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# STATEMENT OF WORK (Issue 2)

# ARROW PROGRAM

## BROCHURE AD-51

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**22 MAY 1958**

ALSO CALLED
BROCHURE SS118


***AVRO AIRCRAFT LIMITED***
**MALTON - ONTARIO**


UNCLASSIFIED

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## GENERAL

As an Associate Contractor, Avro Aircraft Limited shall accomplish the design, development, manufacture and test of the ARROW airframe and aircraft. Avro Aircraft Limited shall also perform the functions of the ARROW Weapon System Co-ordinating Contractor in accordance with the principles set forth in Department of Defence Production draft Statement of Responsibility dated November 27, 1957 and AVRO letter to Department of Defence Production reference C17-5/5423 dated December 30, 1957. These documents are attached as Appendix 20.

Except where otherwise stated, this Statement of Work covers activities through December 31, 1960.

Avro Aircraft Limited shall accomplish the specific items of work outlined herein.

# PART 1

## SPECIFICATIONS AND PRELIMINARY DESIGN

1.1 Preliminary engineering of the ARROW aircraft, including design study and submission of a preliminary design.

1.1.2 Proposals + misc. studies.

1.2 Preparation and revision, as necessary, of model specifications for:

ECP's for 25237

1.2.1 The ARROW 2 Weapon System 25211

1.2.2 The ARROW 1 Aircraft

1.2.3 The ARROW 2 Airframe and GSM Installations - Developmental Version 25236

1.2.4 The ARROW 2 Airframe and GSM Installations - Operational Version 25211 25237

1.2.5 Ground Support Equipment for the ARROW 2 Airframe and GSM Installations

1.3 Assistance to the RCAF in the preparation and/or review of requirements specifications for the ARROW Weapon System and its subsystems.

1.4 Evaluation of Associate Contractors' Model Specifications for the subsystems of the ARROW Weapon System to determine compatibility with ARROW Weapon System objectives.

1.5 Evaluation of proposed changes to requirement and model specification to determine their effect on the ARROW Weapon System.

# PART 2

## ARROW 1

2.1 ARROW 1 Airframe Design and Development:

2.1.1 ARROW 1 basic airframe design comprising design and/or specification of structure and systems, contractor-furnished equipment and installation of CFE and GFE including J75 engines and interim electronic system.

2.1.2 Continuing development, beyond basic design, of items in 2.1.1. This shall include installation of development changes in aircraft allocated to airframe development.

2.1.3 Investigation of change requests and incorporation into the airframe design, specifications, and/or mock-ups of agreed changes resulting from the mock-up or evaluation conferences.

2.1.4 Investigations preparatory to program changes requiring special authorization.

2.1.5 Statistical and technical analysis of defects reported on the airframe and associated GSE during the airframe development program.

2.2 ARROW 1 Tooling

2.2.1 Process planning, design, development and manufacture or acquisition of such tooling, master models, jigs, dies, interchangeability media, fixtures and gauges as may be required for the airframe production and assembly of five ARROW 1 aircraft.

2.2.2 Process planning, design and manufacture or acquisition of such production tooling as may be required for the manufacture and/or incorporation of modification kits for the ARROW 1 aircraft.

2.2.3 Maintenance, process planning, repair and replacement of tooling acquired under paragraph 2.2.1 and 2.2.2. Funds provide for tool maintenance through March 31, 1958.

2.3 Manufacture of 5 ARROW 1 Aircraft

2.3.1 The manufacture of airframes for, and the assembly of five ARROW 1 aircraft, including the procurement of related contractor-furnished

equipment and airframe sensing instrumentation for them, and the procurement of airborne data recording instrumentation for ARROW 1 aircraft allocated to airframe development. These aircraft shall be as follows:

25201 ARROW 1 aircraft to Model Specification AAMS-105/1, instrumented for airframe development.

25202 Same as 25201

25203 ARROW 1 aircraft to Model Specification AAMS-105/1, instrumented for airframe development and weapon pack development.

25204 and 25205 ARROW 1 aircraft to Model Specification AAMS-105/1 with AVRO airframe instrumentation and with ARROW 2 radar nose.

(See Appendix 14 for details of aircraft 25204 and 25205).

NOTE: For further information on instrumentation see Appendix 1.

Manufacturing costs include all those required to progress these aircraft through first flight. On completion of the first flight these aircraft shall be accepted by the RCAF and transferred back to Avro Aircraft Limited to carry out the various phases of the flight test development program.

2.3.2 Manufacture and/or acquisition of spare parts and assemblies proposed by AVRO as being required for the maintenance of ARROW 1 airframes, and approved by the RCAF, including packaging and storage as necessary.

2.3.3 Manufacture and/or acquisition of modification kits for ARROW 1 airframes and the incorporation of such modifications prior to RCAF acceptance, including packaging and storage as necessary. Work covered by paragraph 9.4 is excluded.

# PART 3

## ARROW 2

3.1 ARROW 2 Airframe Design and Development:

3.1.1 ARROW 2 basic airframe design comprising design and/or specification of structure and systems, external fuel tank, Sparrow 2 Mk 1 weapon pack and launchers, contractor-furnished equipment, and installation of CFE and GFE as defined in the Model Specification for the ARROW 2 airframe and installed GSM, including Iroquois engine, ASTRA I electronic system and Sparrow missiles.

3.1.2 Continuing development, beyond basic design, of items in 3.1.1, including continuation of escape system design and development, and continuation of radome design and development initiated for aircraft 25204 and 25205. This shall include installation of such development changes in aircraft allocated to airframe development.

3.1.3 Investigation of change requests and incorporation into the airframe design and/or mock-ups of agreed changes resulting from the mock-up or evaluation conferences.

3.1.4 Investigations preparatory to the issue of proposal documents for work requiring special authorization and investigation preparatory to amendments to the contract.

3.1.5 Statistical and technical ~~analysis of~~ defects ~~reported~~ on the airframe ~~and~~ associated GSE.

3.1.6 Deletion of astra etc.

3.2 ARROW 2 Tooling

3.2.1 Process planning, design, development and manufacture or acquisition of such tooling, master models, jigs, dies, interchangeability media, fixtures and gauges as may be required for the production of 32 ARROW 2 aircraft and the continued production of ARROW 2 aircraft at the rate of 4 aircraft per month thereafter, including tooling for long range fuel tank, Sparrow 2 Mk 1 weapon pack and Sparrow 2 Mk 1 launchers.

3.2.2 Process planning, design and manufacture or acquisition of such tooling as may be required for the manufacture and/or incorporation of modification kits for the ARROW 2 aircraft.

3.2.3 Maintenance, process planning, repair and replacement of tooling acquired under paragraph 3.2.1 and 3.2.2, starting April 1, 1958.

3.2.4 Process planning, design, development, modification and incorporation of such tool improvements as may be ~~deemed necessary by Avro Aircraft Limited~~ to improve the produceability of the ARROW 2 airframe.

→ proposed by AVRO + approved by DDP.

3.3 ARROW 2 Manufacture

3.3.1 The manufacture of airframes for, and the assembly of ARROW 2 aircraft, including the procurement of related contractor-furnished equipment and airframe sensing instrumentation for them, and the procurement of airborne data recording equipment for all ARROW 2 aircraft except those allocated to other associate contractors. These shall comprise:

3.3.1.1 Three ARROW 2 aircraft as follows:

25206 ARROW 2 aircraft to Model Specification AAMS-105/2 instrumented for airframe development.

25207 ARROW 2 aircraft to Model Specification AAMS-105/2 with airframe sensing instrumentation and modified for Iroquois engine development. See Appendix 15 for details.

25208 Same as 25206.

3.3.1.2 Twenty-nine ARROW 2 aircraft as follows:

25209 ARROW 2 aircraft to Model Specification AAMS-105/2 with airframe sensing instrumentation and with developmental ASTRA I electronic system installed.

25210 Similar to 25209 with ASTRA I electronic system installed and with instrumentation for electronic system installation development.

25211 and 25212 ARROW 2 aircraft to Model Specification for ARROW 2 airframe and GSM Installation - Operational Version, with pre-production ASTRA I electronic system installed and with airframe and Sparrow 2 development instrumentation.

25213 and 25214 ARROW 2 aircraft to Model Specification for ARROW 2 airframe and GSM installations - Operational Version, with pre-production ASTRA I electronic system installed and instrumented for systems development and weapon system demonstration.

25215 ARROW 2 aircraft to Model Specification for ARROW 2 airframe and GSM Installations - Operational Version, with developmental Partial ASTRA I electronic system installed and instrumented for airframe development.

25216 through 25237 ARROW 2 aircraft to Model Specification for ARROW 2 airframe and GSM Installations - Operational Version. Certain of these aircraft will have Partial ASTRA systems in lieu of complete ASTRA systems installed.

NOTE: For further information on instrumentation see Appendix 1.

Manufacturing costs include all those required to progress aircraft 25206 through 25215 through first flight. On completion of the first flight these aircraft shall be accepted by the RCAF and transferred back to Avro Aircraft Limited to carry out the various phases of the Flight Test Development Program. Manufacturing costs for aircraft 25216 through 25237 include all those required to progress these aircraft through flight test and RCAF acceptance. (Manufacture of production-type long range fuel tanks is not herein included. These tanks are considered to be special order only.)

3.3.2 Manufacture and/or acquisition of spare parts and assemblies proposed by AVRO as being required for the maintenance of ARROW 2 airframes and approved by the RCAF, including storage and packing as necessary.

3.3.3 Manufacture and/or incorporation of modification kits in ARROW 2 airframes, including storage and packing as necessary. This shall include changes to the radar noses of aircraft 25216 and 25217 to permit the installation of recording instrumentation for RCAF Phase 4 evaluation. Work covered by paragraph 9.4 is excluded.

# PART 4

## TEST PROGRAMS

### 4.1 Laboratory Programs

4.1.1 Design and construction of wind tunnel models and performance of wind tunnel tests. See Appendix 2 for details.

4.1.2 Design and construction of free flight models and of required test rigs, and performance of tests. See Appendix 3 for details.

4.1.3 Design, construction and operation of systems analysis and flight simulation aids for use in stability, control and airframe systems problems, including cockpit simulator, analog computer facilities and flying control test rig.

4.1.4 Deleted

4.1.5 Further development of the aids outlined in paragraph 4.1.3 above for use in weapon system development and evaluation. Government provision of additional analog computing facilities and associated laboratory equipment to simulate the ASTRA I system, Sparrow 2 Mk 1 missiles, radome and other components of the weapon system will be required.

4.1.6 Conducting of a telecommunication antenna development and model test program. (See Appendix 4 and item No. 4 of Exclusions).

### 4.2 Structural and System Test Programs

4.2.1 Manufacture of test components. (See Appendix 6 for list of required components.)

4.2.2 Manufacture of 15 pre-production launchers for Sparrow 2 Mk 1 missiles. (See Appendix 16).

4.2.3 Conduct of ground testing, including firing, of the Sparrow 2 Mk 1 weapon pack, but excluding provision of missile and simulated air vehicles. (See Appendix 16 for details of provision of launchers.)

4.2.4 Structural and systems ground testing, including the design and/or specification of test specimens and the design and construction of test rigs and facilities. (See Appendix 7 for test rigs.)

4.2.5 Conduct of sled tests, if required, to:

4.2.5.1 Establish the limitations of the ARROW crew escape system. This may include design and construction of a sled vehicle, using ARROW components listed in Appendix 6 and 17, and wind tunnel programs, ejection tower testing, flight testing and other means.

4.2.5.2 Implement results of 4.2.5.1

4.2.6 Supply of items of contractor-furnished aircraft equipment needed for test purposes.

4.3 Test Provisions and Instrumentation (for details see Appendix 1).

4.3.1 Design and incorporation of modifications to ARROW 1 aircraft No. 25203 for installation of weapon pack and of necessary instrumentation in the radar nose.

4.3.2 Instrumentation of ARROW aircraft allocated to the airframe development flight test program as follows:

4.3.2.1 Design and/or specification of airframe sensing and airborne data recording instrumentation and of its installation, including manufacture of special parts for mounting the instrumentation and installation, check-out and calibration of the data recording instrumentation.

4.3.2.2 Design, tooling, and manufacture of ARROW 1 and ARROW 2 instrument packs and combination weapon/instrument packs required for this program.

4.3.2.3 Maintenance of and changes to the instrumentation in 4.3.2.1 above after RCAF acceptance of the aircraft.

4.3.3 Design and/or specification, and fabrication of ARROW airframe system developmental installations in CF-100 test vehicles.

4.3.4 Design and/or specification, and provision of ground telecommunication facilities required for the ARROW flight test program at Malton, using Government-furnished telecommunication equipment.

4.4 Flight Testing

4.4.1 Flight test planning and the recording, reduction, and analysis of flight test data for the airframe development program.

