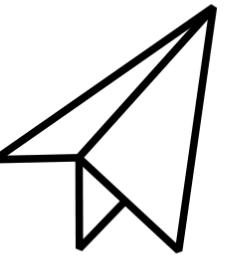
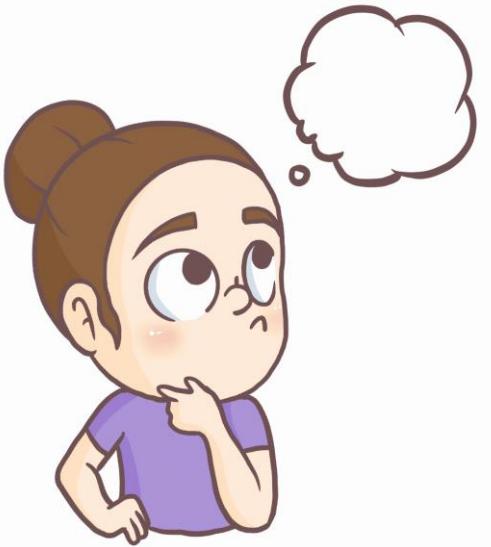


Aeronautics and Aviation

Content Delivery:
Thejas K V
Aakansha

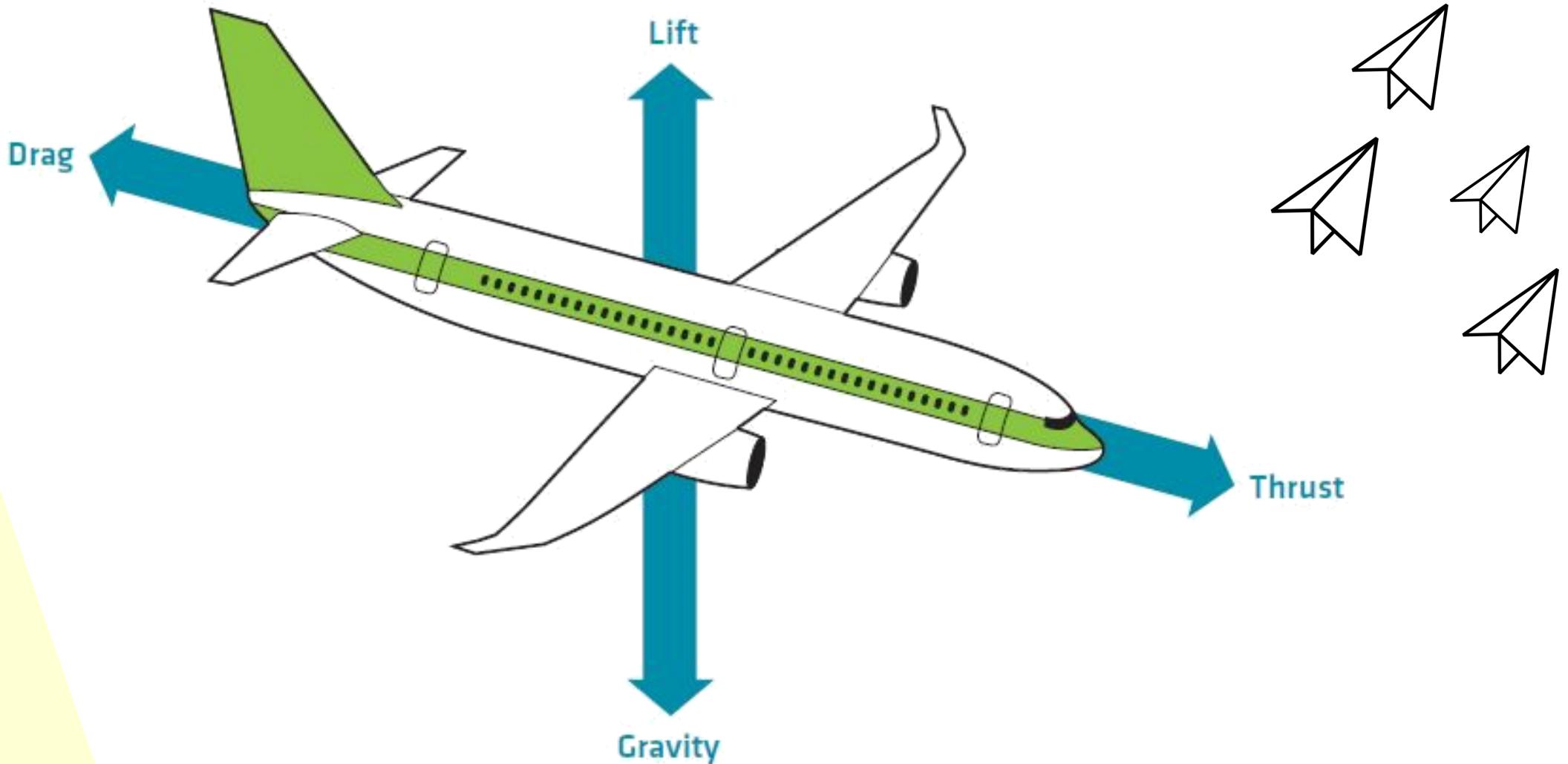




How does an aircraft fly?

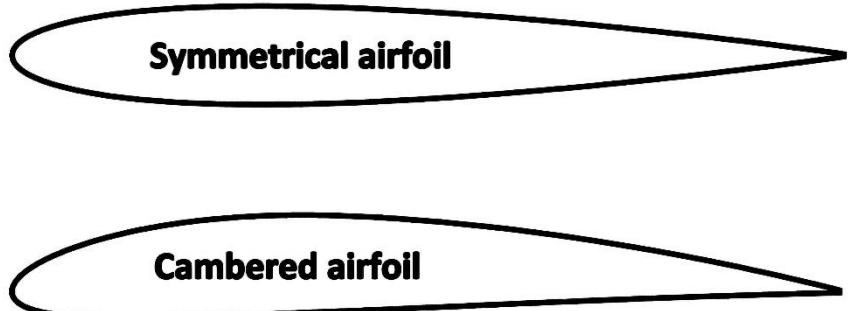


Forces of Flight

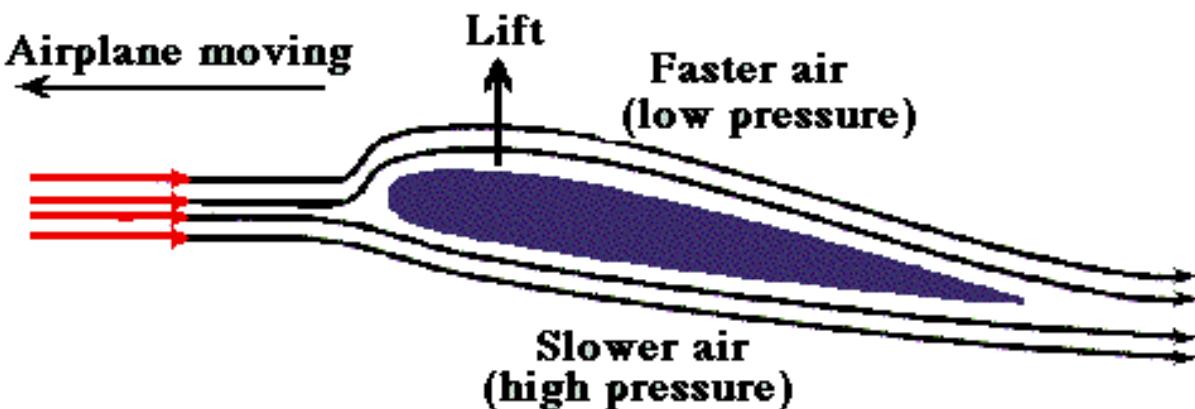


What is an Airfoil?

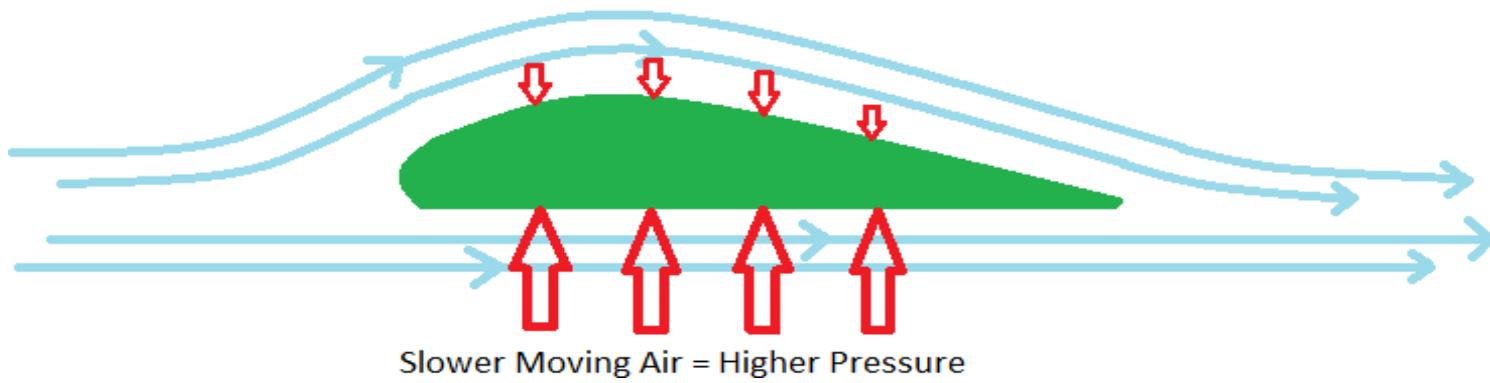
It is a streamlined shape designed to generate a useful reaction force using the flow around it



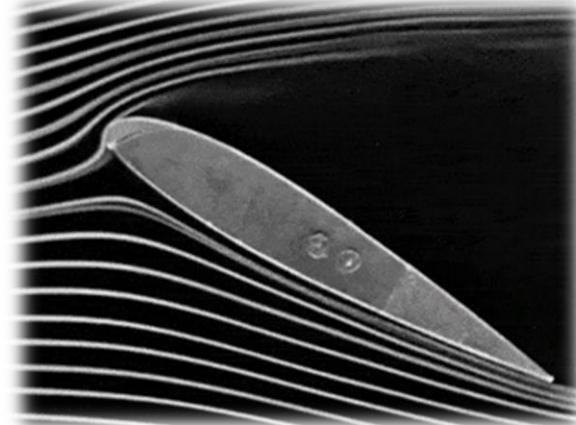
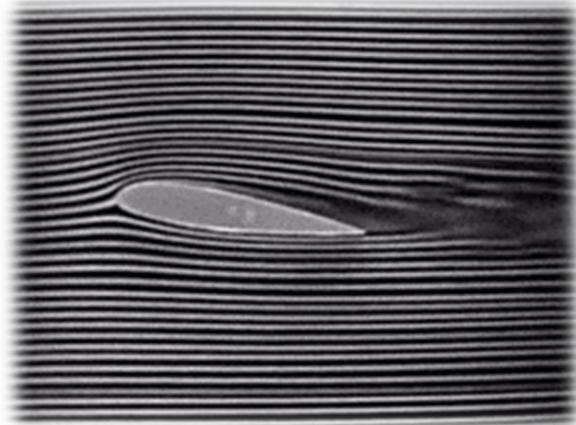
How does it work?



Faster Moving Air = Lower Pressure



Slower Moving Air = Higher Pressure



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?

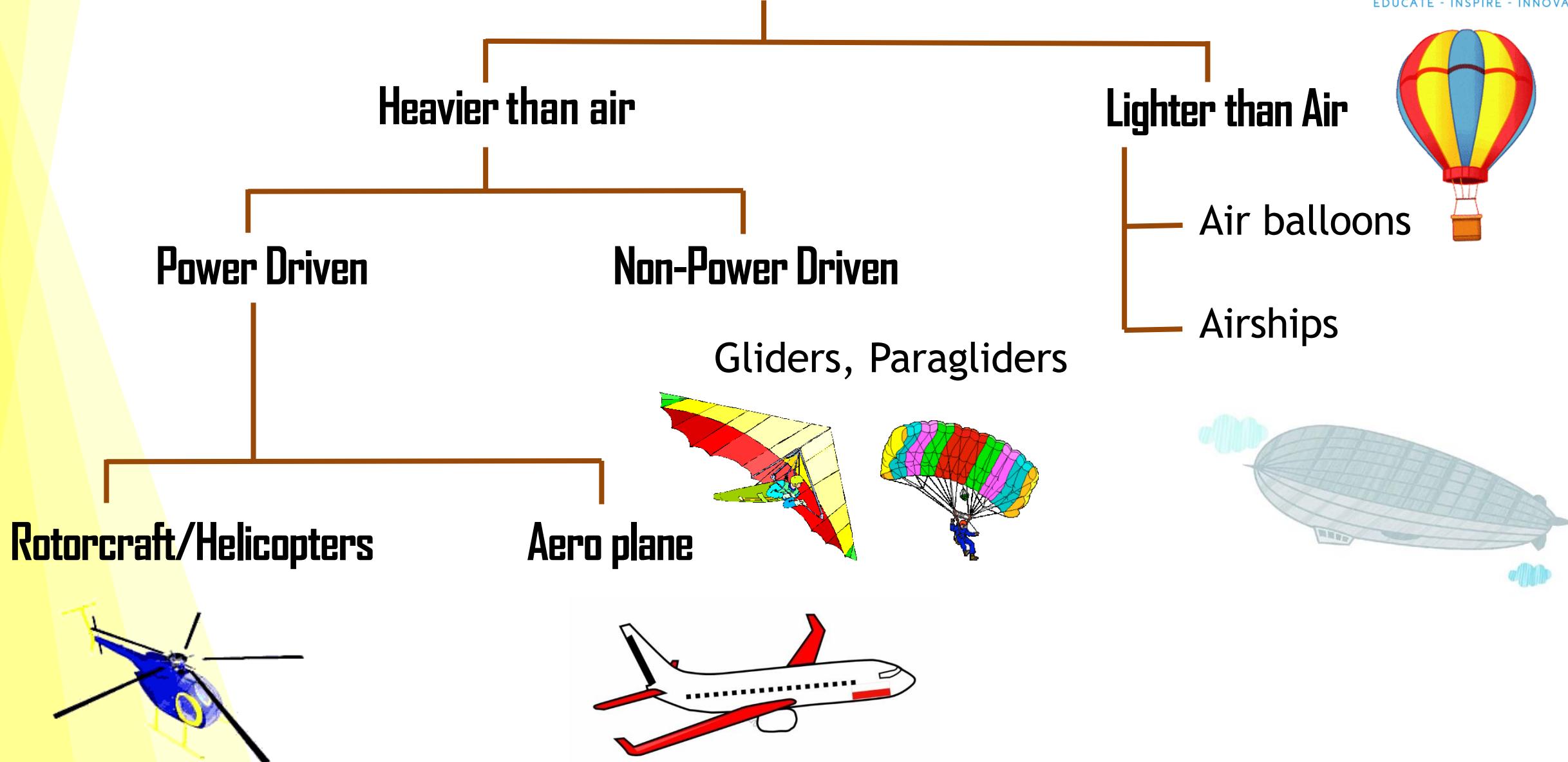
Aviation is an aspect of Aeronautics. It deals with the construction, flying and maintenance of an aircraft.

