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TITLE

RESEARCH AIRCRAFT R&D INTO RPV AND DRONE TECHNOLOGIES. FINAL SUMMARY REPORT

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DRES

CONTRACT REPORT 33-92

RESEARCH AIRCRAFT R&D INTO RPV AND DRONE TECHNOLOGIES

FINAL SUMMARY REPORT

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Winnipeg, Manitoba

March 1992

DEFENCE RESEARCH ESTABLISHMENT SUFFIELD, RALSTON, ALBERTA

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REPORT NO. 917475

FINAL REPORT
for
CONTRACT No.
W7702-9-R102/01-XSG

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1.0 INTRODUCTION

1.1 BACKGROUND

This report has been prepared as a final requirement for the completion of DSS contract number W7702-9-R102/01-XSG. This report summarizes the technical activities completed under the subject contract.

Aero Consulting Services Ltd. (ACS) developed a highly modified twin engine aircraft for airborne testing of avionics subsystems. ACS provided the aircraft to DRES on a dry lease basis for an initial development period. During this period further modifications and special equipment were identified to develop the aircraft into a fully functioning flying laboratory for the development of RPV and drone avionics systems.

Prior to this contract DRES conducted airborne tests of avionics subsystems on a single engine Cessna 172, then subsequently on a light twin engine Piper Seneca, both of which were supplied by ACS under previous contracts. Although the initial development and testing of the Piper Seneca aircraft proved favorable, the requirements of DRES justified further study and development for the testbed aircraft.

1.0 INTRODUCTION

1.2 PROJECT OBJECTIVES

It had been previously demonstrated that using a dedicated aircraft, complete RPV or drone avionics packages could be installed in a suitable frame and tested as a system. This permits the use and development of RPV ground ground stations based on actual flight experience without the risk of unmanned flight with an unproven system. All tracking, communications, and payload control functions may be operational as if the testbed were an RPV except that the altitude and heading hold functions could be provided by the pilot.

The initial contract included an assessment of all candidate twin engine aircraft, including analysis of characteristics of several aircraft and operating costs. The subsequent contract included initial modification and development of the chosen testbed aircraft. The most recent contract included analysis and development into the continued support of the Piper PA-34T selected and utilized in the previous contracts.

This contract was intended to further develop airborne RPV and Drone testing capabilities as a follow-up to the previous modification and development contract.

2.0 AIRCRAFT MODIFICATIONS

These modifications were approved by a Transport Canada DAR, and copies supplied to Transport Canada as required by regulations, and to DRES as specified by the contract.

Continued modifications of the testbed aircraft analyzed and developed under this contract required complete manufacturing and installation drawings to be prepared. Where required, these drawings must provide appropriate quality control specifications for the modification, or a complete structural analysis.

Further modifications to the testbed aircraft under the subject contract included:

1. Flux Detector Installation

2. Rigidized Avionics Beam Mount

3. Rack Mounted Computer Instl'n

3.0 AIRCRAFT OPERATIONS

3.1 MAINTENANCE AND UTILIZATION

ACS made arrangements with **BAR XH Aviation** in Medicine Hat to provide continuing maintenance for the airplane. All required inspections were performed by **BAR XH.**

A total of 200 hours were utilized during a 22 month operating period. In that period the aircraft was out of service for a period of 6 weeks for major inspection and preventive maintenance. There was no loss of aircraft availability caused by unscheduled maintenance or unservicability conditions.

Additional equipment as specified by the scientific authority was supplied at a cost of $ 33,679. The lease rate was held constant at $1565 per month as in the previous contract. Installation of the equipment was done by sub-contractors at a cost of $47,386.

All modifications were accomplished in accordance with Transport Canada approved data. Engineering and approval expenditures were $ 21,845.

4.0 COST & BENEFIT ANALYSIS

Direct operating costs for the airplane include:

1.	Monthly lease fees	($ 1565 /month)	34,430
2.	Hourly use fee	($ 37.50/ hr)	7,500
3.	Fuel and oil	(at cost)	10,340

This represents a direct operating cost of $ 261 per flying hour.

The typical hourly rent for a full IFR equipped Seneca II would be approximately $ 175 to $ 220 per hour. Rental agencies also may impose a daily minimum fee. The convenience of having the airplane for the exclusive use of DRES when required, and the ability to modify the airplane to special configurations are operating advantages which are obtained virtually free of cost to DRES by contracting a dedicated aircraft.

5.0 DELIVERABLES

5.1 ENGINEERING DRAWINGS

The following is a list of drawings delivered:

DWG. NO.	REV.	TITLE
917401	--	Flux Detector Installation
917402	--	Video Camera Instl.
917403	--	Spot Fitting Assembly
917404	--	Aft Seat Modification
917405	--	Aft Seat Installation
917406	--	Equipment Pack Installation
917407	--	Radio Rack Ass'y, Instl.
917408	--	Avionics Beam Holder Ass'y/Instl.
917409	--	Flight Research Aircraft Configuration
917411	--	Exterior Markings
917412	--	Aft Bulkhead Instl'n
917413	--	Interior Markings Instl'n
917414	--	Five Point Harness Instl.
917415	--	Folding Table Ass'y & Instl.
917416	--	Chassis Instl.
917417	--	GPS Antenna Instl. (Wing)
917418	--	GPS Antenna Instl. (Nose)
917419	--	GPS Antenna Instl. (Cockpit)
917420	--	Electrical Sub.
917421	--	Flux Detector Wiring Diagram
917422	--	Video Camera Wiring Diagram
917423	--	GPS Antenna Wiring Diagram

5.0 DELIVERABLES (CONT'D)

5.2 ENGINEERING REPORTS

DWG. NO	REV.	TITLE
917400	--	Modification Data Summary
917410	--	Substantiation Report
917420	--	Electrical Substantiation
917450	--	Test Plan - Chassis Fire Resistance

5.3 HARDWARE

The following is a list of hardware items delivered:

PART NO.	DESCRIPTION
917403	Spot Fitting Assembly
917404	Modified Aft Seat
917405	Additional Aft Seat Instln
917406	Equipment Rack
917407	Radio Rack Ass'y and Instln.
917408	Modified Avionics Beam Holder Ass'y/Instl.
917412	Aft Bulkhead and Instl'n
917413	Interior Markings Instl'n
917414	Five Point Harness and Instl.
917415	Folding Table Ass'y & Instl.
917416	Equipment Chassis Instl.

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