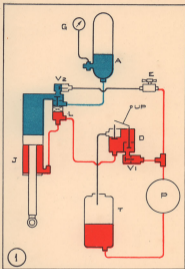# THE
MESSIER
SYSTEM

A description of the basic
features of the MESSIER
Hydraulic System for the
retraction of Aeroplane
Landing Gear

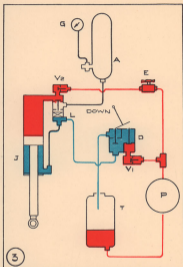## RUBERY OWEN MESSIER LTD.
WARRINGTON

① The distributor being in the "up" position, the pump sucks fluid from the tank and delivers it through the non-return valve on the distributor, through the distributor itself to the underside of the jack, exerting a pressure tending to close the jack. The oil on the top of the jack is prevented from reaching the accumulator by the non-return valve inside the hydraulic lock, but the pressure of the pump moves the internal piston of the hydraulic lock and opens this non-return valve, allowing the fluid then to pass to the accumulator, increasing the air pressure inside it and storing energy.
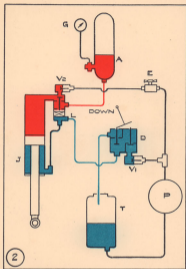
② When the distributor is put in the "down" position, the pump circuit is isolated by the closing of one valve on the distributor. The oil under the jack piston is passed through the other valve inside the distributor to the tank; the pressure in the accumulator lifts open the non-return valve of the hydraulic lock and pushes down the jack.

In the event of an accumulator being burst due to a bullet or a pipe close to it fractures, the jack will not extend when the distributor is put in the "down" position since there is no accumulator pressure to extend it. In this event the emergency cock is opened and the oil from the pump passes through the jack emergency valve and extends the jack. The pressure from the pump closes the non-return valve in the hydraulic lock body and isolates the damaged accumulator circuit.

Key to Diagrams

A : Accumulator.

D : Distributor.

E : Emergency Cock.

G : Pressure Gauge.

J : Jack.

L : Hydraulic Lock.

P : Pump.

T : Tank.

V_1 : Distributor Non-Return Valve.

V_2 : Jack Emergency Valve.

Q. What is the "MESSIER SYSTEM"?

A. The basic Messier system is that shown on the preceding diagrams. The principal feature is the use of a hydraulic accumulator in which is stored energy used to operate the system. The hydraulic pump operates the jack in one direction only, oil from the opposite end of the jack being forced into the accumulator, compressing the air in it and thus storing energy. This energy can then be used subsequently to operate the jack in the opposite direction.

Q. What is the point in doing this?

A. When Messier started designing their first retractable undercarriage for the Messier aeroplane in 1930, they had the choice of all known systems used in general hydraulic engineering, and after due consideration the present one was developed and patented for aircraft use. The chief feature is the simplicity and safeness of the means for lowering the undercarriage by the accumulator, not being dependent on the pump for lowering; failure of the engine or pump does not introduce the possibility of the undercarriage not coming down *safely and rapidly*. For instance, if the engine fails just after take-off, the undercarriage can be lowered at once without any special manoeuvre.

Q. But why not a cartridge or air bottle to get the undercarriage down in the comparatively rare occasion of pump failure?

A. Because this would mean that the best, simplest and safest means was used only in an emergency. The MESSIER system uses the automatic and best method normally and the pumps only in an emergency when an accumulator is out of service. In other words, since a pump is less reliable than an accumulator, the emergency circuit will be used less frequently on the MESSIER system than on others. It is a fact that the accumulator gives the pilot a feeling of security that his undercarriage will always come down.

Q. What other advantages do you claim for the accumulator system?

A. Speed of lowering, independent of the pump output, normal times for a large aeroplane being 5—7 secs., 2—3 secs. on small aircraft. Also saving in pipe runs, only one main pipe being used to feed the jack, the oil passing up and down it. This decreases the vulnerability of the system to bullets. Thirdly, a simplification of the controlling distributor which has only to be "three-way" instead of "four-way."

Q. What are the snags to this system?

A. Firstly, the fact that during retraction extra work has to be done storing energy to lower it, meaning that, other things

being equal, retraction time would be longer. But other things until recently haven't been equal since we have always worked to higher pressures than others and our pumps have delivered more horse-power, thus, in fact, making most MESSIER undercarriages unusual in their rapid retraction times. Now, however, that others are beginning to use high pressures too, we have other features such as "compensation" to speed up the retraction times of future designs.

Q. And what are the other "snags"?

A. Well, the accumulator has to be serviced and maintained. But this consists of checking the inflation pressure before flight and reinflating on rare occasions and is little trouble.

Then the accumulator is fairly bulky, though not at all heavy. The bulk is a nuisance sometimes on a crowded machine and may be a target for a bullet. But the emergency circuit takes care of this emergency and this is not a serious criticism.

Q. What about emergency operation?

A. A second pipe runs from pump to the jack through an emergency cock which when opened admits the pump pressure to the top of the jack in the event of the accumulator being out of service. A jack emergency valve and hydraulic lock respectively isolate the emergency line

under normal conditions and the accumulator under emergency conditions. The engine or hand pump can be used to raise the undercarriage and either of the pumps or the accumulator can be used to lower it.

In other words there are three sources of power to lower the undercarriage and two independent pipe lines.

Q. What is the "hydraulic lock" for?

A. It is primarily a hydraulic lock preventing mechanical loads closing the jack until pump pressure is applied to the jack, but it also allows the emergency circuit to operate and isolate the accumulator when this circuit is opened.

The oil in the jack cannot escape to the accumulator owing to the non-return valve inside the lock, and this prevents the jack closing until oil pressure from the pump pushes the piston in the lock body and opens the valve mechanically. During the extension of the jack, however, the accumulator pressure opens the valve.

When the emergency circuit is used, the distributor must be in the "down" position, allowing the hydraulic lock valve to close and isolate the accumulator.

Q. What is the point in the jack emergency valve?

A. It isolates the pipe line to the emergency cock which may be damaged. It increases the safety of the accumulator circuit.