4.4.2 Provision of assistance to the RCAF in monitoring the flight test programs at Malton.

4.4.3 Maintenance and operation at Malton, including assistance with ASTRA I maintenance, procurement of maintenance assistance from outside contractors, and supply of fuel and oil, of aircraft employed in the airframe development program, comprising Phase 1 and Phase 3 testing. These aircraft shall consist of the following:

| | |
|---|---|
| ARROW 1 aircraft: | 25201 |
| | 25202 |
| | 25203 |
| ARROW 2 aircraft: | 25206 |
| | 25208 |
| | 25210 |
| | 25213 |
| | 25215 |
| Other aircraft: | Two Sabre 6s |
| | One CF-100 Mk 5 |

(Operation of some of these aircraft for periods devoted to RCAF Phase 2 testing and to other Associate Contractors' purposes is covered in Part 8).

4.4.4 Necessary alterations, including incorporation of Government-furnished modification kits, to three RCAF-supplied chase aircraft (namely one CF-100 Mk 5 and two Sabre 6s), and reconversion to their original, or an agreed alternate condition on completion of the program, if this is required before December 31, 1960. (See Appendix 18 for details.)

4.4.5 Planning in conjunction with the other associate contractors of an integrated weapon system flight test program.

4.4.6 — MA1 power + cooling

4.4.7 — Training Arrow pilots

# PART 5

## MOCK-UP AND EVALUATION

5.1 Design and construction of the following developmental and demonstration mock-ups:

5.1.1 ARROW 1 aircraft, including interim electronic system.

5.1.2 ARROW 2 aircraft, including the installation of ASTRA I system and Iroquois engine.

5.1.3 Weapon pack for Sparrow 2 Mk 1 missiles.

5.1.4 Ground support equipment. (See Appendix 10 for list.)

5.1.5 Special cockpit mock-up for evaluation of take-off and landing conditions.

5.1.6 Continuing aircraft mock-up work as required during the development program.

5.2 Construction of full scale ARROW 1 airframe metal mock-up.

5.3 Provision of facilities and services for RCAF mock-up conferences relevant to the mock-ups in paragraph 5.1 above.

5.4 Provision of facilities and services for RCAF Engineering Evaluation conferences for one ARROW 1 and two ARROW 2 aircraft and of associated ARROW 2 GSE (Reference RCAF document DDA-24). (See also paragraph 6.3).

# PART 6

## DATA

6.1 Supply to the RCAF of one microfilm copy of AVRO sub-assembly and assembly drawings for the ARROW 1 and ARROW 2 aircraft, and one reproducible copy of drawings of GSE to PROC 100-2.

6.2 Supply of drawings to other associate contractors as necessary to ensure compatibility of equipment installation in the airframe.

6.3 Provision of data and support for RCAF engineering evaluation of one ARROW 1 and two ARROW 2 aircraft and of associated ARROW 2 ground support equipment. (Ref. DDA-24).

6.4 Provision of services and materials to perform the following work on development and demonstration aircraft.

6.4.1 Maintenance appraisal and the collection and preparation of maintenance and logistics data on the airframe and associated GSE.

6.4.2 Collection and reporting of defects on the airframe and associated GSE.

6.5 Provision of any currently available ARROW technical data specially requested by the RCAF.

6.6 Furnishing of a Program Planning Report and amendments amplifying this Statement of Work. The Program Planning Report shall include a description of methods of accomplishing the work, time scheduling, and cost and manhour data.

6.7 Furnishing of periodic reports of the work defined by the Program Planning Report.

6.7.1 Quarterly physical and financial reports.

6.7.2 Quarterly technical reports.

monthly Info letter.

6.8 Provision of engineering data and reports as listed in Appendix 11.

6.9 ARROW 1 Publications and Service Data

6.9.1 Preparation of Service Data, to be revised twice yearly, describing and illustrating each aircraft system including component removal and installation, maintenance and trouble shooting procedures.

6.9.2 Preparation of additional interim publications as follows to support the aircraft in the absence of normal Engineering Orders.

Pilots' Operating Instructions (to be revised three times yearly).

Weight and Balance Data (to be revised twice yearly).

Maintenance Schedules (to be revised twice yearly).

6.9.3 Preparation of the following general material in support of the program.

Brochures
Film scripts
Reports
Transparencies
Slides
Charts or other visual aids
Service bulletins
Modification bulletins
Contractors' bulletins

Not for Arrow 1.

6.9.4 Preparation of training material as required in support of training programs as follows:

Lecture notes
Transparencies
Slides
Wall diagrams or other visual aids.

6.10 ARROW 2 Publications and Service Data

6.10.1 Preparation of Engineering Orders to RCAF Specifications and revisions to such Engineering Orders as follows:

Pilots' Operating Instructions (to be revised three times yearly).

Pilots' Operating Instructions (to be revised three times yearly). Confidential.

Description and Maintenance Instructions (to be revised twice yearly).

Structural Repair Manual (to be revised twice yearly).

Illustrated Part List (to be revised twice yearly).

Maintenance Schedule - Primary (to be revised twice yearly).

Maintenance Schedule - Periodical (to be revised twice yearly).

Weight and Balance Data (to be revised twice yearly).

Storage, Preservation, Handling and Shipping Instructions (to be revised twice yearly).

Service bulletins
Modification bulletins
~~Contractors' Bulletins~~

6.10.2 Procurement or preparation of Engineering Orders to RCAF Specifications on:

Items of proprietary equipment (to be revised once yearly)

Items of ground support equipment (to be revised twice yearly).

Ejection seat (to be revised twice yearly).

6.10.3 Preparation of instruction manuals for aircraft systems trainers (airframe systems only).

6.10.4 Preparation of material in support of training program, as follows:

Lecture notes
Transparencies
Slides
Wall diagrams or other visual aids

6.10.5 Preparation of the following general material required in support of the program.

Brochures
Film scripts

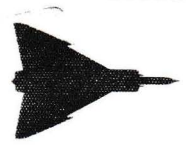
Reports
Transparencies
Slides
Charts or other visual aids

6.11 Weapon System Co-ordination reports as follows:

(a) A consolidated report summarizing the physical progress of the ARROW Weapon System every three months. (See also 7.21).

(b) Special Reports.

6.12 Preparation of descriptive brochures for each ARROW 2 airframe system for the ARROW 2 mock-up conference, and revision of these brochures at least once a year to keep them up to date with system development.



## PART 7

## STUDIES

| | | RCAF References |
|---|---|---|
| 7.1 | Design study of an aircraft systems trainer for the airframe contractor-furnished systems, including construction of a model for design investigation. | S36-38-105-12 (ACE) 28 October 1957 |
| 7.2 | Design study for a ground equipment trainer. | S36-38-105-8 (APO-1) 2 January 1958 |
| 7.3 | Measurement of inflight thrust of the engines. | S36-38-105 (ACE-1) 12 June, 1957 and S36-38-105-14 (ACE-1) 30 August, 1957. |
| 7.4 | Aspects relative to the installation of the ASTRA I system. These studies will be conducted in collaboration with the Radio Corporation of America. (See Appendix 12 for details). | |
| 7.5 | Improvements to the crew escape system. | 35th Co-ordinating Committee. S36-38-105(a) (ACE) 18 October, 1957. |
| 7.6 | Installation of arrester hook on the ARROW. | 36th ARROW co-ord. Committee. 26a and b. |
| 7.7 | Requirements for achieving compatibility between the ARROW and RCAF specified runway barrier. | S36-38-105 (APO) 16 January, 1958. |
| 7.8 | Physical installation of Genie rockets in the ARROW. | S49-38-105(a) (Arm. Eng.) 20 January, 1958 AIR 7-4 Issue 4 draft 7th Ad Hoc Co-ord. Committee. 4 September, 1957. Decision 24 (a) |
| 7.9 | Such additional studies as deemed necessary to complement the design of airframe and associated GSE systems and equipment. Additional studies | |

may be added by special authorization as agreed between the RCAF and Avro Aircraft Limited.

7.10 Review of the RCAF concept of operations for the ARROW Weapon System.

7.11 Study of the weapon system standard achievable within the constraints and limitations of the program. In this study due cognizance will be taken of such limitations as elapsed time available to squadron introduction, availability of flight test vehicles, etc. The objective will be to achieve the optimum weapon system performance within these limitations as indicated by tactical studies.

7.12 Study of the operation of the ARROW Weapon System in conjunction with the air defense ground environment.

7.13 Study of the operation and compatibility of the ARROW Weapon System in conjunction with the requirements for air base facilities, including:

(a) Readiness facility.

(b) First line maintenance facility and turnaround facility.

(c) Second line maintenance facility and workshops.

(d) Armament storage and test facilities.

(e) Aircraft run-up base.

(f) Iroquois engine run-up stand and test facility.

(g) Runway length and strength.

(h) Portable and mobile support test equipment, including quantities required, for use on the aircraft.

7.13.1 Complete operational air base.

7.13.2 Cold Lake air base.

7.13.3 Such other tasks as shall be agreed and funded from time to time.

7.14 Study of the requirements of the weapon system with respect to, and monitoring development of:

7.14.1 Ground support equipment.

7.14.2 Training aids for aircraft and ground support equipment.

7.14.3 RCAF maintenance trade structure and procedures (personnel requirements data, planned maintenance procedures and depth of maintenance).

7.15 Analysis of the technical progress reports of the Associate Contractors.

7.16 Study and analysis of technical problems with respect to GSM on request from the Royal Canadian Air Force, and recommendations of solutions to these technical problems.

7.17 Analysis of GSM defect reports and monitoring of remedial action.

7.18 Conduct of systems analysis of the effectiveness of the weapon system and analysis of the effects of changes to the components of the weapon system.

7.19 Study of the growth potential of the ARROW Weapon System and proposal of methods of modifying subsystems of the weapon system, including the airframe, to improve the capabilities of the weapon system.

7.20 Studies necessary to supply data, generally in accordance with USAF Specification Bulletin No. 124, for defining requirements for a flight and tactical trainer for the ARROW. a/c + engine.

7.21 Analysis of Associate Contractors' physcial progress reports (see also 6.11).

7.22 Studies on request from the RCAF of adaptation of the ARROW aircraft to other mission roles.

7.23 Study jointly with Canadair Limited of sustained semi-submerged carriage of Sparrow 2 missile.

# PART 8

## WEAPON SYSTEM DEMONSTRATION AND SUPPORT TO THE RCAF AND OTHER ASSOCIATE CONTRACTORS

8.1 Support to the Radio Corporation of America (see Appendix 14)

8.1.1 Design and/or specification of modifications to and modification of aircraft 25202 for the RCA AFCS Development Program (pilot assist and air data functions only).

8.1.2 Design and incorporation in aircraft 25204 and 25205 of provisions necessary to adapt them for ASTRA I development, including retrofit installation of the ASTRA components including infra-red sub-system.

8.1.3 Design and/or specification of airframe sensing instrumentation and of its installation together with the installation of ASTRA instrumentation in aircraft 25204, 25205 and 25209.

8.1.4 Manufacture of instrument packs for aircraft 25204 and 25205, and of a combination weapon/instrument pack for aircraft 25209, inclusing design and incorporation of necessary pack modifications.

8.1.5 Assistance with maintenance of and changes to instrumentation after RCAF acceptance of ARROW aircraft allocated to RCA.

8.1.6 Provision at Malton of office, storage and laboratory facilities, including laboratory test equipment and assistance with its operation, but excluding facilities for maintenance and repair of ASTRA I equipment.

8.1.7 Provision of materials and services for the operation of the following aircraft from Malton for RCA's flight test program:

25202 (for development of pilot assist and air data computer functions of AFCS only)

25204, 25205, 25209

Two CF-100 target aircraft allocated to RCA.

Two F-101B ASTRA test vehicles allocated to RCA.

Materials and services to be supplied for the aircraft listed above comprise the following:

(a) Fuel and oil

(b) Maintenance of aircraft including procurement of maintenance assistance from outside contractors. (See item 5 of Exclusions).

(c) Hangar space.

(d) Ground support equipment other than F-101B GSE. (See part 10).

(e) Data reduction facilities and service.

(f) Ad Hoc Experimental Manufacturing support.

(g) Support to RCA in the maintenance of Partial ASTRA and ASTRA I systems.

8.1.8 Training of RCA air crews and on-the-job training of RCA ground crews.

8.1.9 Supply to RCA of one print copy of drawings, specifications and technical data on Sparrow 2 missile auxiliaries, and missile auxiliary test equipment being developed for the CF-100 Mk. 5M. (The cost of this service is being borne by the CF-100 Mk. 5M contract).

8.2 Support to Orenda Engines Limited (See Appendix 15).

8.2.1 Instrumentation work for aircraft 25207 comprising design and/or specification of airframe sensing instrumentation and of its installation; design of the installation and installing of airborne data recording instrumentation; check-out and calibration of airframe instrumentation.