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.



Aircrafts



ALL TYPES OF AIRCRAFT CLASSIFIED

AEROSTAT (*Lighter-than-air Aircraft*)

BALLOON



FREE BALLOON



CAPTIVE BALLOON



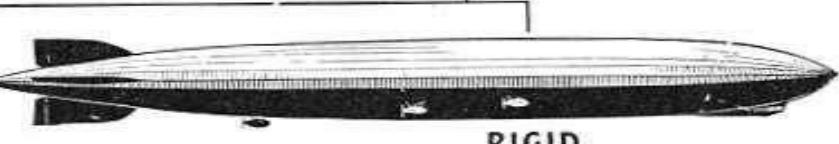
KITE BALLOON

AERODYNE
(*Heavier-than-air Aircraft*)

AIRSHIP



NON-RIGID



RIGID



SEMI-RIGID



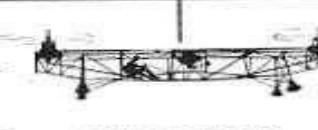
KITE



GLIDER



GYROPLANE



HELICOPTER



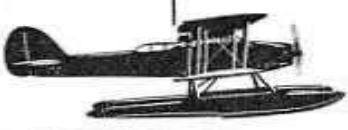
ORNITHOPTER

AEROPLANE



LANDPLANE

SEAPLANE

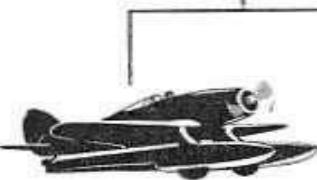


FLOATPLANE



FLYING BOAT

AMPHIBIAN



FLOAT AMPHIBIAN

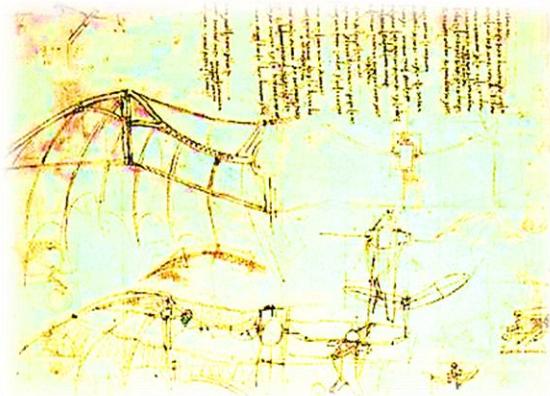
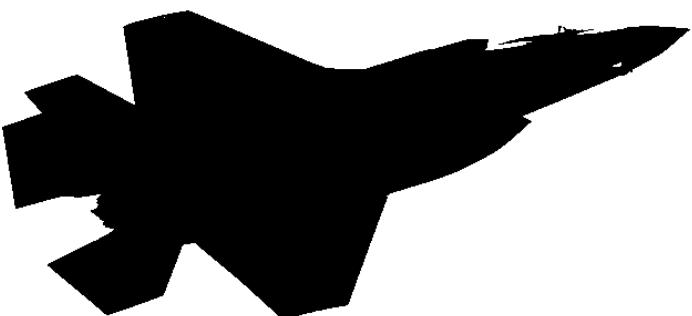
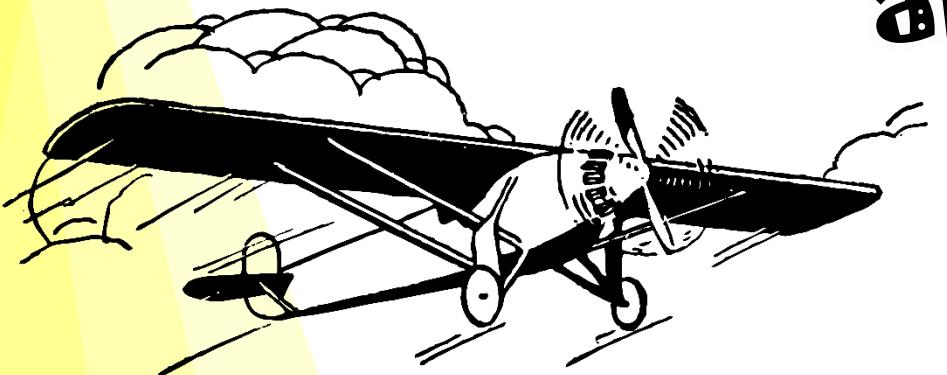


BOAT AMPHIBIAN

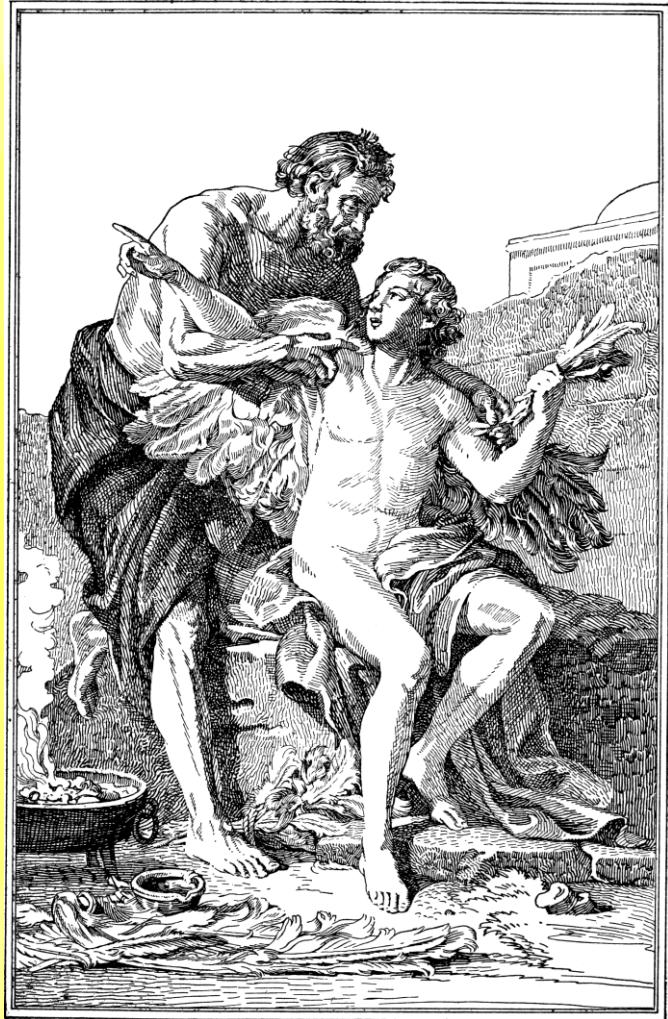


Awe and Aves

Through the legends
and pages of history...



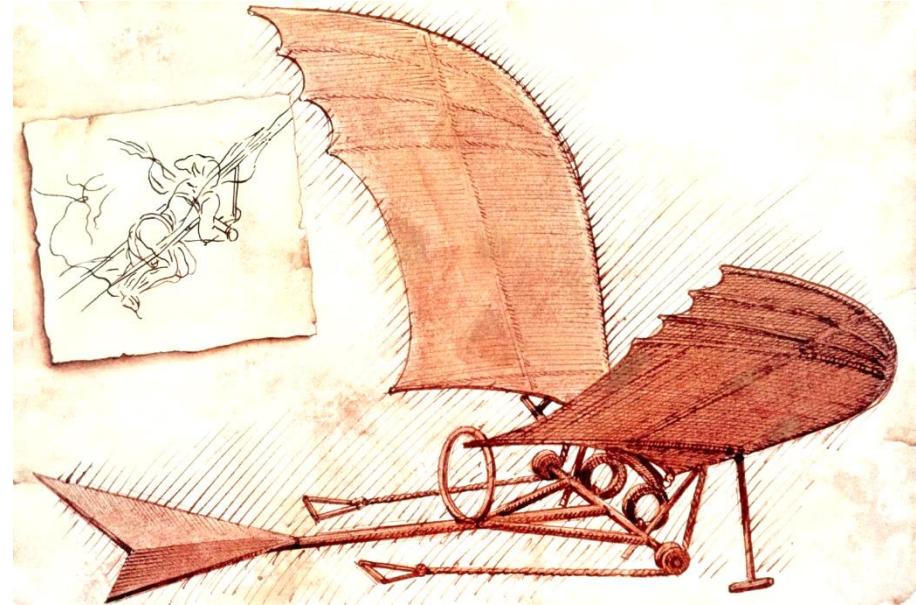
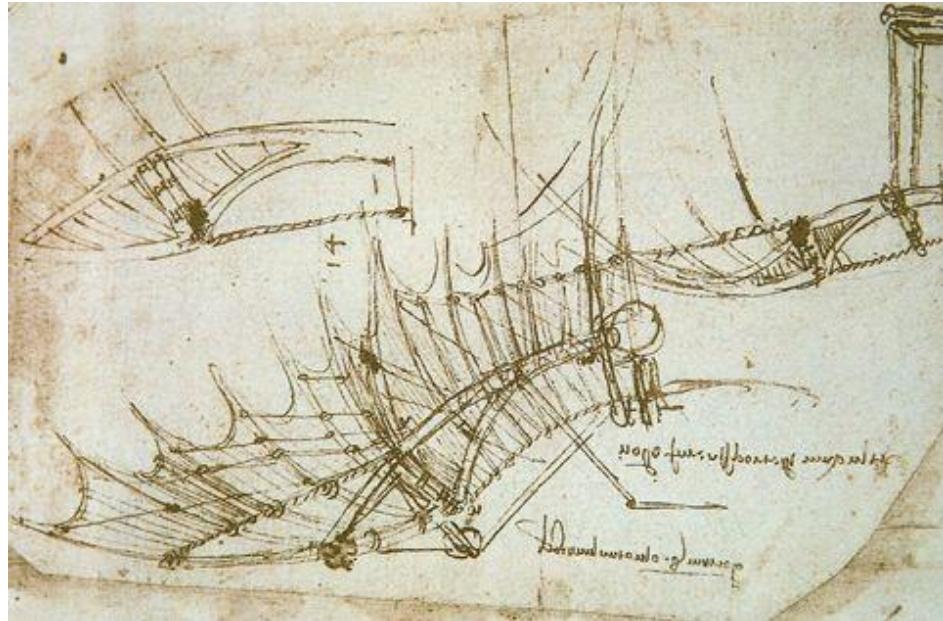
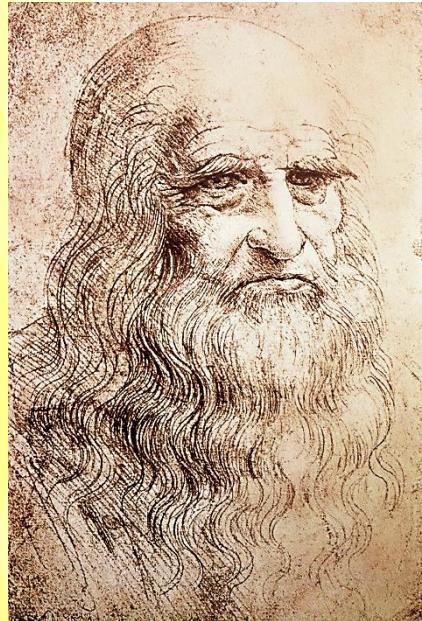
The legend of Daedalus



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.

