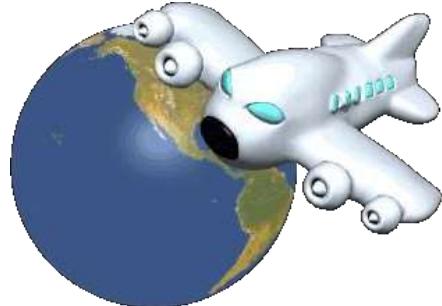


Aeronautics and Aviation

Content Delivery:
Aakansha
Rajeeth



What Is Aeronautics?

Aeronautics is the study of science of flight.

Aeronautical Engineering is the science involved with the study, design, and manufacture of flight-capable machines, or the techniques of operating aircraft.

It involves the use of Aerodynamic science to design and construct flying crafts.



What Is Aviation?

Aviation is an aspect of Aeronautics. It deals with the construction, flying and maintenance of an aircraft.

In a broad sense it is referred to as an industry or a system that controls the operation and maintenance of aircrafts.

The scope of management of standards and rules that govern the aircraft industry also falls under its definition.

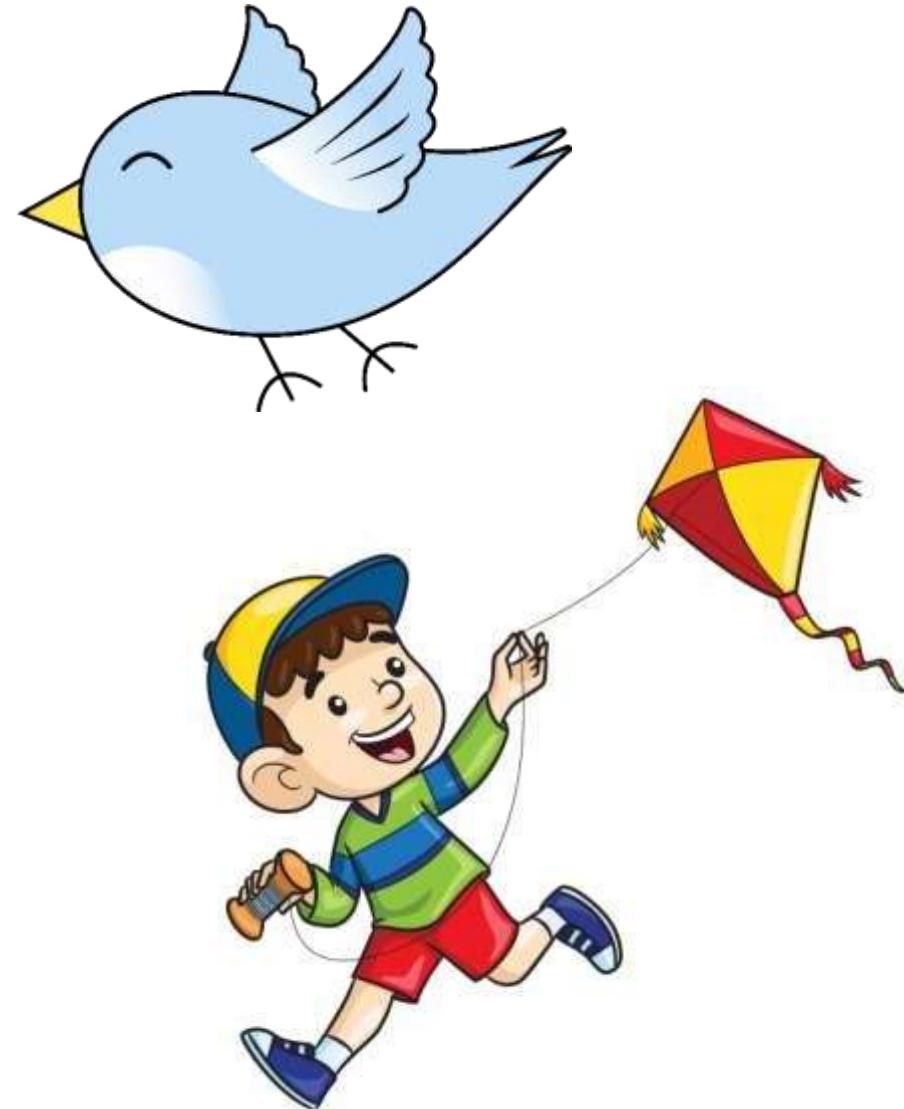
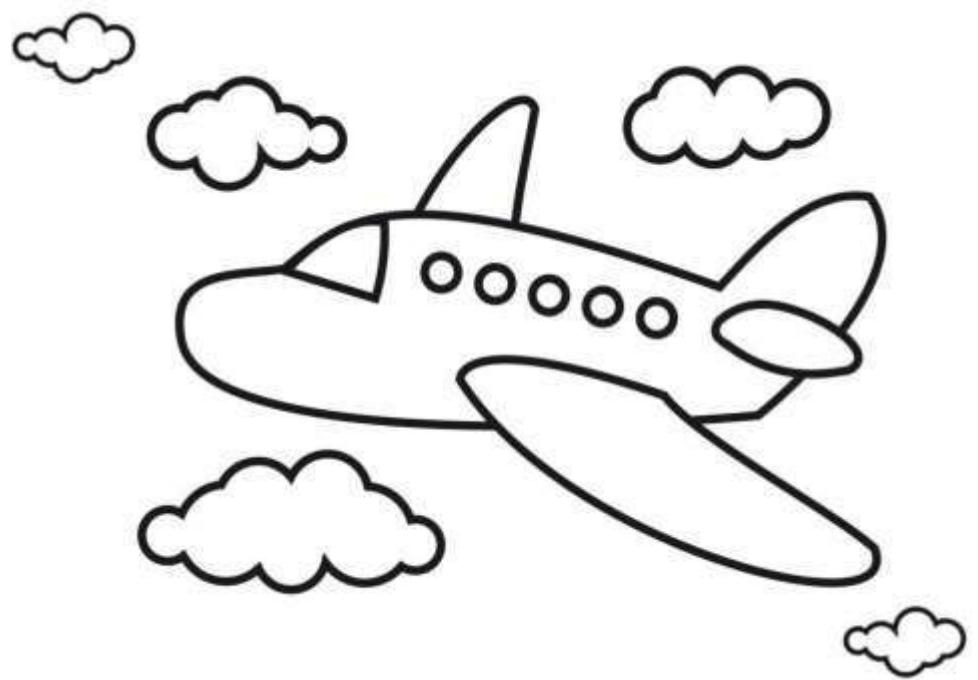




How does an aircraft fly?

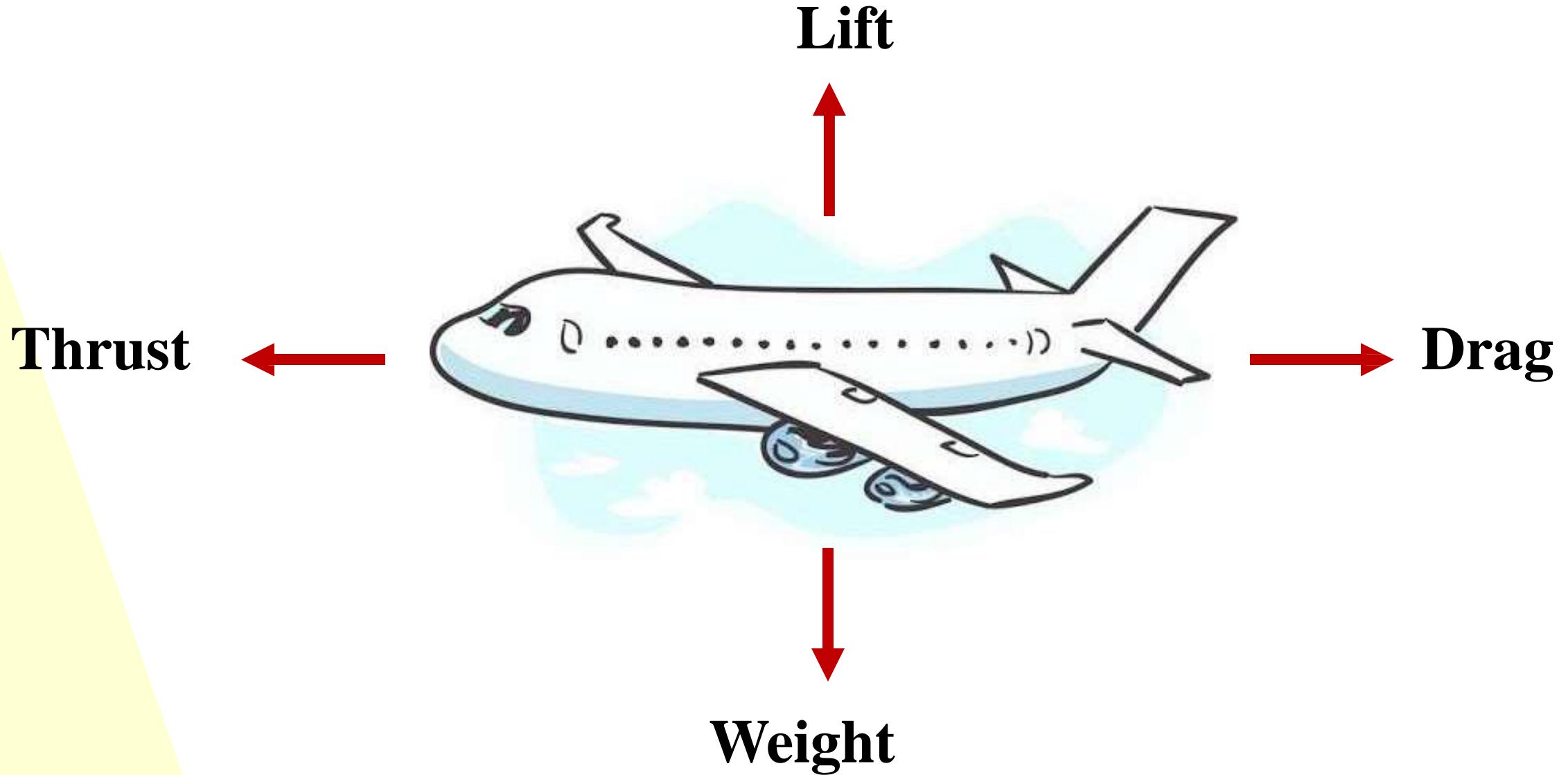


What do they all have in common?



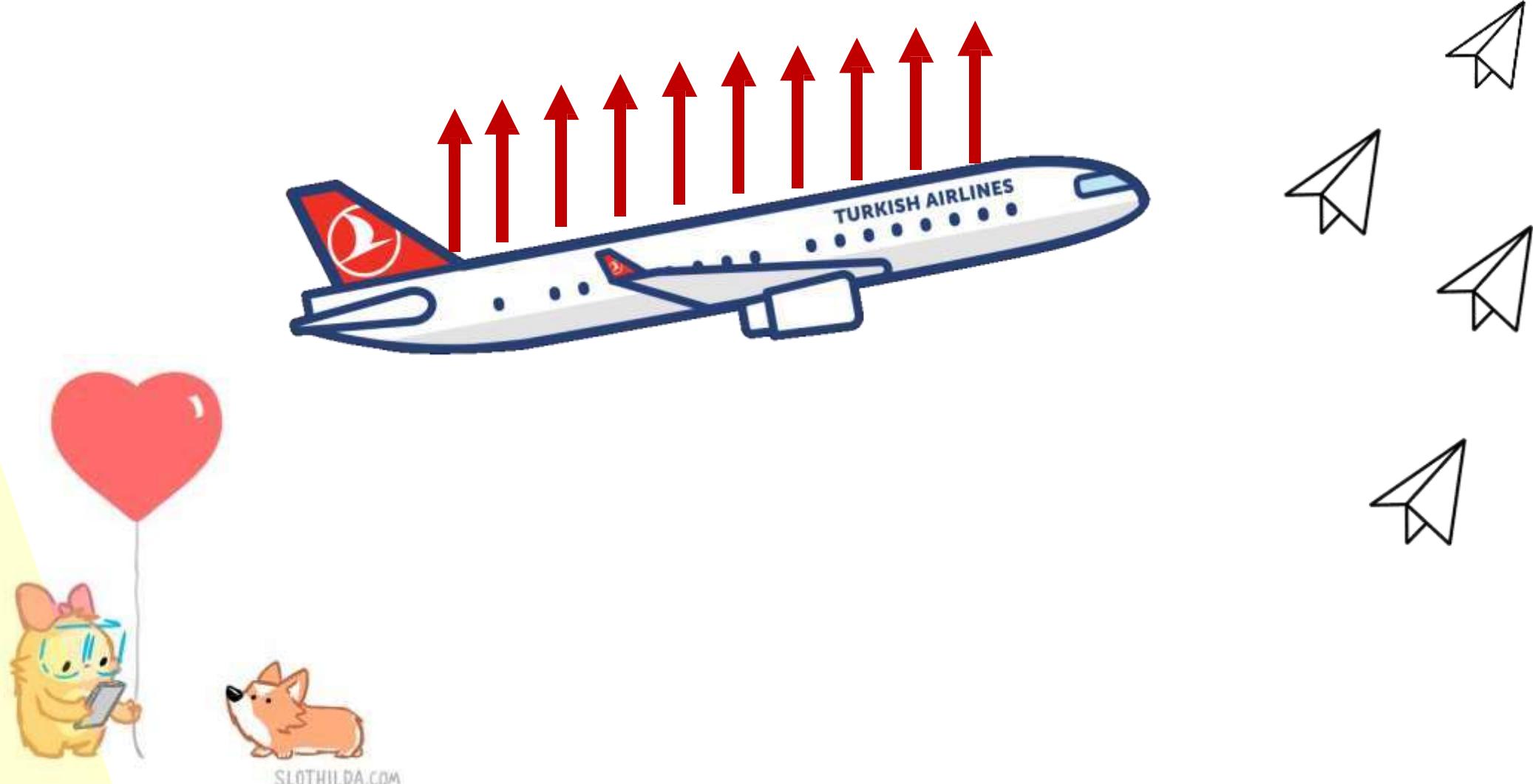
They all can fly!!!

There are four forces that act on an airplane



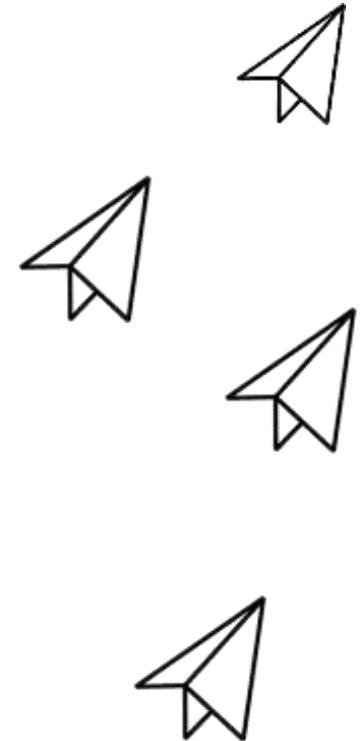
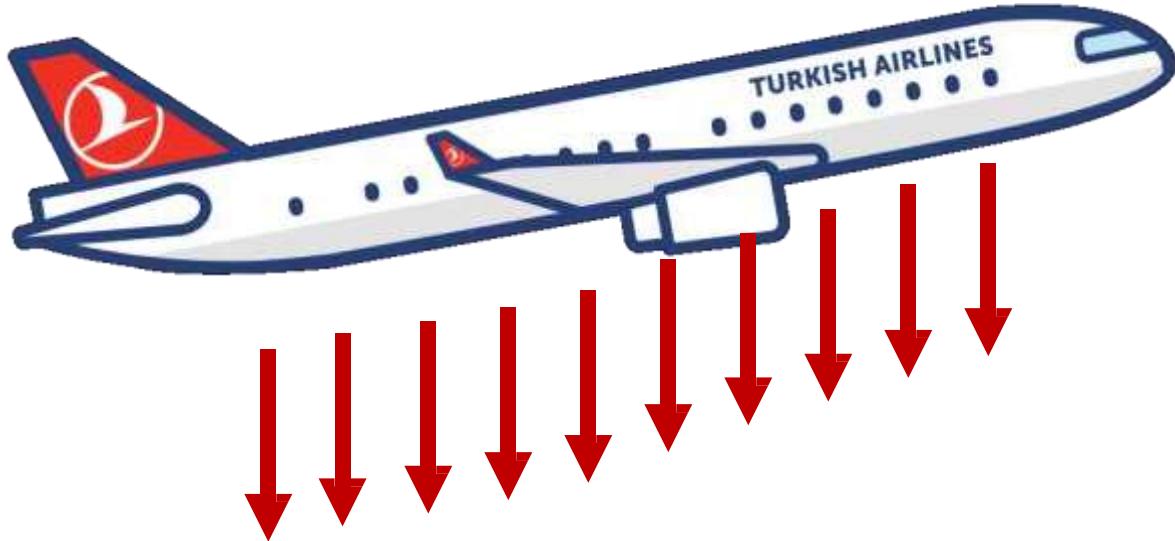
Lift

It is the force that lifts up the aircraft



Weight

It is the force that pulls down the aircraft towards Earth due to gravity



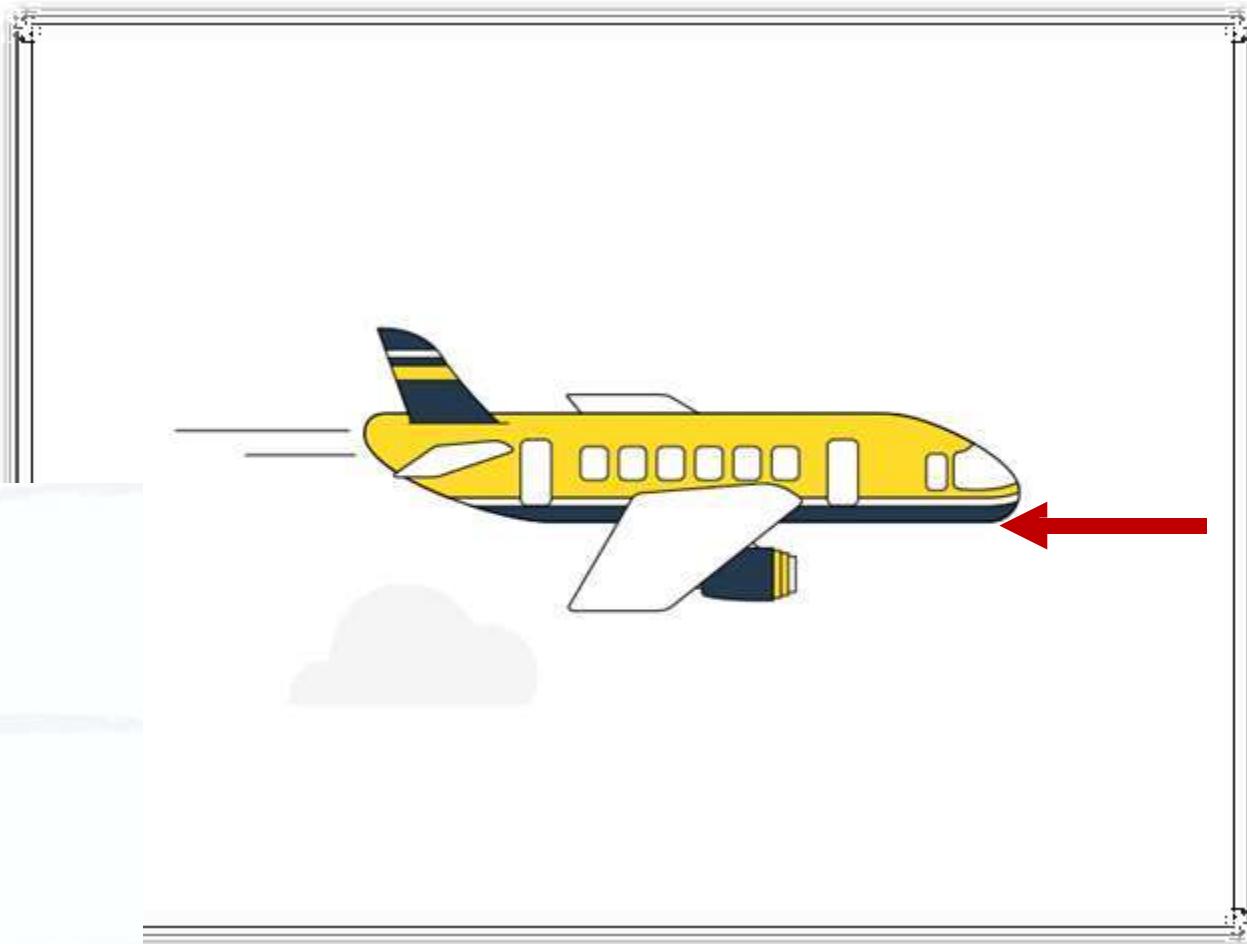
Thrust

It is the force that propels the aircraft forward.

