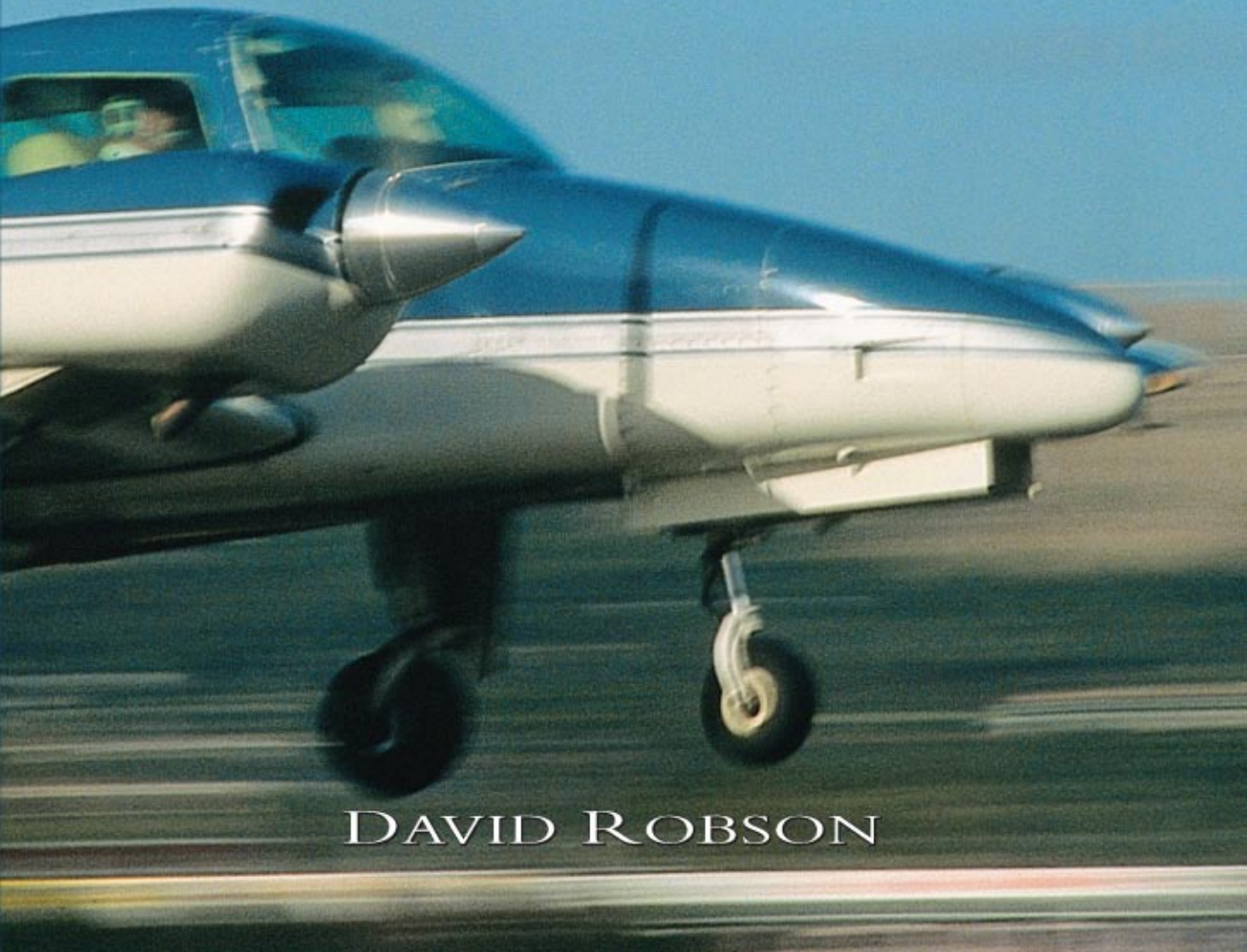
TRANSITION TO TWINS

YOUR FIRST MULTI-ENGINE RATING



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by David P. Robson

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Introducing the Twin and its Systems

Introduction

Where Are You Coming From?

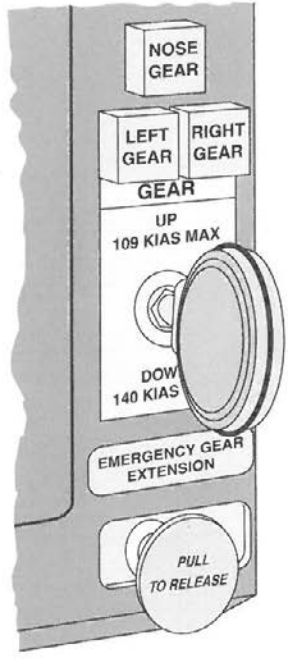
The step up to a twin involves a significant change in complexity from the small single-engine aircraft in which you trained. Probably the best way to approach the twin is to firstly become familiar with the *complex* single, which has many systems in common with a typical twin. Then we will separately tackle the multi-engine aspects. Let's start with a brief look at the features of a typical complex single. The most noticeable features will be:

- retractable landing gear;
- electrically operated flaps;
- perhaps electrically operated elevator trim;
- rudder trim in addition to elevator trim;
- constant-speed propeller; and
- turbocharger on the engine.

