

A detailed technical drawing of a variable pitch propeller mechanism, showing various components and their assembly. The drawing is a cross-section, revealing the internal gears, shafts, and housing. The propeller blades are shown in a curved position, indicating they can adjust their pitch. The drawing is rendered in a light gray color on a dark gray background.

A History of the Development of

The Variable Pitch Propeller

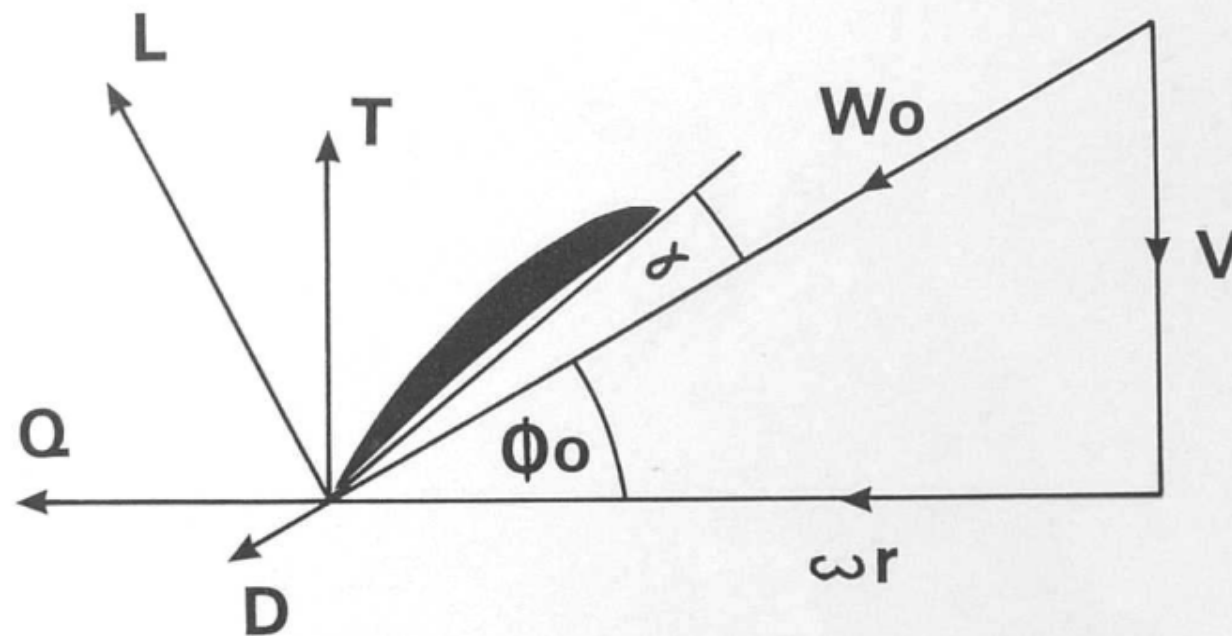
by

Patrick Hassell

RAeS Hamburg 26th April 2012



DRZEWIECKI'S STRIP THEORY – 1892

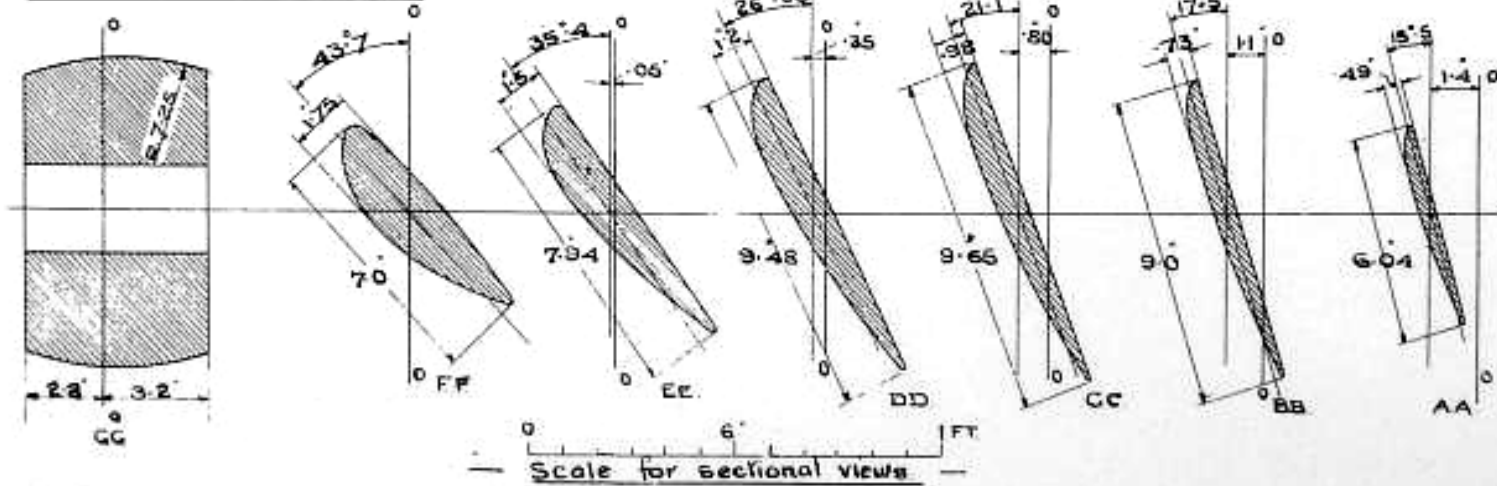


NPL AIRSCREW WITH 'RAF 6' SECTIONS — 1916

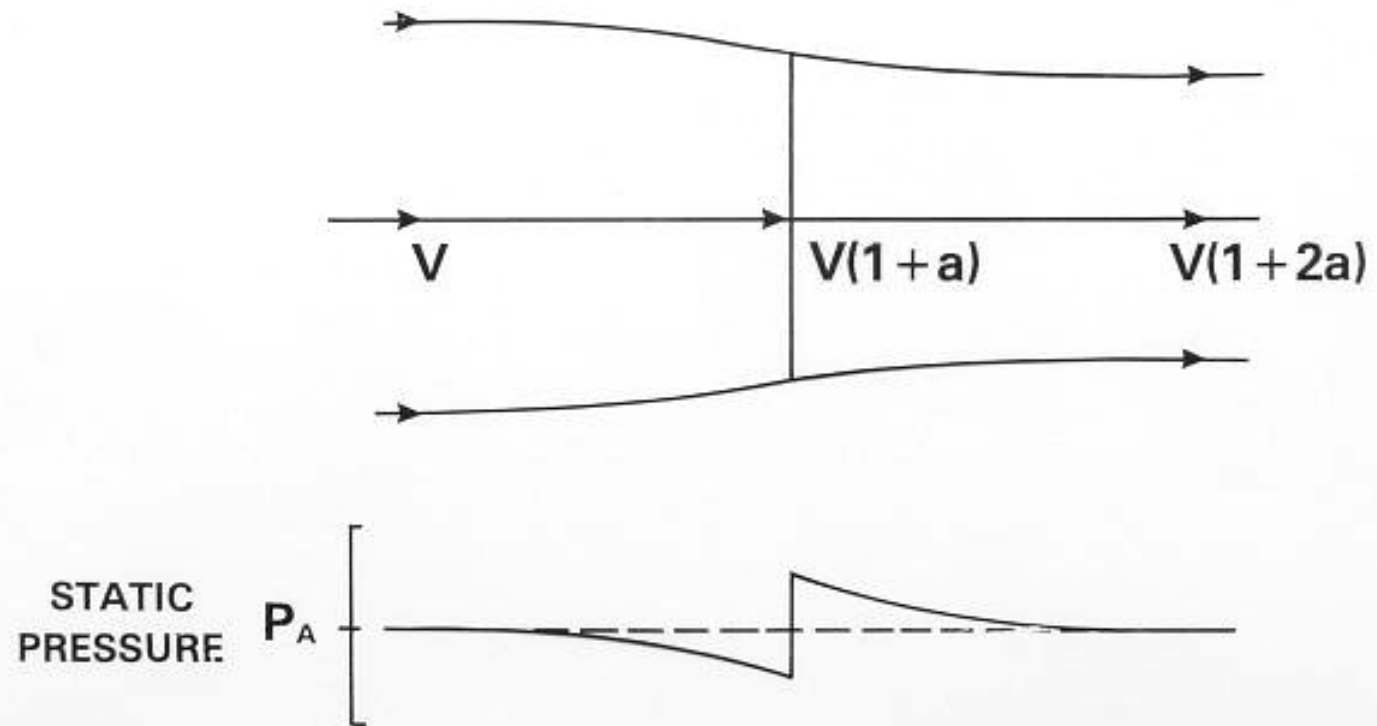
SKETCH OF A BLADE OF AIRSCREW A DIAMETER OF AIRSCREW 8 FEET



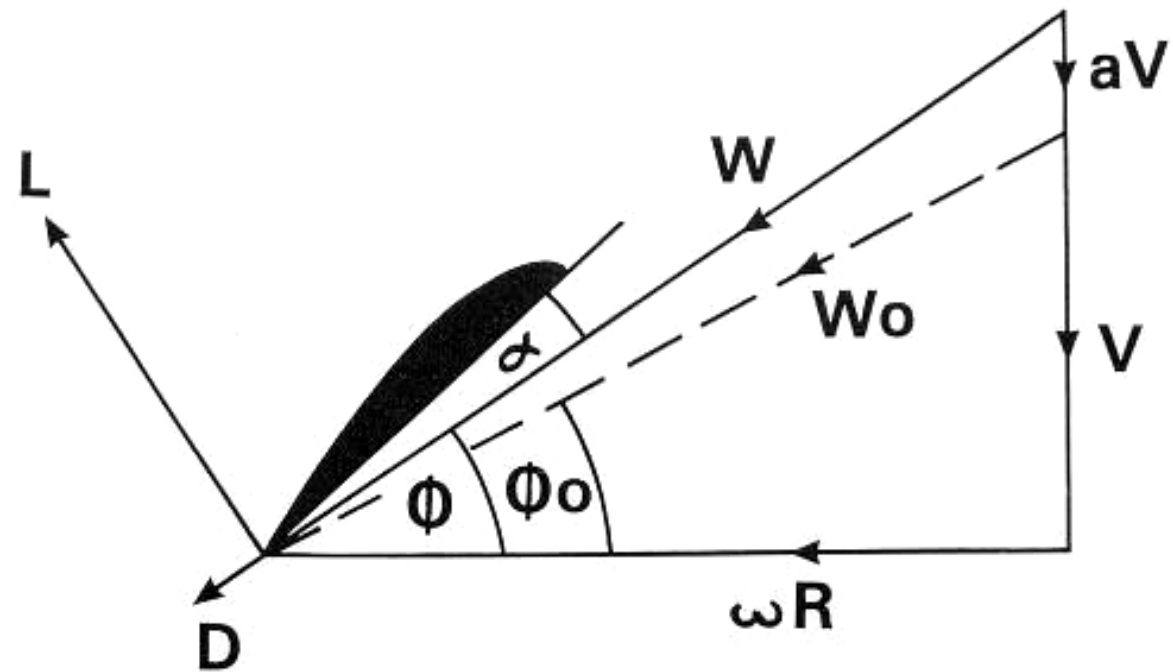
Lines '00' all in one plane
normal to axis of aircrew



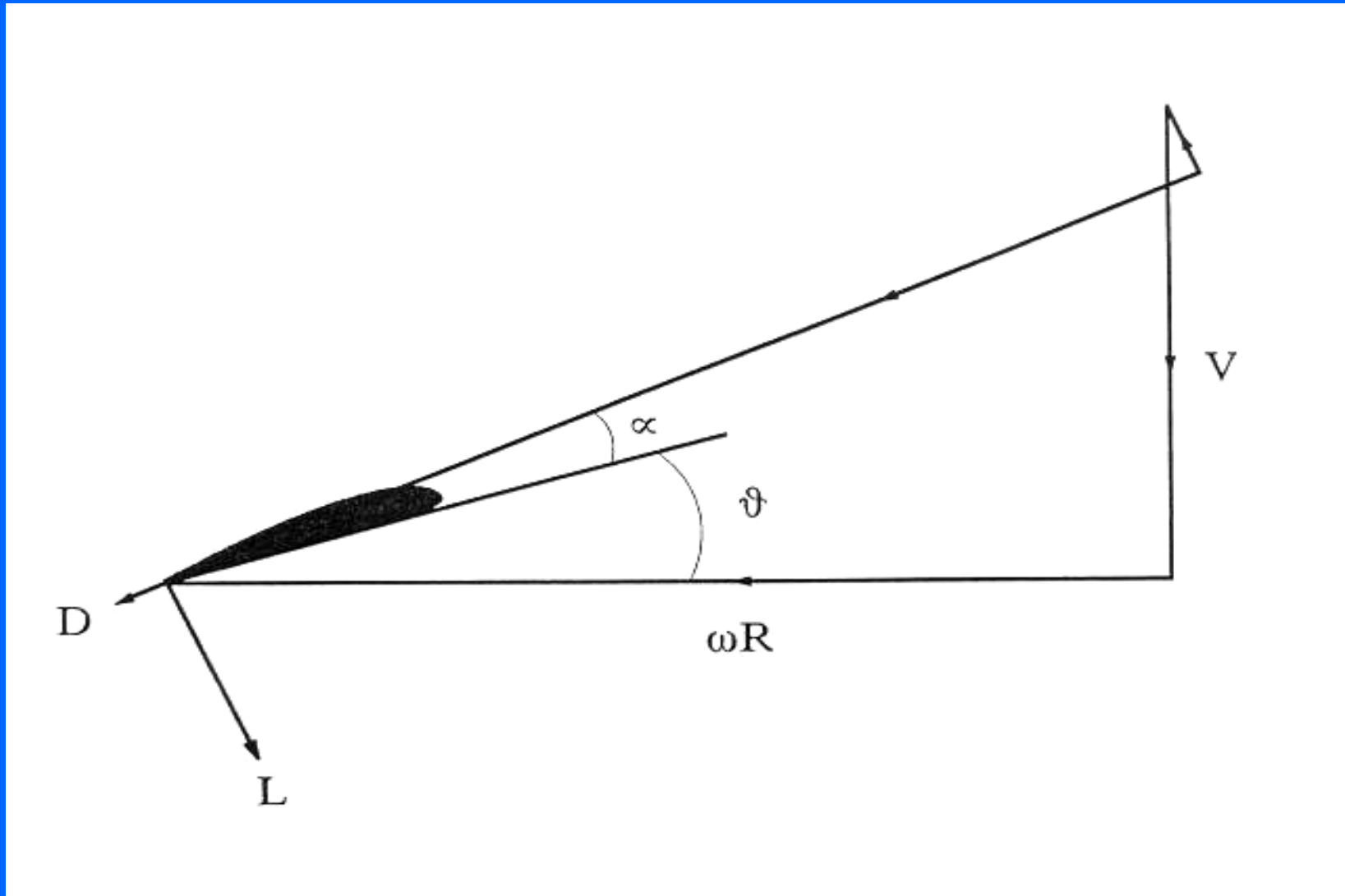
R.E. FROUDE's 'ACTUATOR DISC' THEORY – 1889