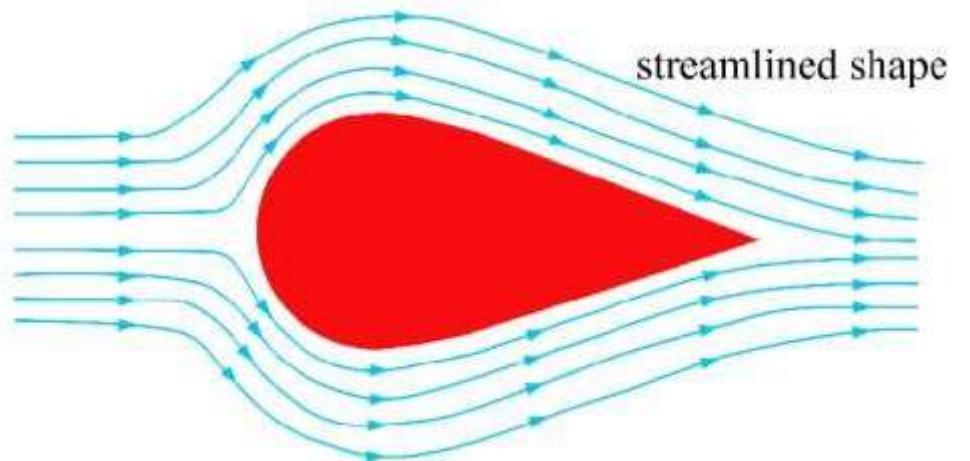
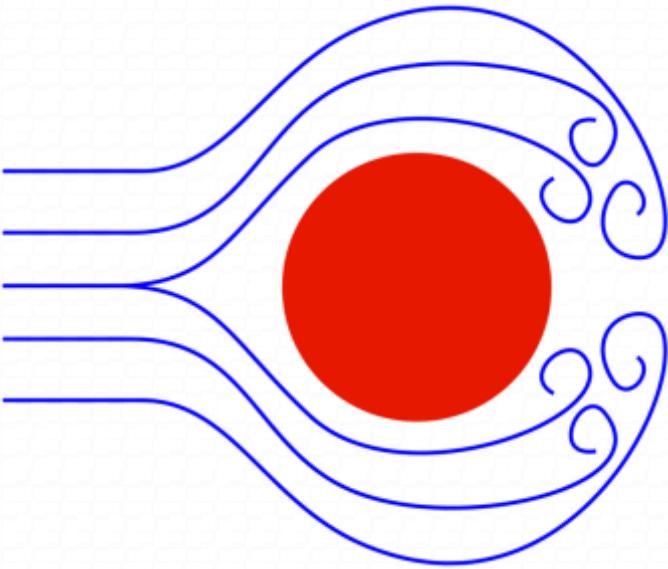
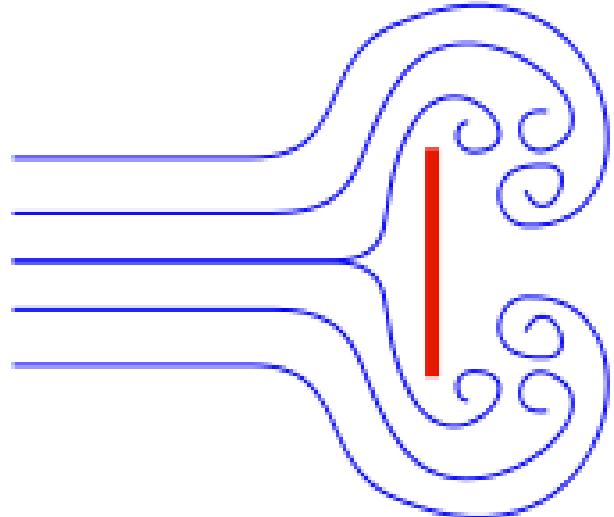


Drag

It is the force that resists the aircraft from going forward



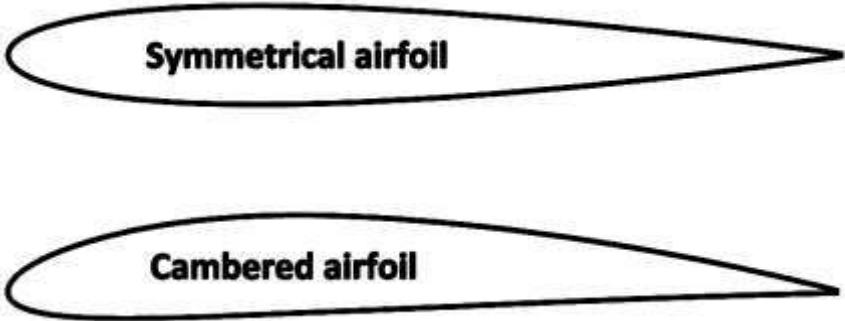
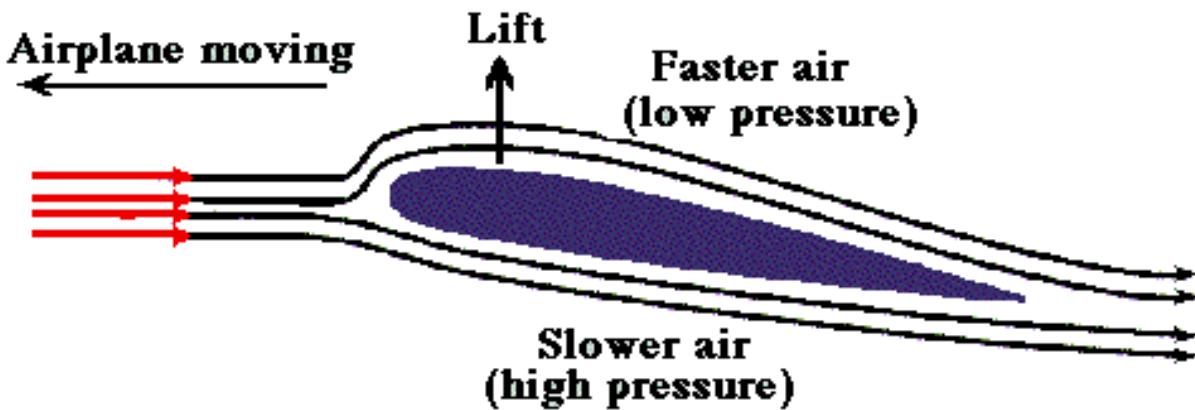
How do different shapes affect drag?

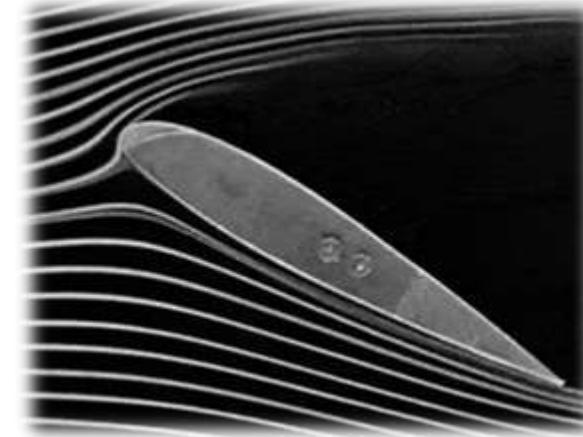
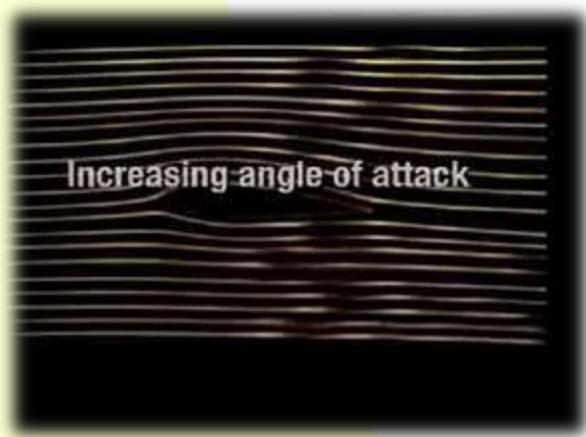
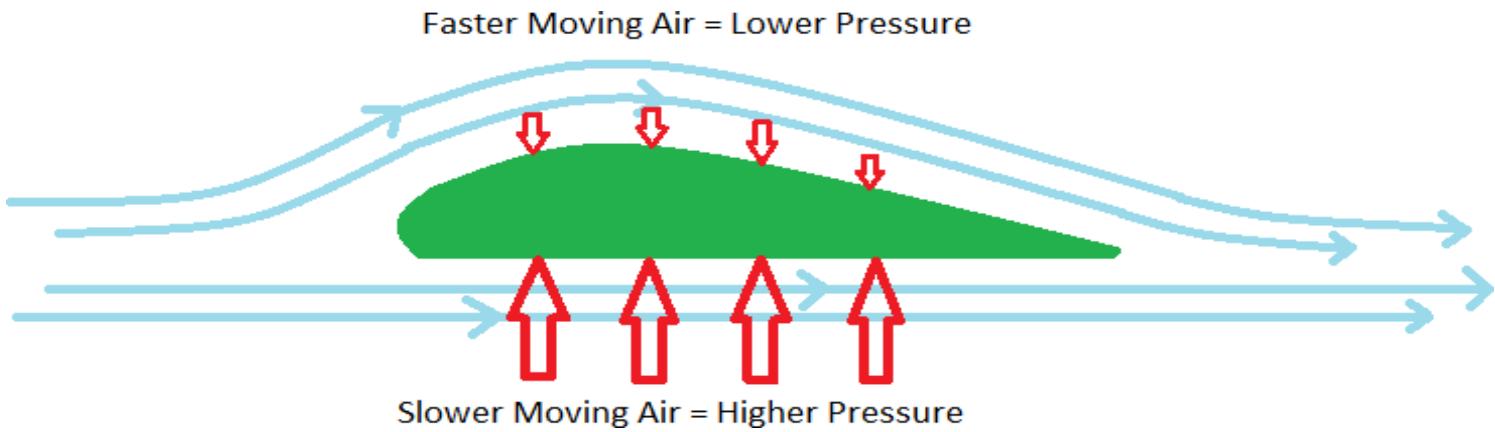


What is an Airfoil?

It is a streamlined shape designed to generate a useful reaction force using the flow around it

How does it work?

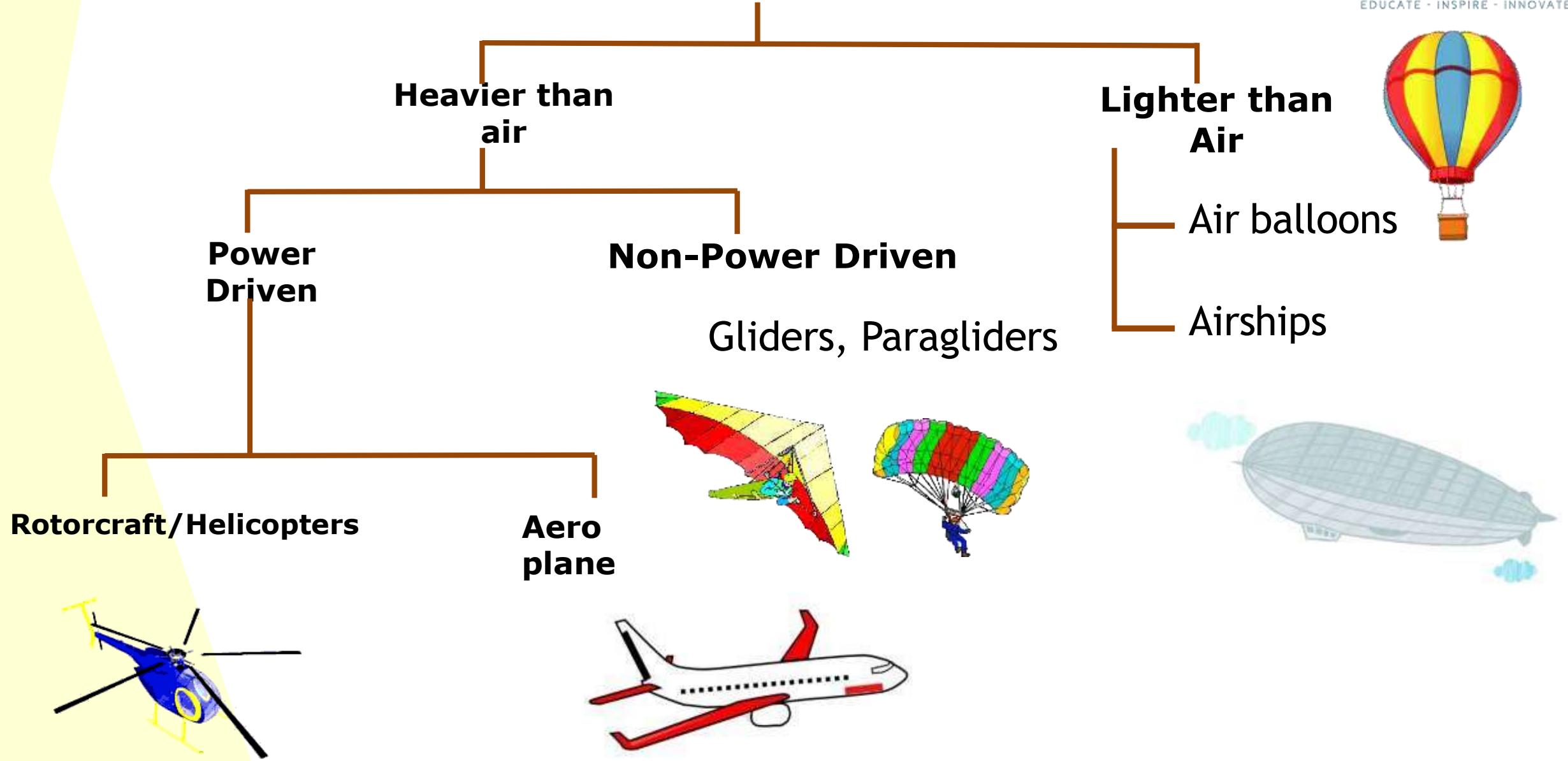




How Do Planes Fly? – Thinking Captain

Source:<https://www.youtube.com/watch?v=wFTHh-6jIT8>

Aircrafts



ALL TYPES OF AIRCRAFT CLASSIFIED

AEROSTAT (*Lighter-than-air Aircraft*)

BALLOON



FREE BALLOON



CAPTIVE BALLOON



KITE BALLOON

AERODYNE
(*Heavier-than-air Aircraft*)

