

A black fighter jet, possibly an F/A-18 Hornet, is shown from a low angle, flying towards the viewer over a rugged, snow-capped mountain range under a clear blue sky. The aircraft has red markings on its wings and tail.

Introduction Aerospace Technology & Air Transportation

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UNIVERSITAT POLITÈCNICA
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BARCELONATECH



Aerospace activities

- Industry
- Airline companies
- Organizations and Agencies for aeronautical & space sector
- Research centers and universities
- Facilities and ground equipment
(airports, airtraffic management, controls)
- Military activities



Aerospace activities

Industry

- High levels of security and reliability
- Very high competition
 - Cutting edge technology (materiels, engines, ...)
 - Highly qualified staff/personal
 - Need for research and continuous innovation (holding still is a step back)
- Relatively small product series
- Very long life cycle of projects
(10 year to introduce a new aircraft from plan to first flight; about 30years for use of an aircraft)
- Difficult automation
- Need of huge/large capitals
 - High risk (secure orders for new airplanes)
 - Alliances and international cooperation
 - Governmental interventions

Aerospace activities

Industry



Rolls-Royce®



arianespace
arianeGROUP



Honeywell

septentrio



Aerospace activities

Airline companies

- Very high competition
 - Important and aggressive marketing (pricing structures; Low cost carriers)
 - Complex pricing algorithms (overbooking strategy!)
 - High planning and organization (optimization; a plane only “makes money” if it is up in the air)
- Need of huge/large capitals
 - High risk - evolution of aircraft → ← “clean sheet” design (new development)
 - Alliances and international cooperation
 - Governmental interventions and/or support (Concord project – France & GB)
- Types and classes/models
 - Global
 - Regional
 - Charter
 - Low cost
 - Cargo

Aerospace activities

Airline companies and alliances





Aerospace activities

Organizations and Agencies for aeronautical & space sector

- Organizations for the Aeronautical Sector
 - **ICAO** (International Civil Aviation Organisation)
 - **ECAC** (European Civil Aviation Conference)
 - **EASA** (European Aviation Safety Agency)
 - **EUROCONTROL**
 - **FAA** (Federal Aviation Authorities)
 - **CANSO** (Civil Air Navigation Services Organization)
 - **ACI** (Airports Council International)
 - **IATA** (International Air Transport Association)
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 - **AENA, DGAC, AESA, Aeroports de Catalunya ...**



Aerospace activities

Organizations and Agencies for aeronautical & space sector

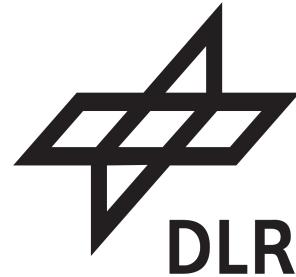
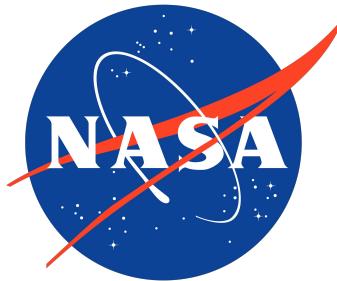
- Organizations for the Space Sector
 - **AST** (Associate Administrator for Commercial Space Transportation)
 - **CCSDS** (Consultative Committee for Space Data Systems)
- Aerospace agencies
 - **ESA** (European Space Agency)
 - **NASA** (National Aeronautics and Space Administration)
 - **CNES** (National Center for Spatial Studies)
 - **BNSC** (British National Space Center)
 - **DLR** (Deutsches Zentrum für Luft- und Raumfahrt)
 - **NLR** (Nederlands Instituut voor Navigatie)
 - **JAXA** (Japan Aerospace Exploration Agency)
 - **RKA** (Russian Federal Space Agency)