COMBINED OR "INFLOW" THEORY – 1917



REF: R & M 328; A. FAGE AND H.E. COLLINS



Negative Blade Angle of Attack (Windmilling)

Three Fundamental Design Problems:

- 1) How to retain the separate VP blades
- 2) How to change pitch and provide the effort to do so
- 3) How to match the pitch to the flight/power condition



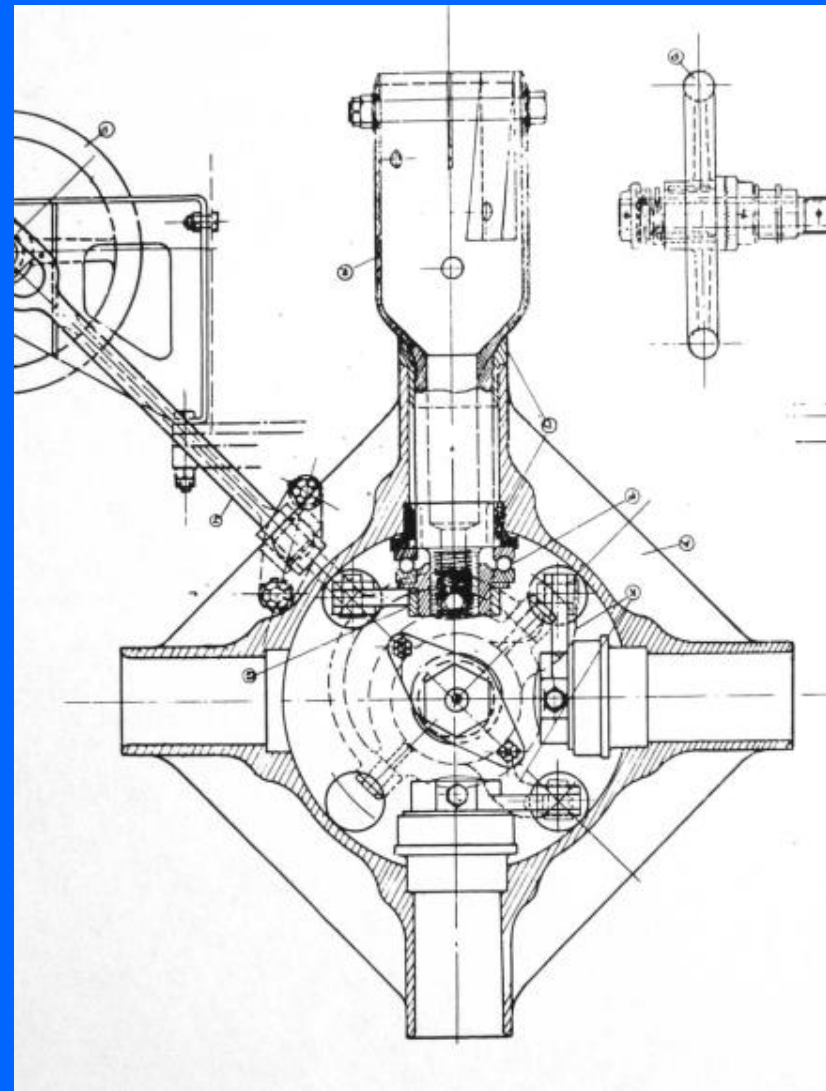
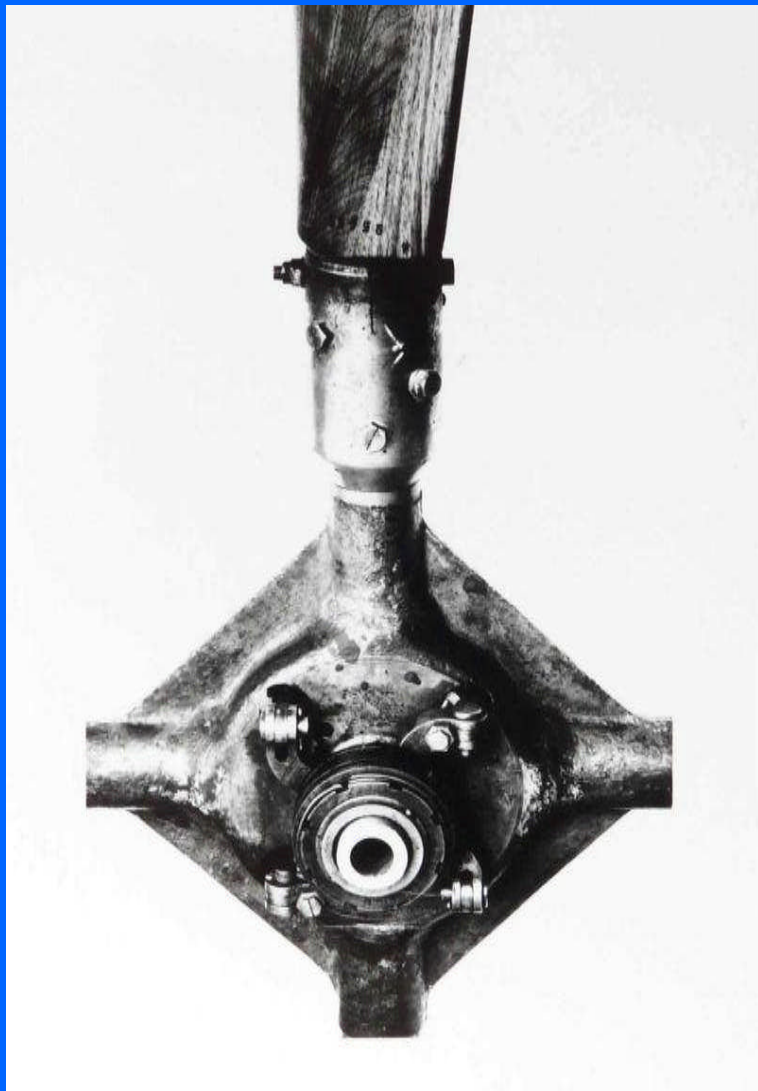
Supermarine S-6B - Fairey-Reed Propeller



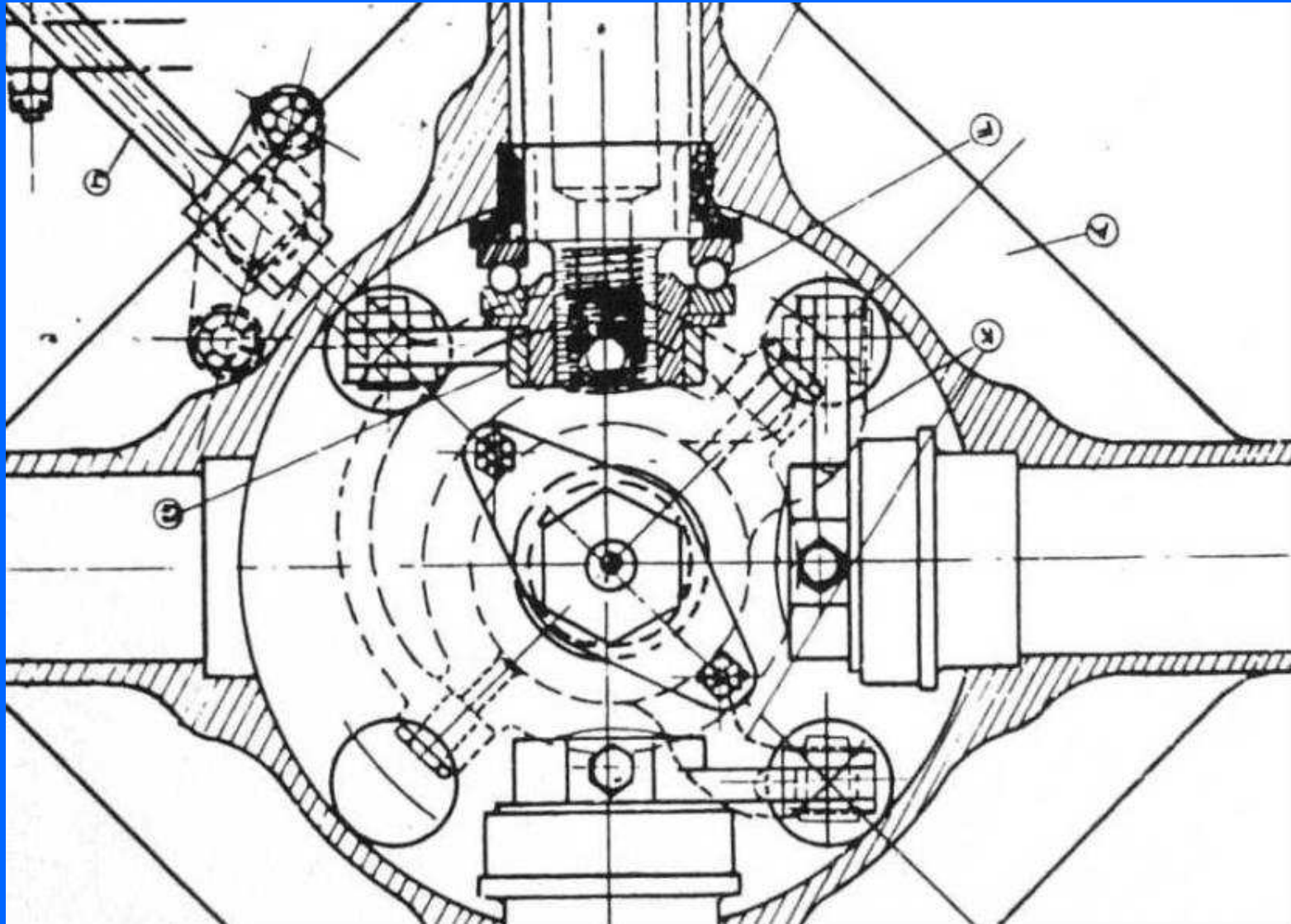
Experimental Chauviere VP Airscrew c.1913



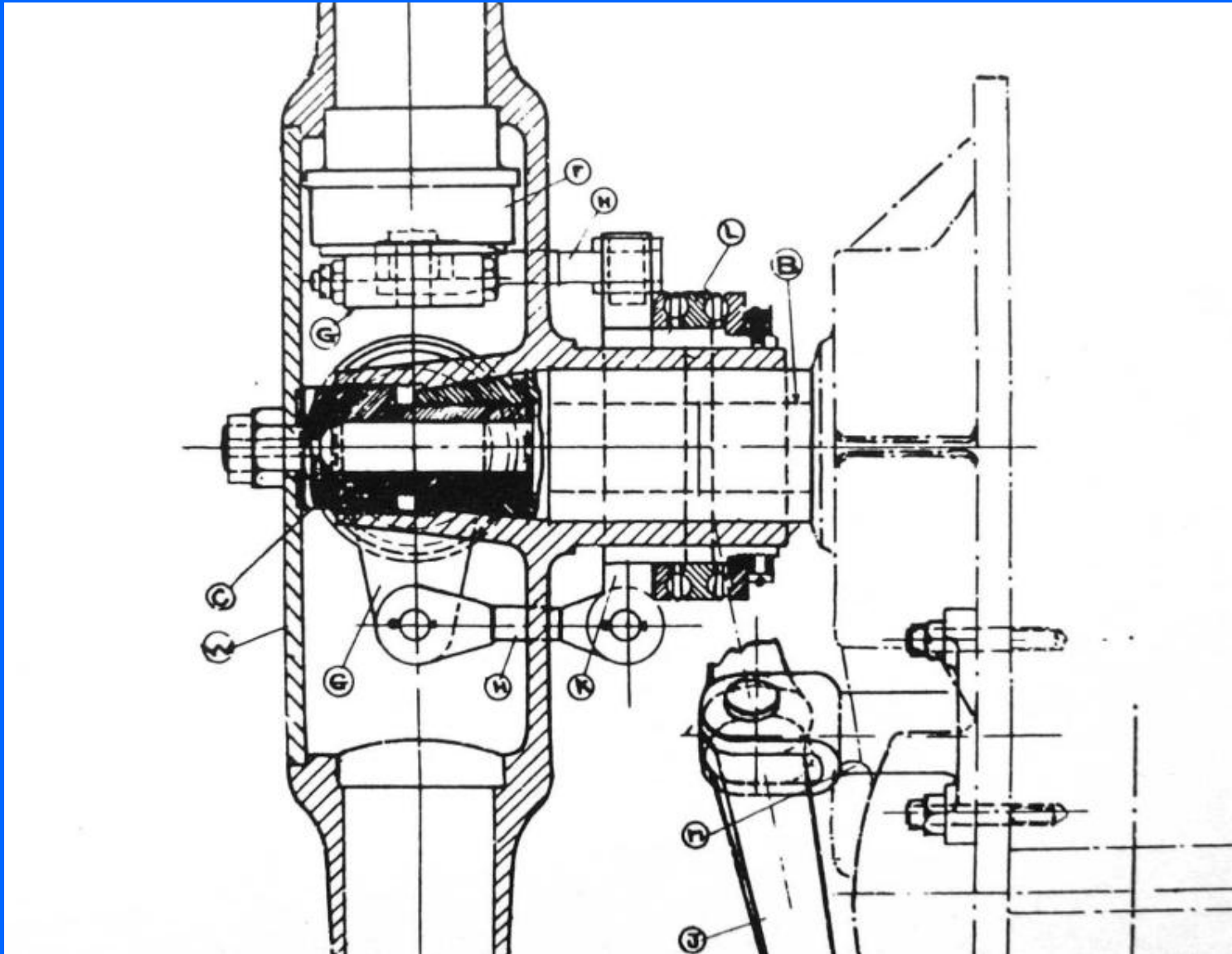
Lynam's Experimental VP airscrew on SE-5a - c.1917