It could also have the following:

- IFR instrumentation, including an autopilot and, perhaps, weather radar;
- separate entrance for the passengers;
- air conditioning and, perhaps, pressurization;
- oxygen system; or
- several baggage compartments and a more complex loading system.

The principle of operation of these systems is well and truly described in the ASA-PM-2 and -3, *Private and Commercial* and *Instrument Flying* manuals, so let's concentrate on the practical implications and functioning of these systems.



■ **Landing gear selector and lights**

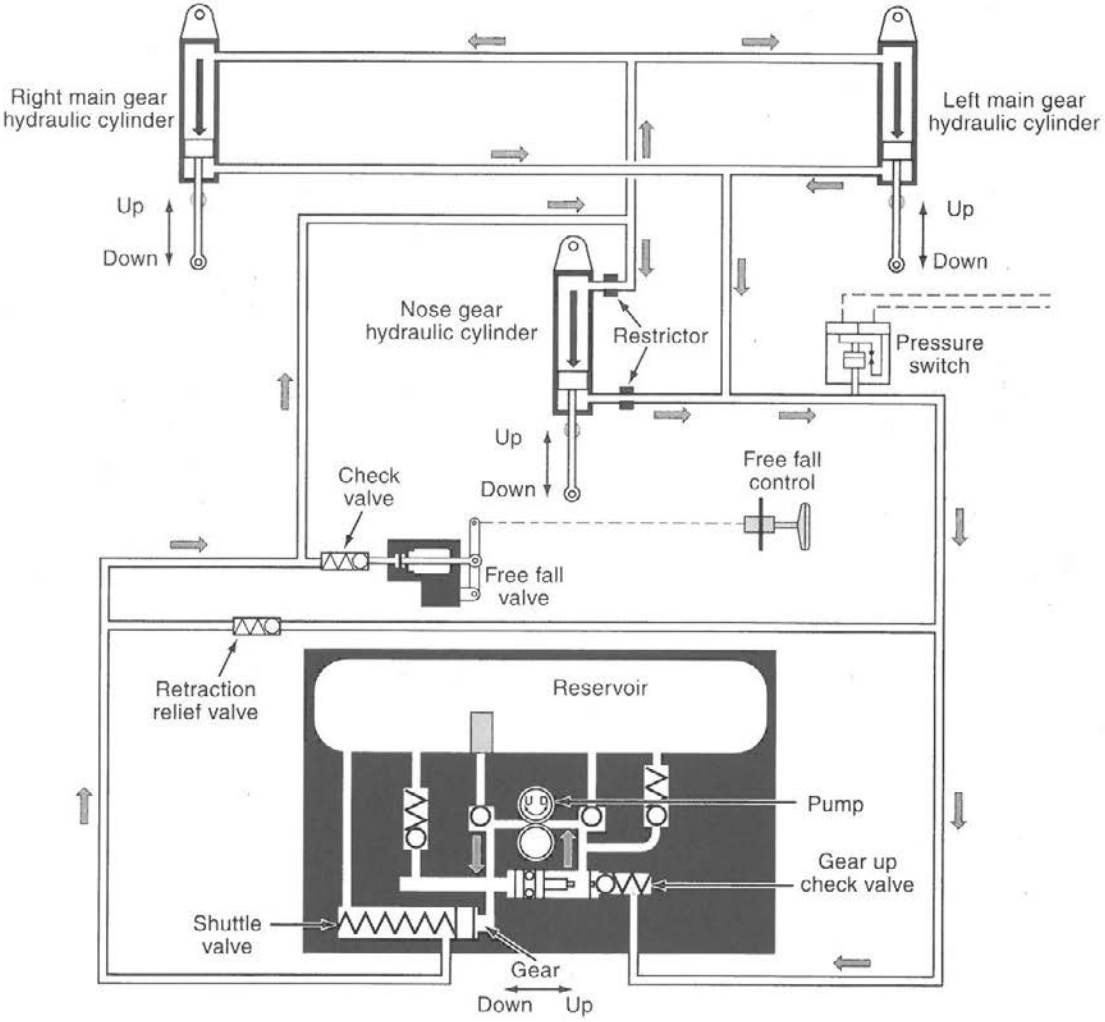
Complex Systems

Retractable Landing Gear

The landing gear will be electrically selected. The normal extension and retraction will either be direct by an electric motor or indirect by an electrically driven hydraulic pump. There is little difference between them as far as the pilot is concerned. The hydraulic gear tends to be faster operating.

