be available in the numbers noted in paragraph 5.

Those people assigned to family dwelling units, and single men in bachelor quarters, will be expected to remain in Cold Lake until the completion of the programs. Married men occupying bachelor quarters will remain a maximum of six months, and where possible will be replaced by RCAF personnel. A survey has shown that about 10% of contractors' employees are unmarried, and thus presumably could remain for the duration of the programs. In preparing these estimates it has been assumed that this will be offset by some married men being unable to remain the full six months on account of illness or family reasons.

2.5 Throughout all the programs discussed in this report, the RCAF will provide the following personnel and facilities:

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(a) Refuelling services, consumable stores, utility transportation and unskilled labour as required.

(b) Secretarial assistance as required.

(c) Labour to transport missiles from the magazine to the missile preparation area.

(d) A ground telemetering facility.

(e) A GCI and a ground station data link, and operation of these facilities.

(f) Data reduction and processing facilities at least comparable to those already in existence at Cold Lake.

(g) Airframe, electronics, missile and engine ground support equipment.

3. Programs

The programs at Cold Lake and their phasing are described in Figure 1.

4. Number of Personnel

4.1 The estimated total number of people required to support the programs, and the relative participation of fully trained contractor and RCAF personnel, are summarized in Figure 2. While it is assumed that a number of RCAF tradesmen will be posted to Cold Lake early in 1960, their Arrow Weapon System training will have consisted largely of lectures. They will require some additional on-the-job training before they can be considered ready for full participation in the program.

4.2 Associate Contractors' personnel requirements for operation of their programs are summarized in Figure 3.

4.3 RCAF participation in the contractors' programs is summarized in Figure 4. This is a minimum requirement for fully trained personnel to maintain program schedules; other RCAF people available may receive contact training and assist in critical stages of the program.

4.4 Associate Contractors' support to RCAF evaluation programs is summarized in Figure 5. This is based on 100% support (on a one shift basis) initially, dropping to 50% maintenance support in September 1960. Maintenance personnel are withdrawn December 31, 1960. Engineering and technical representative support are maintained fully throughout the programs.

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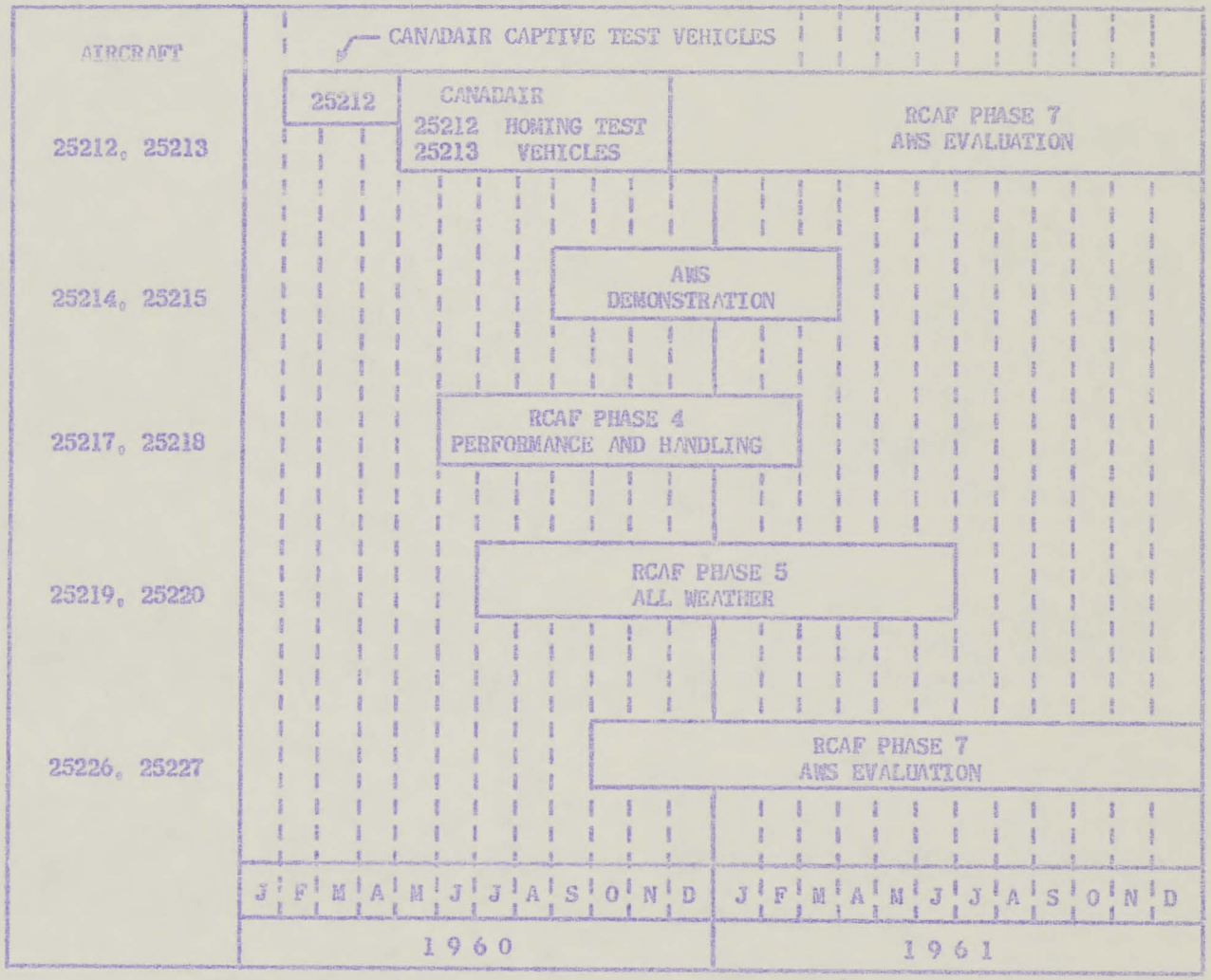
5. Living Accommodation

