Airbus Cargo Drone Challenge Frame Sheet

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

ite 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 : ***Allodola 60 km 5kg***

General Requierements

Description	Symbol	Value	Unit	Comment
Maximum Take-Off Mass	mMTOM =	25,0	kg	Shall stay below 25 kg
Air Density	r=	0,954	kg/m³	@ 2000m MSL and ISA+20°C

Geometry Data:

Description	Symbol	Value	Unit	Comment
Wing Span	b =	4,0945	m	
Aspect Ratio	AR =	19,5940458	-	
Wing Area	Sref =	0,85561351	m²	
Wing Loading (fixed wing mode)	m/Sref =	29,2188	kg/m²	10 - 30 kg/m² recommendation
Disc Loading (rotor disc)	m/Sprop Lift =	18,25	kg/m²	10 - 50 kg/m² recommendation
Lift Propeller Area per Lift Propeller	Sprop Lift =	0,342	m²	
Lift Propeller Diameter	Dprop Lift =	0,660	m	
Cruise Propeller Diameter	Dprop Cruise =	0,47	m	
Cruise Propeller Area per Cruise Propeller	Sprop Cruise =	0,35	m	
Number of Propeller for Hover	npropeller,hover =	4	-	
Number of Propeller for Cruise	npropeller,cruise =	2	-	
Fuselage Length	Lfuselage=	1,8	m	
Fuselage Diameter (max. Diameter)	Dfuselage=	0,8	m	
Vertical Tail Surface	Svertical tail =	0,169	m²	
Vertical Tail Leaver Arm to CoG	lvertical tail =	1,386	m	
Horizontal Tail/Canard Surface	Shorizontal tail =		m²	
Horizontal Tail/Canard Leaver Arm to CoG	lhorizontal tail =		m	
Control Curface Area for Pitch	Scontrol,pitch =	0,069	m²	
Control Surface Leaver Arm to CoG for Pitch	lcontrol,pitch =	1,386	m	
Control Surface Area for Roll	Scontrol,roll =	0,042	m²	
Control Surface Leaver Arm to CoG for Roll	lcontrol,roll =	0,997	m	
Control Surface Area for Yaw	Scontrol,yaw =	0,069	m²	
Control Surface Leaver Arm to CoG for Yaw	lcontrol,yaw =	1,386	m	

Mass and Balance Data:

Description	Symbol	Value	Unit	Comment
Structural Mass (wing, fuselage, empenage, nacelles, …)	mstruct =	8,47	kg	
Avionics Mass (see ignition kit)	mavionics =	3,4	kg	
Flight Control Actuation	mactuation =	0,3	kg	
Electric Motors and Controllers Mass (for hover)	mmotors,hover =	3,2	kg	
Electric Motors and Controllers Mass (for cruise)	mmotors,cruise =	1	kg	
Propellers Mass (for hover)	mpropeller,hover =	0,16	kg	
Propellers Mass (for cruise)	mpropeller,cruise =	0,08	kg	
Battery Mass	mbattery =	2,916	kg	
Additional Mass for Installations	minstalltions =	0,39	kg	mass for wiring, installations, etc.
Empty Mass	å mempty =	19,916	kg	
Payload Mass	ɗ = mMTOM - mempty =	5,08	kg	

Center of gravity location

x-location	xCoG =	0	m
y-location	yCoG =	0	m
z-location	zCoG =	0	m

Efficiencies:

Description	Symbol	Value	Unit	Comment
Efficiencies for Hover Flight				
Electrical Motor Efficiency (incl. Motor controller efficiency)	helect. motor =	88%		
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 =	0,88	-	
Zero Lift Drag Coefficient	CD0=	0,03	-	
Cruise Lift Coefficient	CL Cruise=	1,24	-	
Induced Drag Coefficient	CDi Cruise=	0,03	-	
Lift to Drag Ratio	L/DCruise =	21,24	-	
Static Margin	SM =	10%		

Component specific Energy:

Description	Symbol	Value	Unit	Comment
Battery Specific Energy	wbattery =	243,0	Wh/kg	

Aircraft Range Performance Estimation:

Description	Symbol	Value	Unit	Comment
Required Cruise Thrust	Tcruise =	11,5	N	
Cruise Speed	vcruise =	22,0	m/s	
Range	drange =	60,0	km	
Required Cruise Power	Pcruise =	365,8	W	
Hover nz	nz=	1,1	-	
Required Hover Power	Phover =	5394,3	W	
Required Power for Avionics	PAvionics =	91,0	W	
Cruise Time	tcruise =	50,5	min	including 5 min reserve
Hover Time	thover =	2,0	min	2 min Hover time is required
Battery Energy	Ebattery =	566,9	Wh	