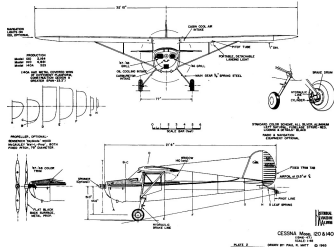


AIRCRAFT GENERAL KNOWLEDGE 3



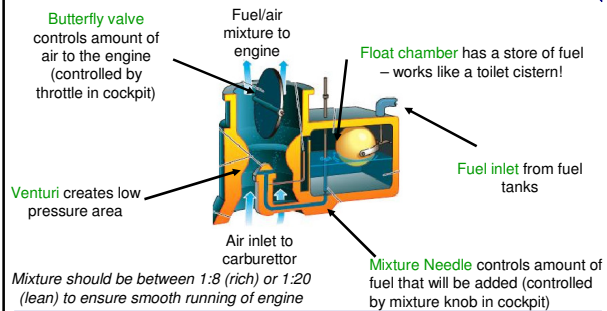
LECTURE THREE: FUEL

1. Carburettors & Fuel Injection
2. Fuel Systems
3. Fires



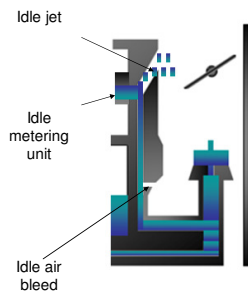
CARBURETTORS: BASICS

The carburettor is where the fuel and air is mixed prior to entering the cylinders



CARBURETTORS: IDLING JET

GROUND
SCHOOL



When throttle butterfly is almost closed the pressure differential between venturi and float chamber is very small

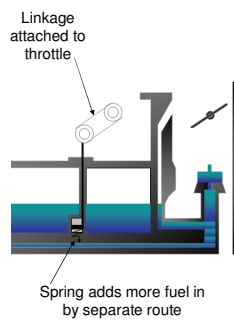
Can cause a "idle cut off" when all fuel flow stops to the engine

Idle jet experiences enough pressure differential and feeds small amount of fuel in downstream of butterfly



CARBURETTORS: ACCELERATOR PUMP

GROUND
SCHOOL



If throttle is opened rapidly the amount of air increases initially at a greater rate than the fuel

This would cause the engine to lag and maybe a "weak cut"

Accelerator pump is activated when throttle gets to full power and "spurts" extra fuel into the carburettor



CARBURETTORS: MIXTURE CONTROL

GROUND
SCHOOL

Engines are designed to run at standard sea level (1013.2 hPa and +15°C)



At altitude there is "less" air and so the aircraft will have too much fuel in comparison to air

The mixture knob / lever can be used to select the best mixture



During climb, mixture should be rich to aid engine cooling
In cruise, lean the mixture to obtain the best fuel/air ratio and best fuel economy



CARBURETTORS: MIXTURE CONTROL

GROUND
SCHOOL



It is safer to shut down an engine using the mixture control at 'idle cut off'

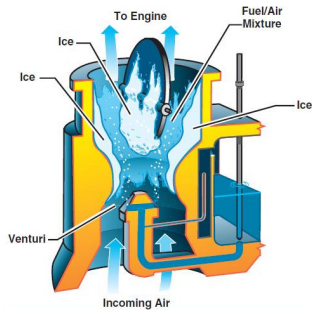
In this way there is no fuel in the lines and if a magneto has failed and is still live, the engine will not start if someone turns the propeller

Fuel is cut off between float chamber and venturi



CARBURETTORS: ICE

GROUND
SCHOOL



CARBURETTOR ICE can form in temperatures up to $+30^{\circ}\text{C}$

As air passes through the VENTURI, it is forced to speed up and this causes the temperature to decrease

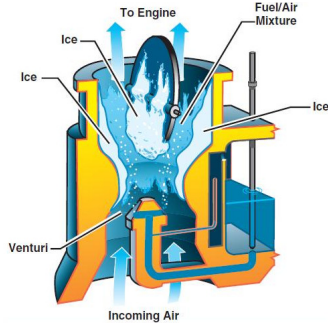
If the air is moist then ICE will form and may block airflow into the engine

This causes ENGINE ROUGH RUNNING and even ENGINE STOPPAGE



CARBURETTORS: ICE

GROUND
SCHOOL



This is more likely at LOW POWER SETTINGS where the gap between the THROTTLE BUTTERFLY and the outer wall of the carburettor is smaller

Carburettor icing is ALWAYS likely when the temperature is below $+30^{\circ}\text{C}$ and the aircraft is within 200nm of any sea surface

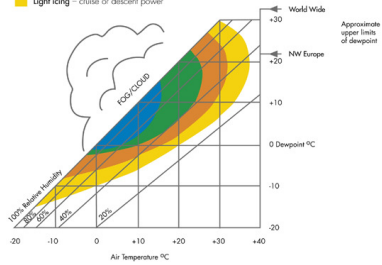
This must be probably on about 99% of days in the UK!