8.2.2 Manufacture of an instrument pack for aircraft 25207.

8.2.3 Assistance with maintenance of and changes to instrumentation in 25207 after RCAF acceptance of the aircraft.

8.2.4 Provision of necessary office and storage facilities at Malton.

8.2.5 Provision of materials and services for the operation of aircraft 25207 from Malton for the Orenda flight test program, comprising:

(a) Operation including fuel and oil.

(b) Maintenance of aircraft including procurement of maintenance assistance from outside contractors. (See item 5 of Exclusions).

(c) Hangar space.

(d) Ground support equipment (see part 10).

(e) Data reduction facilities and service.

(f) Ad Hoc Experimental Manufacturing support.

(g) Use of and assistance with operation of available test equipment.

(h) Provision of ground telemetering facilities.

(i) Operation of chase aircraft.

8.2.6 Training of ~~an~~ two Orenda pilots and on-the-job training of Orenda ground crews.

8.3 Support to Canadair Limited (See Appendices 5 and 9).

8.3.1 Operation of ARROW aircraft 25203 during the Sparrow CTV (Control Test Vehicle) and ETV (Environmental Test Vehicle) test program, including the provision of ground telemetering facilities, supply of recorded data and operation of a chase aircraft.

8.3.2 Instrumentation work to Canadair requirements for ARROW aircraft 25211 and 25212, comprising design and/or specification of airframe sensing instrumentation and of its installation; design of the installation and installing of airborne data recording instrumentation; check-out and calibration of airframe instrumentation.

8.3.3 Manufacture of combination weapon/instrument packs for aircraft 25211 and 25212.

8.3.4 Assistance with maintenance of and changes to instrumentation in 25211 and 25212 after RCAF acceptance of the aircraft.

8.3.5 Provision at Malton of necessary office, storage and laboratory facilities, including use of and assistance with operation of available laboratory test equipment, and the supply of one set of Sparrow missile test equipment. (Any additional Sparrow test equipment is to be furnished by the Canadian Government or Canadair Limited).

8.3.6 Provision of materials and services for the operation of aircraft 25211 and 25212 from Malton for the Canadair flight test program, comprising:

(a) Operation including fuel and oil.

(b) Maintenance of aircraft including procurement of maintenance assistance from outside contractors. (See item 5 of Exclusions).

(c) Hangar space.

(d) Ground support equipment (see para 10).

(e) Data reduction facilities and service.

(f) Ad Hoc Experimental Manufacturing support.

(g) Support in the maintenance of ASTRA I electronic systems.

8.3.7 Maintenance of aircraft 25211 and 25212 at Cold Lake during the Canadair test program, including essential modifications and procurement of services from other contractors.

8.3.8 Training of Canadair flight crews and on-the-job training of Canadair ground crews. C fuel oil etc

8.4 Support to the RCAF during its Phase 2 testing (aircraft 25202 and 25206) and Phase 4 through 8 evaluation (aircraft 25216 through 25237), comprising the following items. (See item 9 of Exclusions).

8.4.1 Design and/or specification of the airframe sensing and airborne data recording instrumentation and of its installation, and installation, check-out and calibration of the recording instrumentation.

8.4.2 Provision of photo-panel installation, aircraft and instrumentation maintenance, fuel and oil for ARROW aircraft used for Phase 2 testing at Malton, and provision of ground data processing facilities for this program. (See Appendix 13 for details).

8.4.3 Manufacture of instrument packs and combination weapon/instrument packs required for Phase 4 through 8 evaluation.

8.4.4 Deleted. (See para. 12.12).

8.5 Support to the Weapon System demonstration.

8.5.1 Planning, in conjunction with the other associate contractors, of the integrated ARROW Weapon System demonstration program.

8. 5. 2 Instrumentation work for aircraft 25213 and 25214 comprising design and/or specification of the airframe sensing and airborne data recording instrumentation and of its installation, and installation, check-out, and calibration of the recording instrumentation.

8. 5. 3 Manufacture of combination weapon/instrument packs for aircraft 25213 and 25214.

8. 5. 4 Provision of materials and services at Cold Lake for the operation of the demonstration program as follows:

(a) Provision of technical assistance to co-ordinate the demonstration program.

(b) Provision of flight crews.

(c) ~~Aircraft~~ airframe maintenance including procurement of services from outside contractors but excluding supply of facilities.

(d) Maintenance of and changes to instrumentation in 8. 5. 2 above.

(e) Data analysis.

(f) Preparation of final report on demonstration of weapon system.

(g) Support in the maintenance of ASTRA I systems.

8. 5. 5 Provision, if required, of mobile repair parties at Cold Lake, to repair and/or modify airframes and associated GSE in support of the weapon system demonstration program.

# PART 9

## ENGINEERING SUPPORT TO PRODUCTION

9.1 Investigations into and design and specification of changes, salvage schemes and/or material substitutions to aid production and/or servicing of the ARROW airframe and associated GSE.

9.2 Design and/or specification of agreed modifications to the airframe structure and/or systems and associated GSE, and of trial installations, resulting from requests by the RCAF ~~or other agencies~~ (but excluding changes resulting from the ARROW development program or RCAF evaluation conferences and changes of such magnitude as to warrant special authorization).

9.3 Testing including specification and manufacture of test rigs and components as required to:

(a) Test modifications to the aircraft (as per paragraph 9.2).

(b) Conduct minor ground tests, as required during the production and testing of the aircraft.

(c) Conduct supplementary structural and systems tests on the major test rigs after the basic test program has been completed.

9.4 Installation into the AVRO airframe development flight test aircraft, after RCAF acceptance, of:

(a) All mandatory modifications.

(b) All approved modifications necessary for the test program.

(c) Trial installation of proposed modifications (as per paragraph 9.2).

(d) All work necessary to attain completion to a standard to permit the commencement of the flight test program.

9.5 Engineering investigation, as required, into accidents to ARROW aircraft. (Repair scheme design is covered by 11.1).

9.6 Provision of liaison, as required, with the RCAF, sub-contractors, and other agencies and organizations, including appraisal of vendors'

proposals and monitoring of vendor qualification testing and type approval of CFE.

9.7 Recommendation and implementation of remedial action to improve reliability of the airframe and associated GSE as a result of defect data analysis done under Section 3.1.5.

# PART 10

## GROUND SUPPORT EQUIPMENT AND TRAINERS

10.1 Aircraft Systems Trainer

10.1.1 Design and/or specification of an aircraft systems trainer (AST) for the instruction of RCAF personnel in maintenance aspects of the airframe systems and airframe ground support equipment. (See Appendix No. 19). This AST does not include training units for GSM, and related GSE, i.e. the ASTRA I electronic system, the Iroquois engine, Sparrow 2 Mk 1 missiles, and other armament.

10.1.2 Design of modifications to the trainer in 10.1.1.

10.2 Design and/or specification of contractor furnished Ground Support Equipment for ARROW 1 and ARROW 2 as defined in AVRO report 70/GEQ/2 and of modifications thereto, including GSE for handling other Associate Contractors' equipment, such as missile hoist, engine stand, covers, and devices for installing and removing ASTRA components from the aircraft. (Detail design of 600, 800 and 900 series items in 70/GEQ/2 is not included).

10.3 The manufacture and/or provision of ground support equipment as defined in AVRO report 70/GEQ/2, other than 600, 800 and 900 series items and other items listed as Government-furnished in the report. Avro Aircraft Limited will supply ground support equipment for the first eight aircraft as per AVRO report 70/GEQ/1 and such equipment as may be ~~required~~ authorized for the subsequent twenty-nine aircraft.

10.4 Investigation of change requests and incorporation into GSE design specifications and/or mock-up of agreed changes resulting from ~~mock-up~~ or evaluation conferences.

10.5 Manufacture and installation of such modifications as may be required to maintain the current modification status of Ground Support Equipment specified in paragraph 10.3.

10.6 Supply of spare parts and assemblies recommended by AVRO as being required for the maintenance and/or repair and overhaul of GSE specified in paragraph 10.3, as authorized by the RCAF including packaging and storage as necessary.

10.7 Procurement, manufacture, assembly and supply of three Aircraft Systems Trainers (see Appendix 19).

10.8 Supply to the RCAF of one reproducible copy of all drawings to PROC 100-2 of Aircraft Systems Trainer (airframe systems only).

10.9 Maintenance, repair and overhaul of the Ground Support Equipment covered by 10.3 above.

10.10 Co-ordination services to achieve compatibility among the Ground Support Equipment being designed by the ARROW Weapon System Associate Contractors.

10.11 Co-ordination services to achieve compatibility among the system and associated GSE trainers being designed by the ARROW Weapon system Associate Contractors.

# PART 11

## REPAIR AND OVERHAUL

11.1 Investigation and design of repair schemes for ARROW airframe and for related spares, after acceptance by the RCAF.

11.2 Repair and overhaul of thirty-seven ARROW airframes and related spares, after acceptance by the RCAF.

11.3 Acquisition and/or manufacture of repair and overhaul spares for ARROW airframes.

# PART 12

## MISCELLANEOUS

12.1 Provision of attendance at ARROW Weapon System Committee meetings.

12.2 Deleted.

12.3 Provision of facilities for other Associate Contractors' test crews participating in ARROW Weapon System development work at Malton. (Refer also to 8.1.6, 8.2.4 and 8.3.5).

12.4 Provision of personnel to be trained on the ASTRA I electronic system, Iroquois engine and Sparrow 2 Mk 1 missile.

12.5 Compilation and maintenance of a master statement of work for the ARROW Weapon System. Review of Associate Contractors' statements of work and program planning reports to determine adequate coverage of system objectives and to avoid unnecessary duplication of effort. Review of proposed changes to Associate Contractors' atatements of work and program planning reports to determine their effects on weapon system objectives. Advice to the RCAF with respect to the foregoing.

12.6 Compilation and maintenance of a master phasing schedule for the ARROW Weapon System. Review of program schedules forecast by Associate Contractors to determine compatibility with weapon system objectives. Monitoring progress of Associate Contractors to determine that system elements including PRD, GSE, AST and other training aids, are properly phased and integrated.

Co-ordination of changes in work programs and phasing schedules to insure weapon system compatibility.

12.7 Examination of the recommendations of the Associate Contractors for weapon system support, including such items as ancillary equipment, services, supporting personnel and facilities. Combination of these recommendations into a unified weapon system support plan. Co-ordination of subsequent design and development of these items to insure proper integration of ground support equipment and maintenance procedures.

12.8 Establishment and maintenance of a master component requirements

schedule for the weapon system and liaison with regard to procurement or supply of weapon system components.

12.9 Co-ordination of the assessment of the effect of reliability statistics on the Weapon System.

12.10 Assessment of the data control systems of all the Associate Contractors and recommendation to the RCAF regarding changes required, if any.

12.11 Provision of a maximum of three representatives at AAWS. (Note: This service will be covered by a separate contract).

12.12 Preparation of a syllabus for, and conducting of such RCAF familiarization courses as may be required.

12.13 (a) Provision of necessary technical assistance to support operation and maintenance of ARROW airframes and equipment in the field.

(b) Provision of assistance to the RCAF in the field for the maintenance and servicing of ARROW aircraft based at four locations during RCAF evaluation and initial operation.

(c) Co-ordination of ARROW Weapon System training programs conducted by Associate Contractors for RCAF personnel, including the curriculum and phasing aspects of such training programs.

12.14 Continuous co-ordination and liaison with AAWS and all Associate Contractors regarding schedule, progress, technical and responsibility aspects of the ARROW Weapon System and its subsystems.

12.15 Provision of necessary power and cooling air facilities for testing of ASTRA I electronic systems in ARROW aircraft located in Production Flight Test.

## SUPPORT FROM CANADIAN GOVERNMENT AGENCIES

The following items of support are assumed to be provided by the Canadian Government:

(a) Provision of the following at RCAF Station Cold Lake: data reduction facilities, fuel, oil, ground support equipment, laboratory and special test equipment, chase, ECM and target aircraft, drones, miss distance instrumentation, and facilities for repair and overhaul.

(b) Provision of other Associate Contractors' hardware and test specimens.

(c) Provision of Government-furnished special test equipment.

(d) Provision of modification kits for chase and target aircraft used by all the Associate Contractors.

(e) Provision of personal equipment, track and facilities for the escape system sled test program.

(f) Provision of office space, laboratory space and living quarters for personnel supplied by AVRO in support of operations at Cold Lake.

(g) Supply of telecommunication equipment for ground telecommunication facilities to support the ARROW flight test program at Malton.

(h) Provision of capital-type equipment necessitated by services to other Associate Contractors and to fulfill co-ordinating contractor responsibilities, including computing and simulating equipment, data processing equipment and ground telemetering installations.

(i) Provision of chase aircraft.

(j) Provision of firing ranges and facilities.

(k) Provision of flight crews, instruments for photo panels and fuel for ferry flights for RCAF Phase 2 testing.

