DEPARTMENT OF NATIONAL DEFENCE

ROYAL CANADIAN AIR FORCE

SPECIFICATION
for

WEAPON SYSTEM, ARROW

AIR 7-4

ISSUE	DATE	REMARKS
3	31 Aug 55	Supersedes Issue 2
4	28 Jun 57	Supersedes Issue 3

This Specification is not valid for contract purposes unless it is read in conjunction with the Specifications referred to herein, and the cover page bears the signature of the authorized representative of the Chief of the Air Staff.

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APPROVED

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Applicable Specifications, Publications and Drawings

The following specifications, publications and drawings, where applicable, including those called up therein, of the issue in effect on the date of first issue of this specification or the date of first issue, whichever is the later (except when listed otherwise), shall be considered to form a part of this specification except as otherwise stated herein. Later issues of individual specifications may be used at the discretion of the coordinating contractor.

Where there is a variation between this specification and the specifications, publications and drawings listed below, this specification shall govern.

SPECIFICATIONS

Royal Canadian Air Force

AIR 7-6	Development of an Electronic system for the Arrow Aircraft dated 11 Jan 56 including A.L No 2
INST 92-5	Development of Automatic Flight Control Sub-system for Arrow Aircraft dated 11 Jan 56 including A.L. No 2
PROC 100-2	Preparation of RCAF Drawings.

Canadian Government Specification Board

3-GP-22A	Aviation Turbine Fuel - Type 11
3-GP-25G	Aviation Fuel

U.S. Military

MIL-I-5099	Indicator Cabin Air Pressure 1-$\frac{7}{8}$ inch Dial, Type MA-1
MIL-F-5572	Fuel, Aircraft Reciprocating Engine
MIL-F-5624	Fuel, Aircraft Turbine and Jet Engine, JP-4
MIL-S-5700	Stress Analysis Criteria
MIL-S-5710	Structural Criteria, Piloted Airplanes, Structural Test, Static
MIL-S-5711	Structural Criteria, Piloted Airplanes, Structural Tests, Flights
MIL-I-5997	Instruments and Instrument Panel, Aircraft Installation of
MIL-G-6099	Generators and Regulators; Aircraft, Alternating Current, General Specification for
MIL-C-6818	Clamp, Mounting, 2-inch size Instrument

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U.S. Military (Cont'd)

MIL-E-7080	Electrical Equipment; Installation of Aircraft. General Specification
MIL-E-7614	Electrical Equipment, Alternating Current, Aircraft Installation of, General Specification.
MIL-P-7788	Plate, Plastic, Cockpit and Interior Controls Lighting.
MIL-E-7894	Electric Power, Aircraft, Characteristics of
MIL-I-8500A	Interchangeability and Replaceability of Component Parts for aircraft.
MIL-F-8785	Flying Qualities of Piloted Airplanes
MIL-V-9370	Valve, Automatic Regulating Pressure, Anti-G Coveralls, Jet Aircraft, General Specification for
MIL-S-25015	Spinning Requirements for Airplanes.
MIL-F-25352	Flutter, Divergence and Reversal in Aircraft; Prevention of

PUBLICATIONS

CAP 479	Manual of Aircraft Design Requirements for the Royal Canadian Air Force.
ARDCM 80-1	Handbook of Instructions for Aircraft Designers.
EO 20-1-6/1	Instruments; Front and Rear Mounting Using Tinnerman Speed Nuts.
EO 00-50-8	Procedure for the Introduction and Approval of Engineering Changes.
ORI/4-2	RCAF Standard Flight Panel

DRAWINGS

U.S. Air Force

AD 2011	Instrument Arrangement Standard
53D 6792	Generator, Alternating Current, Aircraft Engine Driven, 120/208V, 380/420 Cycle, 3 Phase 30KVA, Type MB-2.
53D 6793	Regulator, Voltage, Magnetic Amplifier, A.C. Generator 120/208V, 380/420 Cycle, 3 Phase, Type MB-2

DRAWINGS (Cont'd)

Air Force - Navy

AN 3114	Receptacle - External Power, 115/200 Volts, 3 Phase

Air Force Navy Aeronautical Design Standards

AND 10412	Case - 2 inch Size Instruments, Standard Dimensions for
AND 10413	Instruments - Flight, Basic, Standard Arrangement of

TABLE OF CONTENTS

PART I - WEAPON SYSTEM

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

SPEC NO. AIR 7-4
Issue No. 4

PART I - WEAPON SYSTEM

1. PURPOSE

1.1 Weapon System - This specification states the requirements of the Department of National Defence, Royal Canadian Air Force, hereinafter called the Department, for the development of a weapon system which shall take the name of its aircraft component and be called the Arrow weapon system.

1.2 Scope - This weapon system shall enable the Department to fulfill its obligation to defend Canadian targets as part of the North American defense system in conjunction with the United States government.

2. DEFINITIONS

2.1 General - Reference is made in the various sections of this specification to terms which are defined and arranged in alphabetical order in the following sub-paragraphs.

2.2 Aircraft - The term aircraft shall denote the instrument of combat component of the weapon system which will be the single unit of striking power that leaves the ground and is capable of seeking out and destroying the airborne enemy striking power. This is known by the name of Arrow.

2.3 Airframe - The airframe shall be deemed to include all structure and systems that will make up the platform which when combined with the items that are furnished by the Department will form the aircraft.

2.4 Associate Contractor - Contractors who are manufacturing, developing, and/or assembling components of the weapon system under terms of a contract from DDP shall be referred to as associate contractors.

2.5 Available - Available is a state of readiness whereby the aircraft, with the support of the remainder of the weapon system, can be airborne and capable of a successful interception within 15 minutes of the order to scramble. Pilots will be within call to achieve take-off within 15 minutes. The ground crew will be standing by but may carry on maintenance work provided the aircraft can be made ready for the 15 minute take-off. The aircraft may be positioned in the turn around and first line maintenance hangar or on the tarmac.

2.6 Combat Altitude - Combat altitude is the constant altitude at which the aircraft is flying during the turn in which the combat load factor is developed.

2.7 Combat Ceiling - Combat ceiling is the altitude where the sustained rate of climb has fallen to 500 feet per minute.

2.8 Combat Climb and Acceleration Time - Combat climb and acceleration time is the elapsed time taken to reach combat speed and combat altitude from the time the aircraft becomes airborne during take-off at normal gross weight under sea level conditions.

2. DEFINITIONS (Cont'd)

2.9 Combat Load Factor - Combat load factor is the maximum load factor that can be sustained by the aircraft in a steady turn without loss of speed or altitude.

2.10 Combat Speed - Combat speed is the constant speed at which the aircraft is flying during the turn in which the combat load factor is developed.

2.11 Combat Weight - The combat weight shall be the weight of the aircraft fully loaded with 50 percent of the fuel required for the mission detailed in paragraph 7.2.1 of Part III or the weight of the aircraft at the start of the five minute combat period reference paragraph 7.2.1 (d) Part III whichever is the greater.

