Technical Overview of MT Propeller Systems

Our hydraulic constant speed propellers were introduced to the market in 1983 and are less complex and lighter than common designs with the fact, that the cylinder and piston are integrated in the shank of the propeller hub.

In production are certified 2-, 3-, 4-, 5- and 6-blade models for engines producing up to 5000 hp, that have an hydraulic oil supply to the propeller controlled by a governor.

All our hydraulic propellers are optionally available with our patented feathering and /or reverse system and can optionally be equipped with electric or alcohol de-ice boots.

The single piece hub is made from forged or solid aerospace aluminum alloy. After machining, the outside is shot-peened and thereafter the hub is anodized as corrosion protection (the hub's outside is additionally painted for sea applications). The blade bearings are special design ball bearings, where the balls act as split retainers for holding the blades in the hub, which creates an increased safety factor against blade loss.

The outer bearing race is a single piece part and pressed into the hub, while the inner race is split and installed on the blade ferrule. The blade pre-load is adjusted by changing the thickness of a plastic shim. Blade and bearing are secured in the hub by a retention ring. The outer race is replaceable negating the need to replace the entire hub assembly when wear tolerances are exceeded.

Presently most of our blades are built in natural composite design, by using highly-compressed, thin-layered laminated beech wood, which has a similar tensile strength as steel, in the root section and selected lightweight laminated spruce wood in the remaining part of the blade. The wooden core is reinforced by layers of epoxy fiberglass, Kevlar® or carbon fiber and sealed by several coatings of acrylic-polyurethane paint. An aluminum blade ferrule is attached to the blade root by using special design patented lag screws.

The critical section of the blade's leading edge is protected by a bonded-on stainless steel erosion sheath. The inboard section of the leading edge is protected by a self-adhesive PU-strip. All of the above makes the blade all weather operable.

The propeller can optionally be equipped with electric de-ice boots, which are bonded on the inboard section of the blade's leading edge and compatible with most existing electric propeller de-ice systems consisting of slip ring, brush block, wire harness and the necessary cockpit components, that must already be installed in the aircraft. Complete systems can be provided upon request. Alcohol de-ice boots are available alternatively.

The spinner dome is a single piece part made from fiber reinforced composite (Kevlar®), which replaces the spin-formed aluminum alloy used in the earlier days. It is extremely crack resistant as well as very light.

The bulkheads are made from spin-formed or die forged aluminum alloy. The front bulkhead is seen as a part of the hub assembly and also used as an attachment point for static balancing weights. Filler plates increase the stiffness of the dome around the cutouts for the blades. The dome is attached to the bulkhead with stainless steel spinner screws.

The pitch change of the blade is enabled by an ex-center pin installed in the blade ferrule. A plastic block made out of special carbon material connects the pitch change pin with the piston and the axial movement of the servo piston turns the blades.

A return spring and a sleeve, which acts either as the high or low* pitch stop, are installed between the piston and the front plate as the oil pressure counterpart and completes the single acting pitch change system .

Two check nuts located outside the hub adjust the low or high* pitch stop. The inner part of the hub shank is used as a cylinder for the pressure oil supplied by the propeller governor. This arrangement allows a simple and light-weight design without any additional parts. All weights required for static propeller balancing are installed on the front spinner bulkhead.

The servo pressure necessary for changing pitch is generated by an engine-driven gear pump located inside the propeller governor, which increases the oil pressure supplied by the engine by factor 6 or higher. Flyweights and a speeder spring move a pilot valve, allowing servo oil flow to and from the piston in the propeller. In an on-speed condition there is no oil flow. A speed (RPM) adjusting lever actuated from the cockpit changes the pre-load of the speeder spring. This results in an engine RPM change by changing propeller pitch. The propeller system is single acting and without oil pressure the natural twisting moment of the blades will always turn them into low pitch position (non-counterweighted propellers). The governor produces oil pressure to increase pitch. However, blades having counterweights installed i.e. for aerobatic aircraft or twin engine aircraft always turn into high pitch position without oil pressure and therefore use oil pressure to decrease pitch.

Propellers for aerobatic aircrafts or propellers built with feathering capability are equipped with counterweights, that are installed on the blade ferrule. The pitch change pin is in a different position and the blades are identified by a "C" in front of the numbers, i.e. C200-15. Blades for feathering propellers are identified by a "CF".

An unfeathering accumulator with compatible governors can also be installed in aerobatic airplanes in order to prevent a RPM drop during certain high or zero G aerobatic maneuvers. This unfeathering accumulator maintains the oil supply to the governor for 5-10 seconds, when the governor becomes short of the oil supplied by the engine.

An unfeathering accumulator, which is directly connected to the propeller governor, is optionally available for Feathering Propellers. This feature enables unfeathering the propeller without a running engine.