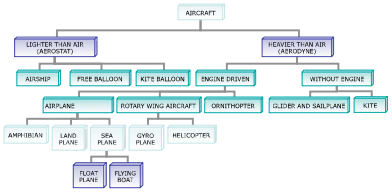
CLASSIFICATION OF AIRCRAFT AND SPACECRAFT

TYPES OF AIRCRAFT

- Aircraft can be classified into various types based on the mode of classification.
- In the following slide, a general classification of aircraft is shown.

CLASSIFICATION OF AIRCRAFT

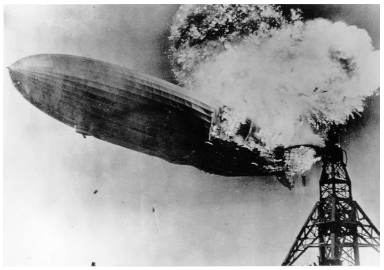


LIGHTER-THAN-AIR AIRCRAFT

- Any aircraft kept aloft by gas, which is lighter than air, contained in the craft is known as an aerostat.
- Examples of aerostats are balloons and airships.
- Today, lighter-than-air aircraft are used almost only for recreational purposes.

Air Ship - Hindenburg

Hydrogen is Inflammable!



LIGHTER-THAN-AIR AIRCRAFT

- Aerostats are further classified as follows, airships, free balloons and kite balloons.
- Airships - These are aerostats having power plant for propulsion and means of steering the craft. They are made buoyant by enclosing a volume of gas which is lighter than air.

LIGHTER-THAN-AIR AIRCRAFT

- In the case of airships, the internal pressure of the gas keeps maintains the shape of the envelope without the need of any longitudinal members.
- Free balloons - These are balloons which are not anchored to the ground and are free to move with the wind.

LIGHTER-THAN-AIR AIRCRAFT

- Kite balloons - A Kite balloon is a balloon which is shaped and trimmed so as to derive stability from wind.

HEAVIER-THAN-AIR AIRCRAFT

- Aerodyne is the technical name for any type of heavier than air aircraft.
- This covers all aircraft that derive lift in flight principally from aerodynamic forces.
- Examples are conventional planes, gliders, helicopters etc.

HEAVIER-THAN-AIR AIRCRAFT

- Aerodynes can be with or without engines.
- Aerodynes with engines are classified as airplanes, rotary wing aircraft and ornithopters.
- Airplane - This is an engine driven aerodyne that achieves lift from the dynamic action of air against fixed wings.

HEAVIER-THAN-AIR AIRCRAFT

- Rotary wing aircraft - These are aerodynes that achieve lift through the dynamic action of air against rotating wings.
- Ornithopter - This is an aircraft that flies due to the lift generated by flapping wings.

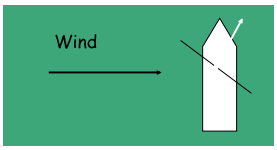
Aerodynamics of Sailing

- Sailing with the wind (running)

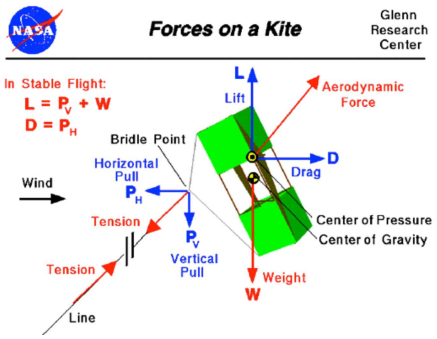
- Vmax < Vwind

Faster Sailing

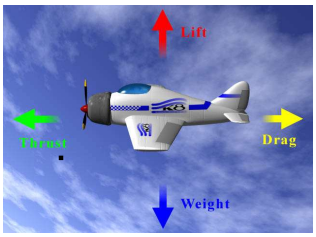
- Sailing across the wind (reach)



Aerodynes - Kite

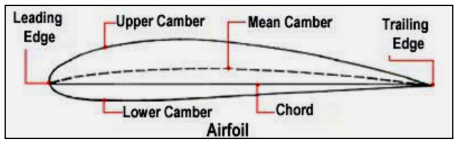


Aerodynes - Airplane



- Ideally, L=W, T=D
- L/D Ratio and T/W ratio

Wing Airfoil Section



HEAVIER-THAN-AIR AIRCRAFT

- Airplanes can be further classified as amphibians, land and sea planes.
- Amphibians - These are airplanes which can take off and land on both land and water.
- Land planes - These can take off and land only on a land surface.

HEAVIER-THAN-AIR AIRCRAFT

- Sea planes - These are aircraft that take off and land only on sea.
- Sea planes are classified further as float seaplanes and flying boats.
- Float seaplane - This is a seaplane supported on water by a pair of floats instead of a hull.

HEAVIER-THAN-AIR AIRCRAFT

- Flying boat - This is an aircraft which has a hull as its main body. The hull also supports the aircraft on water.
- Rotary wing aircraft are classified into two types as gyroplanes and helicopter.

HEAVIER-THAN-AIR AIRCRAFT

- Gyroplane - This is a power driven aerodyne which derives lift mainly from a rotor freely rotating in the horizontal plane, but thrust is obtained from a conventional engine.
- Helicopter - This is an aerodyne which derives both lift and thrust from rotating rotors.

HEAVIER-THAN-AIR AIRCRAFT

- Helicopters can be classified into various types depending on the type of rotor like,
  - Single main rotor with tail rotor,
  - Side-by-side non intermeshing rotors,
  - Torqueless single rotor,
  - Side-by-side intermeshing rotors,
  - Tandem rotors,
  - Three rotors,
  - Coaxial rotors etc.

Tandem Rotor – CH47 Chinook

HEAVIER-THAN-AIR AIRCRAFT

- Aerodynes without engine are classified as gliders, sailplanes and kites.
- Glider - This is an aerodyne which flies without any applied power due to aerodynamic lift generated by its wings and initial thrust given by some launching mechanism.

HEAVIER-THAN-AIR AIRCRAFT

- Sailplanes - These are high performance gliders that soar, maintain and direct their flight over extended periods of time and distance.
- Kites - A kite is any non-power driven structure which is anchored to the earth, and which derives lift from aerodynamic forces.

HEAVIER-THAN-AIR AIRCRAFT

- These aircraft can also be classified based on the following,
  - Mach Number
  - Purpose
  - Type of Engines
  - Number of Engines
  - Number of Wings

CLASSIFICATION OF HEAVIER-THAN-AIR AIRCRAFT

- Range
- Mode of take-off and landing
- Size and Payload Capacity
- Source of Power
- Special features

CLASSIFICATION BASED ON MACH NUMBER

- Aircraft are classified based on their maximum Mach number,
  - Subsonic (M<1)
  - Transonic (M~1)
  - Supersonic (M>1)
  - Hypersonic (M>>1)

CLASSIFICATION BASED ON PURPOSE

- Aircraft are mainly classified based on their purpose as follows,
  - Passenger Transport
  - Business jets
  - Cargo Transport
  - Experimental aircraft
  - Trainers

CLASSIFICATION BASED ON PURPOSE

- Military aircraft
  - »Fighters
  - »Bombers
  - »Medical / Rescue Aircraft
  - »Spy / Reconnaissance Aircraft