2.12 Coordinating Contractor - The contractor who designs, develops and manufacturers the airframe and assembles the airframe together with the government furnished equipment to form the aircraft shall be the coordinating contractor.

2.13 Electronics System - The electronics system shall form a part of the aircraft and shall contribute the necessary ground-to-air and air-to-air guidance, communication, and computation together with navigational aids and cockpit presentations that will enable the aircraft to perform its function.

2.14 First Line Maintenance - First line maintenance is the series of maintenance operations which will be carried out on aircraft that can be raised to the available state within three hours. These operations will consist mainly of:

(a) Primary Inspections
(b) Fault Isolation
(c) Fault rectification
(d) Special Inspections
(e) Alignment of relevant systems.

2.15 Gross Weight for stress Analysis - The gross weight for stress analysis (USAF-Combat Gross Weight) shall not be less than the normal gross weight defined in para 2.18 less fifty percent of the combat mission fuel.

2.16 Landing Gross Weight - The maximum landing gross weight (USAF Maximum Design Landing Gross Weight) and the normal design landing gross weight shall be as defined in para 3.2.2.11 and 3.2.2.10 of MIL-S-5701.

2.17 Maximum Gross Weight - The maximum gross and the maximum weight for take-off (USAF-Maximum take-off gross weight) shall be the weight of the aircraft fully loaded with primary armament, full internal fuel, and external fuel for the overload range mission detailed in para 7.3 of Part III.

2. DEFINITIONS (Cont'd)

2.18 Normal Gross Weight - The normal gross weight and the normal weight for take-off (USAF - Basic Mission Take-Off Gross Weight) shall be the weight of the aircraft fully loaded with primary armament and fuel for the combat mission detailed in paragraph 7.2.1 of Part III.

2.19 Power Plant - The engine together with its ancillary components that are deemed necessary to provide the thrust to achieve the required aircraft performance and the power for the operation of aircraft systems shall be called the power plant.

2.20 Readiness - Readiness is a state whereby the aircraft, with the support of the remainder of the weapon system, can be airborne and capable of a successful interception within five minutes of the order to scramble. The aircraft will be in the readiness hangar, with the engines not running, the ground crew standing by, and the pilot close to the aircraft.

2.21 Readiness Maintenance - Readiness maintenance is the series of maintenance operation(s) which will be carried out on aircraft in the state of readiness, available, or standby and shall consist of such minor operations that will prove and maintain the state and will not interfere with the required operational state of the aircraft.

2.22 Second Line Maintenance - Second Line Maintenance is the series of maintenance operation(s) that will normally be carried out on aircraft that cannot be raised to the available state within three hours. These operations will mainly consist of:

(a) go-no go type of checking

(b) periodic inspection

(c) fault isolation

(d) fault rectification

(e) special inspection

(f) modifications

(g) alignment and calibration of systems

(h) harmonization

2.23 Standby - Standby is a state of readiness whereby the aircraft with the support of the remainder of the weapon system, can be airborne and capable of a successful interception within two minutes of the order to scramble. The engines will not be running, the aircrew will be in the cockpit, the ground crew in position for starting, and the aircraft will be positioned in the readiness hangar ready for immediate taxiing.

2. DEFINITIONS (Cont'd)

2.24 Third Line Maintenance - Third line maintenance is the series of maintenance operation (s) that will consist of major repair, calibration, and modification of aircraft components and can be carried out at an Arrow base using RCAF equipment and skills.

2.25 Turn Around - Turn around is the series of maintenance operations which will be done on aircraft that land in at least a near serviceable state and shall include the replenishment of all consumable stores (including missiles), and minor rectification to enable the aircraft to perform the combat mission of para 7.2.1 of Part III.

2.26 Weapon System - A weapon system denotes an instrument of combat plus the support equipment required to permit the operation of the instrument from a base, either standard or specially prepared. A weapon system comprises the following:

(a)	Airframe	These major components comprise the aircraft
(b)	Power Plant	
(c)	Electronic System	
(d)	Armament	
(e)	Ground Support Equipment	These major items comprise the direct ground support
(f)	Training Aids, and	
(g)	Technical Data	

3. CONCEPT OF OPERATIONS

3.1 General - For purposes of detail design of components and procedures the operational concept of the Arrow weapon system shall be as noted in the following sub-paragraphs.

3.1.1 Object - The object in the operation of the Arrow weapon system in time of war will be the attainment of the highest possible operational potential at all times. In time of peace the operation of the weapon system will be concerned primarily with attaining and maintaining a high degree of proficiency in the all weather role. It will consist of a limited operational program superimposed on a training program. The majority of operational sorties will be considered as training. The main penalty will be that they cannot be scheduled. The object is to have a satisfactory potential available at all times and the associate contractors are to keep these factors in mind throughout the development of their designs.

3.1.2 Battle State - The concept is based on one or more squadrons, of 12 operational plus 2 training aircraft each, at a prepared all-weather base. With 50% of the aircraft undergoing minor maintenance each squadron will be required to maintain 2 aircraft at the state of readiness or standby at all times, and as many of the remainder as possible in a state that can be changed to available within 3 hours.

3. CONCEPT OF OPERATIONS (Cont'd)

3.1.3 Forward Base - In exceptional circumstances, the squadron may be required to operate from a forward base to which the aircraft will be flown in a fully operational state. They will be serviced and brought up to available or readiness on arrival, but normally will return to the main base when scrambled. Should they be required to land back at the forward base only sufficient facility to prepare them for return to the main base is required. This is a detached operation which the main base must be capable of supporting up to a maximum of 50% unit establishment. Individual aircraft will not normally remain on the forward base longer than the time between primary inspections. The servicing equipment required to prepare aircraft at a forward base for return to the main base must be air transportable, with trained personnel to carry out the required operations, in a C119 or similar transport airplane.

3.1.4 Building Facilities - For each squadron, the airfield shall include the following structures:

(a) Hangar(s) to house two aircraft at readiness or standby.

(b) Shelter(s) to house five aircraft undergoing turn around or first line maintenance.

(c) Hangars to house seven aircraft undergoing second or third line maintenance.

(d) A missile preparation and storage structure.

(e) An engine run-up structure capable of housing one aircraft.

(f) An engine run-up structure capable of housing one engine.

3.2 Time Limits

3.2.1 Turn Around - The maintenance organization of the weapons system shall be able to receive and turn around operational aircraft at a rate of five every 15 minutes, provided that the aircraft involved has no major unserviceabilities. The aircraft and ground support equipment shall be designed to meet this requirement due regard being given to the reliability and maintainability of the aircraft and the ground support equipment.

3.2.2 Serviceability - The aircraft is to be capable of being maintained at the states of readiness and for the time periods as follows:

State	Time Period
Available (15 mins)	Indefinitely
Readiness (5 mins)	Indefinitely
Standby (2 mins)	Random periods of not more than 30 mins.

