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ANALYZED

HYDRAULIC SYSTEMS FLUID DISPENSER

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## INTRODUCTION:

This report deals with the requirement for a Fluid Dispenser for use in carrying out the filling of the hydraulic system. The particular reference is to the modifications necessary to the existing R.C.A.F. equipment as per the requirement.

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## HYDRAULIC SYSTEMS FLUID DISPENSER

The existing R.C.A.F. equipment required for use in the above capacity, is the "M1 Dispenser", "M101" model, manufactured by General Motors and Engineering Corp. This dispenser is a 10. litre unit, and is used for filling the hydraulic system.

## PURPOSE:

The function of the hydraulic system is to operate the landing gear, flap, and other accessories. The dispenser is used to fill up the hydraulic system. Each component is topped up separately, through the aircraft's low pressure, ground connections, which are self-sealing, which disconnect fittings conforming to standard specifications.

The hydraulic fluid used is MIL-D-5606.

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## REQUIREMENTS:

To carry out the purposes stated above, the Fluid Dispenser should embody the following features:

### (a) Design:

The dispenser should be light, mobile, highly manoeuvrable, mounted on pneumatic wheels, preferably having a lowing cast steering bar, and be able to be used on rough or improved surfaces.

Prepared by P.A. Bell Sgt.

### (b) Tank:

The tank should have sufficient capacity to be able to permit re-filling, and offer suitable protection against contamination of the fluid. The outlet should be above the bottom level of the tank, and the breather vent should be protected against the ingress of dirt and water.

Approved by J.P. Booth

ENGINEERING DIVISION

AVRO AIRCRAFT LIMITED, MALTON, ONTARIO





### 1. INTRODUCTION:

This report deals with the requirement for an hydraulic fluid dispenser for use in topping up the flying control and utilities hydraulic systems Compensators; with particular reference to the Modifications necessary to adapt existing R.C.A.F. equipment to meet the requirement.

The existing R.C.A.F. equipment proposed for use in the above capacity, is the "Oil Dispenser, "Helot" Model", manufactured by Prencos Progress and Engineering Corp., and listed in CAP. 10. Sect. 4G, Ref. 448 Part No. 9600.

### 2. PURPOSE:

The function of the hydraulic systems fluid dispenser is: To top up the compensators in the flying controls system (1 compensator in each of two systems), and the compensator in the utilities hydraulic system. Each compensator is topped up separately, through the aircraft low pressure ground connections, which are self sealing, quick disconnect fittings conforming to Avrocan specification E232.

The hydraulic fluid used conforms to MIL-O-5606.

### 3. REQUIREMENT:

To Carry out the purposes stated above, the fluid dispenser should embody the following features.

#### (a) Chassis

The chassis should be light, mobile, highly manoeuvrable, mounted on pneumatic wheels, preferably three; have a towing cum steering bar, and be capable of being towed over improved surfaces.

#### (b) Tank

The tank should have sufficient capacity as to preclude frequent re-filling, and offer maximum protection against contamination of the fluid. The outlet should be above the bottom level of the tank, and the breather vent should be protected against the ingress of dirt and water.

3. REQUIREMENT: (Cont'd)(c) Pump

The pump should be a selfpriming, hand operated type, preferably rotary or semi-rotary in operation, and capable of a flow rate not less than  $\frac{1}{2}$  gallon per minute and a pressure of 150 P.S.I., to overcome pressure in the A/C return system, and to give an adequate flow rate under extreme cold weather conditions.

The pump should be mounted in such a position as to give maximum ease of operation.

(d) Filter

The pump discharge line must incorporate a filter, capable of a 5 micron degree of filtration, and having a capacity such as to offer the minimum amount of pressure loss. The filter element should be mounted in such a position as to be readily accessible for servicing.

NOTE: The filter must NOT incorporate a by-pass.

(e) Hose

All hose installations on this dispenser must conform to specification MIL-H-5511. Standard fittings should be used, and the pump discharge hose must have a self sealing, quick disconnect fitting to mate with the A/C low pressure ground connection. This fitting should be protected by a dust plug when not in use. The pump discharge hose should be of sufficient length as to facilitate A/C servicing operations.

