

# Electric Microlight Aircraft for Fun and for Research

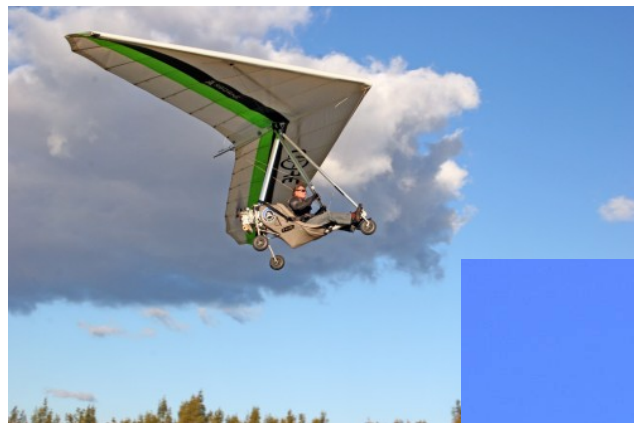
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KASAERO GmbH

## Definition Microlight Aircraft:

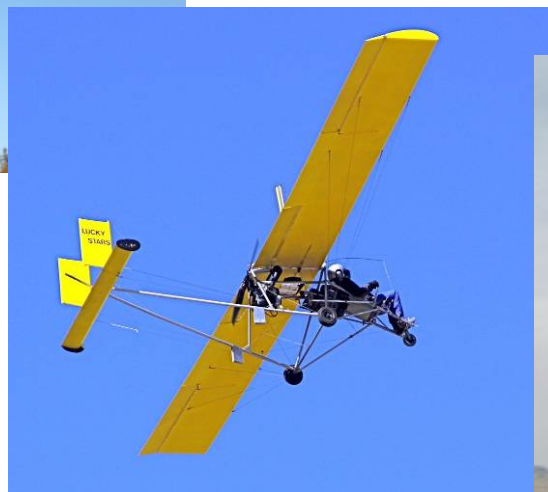
U.S.:	Ultralight Aircraft
Germany:	Leichte Luftsportgeräte
UK:	Microlight Aircraft
	<b>Single Seat De-Regulated Aircraft SSDR</b>
China:	Ultralight Flying Machine ( 轻型飞行器 )

- 1 seat
- only for recreational and sport flying
- max. empty weight 254 lb (116 kg)
- max. speed 55 kts (102 km/h)
- stall speed 24 kts (45 km/h)
- max. (liquid) fuel capacity 5 gal. (19 l)

## Examples of Microlight Aircraft



motorised deltaplane/  
hang-glider



"flying chair"



powered paraglider on trike or backpack



"real" airplane

## Electric Microlight Aircraft (examples)



eLazair



Song 120 E-Drive



eGull 2000

## Advantages of Microlight Aircraft

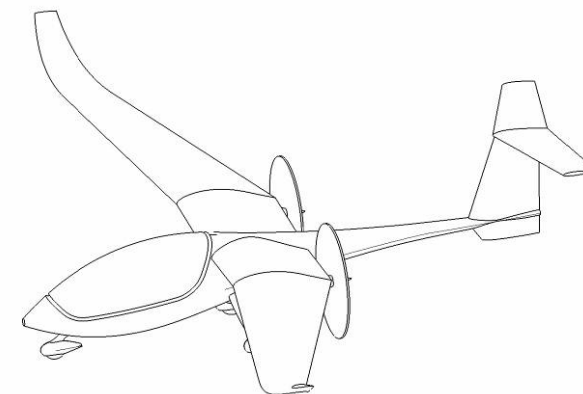
- No Design Organisation Approval
- No Production Organisation Approval
- No Type Certification (U.S., China)
- Considerably Reduced Certification Requirements (UK, Germany, EU)
- No Registration (U.S., China)
- Simplified Registration (UK, Germany, EU)
- No Mandatory Inspections
- No Pilot's License (U.S., China)
- Considerably Simplified Pilot's License Requirements (UK, Germany, EU)

### Regulations:

- FAR Part 103 (U.S.)
- Regulation (EC) No 216/2008, Annex 2
  - LTF-L (Germany)
  - Air Navigation Order 2016 (UK)
- CCAR-91 Section O (China)
- to be cont'd...