3. CONCEPT OF OPERATIONS (Cont'd)

3.2.3 Replacement - An aircraft scrambled from, or becoming unserviceable in a readiness hangar is to be replaced by a serviceable aircraft or returned to the readiness state in a maximum time of 15 minutes.

3.2.4 Utilization - The aircraft together with the support of the ground support equipment and the RCAF shall be capable of a utilization of not less than 20 hours per month when operated as described in this Section.

PART II - DIVISION OF RESPONSIBILITIES

4. INTRODUCTION

4.1 General - The weapons system shall be designed, developed, and produced by four associate contractors and the Department. One of the associate contractors shall be designated as the coordinating contractor who will normally be the one that manufactures the airframe and assembles all components to form the aircraft. The Department shall be responsible for the overall co-ordination between the development agencies and associate contractors.

4.2 Responsibilities - The following paragraphs will outline the division of responsibilities between the co-ordinating contractor and the Department such that when combined by the co-ordination function of the Department (ref para 4.1), the intent of the weapon system will be achieved.

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES

5.1 Responsibility - Details of the diversion of responsibility, regarding the installation and development of GSM, between the co-ordinating and associate contractors shall be the subject of negotiation between the contractors involved and the Government.

5.2 Aircraft

5.2.1 General - The co-ordinating contractor shall design and develop the aircraft in accordance with the requirements of Part III - Aircraft Design of this specification.

5.2.2 Demonstration - Prior to delivery to the RCAF for coordinating development or squadron use, the coordinating contractor shall demonstrate the aircraft to the satisfaction of the Department to prove that, with the aid of the ground support, the aircraft will:

(a) enable the conditions of Part I - Weapon System of this Specification to be achieved.

(b) seek out a known target

(c) carry out successful attack(s) releasing the missiles by combinations of two and four to achieve the performance of which the missiles in these combinations have been proven capable.

(d) Utilize the navigational systems installed in the aircraft to return to a selected base.

5.2.3 Production

5.2.3.1 Construction - Construction of the aircraft shall be done to drawings prepared to the requirements of this specification and other conditions noted in the model specification and the production contract.

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES (Cont'd)

5.2.3.2 Acceptance - Acceptance of the aircraft by the Department at any point in production or stage of development with a reduced performance or with the requirements or intent of any paragraph in this specification not fulfilled shall be the subject of negotiation between the Department and the coordinating contractor. Details of said reduced performance and/or non-compliance with other requirements shall be made available to the Department as soon as they are known, and shall form the basis of a possible deviation to be noted in the Model Specification. It is to be understood that rejection of the coordinating contractor's product may be attributable to an associate contractor's product. In this case it is within the discretion of the Department to reject the associate contractor's product on advice from the coordinating contractor.

5.2.4 Development

5.2.4.1 Aim - The coordinating contractor shall plan, initiate, and maintain a constant, vigorous, development programme to achieve the ultimate aim of this specification unless advice is received from the Department to the contrary.

5.2.4.2 Programme - The phases of development that will occur before the final aircraft is evolved to satisfy the requirements of this specification and delivery to the RCAF commences shall include the aircraft stages noted below. The numbers of each type to be produced shall be detailed in the development plan produced by the co-ordinating contractor and approved by the Department.

(a) Arrow I equipped with test equipment (ref para 5.3.8.6) to be specified by the coordinating contractor, an interim electronic system as agreed betwen the Department and the coordinating contractor and as noted in the Model Specification, and Pratt and Whitney J-75 type engines.

(b) Arrow II equipped with test equipment (ref para 5.3.8.6) to be specified by the coordinating contractor, portions of the electronic system, and Iroquois engines.

5.2.5 Weight Control and Reduction

5.2.5.1 Coordinating Contractor - The coordinating contractor shall maintain, on a high priority, adequate weight control and reduction measures to guard against weight growth arising from changes over the years that shall prejudice the performance of the aircraft. Particular attention shall be given to weight reduction from the following:

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES (Cont'd)

5.2.5.1 (Cont'd)

(a) Redesign of components that were produced over-strength pending flight information.

(b) Deletion of features that do not contribute to or tend to duplicate operations of the aircraft.

(c) Improved and controlled production techniques to ensure parts are not produced over weight to drawing.

(d) Consideration of weight in the basic design and selection of materials.

5.2.5.2 Associate Contractors - The coordinating contractor shall review the weight control and reduction programmes of the other associate contractors and shall advise the Department if such control is not effective to the satisfaction of the coordinating contractor.

5.3 Support Facilities

5.3.1 General - The coordinating contractor shall be responsible to the Department for the integration of items of the support facilities as noted in the following paragraphs, to form the overall support pattern that will enable the weapon system concept to be achieved by the Department.

5.3.2 Equipment

5.3.2.1 Coordinating Contractor - With the exception of special pieces of GSE as negotiated with other associate contractors the coordinating contractor shall select, design, and develop the ground support equipment required to enable the aircraft to be maintained and to enable the operational concept of Part I - Weapon System of this specification to be attained and maintained. Wherever possible, equipment in service shall be used or adapted to use.

5.3.2.2 Associate Contractor - The coordinating contractor shall be responsible for integrating the use of ground support equipment and maintenance procedures developed by other associate contractors with those developed by the coordinating contractor.

5.3.3 Buildings

5.3.3.1 Interiors - The coordinating contractor will recommend the following details and procedures to be carried out in the government furnished structures of Part I para 3.1.4 in order that the required battle state of para 3.1.2 may be accomplished efficiently and completely within these areas. In all cases due regard shall be given to reliability, maintainability, and squadron operations of the aircraft and ground support equipment:

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES (Cont'd)

5.3.3.1 (Cont'd)

(a) physical layout, contents, storage area.
(b) maintenance operations required.
(c) planned maintenance procedures.
(d) services and equipment required.
(e) manpower requirements.

5.3.3.2 Arrangement - The aircraft and its associated ground support equipment shall be compatible with existing RCAF airfield facilities where possible without prejudice to the operational concept of Part I. Where facilities are inadequate, the coordinating contractor will be required to collaborate with the Department on the rectification of the deficiencies so as to achieve a satisfactory Arrow base. (ref para 3.1.4)

5.3.3.3 Telescramble - The coordinating contractor shall recommend a telescramble ground system installation in the hangar(s) housing the two aircraft at standby to connect the weapon system operational sector control to the standby crew (ref para 9.23 of Part III). This system shall be designed in conjunction with the Department.

5.3.4 Personnel

5.3.4.1 Maintenance - The coordinating contractor, in conjunction with the other associate contractors, shall submit the required supporting data to enable the Department to prepare Qualitative Personnel Requirements. Information sheets on all recommended maintenance personnel, in order that the Department may organize a suitable trades structure to assist in achieving the operational intent of Part I.

5.3.4.2 Aircrew - The coordinating contractor shall ensure that the aircraft will cater to the physiological requirements for the crew as laid down by the Department covering all conditions of flight and design missions of Part III - Aircraft Design. This subparagraph shall be read in conjunction with para 9.5 of Part III.