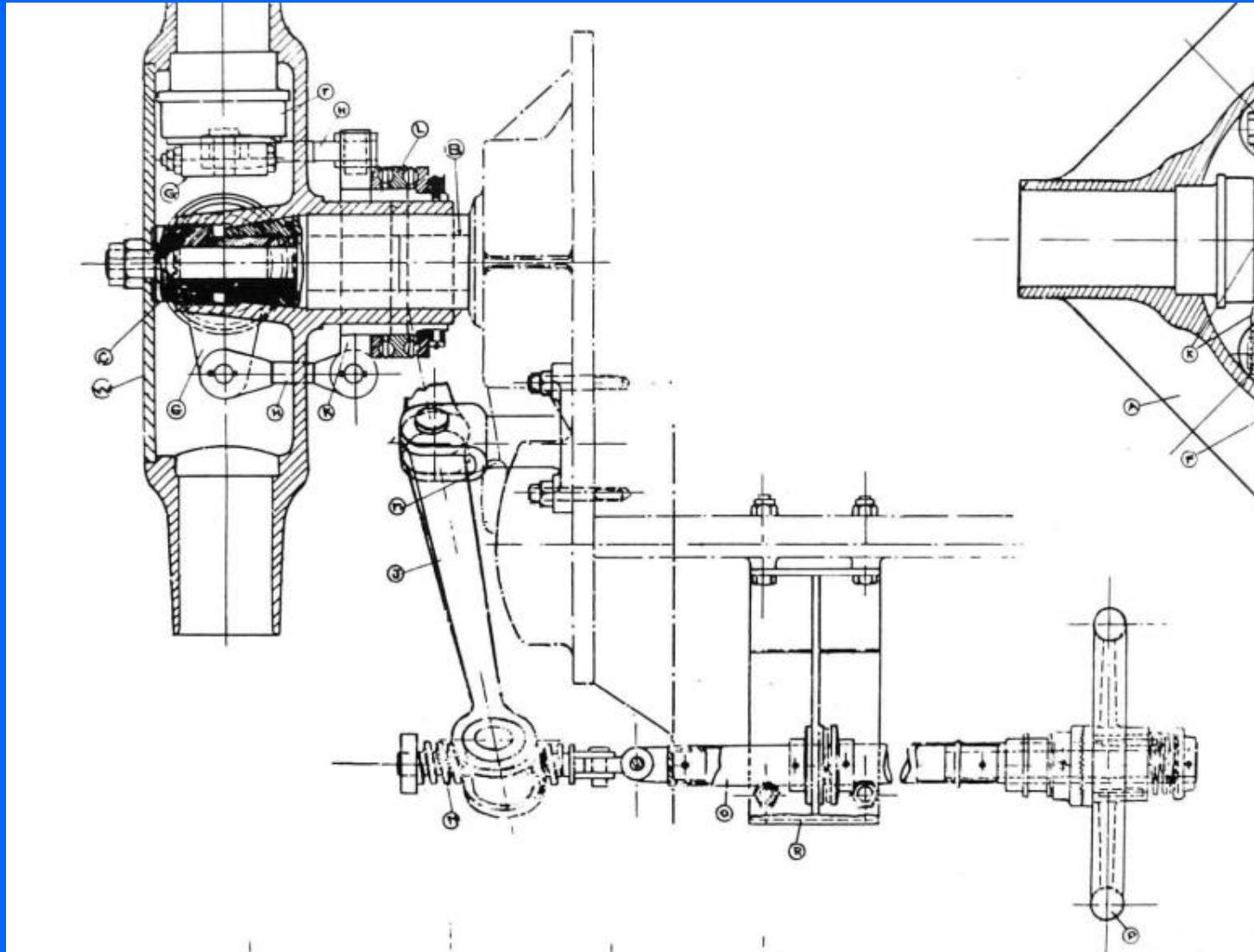
Lynam's VP propeller for BE-2c - c.1917
Bolted blade root