AIRSHIP



NON-RIGID



RIGID



SEMI-RIGID



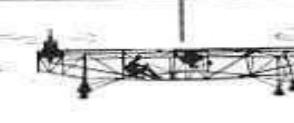
KITE



GLIDER



GYROPLANE



HELICOPTER



ORNITHOPTER

AEROPLANE



LANDPLANE



FLOATPLANE



FLYING BOAT

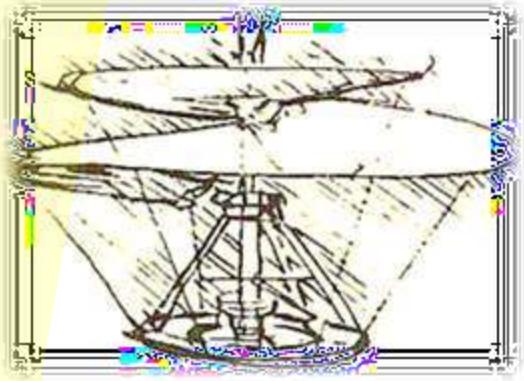
AMPHIBIAN



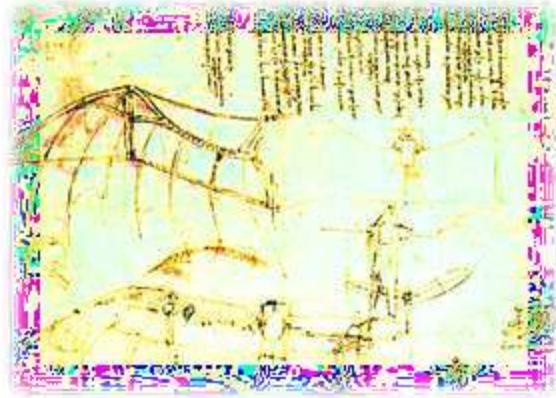
FLOAT AMPHIBIAN



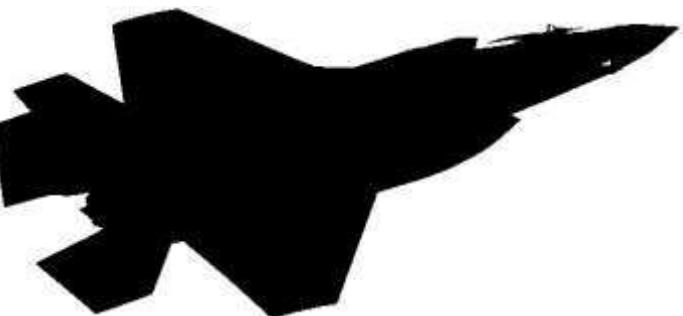
BOAT AMPHIBIAN



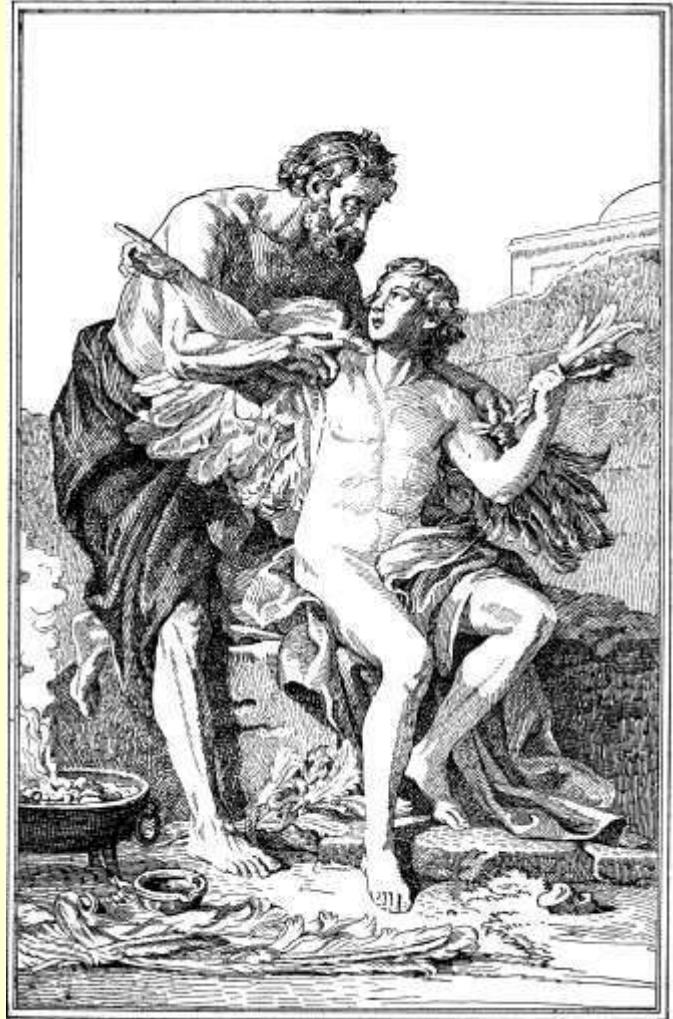
Awe and Aves



*Through the legends
and pages of history ...*



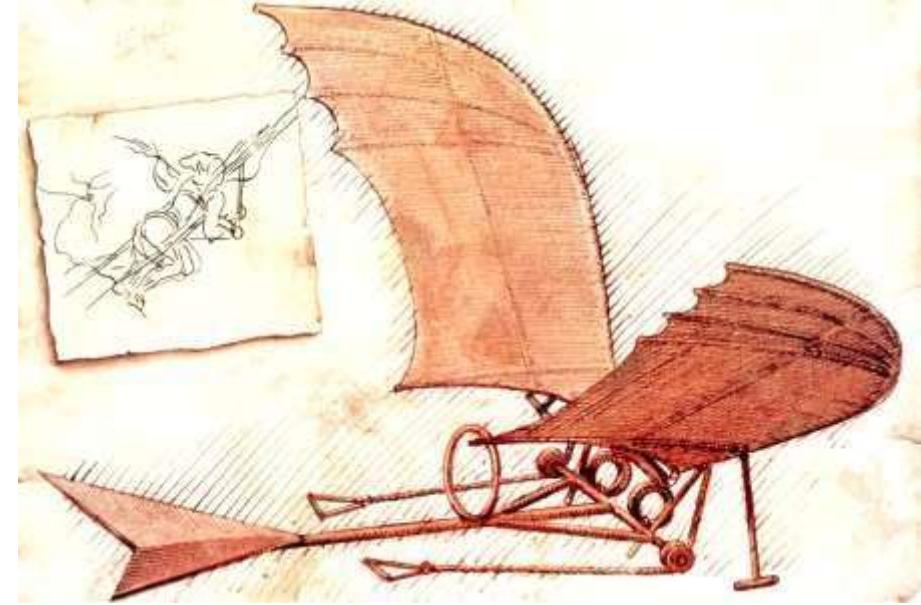
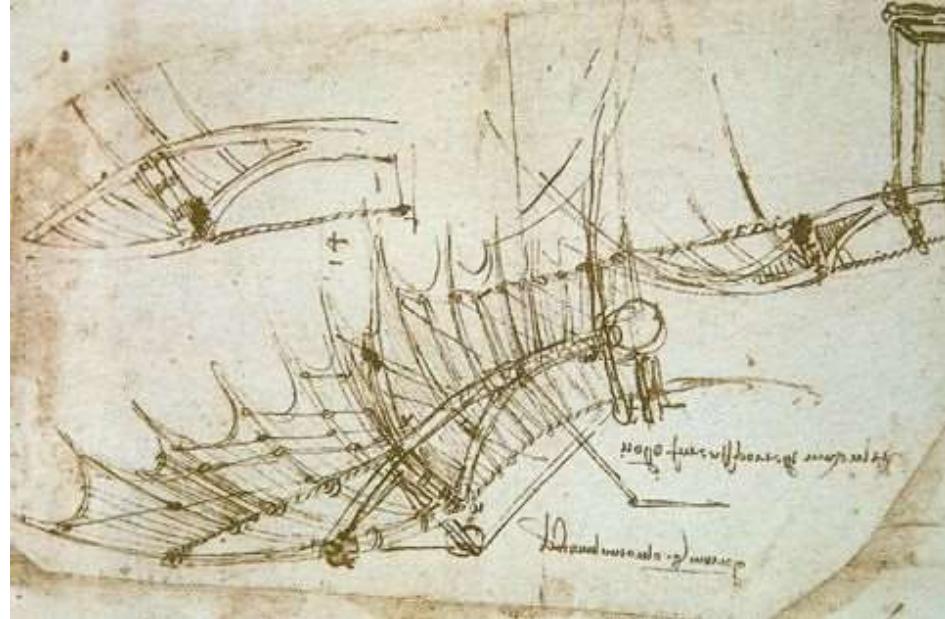
The legend of Daedalus



As the Greek legend has it, an Athenian inventor named Daedalus was the first human to fly. In his attempt to escape from an island, he designed two pairs of wings by using wax procured from the forest on the island and fallen feathers of birds.

This tale inspired many early scholars and inventors to devise flying wings for human flight. However the results of such methods were often disastrous and people met tragic end.

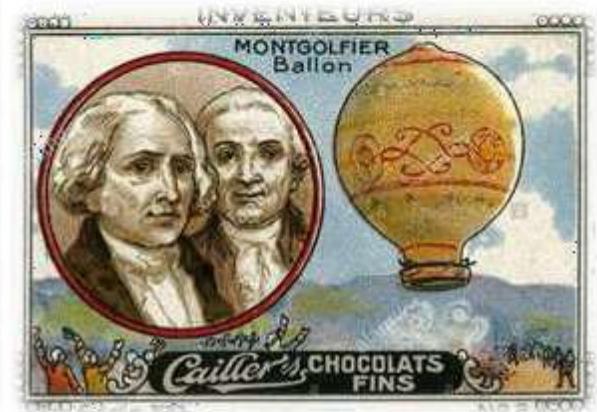
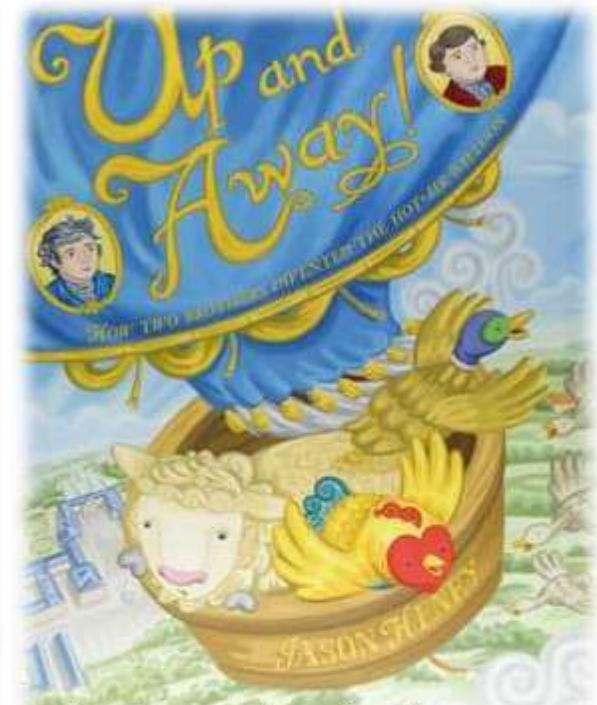
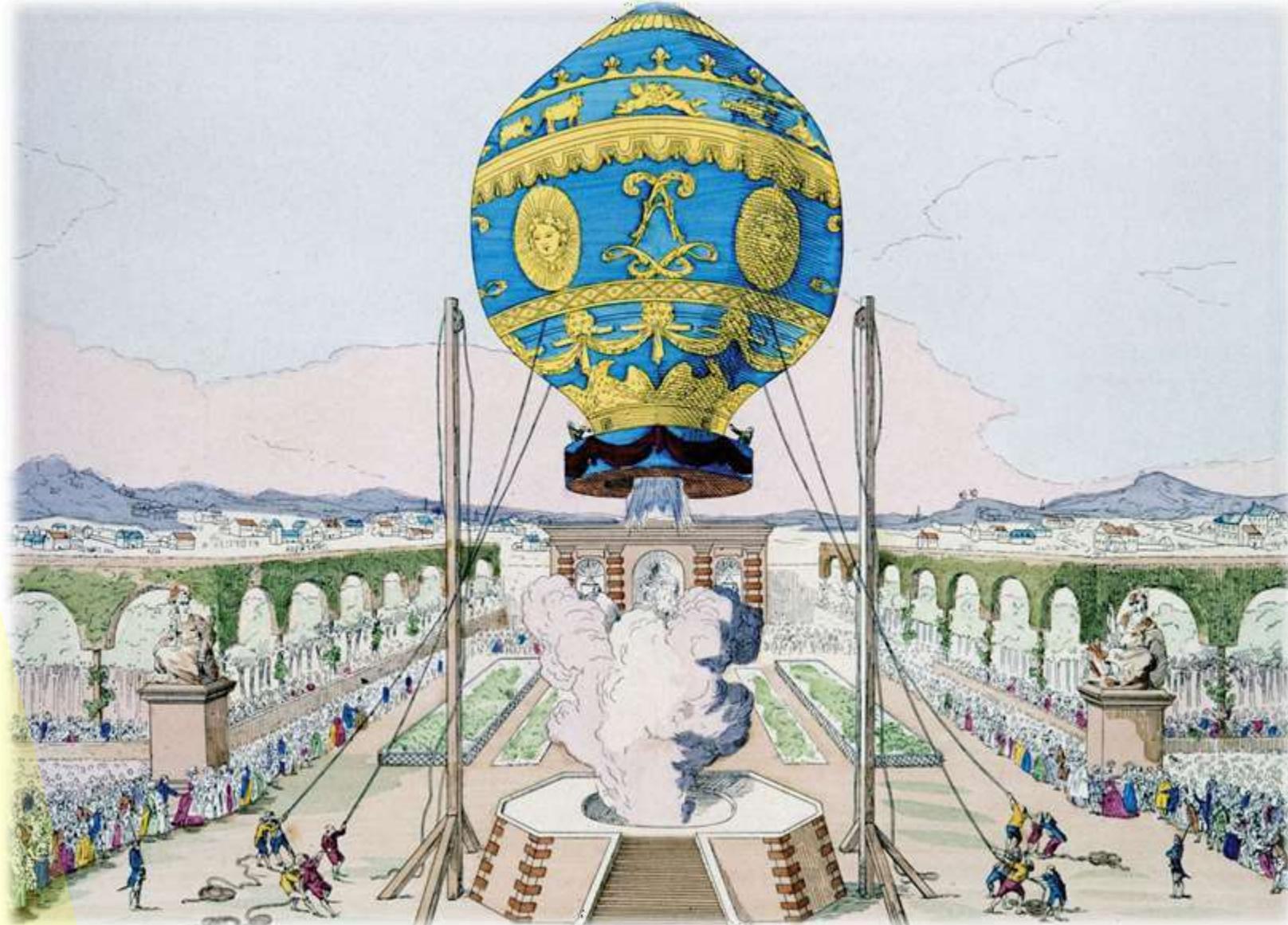
Da Vinci's Flying Machine



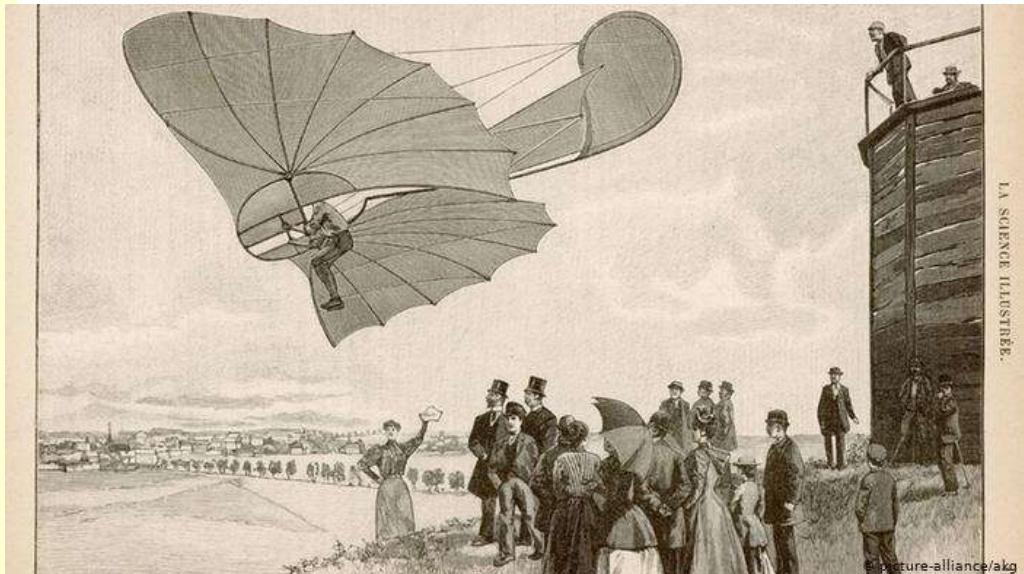
In 15th century, Leonardo da Vinci came up with a design using flapping wing mechanism called Ornithopter. The wings were designed to be powered by human muscles.

Many such designs were developed in the later centuries but were not able to achieve successful flights.

