DUPLEX AIRSCREWS

from the c.s.u. is fed via the oil tubes to the forward side of the piston for coarsening blade pitch, and to the rear of the piston for fining pitch, the oil pressure reacting against the piston area and thus causing the cylinder to move forward or rearward to effect pitch change.

Transmission between cylinder and blades is by means of an articulated linkage whereby the linear motion of the cylinder is converted to rotary motion of the blades.

Pitch Change

The articulated linkage for the front bank of blades is a simple link bolted to the cylinder and sliding in guide sleeves through the front and rear walls of the hub. The central part of the link is swollen and bored to accommodate a sliding Tufnol block, itself recessed to accommodate an operating pin anchored on the base of the blade; thus, as the piston moves the link fore and aft, the Tufnol block can slide laterally in the link to conform with the arcuate motion of the operating pin.

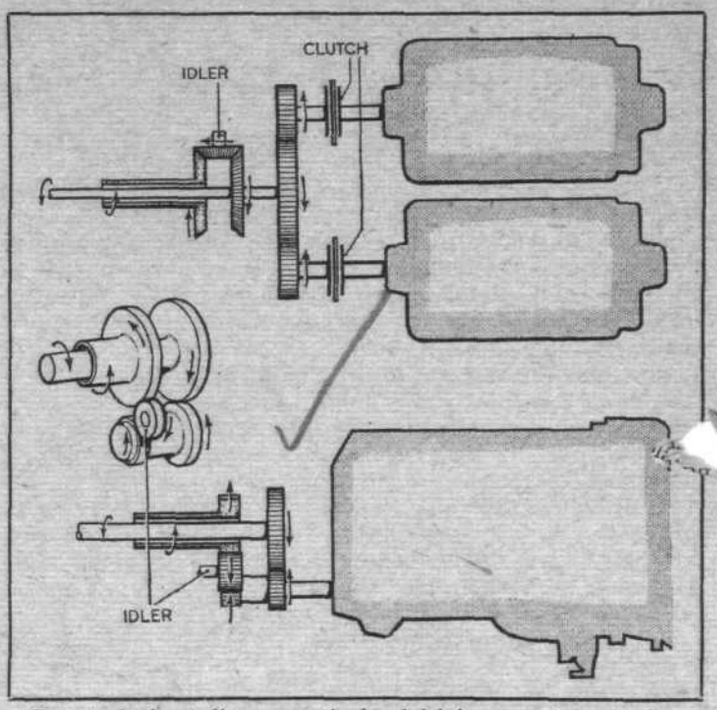
The front blade links are tapped at their rear ends for receiving a connecting bolt which picks up lugs on a sleeve secured to the inner race of the translation bearing. The outer race of this bearing is correspondingly enclosed by a housing to which the rear blade operating links are articulated. Also embodied in this outer housing is a driving joint in the form of a yoke with which registers a driving pin attached to the rear hub. In this manner, the rear blade links are relieved of the duty of rotating the outer race of the translator bearing, the transmission loads being conveyed solely through the pin; however, transmission loads for the inner race are carried by the bearing links of the front hub, a duty which they can well afford since the cantilever is short and thus the bending moment small. The translation bearing is enclosed within a truncated cone housing attached to an annular plate bolted on the rear of the front hub.

Reference has already been made to the supply of control oil from the constant-speed unit to the cylinder via the coaxial oil tubes to effect pitch change, but it might be worth while in conclusion to review the constant-speed operation of the airscrew.