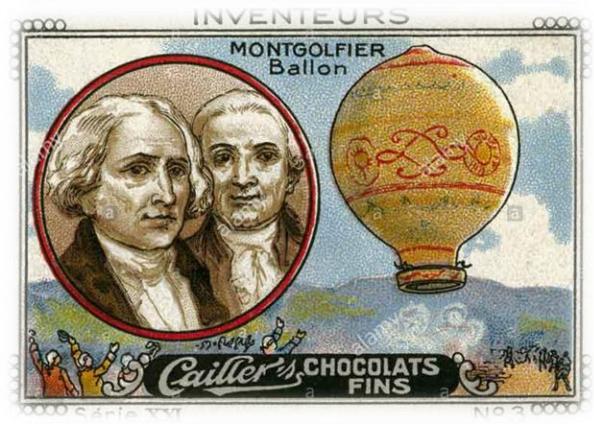
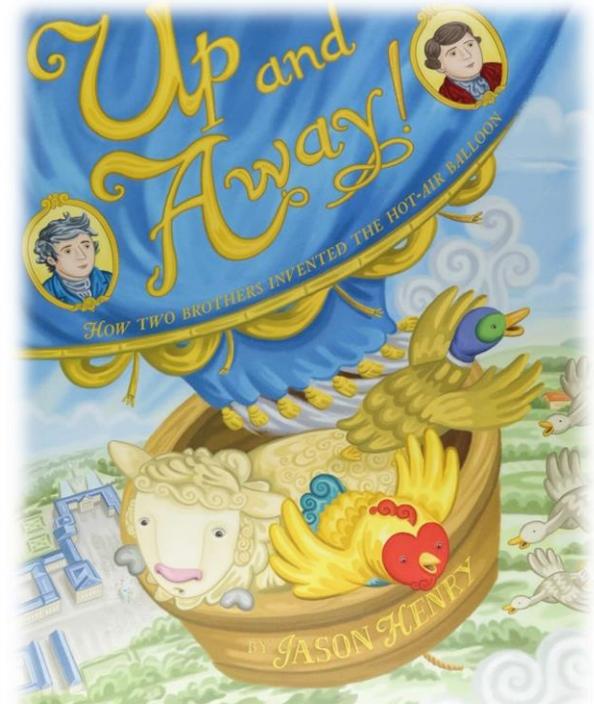
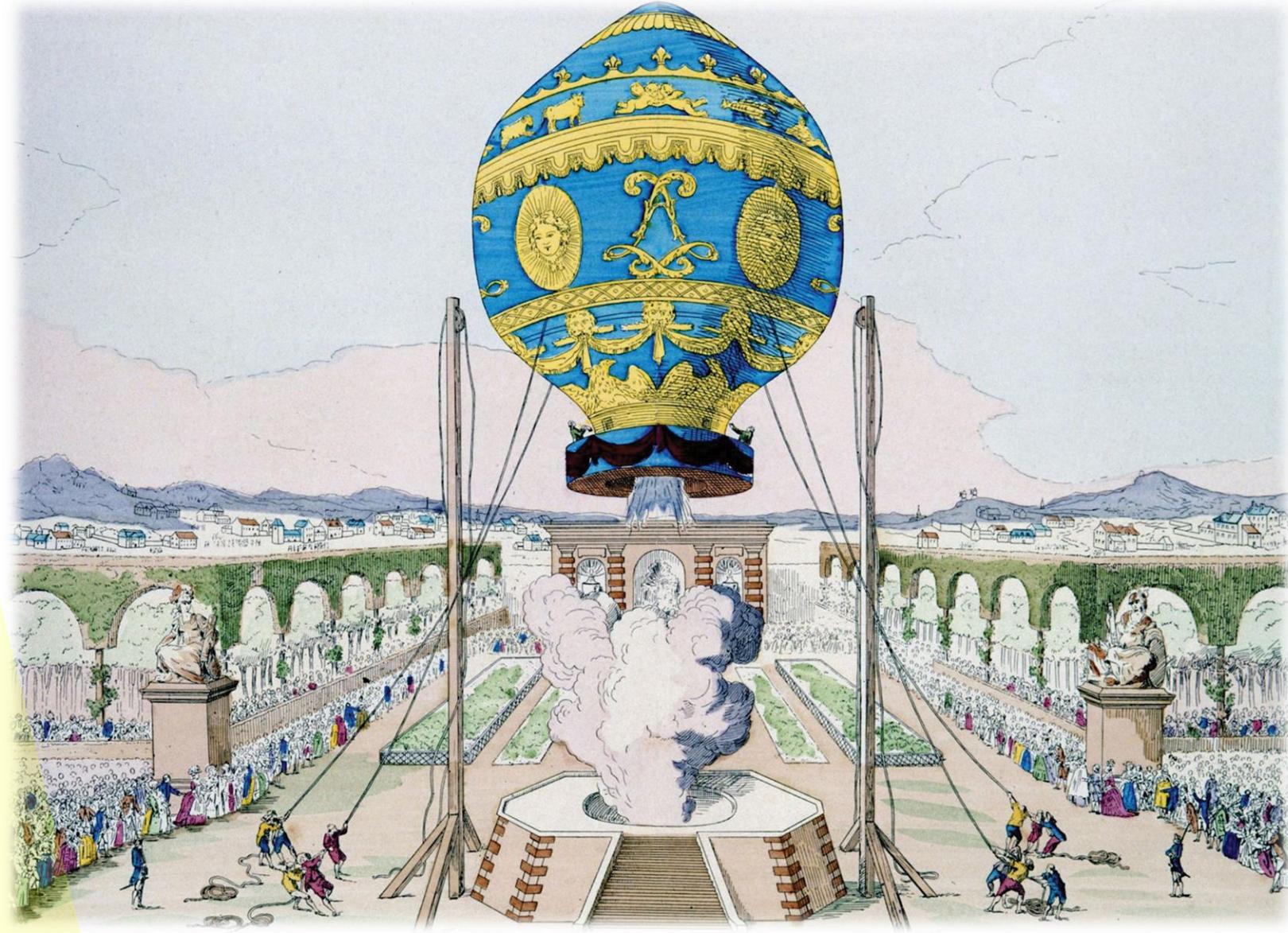
Da Vinci's Flying Machine



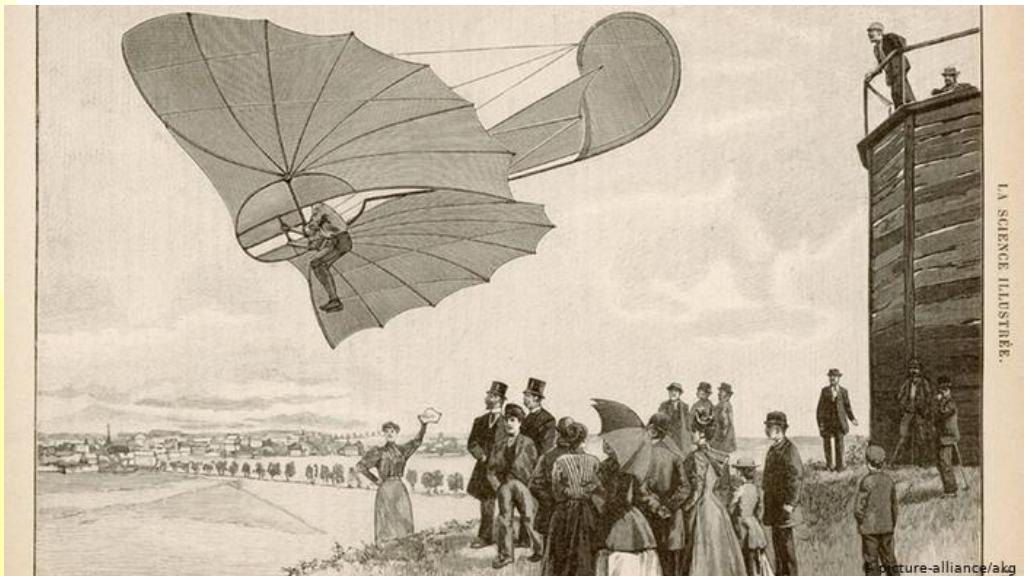
In 15th century, Leonardo da Vinci came up with a design using flapping wing mechanism called Ornithopter. The wings were designed to be powered by human muscles.

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

Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 1520.] SATURDAY, SEPTEMBER 25, 1852. [Price 3d., Stamped 4d.
 Edited by J. C. Robertson, 166, Fleet-street.

SIR GEORGE CAYLEY'S GOVERNABLE PARACHUTES.

Fig. 2.

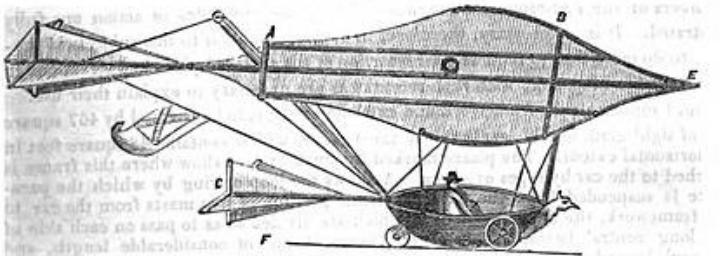
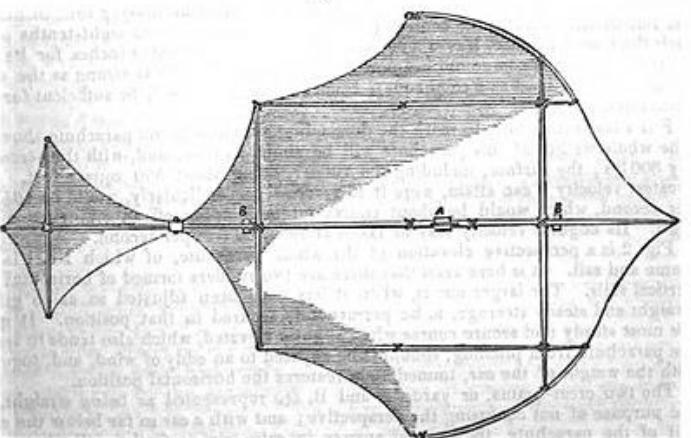


Fig. 1.

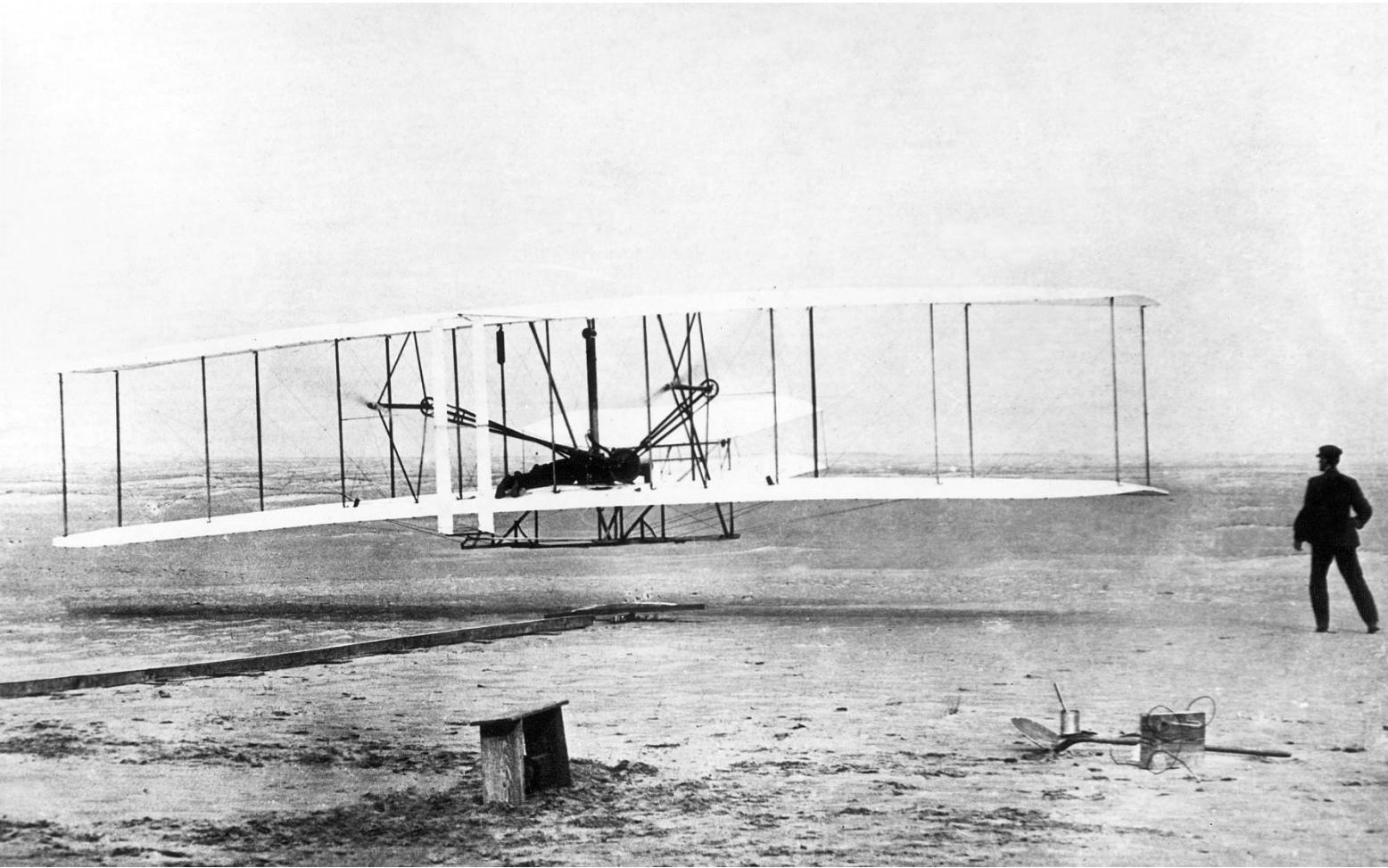
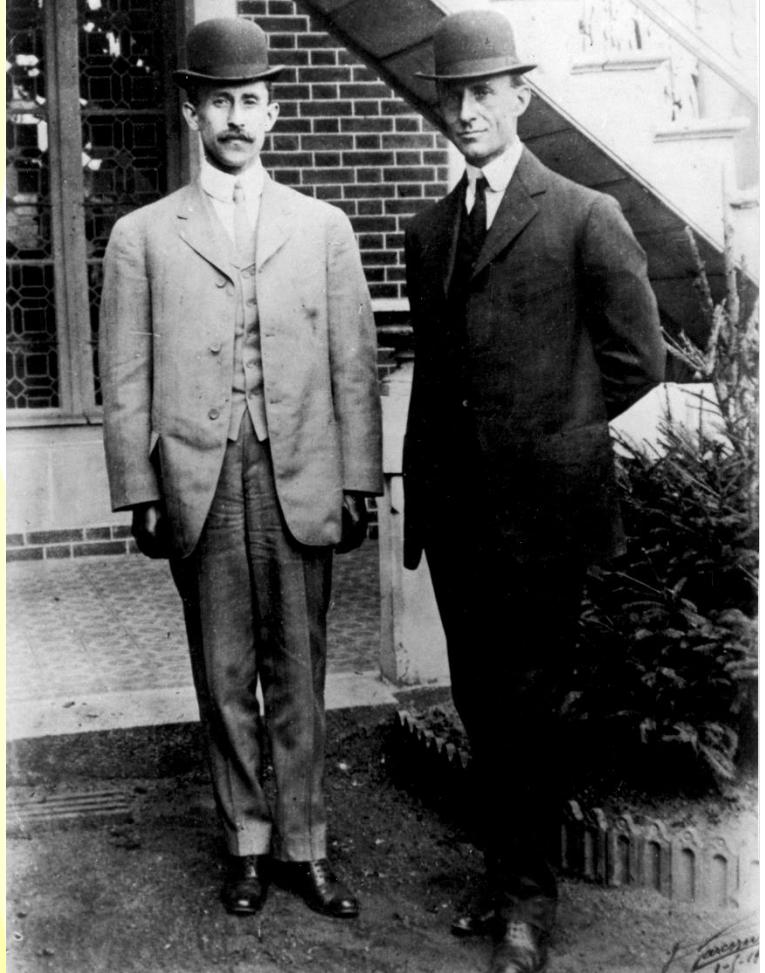