5.1 Allocation of a total of 130 family dwelling units and requirements for bachelor officers' and sergeants' quarters are shown in Figures 6, 7 and 8 respectively.

5.2 In addition to the bachelor quarters specified in Figures 7 and 8, provision should be made for housing about 12 transient contractor employees who may be sent to Cold Lake from time to time to deal with specific problems.

6. Contractual Coverage

Maintenance at Cold Lake for the Sparrow 2 program (aircraft 25212 and 25213), and the demonstration program (aircraft 25214 and 25215) are covered by paragraphs 8.3.7 and 8.5.4(c) respectively in Avro's Statement of Work for the Arrow Program. However, no coverage was included for support to the RCAF Phases 4, 5 and 7 evaluation program because it could not be defined adequately at the time the document was issued.



ARROW WEAPON SYSTEM PROGRAMS
COLD LAKE

FIGURE 1

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FIGURE 2

SUMMARY
NUMBERS OF PERSONNEL

		ASSOCIATE CONTRACTORS' PROGRAMS				RCAF PROGRAMS		
		NO. OF A/C	CONTRACTORS' PERSONNEL	FULLY-TRAINED RCAF SUPPORT PERSONNEL		NO. OF A/C	CONTRACTORS' SUPPORT PERSONNEL	RCAF PERSONNEL
1960	FEB.	1	64	25	89			
	MAR.	1	64	25	89			
	APR.	1	64	25	89			
	MAY	2	89	25	114			
	JUNE	2	93	25	118	2	63	
	JULY	2	94	25	119	4	113	
	AUG.	2	95	31	126	4	114	
	SEPT	4	132	51	183	4	115	
	OCT.	4	132	51	183	6	137	
	NOV.	4	132	54	186	6	137	
	DEC.	2	89	40	129	8	153	
1961	JAN.	2	87	40	127	8	72	
	FEB.	2	87	40	127	8	72	
	MAR.	2	87	40	127	6	55	
	APR.					6	69	
	MAY					6	69	
	JUNE					6	65	
	JULY					4	52	
	AUG.					4	52	TO BE DETERMINED BY CEPE
	SEPT					4	52	
	OCT.					4	52	
	NOV.					4	52	
	DEC.					4	52	

