

Airbus Cargo Drone Challenge Frame Sheet

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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 : Allodola 100 km 3kg

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 ³	@ 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	m ²	
Wing Loading (fixed wing mode)	m/Sref =	29,2188	kg/m ²	10 - 30 kg/m ² recommendation
Disc Loading (rotor disc)	m/Sprop Lift =	18,25	kg/m ²	10 - 50 kg/m ² recommendation
Lift Propeller Area per Lift Propeller	Sprop Lift =	0,342	m ²	
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 ²	
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	m ²	
Vertical Tail Leaver Arm to CoG	lvertical tail =	1,386	m	
Horizontal Tail/Canard Surface	Shorizontal tail =		m ²	
Horizontal Tail/Canard Leaver Arm to CoG	lhorizontal tail =		m	
Control Surface Area for Pitch	Scontrol,pitch =	0,069	m ²	
Control Surface Leaver Arm to CoG for Pitch	lcontrol,pitch =	1,386	m	
Control Surface Area for Roll	Scontrol,roll =	0,042	m ²	
Control Surface Leaver Arm to CoG for Roll	lcontrol,roll =	0,997	m	
Control Surface Area for Yaw	Scontrol,yaw =	0,069	m ²	
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, empennage, 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 =	4,103	kg	
Additional Mass for Installations	minstalltions =	0,39	kg	mass for wiring, installations, etc.
Empty Mass	\bar{a} mempty =	21,103	kg	
Payload Mass	j = mMTOM - mempty =	3,90	kg	
Center of gravity location				

x-location	xCoG =	<input type="text" value="0"/>	m
y-location	yCoG =	<input type="text" value="0"/>	m
z-location	zCoG =	<input type="text" value="0"/>	m

Efficiencies:

Description	Symbol	Value	Unit	Comment
Efficiencies for Hover Flight				
Electrical Motor Efficiency (incl. Motor controller efficiency)	helect. motor =	<input type="text" value="88%"/>		
Figure of Merit	FOM =	<input type="text" value="0,6"/>		
Battery Efficiency	hbattery =	<input type="text" value="97%"/>		
Power Management and Distribution Efficiency	hPMAD =	<input type="text" value="99%"/>		
Efficiencies for Cruise Flight				
Electrical Motor Efficiency (incl. Motor controller efficiency)	helect. motor =	<input type="text" value="88%"/>		
Propeller Efficiency	hpropeller =	<input type="text" value="82%"/>		
Battery Efficiency	hbattery =	<input type="text" value="97%"/>		
Power Management and Distribution Efficiency	hPMAD =	<input type="text" value="99%"/>		

Aerodynamics:

Description	Symbol	Value	Unit	Comment
Oswald Factor	e =	<input type="text" value="0,88"/>		
Zero Lift Drag Coefficient	CD0 =	<input type="text" value="0,03"/>		
Cruise Lift Coefficient	CL Cruise =	<input type="text" value="1,24"/>		
Induced Drag Coefficient	CDi Cruise =	<input type="text" value="0,03"/>		
Lift to Drag Ratio	L/Dcruise =	<input type="text" value="21,24"/>		
Static Margin	SM =	<input type="text" value="10%"/>		

Component specific Energy:

Description	Symbol	Value	Unit	Comment
Battery Specific Energy	wbattery =	<input type="text" value="243,0"/>	Wh/kg	

Aircraft Range Performance Estimation:

Description	Symbol	Value	Unit	Comment
Required Cruise Thrust	Tcruise =	<input type="text" value="11,5"/>	N	
Cruise Speed	vcruise =	<input type="text" value="22,0"/>	m/s	
Range	drange =	<input type="text" value="100,0"/>	km	
Required Cruise Power	Pcruise =	<input type="text" value="365,8"/>	W	
Hover nz	nz =	<input type="text" value="1,1"/>		
Required Hover Power	Phover =	<input type="text" value="5394,3"/>	W	
Required Power for Avionics	PAvionics =	<input type="text" value="91,0"/>	W	
Cruise Time	tcruise =	<input type="text" value="80,8"/>	min	including 5 min reserve
Hover Time	thover =	<input type="text" value="2,0"/>	min	2 min Hover time is required
Battery Energy	Ebattery =	<input type="text" value="797,6"/>	Wh	