First Attempts to Fly by Man – Daniel Madrigal

Source: <https://www.youtube.com/watch?v=8y3flr4dVYE>

Wright Brothers and the first powered flight



Old Movie Collector

Wright Brothers
First Flight
1903

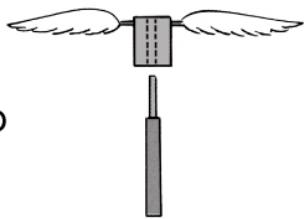
Wright Brothers First Flight, 1903 – Old Movie Collector

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

A brief history of Helicopters

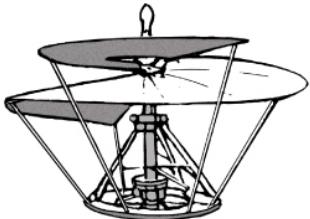
1100

Chinese flying top



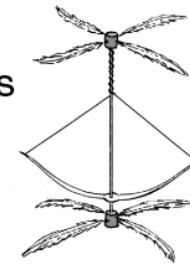
1483

Leonardo da Vinci's helical airscrew



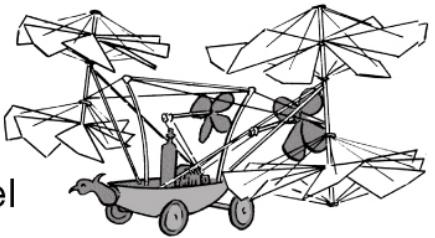
1784

Launoy and Bienvenu's feather model



1843

Sir George Cayley's steam-powered model



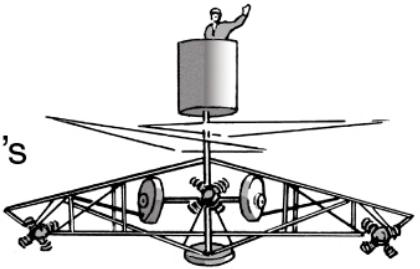
1907

Paul Cornu's first man-carrying helicopter



1916

István Petróczy and Theodore von Kármán's tethered helicopter



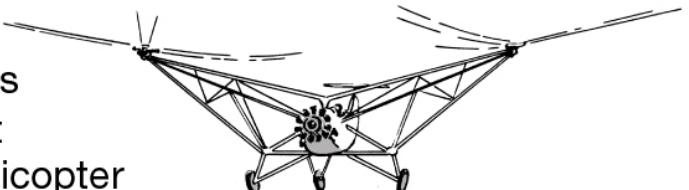
1923

Juan de la Cierva's autogiro



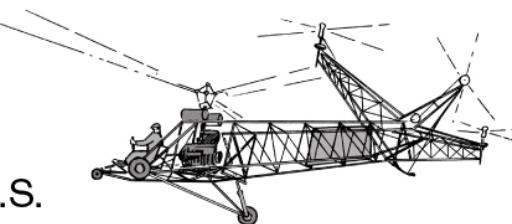
1936

Focke Achgelis Fa 61, the first successful helicopter

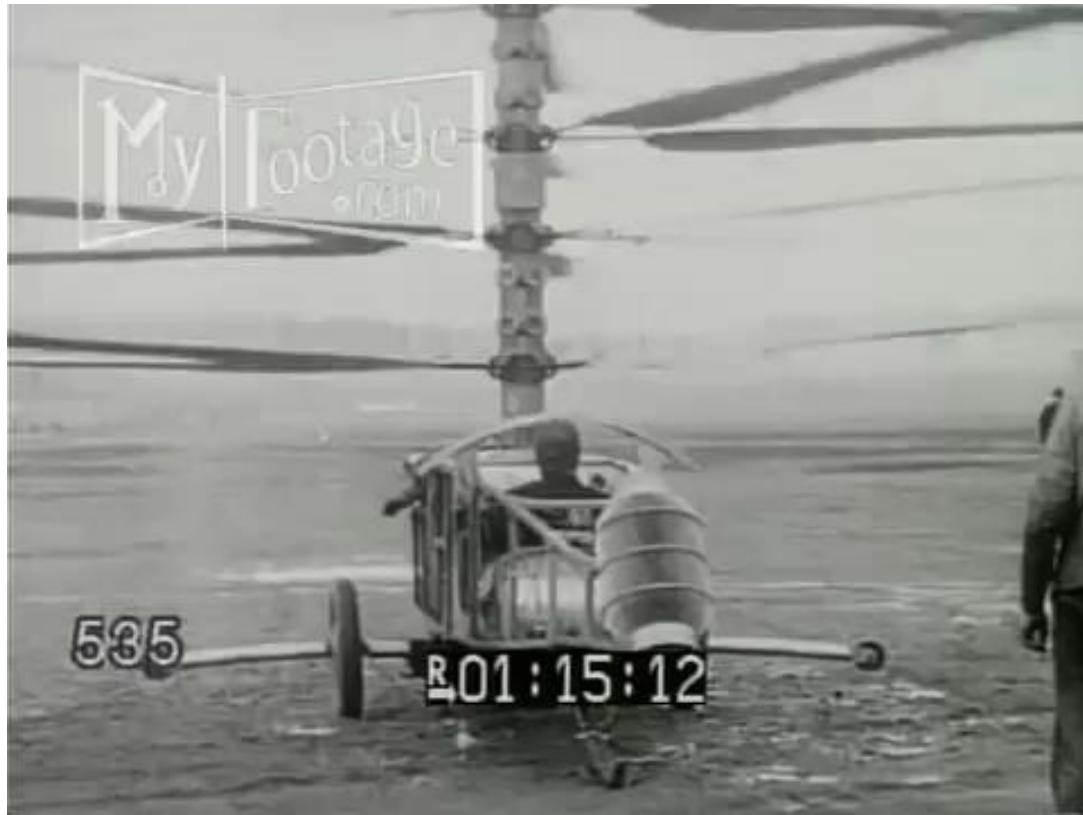


1939

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







1920s Early Helicopters – MyFootage.com

Source: <https://www.youtube.com/watch?v=0VmB2cAqGi4>

What is propulsion?

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

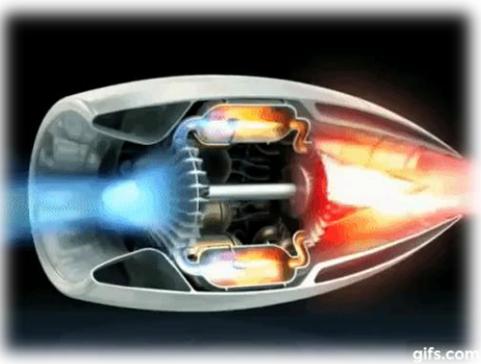
The word is derived from two Latin words:

pro - meaning before or forward

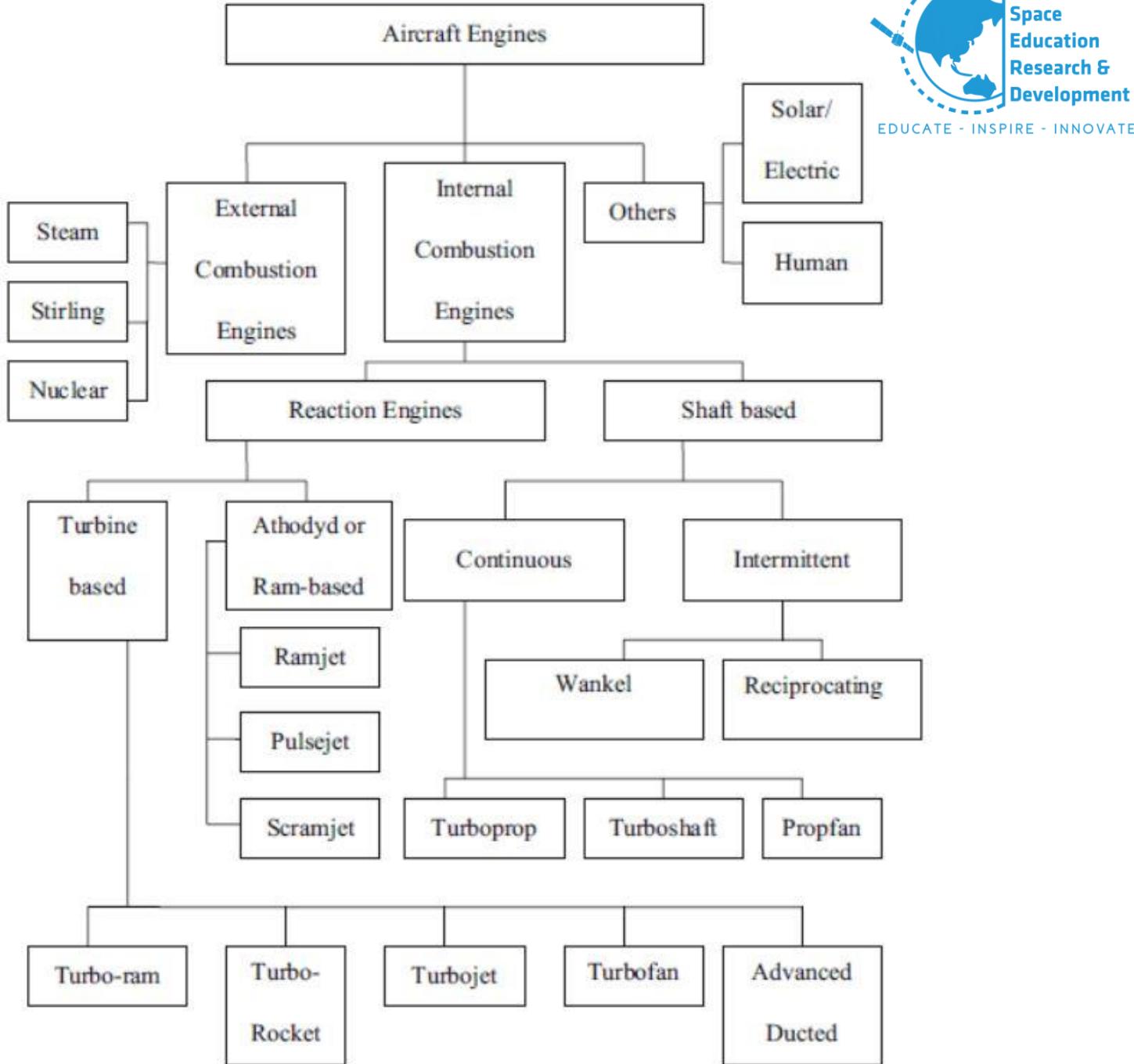
pellere - meaning, to drive



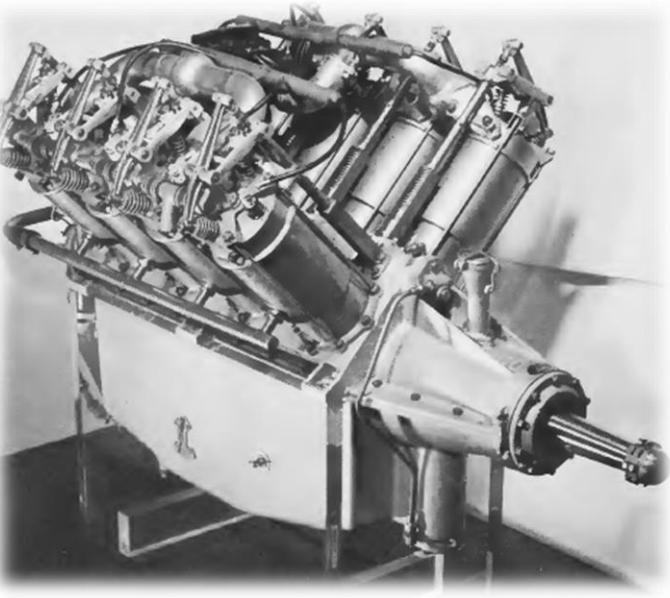
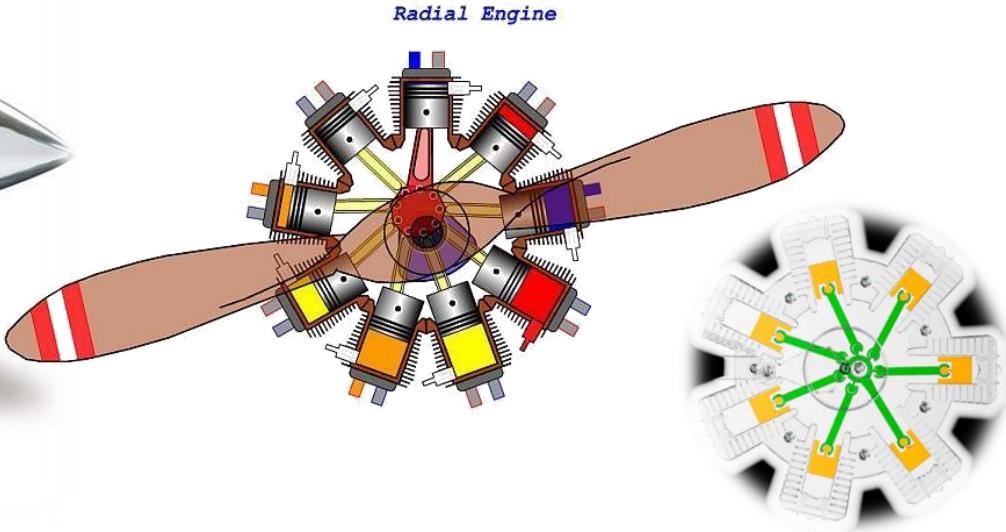
A propulsion system is an engine that produces thrust to push an object, such as an airplane or rocket