## SUPPORT FROM ORENDA ENGINES LIMITED

The following support is assumed to be provided by Orenda Engines Limited:

(a) Three Government-furnished Iroquois engines with full instrumentation, for installation in aircraft 25207.

(b) Provision of, maintenance of (with AVRO installation and removal assistance), and changes to airborne engine data telemetering adaptation equipment and special airborne instrumentation (other than airframe sensing instrumentation) in aircraft 25207.

(c) Provision of agreed Iroquois GSE for programs conducted at Malton.

(d) Provision and operation (at Malton) and operation (at Cold Lake) of Iroquois maintenance facilities, and the provision of maintenance services and spares, to serve all Associate Contractors' requirements.

(e) Provision of facilities and services to train AVRO personnel on the Iroquois engine.

(f) Technical assistance to AVRO in obtaining RCAF acceptance of ARROW 2 aircraft.

(g) Provision to AVRO of available defect data and reliability data on components of the Iroquois engine.

(h) Provision and operation of field-type Iroquois engine run-up stand and check-out facilities, with silencing, at Malton.

(i) Provision of flight crews for aircraft 25207.

(j) Supply to other ARROW Weapon System Associate Contractors of available data required for co-ordination of the ARROW Weapon System and for preparation of Weapon System reports.

## SUPPORT REQUIRED FROM THE RADIO CORPORATION OF AMERICA

The following support is assumed to be provided by RCA:

(a) Local technical assistance to AVRO in obtaining RCAF acceptance of ARROW 2 aircraft.

(b) Continuing technical support to AVRO and other Associate Contractors in the maintenance of Partial ASTRA and ASTRA I systems in ARROW aircraft allocated to development and demonstration programs, after RCAF acceptance of the aircraft.

(c) Provision of AFCS equipment and test equipment for aircraft 25202.

(d) ASTRA support to serve all Associate Contractors' requirements, comprising the following:

  (i) Provision, maintenance and operation of ASTRA maintenance facilities at Malton.

  (ii) Maintenance and operation of ASTRA maintenance facilities at Cold Lake.

  (iii) Provision of maintenance services and spares for both ASTRA equipment and related Ground Support Equipment at Malton and Cold Lake.

(e) Responsibility for airborne instrumentation, other than airframe sensing instrumentation, in ARROW test vehicles assigned to RCA, including:

  (i) Provision

  (ii) Pre-flight testing

  (iii) Maintenance (with AVRO installation and removal assistance)

  (iv) Changes

(f) Provision of GSE and spares to support F-101B aircraft allocated to RCA for ASTRA development.

(g) Provision of facilities and services to train AVRO and Canadair personnel on the ASTRA I electronic system

(h) Provision to AVRO of available defect data and reliability data on components of the ASTRA I electronic system.

(i) Supply of flight crews for all aircraft (ARROW, CF-100 and F-101B) allocated to RCA programs.

(j) Supply to other ARROW Weapon System Associate Contractors of available data required for the co-ordination of the ARROW Weapon System and for preparation of Weapon System reports.

## SUPPORT FROM CANADAIR LIMITED

The following support is assumed to be provided by Canadair Limited:

(a) Provision of Sparrow test vehicles and airborne telemetry equipment and spares necessary for Canadair missile test programs.

(b) Operation and maintenance of Sparrow missile check-out and maintenance facilities, and provision of maintenance services and spares for both missiles and associated GSE, to serve all Associate Contractors' requirements at Malton and at Cold Lake. (The facilities themselves are to be provided by AVRO at Malton and by the RCAF at Cold Lake. Missile seeker service for RCA Camden will be provided by Canadian Westinghouse Co. Ltd.).

(c) Provision of, maintenance of (with AVRO installation and removal assistance) and changes to airborne instrumentation (other than airframe sensing instrumentation) in ARROW aircraft assigned to Canadair.

(d) Provision of special Sparrow test vehicle test equipment and agreed Sparrow GSE for programs conducted at Malton

(e) Provision of facilities and services to train AVRO and RCA personnel on the Sparrow 2 Mk 1 missile.

(f) Provision to AVRO of available defect data and reliability data on components of the Sparrow 2 Mk 1 missile.

(g) Provision of engineering services and materiel to support RCA ASTRA-Sparrow compatibility tests.

(h) Supply to other ARROW Weapon System Associate Contractors of available data required for co-ordination of the ARROW Weapon System and for preparation of Weapon System reports.

## EXCLUSIONS

The following items are excluded from the preceding Statement of Work:

1. Extra work resulting from changes to Specification AIR 7-4 Issue 4 (as proposed).

2. Engineering of any armament installation other than the design and development of the Sparrow 2 Mk 1 missile installation and study of a Genie rocket installation.

3. Missile development or evaluation, and/or the supply of tow targets, tugs, target drones, missiles and simulated air vehicles for ground and flight tests.

4. Design and development of antennas forming part of servo-loops of Government-furnished sub-systems, and of multiplexing for antennas.

5. Repair and overhaul of any aircraft participating in the ARROW program other than ARROW aircraft, or of other Associate Contractors' subsystems or components thereof.

6. Measurement of in-flight thrust, other than a study of methods of accomplishing it.

7. Maintenance and/or operation of RCAF flight test aircraft number 25216 through 25237, or of instrumentation installed therein, after RCAF acceptance.

8. Work entailed by the failure of G. S. M. to meet required schedules or standards.

9. Participation in and/or support of the RCAF evaluation flight test Phases 4 through 8 other than that covered by Section 8.4 and 12.13 of the Statement of Work.

10. Major re-engineering of any work within RCAF Specification AIR 7-4 Issue 4.

11. Provision of facilities for conducting training programs.

12. Any work involving aircraft other than ARROW aircraft, one CF-100 and two Sabre chase/target aircraft assigned to AVRO, and two CF-100 chase/target aircraft and two F-101B test vehicles assigned to RCA.

13. Manufacture of production-type long range fuel tanks. These are considered to be special order only.

14. All changes to this program introduced after April 15, 1958.

15. Supply of any spares other than those covered by paragraphs 2.3.2 and 3.3.2

16. Provision for repair and overhaul of airborne flight test instrumentation.

## SCHEDULE OF DELIVERY DATES

The following schedule lists delivery dates for physically deliverable items, listed by Statement of Work paragraph number reference.

| Para. No. | Description | Date |
|---|---|---|
| 1.2.1 | Model Specification - ARROW 2 Weapon System (first contractual issue) | June 1959 |
| 1.2.2 | Model Specification - ARROW 1 Aircraft | April 1957 |
| 1.2.3 | Model Specification - ARROW 2 Airframe and GSM Installations - Development Version | June 30, 1958 |
| 1.2.4 | Model Specification - ARROW 2 Airframe and GSM Installations - Operational Version | November 15, 1958 |
| 1.2.5 | Model Specification - Ground Support Equipment for the ARROW 2 Aircraft (first draft) | August 30, 1958 |
| 2.2 | ARROW 1 tooling | See 3.2 |
| 2.3 | Five ARROW 1 Aircraft: | |
| | 25201 | March 1958 |
| | 25202 | June 1958 |
| | 25203 | July 1958 |
| | 25204 | September 1958 |
| | 25205 | October 1958 |
| 2.3.2 | Spares for ARROW 1 aircraft. (This provisioning also includes the first three ARROW 2 aircraft.) | 13% complete March 1958<br>90% complete Dec. 1958 including all ARROW 1 spares. |
| 3.2 | ARROW tooling (not including modifications) | Completion March 31st 1960 |
| 3.3.1.1 | Three ARROW 2 Aircraft: | |
| | 25206 | March 1959 |
| | 25207 | May 1959 |
| | 25208 | July 1959 |

| Para. No. | Description | Date |
|---|---|---|
| 3.3.1.2 | Twenty-nine ARROW 2 Aircraft: | |
| | 25209 | September 1959 |
| | 25210 | October 1959 |
| | 25211 | November 1959 |
| | 25212 | December 1959 |
| | 25213 | January 1960 |
| | 25214 | February 1960 |
| | 25215 | March 1960 |
| | 25216 | April 1960 |
| | 25217 and 25218 | May 1960 |
| | 25219 and 25220 | June 1960 |
| | 25221 and 25222 | July 1960 |
| | 25223 and 25224 | August 1960 |
| | 25225, 25226 and 25227 | September 1960 |
| | 25228, 25229 and 25230 | October 1960 |
| | 25231, 25232, 25233 and 25234 | November 1960 |
| | 25235 and 25236 | December 1960 |
| | 25237 | January 1961 |
| 3.3.2 | Spares for three ARROW 2 aircraft | See 2.3.2 |
| | Spares for 29 ARROW 2 aircraft | To be scheduled later |
| 4.2.1 | Test components | Completion December 31,1959 |
| 4.2.6 | Supply of contractor - furnished equipment for test | Completion March 31, 1961 |
| 5.2 | ARROW 1 metal mock-up | Completion March 31, 1958 |
| 6.1 | One microfilm copy of Avro sub-assembly and assembly drawings for the ARROW 1 and ARROW 2 Aircraft. | As issued |
| 6.1 | One reproducible copy of drawings of GSE to PROC 100-2 | As issued |
| 6.6 | Program Planning Report | 3 months after customer approval of S. of W. |
| 6.7.1 | Physical and financial progress reports. | Every three months |

| Para. No. | Description | Date |
|---|---|---|
| 6.7.2 | Quarterly technical reports | Every three months |
| 6.8 | Reports as noted in Appendix 11 of the Statement of Work | As available |
| 6.9.1 | ARROW 1 Service Data | |

| TITLE | SECTION NO. | DATE |
|---|---|---|
| General Information | 1 | January 15, 1958 |
| Structure | 2 | February 15, 1958 |
| Lubrication | 3 | May 15, 1958 |
| Main Landing Gear | 4 | December 11, 1956 |
| Nose Landing Gear | 5 | March 15, 1958 |
| Landing Gear - Hydraulics | 6 | February 20, 1957 |
| Wheel Brakes - Hydraulics | 7 | December 8, 1956 |
| Nose Wheel Steering - Hydraulics | 8 | February 20, 1957 |
| Landing Gear - Electrics | 9 | February 15, 1958 |
| Parachute Brake | 10 | March 15, 1958 |
| Flying Controls - Mechanical | 11 | February 15, 1958 |
| Flying Controls - Hydraulics | 12 | January 15, 1958 |
| Flying Controls - Electrics | 13 | October 1, 1957 |
| Speed Brakes - Hydraulics | 14 | April 1, 1958 |
| Fuel System | 15 | May 21, 1957 |
| Fuel System - Electrics | 16 | May 30, 1957 |
| Air Conditioning and Pressurization | 17 | January 15, 1958 |
| Air Conditioning - Electrics | 18 | May 30, 1957 |
| Low Pressure Air System | 19 | February 15, 1958 |
| Utility Hydraulics - Power Circuit | 20 | November 28, 1956 |
| Pitot Static System | 21 | February 15, 1958 |
| Oxygen System | 22 | May 27, 1957 |
| Power Plant | 23 | May 2, 1957 |
| Engine Controls | 24 | October 11, 1957 |
| Engine Services - Electrics | 25 | February 25, 1957 |
| Fire Protection System | 26 | February 15, 1958 |
| Fire Protection - Electrics | 27 | February 15, 1958 |
| Engine Intake and Ramp De-icing System | 28 | February 1, 1958 |
| Engine Intake and Ramp De-icing Electrics | 29 | May 8, 1957 |
| Accessories Drives and Gear-boxes | 30 | November 18, 1957 |
| Ejection Seat MK. C5 | 31 | January 15, 1958 |

| Para. No. | TITLE | SECTION NO. | DATE |
|---|---|---|---|
| 6.9.1 | Canopies | 32 | October 17, 1957 |
| | Canopies - Electrics | 33 | March 15, 1958 |
| | Windshield and Canopy De-icing | 34 | April 17, 1957 |
| | Instruments | 35 | April 1, 1958 |
| | Electrical System - General Information | 36 | February 15, 1958 |
| | Electrical System - Power Supplies | 37 | March 1, 1958 |
| | Electrical System - Master Warning | 38 | January 15, 1958 |
| | Electrical System - Internal and External Lighting | 39 | March 15, 1958 |
| | Electronics - Power Distribution | 40 | May 27, 1957 |
| | Electronics - Radio Compass AN/ARN-6 | 41 | May 28, 1957 |
| | Electronics - X-Brand Beacon | 42 | February 15, 1958 |
| | Electronics - UHF Homer Adaptor AN/ARA-25 | 43 | June 25, 1957 |
| | Electronics - UHF Command Radio AN/ARC-34 | 44 | June 25, 1957 |
| | Electronics - IFF AN/APX-6A | 45 | September 24, 1957 |
| | Electronics - Interphone AN/AIC-10 | 46 | September 23, 1957 |
| | Electronics - J-4 Gyrosyn Compass | 47 | June 24, 1957 |
| | Instrument Pack | 48 | November 15, 1957 |
| 6.9.2 | ARROW 1 Pilot's Operating Instructions | | Three revisions per year |
| | ARROW 1 Weight and Balance Data | | Two revisions per year |
| | ARROW 1 Maintenance Schedule | | Two revisions per year |
| 6.10.1 | EO 05-135A-1 Pilot's Operating Instructions (to be revised three times yearly.) | | |
| | | Preliminary EO | January 1, 1960 |
| | | Regular EO | January 1, 1961 |