CARBURETTORS: ICE

GROUND
SCHOOL

- Serious icing – any power
- Moderate icing – cruise power
- Serious icing – descent power
- Serious icing – descent power
- Light icing – cruise or descent power



CARBURETTORS: ICE

GROUND
SCHOOL



ALWAYS use CARB HEAT selected to ON / HOT when using throttle settings below the GREEN ARC on the RPM gauge

Check for CARB ICE every 10-15 minutes by selecting CARB HEAT to ON / HOT for at least 30 seconds



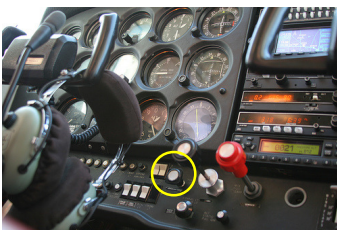
The RPM should drop due to the hotter air entering the engine and the engine should run smoothly

If the RPM does not fall, or RISES when carb heat is on, or the engine runs rough then you have carburettor ice!



CARBURETTORS: ICE

GROUND
SCHOOL



What do you do if you have carburettor icing?

Natural instinct when engine runs rough is to put the carb heat back into the off / cold position

DO NOT DO THIS!

LEAVE the carb heat selector in the ON / HOT position until the engine has been cleared of ice

Then do checks more regularly!




GROUND SCHOOL

PRACTICE QUESTION!

In what flight condition is carburettor ice most common – climb, descent or cruise?

Descent (with low power setting)



GROUND SCHOOL

FUEL INJECTION

Not all aircraft have carburettors – they use fuel injection instead

✓


ADVANTAGES

No fuel ice, no carburettor ice, better control of fuel/air ratio, easier maintenance, instant acceleration, increase efficiency of engine

DISADVANTAGES

Hot starts are more difficult, small fuel lines are easier to block, surplus fuel may be vented overboard

✗




GROUND SCHOOL


FUEL: CLASSIFICATION OF AERO FUEL

AVGAS ONLY

GRADE 100



GRADE 100LL




CAP. 20.0 US GAL
SALE FUEL 19.2)

AVGAS100LL

Aviation Gasoline (AVGAS)
100LL is used in the UK
(100 is the octane level, LL is low lead)

Colour of AVGAS 100LL is blue



FUEL: CLASSIFICATION OF AERO FUEL

GROUND
SCHOOL



Aviation Jetfuel (JET A1)

Colour of fuel is **straw**

JET A1

Always confirm the fuel that your aircraft uses!



FUEL: CLASSIFICATION OF AERO FUEL

GROUND
SCHOOL



Motor Gasoline (MOGAS)

Subject to rigorous conditions of use

CAA Safety Sense Leaflet 4A and
Airworthiness Notice 98 refer

Can only be used in certain aircraft

FUEL TYPE AND GRADE	COLOR OF FUEL	EQUIPMENT COLOR
AVGAS 80	RED	RED AVGAS
AVGAS 100	GREEN	GREEN AVGAS
AVGAS 100LL	BLUE	BLUE AVGAS
JET A	COLORLESS OR STRAW	JET A



FUEL: INSPECTION

GROUND
SCHOOL



Before flight all drain points on the aircraft should
be inspected for fuel contamination

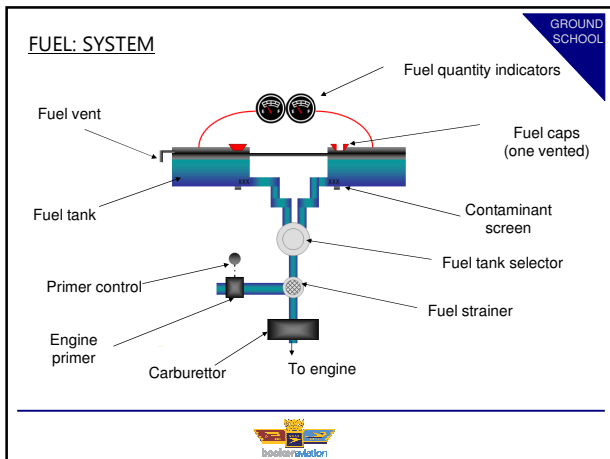
Check colour is correct
(don't check avgas is blue by holding up tester to a
blue sky!)