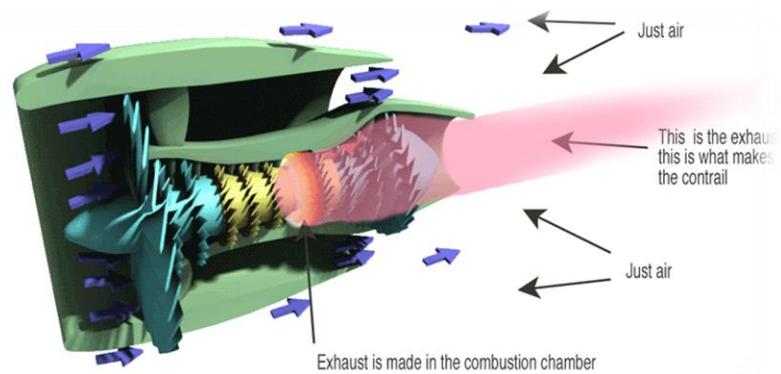
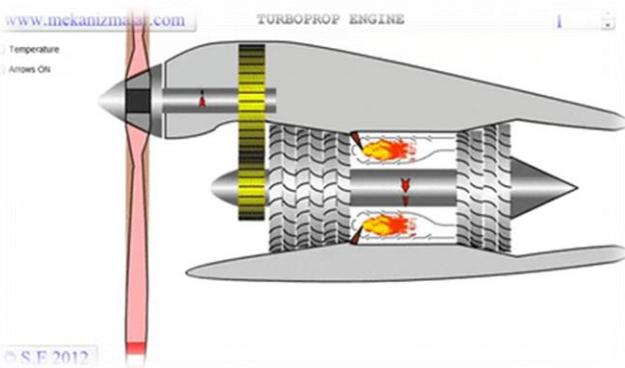
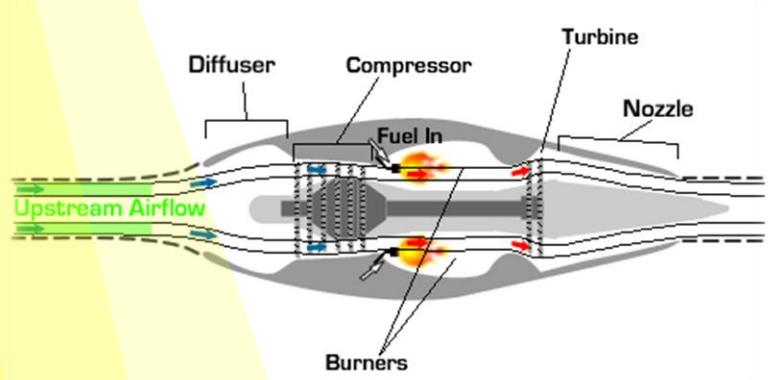
Classification of Aircraft Engines



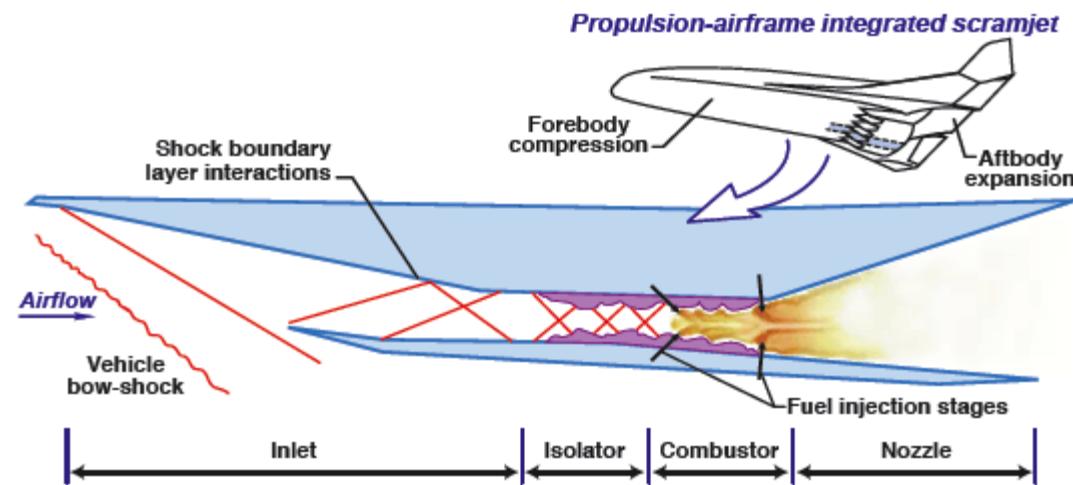
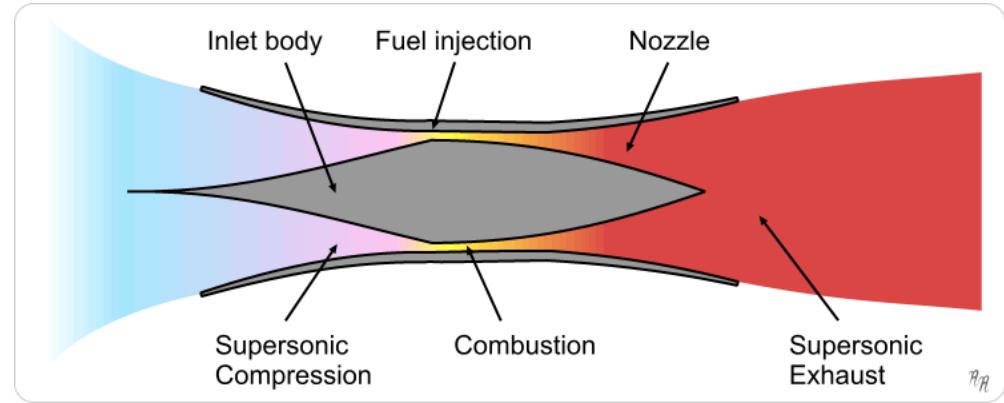
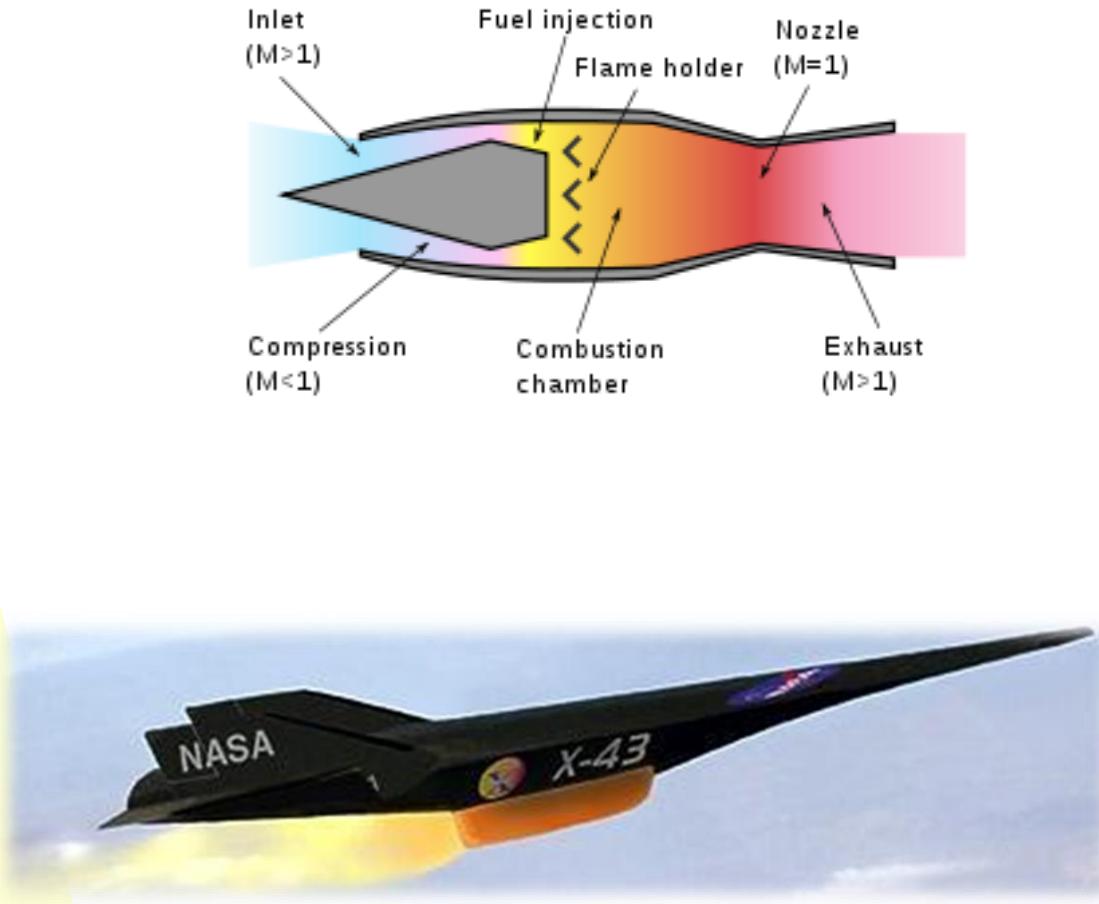
Piston Propeller Engines



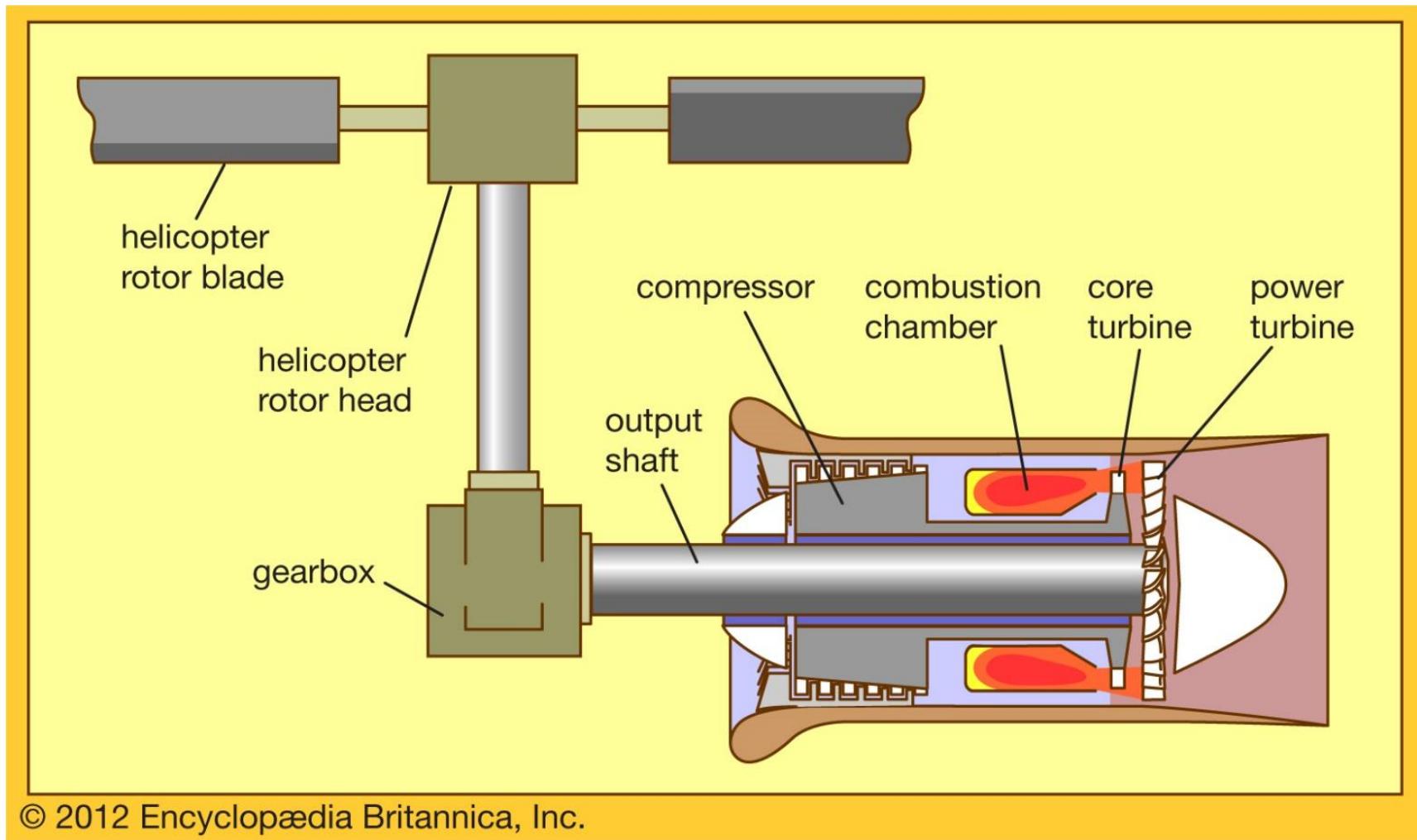
Turbojets, Turboprops and Turbofans



Ramjets and Scramjets



Turboshaft engines

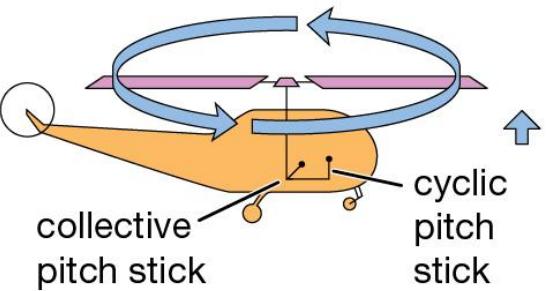


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Helicopter controls

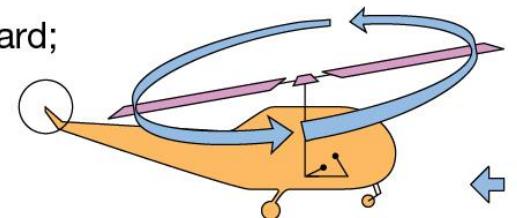
up

all blades at
same pitch



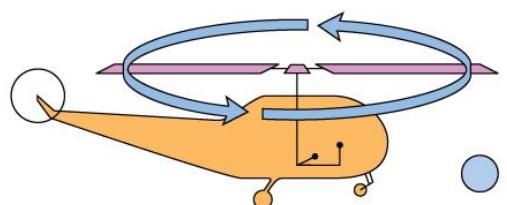
backward

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



hover

all blades at
same pitch

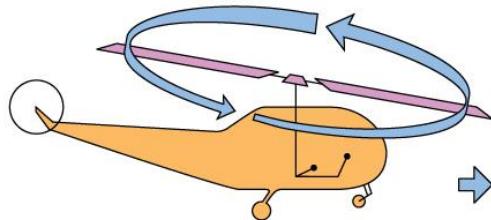


down and autorotation

all blades at low pitch

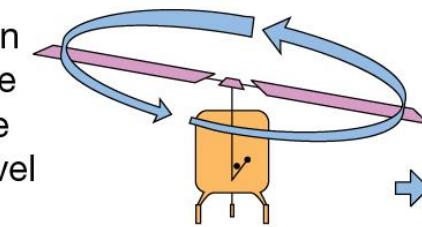
forward

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



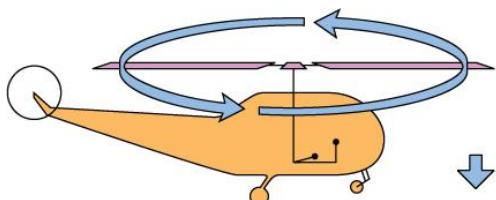
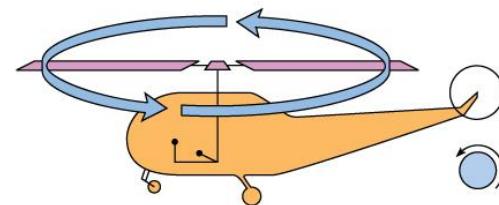
sideways