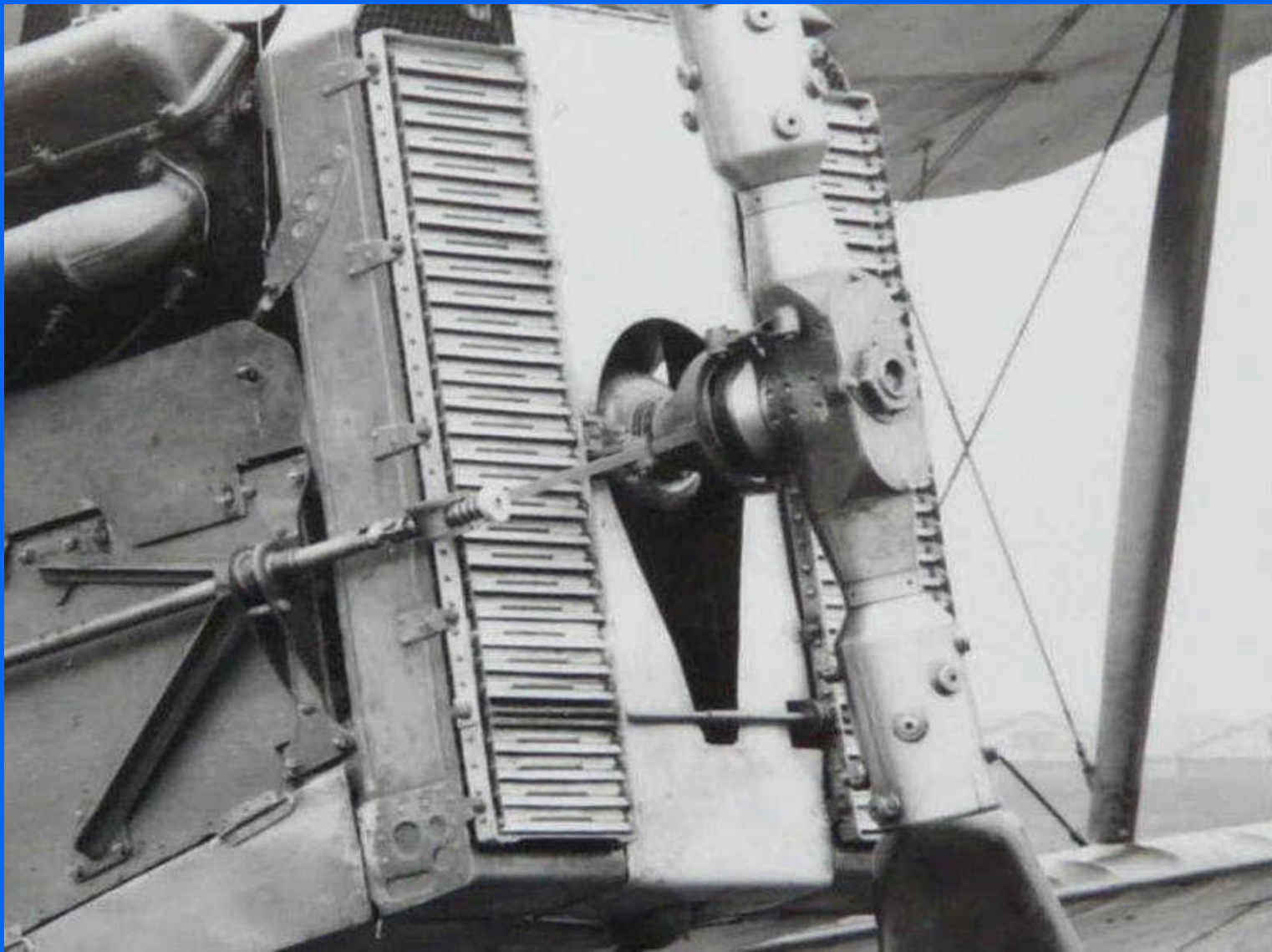
Blade Retention by Ball Race



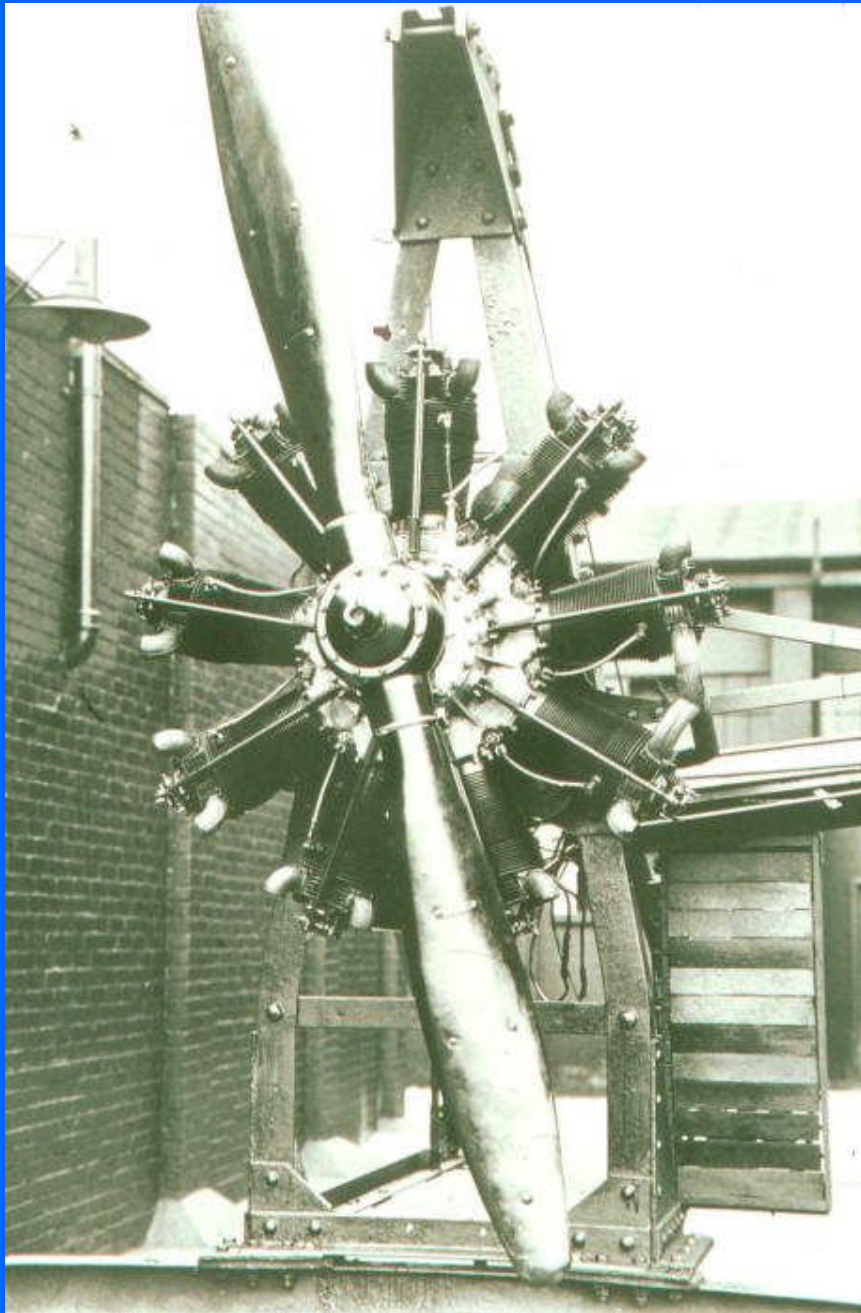
Blade Actuation by Yoke and Pushrods



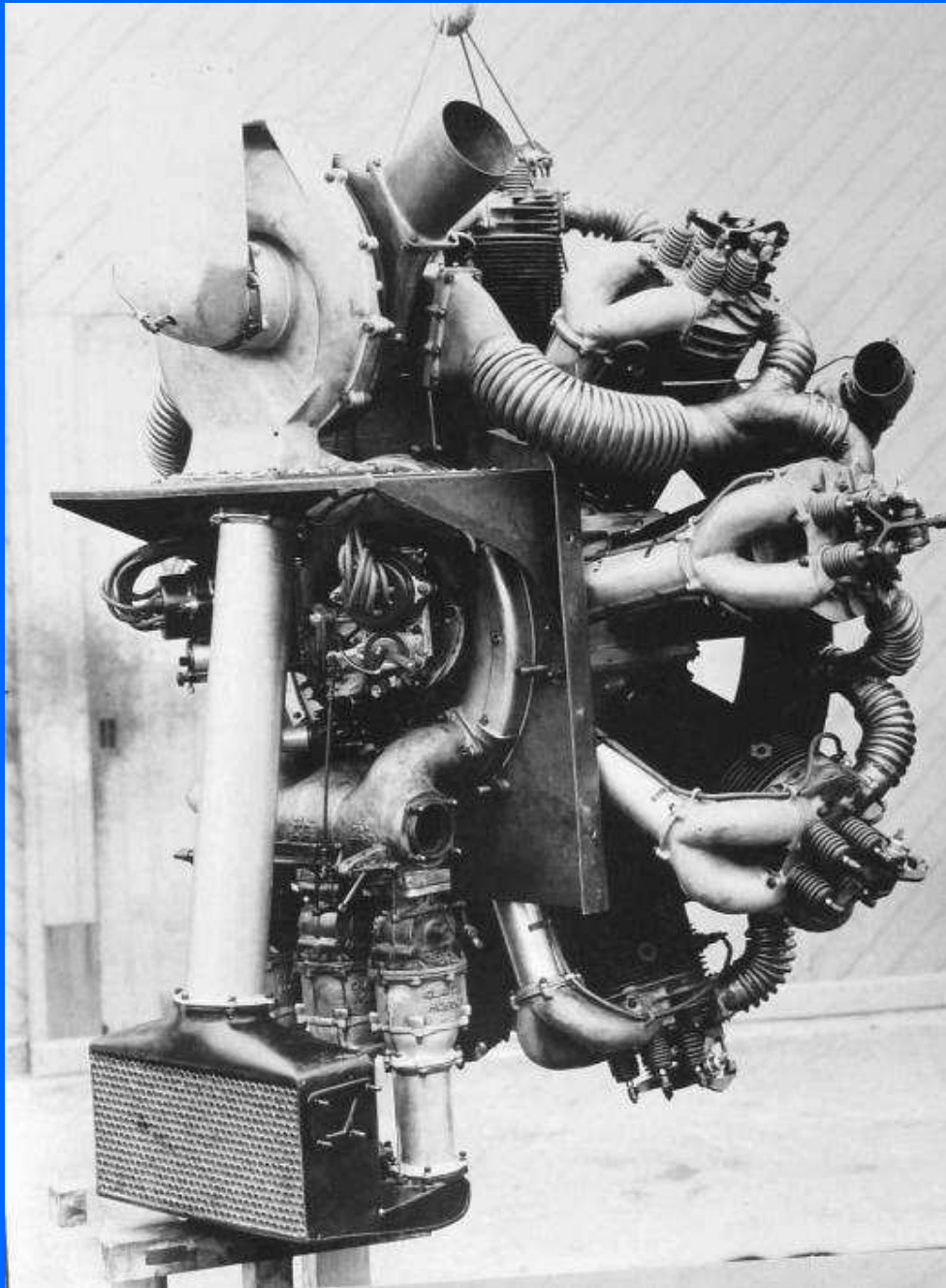
Manual Control System



SE-5A Manual Control by Worm Gear



Bristol VP Propeller
Jupiter engine 1924

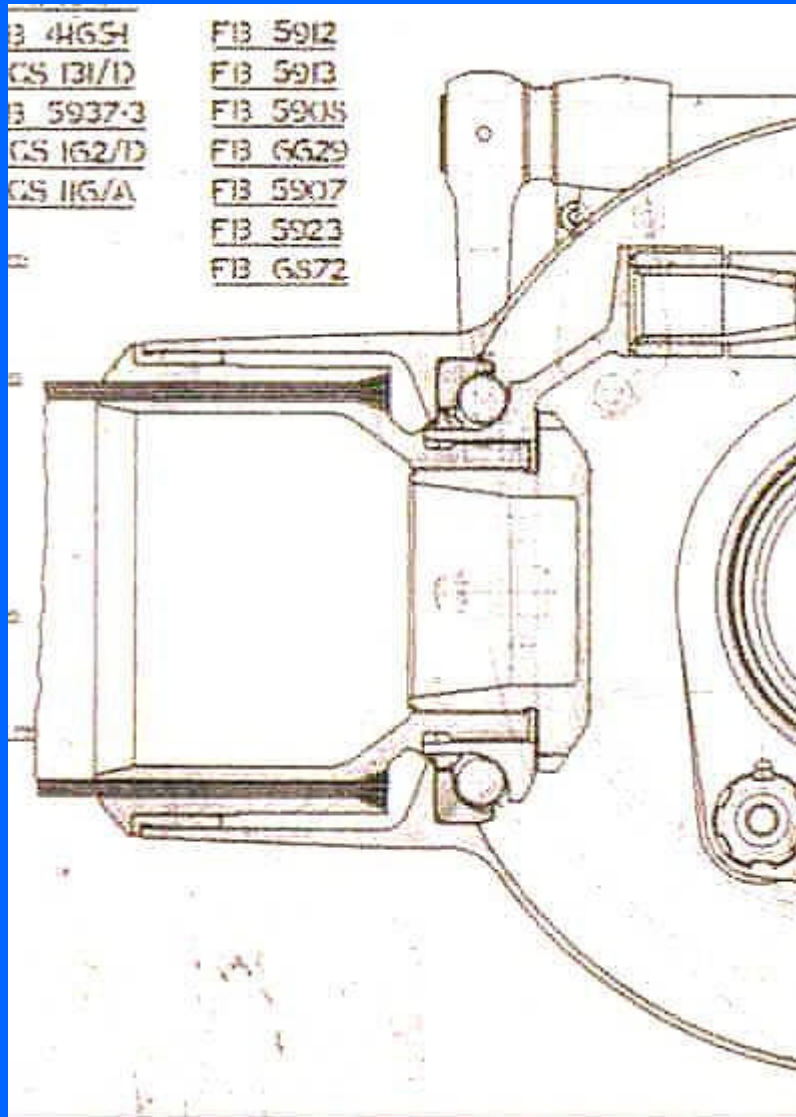


Turbocharged
Bristol Jupiter III

c.1923

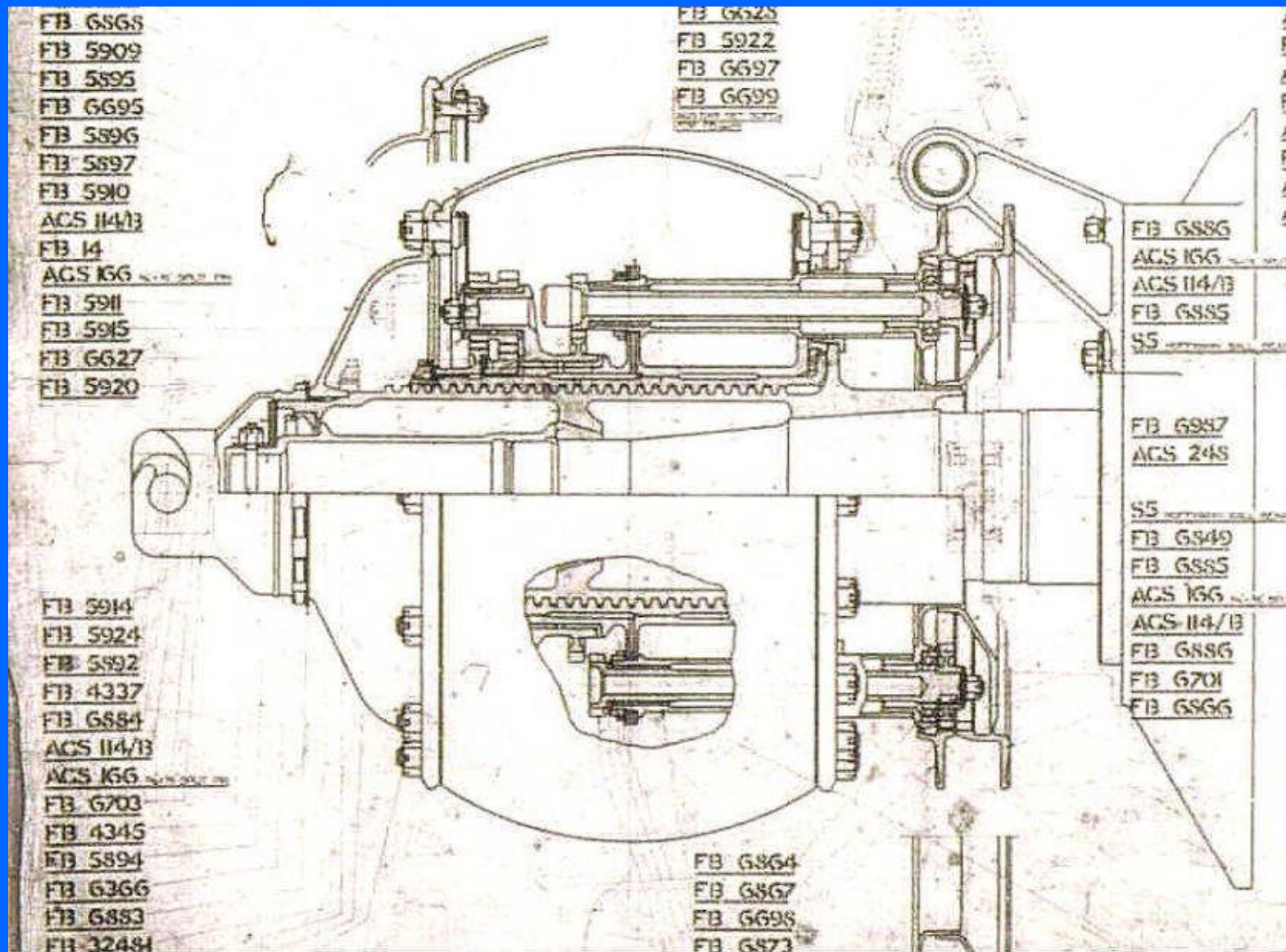


Bristol Seely Tourer with Jupiter III T

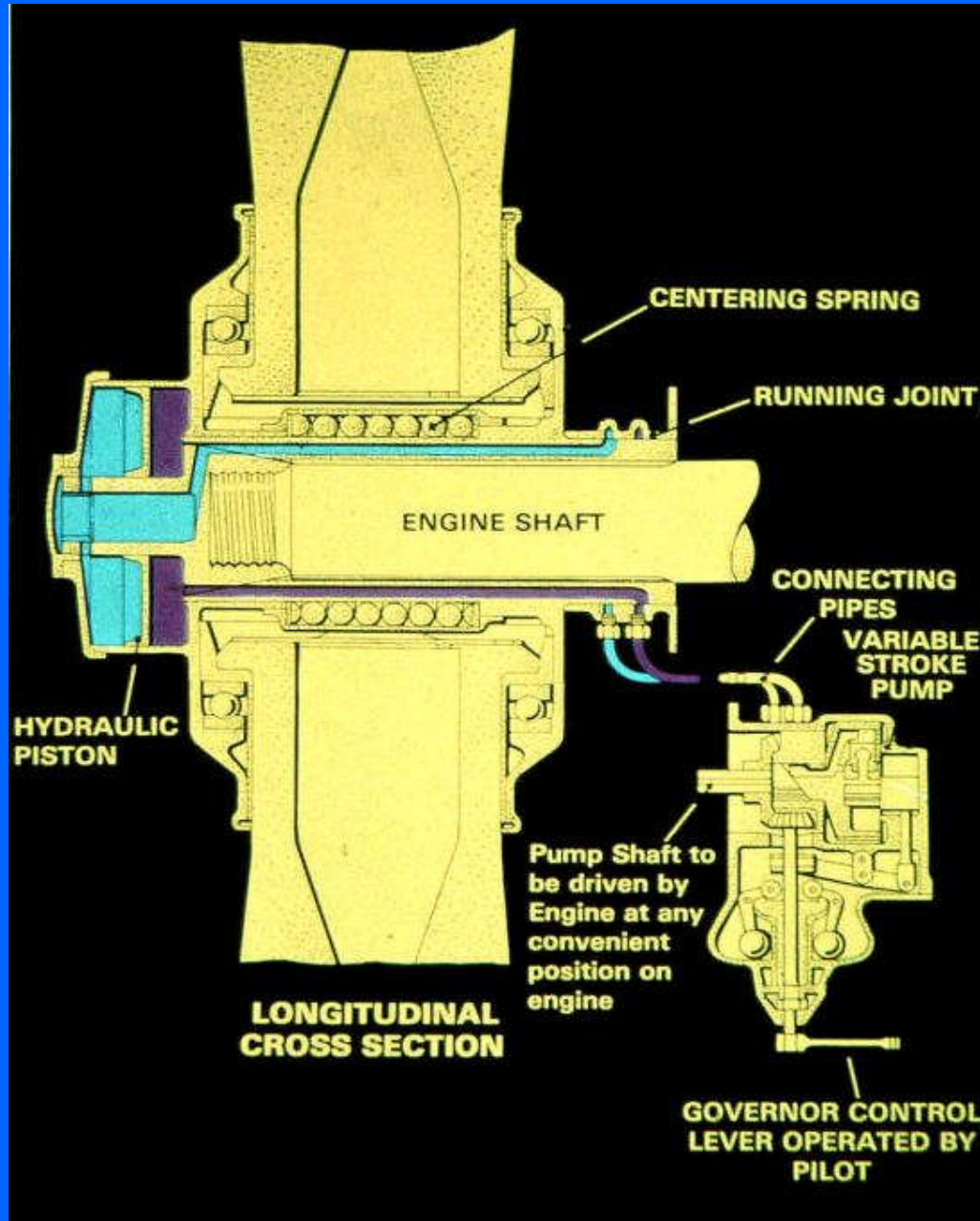


Bristol VP Propeller 1924

Root detail of
Leitner-Watts blade



Bristol Mechanically Actuated VP Propeller - 1924



Hele-Shaw
Constant speed
VP airscrew

1924



H L "Pop" Milner

Propeller Designer

worked at:

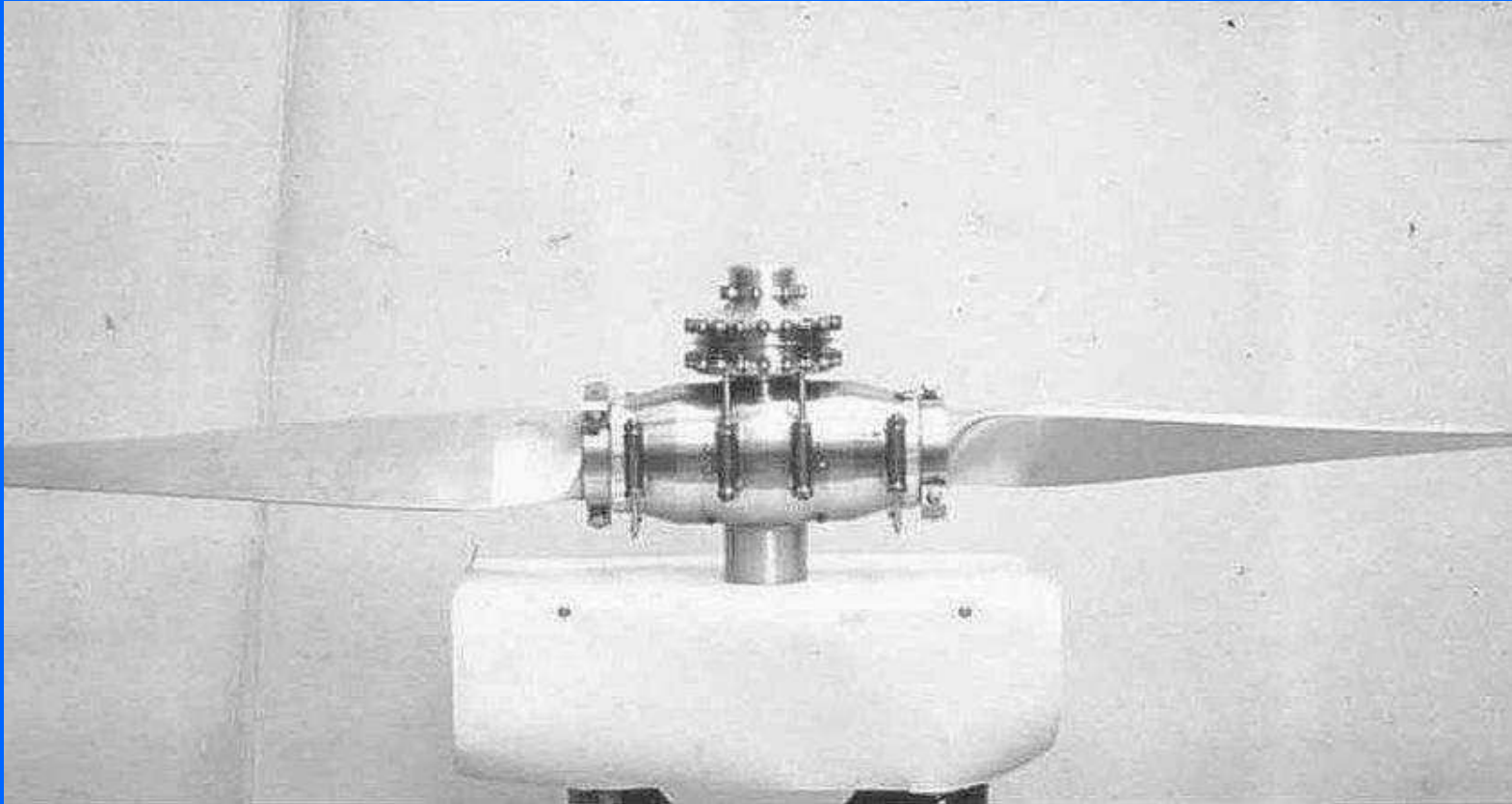
RAE Farnborough

Hele-Shaw

Gloster Aircraft Co.

Bristol Aeroplane Co.