5.3.5 Aircraft System Trainers - The coordinating contractor shall design and develop training equipment that the Department requires to train service personnel to the standards of para 5.3.4.1. The Department's requirements shall be based on the recommendations of the coordinating contractor and these requirements will be made known at the appropriate time as the aircraft develops and trained service personnel are required.

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES (Cont'd)

5.3.6 Escape System - The coordinating contractor shall be responsible for designing, developing, and integrating all aspects of the escape system to meet the requirements of para 9.4.4 of Part III Aircraft Design. The design and development of all articles of personal crew equipment shall be accomplished by the Department and shall cater to requirements of the coordinating contractor and be satisfactory to him in order that he can fulfill his obligations as the coordinating contractor. The physiological limitations will be supplied by the Department to define the term "safe" used in para 9.4.4 of Part III.

5.3.7 Electronic System

5.3.7.1 Telecommunications Antennae - As noted in para 9.21.3 of Part III, all antennae requirements of the telecommunications equipment shall be the responsibility of the coordinating contractor.

5.3.7.2 Flight Sensing Instrumentation - With reference to para 9.21.5.1 of Part III, the coordinating contractor shall be responsible for defining or providing and calibrating the air data, angle of attack, and fuel state requirements of the electronics system.

5.3.8 Flight and Ground Tests

5.3.8.1 Demonstration - The coordinating contractor shall be prepared to demonstrate, by test or otherwise at the discretion of the Department, compliance with any clause of this specification. This demonstration shall be carried out to the complete satisfaction of the authorized representative of the Department and may form a part of the demonstration of para 5.2.2 of Part II.

5.3.8.2 Structural Static Test - Structural Static Tests shall be conducted in accordance with the technical requirements of US Military Specification MIL-S-5710.

5.3.8.3 Structural Flight Tests - Structural Flight Tests shall be conducted in accordance with the technical requirements of US Military Specification MIL-S-5711.

5.3.8.4 Test Components - Sufficient airframe components shall be built to satisfy the static test and demonstration requirements and any other tests that may be required by the coordinating contractor and/or the Department.

5.3.8.5 Test Programme - The coordinating contractor's development flight test programme shall be under his direct control and shall have as its objective, the development and proving of the aircraft to the point where it can enter the RCAF as a proven, flight worthy, and reliable instrument of combat. The minimum testing possible to accomplish this objective shall be performed in order that the said aircraft may enter RCAF service as soon as possible. The coordinating contractor shall satisfy the Department that his flight test programme is such that all aircraft deficiencies can be located and segregated without delay in the overall programme, and successfully rectified within the conditions of this paragraph, and the development and production programme of para 5.2.3 and 5.2.4 of Part II.

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES (Cont'd)

5.3.8.6 Flight Test Equipment - Test equipment specified by the coordinating contractor (ref para 5.2.4.2) for installation in aircraft allocated for his use shall be subject to approval by the Department to the following extent:

(a) the test equipment will enable the requirements of para 5.3.8.5 Part II to be met.

(b) the test equipment will enable RCAF test on contractor aircraft to be accomplished.

(c) the test equipment will be compatible with RCAF ground installations to cater for such operation from or in conjunction with RCAF installations as the contractor may require.

5.3.9 Engineering Drawings and Reports

5.3.9.1 Drawings - Drawings for the airframe and installation details of government furnished equipment shall be provided by the coordinating contractor in accordance with CAP 479. Drawings of items of ground support equipment and aircraft systems trainers procured and/or developed by the coordinating contractor shall be drawn to the requirements of RCAF Specification PROC 100-2 and supplied as required by the Department.

5.3.9.2 Progress Report - A monthly detailed progress report shall be submitted by the coordinating contractor to the Department with the format and content as agreed upon at the time of first issue.

5.3.9.3 System Reports - In addition to the above, detailed system or study reports may be requested by representatives of the Department from time to time during liaison duties for various reasons. However, these reports shall be kept to a minimum and shall not replace the requirement of para 5.3.9.2.

5.3.9.4 Model Specification - The coordinating contractor shall prepare a Model Specification in accordance with CAP 479 to describe each mark of aircraft, and shall submit said Model Specification (s) for approval prior to acceptance of the initial mark of aircraft. Further to para 5.2.3 Part II, acceptance of aircraft will be done to the Model Specification.

5.3.10 Mock-Up Conferences and Engineering Evaluations

5.3.10.1 Mock-Up Conferences

5.3.10.1.1 Occurrence - The coordinating contractor shall request the Department for conferences at each stage in development where major changes have been made. The purpose of these conferences shall be to demonstrate the proposed installation and to receive recommendations for design changes from representative of the Department. The final design requirements proposed and agreed upon at these conferences shall be given in writing. In particular, mock-up conferences shall be called:

5. CO-ORDINATING CONTRACTOR RESPONSIBILITIES (Cont'd)

5.3.10.1.1 (Cont'd)

(a) At the earliest possible state in the design of the first aircraft powered by J-75 engines and destined as a flight test vehicle.

(b) When the Iroquois engine is installed.

(c) When the electronic system is installed.

5.3.10.1.2 Organization - Mock-up conferences shall be organized by the coordinating contractor in conjunction with the Department to satisfy the requirements of the RCAF.

5.3.10.1.3 Installation - The mock-up installation shall be accurately positioned and shall include samples of each component of equipment or accurately constructed dummies. The Department shall supply to the coordinating contractor, on request, samples of service supply items of equipment required for each mock-up, or drawings which will permit dummies to be manufactured by the coordinating contractor.

5.3.10.2 Engineering Evaluations

5.3.10.2.1 Occurrence - The coordinating contractor shall request the Department for engineering evaluations at each major stage of development of the aircraft and the associated ground support equipment to illustrate the intended production item. In particular an engineering evaluation shall be requested:

(a) As soon as possible after contrucation of the first aircraft and preferably before the first flight.

(b) As soon as possible after the production installation of the electronic system and preferably before the demonstration of the weapons system as required in para 5.2.2 of Part II.

5.3.10.2.2 Organization - Engineering evaluations shall be organized by the coordinating contractor in conjunction with the Department to satisfy the requirements of the RCAF.

PART III - AIRCRAFT DESIGN

6. GENERAL

6.1 Design - The aircraft shall be designed in accordance with the Canadian Air Publications 479, "Manual of Aircraft Design Requirements for the Royal Canadian Air Force", the technical requirements of the United States Air Research and Development Command Manual No. 80-1, "Handbook of Instructions for Aircraft Designers", publications and specifications referred to therein and such additional requirements as may be specified by the Department and such deviations from these specifications and requirements as may be agreed between the Department and the coordinating contractor. Where there is any conflict between the requirements of CAP 479 and those of USAF ARDC Manual No. 80-1, the former shall govern.

6.2 Role

6.2.1 Primary Role - The main role of the aircraft in the weapon system shall be the airborne striking arm capable of high altitude, all weather, night and day interception and destruction of airborne enemy aircraft.