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

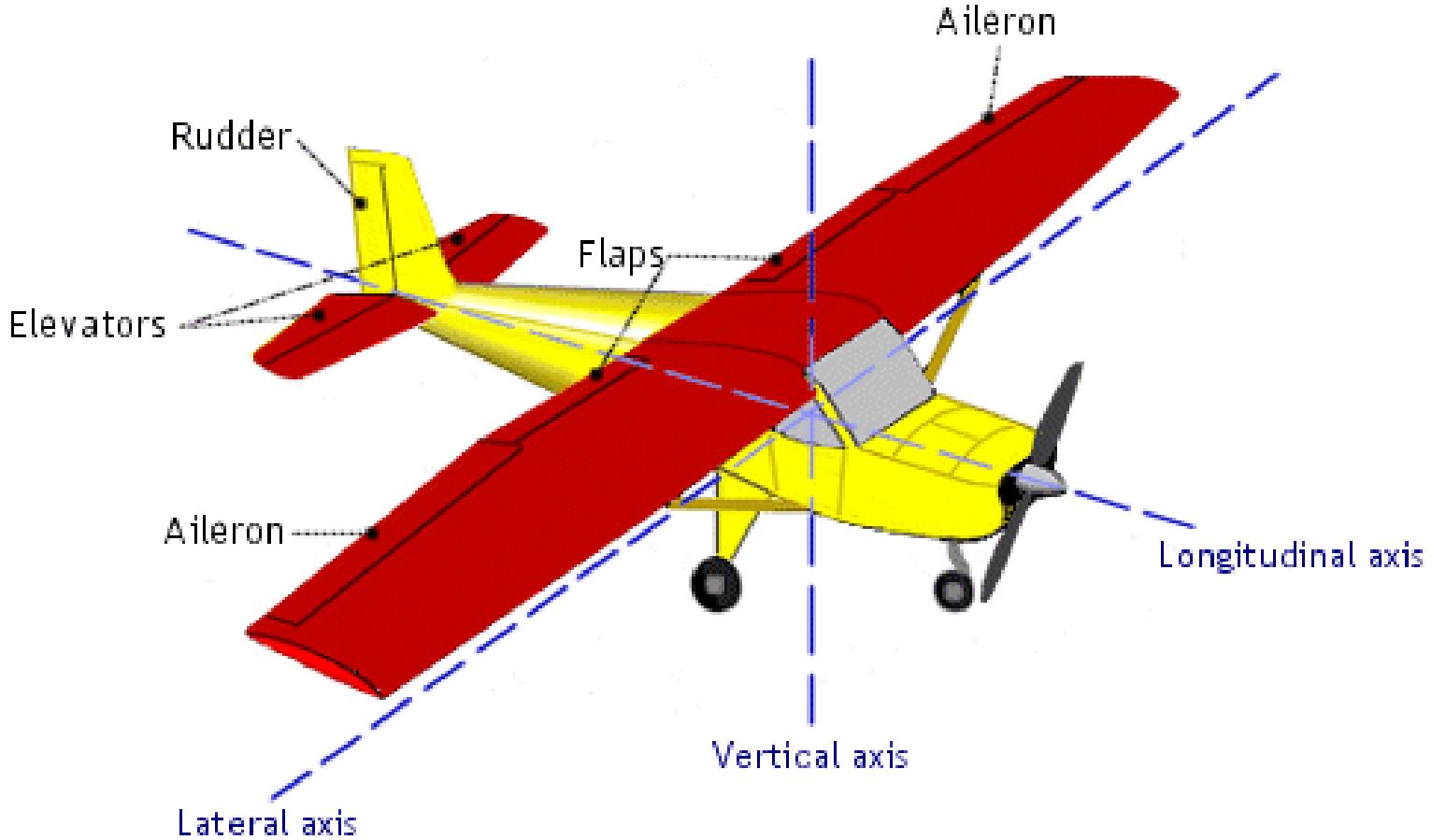


turn

helicopter hovers;
pitch of tail rotor
blades swings craft

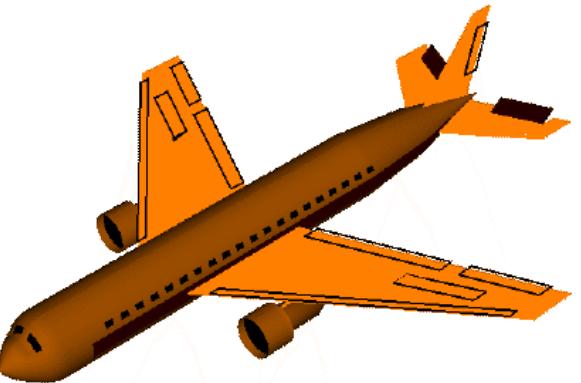


Control Surfaces on an Airplane

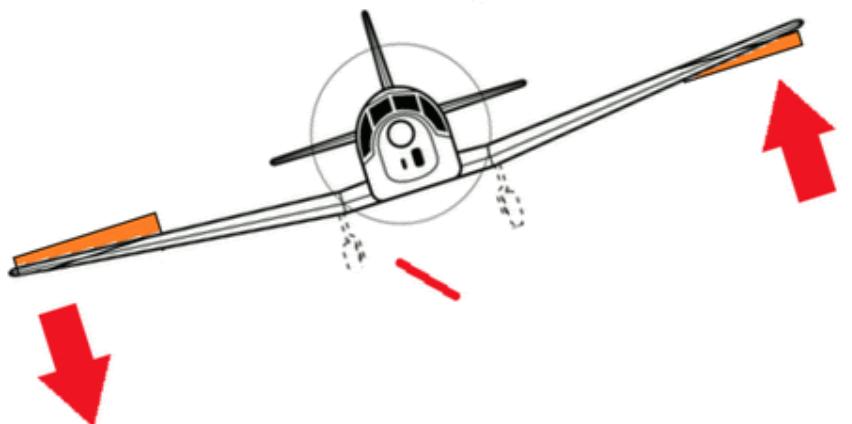


Control Surfaces on an Airplane

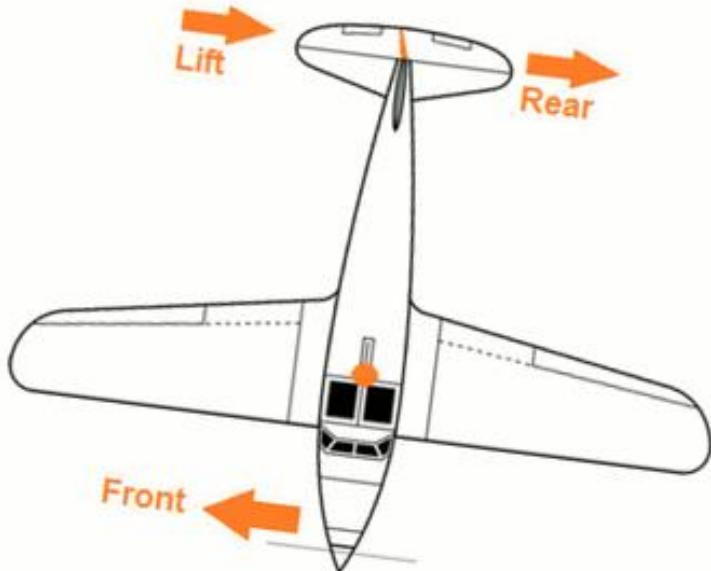
Pitch Control (Elevators)



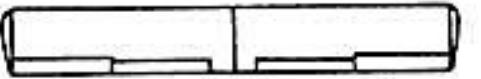
Roll Control (Ailerons + Rudders)



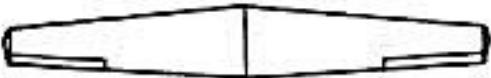
Yaw Control (Rudders + Ailerons)



Types of wings (based on planform shape)



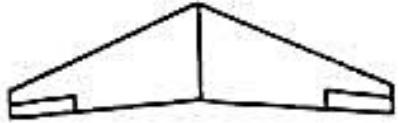
Rectangular
straight wing



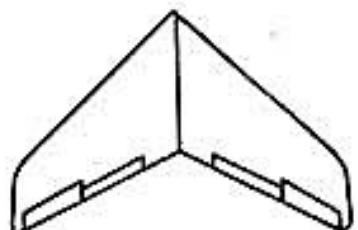
Tapered straight wing



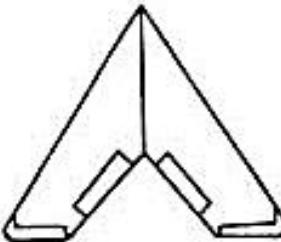
Rounded or elliptical
straight wing



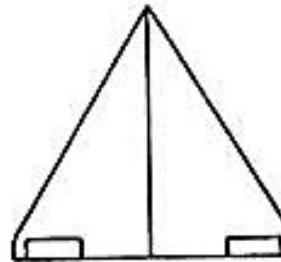
Slightly swept wing



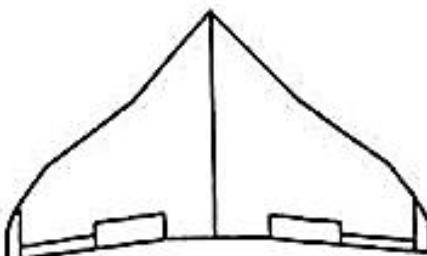
Moderately swept wing



Highly swept wing



Simple delta wing

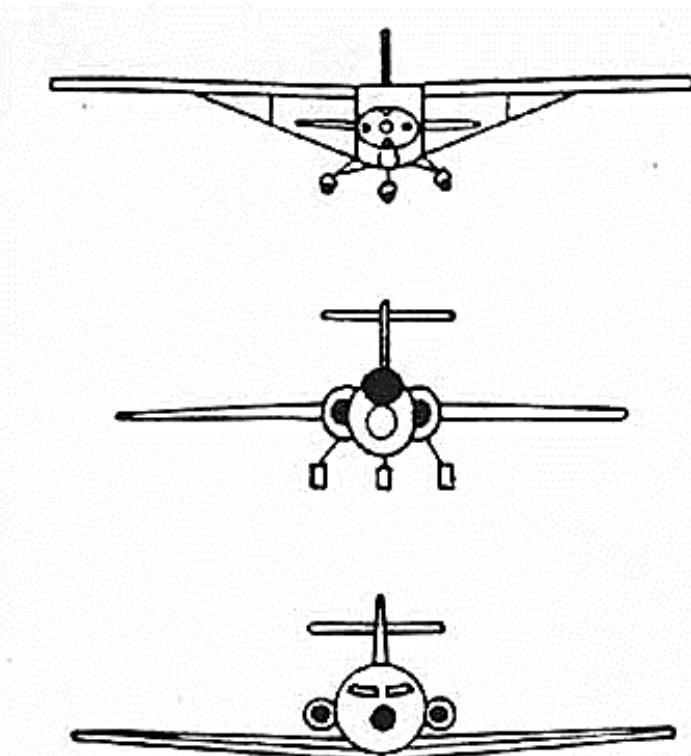


Complex delta wing

Learning from Nature



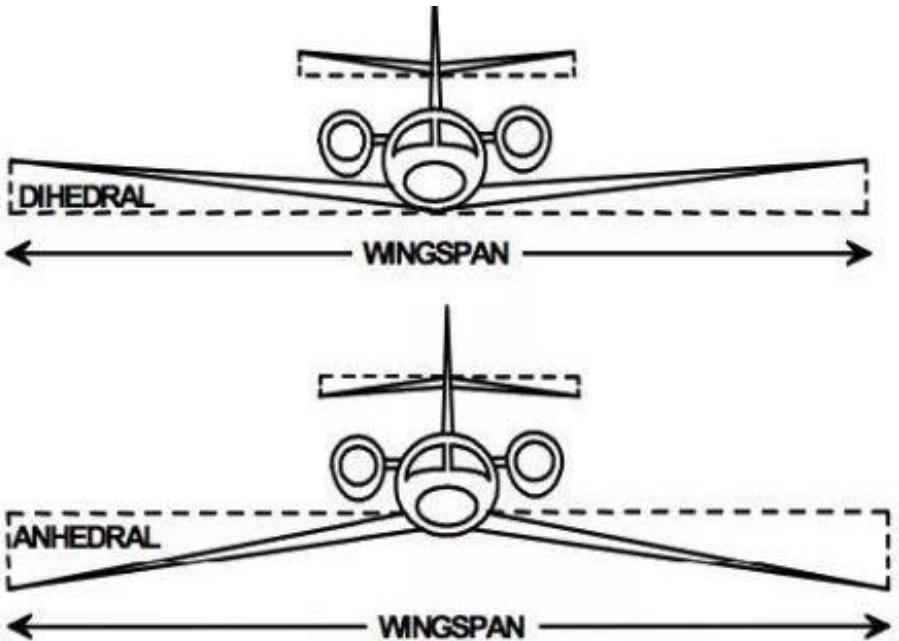
Types of wings (based on wing position)



High-wing

Mid-wing

Low-wing

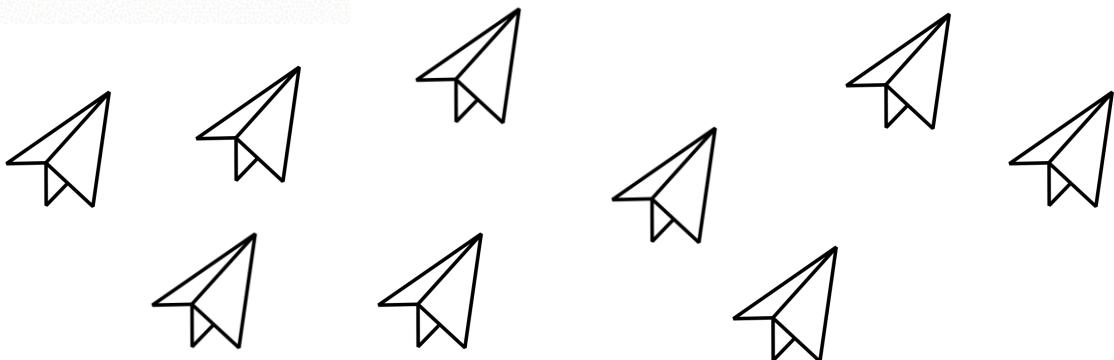


Pause-Point

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



Its time to explore through an activity!