| Para. No. | Description | Date |
|---|---|---|
| 6.10.1 | EO 05-135A-1A Pilot's Operating Instructions (to be revised three times yearly). Confidential | |
| | Preliminary EO | July 1, 1960 |
| | Regular EO | July 1, 1961 |
| | EO 05-135A-2 Description and Maintenance Instructions (to be revised twice yearly). | |
| | Preliminary EO | January 1, 1960 |
| | Regular EO | January 1, 1961 |
| | EO 05-135A-2A Description and Maintenance Instructions (to be revised twice yearly). Confidential | |
| | Preliminary EO | July 1, 1960 |
| | Regular EO | July 1, 1961 |
| | EO 05-135A-3 Structural Repair Manual (to be revised twice yearly) | |
| | Preliminary EO | July 1, 1960 |
| | Regular EO | July 1, 1961 |
| | EO 05-135A-4 Part List (to be revised twice yearly). | |
| | Preliminary EO | January 1, 1960 |
| | Regular EO | January 1, 1961 |
| | EO 05-135A-7 Maintenance Schedule - Primary (to be revised twice yearly) | |
| | Preliminary EO | January 1, 1960 |
| | Regular EO | January 1, 1961 |
| | EO 05-135A-7A Maintenance Schedule - Periodical (to be revised twice yearly). | |
| | Preliminary EO | January 1, 1960 |
| | Regular EO | January 1, 1961 |
| | EO 05-135A-8 Weight and Balance Data (to be revised twice yearly). | |
| | Preliminary EO | January 1, 1960 |
| | Regular EO | January 1, 1961 |

| Para. No. | Description | Date |
|---|---|---|
| 6.10.1 | EO 05-135A-9 Storage, Preservation, Handling and Shipping Instructions (to be revised twice yearly) | |
| | Preliminary EO | July 1, 1960 |
| | Regular EO | July 1, 1961 |
| 6.10.2 | EO 65A-40EC-2 Handbook with Part List - Trailer Lift, Aircraft, Main Oleo. -Ref. 4G/3375 | January 1, 1960 |
| | EO 65A-40ED-2 Handbook with Part List - Trailer Lift, Aircraft, Nose Oleo. - Ref. 4G/3376 | January 1, 1960 |
| | EO 65A-40JA-2 Handbook with Part List - Trailer, Aircraft Elevators, Aileron and Control Boxes. Ref. 4G/3377 | January 1, 1960 |
| | EO 65A-15BM-2 Handbook with Part List - Towing Equipment Bar. Ref. 4G/2984 | January 1, 1959 |
| | EO 65A-90CD-2 Handbook with Part List - Stand Maintenance, Aircraft Engine. Ref. 4G/3357 | January 1, 1960 |
| | EO 65A-70GA-2 Handbook with Part List - Pump Dispensing, Oil, Hand Operated. Ref. 4G/3283 | June 1, 1959 |
| | EO 65A-40GB-2 Handbook with Part List - Trailer Lift, External Fuel Tanks. Ref. 4G/3358 | January 1, 1960 |
| | EO 65A-90CE-2 Handbook with Part List - Trailer Aircraft Engine. Ref. 4G/3397 | January 1, 1960 |
| | EO 65B-55AA-2 Handbook with Part List - Starter, Engine, Air Turbine. Ref. 4G/3394 | January 1, 1960 |
| | EO 65D-45CA-2 Handbook with Part List - Air Conditioner and Generator AC and DC. Ref. 4G/3395 | January 1, 1960 |

| Para. No. | Description | Date |
|---|---|---|
| 6.10.2 | EO 65B-35DB-2 Handbook with Part List - Compressor, Air, Reciprocating Air or Nitrogen, Gas Driven. Ref. 4G/3396 | January 1, 1960 |
| | EO 65B-35DA-2 Handbook with Part List - Compressor, Air, Reciprocating Air or Nitrogen, Electric Motor Driven. Ref. 4G/2993 | June 1, 1959 |
| | EO 65D-5JA-2 Handbook with Part List - Stand, Test, Aircraft Hydraulic System. Ref. 4G/2994 | June 1, 1959 |
| | EO 30-20MV-2 Handbook with Part List - Stand, Armament Harmonizing. Ref. 11D/431 | January 1, 1960 |
| | EO 30-20MP-2 Handbook with Part List - Trailer, Radome. Ref. 11D/747 | January 1, 1960 |
| | EO 30-20MG-2 Handbook with Part List - Trailer, Lift, Sparrow Missile. Ref. 11D/741 | January 1, 1960 |
| | EO 30-20MJ-2 Handbook with Part List - Hoist, Missile, Pack. Ref. 11D/428 | June 1, 1959 |
| | EO 30-20MH-2 Handbook with Part List - Console, Checkout, Missile Pack, Ref. 11D/743 and Stand, Checkout, Missile Pack. Ref. 11D/742 | January 1, 1960 |
| | ARROW 2 Engineering Orders on Proprietary Equipment | One revision per year |
| | ARROW 2 Engineering Orders on GSE | Two revisions per year |
| | ARROW 2 Engineering Orders on Ejection Seat | Two revisions per year |
| 6.11 | Weapon System Progress Report | Every three months |

| Para. No. | Description | Date |
|---|---|---|
| 7.1 | Design Study of Aircraft Systems Trainer. | December 1957 |
| 7.2 | Design Study of Ground Equipment Trainer. | May 9, 1958 |
| 7.3 | Design Study of Measurement of In-flight Thrust of Engines. | June 15, 1958 |
| 7.4 | Design Study of Aspects Relative to the Installation of ASTRA I System in collaboration with Radio Corporation of America. | Not available |
| 7.5 | Design Study of Improvements to the Crew Escape System. | May 15, 1958 |
| 7.6 | Design Study of the Installation of an Arrester Hook on the ARROW. | Preliminary issue April 30, 1958 |
| 7.7 | Design Study for Achieving Compatibility between the ARROW and RCAF specified Runway Barrier. | |
| 7.8 | Design Study of the Physical Installation of Genie Rockets in the ARROW. | May 1, 1958 |
| 7.11 | Study of Weapon System Standard Achievable within the Constraints and Limitations of the Program. | Continuous |
| 7.12 | Study of the Operation of the ARROW Weapon System in Conjunction with the Air Defence Ground Environment. | Continuous |
| 7.13 | Study of Operation and Compatibility of the ARROW Weapon System in conjunction with the Requirement for Air Base Facilities. | As Issued |
| 7.13.2 | Study of Facilities required at Cold Lake. | As Issued |
| 7.14.3 | Personnel Requirements Data Report - Issue 1. | March 31, 1959 |

| Para. No. | Description | Date |
|---|---|---|
| 7.20 | Studies to Supply Data for Defining Requirements for a Flight and Tactical Trainer for the ARROW. | Not yet defined. |
| 8.1.4 | Instrument Pack for Aircraft 25204 | April 1959 |
| | Instrument Pack for Aircraft 25205 | May 1959 |
| | Weapon - Instrument Pack for Aircraft 25209. | December 1959 |
| 8.2.2 | Instrument Pack for Aircraft 25207. | July 1959 |
| 8.3.3 | Weapon - Instrument Pack for Aircraft 25211. | January 1960 |
| | Weapon - Instrument Pack for Aircraft 25212. | February 1960 |
| 8.4.3 | Weapon - Instrument Pack for Aircraft 25218 and 25219. | July 1960 |
| | Weapon - Instrument Pack for Aircraft 25226 and 25227. | October 1960 |
| 10.1 | Aircraft System Trainers. | Completion March 31, 1961 |
| 10.3 | Ground Support Equipment for Aircraft 25201 through 25208. | Completion December 1958 |
| | Ground Support Equipment for Aircraft 25209 through 25237. | Not yet Scheduled |
| 10.6 | Spares for GSE for 25201 through 25208. | Completion December 1958 |
| | Spares for GSE for 25209 through 25237. | To be Scheduled later |

D < 59

too late

## APPENDIX 1

Appendix 1 - Instrumentation and Instrument Pack Allocation and Responsibility

| Aircraft | Role | Airframe sensing instrumentation supplied by AVRO | Recording Instrumentation | | Pack Type (Note: Weapon packs will be available for all ARROW 2s in addition to instrument and weapon-instrument packs listed) | Remarks |
|---|---|---|---|---|---|---|
| | | | Specified and supplied by | Installation design and Installation by | | |
| 25201 | AVRO airframe development | Yes | AVRO | AVRO | Instrument | |
| 25202 | (a) AVRO airframe development<br>(b) RCAF Phase 2 test<br>(c) AFCS development<br>(d) Antenna pattern testing | Yes | AVRO | AVRO | Instrument | Special Instrumentation for RCAF Phase 2 Testing (See Appendix 13) |
| 25203 | (a) AVRO airframe development<br>(b) Weapon pack development | Yes | AVRO | AVRO | (a) Instrument<br>(b) Weapon Pack with radar nose instrumentation | Canadair CTV program operated on this aircraft |
| 25204 and 25205 | (RCA ASTRA I (development ( | Yes | RCA | AVRO | Instrument | See also Appendix 14 |
| 25206 | (a) AVRO airframe development<br>(b) RCAF Phase 2 test | Yes | AVRO | AVRO | Instrument | Special instrumentation for RCAF Phase 2 testing (See Appendix 13) |
| 25207 | Orenda Iroquois development | Yes | Orenda | AVRO | Instrument | See Appendix 15 |
| 25208 | AVRO airframe development | Yes | AVRO | AVRO | Instrument | |
| 25209 | RCA ASTRA I development | Yes | RCA | AVRO | Combination weapon-instrument | |

APPENDIX 1 (Cont'd)

| Aircraft | Role | Airframe Sensing instrumentation supplied by AVRO | Recording Instrumentation | | Pack Type (Note: Weapon packs will be available for all ARROW 2s in addition to instrument and weapon-instrument packs listed) | Remarks |
|---|---|---|---|---|---|---|
| | | | Specified and supplied by | Installation design and Installation by | | |
| 25210 | (a) AVRO electronic system installation<br>(b) Canadair Sparrow 2 Mk 1 testing | Yes | AVRO | AVRO | Combination weapon-instrument | |
| 25211 and 25212 | (Canadair Sparrow 2 (Mk 1 development ( | Yes | Canadair | AVRO | Combination weapon-instrument | |
| 25213 | (a) AVRO development<br>(b) Weapon system demonstration | Yes | AVRO | AVRO | Combination weapon-instrument and weapon | |
| 25214 | Co-ordinating Contractor Weapon System demonstration | Yes | AVRO | AVRO | Combination weapon-instrument and weapon | |
| 25215 | AVRO structural integrity | Yes | AVRO | AVRO | Instrument | |
| 25216 and 25217 | (RCAF Phase 4 (evaluation ( | Yes | AVRO | AVRO | Weapon | Special radar nose instrumentation |
| 25218 and 25219 | (RCAF Phase 5 (evaluation | Yes | AVRO | AVRO | Combination weapon-instrument | |

APPENDIX 1 (Cont'd)

| Aircraft | Role | Airframe sensing instrumentation supplied by AVRO | Recording Instrumentation | | Pack Type (Note: Weapon packs will be available for all ARROW 2s in addition to instrument and weapon-instrument packs listed | Remarks |
|---|---|---|---|---|---|---|
| | | | Specified and supplied by | Installation design and installation by | | |
| 25220 through 25225 | (RCAF Phase 6 (evaluation ( | Yes | AVRO (if required) | AVRO (if required) | Weapon | |
| 25226 and 25227 | (RCAF Phase 7 (evaluation ( | Yes | AVRO | AVRO | Combination weapon-instrument | |
| 25228 through 25233 | (RCAF Phase 8 (evaluation ( | Yes | AVRO (if required) | AVRO (if required) | Weapon | |
| 25234 through 25237 | (Attrition ( ( | Yes | AVRO (if required | AVRO (if required) | Weapon | |