Rotol Ltd



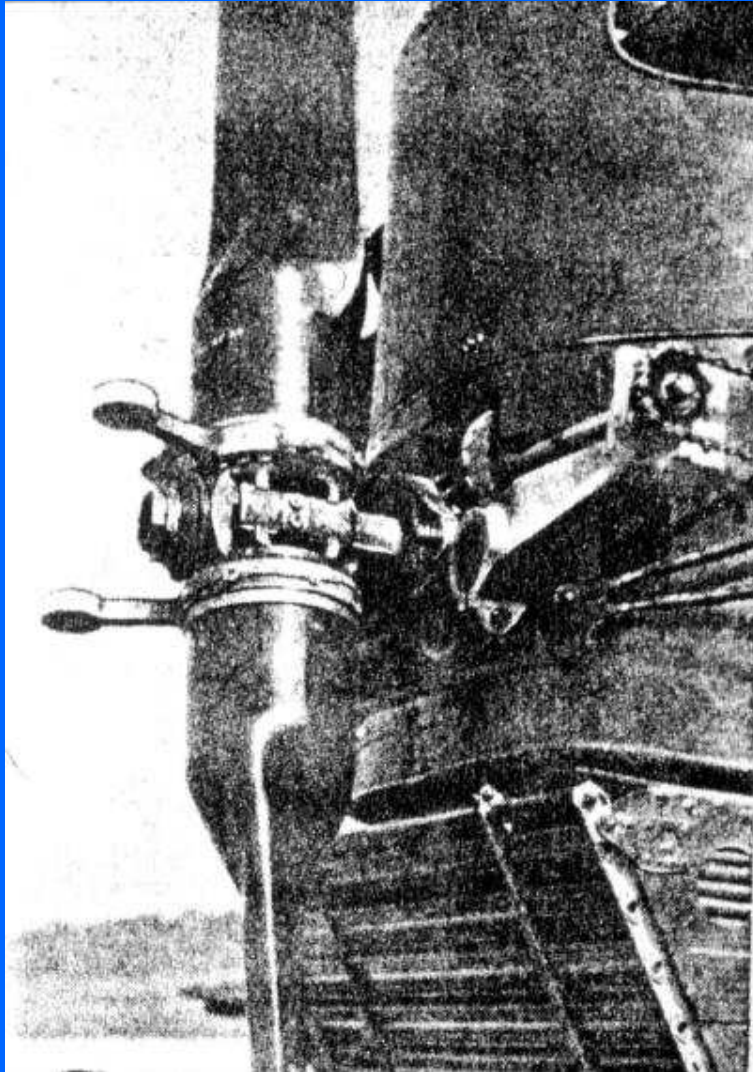
Gloster's Hele-Shaw propeller - 1927



Boeing 247 of United Airlines -1933

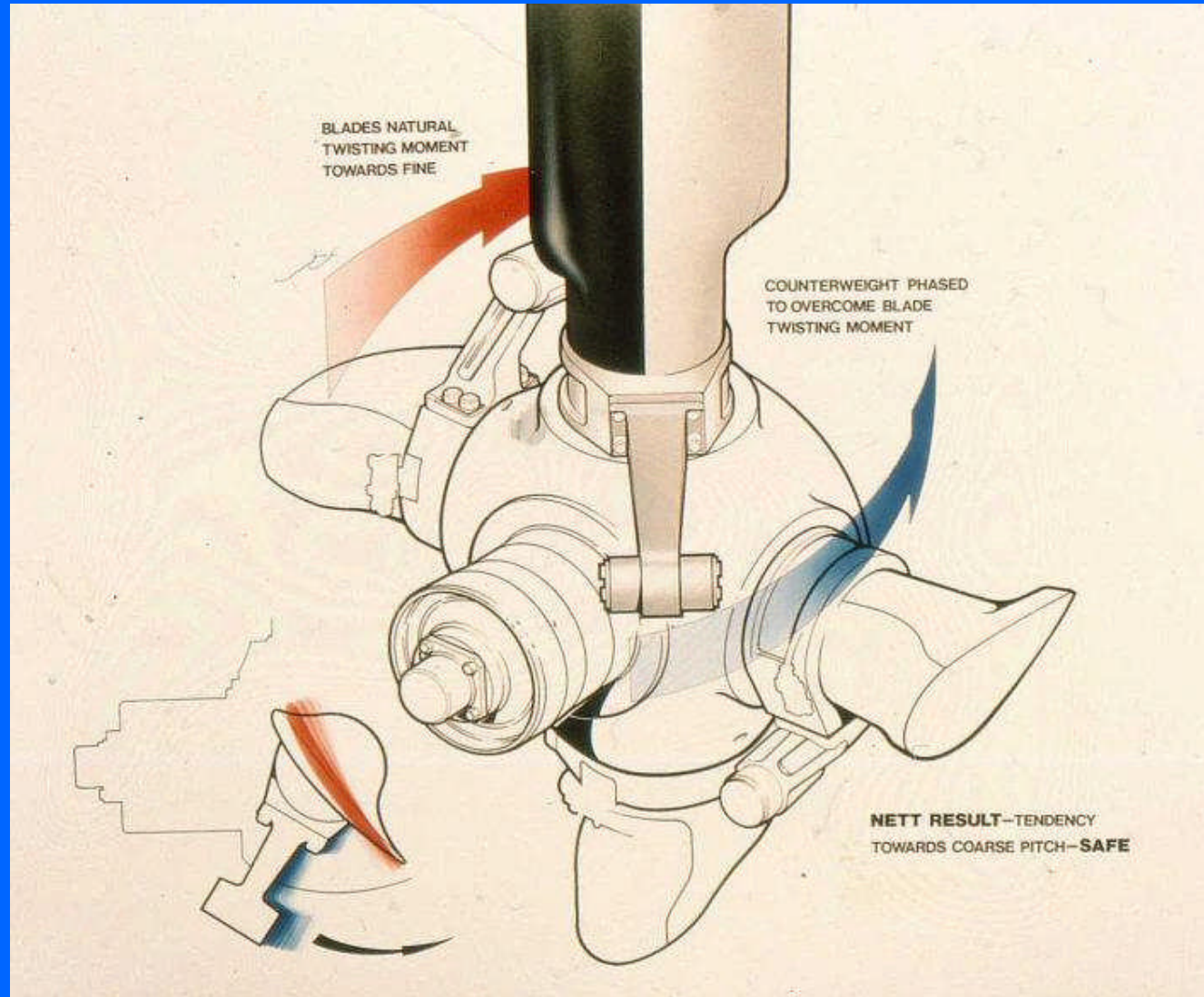


De Havilland DH.88 Comet Racer - 1934

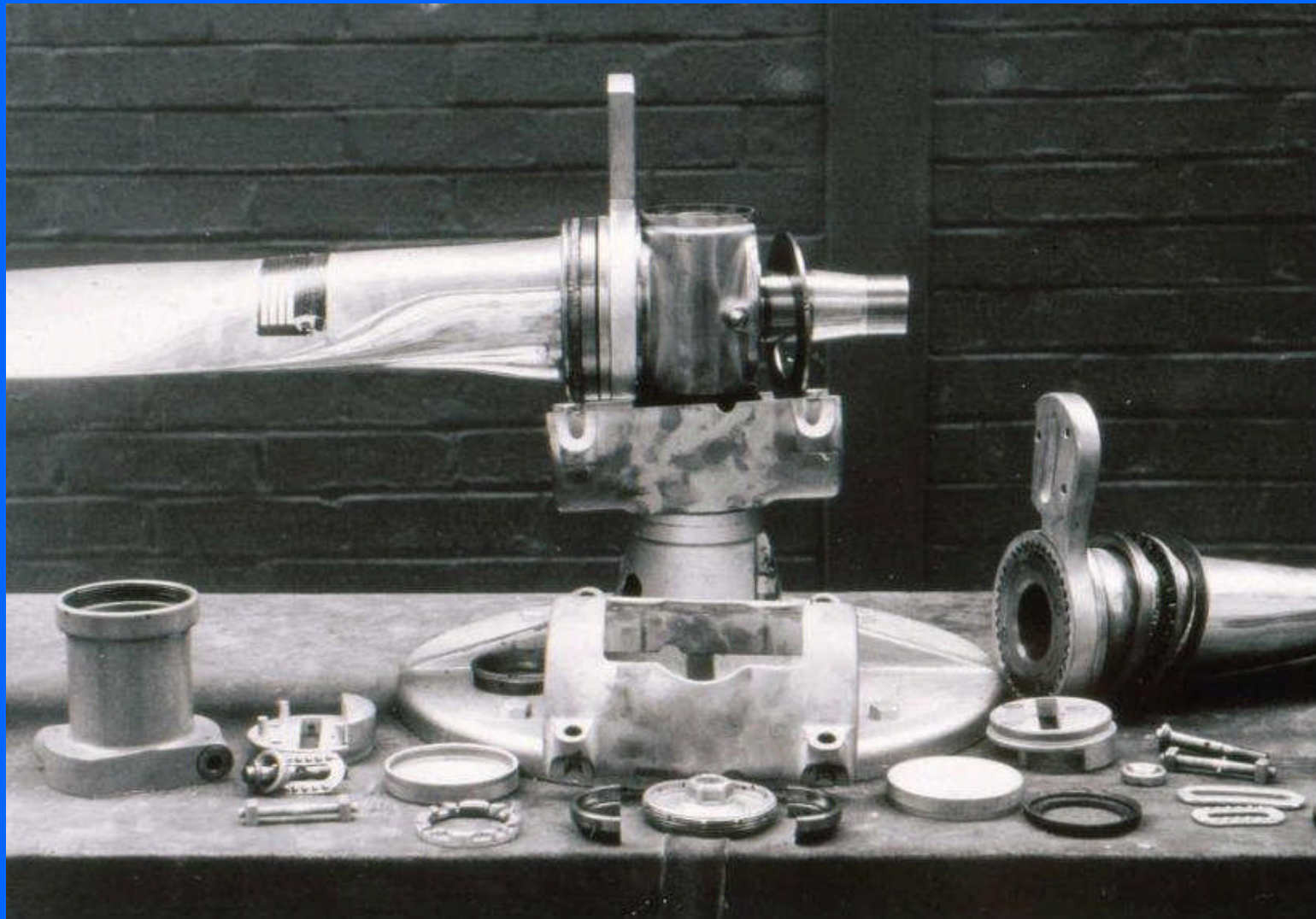


Experimental
US Army
Propeller

Wright Field
c.1925



Effect of Counterweights



Caldwell (Hamilton) "Bracket" Prop



Douglas DC-1 with
Hamilton Standard
bracket propeller



Frank Caldwell receiving the 1933 Collier Trophy from FDR



Bristol Type 142 with original propellers - April 1935

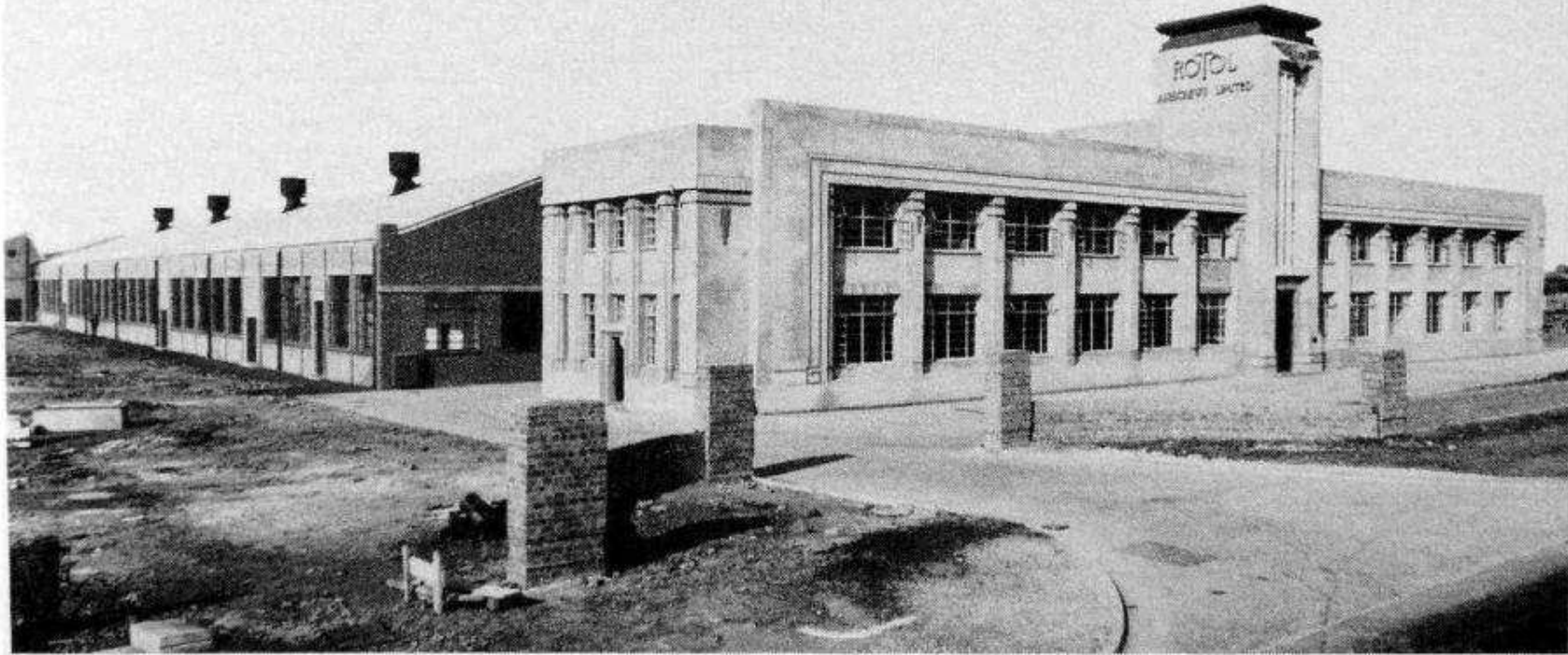


Bristol Bulldog FTB

Mercury engine and
HS "bracket" propeller
as for Type 142



Bristol Blenheim IV with DH bracket propeller 1939

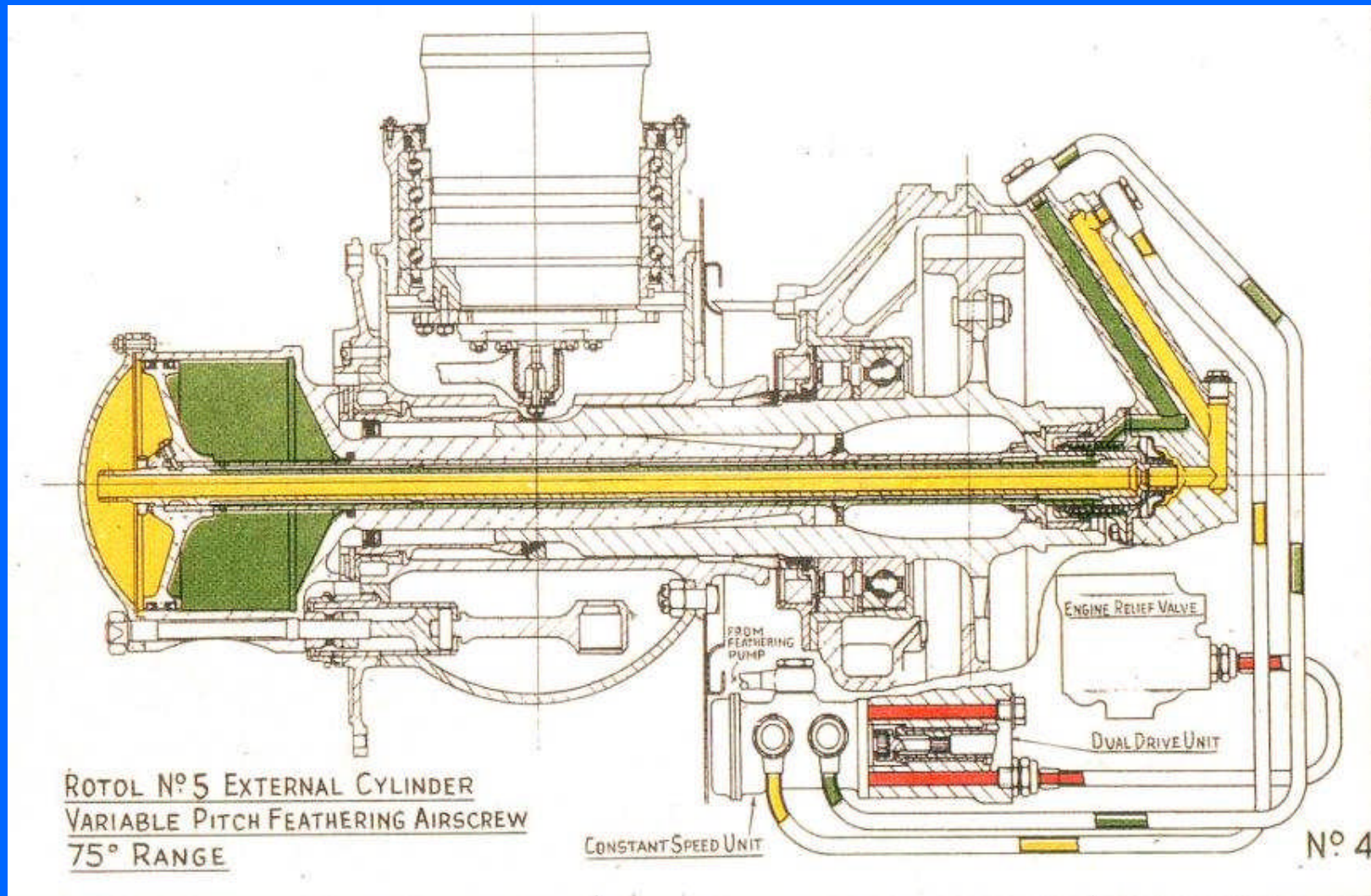


The finished office block in March 1938. The 'White Block' was originally designed to receive another storey, which it did in 1951.