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FIGURE 3

ASSOCIATE CONTRACTORS' PERSONNEL REQUIRED FOR CONTRACTORS' PROGRAMS

AVRO AIRCRAFT LIMITED	1960 J	F	M	A	M	J	J	A	S	O	N	D	1961 J	F	M	A	M	J	J	A	S	O	N	D
		1A/C									DEMONSTRATION													
Demonstration Controller							2A/C		1	1	1	1	1	1	1									
Project Engineers									2	2	2	2	2	2	2									
Liaison Engineers								1	2	2	2	2	2	2	2									
Instrumentation Engineers		1	1	1	1	1	2	2	3	3	3	3	3	3	3									
Pilots		1	1	1	2	2	2	2	4	4	4	2	2	2	2									
Aircrew Engineers		1	1	1	2	2	2	2	4	4	4	2	2	2	2									
Sr. Service Representative		1	1	1	1	1	1	1	1	1	1	1	1	1	1									
Service Representatives		1	1	1	1	1	1	1	3	3	3	1	1	1	1									
Maintenance Analysts		1	1	1	2	2	2	2	4	4	4	2	2	2	2									
Foreman, Aircraft - AF Tech		1	1	1	1	1	1	1	2	2	2	1	1	1	1									
Foreman, Inspector - AF Tech		1	1	1	1	1	1	1	2	2	2	1	1	1	1									
Sub-foreman, electrical Elec Tech		1	1	1	1	1	1	1	2	2	2	1	1	1	1									
Sub-foreman, engines AE		1	1	1	1	1	1	1	2	2	2	1	1	1	1									
Sub-foreman, airframe AF		1	1	1	1	1	1	1	2	2	2	1	1	1	1									
Sub-foreman, armourer M&W		1	1	1	1	1	1	1	2	2	2	1	1	1	1									
Inspectors - AF Tech		2	2	2	4	4	4	4	8	8	8	4	4	4	4									
Flight Mechanics - AF Tech		3	3	3	6	6	6	6	6	6	6	3	3	3	3									
Electronics Mechanics Com Tech		2	2	2	3	3	3	3	3	3	3	2	2	2	2									
Electrical Mechanics - E Tech		2	2	2	4	4	4	4	4	4	4	2	2	2	2									
Safety Equipment Mechanics - SE		1	1	1	1	1	1	1	1	1	1													
Ground Equipment Mechanics - AF Tech		1	1	1	2	2	2	2	2	2	2	1	1	1	1									
Armourers M&W Tech		1	1	1	2	2	2	2	2	2	2	1	1	1	1									
Instrumentation Technicians Tech		1	1	1	2	2	2	2	2	2	2	1	1	1	1									
Engine Mechanics - AF		1	1	1	2	2	2	2	2	2	2	1	1	1	1									
	26	26	26	41	41	42	43	66	66	66	37		37	37	37									
	1A/C			2A/C				4A/C					2A/C											

	1A/C	2A/C
AF	10	17
AE		7
E Tech	4	5
Com Tech	2	3
SE Tech	2	1
I Tech	1	2
M&W Tech	2	3
A S Tech (ASTAN)	4	6
" " (MISSILE)	11	15
	38	59

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FIGURE 3

ASSOCIATE CONTRACTORS' PERSONNEL REQUIRED FOR CONTRACTORS' PROGRAMS (CONT'D)

	1960											1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
ORENDA ENGINES LIMITED																								
Senior Service Rep.		1	1	1	1	1	1	1	1	1	1	1	1	1	1									
Service Representative		1	1	1	2	2	2	2	2	2	2	2	2	2	2									
Foremen AE		1	1	1	2	2	2	2	2	2	2	2	2	2	2									
Engine Mechanics AE		2	2	2	4	4	4	4	4	4	4	2	2	2	2									
		5	5	5	9	9	9	9	9	9	9	7	7	7	7									
RADIO CORP. OF AMERICA																								
Engineer-in-charge		1	1	1	1	1	1	1	1	1	1	1	1	1	1									
Systems Engineers		2	2	2	3	3	3	3	6	6	6	3	3	3	3									
Field Engineers		3	3	3	5	5	5	5	10	10	10	5	5	5	5									
Instrumentation Engineer -		1	1	1	2	2	2	2	4	4	4	2	2	2	2									
Service Representatives - AStech		2	2	2	4	4	4	4	8	8	8	4	4	4	4									
Technicians - AStech		2	2	2	2	2	2	2	2	2	2	2	2	2	2									
		11	11	11	17	17	17	17	31	31	31	17	17	17	17									
CANADAIR LIMITED																								
Engineer-in-charge		1	1	1	1	1	1	1	1	1	1	1	1	1	1									
Engineers		10	10	10	10	10	10	10	10	10	10	10	10	10	10									
Technicians - AStech		11	11	11	11	15	15	15	15	15	15	15	15	15	15									
		22	22	22	22	26	26	26	26	26	26	26	26	26	26									

