

## Airbus Cargo Drone Challenge Frame Sheet

John Boren

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Green cells are calculated by formulas or are given (not changeable) requirement values  

White cells are specific to the design entry; mandatory to be filled out by the participant as delivery item  

Blue cells are optional delivery items  

### Aircraft Data:

Aircraft name : **MEDITRANS**

### General Requirements

Description	Symbol	Value	Unit	Comment
Maximum Take-Off Mass	mMTOM =	25.0	kg	Shall stay below 25 kg
Air Density	r =	0.954	kg/m <sup>3</sup>	@ 2000m MSL and ISA+20°C

### Geometry Data:

Description	Symbol	Value	Unit	Comment
Wing Span	b =	3.62	m	
Aspect Ratio	AR =	9.15	-	
Wing Area	Sref =	1.454	m <sup>2</sup>	
Wing Loading (fixed wing mode)	m/Sref =	20	kg/m <sup>2</sup>	10 - 30 kg/m <sup>2</sup> recommendation
Disc Loading (rotor disc)	m/Sprop Lift =	30	kg/m <sup>2</sup>	10 - 50 kg/m <sup>2</sup> recommendation
Lift Propeller Area per Lift Propeller	Sprop Lift =	0.202	m <sup>2</sup>	
Lift Propeller Diameter	Dprop Lift =	0.508	m	
Cruise Propeller Diameter	Dprop Cruise =	0.3556	m	
Cruise Propeller Area per Cruise Propeller	Sprop Cruise =	0.14	m <sup>2</sup>	
Number of Propeller for Hover	npropeller,hover =	4	-	
Number of Propeller for Cruise	npropeller,cruise =	1	-	
Fuselage Length	Lfuselage =	1.95	m	
Fuselage Diameter (max. Diameter)	Dfuselage =	0.41	m	
Vertical Tail Surface	Svertical tail =	0.139	m <sup>2</sup>	
Vertical Tail Leaver Arm to CoG	lvertical tail =		m	
Horizontal Tail/Canard Surface	Shorizontal tail =	0.335	m <sup>2</sup>	
Horizontal Tail/Canard Leaver Arm to CoG	lhorizontal tail =		m	
Control Surface Area for Pitch	Scontrol,pitch =	0.0648	m <sup>2</sup>	
Control Surface Leaver Arm to CoG for Pitch	lcontrol,pitch =		m	
Control Surface Area for Roll	Scontrol,roll =	0.153	m <sup>2</sup>	
Control Surface Leaver Arm to CoG for Roll	lcontrol,roll =		m	
Control Surface Area for Yaw	Scontrol,yaw =	0.0365	m <sup>2</sup>	
Control Surface Leaver Arm to CoG for Yaw	lcontrol,yaw =		m	

### Mass and Balance Data:

Description	Symbol	Value	Unit	Comment
Structural Mass (wing, fuselage, empenage, nacelles, ...)	mstruct =	4	kg	
Avionics Mass (see ignition kit)	mavionics =	3.4	kg	
Flight Control Actuation	mactuation =	0.4	kg	
Electric Motors and Controllers Mass (for hover)	mmotors,hover =	2.38	kg	
Electric Motors and Controllers Mass (for cruise)	mmotors,cruise =	0.523	kg	
Propellers Mass (for hover)	mpropeller,hover =	0.468	kg	
Propellers Mass (for cruise)	mpropeller,cruise =	0.037	kg	
Battery Mass	mbattery =	8.500	kg	
Additional Mass for Installations	minstalltions =	0.3	kg	mass for wiring, installations, etc.
Empty Mass	mempty =	19.928	kg	
Payload Mass	d = mMTOM - mempty =	5.07	kg	
Center of gravity location				
x-location	xCoG =	1.03	m	
y-location	yCoG =	0	m	
z-location	zCoG =	0.208	m	

### Efficiencies:

Description	Symbol	Value	Unit	Comment
Efficiencies for Hover Flight				
Electrical Motor Efficiency (incl. Motor controller efficiency)	helect. motor =	92%		
Figure of Merit	FOM =	0.6	-	
Battery Efficiency	hbattery =	97%		
Power Management and Distribution Efficiency	hPMAD =	99%		
Efficiencies for Cruise Flight				
Electrical Motor Efficiency (incl. Motor controller efficiency)	helect. motor =	88%		
Propeller Efficiency	hpropeller =	82%		

Battery Efficiency	hbattery =	97%
Power Management and Distribution Efficiency	hPMAD =	99%

**Aerodynamics:**

Description	Symbol	Value	Unit	Comment
Oswald Factor	e =	0.962	-	
Zero Lift Drag Coefficient	CD0=	0.03	-	
Cruise Lift Coefficient	CL Cruise=	0.73	-	
Induced Drag Coefficient	CDi Cruise=	0.02	-	
Lift to Drag Ratio	L/DCruise =	14.82	-	
Static Margin	SM =	10%	-	

**Component specific Energy:**

Description	Symbol	Value	Unit	Comment
Battery Specific Energy	wbattery =	170.0	Wh/kg	144 Wh/Kg for Vertical Flight

**Aircraft Range Performance Estimation:**

Description	Symbol	Value	Unit	Comment
Required Cruise Thrust	Tcruise =	16.6	N	
Cruise Speed	vcruise =	28.0	m/s	
Range	drange =	100.0	km	
Required Cruise Power	Pcruise =	671.1	W	
Hover nz	nz=	1.1	-	
Required Hover Power	Phover =	6748.4	W	
Required Power for Avionics	PAvionics =	91.0	W	
Cruise Time	tcruise =	64.5	min	including 5 min reserve
Hover Time	thover =	2.0	min	2 min Hover time is required
Battery Energy	Ebattery =	1047.6	Wh	