6.2.2 Secondary Role - The secondary role of the aircraft shall be low altitude, all-weather, night and day interception and destruction of enemy bomber aircraft. However, the aircraft shall be designed to fulfill its primary role and limitations will be accepted in the fulfilment of its secondary role.

6.3 Crew - The crew shall consist of a pilot and an observer /AI.

7. PERFORMANCE

7.1 General - The aircraft shall meet the performance requirements detailed hereinafter under NACA standard atmospheric conditions, except where otherwise specified.

7.2 Radius of Action - The radius of action in still air with internal fuel shall be as follows:

7.2.1 Combat Radius of Action - The combat radius of action at normal gross weight (ref para 2.18 of Part I) shall not be less than 200 nautical miles. It shall be based on the following missions:

(a) Scramble

(b) Combat Climb and acceleration to 50,000 feet and Mach 1.5

(c) Cruise out at combat speed of Mach 1.5 at 50,000 feet altitude to a distance of 200 nautical miles from base.

7. PERFORMANCE

7.2.1 Cont'd.

(d) Combat under combat performance conditions and retaining armament for 5 minutes.

(e) Return to base at economical cruising speed.

(f) Loiter over base above 30,000 feet for 15 minutes.

(g) Descend to sea level. (Distance covered during descent is not to be credited to the radius of action).

(h) Land with 5 minutes sea level loiter reserve remaining in fuel tanks.

7.2.2 Cruising Radius of Action - The cruising radius of action at normal gross weight (ref para 2.18 of Part I) shall not be less than 300 nautical miles. It shall be based on the following mission.

(a) Scramble

(b) Economial Climb

(c) Economical cruise out to a distance of 300 nautical miles from base.

(d) Combat under combat performance conditions and retaining armament, for 5 minutes.

(e) Return to base at economical cruising speed.

(f) Loiter over base above 30,000 feet for 15 minutes.

(g) Descend to sea level (Distance covered during descent is not to be credited to the radius of action).

(h) Land with 5 minutes sea level loiter reserve remaining in fuel tanks.

7.3 Overload Range - Sufficient fuel shall be carried in jettisonable overload tanks such that internal and external fuel permits an overload range of not less than 1500 nautical miles. The overload range shall be based on the following mission.

7. PERFORMANCE (Cont'd)

7.3 (a) Take-off

(b) Economical climb

(c) Cruise to destination 1500 nautical miles from take-off point using optimum cruising technique.

(d) Loiter over destination above 30,000 feet for 15 minutes.

(e) Descend to sea level. (Distance covered during descent is not to be credited to range).

(f) Land with 5 minutes sea level loiter reserve remaining in fuel tanks.

7.4 Performance with External Overload Tanks - The aircraft shall be operable and have satisfactory handling characteristics with overload fuel tanks installed up to a speed of not less than Mach. 95.

7.5 Location of External Overload Tanks - It shall be possible to fire all the armament weapons after jettisoning external overload tanks.

7.6 Ceiling - The combat ceiling (ref para 2.7 Part I) at combat weight (ref para 2.11 Part I) shall not be less than 60,000 feet.

7.7 Take-off

7.7.1 Length - The aircraft shall be capable of taking-off safely in still air at a maximum gross weight (ref para 2.17 of Part I) from 6000 foot runways at sea level and at a standard summer temperature of 38C.

7.7.2 Time - With the aircraft at normal gross weight (ref para 2.18 of Part I) and positioned at the end of the runway firing into wind, the elapsed time from an initiation of engine starting, until the aircraft becomes airborne shall not be more than one minute. This requirement shall be fulfilled within the time limits stated for the states of readiness (ref paras 2.23, 2.20, 2.5 of Part I).

7.8 Landing - The aircraft shall be capable of landing safely in still air under NACA standard atmospheric conditions at maximum landing gross weight (ref para 2.16 of Part I) on 6000 foot runways, at sea level.

7.9 Combat Performance - The combat performance at combat weight (ref para 2.11 Part I) shall not be less than a combat load factor of 2 at a combat speed of Mach 1.5 and at a combat altitude of 50,000 feet.

7. PERFORMANCE (Cont'd

7.10 Combat Climb and Acceleration Time - The elapsed time required to reach a level flight combat speed of Mach 1.5 and a combat altitude of 50,000 feet from the time the aircraft becomes airborne during take-off at normal gross weight (ref para 2.18 Part I) under sea level conditions shall not be more than five minutes. The optimum climb and acceleration schedule shall be used.

7.11 Flying Qualities

7.11.1 General - The flying qualities of the Arrow shall meet the requirements of MIL-F-8785 (ASG).

7.11.2 Spinning - The spinning requirements shall be as detailed in MIL-S-25015.

8. AIRWORTHINESS

8.1 General - The aircraft shall be designed to meet the structural strength and stiffness requirements of USAF Specifications MIL-S-5700 and MIL-F-25352.

8.2 Load Factors - At the gross weight for stress analysis, the limit load factors as defined in USAF Specification MIL-S-5700 shall not be less than 7.33 and -3.0. The load factor of safety shall be 1.364.

8.3 Design Diving Speed - The design diving speed VD shall be the lesser of either the speed corresponding to Mach 2 or 700 knots EAS.

8.4 Aero Elasticity - The airframe structure shall be sufficiently rigid to keep structural distortion within limits that will not unacceptably impair control or stability. All requirements of USAF Specification MIL-F-25352 shall be met.

9. DETAIL DESIGN

9.1 General

9.1.1 Performance - The design of the weapons system shall comply with Section II - Performance of this Specification.

9.1.2 Pilot Capability - The aircraft shall be designed such that the pilot can perform all the normal and emergency functions required to fly the aircraft without the assistance or presence of the second crew member. This is not to imply that the aircraft will be flown in combat with one occupant.

9. DETAIL DESIGN

9.1.3 Control Fouling - Airframe compartments that accomodate flying control components susceptible to jamming from foreign objects shall be protected from the ingress of such foreign material by the consideration of the use of isolating bulkheads or similar techniques.

9.1.4 Production - The design of the aircraft shall be such that it is suitable for large quantity production.

9.1.5 Ground Facilities - During design of the aircraft components, the coordinating contractor shall give full consideration to the ground facilities required to maintain these components, such that the optimum utilization of squadron aircraft can be obtained within the resources available to the Department. The aircraft performance is not to be prejudiced in favour of the ground support facilities without the prior approval of the Department.

9.2 Design Changes

9.2.1 Control - The development and introduction into production of design changes that tend to fulfil the intent of this specification except those changes in para 9.2.3, shall be under the direct control and at the discretion of the coordinating contractor up to the point where delivery of the aircraft to the RCAF commences.

9.2.2 Scope - The development of features or changes to design that are beyond the scope of this specification shall be the subject of the Development Engineering Change Proposal procedure as described in EO 00-50-8.