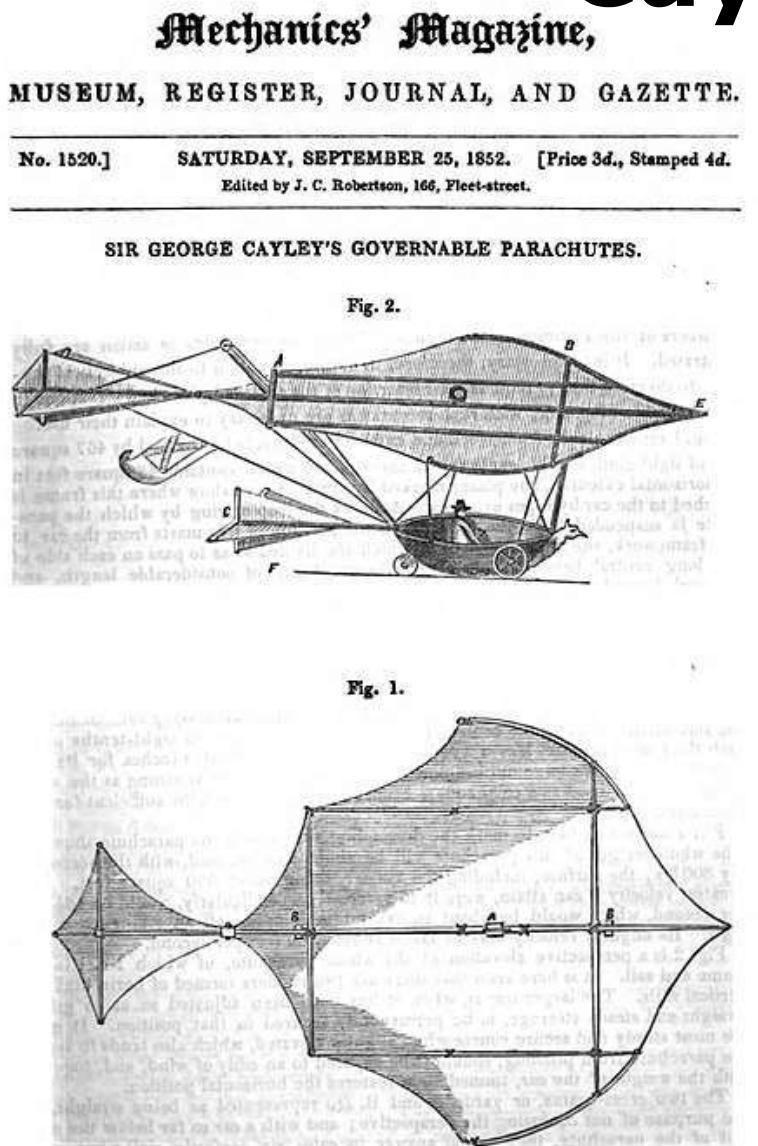
Montgolfier brothers and hot air balloons



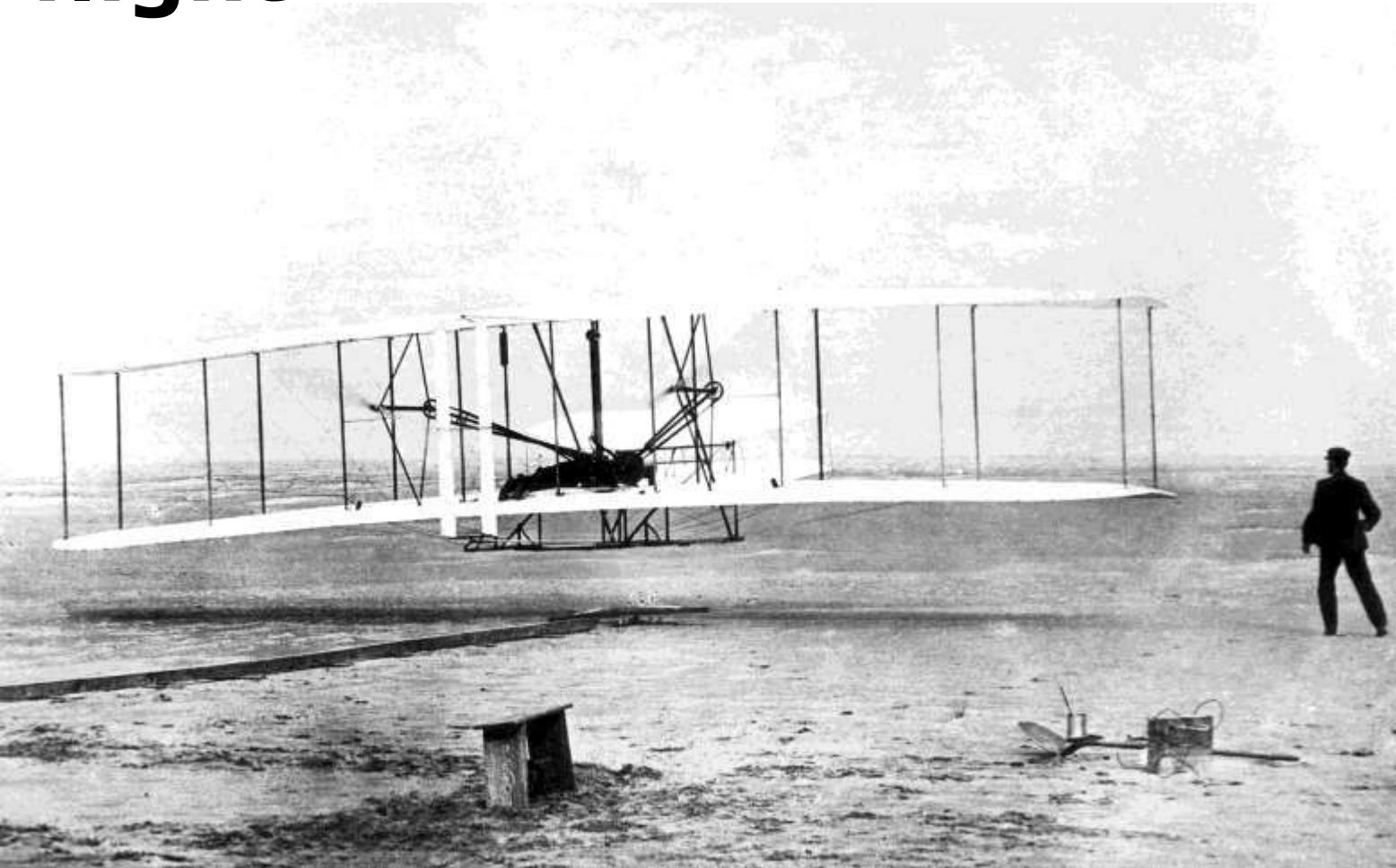
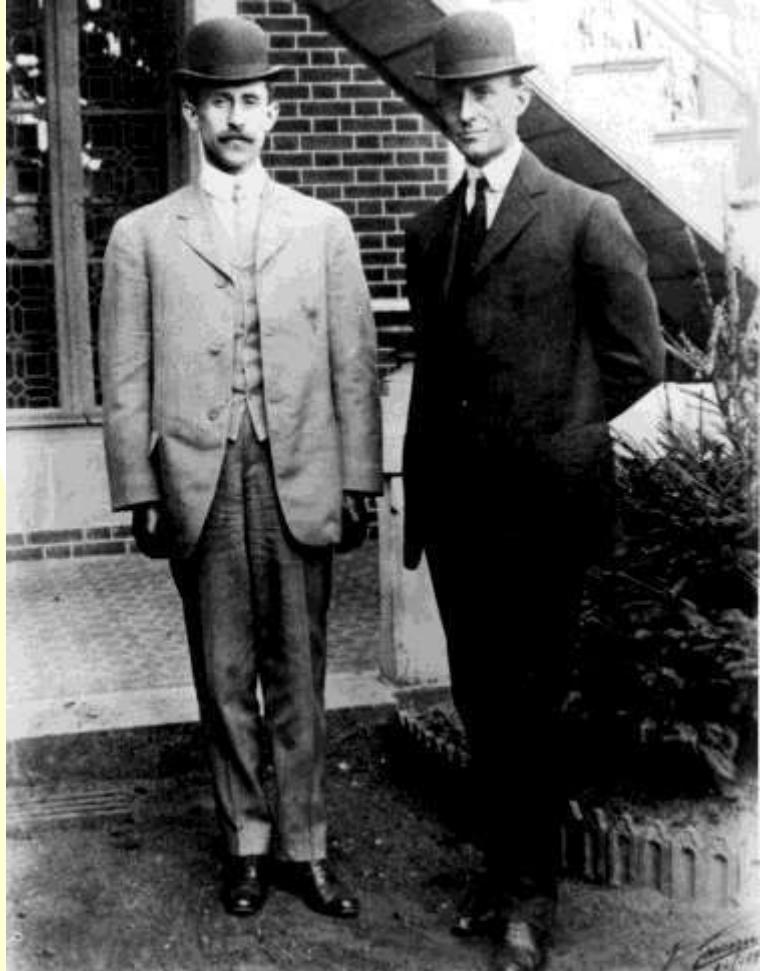
Otto Lilienthal and his gliders



Father of Aeronautics – Sir George Cayley



Wright Brothers and the first powered flight





Wright Brothers First Flight 1903

Wright Brothers First Flight, 1903 – Old Movie Collector

Source: <https://www.youtube.com/watch?v=kRLQ-KBc>

What is propulsion?

Propulsion is the act of moving or pushing an object forward.

The word is derived from two Latin words:

pro – meaning before or forward

pellere – meaning, to drive



A propulsion system is an engine that produces thrust to push an object, such as an airplane or rocket



What is propulsion?

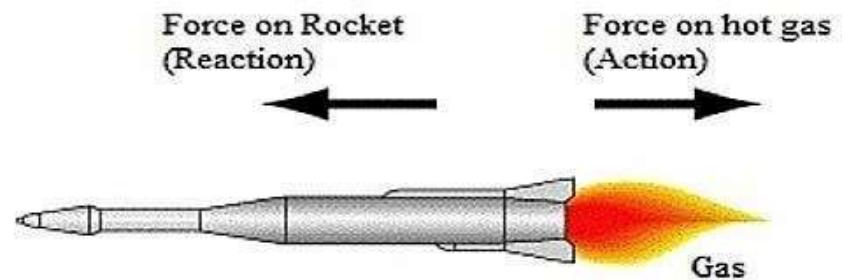
Propulsion is the act of moving or pushing an object forward.



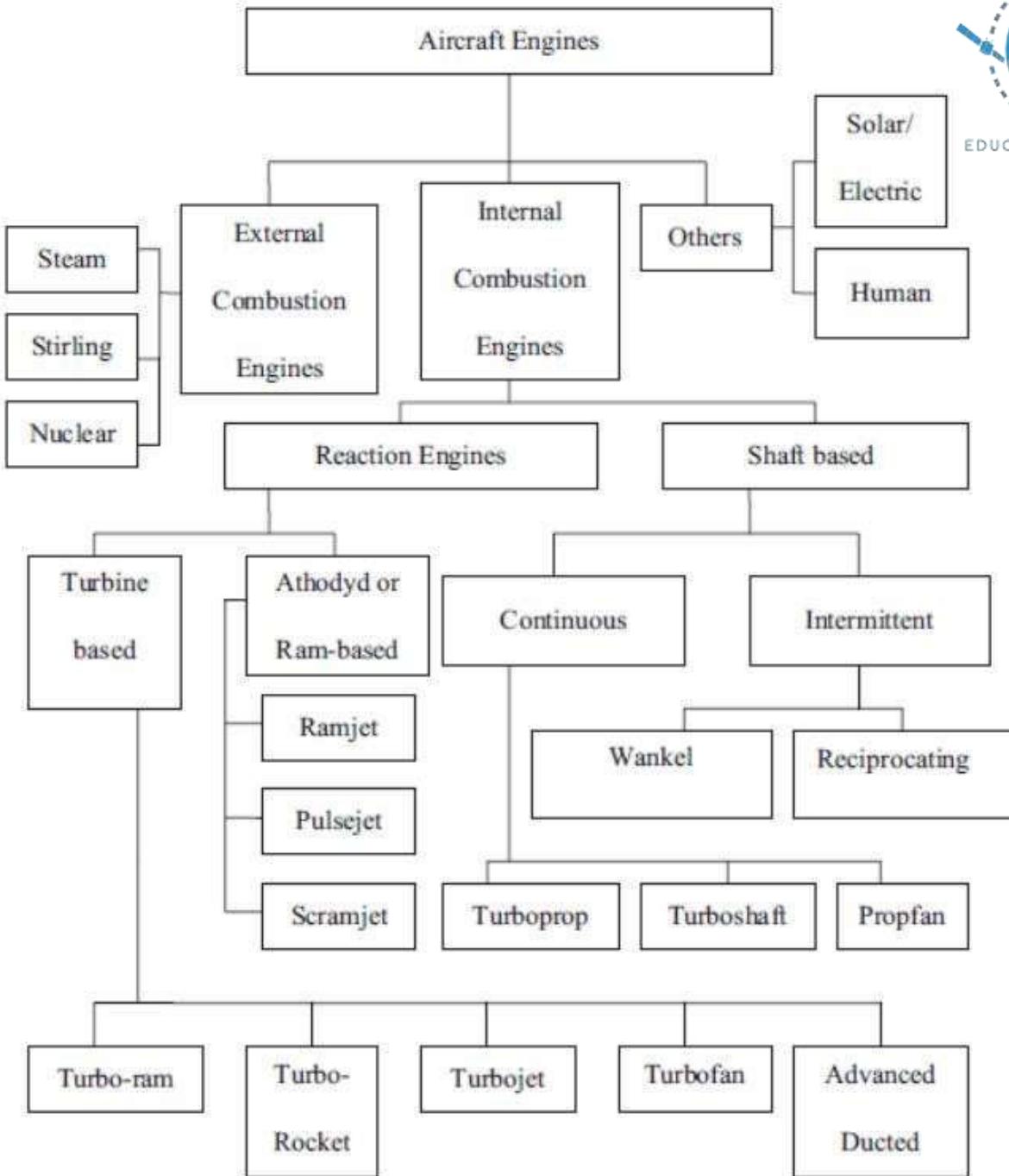
From rowing a boat to firing a rocket...



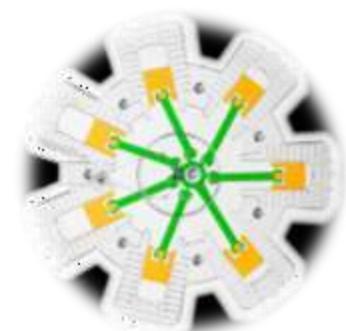
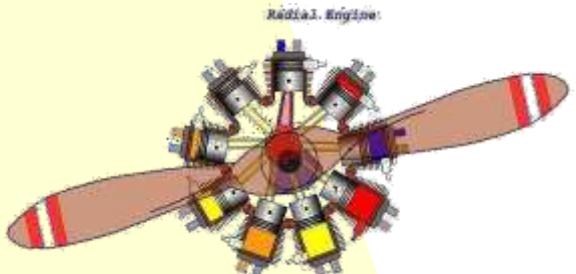
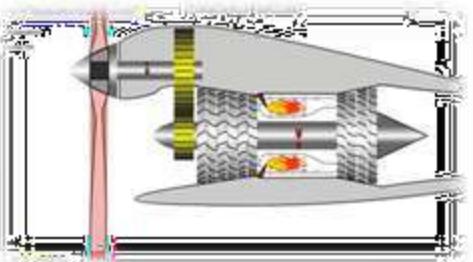
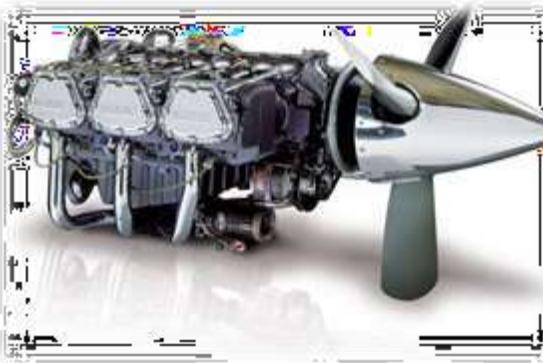
Newton's Third Law of Motion



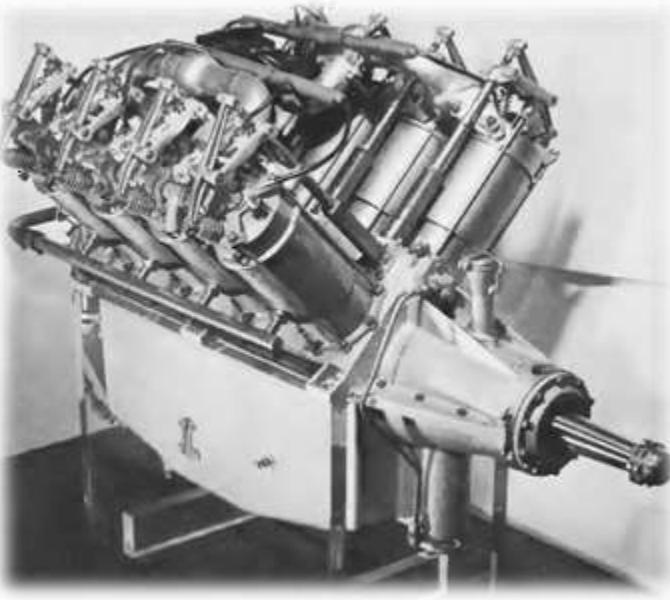
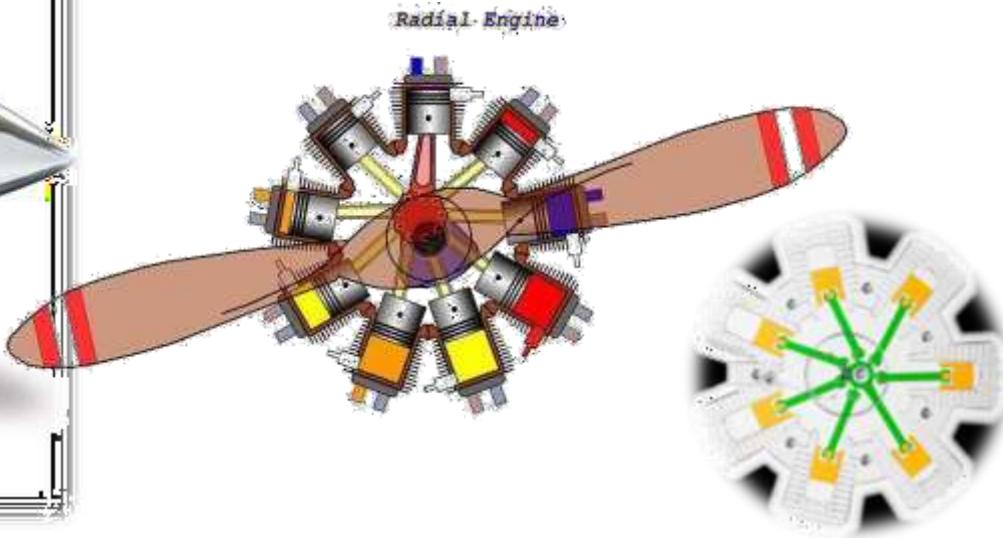
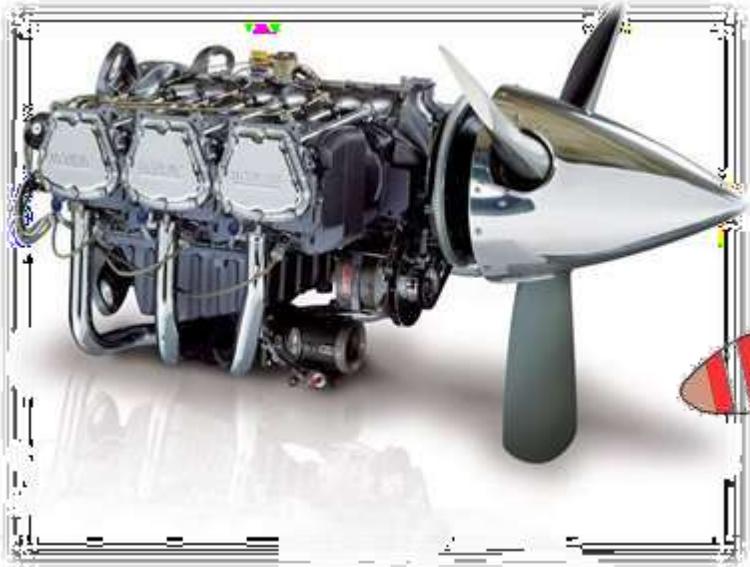
Classification of Aircraft Engines