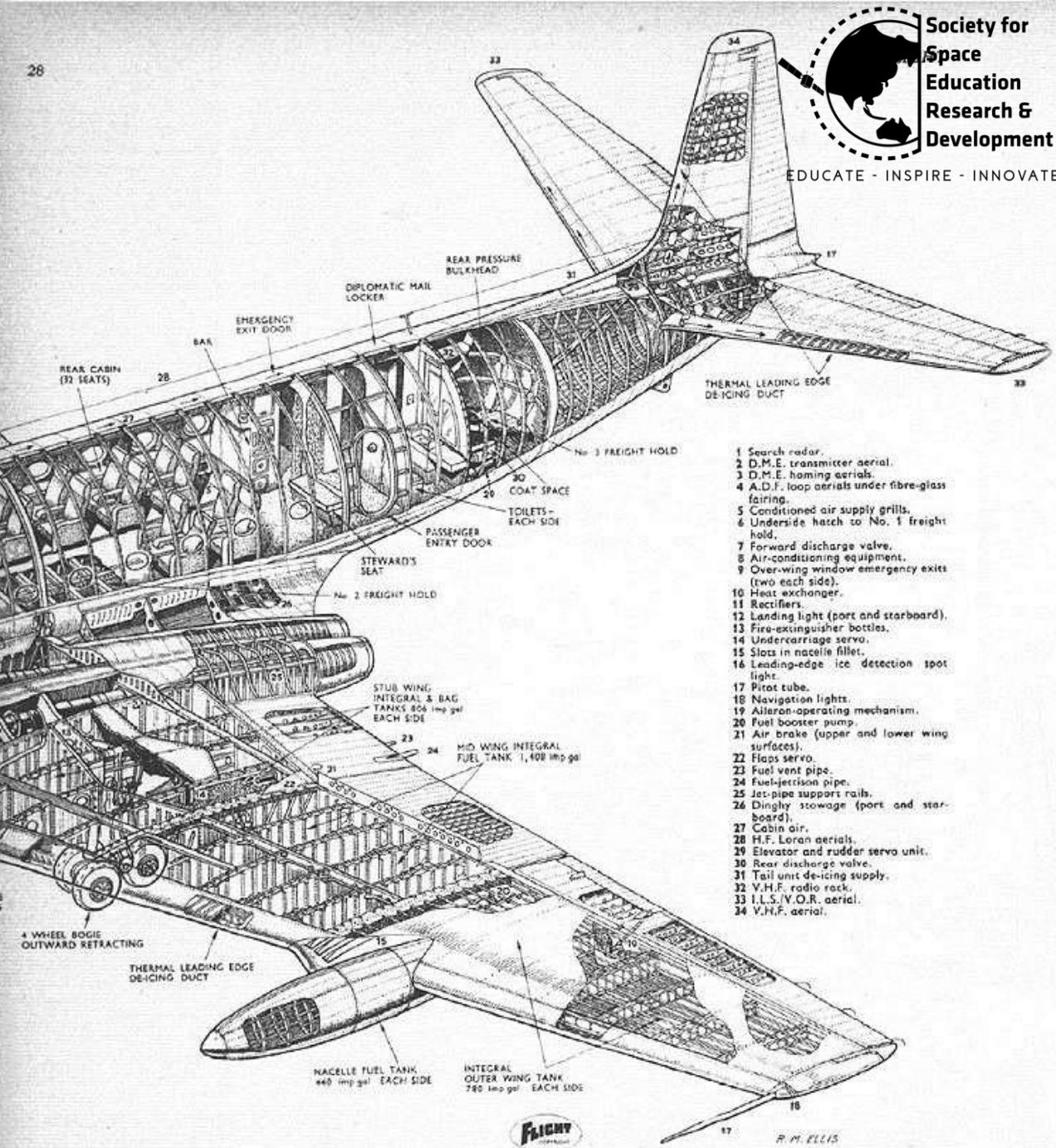
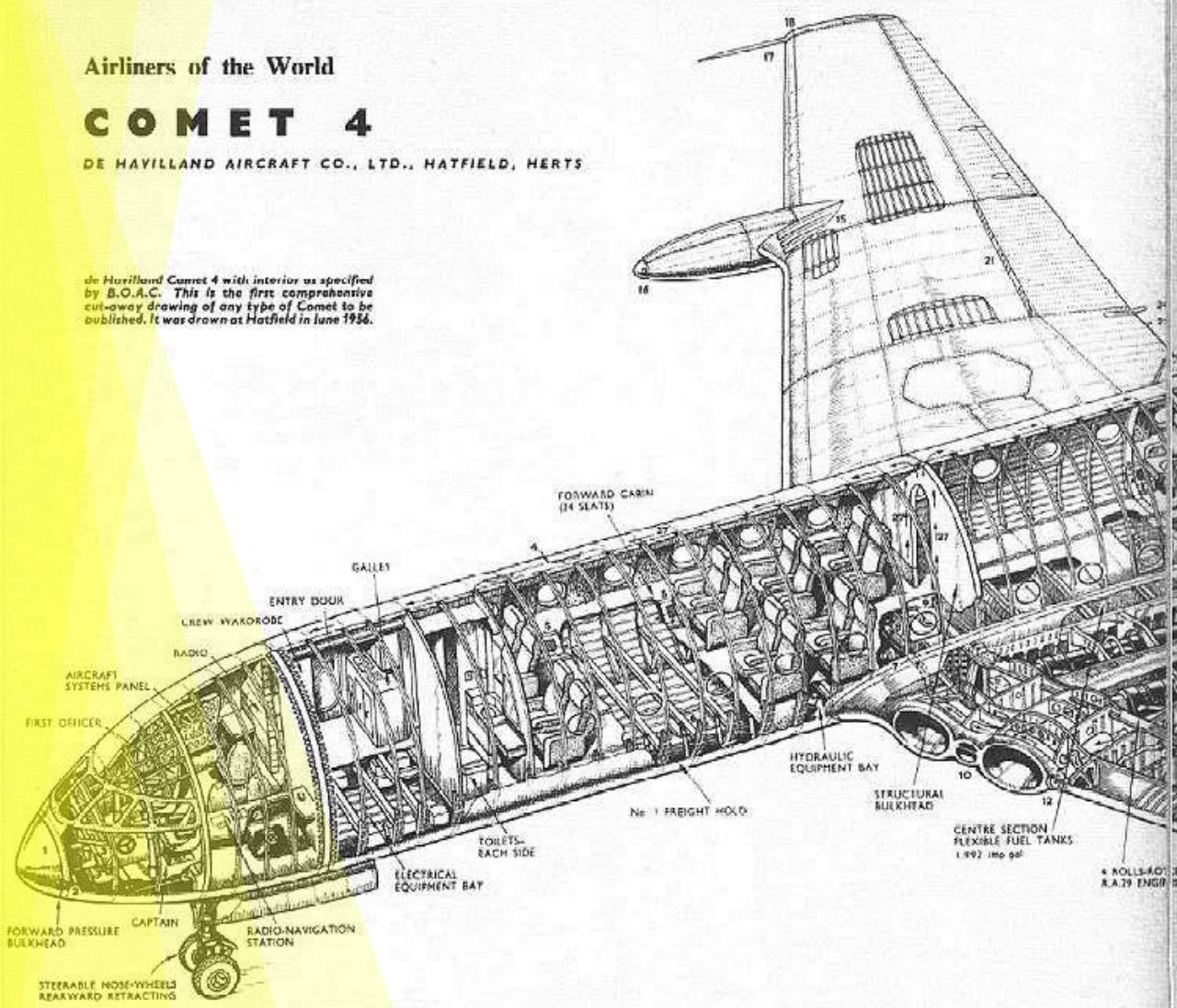
Aircraft Assembly