9.2.3 Mock-UP - The design of the weapons system in its various stages shall ensure that changes resulting from Mock-Up Conferences and Engineering Evaluation Boards are incorporated in accordance with the results of these Boards.

9.3 Maintenance - The aircraft shall be designed such that reliability and ease of maintenance is given a priority second only to the dictates of performance. Positioning of equipment, use of interchangeable access panels, quick release fasteners, and other techniques, processes and standards commonly used on modern aircraft are to be given full consideration in order to ensure a high standard of maintainability.

9. DETAIL DESIGN (Cont'd)

9.4 Cabin

9.4.1 Pressurization - The cabin shall be pressurized in accordance with USAF Manual 80-1 except as specified hereinafter. The cabin pressure differential shall be zero over the altitude range from zero to 10,000 feet. Above 10,000 feet it shall increase linearly with the ambient pressure, reaching a value of 4.5 plus 0.5, minus 0 psi at an ambient pressure altitude of 60,000 feet. Above this point a constant differential of 4.5 plus 0.5, minus 0 psi shall be maintained. A cabin pressure altimeter to USAF Specification MIL-I-5099 shall be installed. A manually operated dump valve shall be installed to permit the release of cabin pressure. Reduced cockpit pressurization for combat is not required.

9.4.2 Cabin Leak Rate - The cabin leak rate shall be less than two-thirds of the maximum quantity of air available for pressurization at the absolute ceiling of the aircraft.

9.4.3 Air Conditioning - One outlet of the air conditioning system shall be utilized to maintain the cockpit at a temperature between 40F and 80F under all design conditions of flight except when controlled by the pilot for de-misting purposes. A control panel shall be located in the cockpit to provide the pilot with in-flight control of the cockpit temperature. Within the limitations of the capacity of the air conditioning system a selected cockpit temperature shall be automatically maintained.

9.4.4 Emergency Exit - For emergency use, crew members shall be provided with a fully automatic and safe means of ejecting from the aircraft decelerating, descending from altitude, and alighting upon the ground. This provision must be operable throughout all speeds, altitudes, attitudes, and operable acceleration conditions of which the aircraft is capable or is able to withstand structurally. Clearance of the ejection path and the actual ejection shall be initiated by one action which can easily be performed throughout the foregoing flight conditions. All devices and equipment, including protective clothing, which in any way may affect the success of an emergency exit, deceleration descent from altitude and alighting upon the ground, shall be considered as an engineered system. Provision shall also be made to include a standard survival pack.

9.4.5 Emergency Escape Path- In addition to the fully automatic clearance of the escape path described in para 9.4.4 above, provision shall be made for emergency clearance of the escape path for each crew member by a hand operated mechanical control in each cockpit.

9. DETAIL DESIGN

9.5 Landing Gear

9.5.1 Description - A fully retractable, power operated landing gear, with the nose wheel steerable, shall be fitted. A device shall be fitted to prevent inadvertent retraction of the undercarriage while the wheels are on the ground.

9.5.2 Emergency - An emergency means of extending and locking the landing gear in the event of failure of the landing gear primary power system shall be installed.

9.6 Speed Brakes - Speed brakes shall be fitted to produce additional drag when opened. The controls shall be arranged such that the pilot can set the brakes at the fully opened, intermediate, or fully closed position. Actuation of the speed brakes shall have a minimum effect on the trim or attitude throughout the flight envelope of the aircraft.

9.7 Anti-icing and Anti-misting Protection

9.7.1 Description - Adequate anti-icing protection of the engine and airframe, and anti-misting of the pilots windscreen and canopy and navigator's windows shall be incorporated so that the aircraft can carry out the missions detailed in this specification under all weather conditions, including heavy rain or snow and icing conditions.

9.7.2 Detail - Particular attention shall be given to the following:

(a) Engine

(b) Windscreen, Pilot's Canopy, and Nav./AI's windows.

(c) Radome

(d) Engine Air Intakes

(e) Control surfaces, flaps and doors

9.8 Protection from Enemy Fire - During the design of the aircraft special consideration shall be given to the building-in of invulnerability to enemy fire by the maximum use of such inherent types of protection as positioning of components, fuel and hydraulic lines, and like items, providing such positioning does not result in unreasonable complication or weight penalty.

9. DETAIL DESIGN

9.9 Automatic Disconnect Couplings - All external connections from the aircraft to ground equipment shall be made through automatic disconnect couplings preferably located in an adjacent area. The automatic couplers shall be positioned such that they will be disconnected by the aircraft taxiing straight away.

9.10 Reduced Power System Requirements

9.10.1 General - The electrical and hydraulic systems shall be designed such that the following reduced power system requirements can be achieved.

9.10.2 Electrical

Partial Loss of Power or One Engine Failed	Double Engine Failure	One engine seized One engine failed
(a) Receiver, Transmitter, Interphone	(a) Required	(a) Required
(b) IFF (Air to Ground)	(b) Required	(b) Required
(c) Flight Instrument	(c) Required	(c) Required
(d) Radio Compass or Tacan	(d) Required	(d) Required
(e) Ejection capability	(e) Required	(e) Required
(f) Re-light capability	(f) Required	(f) Required
(g) Stores Jettison capability	(g) Required	(g) Required
(h) Windscreen de-misting	(h) Required	(h) Required
(i) Cockpit and Instrument Lighting	(i) Required	(i) Required
(j) Override of AFCS pilot	(j) Required	(j) Required
(k) Automatic continuous transmit of RT and IFF if aircraft abandoned	(k) Required	(k) Required
(l) Capability of firing the missile if in the final stages of attack (on one engine or one alternator)	(l) not required	(l) not required

9. DETAIL DESIGN

9.10.3 Hydraulic

Partial Loss of Power or One Engine Failed	Double Engine Failure	One engine seized One engine failed
(a) Undercarriage - Lowering	(a) Required	(a) Required
(b) Speed Brakes- Operation	(b) Required	(b) Required
(c) Wheel Braker - Limited Operation	(c) Required	(c) Required
(d) Flight Controls - sufficient power to provide full control of the aircraft until landing is effected	(d) Required	(d) Sufficient power available to manoeuvre the aircraft toward a suitable ejection area.
(e) Stores jettison capability - operation of armament system (if required).	(e) Required	(e) Required

9.11 Fuel System

9.11.1 General - The fuel systems shall be designed in accordance with the requirements of ARDC Manual 80-1, except as specified hereinafter. Every effort shall be exerted to ensure simplicity and reliability in the system and its controls, and in particular, in its presentation to the pilot. Normal operation of the system shall be entirely automatic and shall not require any monitoring action by the crew.

9.11.2 Fuel - The fuel system shall be designed for fuel to CGSB Specification 3-GP-22A(MIL-F-5624) and shall be such that in the event of a single strike, the maximum amount of fuel is retained, but in any case not more than 20% of the total fuel in the tanks shall be lost or made unavailable to the engines. The fuel system shall be capable of using fuel to CGSB 3-GP-25 (MIL-F-5572) for limited ferry mission.