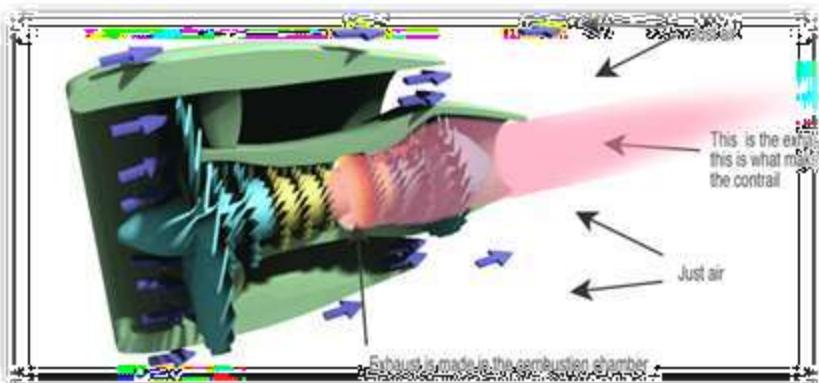
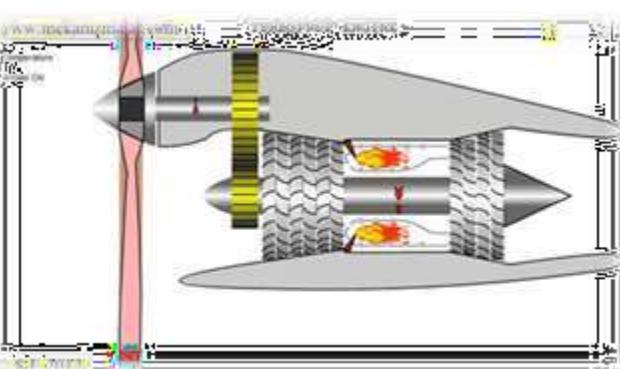
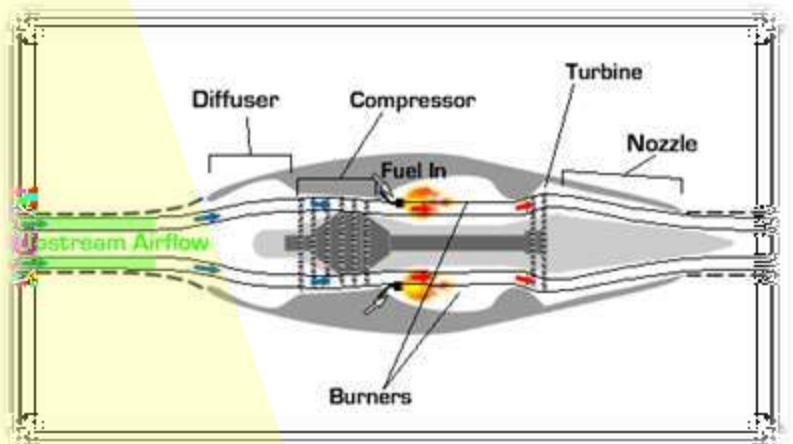
Aircraft Engines



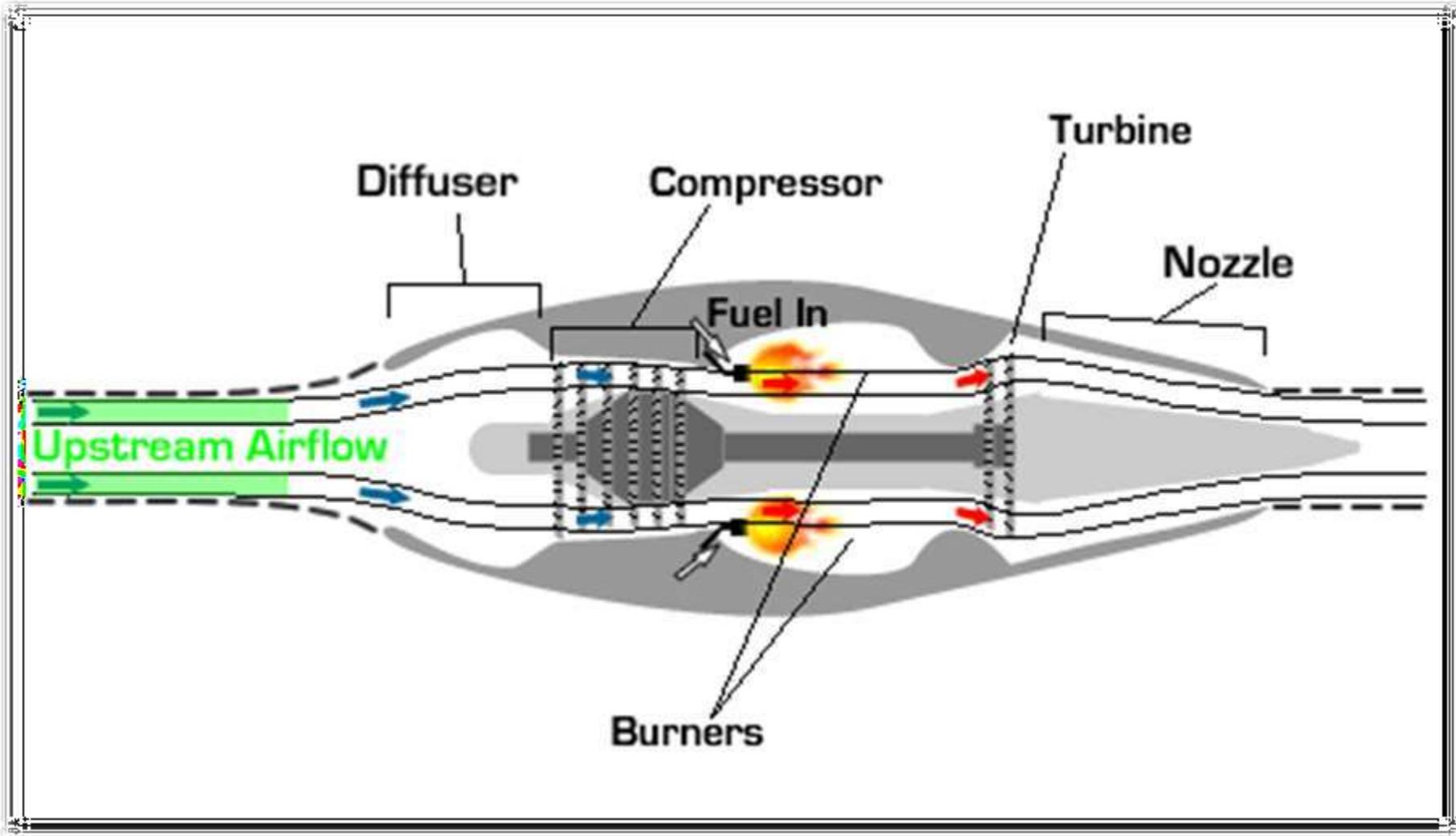
Piston Propeller Engines



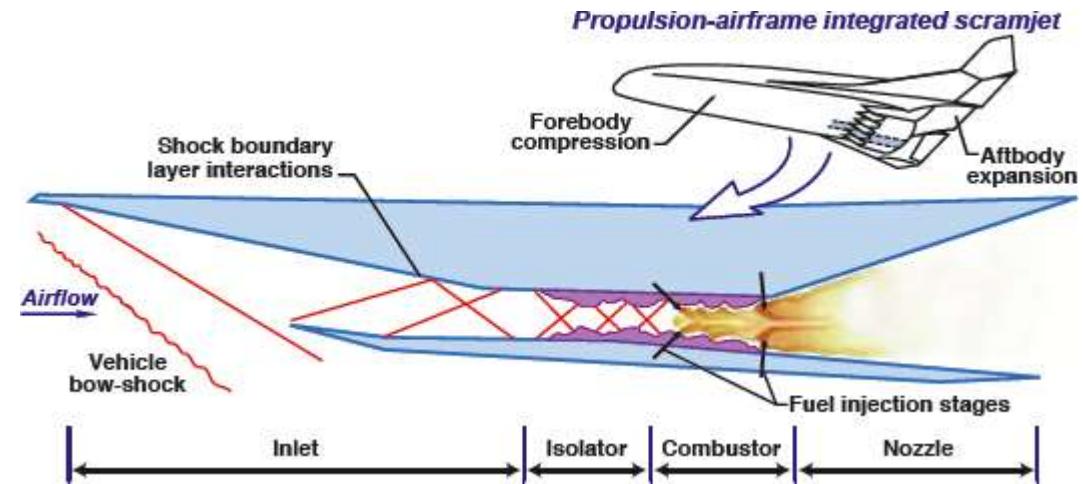
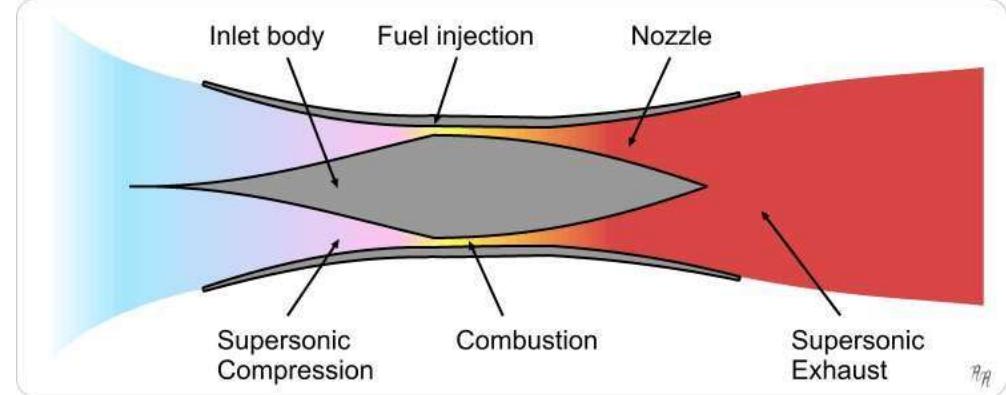
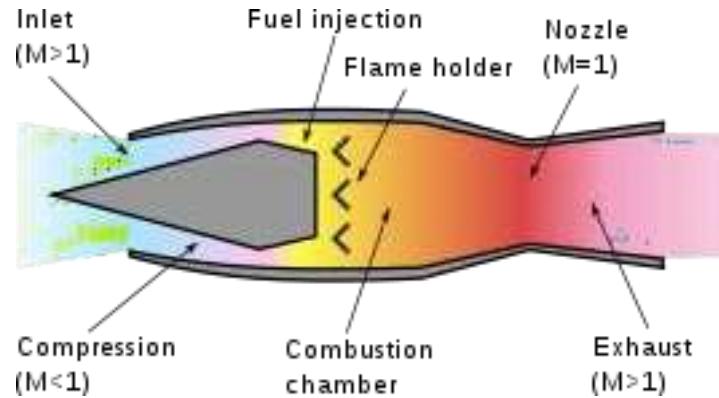
Turbojets, Turboprops and Turbofans



Parts of a Jet Engine



Ramjets and Scramjets

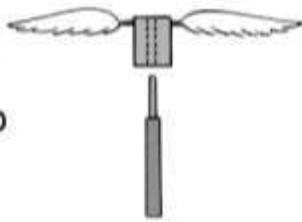


A brief history of Helicopters



1100

Chinese flying top



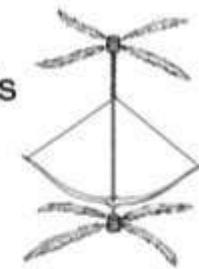
1483

Leonardo da Vinci's helical airscrew



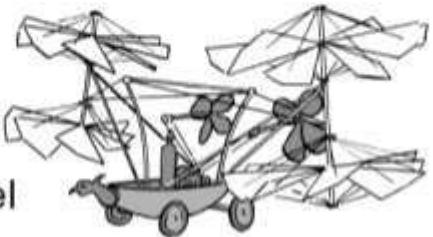
1784

Launoy and Bienvenu's feather model



1843

Sir George Cayley's steam-powered model



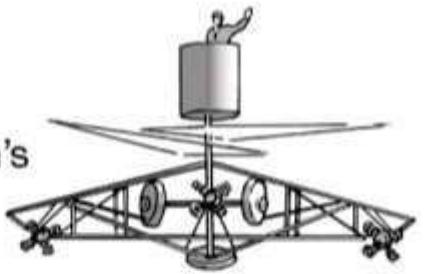
1907

Paul Cornu's first man-carrying helicopter



1916

István Petróczy and Theodore von Kármán's tethered helicopter



1923

Juan de la Cierva's autogiro



1936

Focke Achgelis Fa 61, the first successful helicopter



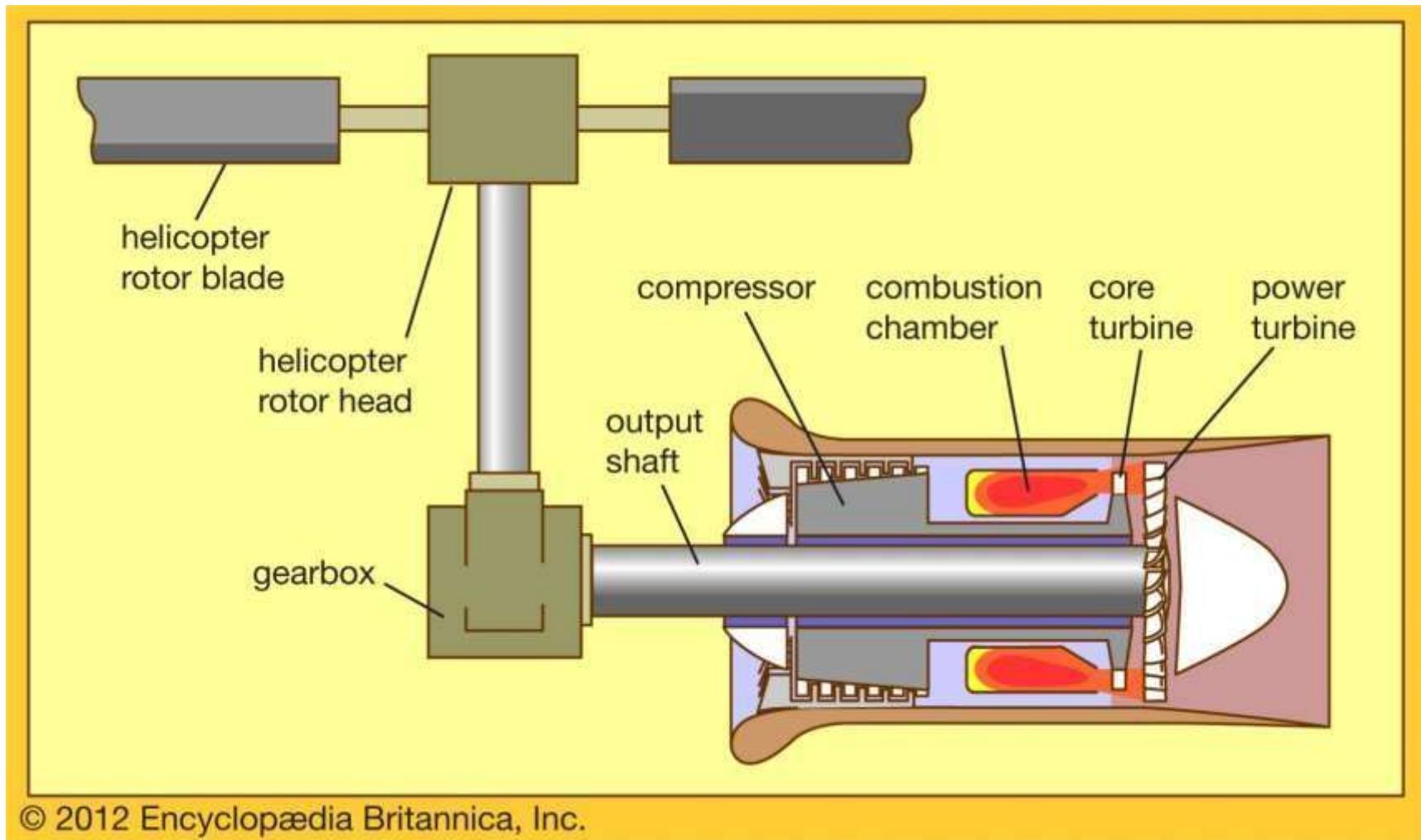
1939

Sikorsky VS-300, the first practical helicopter in the U.S.