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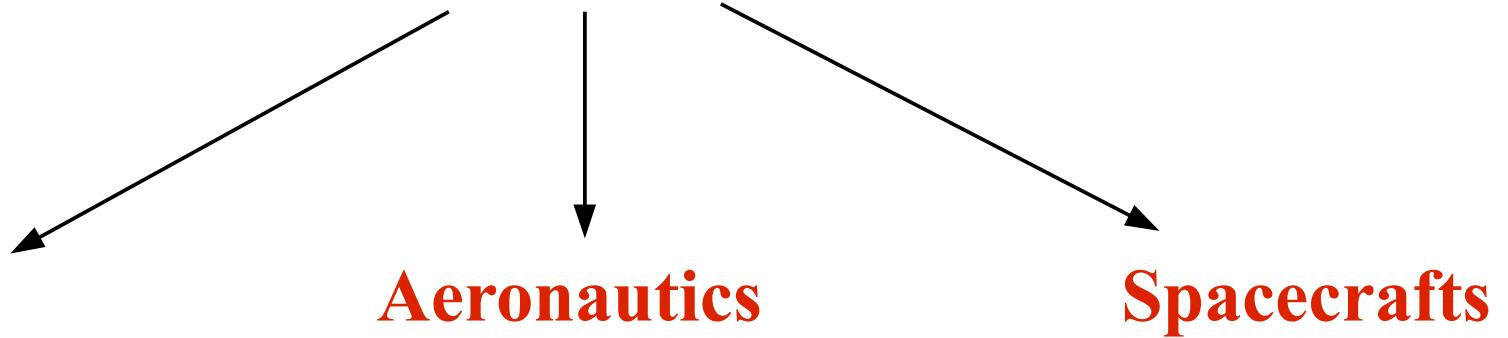
Aerospace activities