# M-E-E Aircraft as a Development Plattform

- **electric propulsion**  
safe in operation, no “black fingers”
- **easy to fly**  
one-power-lever-concept
- **highly integrated, robust composite structure**  
the key to low production time and ultra light weight
- **efficient**  
composite structure allows smooth aerodynamic design
- **fashion looking**  
composite structure allows smooth fashion design
- **foldable for storage and transportation**  
easily roadable in a trailer
- **cheap to operate**  
fly for less than \$ 1per hour fuel costs  
(\$ 15 per hour live cycle costs)



## technical specs:

span:	10 m
area:	9,2 m²
length:	5,95 m
empty mass:	120 kg
battery mass:	20 kg
propulsion chain mass:	10 kg
motor power:	2 x 7 kW
battery capacity (basic):	3,5 kWh
endurance (basic):	1 hour



# Run-Up Protection for Electric Power Trains: ePropeller Safety Device [eSD]

## Why [eSD]?

Classic Fixed-Wing Aircraft Configurations:



The propeller is in the field of view of the pilot

New Electric Aircraft Configurations:

- alternative motor locations
- distributed propulsion
- when “on/armed” electric power trains are silent, but run up abruptly



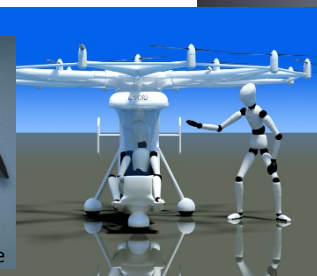