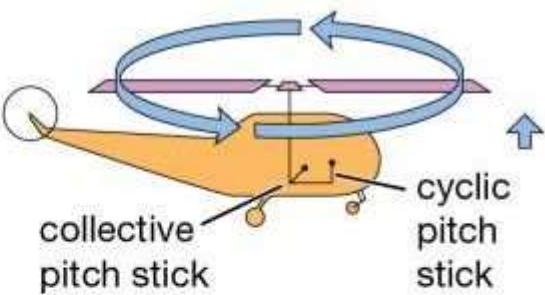
Turboshaft engines



Helicopter controls

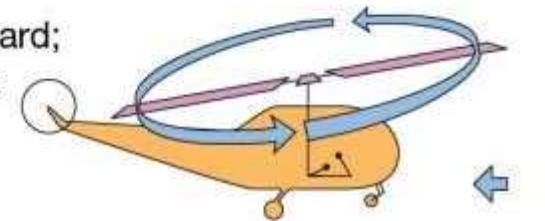
up

all blades at
same pitch



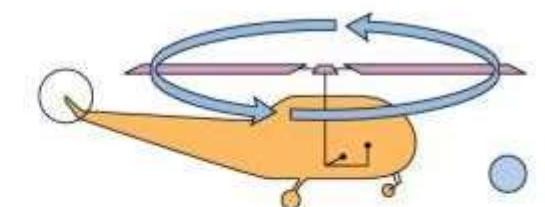
backward

rotor tilts backward;
blades get more
pitch on way
toward nose



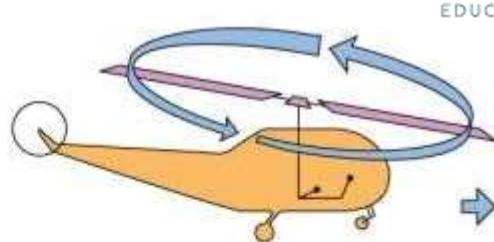
hover

all blades at
same pitch



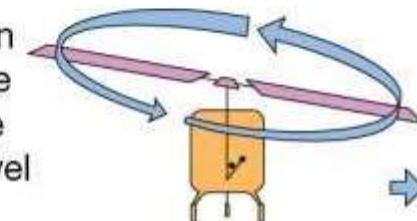
forward

rotor tilts forward;
blades get more
pitch on way
toward tail



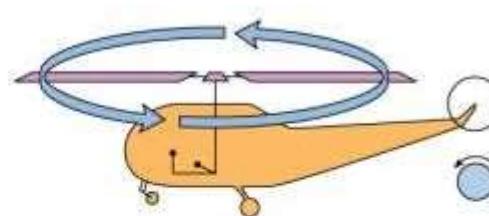
sideways

rotor tilts toward direction
of travel; blades get more
pitch on way toward side
opposite direction of travel

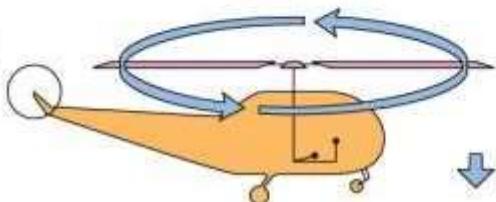


turn

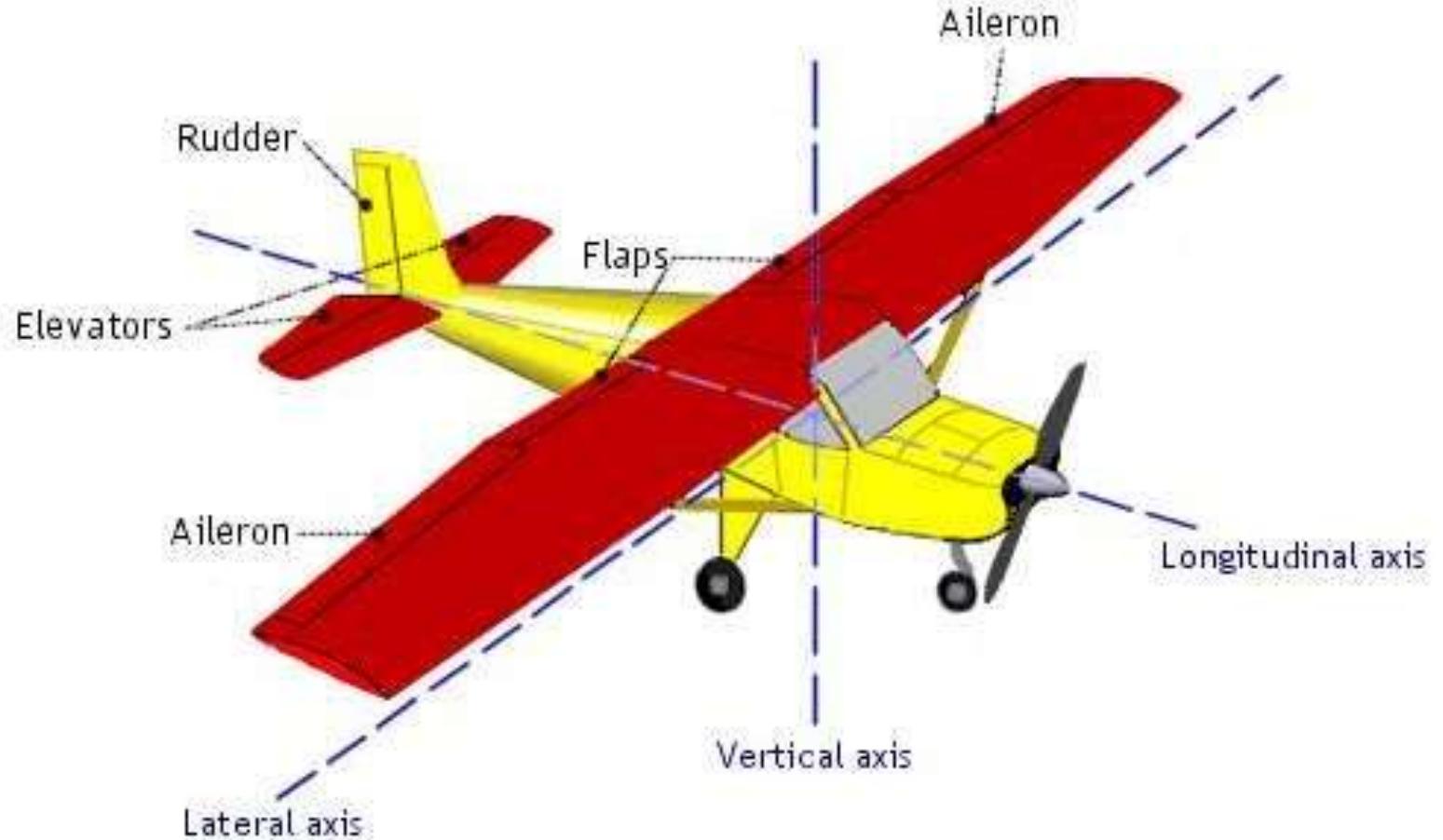
helicopter hovers;
pitch of tail rotor
blades swings craft



down and autorotation
all blades at low pitch

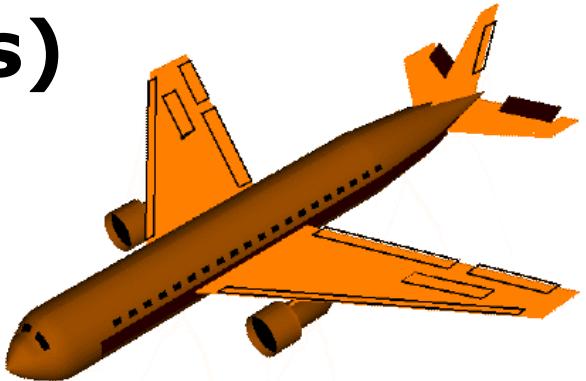


Control Surfaces on an Airplane

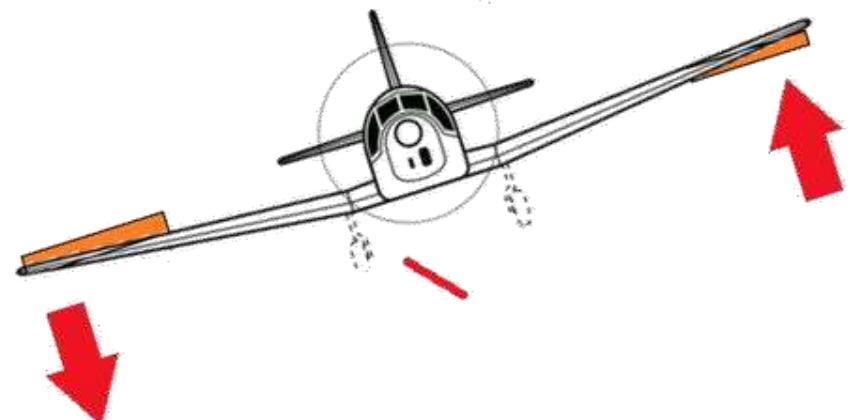


Control Surfaces on an Airplane

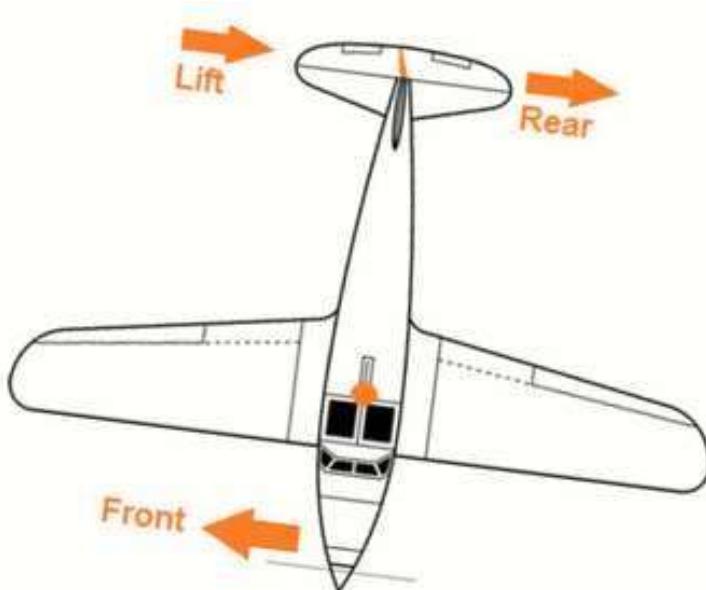
**Pitch Control
(Elevators)**

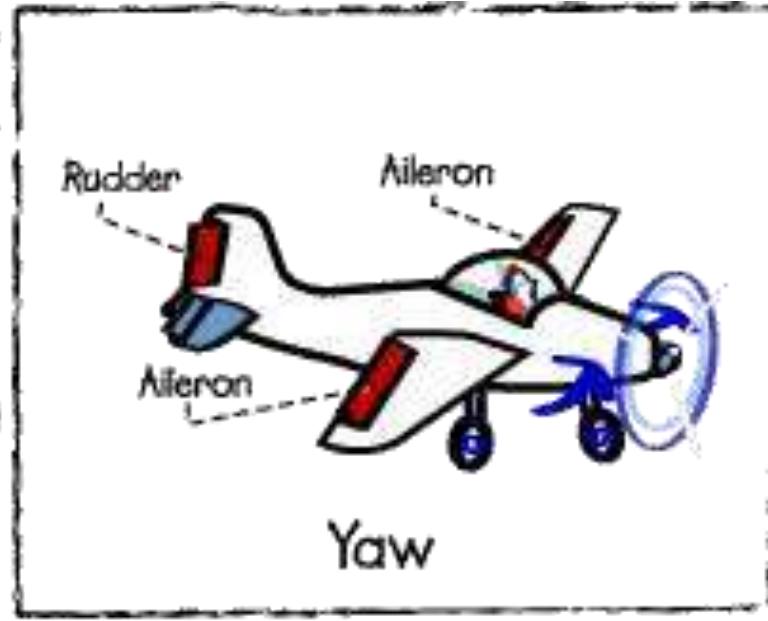
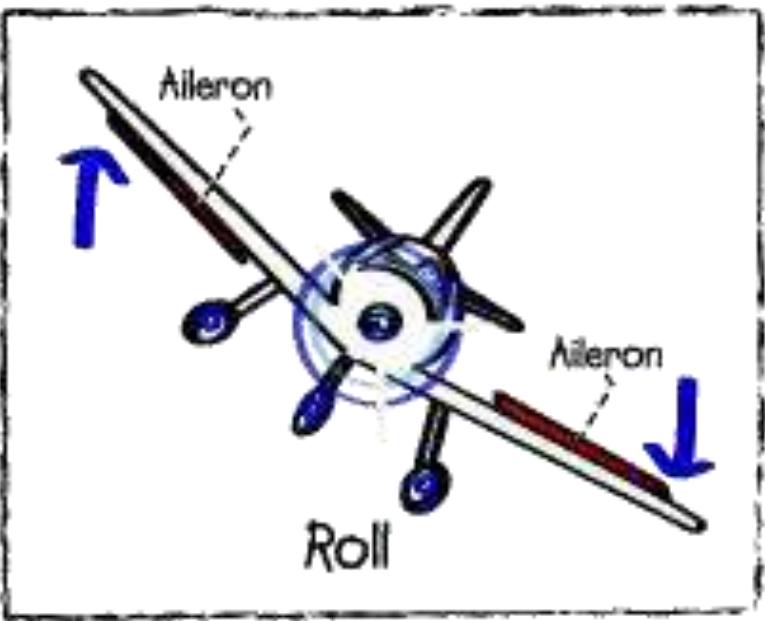
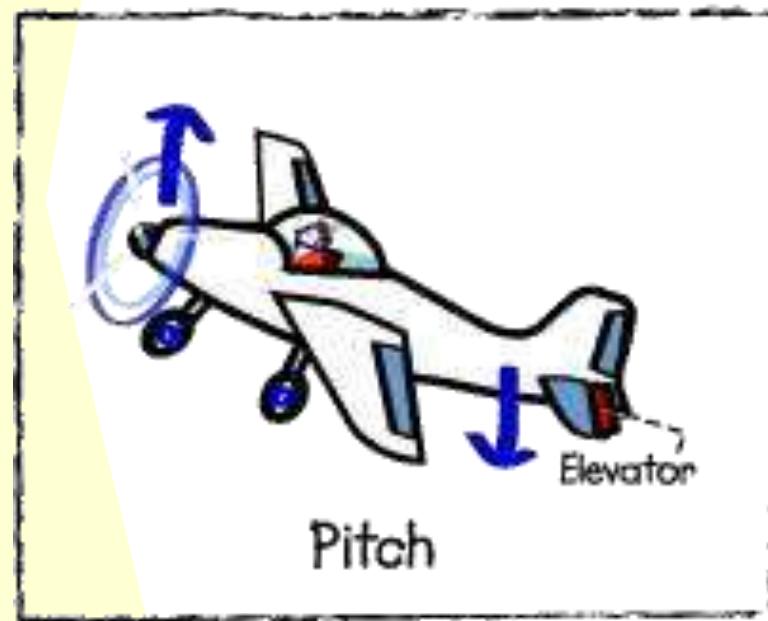