9.11.3 Flow Indication - The fuel systems shall incorporate one fuel contents gauge, a capacitance type fuel contents system, and one On-Off fuel cock for each engine system. Equipment shall be installed to give the pilot positive indication that fuel is being transferred from the external fuel tanks to the internal fuel system. The components of the fuel system shall not deteriorate excessively or fail prematurely due to fuel constituents, vibration or extreme temperatures. The fuel contents system need not show fuel contents in the external fuel tank.

9. DETAIL DESIGN (Cont'd)

9.11.4 Accessibility - Accessibility to all components of the system shall be provided to facilitate to the upmost maintenance, without dissassembly of main components of the airframe structure.

9.11.5 Tanks - Integral wing fuel tanks shall be used if their use will effect a saving in weight. Each tank shall have an expansion space equal to 3% of its normal fuel capacity. In computing the tank dimensions, the specific gravity of the fuel shall be taken as 0.75. All fuel filters shall be accessible and readily removable for quick draining and cleaning.

9.11.6 Filtration - Fuel filtration shall be provided if required to ensure that fuel entering the engine contains particles no larger than 74 microns (200 mesh strainer). This requirement if required shall not be deemed to be satisfied by fuel filtration prior to refuelling.

9.11.7 Refuelling - Complete pressure refuelling of the internal fuel system for the combat radius of action fuel load detailed in paragraph 7.2.1 of Part III shall be accomplished within the turn-around time limit of para 3.2.1 of Part I.

9.11.8 Overload Tanks - External overload fuel tanks of sufficient capacity to meet the range requirement of para 5.3 of Part III shall be installed. The tanks shall be jettisonable while in flight and shall be capable of rapid installation and removal with the aircraft on the ground.

9.11.9 Defuelling - Complete defuelling of one side shall be accomplished in not more than 15 mins. utilizing one fuel outlet only.

9.12 Fire Prevention

9.12.1 Areas - The areas that require fire detection, prevention, and/or extinguishing shall be determined by the Department as the design developes and fire hazards can be assessed. In any case the requirements of CAP 479 and ARCM-80-1 shall be accomplished.

9.12.2 Type - A continuous wire type or a rate of change of temperature type fire detection system shall be installed. A fire extinguishing system shall be installed in accordance with CAP 479.

9.13 Oxygen

9.13.1 Quantity - Sufficient oxygen shall be provided for the crew members for at least a maximum length ferry mission.

9. DETAIL DESIGN (Cont'd)

9.13.2 System Type - The oxygen system shall be of the liquid oxygen type, operating at 300 psi, using one 5 litre converter.

9.13.3 Converter - The converter shall be in a readily accessible location and shall be quickly removable from the aircraft.

9.13.4 Contents Indication - The liquid oxygen system shall include quantity gauges in the front and rear cockpit.

9.13.5 Outlets - A high altitude automatic pressure demand dual outlet oxygen regulator shall be installed on each ejection seat. The second outlets shall provide pressure to inflate the crew's pressure suits when required. Composite quick-disconnects embodying all the services between the crew and the ejection seats and between the ejection seats and the airframe shall be provided.

9.13.6 Bail-Out - Bail-out oxygen bottles shall be provided on the seats, connected to the oxygen regulators referred to in para 9.13.5 through automatic selector valves which are actuated when the seats are ejecting.

9.14 Anti-"G" Protection - Anti-"G" valves as detailed in MIL-V-9370 shall be provided for anti "G" protection. The outlets of the valves shall terminate through the composite disconnects referred to in para 9.13.5.

9.15 Interchangeability - The requirement of Interchangeability Specification MIL-I-8500A shall be met in the design and construction of the aircraft. The Working List shall form a part of MIL-I-8500A and consequently of this specification. This list shall include the weapon package.

9.16 Instruments

9.16.1 Specifications - Instruments manufactured to RCAF Specifications shall be given preference. The USAF ARDC Manual 80-1 together with relevant specifications shall be used in selecting other instruments.

9.16.2 Mounting - All panel instruments shall be front-mounted in accordance with EO 20-1-6/1.

9.16.3 Installation - The installation of instrument equipment shall be in accordance with USAF Specification MIL-I-5997.

9. DETAIL DESIGN (Cont'd)

9.16.4 Panel - The arrangement and selection of the instruments on the panel shall be agreed upon between the RCAF and the contractor at an early stage in the design, based as closely as possible on ORI/4-2 and 10413, ABC Standards and USAF AD2001.

9.16.5 Lines and Leads - All air lines and electrical leads shall be flexible and fitted with quick-disconnects and shall be of sufficient length to allow easy instrument removal.

9.16.6 Engine Instruments - All engine instruments shall be of the electrical remove single indication type and 2-inch case size in accordance with US Drawing AND 10412 and shall be clamp mounted in accordance with MIL-C-6818.

9.17 Electrical Equipment

9.17.1 Specifications - All electrical equipment shall be in accordance with Specifications MIL-E-7894, MIL-E-7614, MIL-E-7080, MIL-G-6099, and the requirements of USAF Drawings 53D6792 and 53D6793 and otherwise detailed in the specification. The requirements of USAF Drawings 53D6792 and 53D6793 have precedence over MIL-G-6099. Approved hermetically sealed components shall be installed where available.

9.17.2 Battery - A nickel-cadmium type battery or equivalent shall be installed.

9.17.3 Receptacle - An external alternating current power receptacle in accordance with the outline of US Standard Drawing AN-3114 shall be provided.

9.17.4 Interior Lighting

9.17.4.1 General - The cockpit lighting system shall be in accordance with CAP 479.

9.17.4.2 Console Lighting - Where possible, all cockpit control panels shall be provided with red console lighting in accordance with USAF Specification MIL-P-7788. The intensity of illumination shall be controllable.

9.17.5 Exterior Lighting

9.17.5.1 Navigation - External lights shall be provided in accordance with CAP 479 except that the landing light shall be installed on the nose gear structure. Upper and lower fuselage lights are not required.

9.17.5.2 Taxi - A taxi light shall be fitted to the nose undercarriage assembly such that it will follow the direction of the nosewheel steering.

9. DETAIL DESIGN (Cont'd)

9.18 Radome Transmission Efficiency - The radome shall have a one way transmission efficiency of 90%. The maximum allowable foresight error shall be 1.0 milliradians with a rate of change no more than 0.2 milliradians per degree.

9.19 Pressurization and Air Conditioning

9.19.1 Cockpit - The cockpit shall be supplied with sufficient pressurized air to enable the conditions of para 9.4.1 to be met.

9.19.2 Systems - Those portions of the electronics and other aircraft systems that require conditioning air to ensure satisfactory operation shall be supplied from the aircraft system.

9.20 Power Plant Installation

9.20.1 General

9.20.1.1 Contractor - The engine shall be designed and developed by Orenda Engines Ltd. (who will be an associate contractor) and shall be acceptable to the Department, and the coordinating contractor for installation in the airframe.