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FIGURE 5

ASSOCIATE CONTRACTORS' PERSONNEL REQUIRED FOR SUPPORT OF RCAF PROGRAMS

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
AVRO AIRCRAFT LIMITED																								
Instrumentation Engineers																2	2	2	1	1	1	1	1	1
Senior Service Rep.																1	1	1	1	1	1	1	1	1
Service Representatives						2	4	4	4	6	6	8	8	8	6	6	6	4	4	4	4	4	4	4
Maintenance Analysts						2	4	4	4	6	6	8	8	8	6	6	6	4	4	4	4	4	4	4
Foreman, aircraft						1	2	2	2	3	3	3												
Foreman, inspector						1	2	2	2	3	3	3												
Sub-foreman, electrical						1	2	2	2	3	3	3												
Sub-foreman, engines						1	2	2	2	3	3	3												
Sub-foreman, airframe						1	2	2	2	3	3	3												
Sub-foreman, armourer						1	2	2	2	3	3	3												
Inspectors						4	8	8	8	8	8	8												
Flight Mechanics						6	12	12	12	12	12	12												
Electronics Mechanics						3	6	6	6	6	6	6												
Electrical Mechanics						4	8	8	8	8	8	8												
Safety Equipment Mechanics						1	2	2	2	2	2	2												
Ground Equipment Mechanics						2	4	4	4	4	4	4												
Armourers						2	4	4	4	4	4	4												
Instrumentation Technicians						2	4	4	4	4	4	4												
Engine Mechanics						2	4	4	4	4	4	4												
						36	72	72	72	82	82	86	16	16	12	15	15	11	10	10	10	10	10	10

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FIGURE 5

ASSOCIATE CONTRACTORS' PERSONNEL REQUIRED FOR SUPPORT OF RCAF PROGRAMS (CONT'D)

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
ORENDA ENGINES LIMITED																								
Senior Service Rep.																1	1	1	1	1	1	1	1	1
Service Representatives																2	2	2	2	2	2	2	2	2
Foremen																2	2	2	2	2	2	2	2	2
Engine Mechanics						8	8	8	8	8	8	8												
						8	8	8	8	8	8	8				5	5	5	5	5	5	5	5	5
RADIO CORP. OF AMERICA																								
Engineer-in-charge																1	1	1	1	1	1	1	1	1
Systems Engineers						3	6	6	6	9	9	12	12	12	9	9	9	9	6	6	6	6	6	6
Field Representatives						5	10	10	10	15	15	20	20	20	15	15	15	15	10	10	10	10	10	10
Service Representatives						4	8	8	8	12	12	16	16	16	12	12	12	12	8	8	8	8	8	8
Technicians																2	2	2	2	2	2	2	2	2
Instrumentation Engineers																2	2	2	2	2	2	2	2	2
						12	24	24	24	36	36	48	48	48	36	41	41	41	29	29	29	29	29	29
CANADAIR LIMITED																								
Engineer-in-charge																1	1	1	1	1	1	1	1	1
Engineers						5	7	7	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	7
Technicians						2	2	3	3	3	3	3												
						7	9	10	11	11	11	11	8	8	7	8	8	8	8	8	8	8	8	8

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FIGURE 6

ALLOCATION OF FAMILY DWELLING UNITS

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
AVRO AIRCRAFT LIMITED																								
Demonstration Controller									1	1	1	1	1	1	1									
Project Engineers									2	2	2	2	2	2	2									
Liaison Engineers								1	2	2	2	2	2	2	2									
Instrumentation Engineers		1	1	1	1	1	2	2	3	3	3	3	3	3	3	2	2	2	1	1	1	1	1	1
Pilots		1	1	1	2	2	2	2	2	2	2	2	2	2	2									
Aircrew Engineers		1	1	1	2	2	2	2	2	2	2	2	2	2	2									
Senior Service Rep.		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Service Representatives		1	1	1	1	3	5	5	5	7	7	7	7	7	7	6	6	4	4	4	4	4	4	4
Maintenance Analysts		1	1	1	2	4	6	6	8	8	8	8	8	8	8	6	6	4	4	4	4	4	4	4
Foreman, aircraft		1	1	1	1	2	2	2	2	2	2	2	1	1	1									
Foreman, inspector		1	1	1	1	2	2	2	2	2	2	2	1	1	1									
Sub-foreman, electrical		1	1	1	1	2	2	2	2	2	2	2	1	1	1									
Sub-foreman, engines		1	1	1	1	2	2	2	2	2	2	2	1	1	1									
Sub-foreman, airframe		1	1	1	1	2	2	2	2	2	2	2	1	1	1									
Sub-foreman, armourer		1	1	1	1	2	2	2	2	2	2	2	1	1	1									
Inspectors		2	2	2	4	4	4	4	4	4	4	4	4	4	4									
		14	14	14	19	29	34	35	42	44	44	44	38	38	38	15	15	11	10	10	10	10	10	10
ORENDA ENGINES LIMITED																								
Senior Service Rep.		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Service Representatives		1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Foremen		1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
		3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

