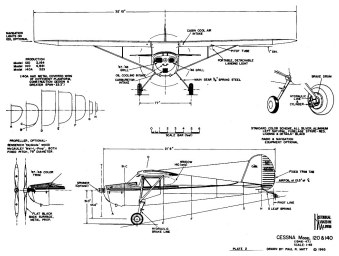
GROUND SCHOOL

AIRCRAFT GENERAL KNOWLEDGE 1



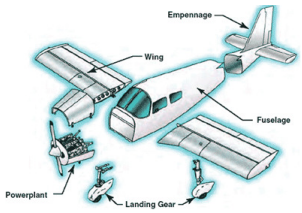
GROUND SCHOOL

LECTURE ONE: AIRFRAMES

1. Airframes
2. Flaps and Slats
3. Undercarriages – Steering & Braking

GROUND SCHOOL

AIRFRAMES: STRUCTURE



The airframe is made up of various components, we will examine each in turn:

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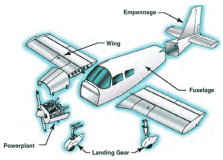
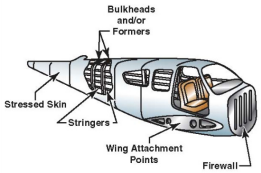
AIRFRAMES: FUSELAGE



FUSELAGE
Forms main body of airframe to which all other components are fixed

Most training aircraft have a semi-monocoque construction (framework covered by a skin)



Stresses on airframe are shared between the formers, bulkheads and stringers and also with the aluminium skin

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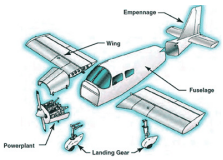
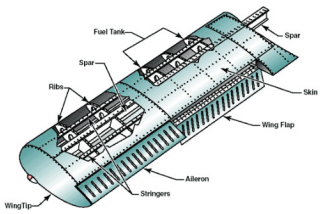
AIRFRAMES: WINGS



WINGS
Used to generate lift required for flight and usually also carry fuel tanks

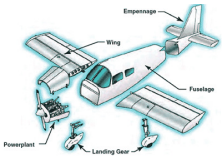


Internal structure made up of ribs and stringers. A main spar runs along the length of the wing

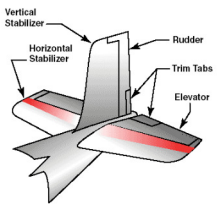
High wing aircraft also generally have a strut to give the wing more strength

GROUND SCHOOL

AIRFRAMES: EMPENNAGE



EMPENNAGE / TAIL PLANE
Many different designs used (as below, all-flying tailplane, T-tail etc)



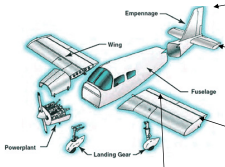
Internal structure as per the wings

Carries the rudder, elevators and trim tabs

Horizontal stabiliser also produces a component of lift downwards to balance the aircraft's lifting ability

AIRFRAMES: FLIGHT CONTROLS

GROUND SCHOOL



RUDDER
Used for movement about the directional (normal) axis

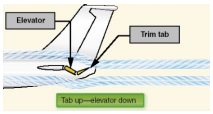
ELEVATORS
Used for movement about the lateral axis

AILERONS
Used for movement about the longitudinal axis

FLAPS
Used to delay the stall and allow the aircraft to fly slower with a lower attitude

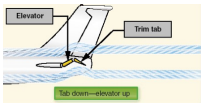
AIRFRAMES: TRIM TABS

GROUND SCHOOL



Used to relieve control pressures for the pilot

All aircraft have trim tabs on the elevators but some also have trim tabs on rudders and ailerons



The trim tab moves in the opposite direction to the control surface to provide an opposing force which maintains the main surface in place

Anti-balance tabs make sure that stick loads increase as deflection increases – stops pilot damaging them!

AIRFRAMES: FLAPS

GROUND SCHOOL

Flaps increase the camber of the wing and help the aircraft produce more lift

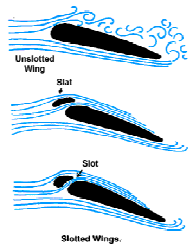
The later stages of flap stick into the airflow so much they cause extra drag

Fowler flaps are used so that larger angles of flap can be used but so that the airflow does not separate from the upper surface

Flaps give a LOWER stalling angle of attack when related to a clean aerofoil (seems backwards but trust me!)