There will be limiting speeds for operation of the gear (V_{LO}) and for flight with it extended (V_{LE}). There may even be one maximum speed for selecting the gear down and another maximum speed after takeoff by which the landing gear must be up. The Pilot's Operating Handbook will explain the particular limits for your aircraft.

The lights show green when the gear is down and locked, red when the gear is in transit, and go out when the wheels are up and locked. The gear will have a micro-switch on one leg, known as the *squat switch*, to prevent up selection when there is weight on the wheels. There will be a warning horn that operates when the throttles are retarded at low airspeed and the gear is up. It may also depend on flap position.



■ **Typical hydraulic retractable landing gear system**

There will be an emergency extension facility—either:

- a pressure dump and gravity drop of the gear (free fall);
- a manual handle to pump the gear down hydraulically; or
- a crank handle which will manually wind the gear down.

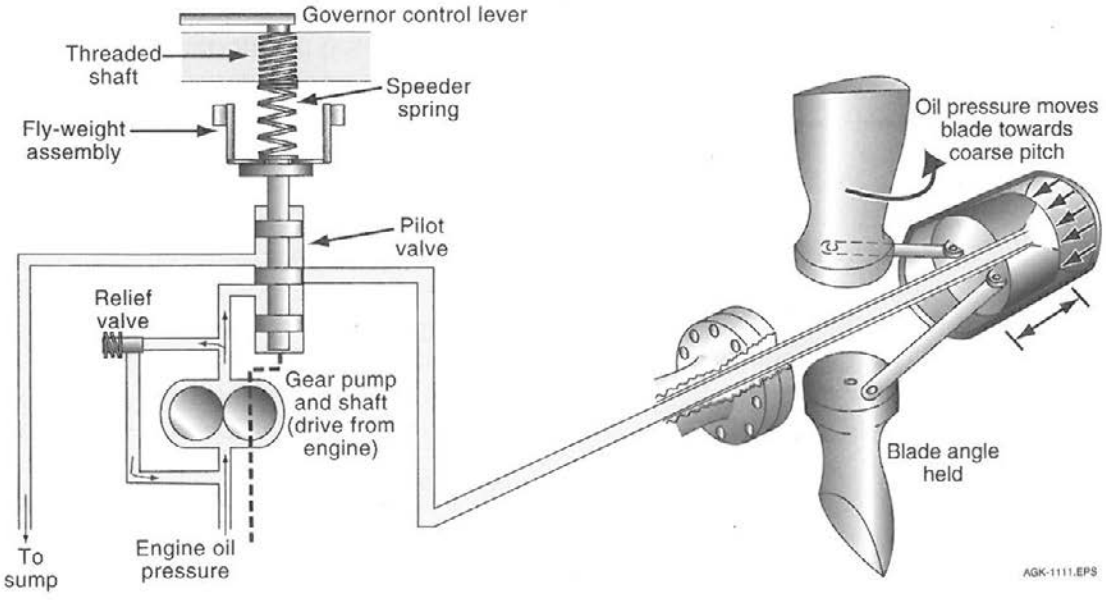
The manual crank may take 50–60 turns and may be difficult to operate while flying. Practice occasionally in VFR conditions.

With manual extension there may be no lights to indicate the landing gear is down and locked—but generally you can feel them extend and lock. (There may be a mirror on the side of the engine nacelle of the twin to visually check the extension of the nosewheel.)

Constant-Speed Propeller

The constant-speed propeller offers a much higher level of efficiency and, with it, some complication in its operation. Oil pressure is used to drive the blade angle, and a governor mechanism then controls the angle to maintain the selected RPM. Loss of oil pressure causes the blades to go to the full fine position. In addition to the RPM indicator, the pilot has a manifold pressure gauge (MP) with units of inches of mercury. Power is set by a combination of MP and RPM. The throttles control MP and the propeller levers, RPM. Typical settings are 25 in./2,500 RPM for climb and 23 in./2,300 RPM for cruise.

To avoid stress on the engine, MP should be less than RPM ÷ 100.



■ **Constant speed propeller unit**

A FOCUS SERIES BOOK

TRANSITION TO TWINS

YOUR FIRST MULTI-ENGINE RATING

This manual has been prepared for those pilots embarking on their first Type Endorsement on a Multi-Engined aircraft. It is done in the knowledge that the Type Endorsement has to be oriented to a specific aircraft. Nevertheless the principles are common to all types. It was felt that a general but detailed text was needed to allow the student to prepare for the Rating and to assist the instructor in structuring the program and its content.

The manual is in two parts:

Part One covers all facets of twin operation including systems description, aerodynamics, normal operations, abnormal operations, VFR, Night and IFR considerations and flight planning. There is also a Chapter on commercial operations with traps for the unwary.

Part Two describes a structured Type Rating program with suggested content for the lectures, long briefings and pre-flight briefings.

We hope this manual will be invaluable to student and instructor alike.