## APPENDIX 2

ARROW WIND TUNNEL PROGRAM - CURRENT AND COMPLETED

| Model Scale and Type | Purpose of Test | Test Facility | Duration |
|---|---|---|---|
| 3/100 complete model sting mounted | Subsonic and transonic 3 axis stability and control | Cornell 3' x 4' transonic 10' x 12' subsonic | 1208 runs |
| 4/100 complete model sting mounted | Transonic armament tests longitudinal and directional stability and control | Cornell 3' x 4 ' transonic | 662 runs |
| 1/10 reflection plane wing | Subsonic, preliminary study of icing conditions on longitudinal and lateral control | NAE Ottawa 10' x 5.7' low speed | - |
| 1/8 reflection plane wing | Subsonic, more advance study of icing conditions with notch and leading edge extension included | NAE Ottawa 10' x 5.7' low speed | (Cancelled) |
| 7/100 complete model | Subsonic missile jettison, canopy, ground effects | NAE Ottawa 10' x 5.7' low speed | 348 runs |
| 1/80 complete model sting mounted | Supersonic lateral and directional stability and control | NAE Ottawa 16" x 30" Supersonic | 177 runs |
| 1/40 fuselage intake | Supersonic study of airflow through the intakes | NAE Ottawa 10" x 10" Supersonic | 400 runs |

APPENDIX 2 (Cont'd)

| Model Scale and Type | Purpose of Test | Test Facility | Duration |
|---|---|---|---|
| 1/50 reflection plane | Supersonic longitudinal stability and control and lateral control | NAE Ottawa 16" x 30" Supersonic | 177 runs |
| 1/24 complete model | Subsonic, spin characteristics, and recovery post stall gyrations | NAE Ottawa Spinning tunnel | 68 hrs. occupancy |
| 1/6 fuselage intake | Supersonic, study of airflow through intakes | NACA Cleveland 8' x 6' Supersonic Lewis Lab. | 116 hrs. occupancy 92 hrs. running |
| 3/100 complete model | Supersonic, directional stability at high angles of attack | NACA, Langley 4' x 4' Supersonic | 113 runs |
| 1/50 canopy model | High subsonic rake survey of canopy and dorsal | NAE, Ottawa 10" x 10" Supersonic | 21 runs |
| 1/10 complete model | Low Speed flutter | NAE, Ottawa 10' x 5.7' low speed | 350 hrs. occupancy |
| 1/40 reflection plane (Size dependent upon facility) | Transonic flutter | MIT 22" diameter transonic | 11 runs |

APPENDIX 2 (Cont'd)

| Model Scale and Type | Purpose of Test | Test Facility | Duration |
|---|---|---|---|
| 4/100 fin model | Supersonic rudder buzz | NAE, Ottawa<br>16" x 30"<br>Supersonic | 72 hrs.<br>occupancy |
| 4/100 complete model | Sparrow missile trajectories<br>Canopy hinge moment and effect of canopy on directional stability | Cornell | 138 hrs.<br>occupancy |
| Alpha-beta vane full size | Supersonic functional test of vane developed by Phoenix Engineering Ltd. for ARROW. | NAE, Ottawa<br>16" x 30"<br>Supersonic | 104 hrs.<br>occupancy |
| | WATER TUNNEL PROGRAM | | |
| 3/100 canopy model with dorsal and nose fuselage | Water tunnel test with visual flow check on canopy/dorsal combination | NAE, Ottawa<br>water tunnel<br>9.84" x 13.11" | - |
| | ENGINE DUCT MODEL | | |
| 6/10 duct model Iroquois configuration | Flow and efficiency of duct system including air bleed for an Iroquois engine installation | Orenda Engines Ltd.<br>Test Cells | - |

## APPENDIX 3

## ARROW FREE FLIGHT MODEL PROGRAM - COMPLETED

| Models | | | | | |
|---|---|---|---|---|---|
| Scale | Quantity | Type | Purpose of Test | Test Facility | Remarks |
| 1/8 | 2 | Crude models | Check firing technique, telemetering and tracking | CARDE Range, Picton, Ont. | Complete |
| 1/8 | 1 | Crude model | Check functioning of yaw impulse and alpha-beta vanes | CARDE Range, Picton, Ont. | Complete |
| 1/8 | 1 | Drag model | Telemetry system check and preliminary drag check including flow through air intakes and ducts | CARDE Range, Picton, Ont. | Complete |
| 1/8 | 1 | Crude model | Recheck functioning of yaw impulses and alpha-beta vanes | CARDE Range, Picton, Ont. | Complete |
| 1/8 | 1 | Drag model; extended leading edge, notch and droop, area rule, 30° cone nose | Check drag with two different air intakes and ducts | Langley Field Range, Va. | Complete |
| 1/8 | 2 | Yaw stability models, extended leading edge, notch and droop, area rule, 30° cone nose | Check directional stability | CARDE Range, Picton, Ont. | Complete |
| 1/8 | 2 | Longitudinal stability models with elevators, extended leading edge, notch and droop, area rule, 30° cone nose | Check longitudinal stability | CARDE Range, Picton, Ont. | Complete |

## APPENDIX 4

### ANTENNA RESEARCH MODELS AND MOCKUPS - CURRENT AND COMPLETED

| Model Scale and Type | Purpose of Test | Test Facility | Remarks |
|---|---|---|---|
| 1/48 scale complete model, sheet metal | Free flight model antenna research | Sinclair Radio Labs. Ltd. | Complete |
| Modified 1/48 scale model | Low frequency radio compass research | Sinclair Radio Labs Ltd. | Complete |
| 1/18 scale complete model, cast aluminum | UHF and L-band antenna | Sinclair Radio Labs. Ltd. | Complete |
| 1/8 scale complete model, sheet metal | Experimental UHF and L-band Antenna | Sinclair Radio Labs. Ltd. | Complete |
| Full scale fin mock-up | Fin cap antenna research | Sinclair Radio Labs. Ltd. | Complete |
| Dorsal fairing mock-up | Radio compass sense antenna research | Sinclair Radio Labs. Ltd. | Complete |
| Plastic CF-100 model | Radio compass sense antenna research | Sinclair Radio Labs. Ltd. | Complete |
| 1/10 scale CF-100 wind tunnel Model | Fin UHF antenna pattern measurements in support of antenna evaluation program on CF-100 | Sinclair Radio Labs. Ltd. | Pattern measurements for principal plane and conical cuts in work |
| 0.07 scale ARROW wind tunnel Model | UHF and L-band antenna pattern measurements for a "clean" aircraft and for the aircraft with missiles and drop tank | Sinclair Radio Labs. Ltd. | Pattern measurements for principal plane and conical cuts in work |

# APPENDIX 5

## ARROW 2 Aircraft for Sparrow 2 Homing Test Vehicle (HTV) Firings

This Appendix summarizes the work necessary to provide two ARROW 2 aircraft (25211 and 25212) for the Canadair Sparrow 2 HTV firing program.

1. Design and incorporation of airframe sensing instrumentation as specified by Canadair.

2. Design and installation of Canadair-supplied data recording instrumentation to Canadair specifications in combination weapon/instrument packs.

3. Operation and maintenance of the two aircraft at Malton until such time as they are ready to commence the program at Cold Lake.

4. Ferrying the two aircraft to RCAF Station Cold Lake including provision of personnel and ground support equipment at a staging base.

5. Maintenance of the two aircraft at Cold Lake.

# APPENDIX 6

## ARROW TEST COMPONENTS

| COMPONENT | QUANTITY |
|---|---|
| Front fuselage | 1 including canopy and canopy actuation mechanism |
| Canopy | 5 aircraft sets including one canopy mounted on the front fuselage above |
| Centre Fuselage | 1 |
| Air intake | 1 aircraft set |
| Duct bay | 1 |
| Engine bay | 1 |
| Rear fuselage | 1 |
| Inner wing complete | 1 |
| Outer wing | 1 aircraft set |
| Dive brakes | 1 brake, left hand component only |
| Aileron | 2 standard aircraft sets |
| | 1 modified aircraft set |
| Elevator | 2 standard aircraft sets |
| | 1 modified aircraft set |
| Fin | 1 |
| Rudder | 2 standard |
| | 1 modified |
| Main and nose landing gear | 1 aircraft set |
| Main and nose landing gear door | 1 aircraft set |
| Main landing gear pivot doors | 1 door - right hand only |

| COMPONENT | QUANTITY |
|---|---|
| Main landing gear leg fairings | 1 fairing - right hand only |
| Weapon pack (Sparrow) | 3 |
| Fin trailing edge for rudder tests | 1 complete with control linkage and mountings |
| Outer wing trailing edge for aileron tests | 1 aircraft set complete with control linkage and mountings |
| Air conditioning ducting | 1 aircraft set |
| Engine intake duct - forward portion | 1 aircraft set |
| Engine intake duct - aft portion | 1 duct - left hand component only |
| Inner wing posted box tanks | 5 |
| Windshield for canopy testing | 2 |
| Single missile extension linkage | 1 |
| Power panel for electrical system | 1 |
| Ram and fan exhaust duct | 1 (Part number 7-2254-884) |
| Fan exhaust duct | 1 (Part number 7-2254-1171) |
| Transmission duct assembly | 1 (Part number 7-2254-663) |
| Dorsal fairing (fiberglass) | 1 (Part number 7-1000-473) |
| Engine mount (worm and gear) | 6 |
| Elevator drive links | 3 |
| Radar nose | 3 |
| | Part only-unassembled details |
| Engine intake transition duct ARROW 2 | 1 |
| Dive brake, ARROW 2, RH complete | 1 (Part number 7-1072-2) |

| COMPONENTS | QUANTITY |
|---|---|
| Dive brake hydraulic jack | 1 (Part number 7-1956-7) |
| Hydraulic components required to complete RH dive brake assembly to drawing 7-1956-42 | 1 set |
| Long range tanks | 2 + 6 for flight test |
| Former 469, ARROW 2 | 1 (Part number 7-1054-15031) |

Front fuselage together with 18 ejection seats, 4 canopies and canopy actuating gear as required for the sled testing program. Financial contingency is also allowed for seats and canopies for additional 10-run escape development program.

Miscellaneous items as required to supply production parts for combination weapon-instrument packs and for future tests.


## APPENDIX 7

(See Paragraphs 4.2.3 and 4.2.4 of the Statement of Work)

The following ground test rigs will be constructed for the structural and system tests:

(a) Landing gear complete

(b) Flying controls

(c) Fuel system for ARROW 1 and fuel system for ARROW 2

(d) ARROW 1 air conditioning

(e) ARROW 2 air conditioning

(f) Static aircraft

(g) Flight simulator for control development

(h) Sparrow weapon pack development

(i) Miscellaneous smaller test rigs

# APPENDIX 8

DELETED

## APPENDIX 9

### CTV Flight Test Program for Canadair Ltd.

Canadair Limited has a requirement to fire four missile control test vehicles (CTV) at high altitude during the first three months of 1960. ARROW aircraft 25203 will be flight testing the weapon pack at this time, so these firings can be integrated in this program.

The allocation of responsibilities is as follows:

| | | |
|---|---|---|
| 1. | Operation of firing range | Canadair |
| 2. | Telemetering and recording equipment at range | Canadair |
| 3. | Laboratory facilities and equipment for Canadair at Malton | AVRO |
| 4. | Supply of CTVs | Canadair |
| 5. | Personnel to service CTVs | Canadair |
| 6. | Aircraft 25203, crew, servicing and maintenance for ten flights | AVRO |
| 7. | Airborne data recording on Aircraft 25203 | AVRO |
| 8. | Data processing | Canadair |
| 9. | Chase aircraft, crew, servicing and maintenance | AVRO |

# APPENDIX 10

## GROUND SUPPORT EQUIPMENT MOCK-UPS

The following mock-ups of ground support equipment will be constructed:

(1) ARROW 1 engine change stand (Completed)

(2) ARROW 2 engine change stand (Completed)

(3) ARROW armament pack hoist trolley (Completed)

(4) ARROW cockpit access ladder (Completed)

(5) ARROW cockpit access stairway (Completed)

# APPENDIX 11

## ENGINEERING DATA AND REPORTS

In the process of design, a number of preliminary reports are prepared for internal Company use. While satisfactory for design purposes, these reports are not completed to Company standards for outside release. Considerable time, manpower, and money would be required to develop these reports, which, because of the viable nature of the design process, would probably be obsolete before issue. Such preliminary reports as are significant will be developed to release standards and made available to the RCAF.

