NOTES ON PROPOSED DESIGN OF

CF-105 ARMAMENT PACK HOIST/TRANSPORT TRAILER

LOG/105/44

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1. FOREWORD

To prove the removable armament pack concept it was essential that the ground equipment required to remove, transport, and install the package was available on the completion of the pack-and aircraft mock-up. Accordingly, a preliminary hoist/transport was built for the Falcon missile-pack mock-up using readily available components. It was realized that this equipment had some shortcomings, such as the type of wheels and control valves used. It was, however, adequate for the following purpose:-

(a) To provide data for the ground equipment design group for further development of the hoist trailer and the armament pack.
(b) To demonstrate to the R.C.A.F. that the armament pack could in fact be changed rapidly with the minimum of effort and manpower.

Finally, the hoist in this original form would be suitable for AVRO use for handling instrument packs during the flight test programme.

2. R.C.A.F. EVALUATION

The armament pack changing procedure was demonstrated during the CF-105 mock-up evaluation conference last February.

The hoist was examined and the following comments made:-

(1) The operation of the hoist should be controlled by one variable speed valve with differential control, rather than by two separate control levers.
(2) The castor wheels and hard tires were not suitable and pneumatic tires should be employed.
(3) Every effort should be made to reduce the size of the frame members. The hoist should be lightened and consideration given to aluminum construction.

3. SPARROW MISSILE

The advent of the Sparrow II missile and semi-submerged stowage with protruding fins, required considerable change to the original hoist design; also in the event that Sparrow III missiles will eventually be used, it was considered necessary that the hoist be designed to cater to that possibility. It was decided to re-design the hoist in

the form of an open box frame of large square section aluminum tube with no cross bracing, the square tubes housing the hoisting mechanism, the pack being supported on 4 pedestals and the running gear consisting of 4 fully castoring sprung pneumatic wheel assemblies. The general arrangement of the proposed hoist is shown on drawing 7-2700-45, the internal mechanism on drawing 7-2700-1789. The relationship of the hoist to the aircraft on drawing 7-4427-72.

4. CHOICE OF CASTOR ASSEMBLIES

So that the hoist can be readily manoeuvred in confined spaces, or moved at 90° without the necessity of executing wide radius turns, a fully castoring wheel assembly is essential. The castor assembly should be fitted with pneumatic wheels, a locking arrangement, parking brakes, and (if possible) be sprung. It so happens that a requirement for this type of castor existed in the U.S.A.F., in the form of Specification MIL-C-4751. Castor assemblies to this specification are now available, and in fact are in large scale use on a variety of different items of ground equipment. However, in common with all trailer type castors, they tend to shimmy at speeds in excess of 10 miles per hour.

The U.S.A.F. considered that ground equipment fitted with this type of castor assembly should be capable of towing speeds of up to 20 miles per hour, therefore some type of steering became essential. This is achieved as follows. Basically, the assemblies are fully castoring wheels fitted with plunger locks which allow them to be fixed at 90° intervals. The 2 leading wheels are fitted with steering arms which are also locked by a plunger. Coupled to the steering arms are steering rods which in turn are attached to the tow bar. This arrangement gives a normal steering lock of about 30° on the front wheels while the trailing wheels are locked. When a greater degree of turn is required, the plunger locks in the steering arms are withdrawn leaving the wheels free to castor.

If the R.C.A.F. consider that a towing speed of not more than 10 miles per hour is acceptable, no steering gear will be required.

The advantage of this particular castor assembly can be summarized as follows:-

(1) It is of light weight construction (aluminum) combined with rugged design.
(2) Incorporates springing.
(3) Simple type of parking brake.
(4) Has four position lock.

(5) Can be steered if high towing speeds are required.
(6) Has simple bolt on mounting plate.
(7) Is capable of carrying the required load.
(8) Is commercially available.

5. DIRECTION OF TOWING

The fully loaded Sparrow pack is expected to weigh approximately 4,000 pounds and the hoist nearly 1,000 lbs., giving a combined total weight approaching 5,000 pounds. It follows, that no matter how efficient the running gear, considerable effort will be required to move a hoist with pack. In its capacity as a transporter, the hoist is required to transport the pack from an armament building to the aircraft. It is considered that a loaded hoist should be towed directly into position under the aircraft; this must be done from the side, which means that the pack is towed sideways and the towing bar(s) stowed before the hoist is operated.

Drawing 7-4427-74 has been prepared to illustrate the various aspects of towing the pack sideways or longitudinally.

It will be seen that rigid tow bars are proposed, of a type which would be employed if the two leading wheels were free castoring, as in the low speed towing case discussed above. This however, does not affect the main issue, concerning the direction in which the pack is normally towed.

The various figures shown on drawing 7-4427-74 are self explanatory and can be summarized as follows:-

5.1 Longitudinal Towing

Disadvantages

(a) The very small clearance that can be obtained between the tow bar and the under side of the pack. When towing several armament packs in train, the pedestrals supporting the pack would have to be raised considerably in order to obtain clearance between the tow bars and the missile fins.
(b) The effect of ramps on tow bar angle.
(c) The access available for attaching the tow bar of a second hoist under the rear of the front pack, and the possibility of damage to the under side of the pack and missile fins.
(d) The tow bar(s) are much longer and more difficult to handle and stow.
(e) A secondary tow bar will be required so that the pack can be towed under the aircraft sideways.

Advantages

The only apparent advantage is the saving of 5 ft. 10 inches in width which will facilitate passing the assembly through doorways. It is suggested that large doors will be required in any case and as the pack handling facility is known to be still in the planning stage, the provision of doorways large enough to permit sideways towing may not be too serious a problem.

5.2 Sideways Towing

This does not suffer from any of the problems summarized above, the only disadvantage being the greater width of doorways required.

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