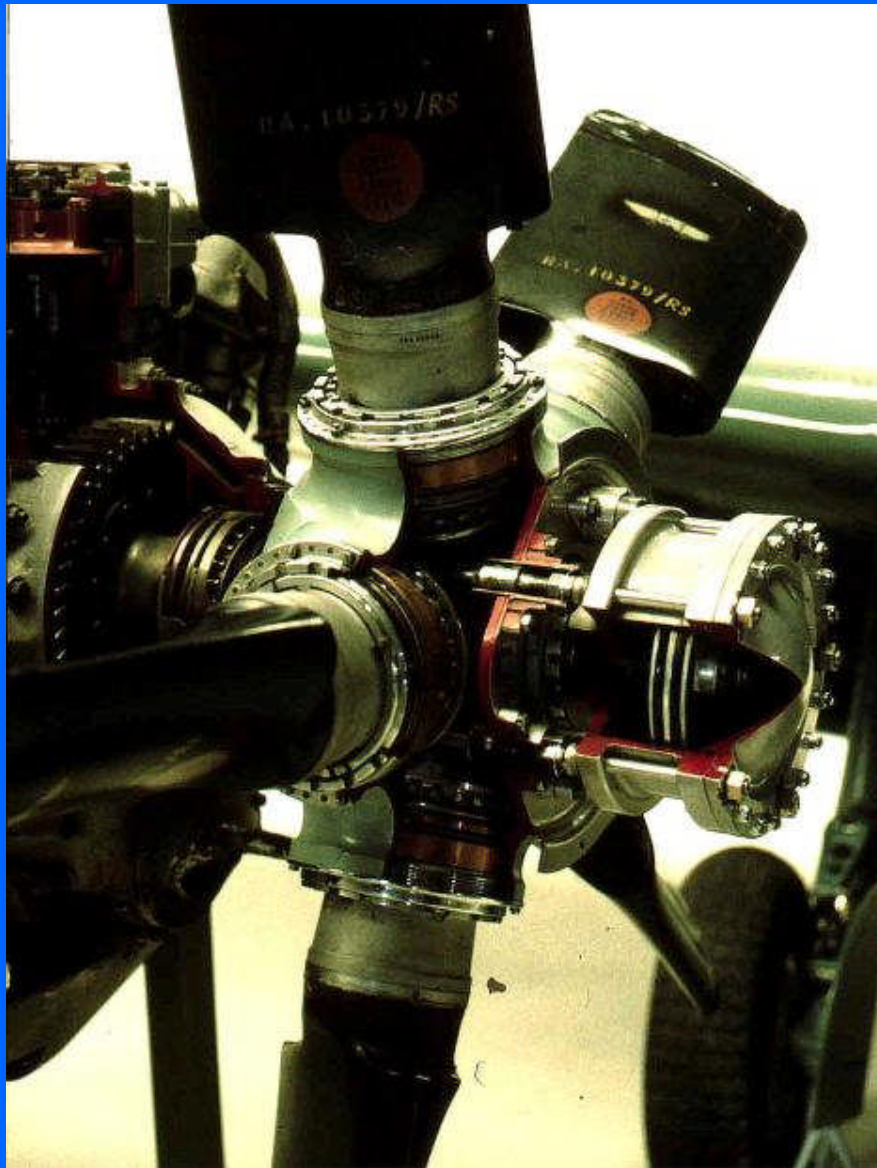
Roto Factory at Staverton, Gloucester, 1938
(now Messier-Dowty landing gear)



Vickers Wellesley with Rotol airscrew - Egypt 1938
RAF Long Range Development Flight