Each Quarterly Technical Report will list the Engineering reports which have been completed during the reporting period. The Engineering reports will fall into the following categories:

| | Remarks |
|---|---|
| 1. Preliminary Design Proposal | P/C105/1 and P/C105/2, to Specification AIR 7-3 were issued to the RCAF in May and June of 1953 in full compliance with requirements. |
| 2. Wind Tunnel Data | Coverage of this data would involve about 100 reports. The data for many of these, without explanatory texts, has been submitted at RCAF request as preliminary reports, and the rest will also be submitted in this form, if they are requested to fill a specific need. |
| 3. Weight and Balance Reports | The following reports are issued monthly, as required by CAP479:<br>ARROW 1: 7-0400-44;<br>ARROW 2: 7-0400-34. |
| 4. Performance Reports | RCAF requirements for performance data will be met by the issue of reports termed Periodic Performance Reports which contain the specific data requested. |
| 5. Stress Analysis | |
| 6. Structural Strength Test Reports | |

| | Remarks |
|---|---|
| 7. Electrical Load Analysis | CAP479 requirements will be met |
| 8. Aircraft Ground and Flight Test Reports | |
| 9. Functional Type Test Reports | Each item of equipment procured to an Avrocan specification will undergo qualification testing. All functional type test data and qualification test reports for bought out equipment will be indexed under AVRO drawing numbers and retained in AVRO's Central Engineering Files. |
| 10. Systems Reports | |
| 11. General Technical Design | This will include analog and digital computing, stability and control, thermodynamics, elastics, aeroelastics, human factors, etc. |
| 12. Maintenance, Ground Support and Personnel Requirements Reports | |

# APPENDIX 12

The following aspects of the ASTRA I system installation will be studied and reported on jointly by the Radio Corporation of America and AVRO. To this end AVRO will supply all relevant information, study RCA findings and recommendations, and approve RCA reports, when required, on:

(a) Investigations of electrical power requiredments and power supply equipment.

(b) Design study on integrated display, controls, and cockpit layouts, including the division of functions between the two cockpits.

(c) Investigation of missile stowage, launching, and power supplies.

(d) Investigation of snap-up and breakway.

(e) Investigation of the optimum installation design for the infra-red scanner.

(f) Report on maintenance and overhaul of ASTRA I advanced electronic system.

The following will be investigated jointly by RCA and AVRO during the design stages, but no formal reports will be issued on these subjects:

(a) Installation, configuration, volume, weight, cooling pressurization, and environment of the ASTRA I equipment.

(b) Air data and flight data requirements.

(c) Range of pitch and roll at which engagement of the Automatic Flight Control System can be accomplished and the range of pitch attitude under AFCS control.

# APPENDIX 13

## INSTRUMENTATION PROVISIONS FOR RCAF PHASE 2 FLIGHT TESTING

1. Design, manufacture, installation and calibration of an airborne photo instrumentation panel in each aircraft used for Phase 2 testing, using Government-furnished instruments, and meeting the requirements of RCAF letter S36-38-105-14 (APO) 04 February, 1958.

2. Airborne telemetering and magnetic tape instrumentation, including manpower necessary to service, maintain and calibrate it.

3. Ground telemetering station and readout facilities including manpower for operation, maintenance and calibration.

4. Ground magnetic tape readout facility, including manpower for operation.

5. Facilities and manpower for reduction of data from the photo instrument panel film records.

6. Programming and processing performance results through the IBM 704 computer.

# APPENDIX 14

## ARROW 1 AIRCRAFT FOR ASTRA I DEVELOPMENT

This Appendix summarizes the modifications, alterations and installations necessary to provide two ARROW 1 aircraft (25204 and 25205) for the RCA ASTRA I development program.

This work shall include the following:

(1) Design, specification and incorporation of all necessary alterations to accommodate all ASTRA I components including the infra-red sub-system. This will include the radar nose, radome, modification to the cockpits and necessary structure and systems changes to augment and redistribute the ARROW 1 cooling air supply. In addition, other minor changes are required, including a modified instrument pack, accomodating RCA-supplied recording instrumentation, and a pylon-mounted Sparrow 2 Mk 1 seeker for each of the aircraft.

(2) Provision of necessary ground testing of modified airframe systems.

(3) Design, specification and incorporation of the built-in items of airframe test instrumentation, including items for possible alternate roles.

(4) Flight testing of the aircraft to ensure aircraft airworthiness and adequacy of the cooling air supply.

(5) Maintenance of aircraft 25204 and 25205 during RCA ASTRA I installation, including hangar and office facilities.

Note: In order to meet the schedule for these aircraft it will be necessary to retrofit some of the necessary wiring and other provisions after acceptance by the RCAF i.e. - removal of interim electronic system and the installation of wiring and other provisions for the installation of ASTRA I equipment.

# APPENDIX 15

## FLIGHT TEST VEHICLE FOR IROQUOIS ENGINE

This Appendix summarizes the modifications, alterations and installations necessary to provide a flight test vehicle (aircraft 25207) for the Iroquois engine.

This work includes the following:

(1) The installation of two special Iroquois engines.

(2) Design and/or specification, provision and installation of special cockpit instrumentation, safety monitoring instrumentation, cables and pipe runs, etc.

(3) Design and incorporation of airframe and systems changes to accommodate (1) above.

(4) Specification of the packaging and installation of recording instrumentation to be supplied by Orenda Engines Limited.

(5) Design and/or specification of changes to and the manufacture of one standard ARROW 2 instrument pack, provision of a space mock-up and installation of recording instrumentation and/or telemetry.

(6) Provision of special liaison services with Orenda Engines Limited as may be necessary.

(7) To assist Orenda in its flight test program until December 31st 1960, including:-

(a) the supply of new data

(b) the operation and maintenance of ARROW aircraft no. 25207

(c) informal on-the-job training for Orenda personnel

(d) services for ground checkout runs

(e) recording and reduction of telemetry data

(f) provision of necessary hangar and office space and safety facilities.

(g) three supersonic chase aircraft flights and five CF-100 chase flights.

# APPENDIX 16

## SPARROW LAUNCHERS

This Appendix summarizes the work necessary for the re-design of the Sparrow 2 launcher to adapt the design for use in the ARROW weapon pack.

This work includes the following:

(1) The re-design, development and manufacture of fifteen prototype launchers and miscellaneous test equipment, dummy missiles, etc.

(2) The conducting of necessary static, simulated firing and actual firing ground tests.

(3) The preparation of drawings to enable production of the developed launchers.

(4) Liaison with Douglas Aircraft Company, Inc. + Canadair.

Note: The re-design will be based on the Douglas launcher. The front and rear launchers will be kept similar to the greatest practicable extent.

# APPENDIX 17

## ESCAPE SYSTEM SLED TESTING

This Appendix summarizes the proposal for ground testing the ARROW escape system by conducting rocket sled tests. The object of this program is to demonstrate as fully as is possible that the emergency canopy opening and crew ejection mechanisms function correctly and that crew members are safely ejected clear of the aircraft structure over a full range of aircraft speeds.

The work includes the following:

(1) Plan, specification, co-ordination and direction of the program.

(2) Design and provision of a suitable sled, including an ARROW front fuselage.

(3) Operation of the sled at a track facility to be provided by the Government, including approximately five data gathering runs plus necessary calibration and abortive run allowance. This includes the maintenance of the sled, provision of 18 Martin-Baker seats and cartridges, glazed canopies and fuel necessary to operate the sled.

(4) Data handling, reduction and analysis.

(5) Submission of a report to the RCAF.

# APPENDIX 18

## CHASE AIRCRAFT FOR 'ARROW AIRFRAME DEVELOPMENT

This Appendix summarizes the use of chase aircraft to perform the dual functions of obtaining additional test data and assisting the ARROW pilots during landing if necessary.

This will include the following:

(1) Design and incorporation of AN/ARC-34 UHF communication installation in two Sabre 6 aircraft.

(2) Design and incorporation of an AN/ARC-34 UHF communication installation in one CF-100 Mk 5 aircraft.

(3) Operation and maintenance of two Sabre 6 aircraft and one CF-100 Mk 5 aircraft.

The above aircraft and AN/ARC-34 equipment are to be Government-furnished.

# APPENDIX 19

## AIRCRAFT SYSTEMS TRAINERS FOR ARROW 2 AIRFRAME SYSTEMS

This Appendix summarizes the work entailed in the design and manufacture of trainers and manufacture of three ASTs in accordance with AVRO design study brochure 72/GEQ/2:

This work will include:

(1) The design, specification and manufacture of eleven systems trainer panels and five trainer rigs, including the design of the basic panel used for all system panels.

(2) The provision of projection slides.

(3) The specification of all required demonstration test equipment and auxiliary equipment.

(4) Design specification and manufacture of suitable covers for protection and storage.

(5) Provision of drawings and specifications for all units to the requirements of PROC 100-2.

(6) Provision of reports and other engineering data for the use and maintenance of airframe systems trainers

(7) Liaison with associate contractors to ensure compatibility of their systems trainers with the AVRO ASTs.

The configuration on which trainer units are to be based is that applicable to the systems of ARROW 2 aircraft No. 25216.


APPENDIX 20 - Part (a)

DEPARTMENT OF DEFENCE PRODUCTION

DRAFT STATEMENT OF RESPONSIBILITY

Dated November 27, 1957

## 1. INTRODUCTION

Basic in the consideration of responsibility for creation of the ARROW Weapon system must be the recognition that only the RCAF, DND which outlined the operational requirement, has monitored and accepted or rejected each step of the program and will eventually operate the weapon system, can assume ultimate responsibility. The responsibility of all other agencies or contractors is limited by contract or establishment terms of reference.

In the interest of better control and co-ordination by the RCAF of the development and production of the ARROW Weapon System, a group has been formed under the direction of an Assistant for ARROW Weapon System (A/AWS), reporting to Chief of Aeronautical Engineering (CAE) RCAF who has been delegated "Design Authority" for the program. This group, designated A/AWS though principally engaged in technical control of the program has also in it personnel from all Departments and Branches of the Government which have active functions in the program. The group is largely made up of RCAF engineering officers drawn from the various specialist engineering directorates of this service. The activities of all directors (RCAF) are monitored by the appropriate officer in A/AWS for co-ordination purposes, and, to make A/AWS a focal point many lines of communication must be re-routed. RCAF decisions will still be made in conjunction with or by the directorates, but, will emanate from A/AWS. The Contractor's approach to the RCAF on all matters pertaining to the Weapon System as such is through the A/AWS.

A portion of the management responsibility of A/AWS is sub-contracted to a co-ordinating contractor (AVRO) which undertakes much of the detail co-ordination of the whole program subject to monitoring by A/AWS. The co-ordinating contractor is free to negotiate areas of dispute with the associate contractors and to investigate and recommend compatibility of GSM. Arbitration of disputes is done by the A/AWS. He may recommend to the A/AWS changes in any part of the Weapon System and is consulted prior to approval by the A/AWS of any change arising from any other source. He will liaise with and accept liaison from all contractors and suppliers of Weapon System components, and

will report regularly to the A/AWS on the co-ordinated progress of the program. He will maintain engineering data supervision on all aspects of the program and shall present for approval by the A/AWS all specifications raised to cover the Weapon System and will in turn be consulted by the A/AWS on all specifications presented for approval by the associate contractor or by the GSM suppliers.

The associate contractors will be contractually required to liaise in detail with Avro on all technical aspects of their work as is to a degree already done, but must now be more complete and should include detail of their work as well as the detail on spheres of common interest with the airframe manufacturer. The RCAF through A/AWS will still retain direct liaison with each associate contractor and DDP will likewise administer the contracts as before. Any change to the work schedules or specifications (including ECP's or DECP's) will be negotiated and processed as presently laid down except that Avro and A/AWS must assess its impact on the Weapon System prior to authorization.

1.1 General

The Weapon System shall be designed, developed and produced by four associate contractors under the Design Authority and the overall program management of the Department of National Defence through its Assistant for ARROW Weapon System. The Associate Contractors are as follows:-

| | |
|---|---|
| Avro Aircraft Limited | (Airframe, assembly of finished aircraft). |
| R.C.A. | (Astra system) |
| Orenda Engines Limited | (Iroquois engine) |
| Canadair Limited | (Missile) |

Avro Aircraft is also designated as the Co-ordinating Contractor.

1.2 The following paragraphs will outline the division of responsibility between the associate contractors and the A/AWS such that when combined by the co-ordination function of the Co-ordinating Contractor and the management function of the A/AWS, the intent of the weapon system as outlined in the approved Weapon System Specification will be achieved.

## 2. ASSOCIATE CONTRACTOR RESPONSIBILITY

### 2.1 General

Each Associate Contractor is responsible for:

(a) In direct association with the A/AWS such design, production or development work etc., on the weapon system as may be specified in his contract(s). His product shall be made to the drawings prepared by him to meet the requirements laid down in the RCAF requirement specification pertinent to his work. Final acceptance of his product will be made against the associate contractors model specification as approved by A/AWS. Acceptance at any point in production or stage of development with a reduced performance or with the requirements of the governing specification unfulfilled, shall after consultation with the Co-ordinating Contractor be the subject of negotiations between A/AWS and the associate contractor. Details of said deviations from specified requirements shall be made available to A/AWS as soon as they are known and shall form the basis of a possible deviation to be noted in the Model Specification. Rejection of the aircraft may result from deficiencies in the product of another associate contractor or in GSM in which case the A/AWS may reject the deficient product on advice of the co-ordinating contractor. It is recognized that prior to production of a product fully in accordance with requirements, a number of aircraft and components in interim stages of development are required. Exact definition of each product is impractical and it may be accepted at the discretion of A/AWS when deemed fit to fulfill its role in the development program.