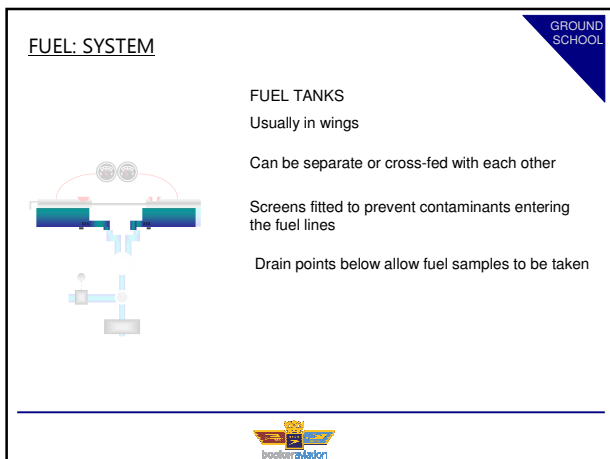
Check no "bits" in the strainer
(metal, dirt, paint etc)

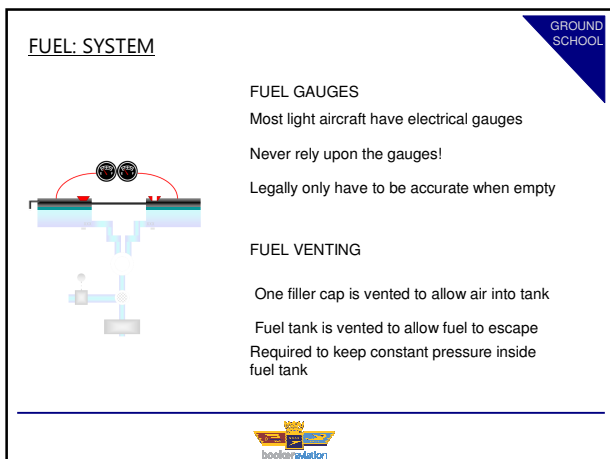
Check no water is in the strainer
(it will sink to the bottom because it is heavier)

Check smell
(however be aware that only a small amount of fuel
will cause water to smell)



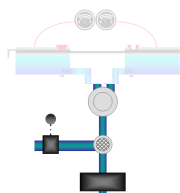






FUEL: SYSTEM

GROUND
SCHOOL



TANK SELECTOR

To select individual tanks (in Cessna 152/172 the fuel is crossfed from both tanks at the same time)

FUEL STRAINER

Allows fuel sample to be taken from lowest point in system

PRIMER

Allows neat fuel to be fed direct into cylinders for starting (use during flight would cause a rich cut)

In low winged aircraft a fuel pump will be required for starting to begin flow of fuel.
High wings rely on gravity.



PRACTICE QUESTION!

GROUND
SCHOOL

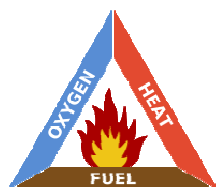
As the aircraft climbs the air density increases/decreases and so the fuel/air mixture becomes weaker/richer

Air density – decreases
Fuel/air mixture – becomes richer



FIRES

GROUND
SCHOOL




All fires associated with aircraft can be dangerous –
always know how to extinguish each type of fire that
could occur

Most extinguishers work on eliminating one side
of the "fire triangle"





FIRES: EXTINGUISHERS


GROUND SCHOOL




WATER extinguishers used for:

Wood


Paper

Cloth





FIRES: EXTINGUISHERS


GROUND SCHOOL





FOAM extinguishers used for:

Wood

Paper


Cloth

Flammable Liquids



FIRES: EXTINGUISHERS

GROUND SCHOOL



CARBON DIOXIDE extinguishers used for:

Flammable Liquids

Electrical Fire



FIRES: EXTINGUISHERS

GROUND SCHOOL

DRY POWDER extinguishers used for:



Flammable Liquids

Flammable Gases



Electrical Fires

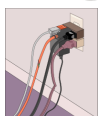
Wheel Fires



FIRES: EXTINGUISHERS

GROUND SCHOOL

BCF HALON extinguishers used for:



Anything!

BCF Halon is now illegal in the UK except in an aviation setting

With all extinguishers – ALWAYS ventilate well after usage to ensure you don't run out of oxygen!!



PRACTICE QUESTION!

GROUND SCHOOL

Which is the safest extinguisher to use on a wheel fire

Dry powder



Lecture complete
Any Questions?