**Roll Control
(Ailerons + Rudders)**

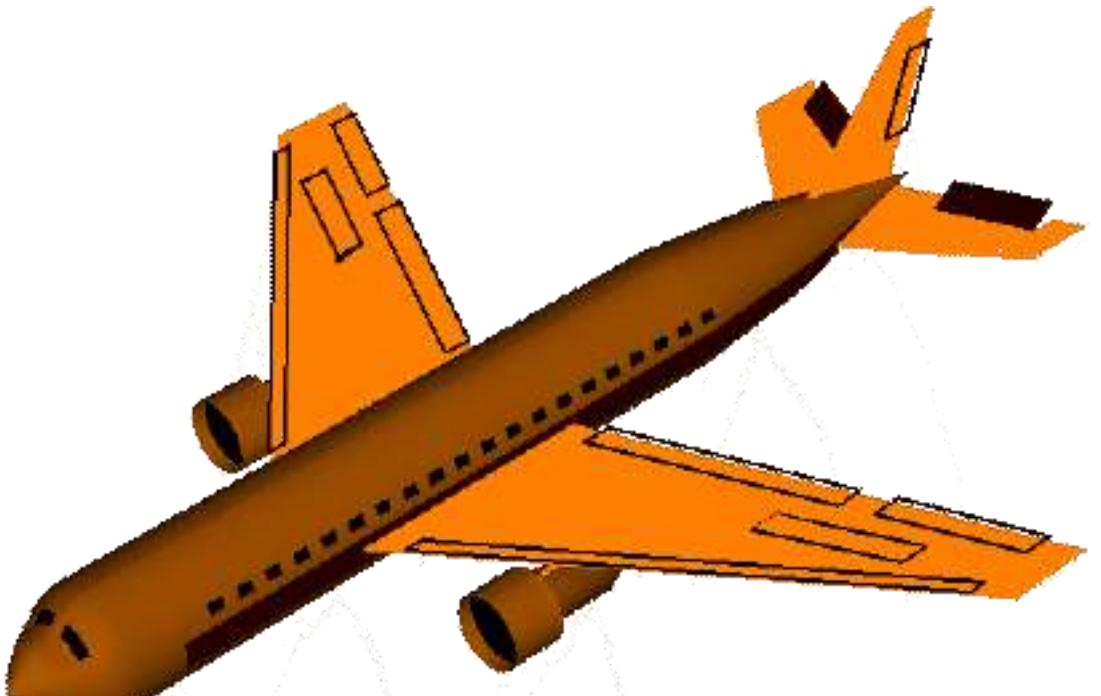


**Yaw Control
(Rudders + Ailerons)**

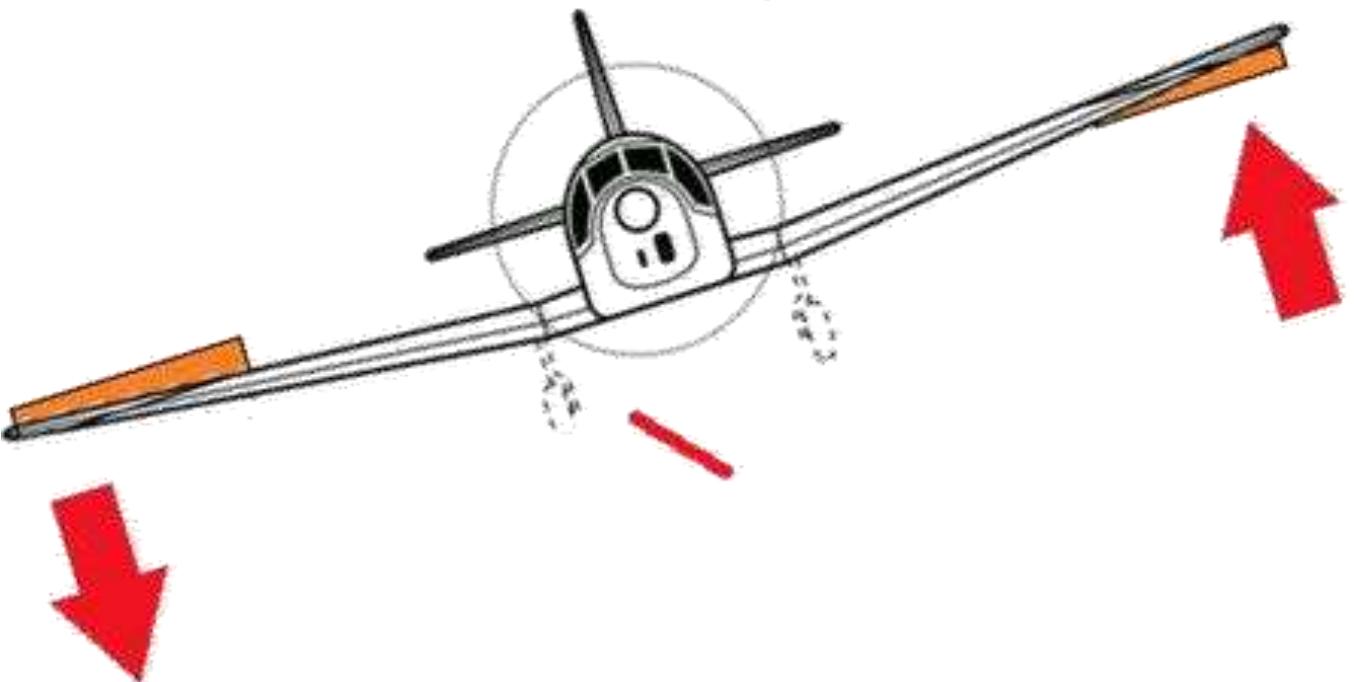




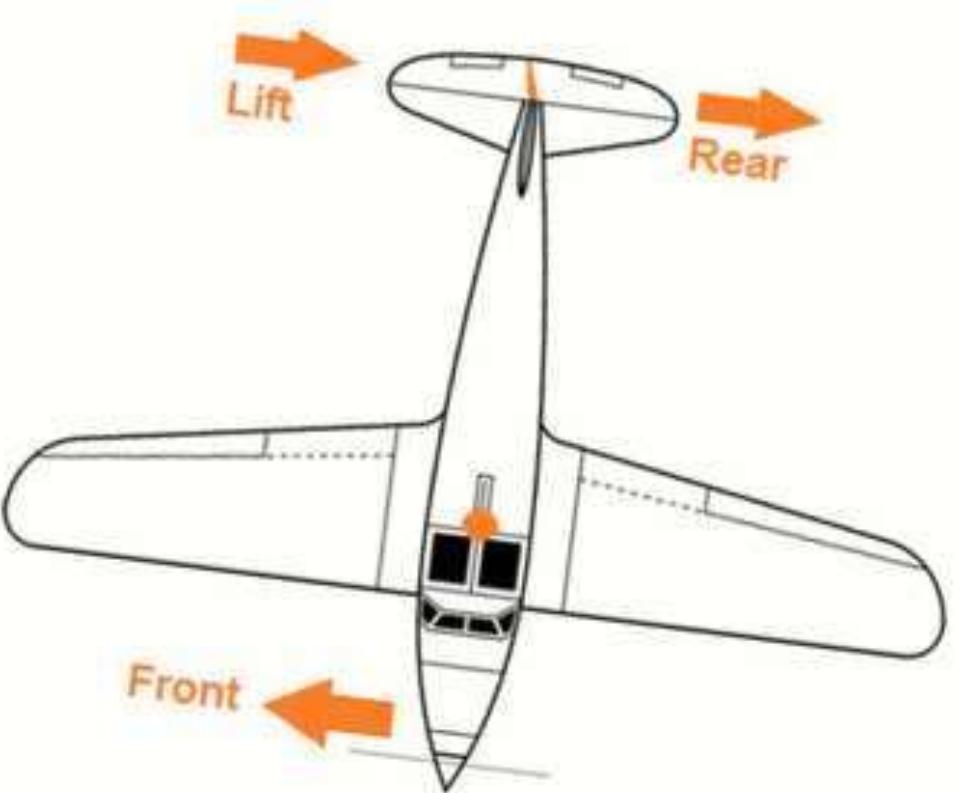
Pitch Control (Elevators)



Roll Control (Ailerons + Rudders)



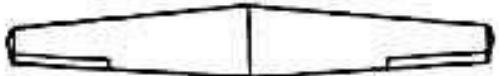
Yaw Control (Rudders + Ailerons)



Types of wings (based on planform shape)



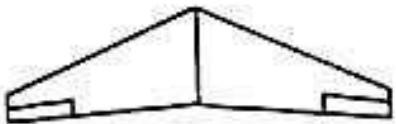
Rectangular
straight wing



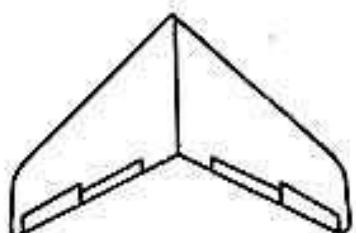
Tapered straight wing



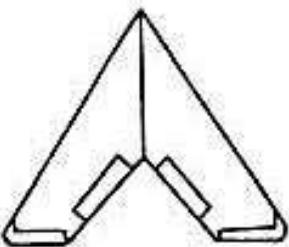
Rounded or elliptical
straight wing



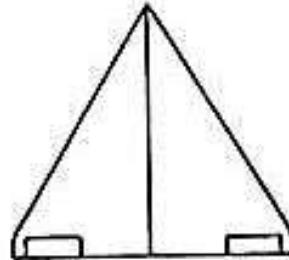
Slightly swept wing



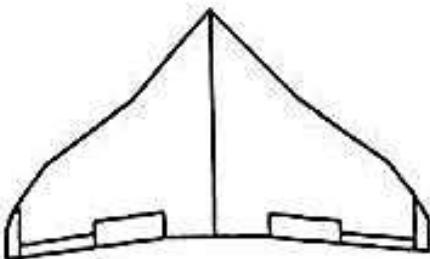
Moderately swept wing



Highly swept wing

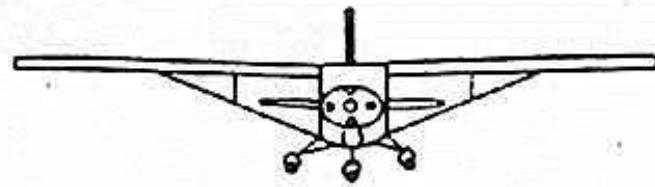


Simple delta wing

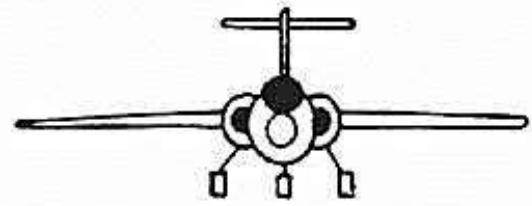


Complex delta wing

Types of wings (based on wing position)



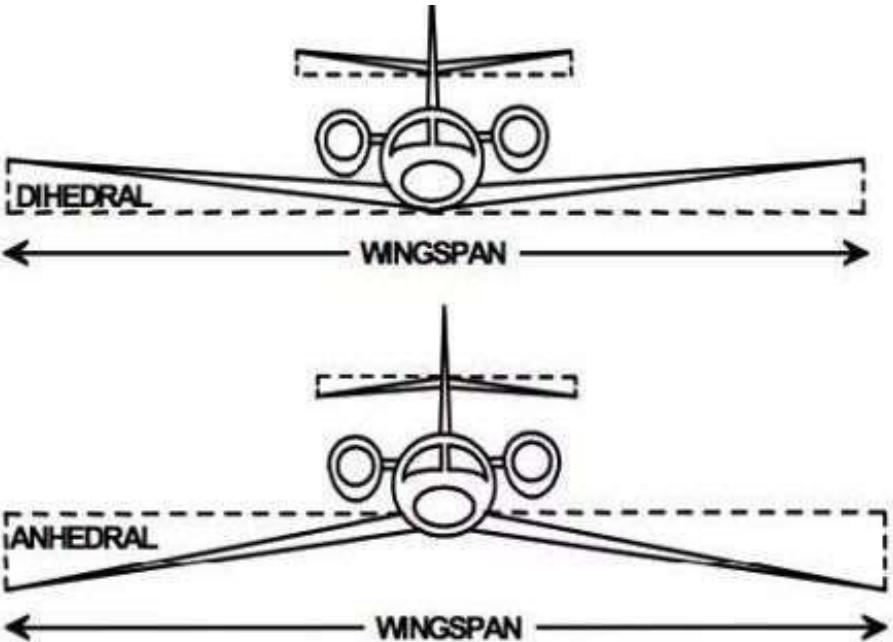
High-wing



Mid-wing



Low-wing

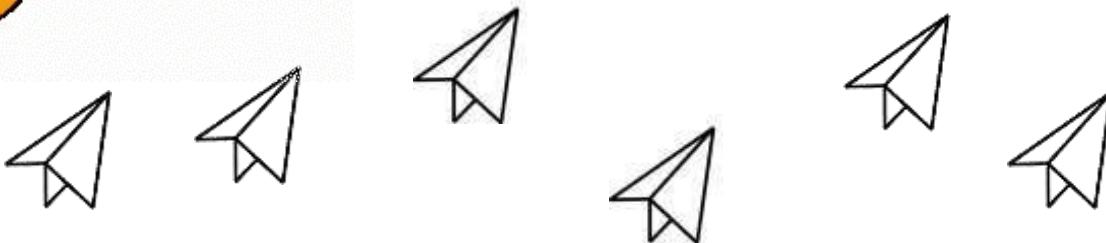


Pause-Point

How does the shape and position of wings
affect aircraft performance?



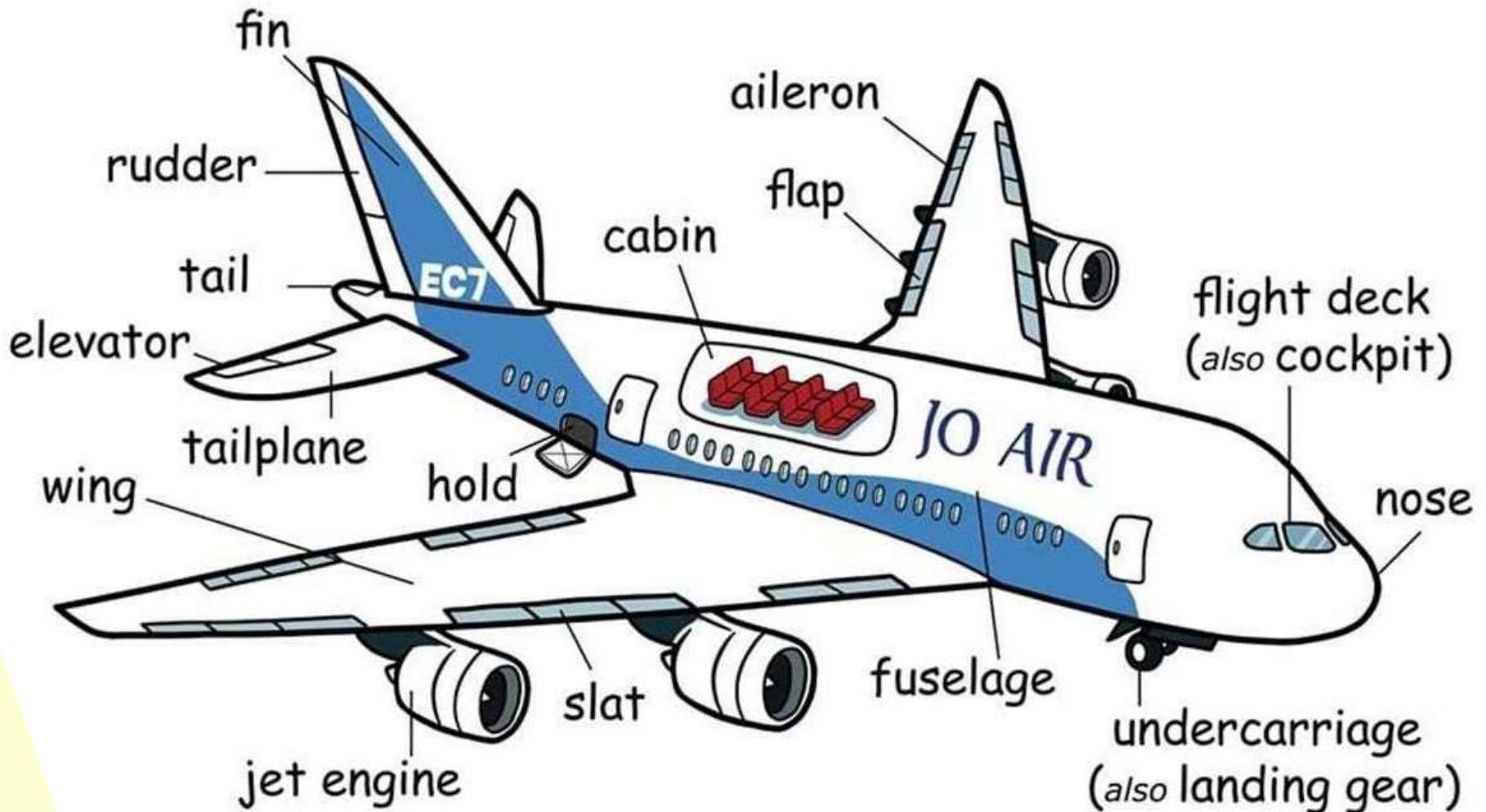
Its time to explore through
an activity!



Refer to the following site for more Paper Plane Designs

<http://www.paperairplanes.co.uk/planes.php>

Parts of an Airplane



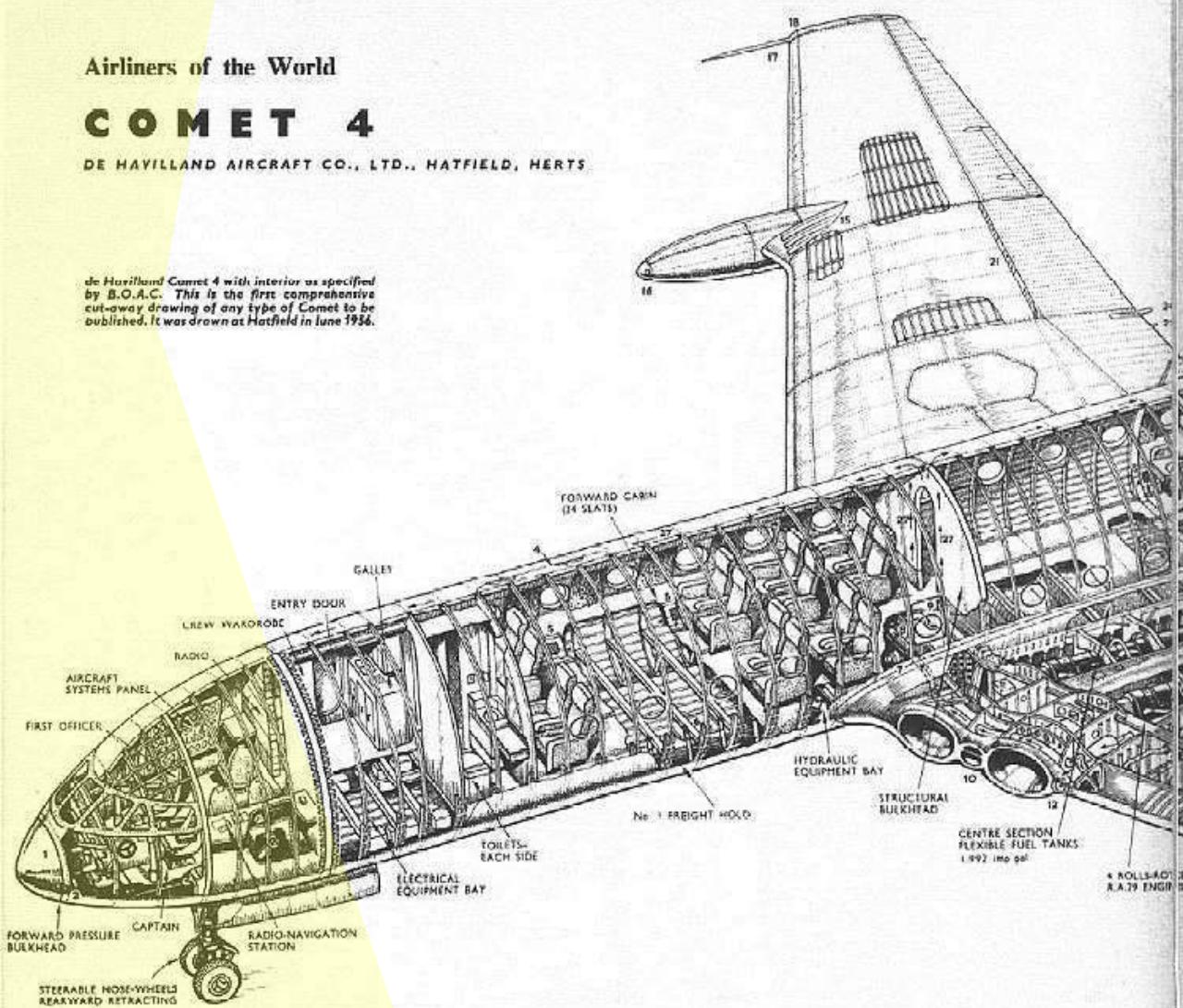
Aircraft Assembly

Airliners of the World

COMET 4

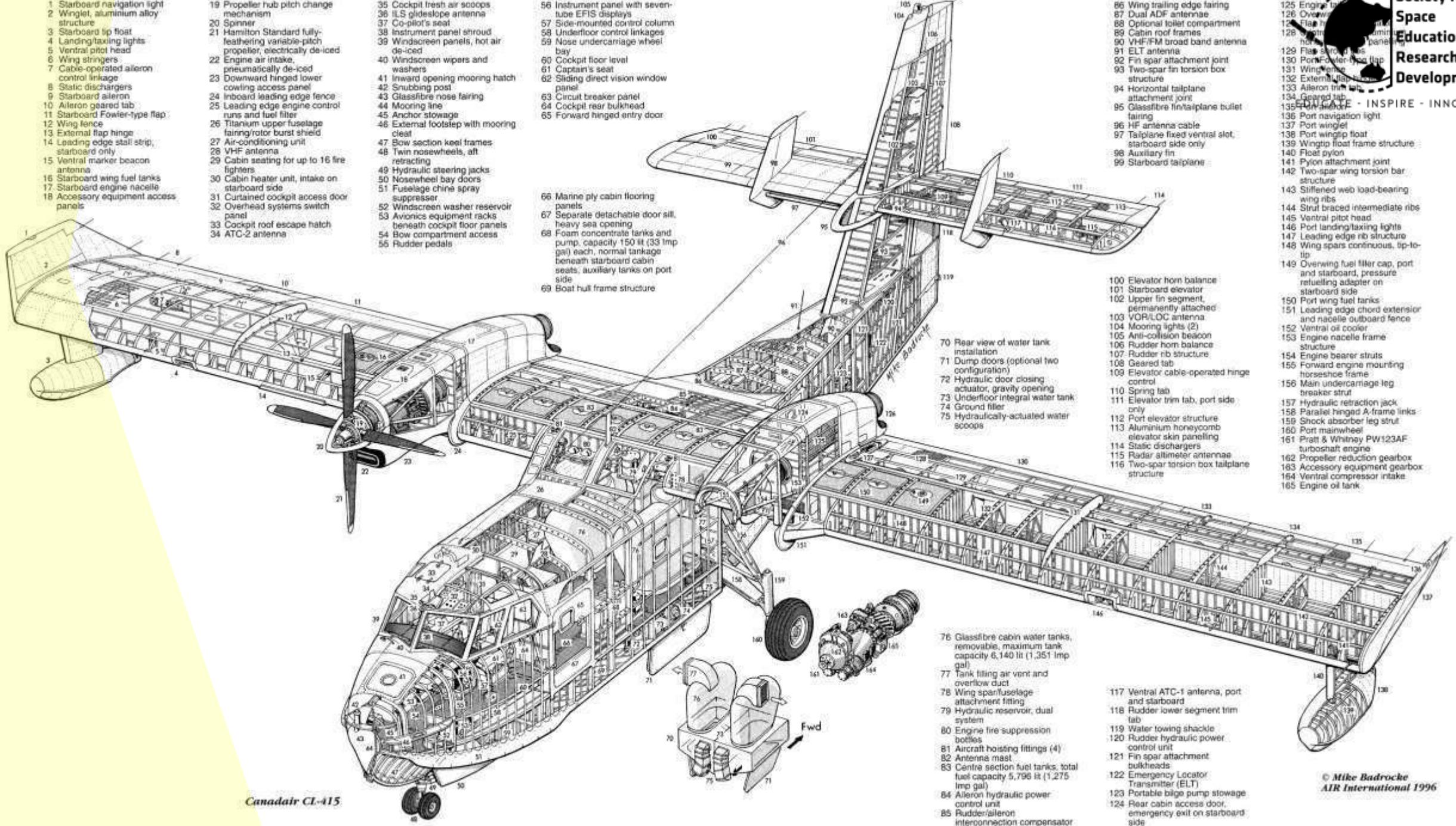
DE HAVILLAND AIRCRAFT CO., LTD., HATFIELD, HERTS

de Haribus' Comet 4 with interior as specified by B.O.A.C. This is the first comprehensive cut-away drawing of any type of Comet to be published. It was drawn at Hatfield in June 1936.