Aerospace agencies



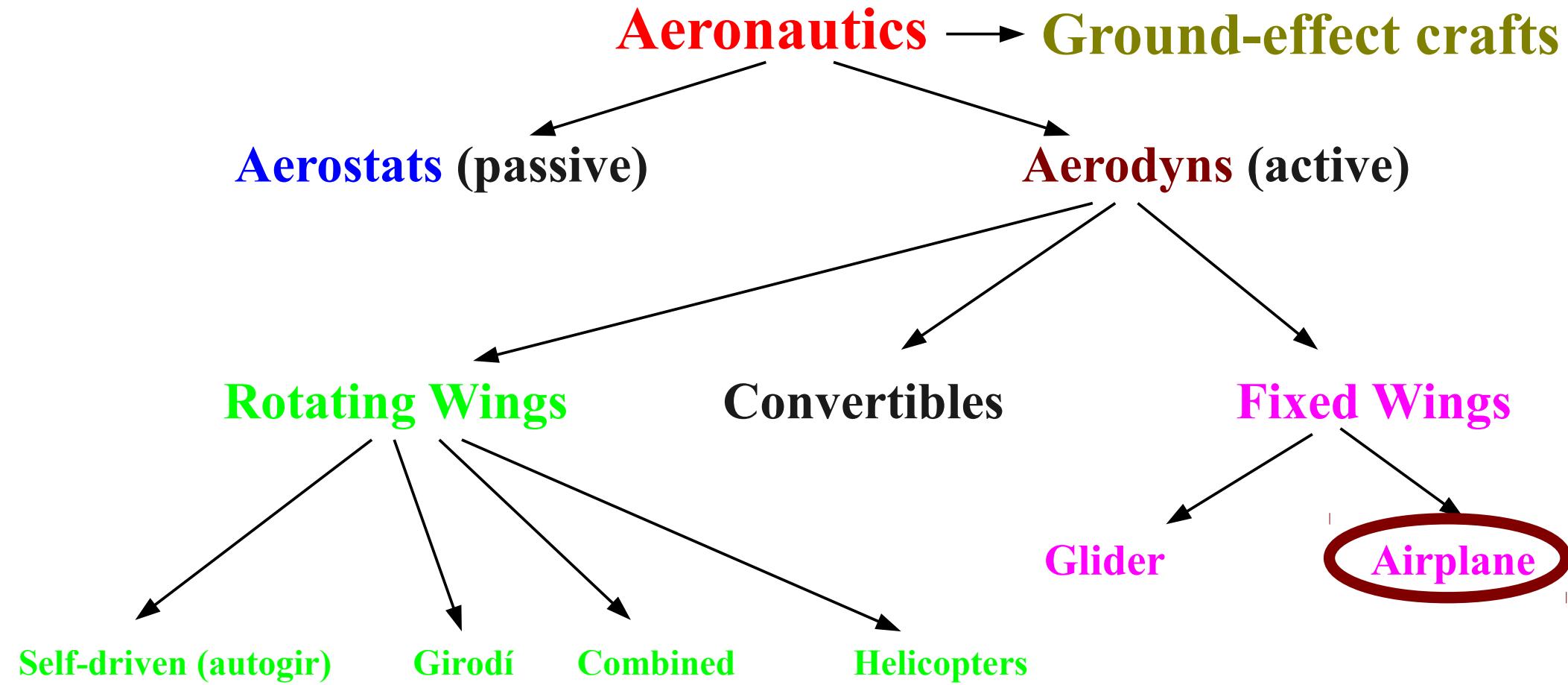
Aerospace Vehicles

Aerospace Vehicles



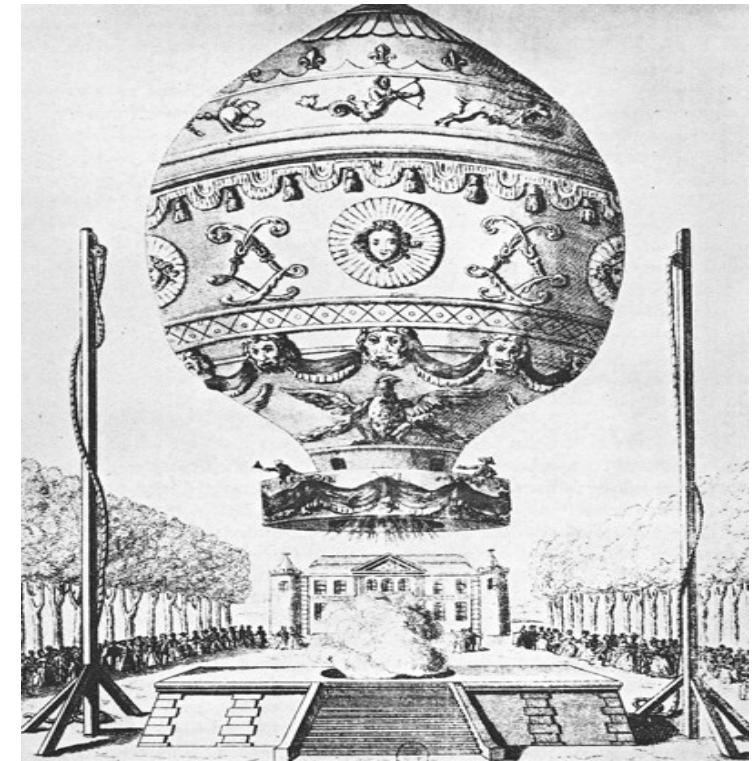
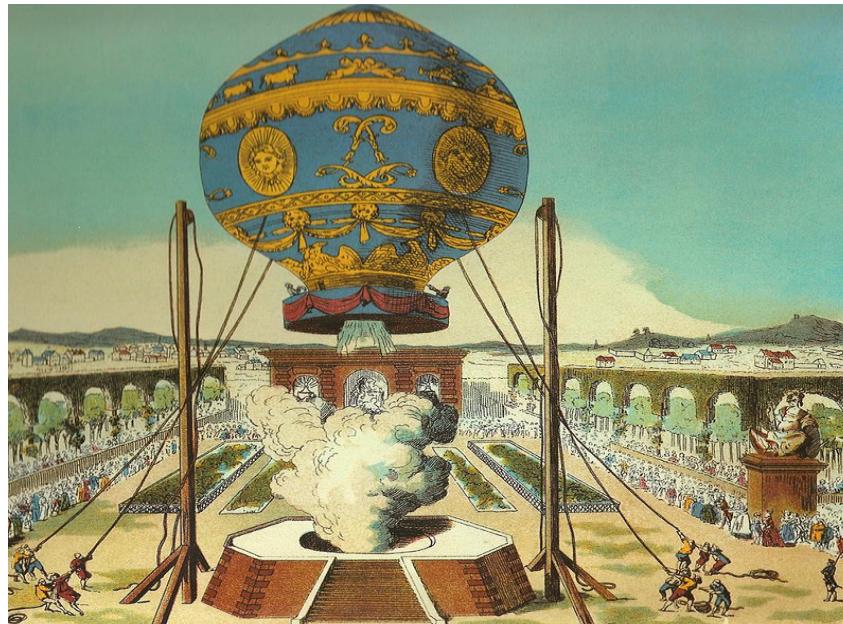
- Vehicle that is sustained thanks to a propulsive organ
- Vehicle to be sustained inside the atmosphere thanks to an interaction between the vehicle and the air that surrounds it
- Vehicles intended for evolve out the atmosphere

