Aircraft Design Requirements
(Mission, Performance, Stability, Control, Cost, Operational, Time, Manufacturing)

Identify major components that the aircraft requires to satisfy the design requirements

- Wing configuration
- Tail configuration
- Engine configuration
- Landing gear configuration
- Structural configuration
- Mechanisms configuration

Aircraft approximate 3-view (without dimensions)

Configuration optimization

Aircraft optimum configuration

Figure 3.1. Aircraft conceptual design
Figure 3.2. Wing configuration alternatives

1. Aft tail 2. Canard 3. Three surfaces

Figure 3.3. Tail configuration alternatives
1. Tractor (single engine) 2. Pusher (twin engine) Prop-driven jet

1. Tri-engine 2. Four engine (underwing)

Figure 3.4. Engine configuration alternatives

1. Tail gear 2. Tricycle

Figure 3.5. Landing gear configuration alternatives
1. Cabin  
1. Tandem

2. Cockpit  
2. Side-by-side

Figure 3.6. Fuselage configuration alternatives
Boeing 747 (Courtesy Anne Deus)

Cessna 182 (Courtesy of Jenny Coffey)
Eurofighter Typhoon (Courtesy of Antony Osborne)
Figure 3.7. General aviation, civil-transport, and military aircraft
1. Air ship Zeppelin NT (Lighter-than-air craft)

2. ATR-42 (Courtesy of Anne Deus)

Figure 3.8. Lighter-than-air craft versus heavier-than-air craft
1. Beech 76 Duchess (Courtesy of Jenny Coffey)
2. Global Hawk
3. Radio controlled model aircraft

Figure 3.9. Manned aircraft, unmanned aircraft, and remote controlled aircraft
Figure 3.10. Trade-off analysis process
Figure 3.11. The Phases in the configuration design optimization
1. Boeing 747 (Courtesy Anne Deus)
2. Stampe-Vertongen (Courtesy Jenny Coffey)
3. Rutan 33 VariEze (Courtesy Jenny Coffey)
Figure 3.12. Four aircraft to be used in Example 3.2

4. F-15C Eagle (Courtesy Antony Osborne)
Figure 3.13. Canadian Vickers PBV-1A Canso A (Courtesy of Jenny Coffey)
Figure 3.14. Commonwealth CA-18 Mustang (Courtesy of Jenny Coffey)
Figure 3.15. Antonov An-140 (Courtesy of Antony Osborne)
1. MD-11 (Courtesy of Anne Deus)
2. De Havilland Vampire (Courtesy of Antony Osborne)
Figure 3.16. McDonnell Douglas MD-11 and De Havilland Vampire
Figure 3.17. Saab MFI-17 Supporter (Courtesy of SAAB)
Figure 3.18. F/A-18 Hornet, Pilatus PC-7, and Lockheed C-130 Hercules
Figure 3.19. Solar Impulse (Courtesy of Vladimir Mykytarenko)