e-Genius



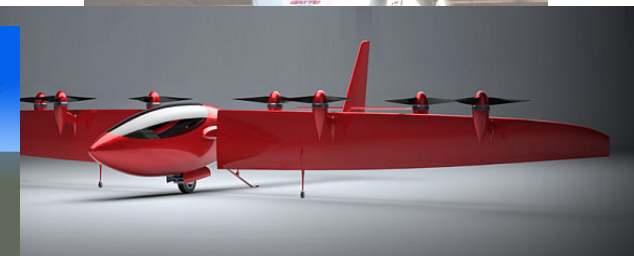
Long-ESA



Aerovironment Qube



e-volo



Joby Aviation

## Example: e-Genius Test Flights



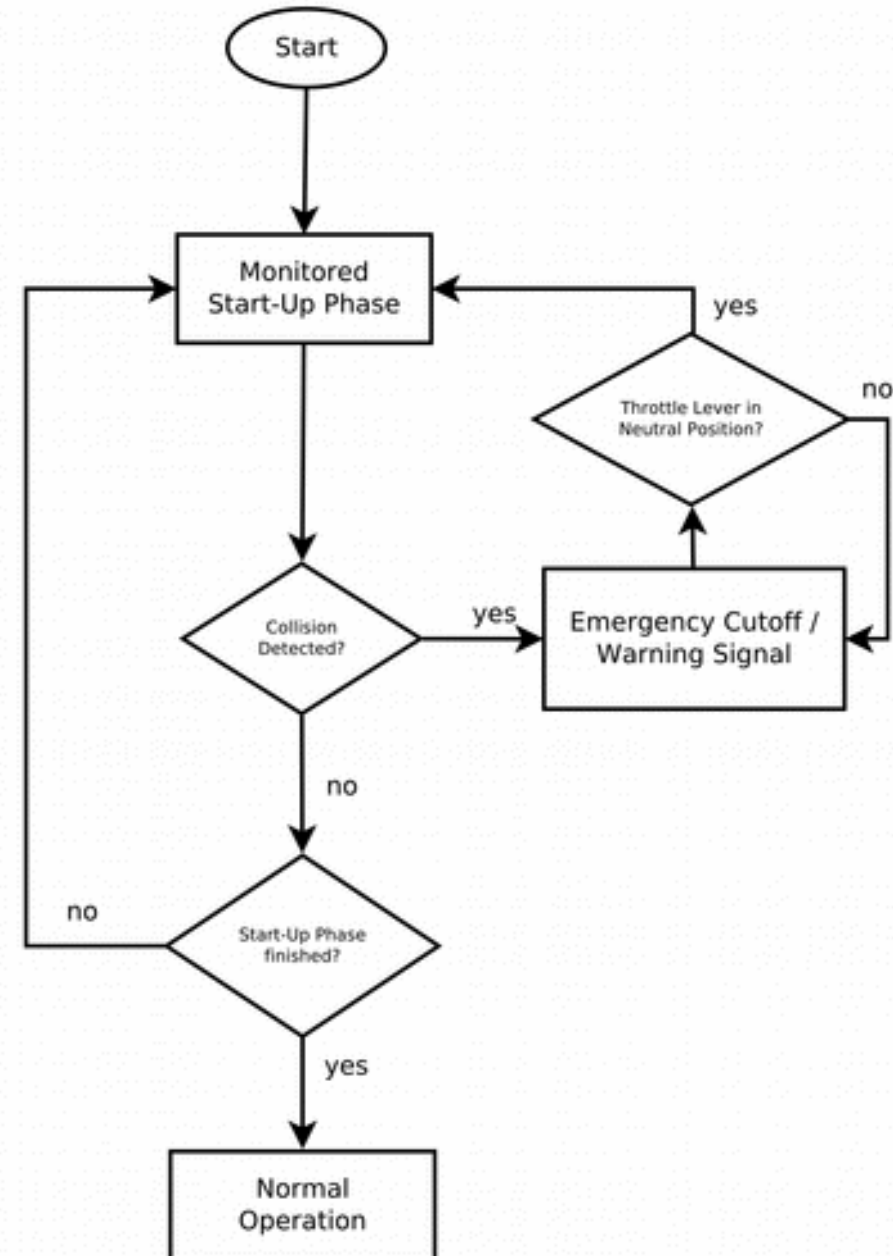


## Example: e-Genius Test Flights

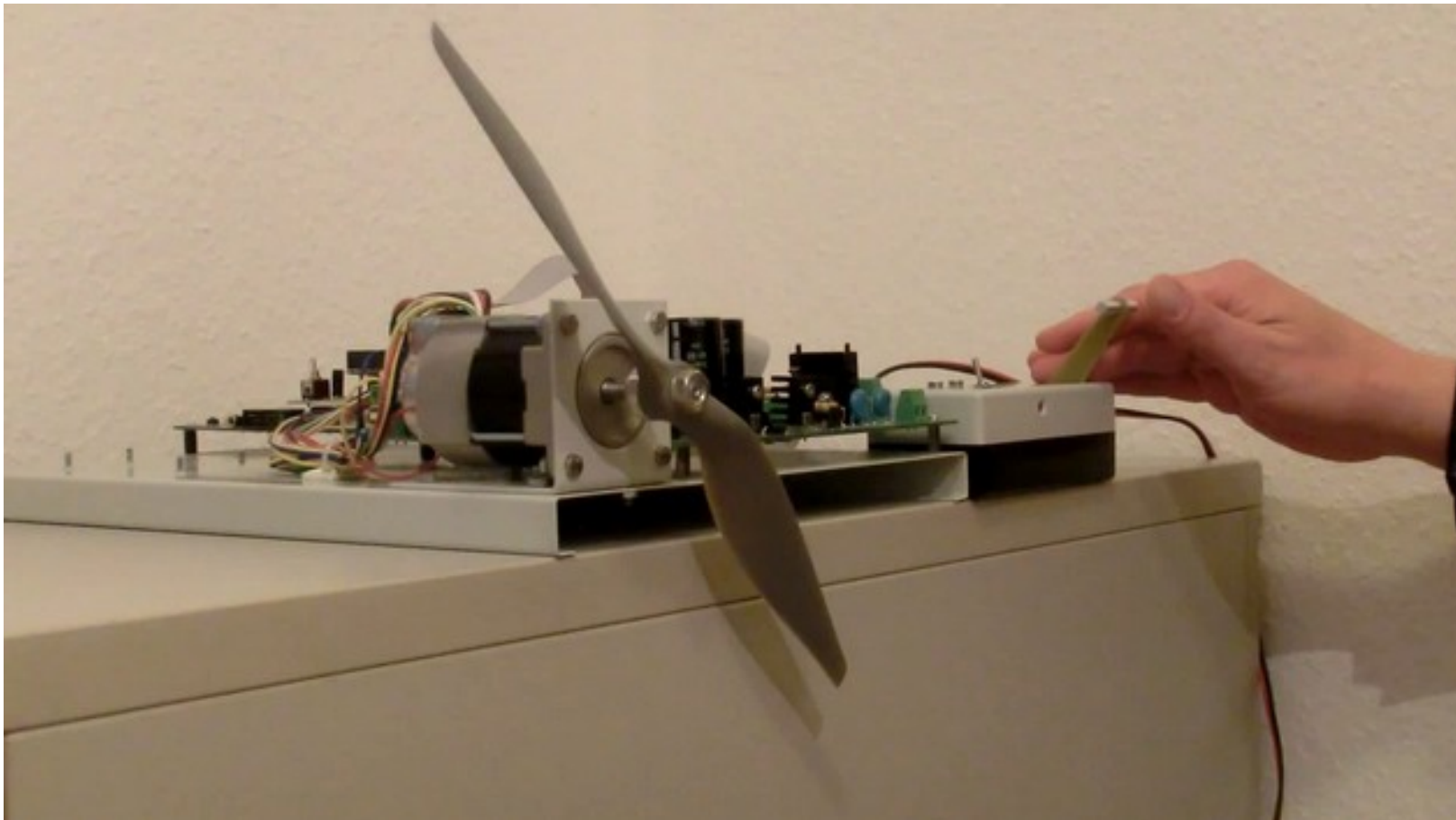


## Solution

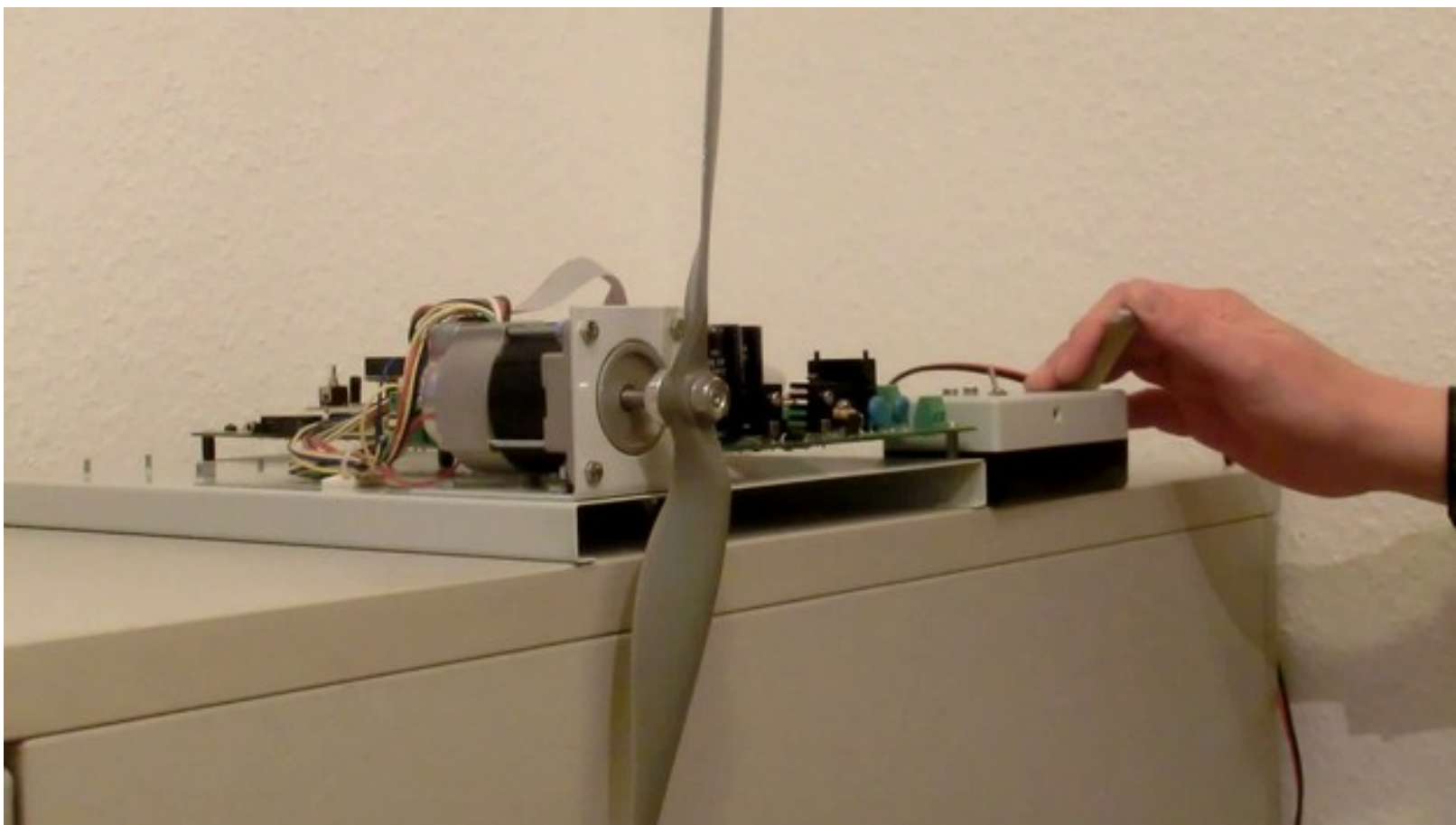
- Protected startup mode
- Collision detection by monitoring:
  - rotational speed
  - motor torque/electric current
  - rotor position
- Emergency cutoff if threshold exceeded / underrun
- Transition to normal operation mode if disk area reliably detected clear