Aerospace Vehicles



Aeronautics

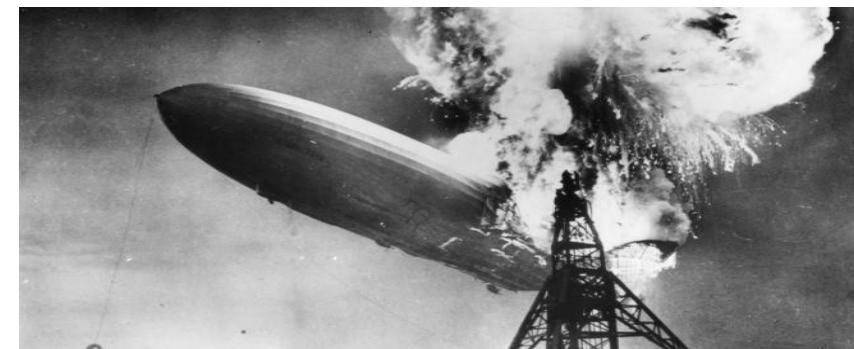
- **Aerostats (passive)** “beginning of getting up in the air (1783)”
 - The support in the air is achieved thanks to the aeroestatic push or arquimedetic force
 - Vehicles "**less heavy than air**" (initial use of H₂ but dangerous! → Hindenburg)



Aeronautics

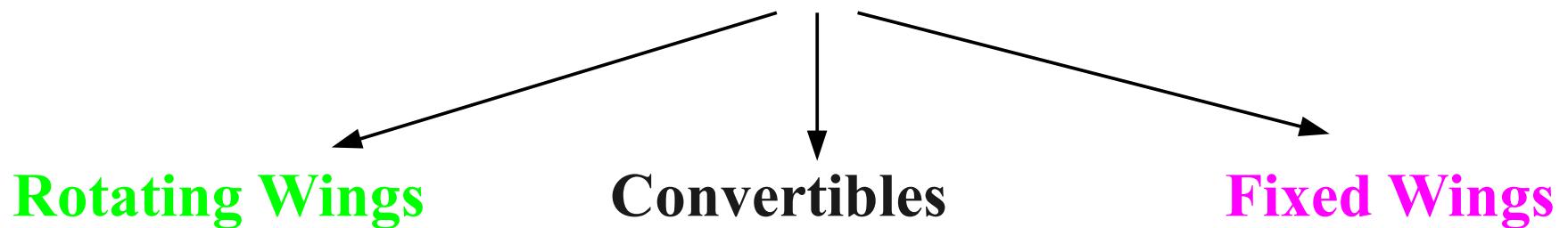
- **Aerostat (passive) - today**

- Historical “Huge Flight Ships” → dangerous
- Today only used for advertising and leisure purposes
- Cargo project failed

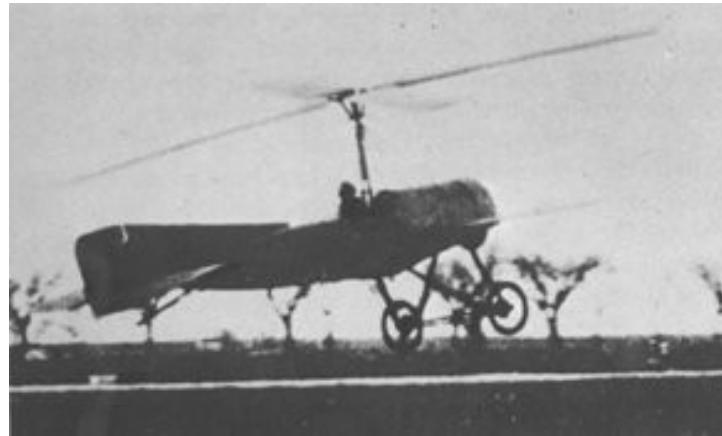


- **Aerodyns (active)**

- The support in the air is achieved thanks to a force resulting from the dynamic effect between the air and the wing of the aircraft
- Vehicles “**heavier than air**”



- **Aerodins - Rotating Wings (passive) - Autogir - Self-driven**
 - Two or more revolving wings (propeller), or shovels, form the main rotor that provides the support
 - The rotor moves through the air rubbing at consequence of the displacement of the aircraft
 - Need for a propulsive organ (engine) to advance
 - The **stationary flight** is **not** possible
 - Advantage → support lift → short runway for take off



1923 Cierva



Aeronautics

- **Aerodins - Rotating Wings (active) - Girodí**
 - Very similar to autogir
 - Part of the power of the motopropulsor group is applied to the main rotor → “jump start” possible
 - The **stationary flight** is still **not** possible