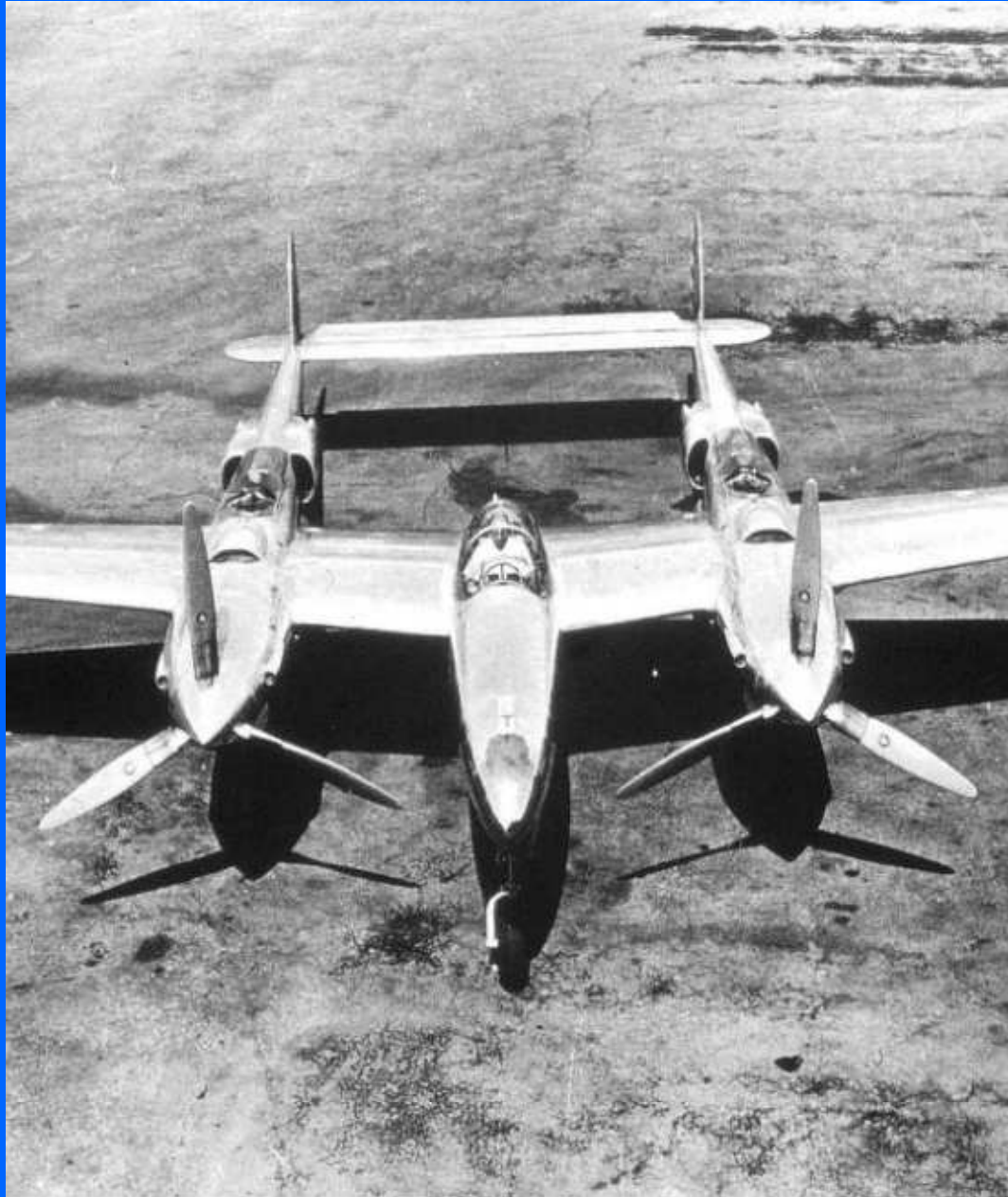


Rotol External Cylinder Constant-speed Airscrew



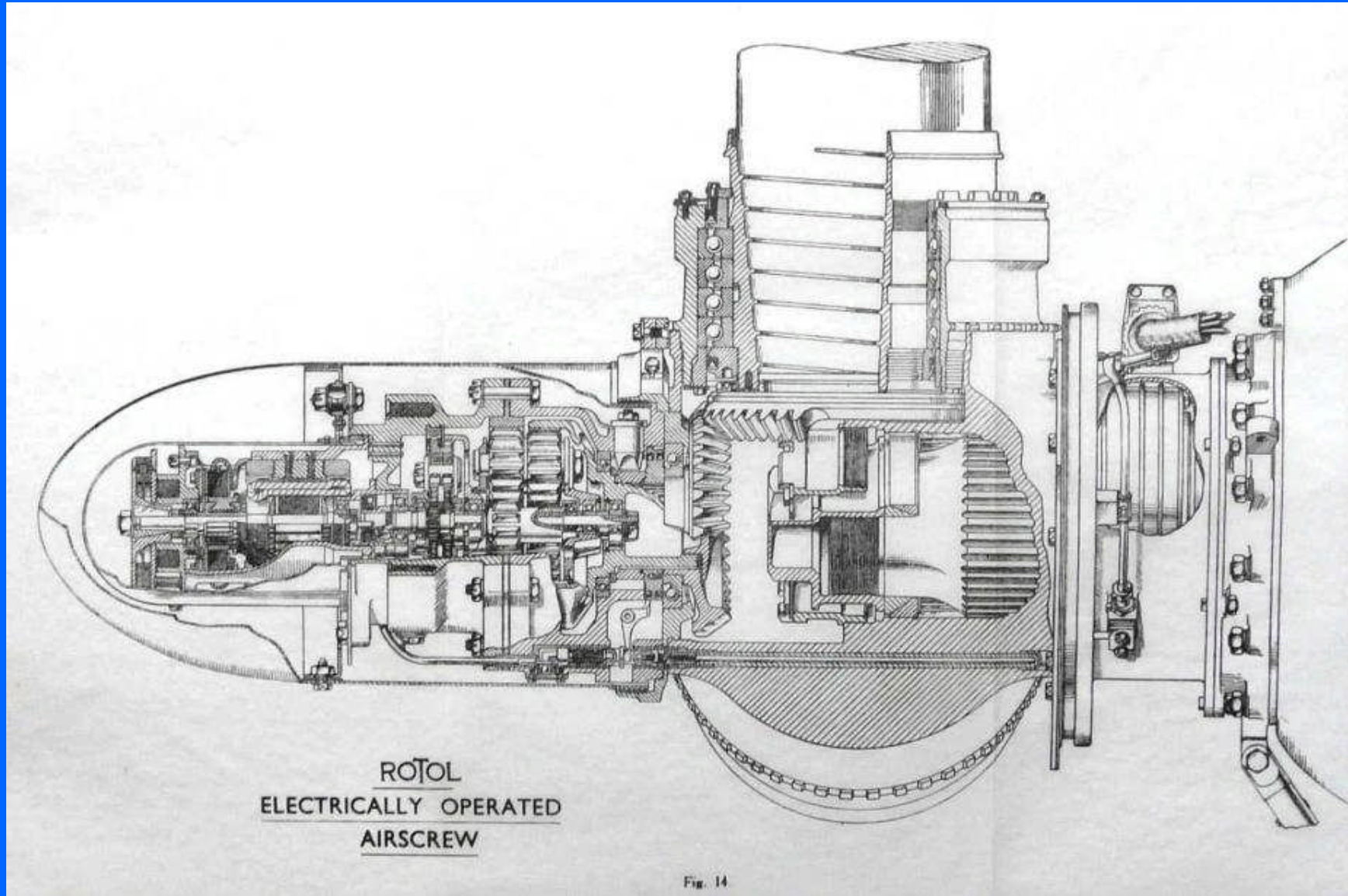
Roto 5-blade
External Cylinder

Airscrew

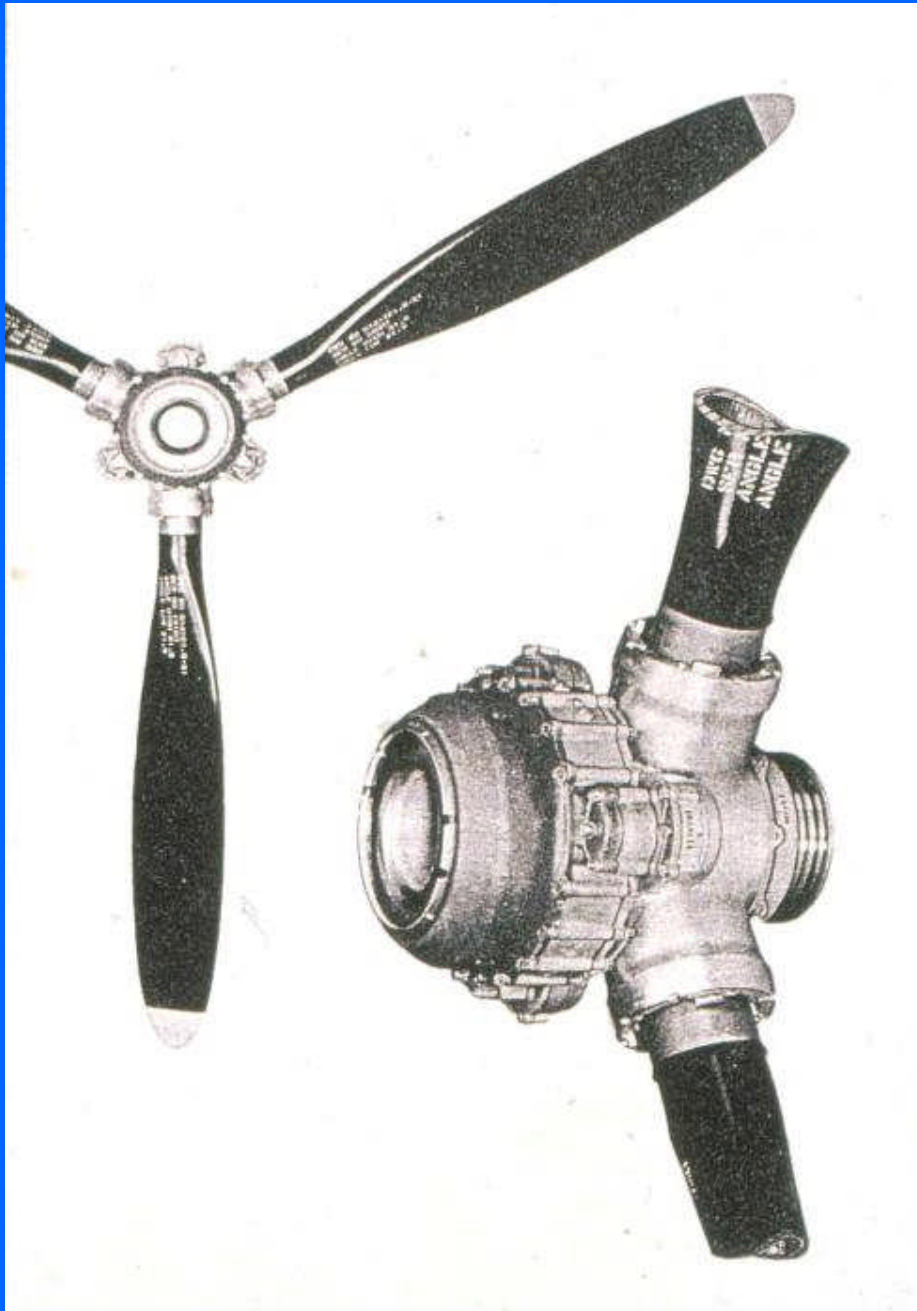


Lockheed YP-38
1940

Curtiss Electric
propellers



Roto / Curtiss Electric Propeller



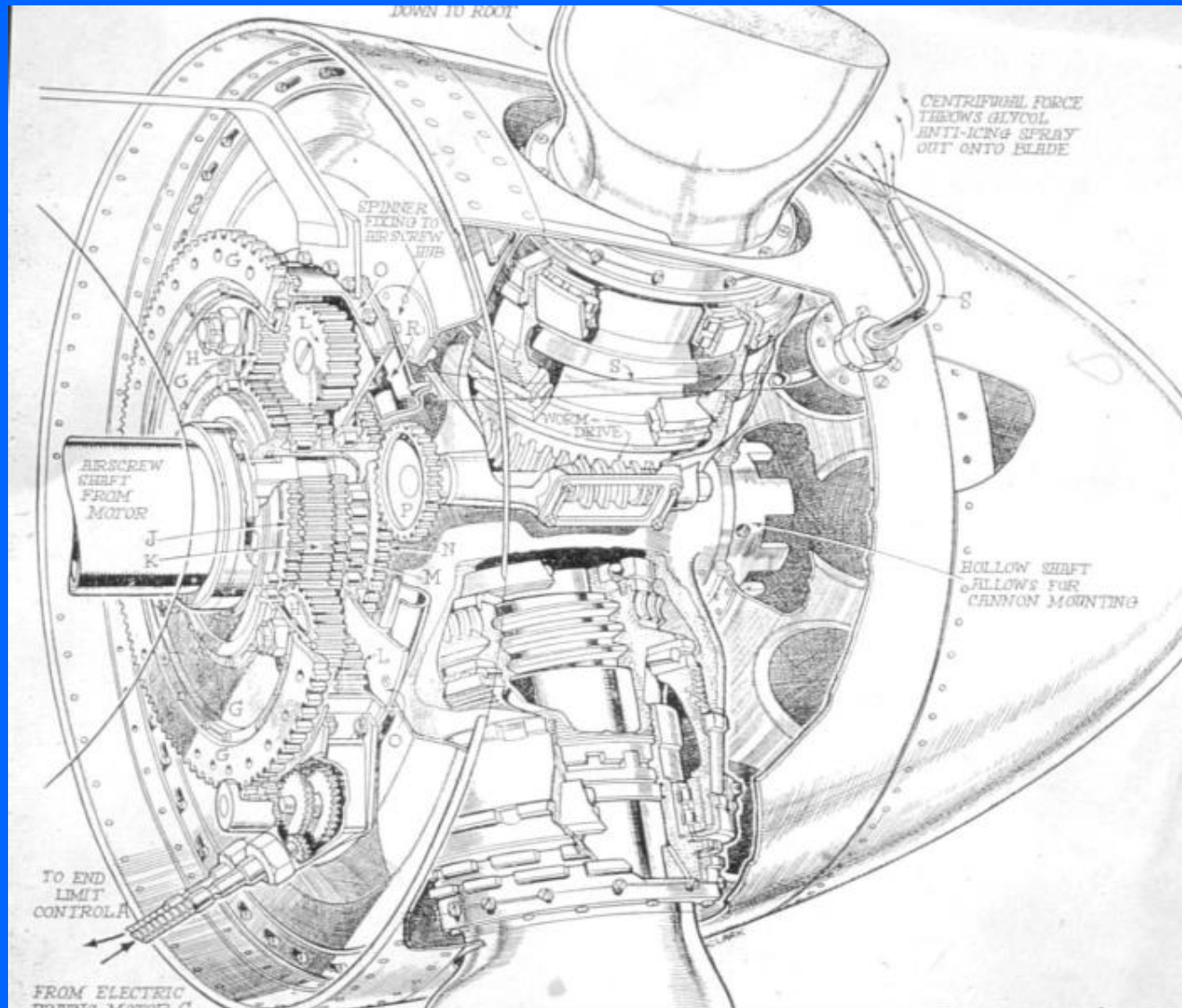
Curtiss Electric
"Doughnut"
propeller



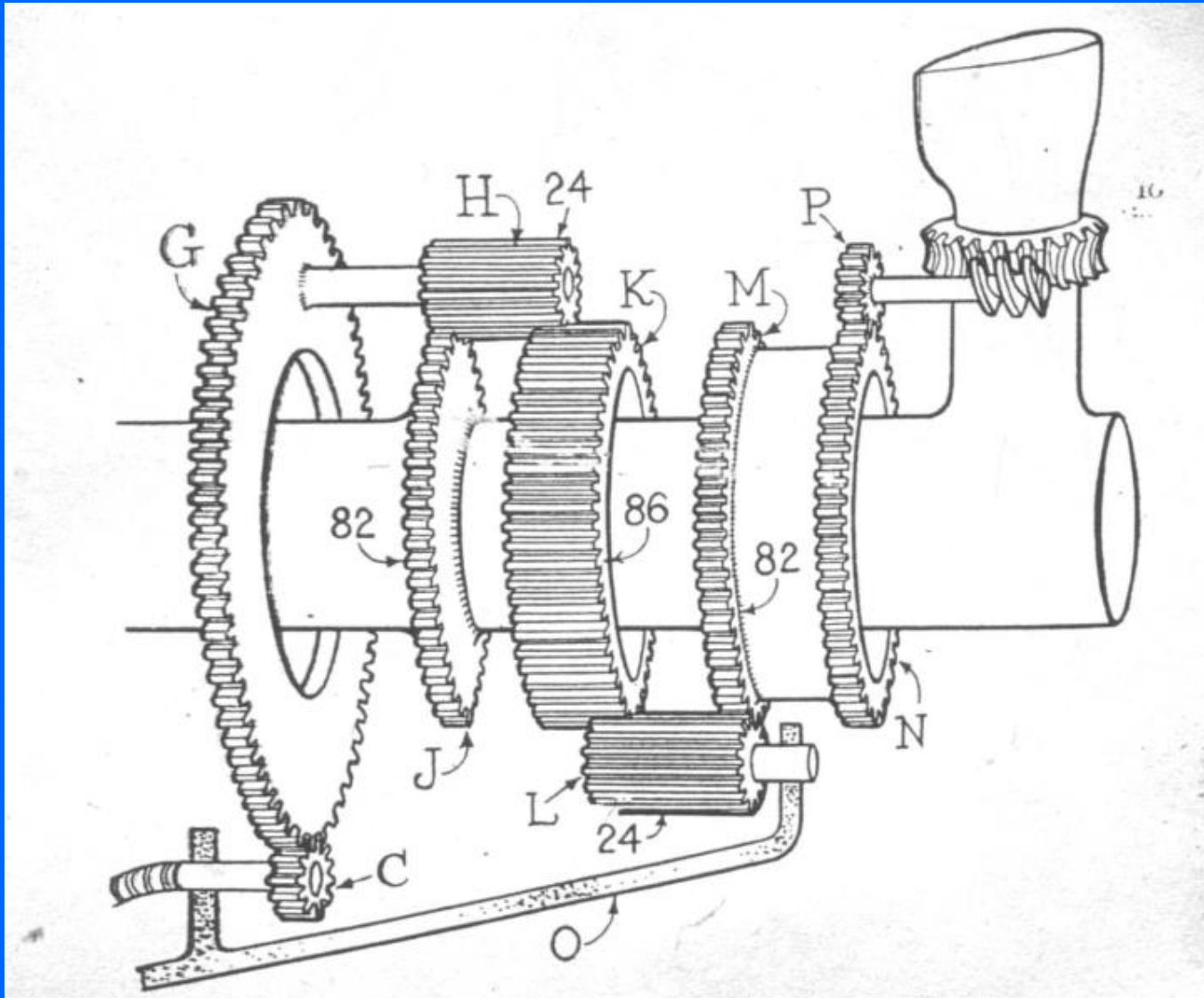
Lockheed C-130A with Aeroproducts propellers - 1956



