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## INTRODUCTION

The moveable Flight Control surfaces on the Douglas DC-3 aircraft consist of two ailerons, the right aileron trim tab, two elevators, two elevator trim tabs, the rudder, the rudder trim tab, and the wing flaps. All of these surfaces except the wing flaps are operated manually from the cockpit by means of conventional controls and cable systems. The wing flaps are controlled from the cockpit, but are hydraulically actuated.

This chapter provides a general overview of the DC-3 Flight Controls Systems as well as normal operations and limitations.

## GENERAL

### PRIMARY CONTROL SYSTEMS

The ailerons, elevators, and rudder consist of aluminum alloy frames covered with treated poly-fiber fabric. Each surface is counter balanced by weights built into the flight control structure. Each elevator and rudder is attached to its respective stabilizer at two attach points. Each aileron is 24 Ft long and is attached to its wing at six attach points.

### TRIM TAB SYSTEMS

Adjustable metal trim tabs are installed on the right aileron, the rudder, and each elevator.

The aileron trim tab is on the trailing edge of the right aileron and is controlled by a crank on the right side of the lower panel on the control pedestal. Clockwise rotation of the control crank corrects a low left wing flight condition, and counter-clockwise rotation corrects a low right wing flight condition. A graduated dial is adjacent to the control to indicate the degree of tab deflection.

The elevator trim tabs are controlled by a wheel installed on the left side of the control pedestal. Forward rotation trims the nose down. A graduated dial is adjacent to the control to indicate the degree of tab deflection.

The rudder trim tab is controlled by a crank on the left side of the lower panel on the control pedestal. Clockwise rotation of the control corrects yaw to the left and counter-clockwise rotation of the crank corrects yaw to the right. A graduated dial is adjacent to the control to indicate the degree of tab deflection.

## CONTROL LOCKS

Removable control locks are provided for securing the Flight Controls when the airplane is parked. They will normally be installed at the inboard ends of the ailerons and elevator and at the base of the rudder in accordance with the Termination Checklist.

## WING FLAPS

The flap system is a single cable system which actuates four sections of flaps, simultaneously. The flaps are "split" type flaps and are arranged in two equal sections on either side of the aircraft at the trailing edge of the wing and under the fuselage. The split flap system is a flap system that utilizes a hinged portion of only the bottom surface of the wing. When extended, split flaps increase the angle of attack of the wing by changing the chord of the wing. Split flaps also cause minimal change in pitch as they are extended or retracted. This is due to the fact that split flaps provide some lift but significantly more drag than other types of flaps.

Full flaps provide 45° of deflection causing an increase in lift of approximately 35% with an increase in parasite drag of approximately 250%.

### Wing Flap Selector

The wing flap selector valve is located on the hydraulic control panel, and has three positions: DOWN, NEUTRAL, and UP. The Flap Handle is connected to this valve and is held in the NEUTRAL position by a slot in the lock ring. To move the Flap Handle to UP or DOWN, it must be moved first to the left out of the slot and then UP or DOWN as desired.

**NOTE:** *Placing the Flap Handle in the UP position in accordance with the Shutdown Checklist will prevent excessive hydraulic pressure build-up due to thermal expansion.*

**Flap Relief Valve**

A relief valve is installed in the flap down line to prevent the extension of flaps at airspeeds in excess of the manufacturer's recommended maximum flap speeds. This system reduces hydraulic pressure so that flaps will extend only when air loads are less than approximately 97 KIAS.

However, once the flaps have been extended, they will stay in position regardless of aircraft speed. Structural damage could result if the airplane is allowed to accelerate above flap speed limits after flap extension and the flap handle has been returned to the neutral position.

**Flap position indicator**

The flap position indicator consists of an electrical transmitter mounted on the left inboard flap section and an indicator located on the First Officer's Instrument Panel. The indicator is marked in increments of 0, 1/4, 1/2, and full.

**OPERATION****WING FLAP EXTENSION OR RETRACTION**

- Move Flap Selector Handle to the left (to release from the Lock ring) and then UP or DOWN as desired.
- Monitor Flap Position Indicator.
- Return Flap Handle to NEUTRAL when flaps have reached the desired position.

**LIMITATIONS**

Maximum allowable aileron trim ..... 4°  
Maximum loading (flaps up) .... +2.83 G/ -0.83G  
Maximum loading (flaps down) +1.58 G/ -0.44G

———— End of Chapter ————