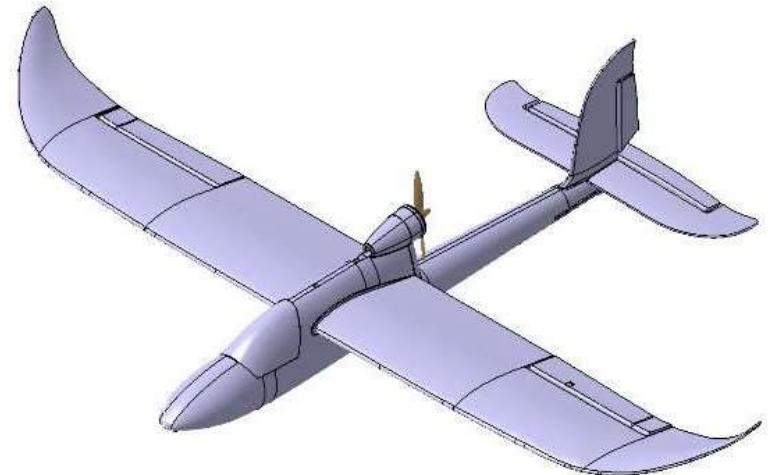
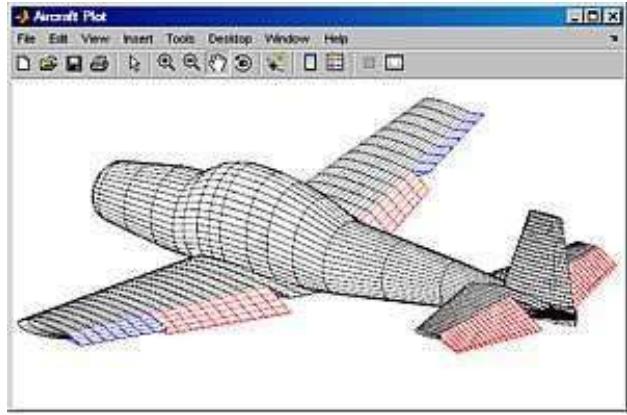
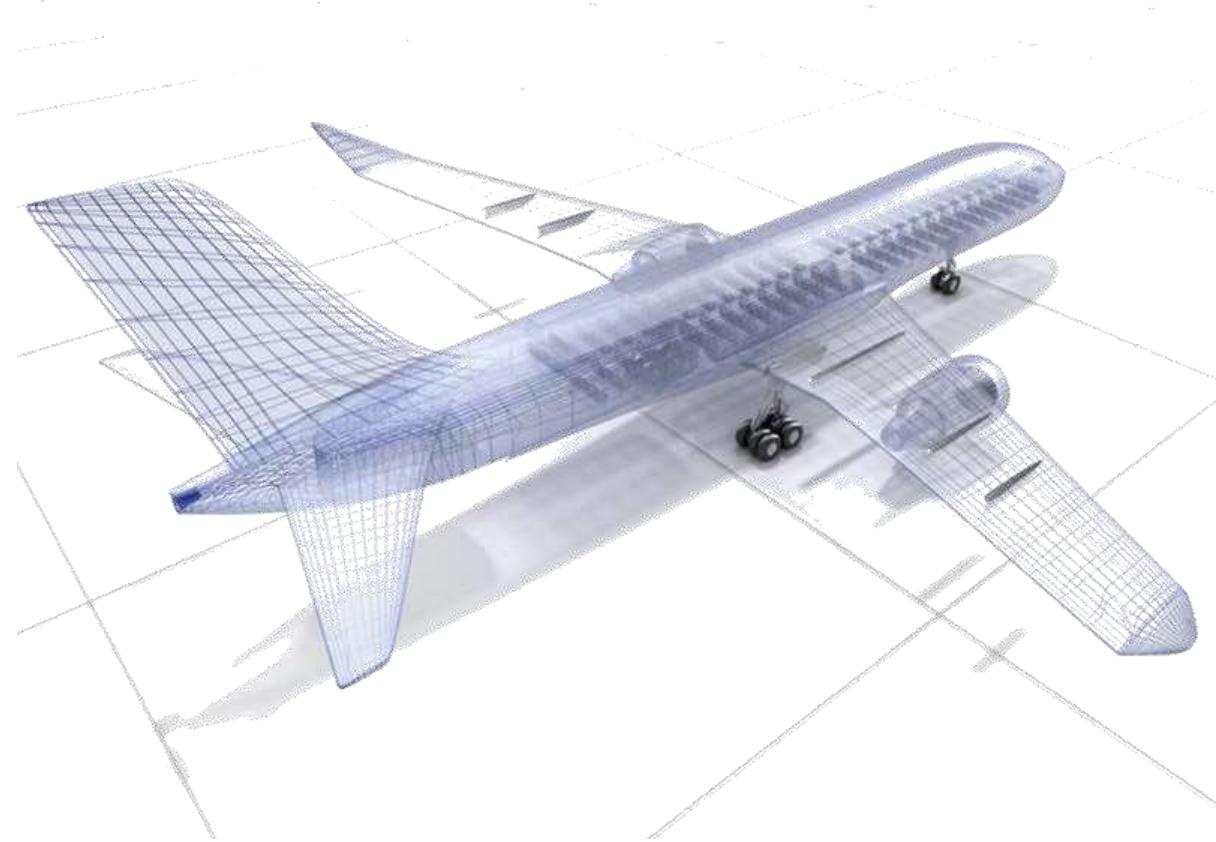


Society for
Space
Education
Research &
Development

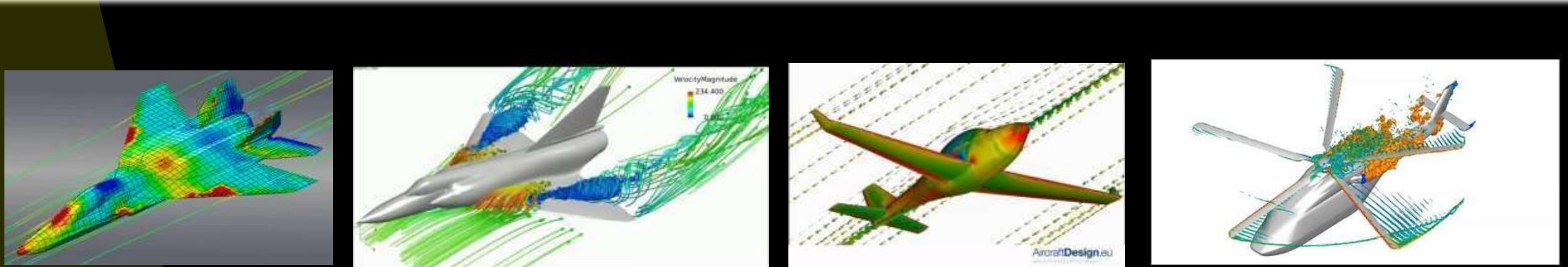
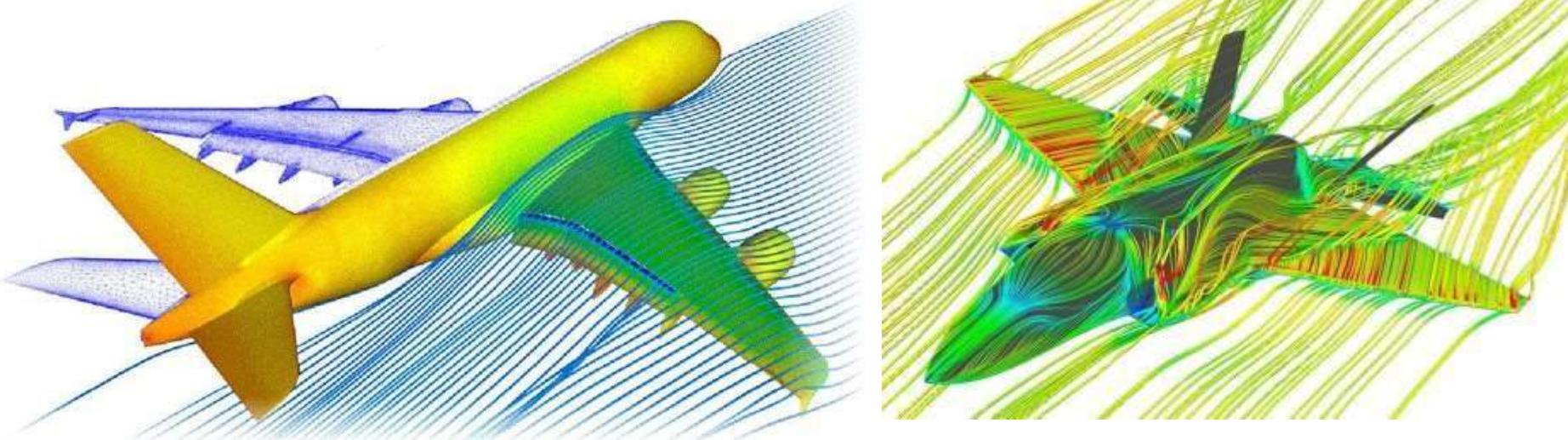
EDUCATE - INSPIRE - INNOVATE



Aircraft Designing

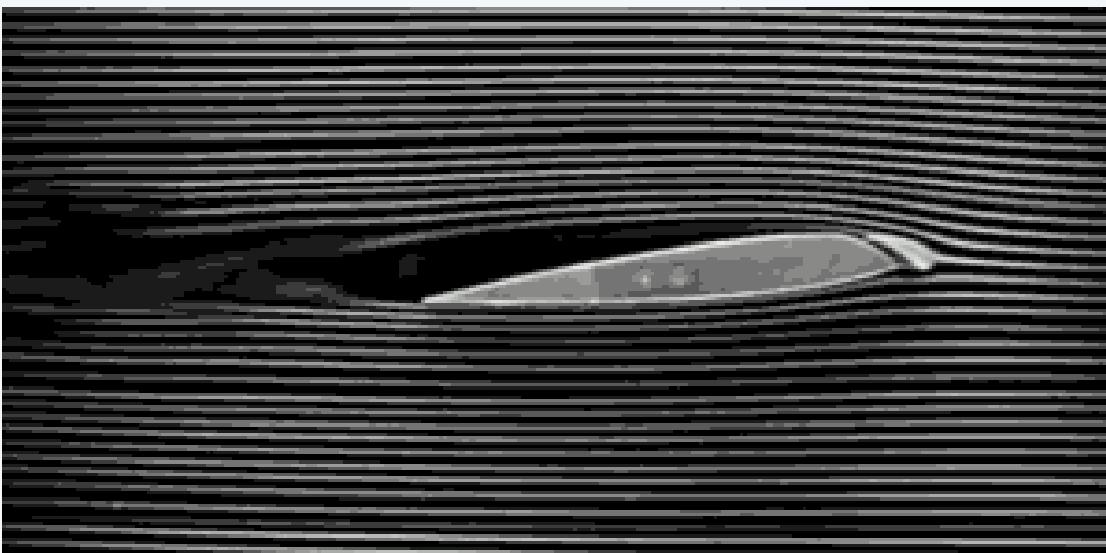


Testing the aircraft designs through computer simulations



Computational Fluid Dynamics(CFD)

Wind Tunnel testing of scaled model



Roles and applications of Aircrafts in modern world



Types of Private Jets



VeryLight Jets (VLJ): short flight duration (1-2 hours), limited cabin space, max 6-8 passengers

Light Business Jets: transcontinental flights, more cabin space, max 8 passengers

Mid-Size Business Jets: transcontinental flights, more cabin space, improved speed and comfort, can accommodate up to 10 passengers

Heavy Business Jets: transcontinental flights, luxurious cabin, improved speed, can accommodate close to 18-20 passengers

Types of Commercial Airplanes



Jumbo Passenger Airplanes
Boeing 747



Light Passenger Airplanes
Embraer E-175



Mid-Size Passenger Airplanes
Airbus A-350



Cargo Airplanes
Airbus A300-600ST Beluga

Military Aircrafts

Combat Aircrafts

Fighter Aircraft



Bombers



Multi Role Combat Aircraft



Non Combat Aircrafts

Military Transport



Airborne Early Warning and Control

Air to air fuel tanker



Military Aircrafts



Learning from Nature



Unmanned Aerial Vehicles (UAV)



Agriculture



Photography



Surveillance



Remote tracking

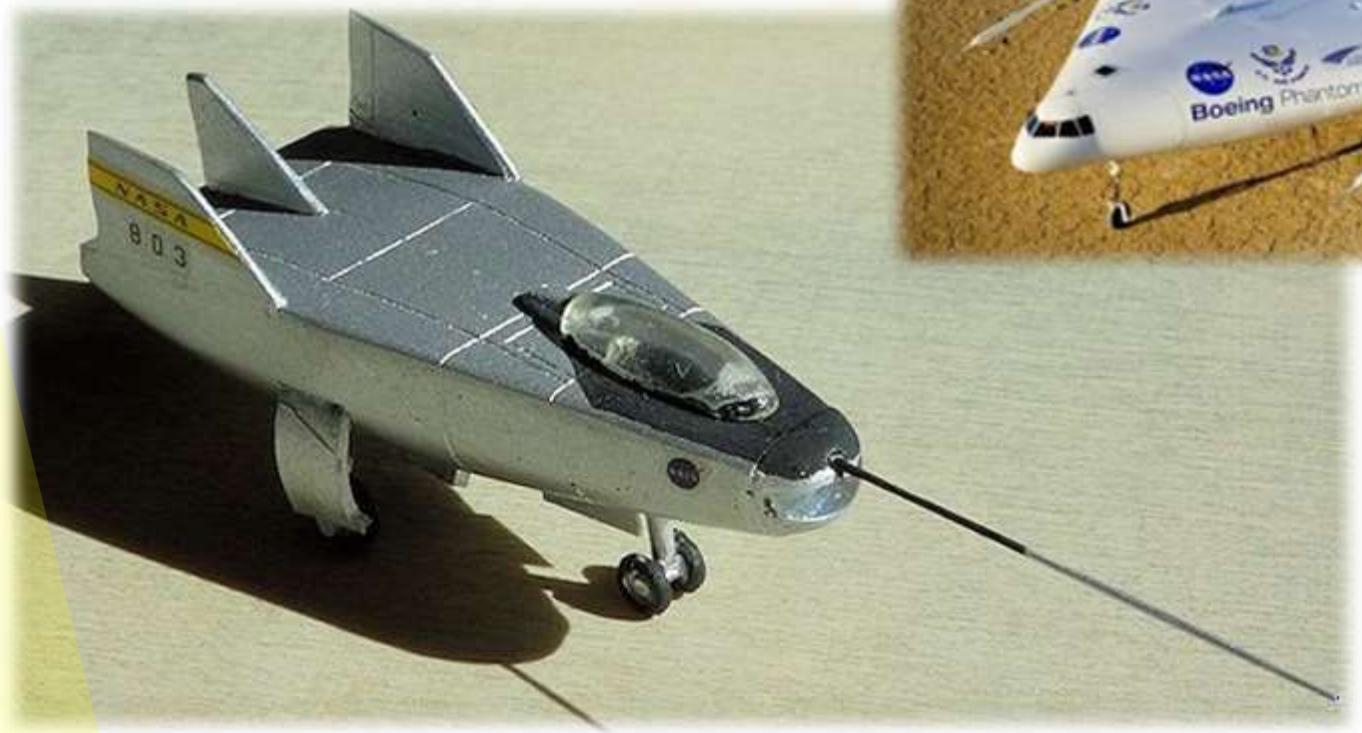


Air strikes

Solar Impulse-2 : Solar Powered Aircraft



Few unusual Aircrafts



Few unusual Aircrafts



Career in Aeronautics and Aviation

1. Aeronautical Engineer
2. Pilot
3. Scientist / Researcher
4. Technical Author
5. In the Airport [AME – AEE – Ground Support – ATC]
6. Professor / Instructor





Thank You!

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