Carleton University
Department of Mechanical and Aerospace Engineering

ADVANCED AIRCRAFT DESIGN

Objectives

- Advanced air mobility (AAM)
- Fixed wing lift generation with longer range and icing protection
- Autonomous and pilotless capabilities
- Compliant with Remotely Piloted Aircraft Systems (RPAS) Traffic Management (RTM System)
- Reduced or net zero GHG emissions over the entire life cycle
- Reach underserved communities

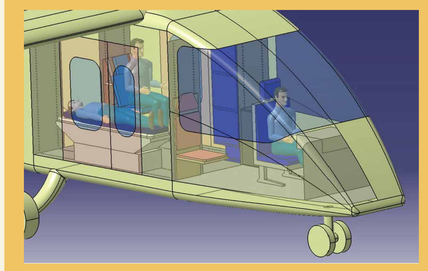
Requirements

- Performance
  - Range: 300 km, divert 10 km
  - Maximum take-off weight: 3300 kg
  - Cruise Speed: 100-200 knots at 1500 m above ground level (AGL)
  - Service ceiling: 3000 m above sea level (ASL)
  - Operating Temperature Range: -40°C to 50°C
- Vertical take-off and landing (VTOL) capability
  - Prepared or unprepared landing fields, typical helipads
- Optionally piloted/pilotless operations
- Capable of operating IFR and known icing conditions

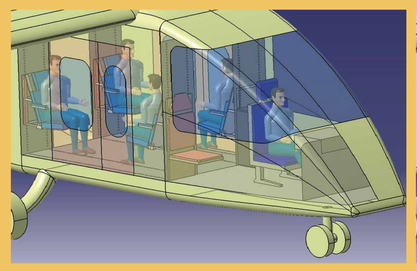
Mission

- ***Aeromedical Mission***
  - 1 Pilot
  - 1 Air ambulance stretcher with a patient (150 kg)
  - 1 Paramedic (150 kg)
  - Equipment (100 kg)
- ***Cargo Mission***
  - 1 Pilot
  - Palleted Cargo (500 kg)
- ***Passenger Mission***
  - 4-6 Passengers

Cabin Layout



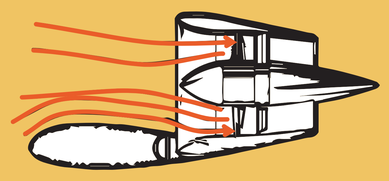
Aeromedical Mission



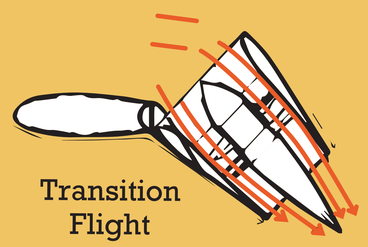
Passenger Mission

Cargo Mission

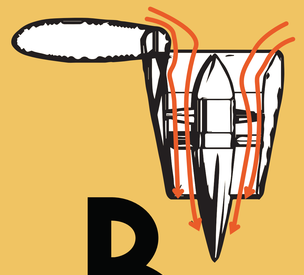
Electric Ducted Fans Position



Horizontal Flight

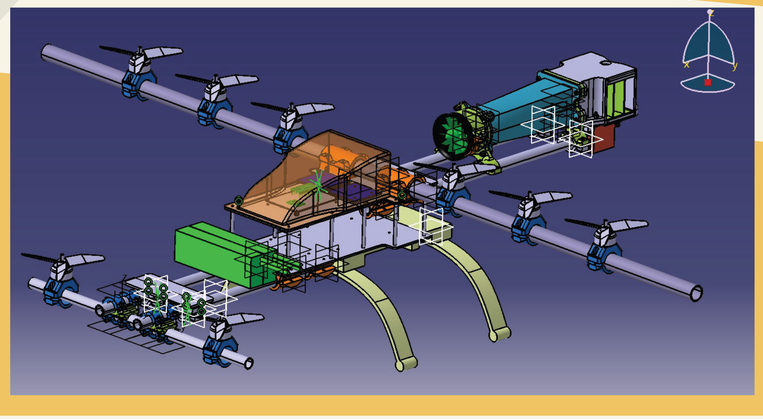


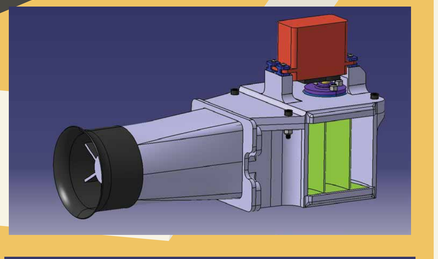
Transition Flight

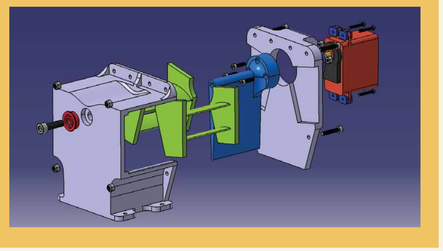


Vertical Flight

Sub-Scale Demonstration and Yaw Thruster Design







BUMBLE B