9.20.1.2 Iroquois - The aircraft shall be designed to be powered with two Orenda Engines Ltd., Iroquois gas turbine jet propulsion engines with afterburners.

9.20.1.3 Thrust Control - Variation of thrust with the afterburners operating shall be provided, and shall be controlled by a means agreed between the Department and the coordinating contractor, in conjunction with the engine manufacturer. Such variation shall be effected by means of the throttle control for each engine.

9.20.1.4 Installation and Removal

9.20.1.4.1 General - The engine and afterburner installation shall be designed so that the complete unit in operating condition may be removed and another unit installed and ready for running in not more than thirty minutes. This shall be accomplished with no special tools other than an engine sling and an engine hoist or suitable trolley. The thirty-minute period shall not include time required to set up or synchronize the engine controls.

9.20.1.4.2 Connectors - All engine controls, fuel lines and electrical leads shall incorporate quickly detachable connectors to facilitate engine installation and removal.

9. DETAIL DESIGN (Cont'd)

9.20.1.5 Protection - Shields shall be fitted to protect the engine compartment and all parts of the aircraft structure, including adjacent equipment, from engine heat which may adversely affect the physical properties of the materials. Special consideration shall be given to the ventilation, cooling and expansion of the engine and adjacent airframe components.

9.20.1.6 Maintenance - Special attention shall be given to the engine and accessory installations so that maintenance and inspection will be facilitated to the utmost.

9.20.2 Engine Starting

9.20.2.1 General - The engine starting shall be under the control of the occupant of the front cockpit.

9.20.2.2 Airborne Relight - A starting system shall be installed to cater for relight of either or both engines during airborne operations at all design altitudes for use when the engine(s) has flamed out.

9.20.3 Exhaust System - Provision shall be made for longitudinal and radial expansion and contraction of the exhaust system components.

9.21 Electronics Installation

9.21.1 General - An electronic system consisting of equipment selected, designed, developed, and constructed to the requirements of RCAF Specification AIR 7-6, "Development of an Electronic System for the CF105 Aircraft" shall be procured by the Radio Corp. of America (who shall be an associate contractor) and shall be acceptable to the Department and the coordinating contractor for installation in the airframe to perform the following functions:

(a) Intercept Functions

(b) Attack Functions

(c) Return-to-Base Functions.

9.21.2 Content- The Arrow Electronic System consists of the following equipment and is covered by RCAF Specifications AIR 7-6 and INST 92-5:

9. DETAIL DESIGN (Cont'd)

9.21.2.1 Fire Control Sub-System

(i) Radar

(ii) Fire Control Computer

(iii) Missile Auxiliaries

(iv) Infra-Red Search and Track Equipment

9.21.2.2 Telecommunication Sub-System

(i) Voice communications

(ii) Data link

(iii) Identification

(iv) Navigation and Approach radio aids

(v) Electronic countermeasures equipment

9.21.2.3 Automatic Flight Control System

9.21.2.4 Navigation Sub-System

9.21.2.5 Flight Data Sub-System

(i) Stabilized Platform

(ii) Air Data Computer

9.21.2.6 Power Supplies that are Internal to Electronic System

9.21.2.7 Cockpit Controls and Presentation

(i) Flight Instruments

(ii) Fuel and Engine Instruments Presentation

(iii) Navigation Pressntation and Controls

(iv) Fire Control Presentations and Controls

(v) Missile Controls and Indicators

(vi) Telecommunication Controls

(vii) AFCS Controls

(viii) All other cockpit presentations and controls on the panels and consoles except the throttle assembly and direct aircraft component controls

9. DETAIL DESIGN (Cont'd)

9.21.3 Telecommunication Antennae - All antennae requirements of the telecommunications equipment shall be the responsibility of the coordinating contractor.

9.21.4 Flight Sensing Instrumentation

9.21.4.1 Content - The flight sensing instrumentation shall embody that instrumentatuon necessary to define or provide, as required by RCAF Specification AIR 7-6 the following:

(a) Air Data

(b) Weapons System Attitude

(c) Angle of Attack

(d) Heading Information

(e) Fuel State

(f) Acceleration Data

9.21.4.2 Power - The coordinating contractor in conjunction with the electronics associate contractor shall ensure that sufficient power is available from the airframe system to enable the electronics system to operate as required by this specification and AIR 7-6.

9.22 Weapon Installation

9.22.1 General - The weapon installation shall be designed such that the armament bay is free of permament structural members. The weapons shall be installed in a removable package that when inserted into the armament bay forms a portion of the aircraft fuselage. It shall be a design objective to replace packages as a normal rearming procedure but nothing in the design shall prevent the reloading of individual weapons. When the package is removed from the aircraft it shall be entirely self-contained. Provision shall be made to carry the following weapons.

(a) Four Sparrow II (Douglas Model 1242-D) Missiles or

(b) MB-1 Rockets

9. DETAIL DESIGN (Cont'd)

9.22.2 Installation - The aircraft shall be designed to carry four Sparrow II (Douglas Model 1242-D) missiles. The installation of MB-1 rockets shall be engineered by the coordinating contractor as soon as design information is received from the Department.

9.22.3 Firing Sequence - The Sparrow missile load referenced in para 9.22.1 shall be capable of being fired in the following salvos:

(a) Two separate firings of two missiles each

(b) All four missiles in one firing in the order of missile.

9.22.4 Performance - The coordinating contractor shall provide all conditions and facilities in the aircraft to ensure that the weapons performance can be achieved in full and that the aim of the aircraft is maintained.

9.22.5 Supply - The environmental and ballistic data of the weapons and the weapons themselves shall be provided by the Department.

9.22.6 Jettisoning - Provision shall be made to jettison missiles without firing.

9.22.7 Umbilical Connection - The umbilical connections shall be designed for release by the weapon motion.

9.22.8 Connections - Electrical connections between the package and the aircraft shall be of the quick disconnect type and shall be positioned in such a manner as to minimize danger to the ground crews and inadvertent firing.

9.22.9 Firing Capability - Weapon firing capability shall be retained upon failure of an alternator provided engine intake de-icing is not required simultaneously.

9.22.10 Safety Requirements - The weapons installation shall include all relevant safety features as required by ARM 100-4 "Safety Requirements for Armament Installations in Aircraft".

9.22.11 Ground Operating Controls - Shall be grouped for easy access through a hinged door on the missile pack. Controls for raising and lowering the weapons during ground operation shall be provided. The attachments at the front and rear of the package shall be releaseable through access doors.

9. DETAIL DESIGN (Cont'd)

9.22.12 Hook Angle - Blanking of the missile hook angle in the extended position shall not degrade the effectiveness of the aircraft as the airborne striking arm of the weapon system.

9.23 Telescramble - The aircraft shall have provision for a telescramble communication system whereby the crew positioned in the cockpit ready for flight may receive operational instructions from a ground source (ref para 5.3.3.3 of Part II) utilizing the normal aircraft equipment.