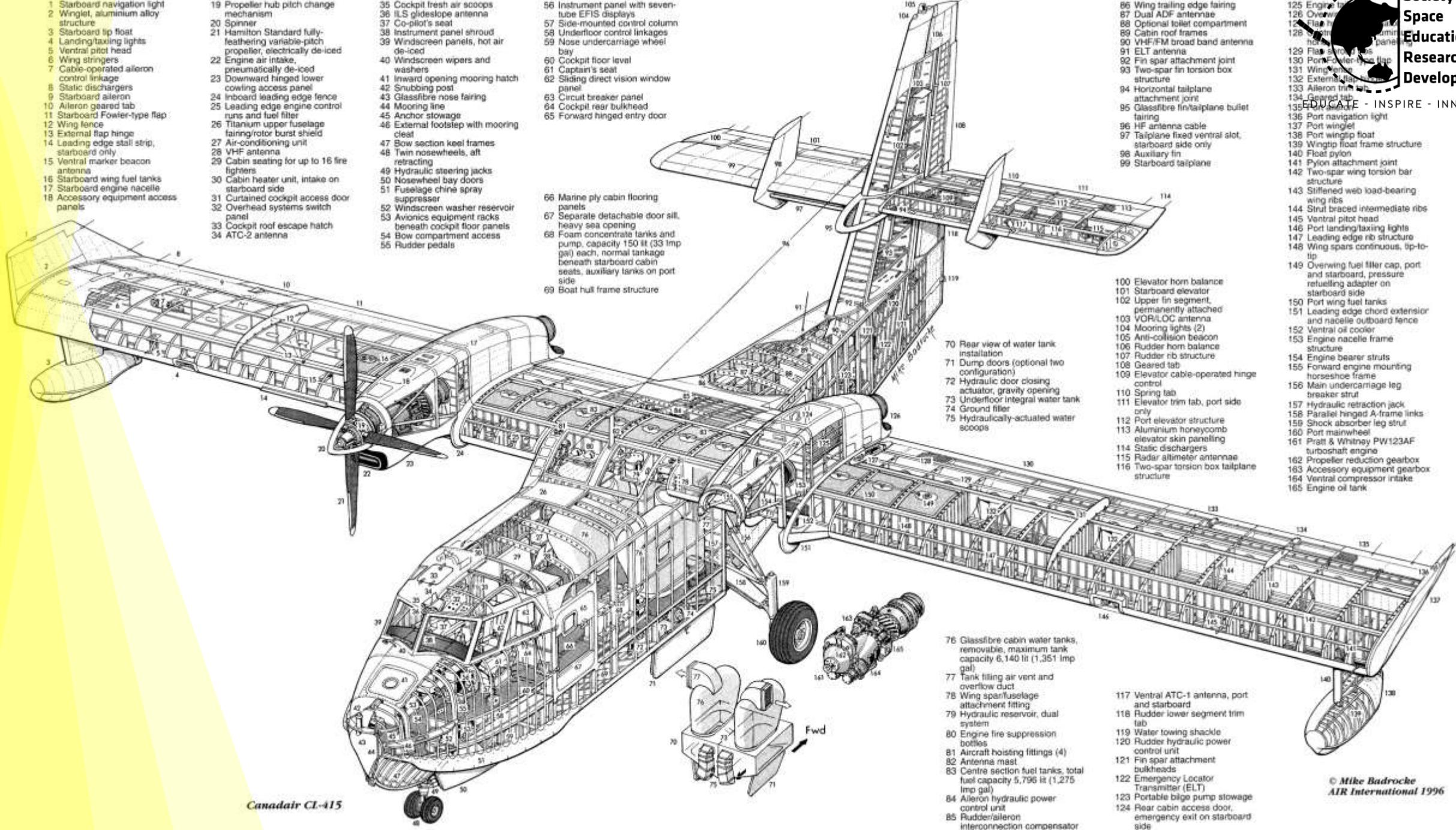
Airliners of the World

COMET 4

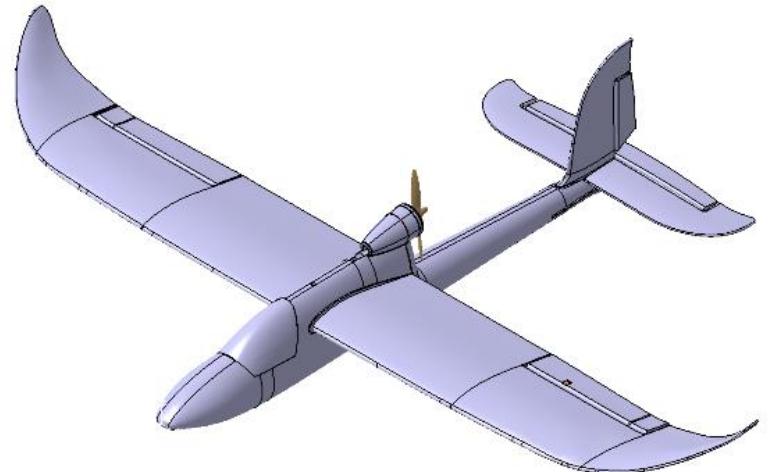
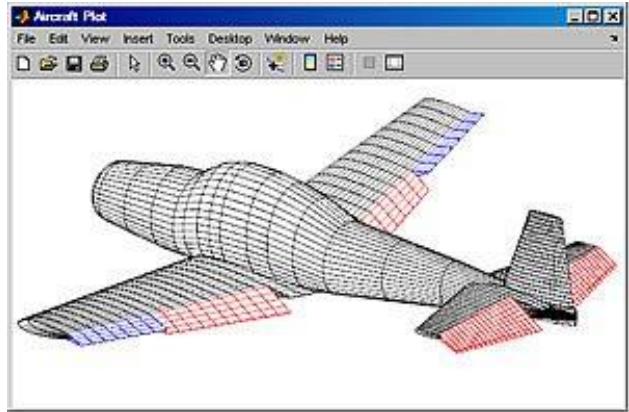
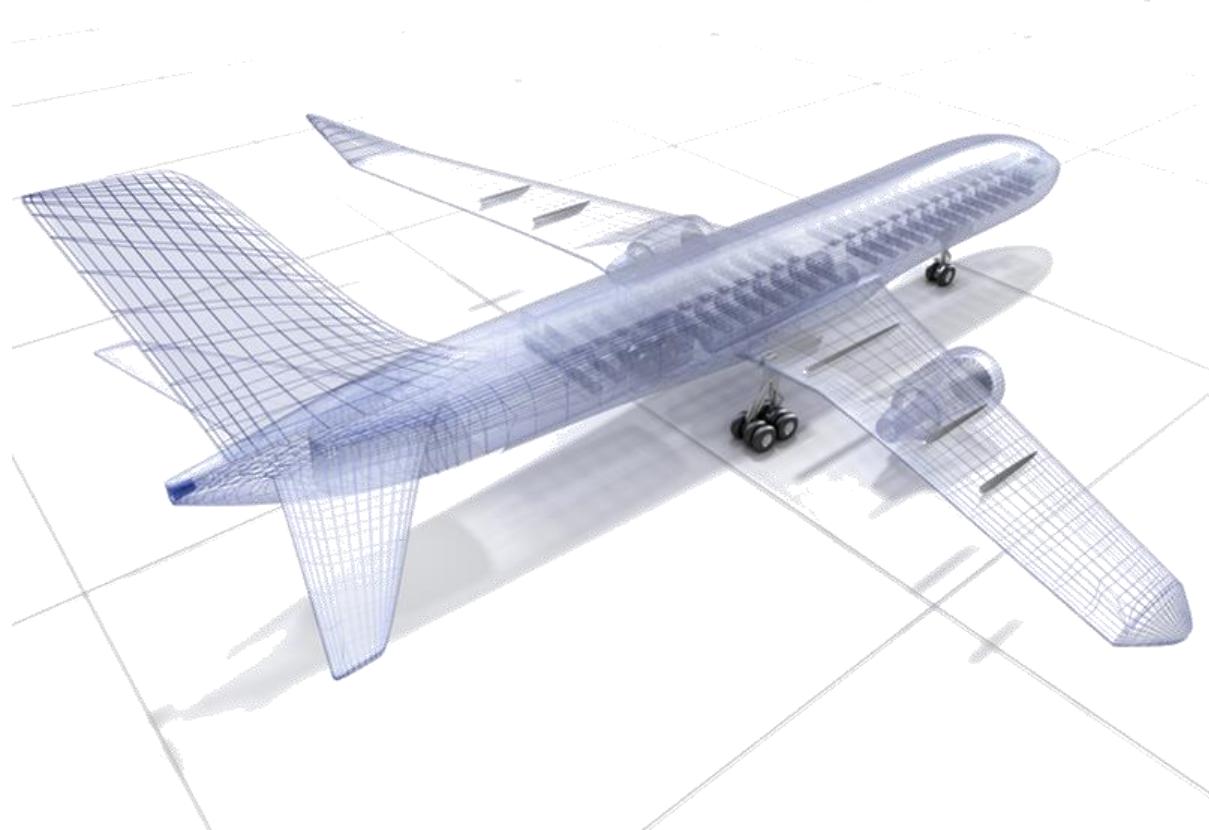
DE HAVILLAND AIRCRAFT CO., LTD., HATFIELD, HERTS

de Havilland 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 1956.

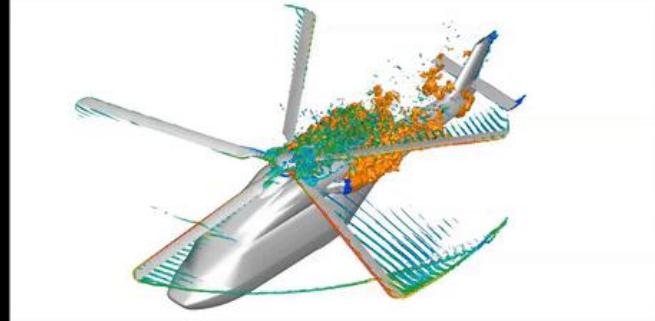
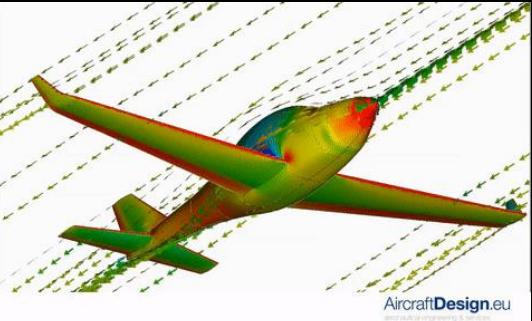
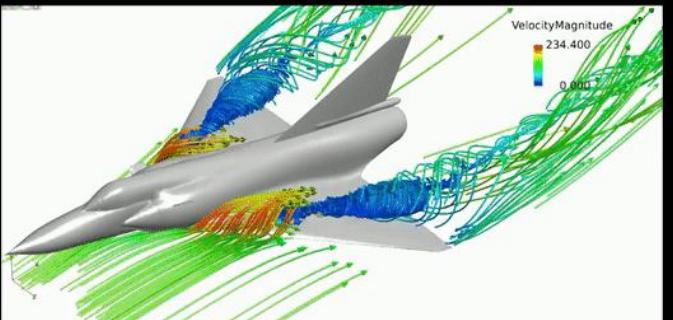
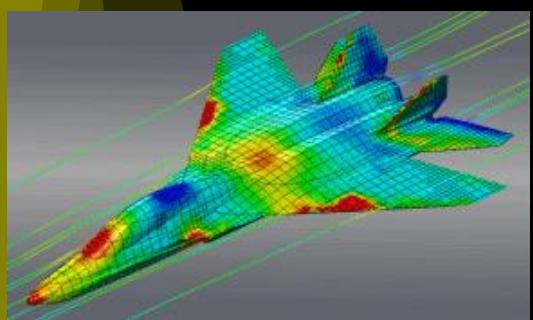
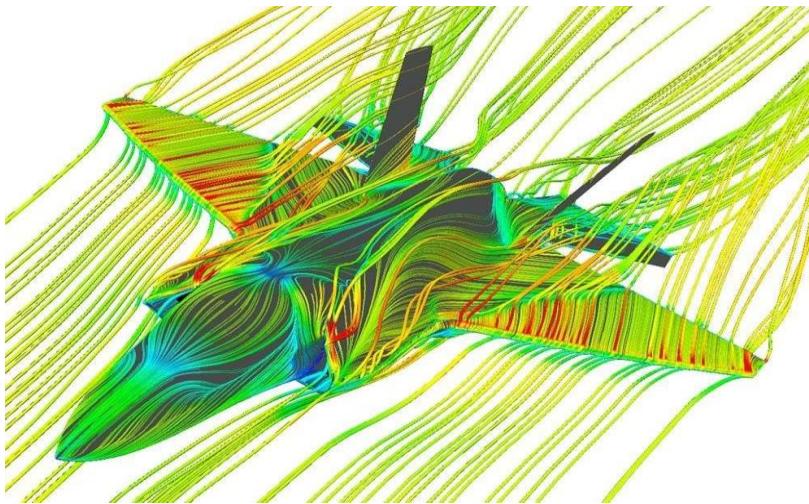
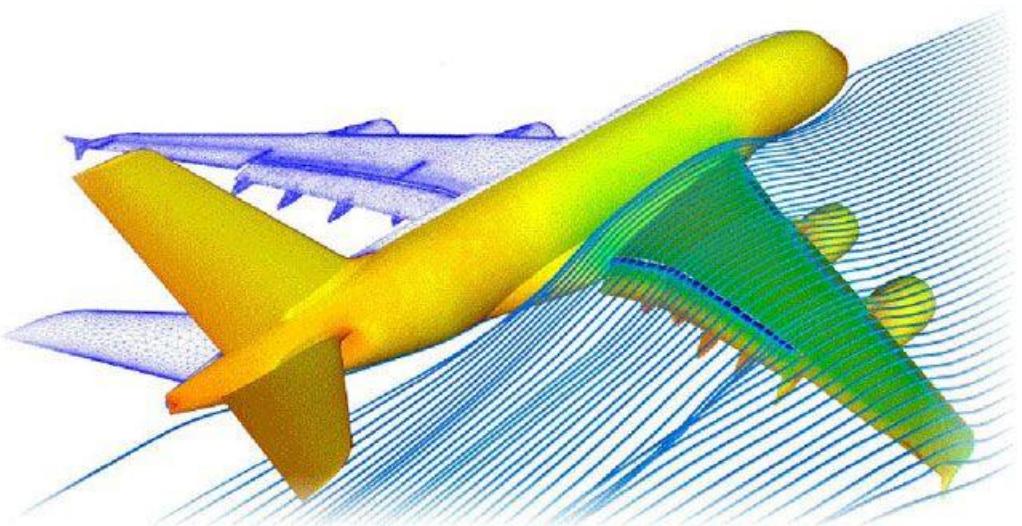




Aircraft Designing

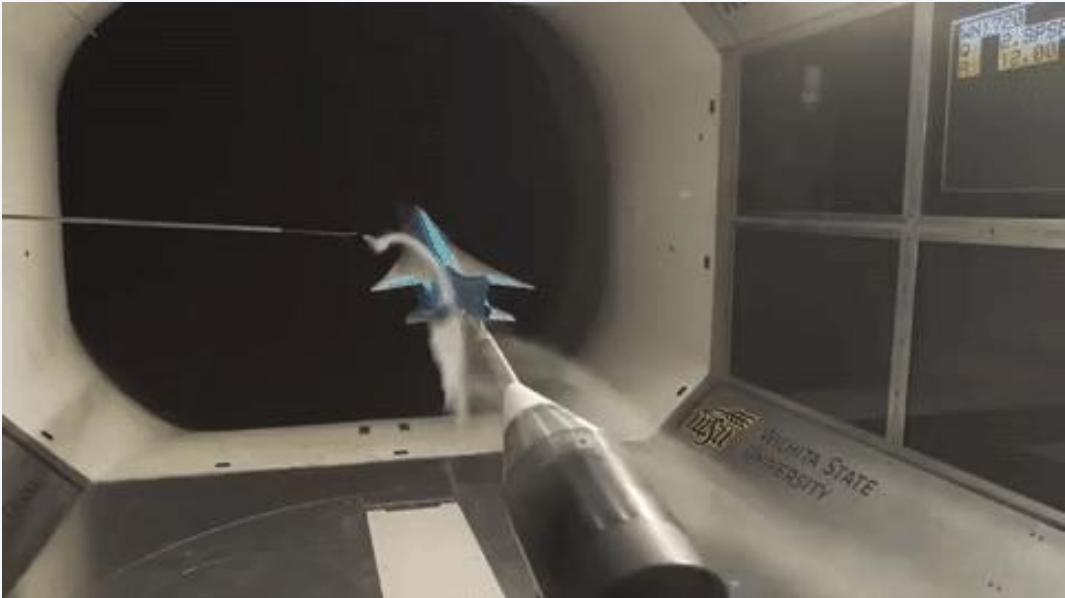


Testing the aircraft designs through computer simulations



Computational Fluid Dynamics (CFD)

Wind Tunnel testing of scaled model



Roles and applications of Aircrafts in modern world



Types of Private Jets



Very Light 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



Mid-Size Passenger Airplanes
Airbus A-350



Light Passenger Airplanes
Embraer E-175



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



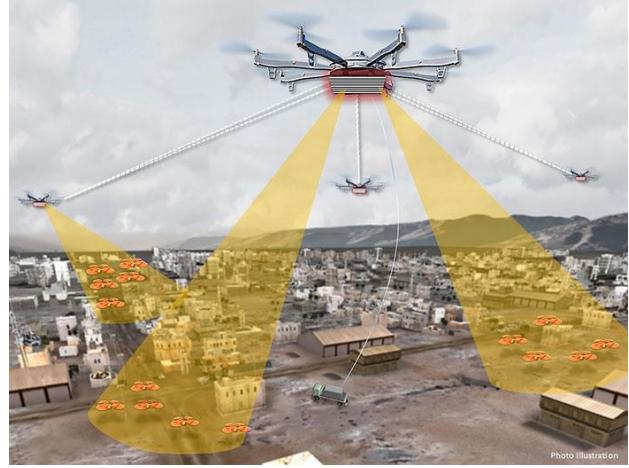
Unmanned Aerial Vehicles (UAV)



Agriculture



Photography



Surveillance



Remote tracking



Air strikes

Solar Impulse-2 : Solar Powered Aircraft



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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