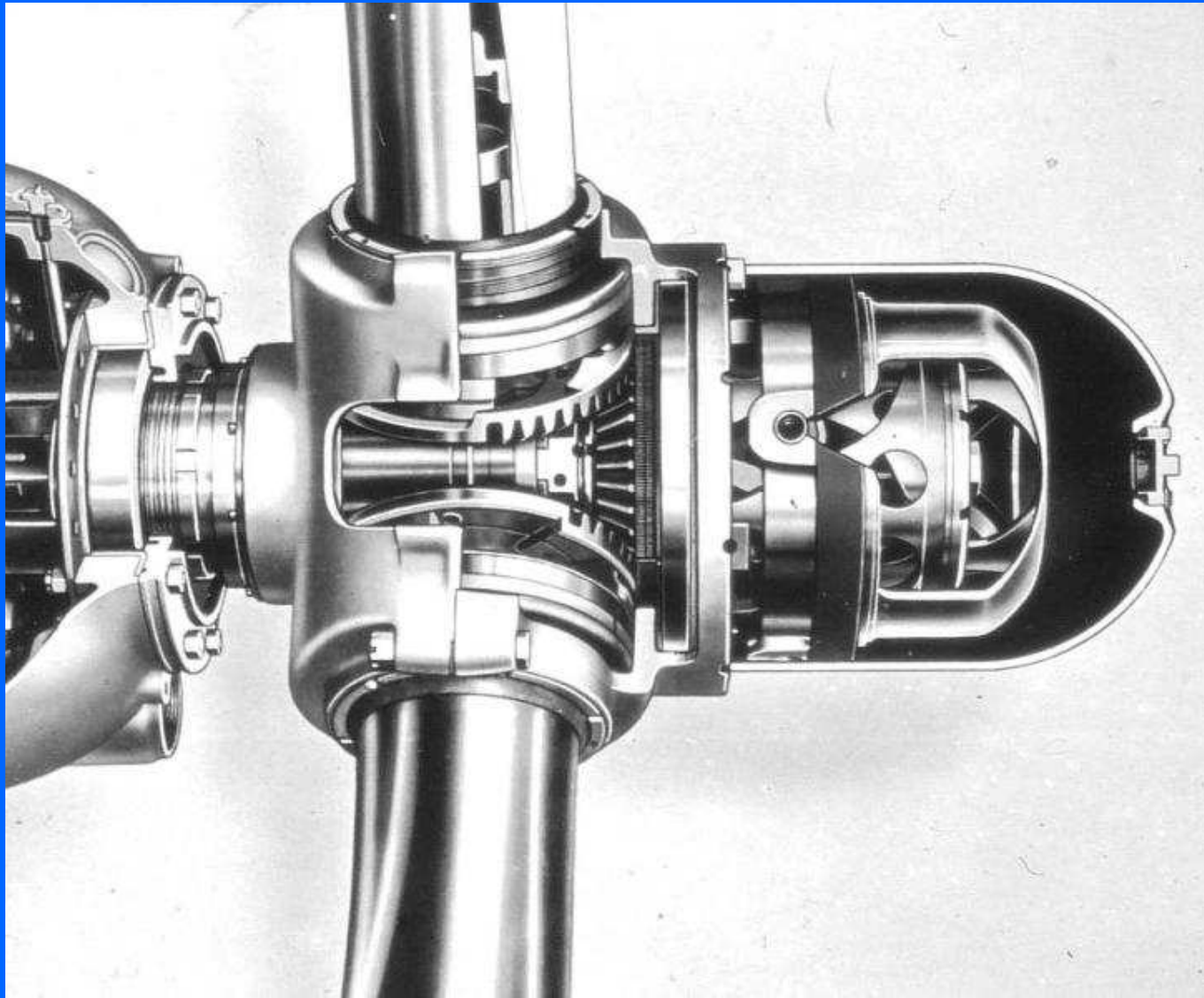
Bell P-39 Airacobra



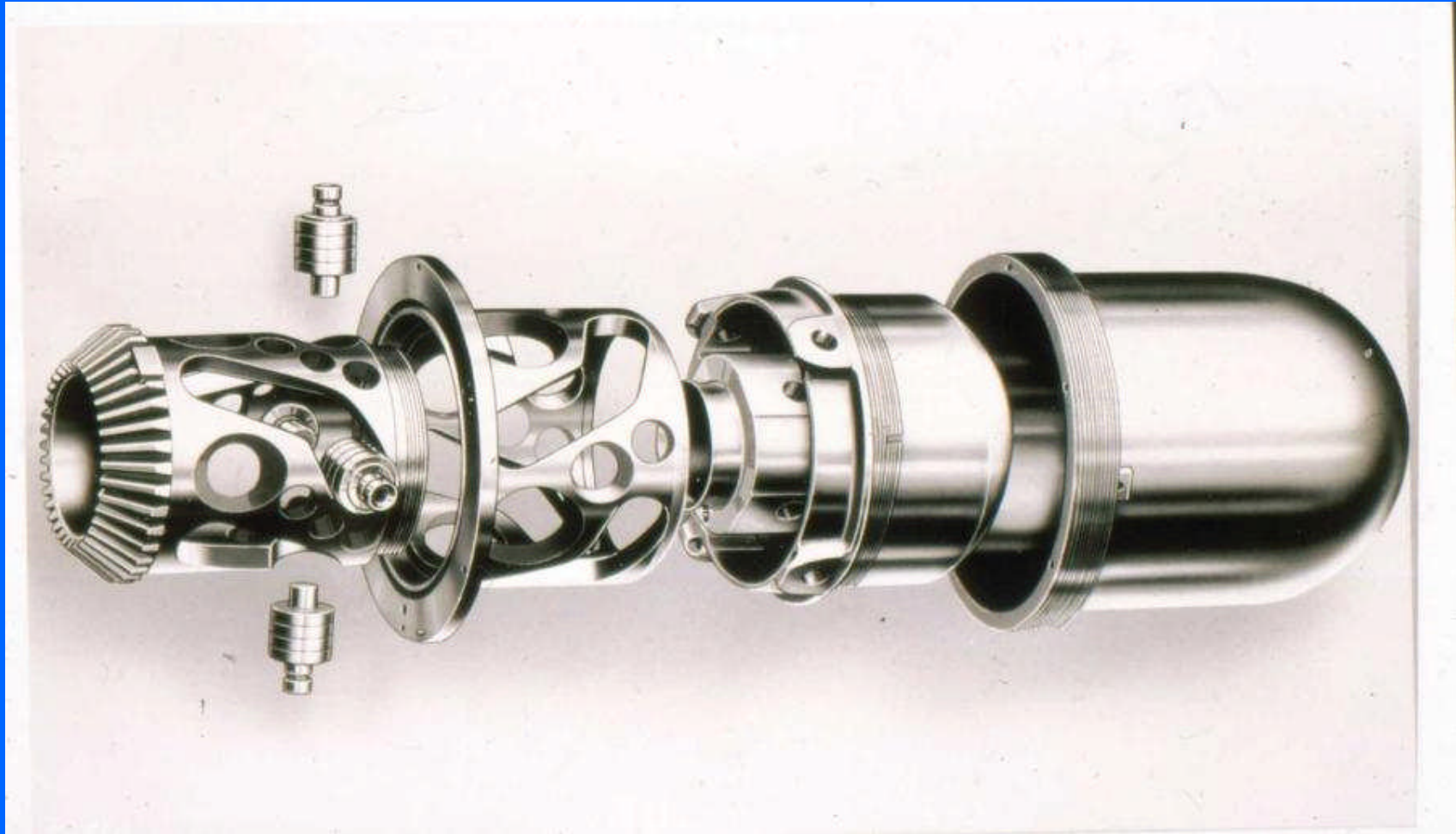
VDM Propeller with external electric drive - 1939



VDM Propeller pitch change mechanism



Hamilton Standard "Hydromatic" propeller hub



Hydromatic cylinder, cams and gear drive



Spitfire with Rotol 5-blade airscrew - 1944



Experimental Meteor with R-R B.50 Trent turboprops



Vickers Viscount R-R Darts with Rotol propellers - 1948



Tyne Lincoln FTB with DH Hydromatic propeller



Vickers Vanguard R-R Tynes with DH propellers



Hamilton 54H60
propeller

Lockheed C-130B-H
Lockheed P-3 Orion



De Havilland Comet 1 1st Jet Airline Service - May 1952



McDonnell XF-88B Voodoo - 1953



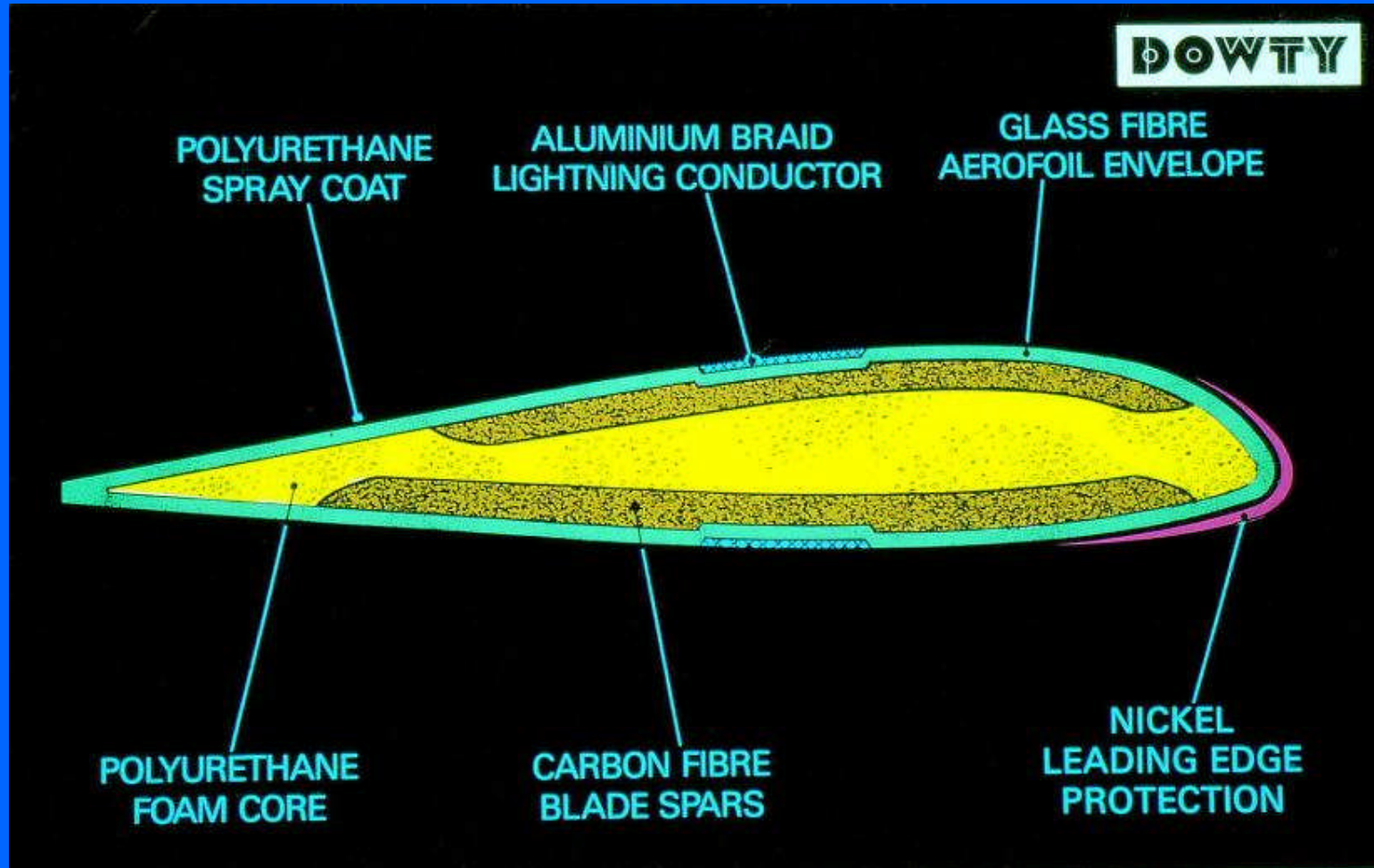
Typical Hartzell GA prop on Mitsubishi Mu-2



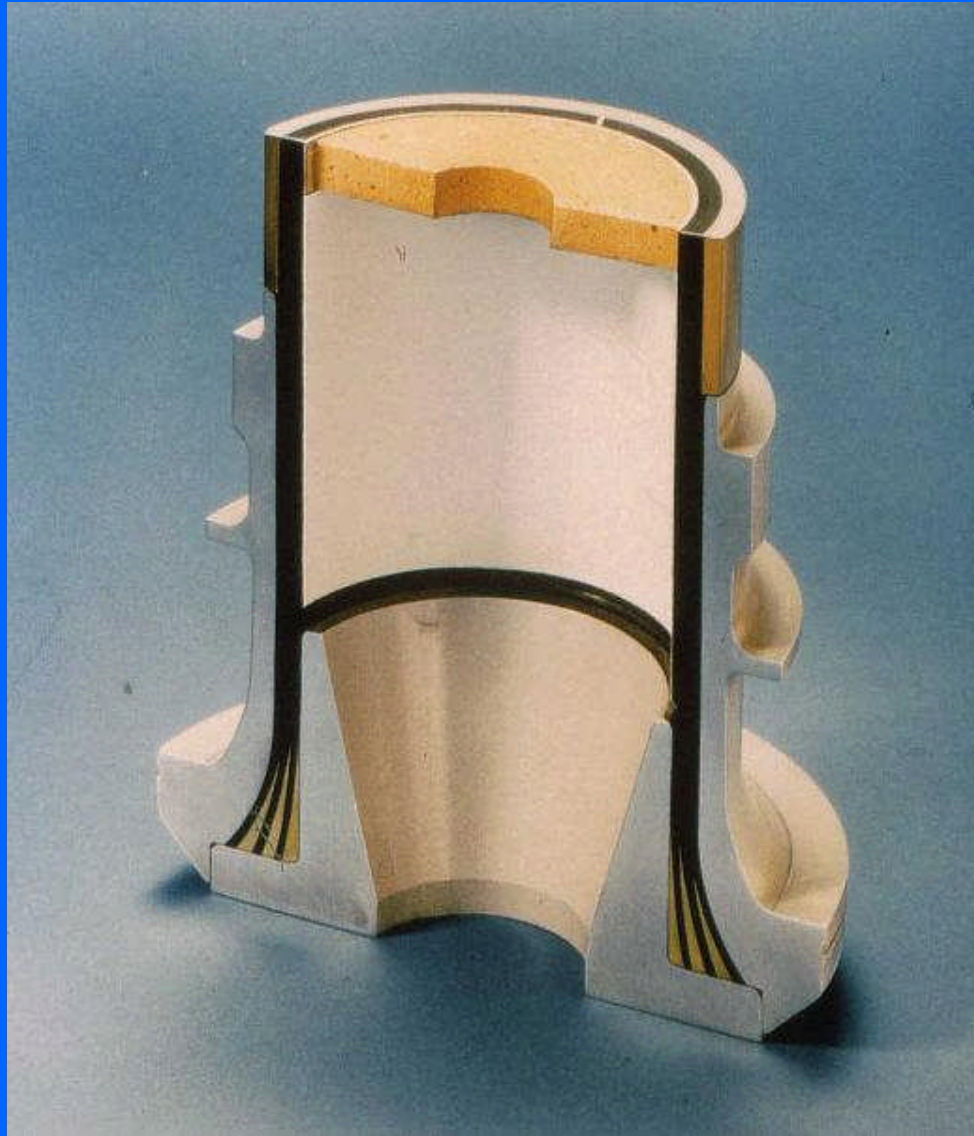
Dowty RotoL
propeller on
BAe Jetstream 31
c.1982



Hamilton metal-spar
composite-shell
propeller
c.1982



Section of Dowty all-composite propeller blade



Dowty Composite
Blade Root c.1980



ATR-42 Hamilton Standard part-composite blades 1983



Dowty
composite bladed
propeller for
Saab 340
1983



Fokker 50 with Dowty computer-controlled 6-bladers



Saab 2000 High-speed Turboprop - 1992
Dowty 6-blade swept propellers with integrated electronic control



Dowty 6-blade
propeller for
Lockheed C-130J
Hercules



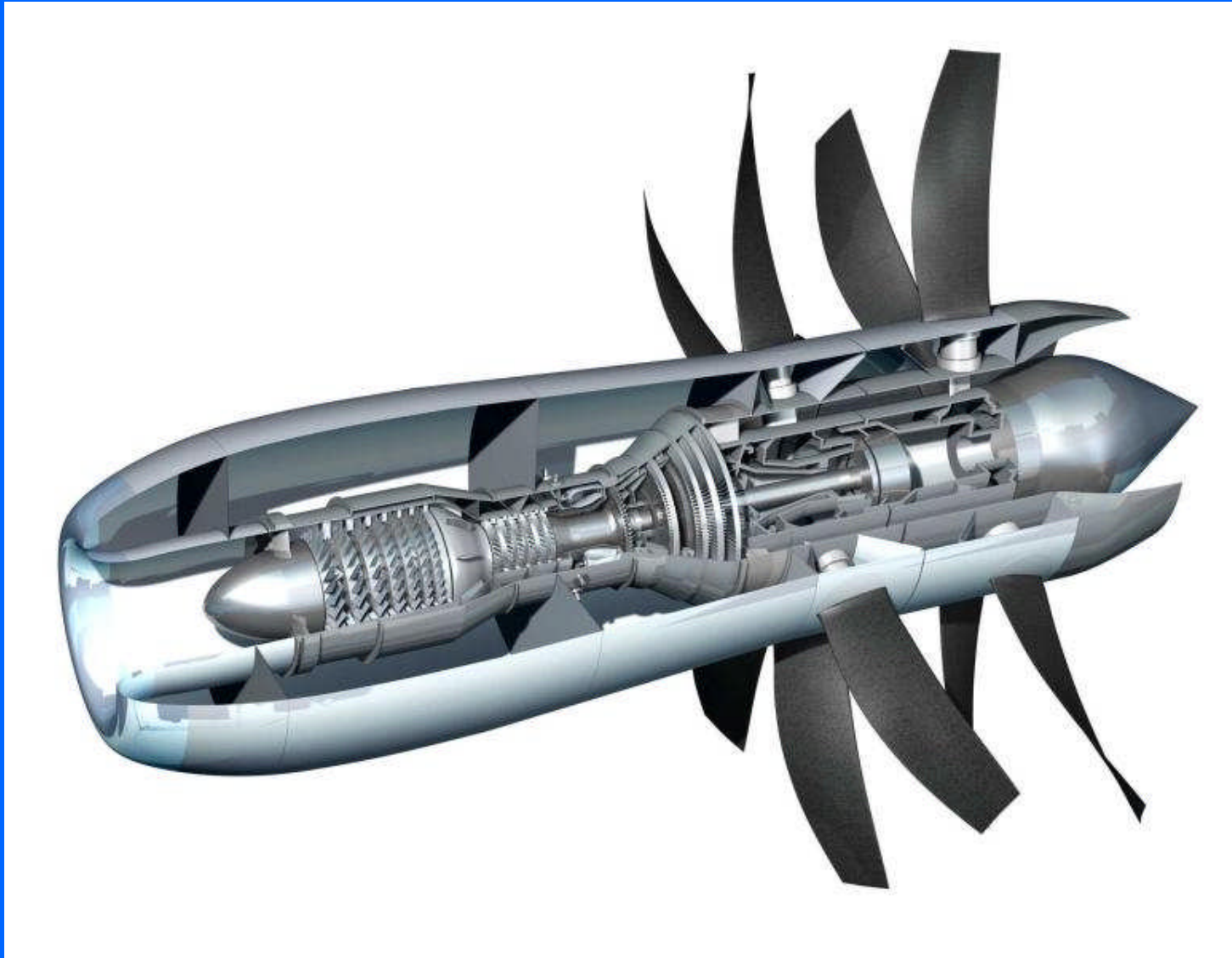
General Electric GE36 UDF “Unducted Fan”
on Douglas MD-80 FTB - 1988



Pratt / Allison 578DX Propfan Demonstrator



Last Touchdown Filton 26 November 2003



Rolls-Royce Open Rotor Pusher Concept - 2011



Airbus A400M Ratier 8-blade propellers



Next Generation Airliner - circa 20xx ??