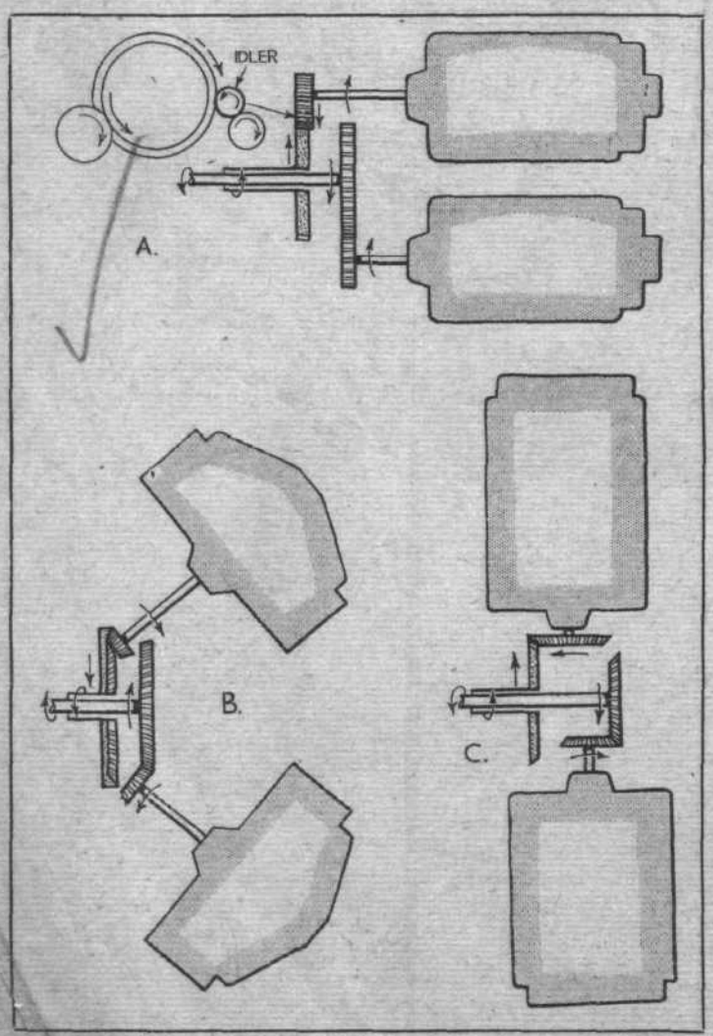
First, one must bear clearly in mind that the pilot has two major engine controls, (i) the throttle, which controls the degree of supercharge given to the engine and has only an indirect bearing on the engine r.p.m.; and (ii) the speed control which, through the medium of the constant-speed unit, by regulating the pitch of the airscrew blades, determines the speed at which the engine shall run, irrespective, within limits, of the load and likewise of the boost pressure.

Let us consider an example: an aircraft is flying straight and level at normal cruise conditions; the boost, we will assume to be plus 6 lb/sq in and the engine r.p.m. steady at 2,100. The pitch angles of the blades at these values we will take as being 40 deg. for the front blades and 38 deg. for the rear blades, the latter having a relatively finer basic pitch setting to compensate for their having to operate in the helical wash from the front blades.

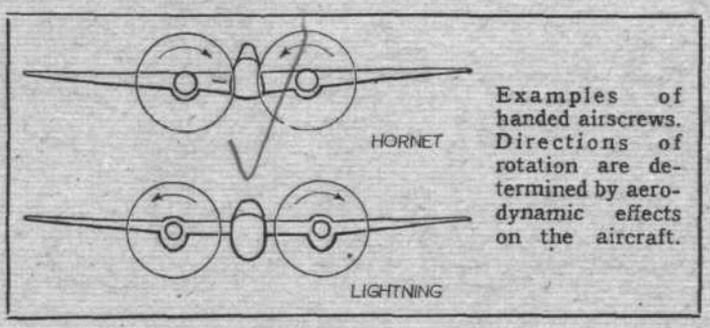
The pilot then decides to climb a few thousand feet;



Two typical yet diverse methods of driving a contra-rotating airscrew. Top: By two parallel engines driving compound reduction gears through clutch couplings. Bottom: By one engine, as in Griffon and Merlin installations, where the crankshaft powers a double pinion and an idler is used to give contra-rotation.



Three typical methods of driving coaxial airscrews. A: By parallel engines driving through spur reduction gears, one incorporating an idler pinion. B: By raked engines driving bevel reduction gears, one an internal type. This scheme is used for the Bristol 167. C: By opposed engines driving right-angle simple bevel reduction gears.



Examples of handed airscrews. Directions of rotation are determined by aerodynamic effects on the aircraft.