- **Aerodins - Rotating Wings (active) - Helicopters**

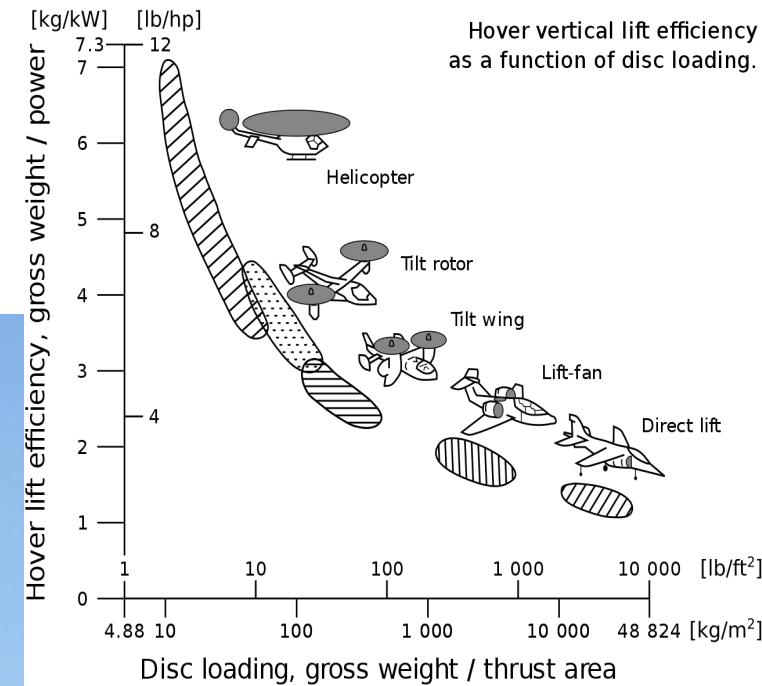
- Two or more revolving wings, or shovels, form the main rotor that provides the support
 - The rotor moves through the action of a motor group
 - The rotor is articulated so that it gives one power of sustentation and one of propulsion
 - Back-rotor; or engine to kill the angular momentum! (10% of power of the main rotor)
- The **stationary flight is possible**



Aeronautics

- **Aerodins - Rotating Wings (active) - Combined**

- Aircraft that can be like a helicopter or self-driven
 - The engine power can be applied to the rotor or a propeller or both (variable geometry)
- (pure helicopter: limited in horizontal speed (max 400km/h))



Aeronautics

- **Aerodins – Fixed Wings - Glider**

- No engine! Need help to get up in the air
- Very light
- Large span (optimal wing design)

Hang glider



Sailplane



Toy plane



Otto Lilienthal 1895

Space Shuttle
(very bad glider)





Aircrafts

- **Aerodins – Fixed Wings – Airplane**
 - Commercial passenger transport
 - General Aviation (rescue,support,...)
 - Military aviation
 - Subsonic low
 - Subsonic middle
 - Subsonic high
 - Supersonic
- **Sonic - Speed of sound M:**
 - Air: about 340 m/s
 - Water: about 1500 m/s
 - Steel: about 6000 m/s
- **Various different configurations (see AR)**
 - Wing mounting
 - Engine positioning
 - Engine type
 - Functional purpose and requirement

Aircrafts

- **Aerodins – Fixed Wings – Airplane**

- Private
- Acrobatic
- Work



Wrights Brothers 1903



Aircrafts

- **Aerodins – Fixed Wings – Airplane**

- Commercial
- Military



Aeronautics

- **Ground-effect crafts**

- able to move over the surface by gaining support from the reactions of the air against the surface of the earth or water
- **Ground effect**: the aerodynamic interaction between the moving wing and the surface below



www.flighthip.net



Akranoplan
“caspian sea monster”

Rockets

- The support in the air is achieved thanks to propulsive forces (all fuel on board!)
- They usually work without the need the atmosphere (depending on construction; requires to carry an extra air tank!!!)
- Aerodynamic forces in the fuselage (not on wings as on aircraft; in principle no wings needed - do **not** depend on aerodynamical lift) *'If you put enough power on it any stone with any shape will fly'*
- Aerodynamic control surfaces not necessary
→ propulsion forces



Spacecrafts

- **Vehicles designed to evolve without atmosphere**
 - Satellites
 - Interplanetary probes
 - Rovers
 - Space vehicles
 - Space station





**THANK YOU!
GRACIES!**