(b) Keeping the co-ordinating contractor and the A/AWS continuously and intimately informed on the progress of the work detailed in his contract. To this end he will prepare periodic reports against his Work Program in a format acceptable to A/AWS. In addition he will prepare such system reports as are required from time to time.

(c) Keeping the co-ordinating contractor continuously informed on all requirements and demands that the associate contractor's equipment may make on the weapon system.

(d) Approaching the co-ordinating contractor with proposals to assist in resolving any technical difficulties arising from the efficient incorporation of the associate contractor's equipment into the weapon system. Normally the co-ordinating contractor will advise the A/AWS of these difficulties and their solution, but, in the event of disagreement between the co-ordinating and associate contractors the A/AWS will arbitrate.

(e) Keep the DDP advised as directed of costs incurred and forecast in the work assigned.

(f) Laying down a detailed Statement of Work he considers necessary to fulfill his obligation in the contract and, based on this, a Work Program describing in detail the means (facilities, manpower, phasing, sub-contractor etc.) he intends to use, the targets he must achieve on a time scale and the funds he requires to meet his targets. The Statement of Work and Work Program will be subject to recommendation by A/AWS and approval and referenced in the contract by DDP. The final release of a project or program is predicated on this approval of the Statement of Work and the Work Program. The periodic program progress reports (2.1.b) are to be based on them and significant changes in the Work Program either technically or financially will require amendment of the Statement of Work and Work Program and proper authorization.

(g) With respect to such equipment as may be specified as CFE or GSM.

(i) Incorporation of said equipment. Avro, as an associate contractor, is also responsible for installation of the other associate contractors' equipment in the airframe and to test the aircraft as a complete unit. (Ref. para. 3e (v)).

(ii) The detection and analysis of either technical deficiencies or deficiencies of time phasing.

(iii) The definition of resulting limitations on the performance of his portion of the weapon system.

(iv) Recommendations regarding alternative equipment or other courses of action leading to remedy or improvement.

(v) Making the resulting corrections to his portion of the system with suitable contract action or DECP procedure.

(h) Providing from time to time on a temporary basis such competent personnel and facilities as may be required to assist A/AWS and/or the Co-ordinating Contractor to fulfill their functions.

(i) Demonstrating to A/AWS and the Co-ordinating Contractor, prior to the delivery of his product, its capability against the requirements laid down in the pertinent specifications.

(j) Maintaining on a high priority, adequate weight control and reduction measures satisfactory to A/AWS and the Co-ordinating Contractor, to guard against weight growth arising from changes

over the years which may prejudice the performance of the aircraft.

(k) Assisting A/AWS and the Co-ordinating Contractor in determining the requirements for ancillary equipment, services, publications, spares, supporting personnel, and facilities needed for the proper use of his product in the Weapon System; designing and/or developing and/or manufacturing, as called for, such ancillary equipment services or facilities as may be deemed peculiar to his product by the Co-ordinating Contractor, and A/AWS and approved by DDP.

(l) Direct control of the test program as approved by A/AWS on his product as such. Wherever reasonably possible, tests of consequence should be witnessed by the Co-ordinating Contractor and/or A/AWS. However the contractor may be required to demonstrate to A/AWS that the test equipment and/or instrumentation and procedures will satisfactorily meet the requirements of these tests and will ensure that deficiencies can be located and rectified without undue delay to the overall program. Where follow-on tests are to be conducted by the co-ordinating contractor and/or the RCAF he will be required to demonstrate that his test equipment and/or instrumentation has been reasonably planned for compatibility with the test installation to be used by the Co-ordinating Contractor and the RCAF.

(m) Ensuring that his system of control of data drawings and reports are in accordance with the provisions of Proc. 100-11 as amended by negotiation with AMC/RCAF in conjunction with the Co-ordinating Contractor for inclusion in this contract. Proc. 100-11 has no contractual significance other than in its intended use as a prescribed method of data control. Drawings of items of ground support equipment (GSE) and aircraft system trainers shall be drawn to the requirements of RCAF Specification Proc. 100-2.

(n) Preparing and maintaining a model specification for his product in accordance with CAP. 479 and shall submit to A/AWS said Model Specification for approval prior to acceptance of the initial mark of aircraft or system. Acceptance of the product (para. 2.1.a) will be done to the approved Model Specification.

(o) Ensuring that the Co-ordinating Contractor and A/AWS is promptly notified of any significant projected changes to permit him to analyse its effect on the weapon system performance and program schedules.

(p) Mock-up conferences and Engineering Evaluations.

P-1 Mock-up Conferences

P-1-1 Occurrence - The Co-ordinating contractor shall arrange with the Associate Contractor for conferences at each stage in development where major changes have been made. The purpose of these conferences shall be to demonstrate the proposed installations and to receive recommendations for design changes from representatives of the Department of National Defence. The final design requirements proposed and agreed upon at these conferences shall be given in writing. In particular, mock-up conferences shall be called:

(i) At the earliest possible state in the design of the first aircraft or system.

(ii) When the Iroquois engine is installed.

(iii) When the electronic system is installed.

(iv) At any other time as recommended by the associate and/or co-ordinating contractor and approved by A/AWS.

P-1-2 Organization - Mock-up conferences shall be organized by the Co-ordinating Contractor in conjunction with the associate contractor and A/AWS to satisfy the requirements of the RCAF.

P-1-3 Installation - The mock-up installation shall be accurately positioned and shall include samples of each component of equipment or accurately constructed dummies. Samples of service supply items of equipment required for each mock-up, or drawings which will permit dummies to be manufactured by the associate contractor will be supplied on request to A/AWS.

P-2 Engineering Evaluations

P-2-1 Occurrance - The Co-ordinating Contractor and/or A/AWS and/or the associate contractor shall request engineering evaluations at each major stage of development as required.

P-2-2 Organization - Engineering evaluations shall be organized by the co-ordinating Contractor in conjunction with the A/AWS to satisfy the requirements of the RCAF.

(q) Maintain on a high priority adequate reliability statistics control

in conjunction with and to the satisfaction of the Co-ordinating Contractor.

3. CO-ORDINATING CONTRACTOR RESPONSIBILITY

3.1 In addition to responsibilities as an associate contractor on a portion of the Weapon System, Avro Aircraft Limited, is responsible for:

(a) Co-ordinating with the Associate Contractor in his development program to assist A/AWS in achieving the most effective compromise between the performance and maintenance requirements of the weapon system and the availability of the system as an effective operational instrument.

(b) The establishment of master component requirement schedules for the weapon system and liaison with all agencies engaged in procurement or supply of weapon system components to illustrate the requirements of the production schedules of the Weapon System as agreed by contract and to report regularly on deficiencies.

(c) The Study and recommendation of improvements to the Weapon System during its life to maintain the achievement of the Weapon System objectives. This includes recommendation to A/AWS on the usefulness of equipment to be installed with respect to its role in achieving weapon system objectives.

(d) Co-ordinating with A/AWS and associate contractors the issuance of all requirement and model specifications pertinent to the Weapon System. This responsibility does not in any way imply the right of delay or veto on any specification but is noted to emphasize Avro's need to know in conducting continuous systems analyses on behalf of A/AWS.

(e) Additional functions with respect to GSM under development by an associate contractor in:

(i) Co-operating with the associate contractor, keeping abreast of his progress, making constructive suggestions, and ensuring compatibility of the associate contractor's product with the Weapon System.

(ii) Reporting regularly to A/AWS all technical difficulties arising with the associate contractors along with the solution. The A/AWS reserves the right to monitor the decisions and in instances where it is deemed by the A/AWS of special importance to the project the co-ordinating contractor's decision may be reversed or modified. Normally a solution by the

Co-ordinating Contractor will be negotiated with the associate contractor and a decision reached. Disagreement between Avro and the associate contractor would require arbitration by the A/AWS.

(iii) Discussing with the associate contractor suitable division of responsibility in areas where both contractors have work to do and refer the solution to the A/AWS for ratifications, resolution and contractual coverage.

(iv) Keeping the associate contractor informed of the technical schedules, progress and status of the whole program particularly as it affects his portion of the system and as it may affect the performance requirements of this system.

(v) During the installation and subsequent testing of the associate Contractor's equipment in the airframe by Avro as associate contractor, ensuring that proper steps are taken to:

(1) Detect and analyse both technical deficiencies and deficiencies in time phasing.

(2) Define the resulting deviations from required performance and time schedules.

(3) Recommend alternative equipment or other courses of action leading to remedy or improvement in conjunction with the associate contractors concerned.

(4) Force the decision needed by (3) within the time allowable and implement the decision reached by suitable contract action or DECP procedure.

(f) Demonstrating the capabilities of the Weapon System against the requirements laid down in the Weapon System specification.

(g) Reviewing the weight control and reduction programs of the associate contractors and advising A/AWS if such controls are not effective to the satisfaction of the Co-ordinating Contractor.

(h) Compiling the recommendations of all associate contractors into a unified plan for Weapon System ancillary equipment, services, supporting personnel and facilities for approval by A/AWS. Co-ordinating the subsequent design, development, and demonstration of the ancillary equipment, services and facilities as directed and ensuring that the GSE and maintenance procedures are properly integrated.

(i) Arranging such Mock-up Conferences and Engineering Evaluations with the associate contractors as may be required by A/AWS.

(j) Conducting continuous systems analyses to gauge the effect of any and all changes on the Weapon Systems and its timely progress.

(k) Reporting on the co-ordinated progress of the program.

(l) Supervising the data control of the associate contractors to ensure its adequacy and to recommend on any deficiencies to A/AWS.

APPENDIX 20 - Part (b)

Ref: C. 14-5/5423

30th December 1957.

Mr. D. L. Thompson,
Director,
Aircraft Branch,
Department of Defence Production,
Ottawa, Ontario.

Dear Sir:

Your letter to Mr. J.R. Douglas dated November 27th 1957 together with the attached "Statement of Responsibility" for co-ordinating contractor and associate contractor functions has been considered by this Company.

We have been given to understand that the detailed provisions of the "Statement of Responsibility" are not, in themselves intended to be contractually binding and our acceptance of the role of Co-ordinating Contractor is an acceptance of the general principles described in the "Statement of Responsibility" in the establishment of an RCAF, DDP, co-ordinating contractor and associate contractor relationship for the more effective co-ordination of development and production of the Arrow Weapons System.

Our acceptance of the Co-ordinating Contractor role is based upon the following interpretation. Canadair, Orenda, RCA and Avro remain responsible to the Crown for development and production of the sub-systems, as under the present system. However, the associate contractors, under the "Statement of Responsibility" are obliged to provide the co-ordinating contractor with scheduling, specification, drawing release, programming and other development and technical data necessary to enable the co-ordinating contractor to advise the RCAF of such action as may be necessary to ensure compatibility of scheduling, performance and engineering of the Weapons System, its sub-systems and equipment within the requirements of the Weapons System Model Specification and to recognize problem areas at an early stage of development to allow for testing, development and early implementation of modifications.

The co-ordinating contractor, though responsible to co-ordinate and influence the complete program, shall exercise no direct control over the associate contractors. Responsibility for performance of the weapons system and its sub-systems will remain with the Crown, who will exercise control over the detailed operations of the associate contractors to ensure

implementation of recommendations agreed upon between the co-ordinating contractor and the RCAF.

Similarly, the co-ordinating contractor will arrange for a demonstration of the weapons system, but the responsibility for performance of the sub-systems will remain with the associate contractors under the direct control of the Crown.

You will recognize that we are unable to define the basis on which co-ordinating contractor recommendations will be implemented since we have not been fully informed of the responsibility of A/AWS. However, we feel that we understand the intention of the Crown in its establishment of the A/AWS office and are satisfied that we can fulfill the co-ordinating contractor function by co-operation with the associate contractors in a manner which would enable A/AWS to impose a system of management control over the entire program. The extent to which the co-ordinating contractor can effectively support A/AWS in its control function depends upon:

(a) The contractual requirements placed upon the associate contractors and their co-operation in fulfilling such requirements to keep the co-ordinating contractor fully informed; and

(b) The expediency with which A/AWS implements the co-ordinating contractor recommendations through action under the contract control which the Crown holds over all associate contractors.

It is felt that this letter sets forth a realistic interpretation of our responsibilities as Co-ordinating Contractor, however, should amplification of the responsibilities of the co-ordinating contractor be required, we are prepared to discuss the matter further at your convenience.

Yours very truly,

AVRO AIRCRAFT LIMITED,

J.A. Morley
Vice-President, Sales & Service.

cc: Mr. C.A. Hore
Mr. E.G. Mahoney

sc: Mr. J.L. Plant
Mr. J.C. Floyd
Mr. J. Turner
Mr. W.H. Riggs
Mr. J.R. Douglas