AIRFRAMES: SLATS

GROUND SCHOOL



Slats are flaps at the leading edge of the wing

Used to re-energise the boundary layer and to delay separation of the airflow on the wing upper surface

Rare on training aircraft as flaps are cheaper and easier to maintain

AIRFRAMES: LANDING GEAR

GROUND SCHOOL

Generally 3 wheels – 2 mains and either a tailwheel or nosewheel

Tail "wheel" may actually be a skid

Wheels may be attached by shock-absorbed sections or fixed "spring leaf" sections

Landing gear is either fixed or retractable

AIRFRAMES: NOSEWHEEL & GROUND STEERING

GROUND SCHOOL

STEERING RODS
Use of rudder pedal moves steering rods left and right

SHIMMY DAMPER
Prevents sideways oscillation of the nosewheel

OLEO
Mixture of air and fluid to provide shock absorption

TORQUE LINK
Some suspension, keeps wheel straight and keeps wheel attached to aircraft!

FORK
Attaches nose wheel assembly to tyre

AIRFRAMES: NOSEWHEEL & GROUND STEERING

GROUND SCHOOL

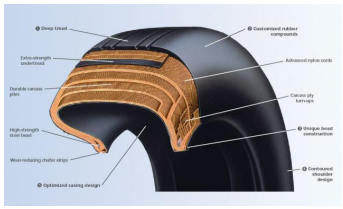
Nose wheels are not built to take the initial impact of landing!

Usually steering the nosewheel on the ground will also move the rudder

When the aircraft becomes airborne, the oleo extends to its maximum and rudder pedal movement no longer makes the wheel move left and right

AIRFRAMES: TYRES

GROUND SCHOOL



Aircraft tyres made up of many different layers

There is no legal requirement for tyre tread depth on aircraft tyres

If a tyre has no tread it will take longer to stop and be less secure in wet conditions

AIRFRAMES: TYRES

GROUND SCHOOL

Creep marks show if a tyre has moved from its initial fit position

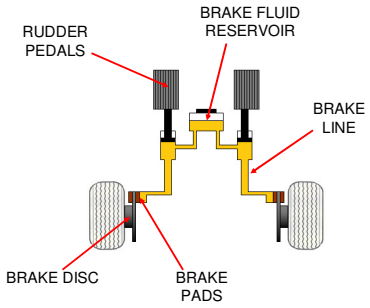
If the creep marks aren't touching the valve and tube will be being stressed and could fail

Over-inflated tyres cause unnecessary stresses on the side walls of the tyres and on the valves. This may lead to a tyre "blow out"

Under-inflated tyres cause increased wear at the shoulders of the tyre and may also cause "hot spots" which again can lead to a tyre "blow out. It also makes the tyre more likely to creep.

AIRFRAMES: BRAKING SYSTEMS

GROUND SCHOOL



The brakes on the rudder pedals push an actuator

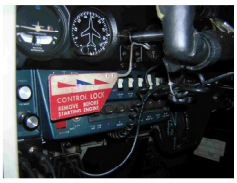
This then pushes hydraulic fluid (pink/orange colour)

Hydraulic fluid squeezes the brake pads against the brake disc

Friction from the disc slows the tyre

AIRFRAMES: SAFETY PRECAUTIONS

GROUND SCHOOL



CONTROL LOCKS
Can be internal or external
Prevent control surface being damaged by high winds

PITOT COVERS

Prevent pitot tubes becoming blocked by ice / insects etc

AIRFRAMES: SAFETY PRECAUTIONS

GROUND SCHOOL

AIRCRAFT COVERS AND TIE DOWNS
Prevent icing up, water ingress and the aircraft not being there when you return to it!

WHEEL CHOCKS

Used on slopes or when the pilot does not trust the parking brake

GROUND SCHOOL

AIRFRAMES: SAFETY PRECAUTIONS

ENSURE all control locks, covers, tie downs and chocks are removed before attempting to taxy or fly!

GROUND SCHOOL

PRACTICE QUESTION!

What does an aircraft "creep" mark look like and what is it for?

Painted mark on tyre / wheel to show whether the tyre has moved in relation to its original fitted position

GROUND SCHOOL

Lecture complete

Any Questions?