(f) Pressure Relief Cock and Relief Valve

A means should be provided to relieve pressure trapped in the pump discharge hose between the pump and the quick disconnect fitting on completion of the topping up operation. This could be in the form of a manual relief cock in a by-pass line around the pump, which when opened, relieves pressure back to the pump inlet.

3. REQUIREMENT: (Cont'd)(f) Pressure Relief Cock and Relief Valve

Since it is essential that no air be allowed to enter the charging line, a relief valve with a nominal setting of 10-20 P.S.I. should be installed downstream of the manual relief cock. This relief valve would maintain sufficient pressure in the charging line to prevent cavitation and consequent ingress of air.

(g) Breather Vent

The tank breather vent should be provided with a hooded, screened plug, to prevent possible ingress of dirt and water to the tank.

(h) Safety Precautions

Each dispenser used for this purpose should be equipped with a warning placard, displayed in a clearly visible location, stating: "Use only for MIL-O-5606".

4. MODIFICATIONS

Modifications required to adapt the "Helot" model oil dispenser to conform to the foregoing requirements

(a) Pump

The "Helot" model oil dispenser is presently equipped with either of two pump installations:

- (1) The model WH404, capable of 10 gallons per minute.
- (2) The model TA414, capable of 14 gallons per minute.

If tests show that neither of these pumps have sufficient capacity to meet the requirement noted in (3C) i.e.  $\frac{1}{2}$  G.P.M. at 150 P.S.I., a pump of sufficient capacity must be installed.

(b) Filter

To fill the requirement of (4), the "Helot" model oil



4. MODIFICATIONS (Cont'd)(b) Filter

dispenser requires the installation, in the pump discharge line of a replaceable element type filter, capable of a 5 micron degree of filtration, and of sufficient capacity to ensure the minimum amount of back pressure when operating under extreme cold weather conditions. The filter is to be installed in such a manner as to be readily accessible for servicing.

NOTE: The filter is NOT to incorporate a by-pass.

(c) Hose

To conform to the requirement noted in (3e) all hose on the "Helot" model oil dispenser to be used for the purpose stated in 2, must conform to specification MIL-H-5511.

The pump discharge hose must be 1 inch in diameter and 15 feet in length, attaching at one end by a standard AN fitting to the filter outlet, and the delivery end attaching by end fitting AND10056 to a self sealing, half coupling Aeroquip 155-S5-16D, the half coupling to have a dust plug to 155-S9-16D, attached by a length of safety chain to the half coupling.

The pump suction line is acceptable in it's present configuration, but must conform to spec. MIL-H-5511.

(d) Pressure Relief Cock and Relief Valve

To conform to the requirement noted in (3f), a line to by-pass pressure from pump outlet to pump inlet must be installed, the line to incorporate and "on" - "off" manual cock. A pressure relief valve with a nominal setting of 10-20 P.S.I. must be installed downstream of the Manual cock. The purpose of the relief valve is to maintain sufficient pressure in the charging line to prevent cavitation when the manual cock is open.



4. MODIFICATIONS (cont'd)

(e) Breather Vent

To conform to the requirement noted in (3g), a hooded screened vent plug must be provided, the plug to have a 1 inch American standard straight pipe thread, to fit the small bung opening in a standard 45 gallon oil barrel.

The vent plug should be equipped with a 12 inch length of safety chain (e.g. #16 Jack chain), and a safety lock pin (AN416-719), to permit stowage of the vent plug on the dispenser when not in use.

(f) Warning Placard

To conform to the requirement noted in (3h), each dispenser is to be equipped with a metal placard, attached to the upright frame at the front of the dispenser, and bearing the warning notice on front and reverse faces: "Use only for MIL-O-5606".

NOTE: Use of the "Helot" model oil dispenser requires user units to demand MIL-O-5606 packaged in 45 gallon barrels.

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