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FIGURE 7

OFFICERS' BACHELOR QUARTERS REQUIRED FOR CONTRACTOR PERSONNEL

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
AVRO AIRCRAFT LIMITED																								
Pilots									2	2	2													
Aircrew Engineers									2	2	2													
Service Representatives										2	2	2	2	2										
Maintenance Analysts									2	2	2	2	2	2										
Foremen, aircraft							1	1	2	3	3	2												
Foremen, inspector							1	1	2	3	3	2												
Sub-foremen, electrical							1	1	2	3	3	2												
Sub-foremen, engines							1	1	2	3	3	2												
Sub-foremen, airframe							1	1	2	3	3	2												
Sub-foremen, armourer							1	1	2	3	3	2												
							6	6	18	26	26	16	4	4										
RADIO CORP. OF AMERICA																								
Systems Engineers									1	4	4	4	4	4	1									
Field Engineers										5	5	5	5	5										
Service Representatives										4	4	4	4	4										
Instrumentation Engineers									2	2	2	2												
									3	15	15	15	13	13	1									
CANADAIR LIMITED																								
Engineers									1	1	1	1	1	1										
									1	1	1	1	1	1										

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FIGURE 7

OFFICERS' BACHELOR QUARTERS REQUIRED FOR CONTRACTOR PERSONNEL (CONT'D)

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
RECAPITULATION																								
Avro Aircraft Limited							6	6	18	26	26	16	4	4										
Orenda Engines Limited																								
Radio Corp. of America									3	15	15	15	13	13	1									
Canadair Limited									1	1	1	1	1	1										
							6	6	22	42	42	32	18	18	1									

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FIGURE 8

SERGEANTS' BACHELOR QUARTERS REQUIRED FOR CONTRACTOR PERSONNEL

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
AVRO AIRCRAFT LIMITED																								
Inspectors						4	8	8	12	12	12	8												
Flight Mechanics		3	3	3	6	12	18	18	18	18	18	15	3	3	3									
Electronics Mechanics		2	2	2	3	6	9	9	9	9	9	8	2	2	2									
Electrical Mechanics		2	2	2	4	8	12	12	12	12	12	10	2	2	2									
Safety Equipment Mechanics		1	1	1	1	2	3	3	3	3	3	2												
Ground Equipment Mechanics		1	1	1	2	4	6	6	6	6	6	5	1	1	1									
Armourers		1	1	1	2	4	6	6	6	6	6	5	1	1	1									
Instrumentation Technicians		1	1	1	2	4	6	6	6	6	6	5	1	1	1									
Engine Mechanics		1	1	1	2	4	6	6	6	6	6	5	1	1	1									
		12	12	12	22	48	74	74	78	78	78	63	11	11	11									
ORENDA ENGINES LIMITED																								
Engine Mechanics		2	2	2	4	12	12	12	12	12	12	10	2	2	2									
		2	2	2	4	12	12	12	12	12	12	10	2	2	2									
CANADAIR LIMITED																								
Technicians						6	6	7	7	7	7	7	4	4	4									
						6	6	7	7	7	7	7	4	4	4									

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FIGURE 8

SERGEANTS' BACHELOR QUARTERS REQUIRED FOR CONTRACTOR PERSONNEL (CONT'D)

	1960												1961											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
RECAPITULATION																								
Avro Aircraft Limited		12	12	12	22	48	74	74	78	78	78	63	11	11	11									
Orenda Engines Limited		2	2	2	4	12	12	12	12	12	12	10	2	2	2									
Radio Corp. of America																								
Canadair Limited						6	6	7	7	7	7	7	4	4	4									
		14	14	14	26	66	92	93	97	97	97	80	17	17	17									

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