## How *[eSD]* Works (Demonstration Mode)

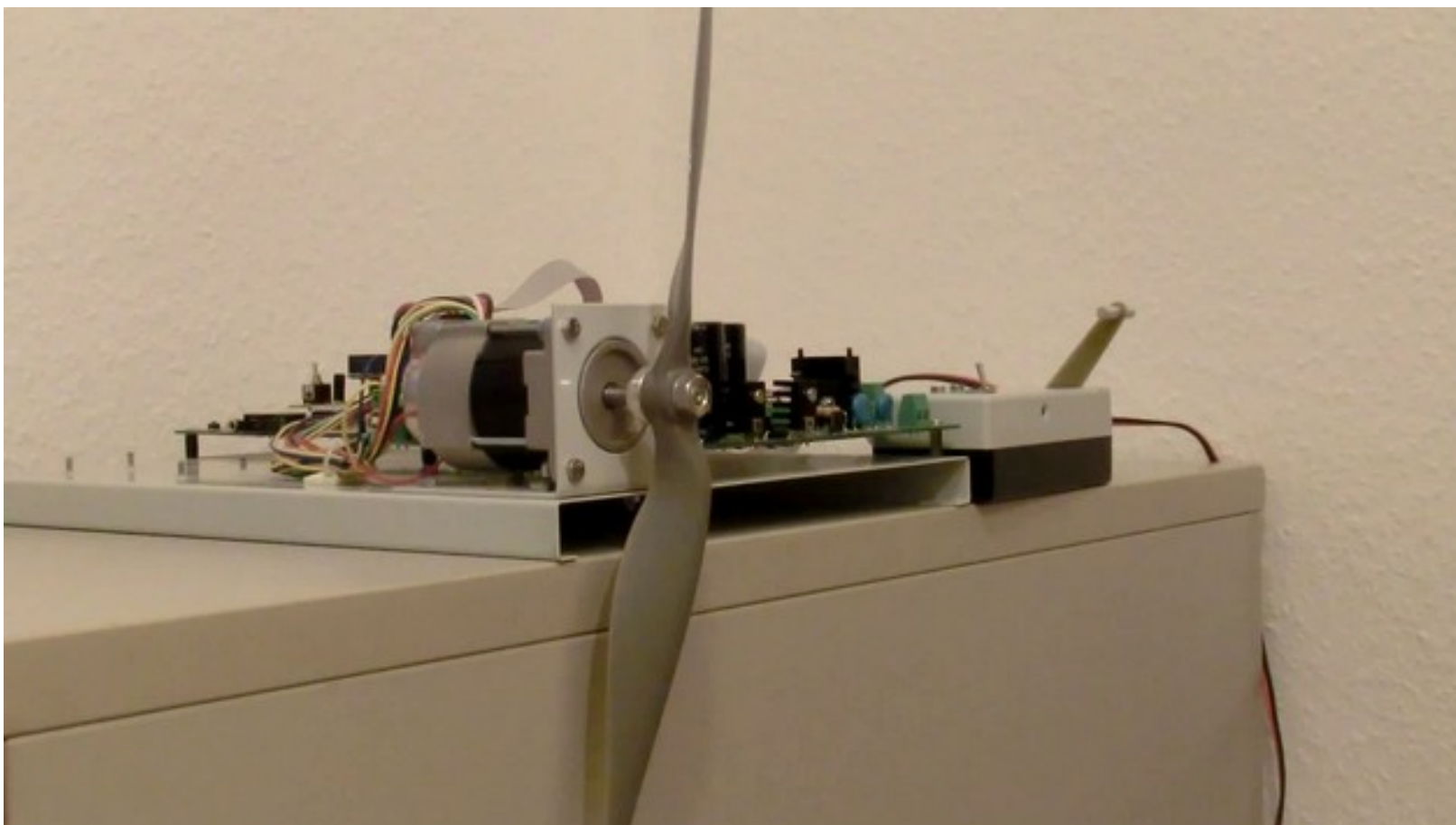


## *[eSD]* Full Operation Mode



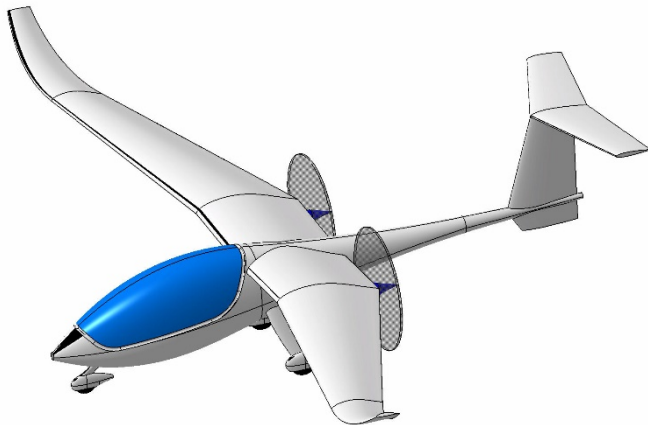


## Skipping of Protection Mode (In-Flight Mode)



# Outlook

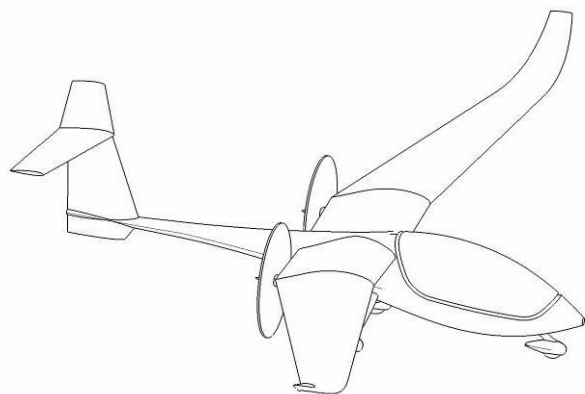
- Integration into ultralight aircraft power train
- Integration into UAV power trains -> avoid prop-guards



By courtesy of TB Copters

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