

## Airbus Cargo Drone Challenge Frame Sheet

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Version .....  
 Last Update .....

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 60 km 5kg**

### General Requirements

Description	Symbol	Value	Unit
Maximum Take-Off Mass	mMTOM =	25,0	kg
Air Density	r =	0,954	kg/m <sup>3</sup>

### Geometry Data:

Description	Symbol	Value	Unit
Wing Span	b =	4,0945	m
Aspect Ratio	AR =	19,5940458	-
Wing Area	Sref =	0,85561351	m <sup>2</sup>
Wing Loading (fixed wing mode)	m/Sref =	29,2188	kg/m <sup>2</sup>
Disc Loading (rotor disc)	m/Sprop Lift =	13	kg/m <sup>2</sup>
Lift Propeller Area per Lift Propeller	Sprop Lift =	0,481	m <sup>2</sup>
Lift Propeller Diameter	Dprop Lift =	0,782	m
Cruise Propeller Diameter	Dprop Cruise =	0,47	m
Cruise Propeller Area per Cruise Propeller	Sprop Cruise =	0,35	m <sup>2</sup>
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 <sup>2</sup>
Vertical Tail Leaver Arm to CoG	lvertical tail =	1,386	m
Horizontal Tail/Canard Surface	Shorizontal tail =		m <sup>2</sup>
Horizontal Tail/Canard Leaver Arm to CoG	lhorizontal tail =		m
Control Surface Area for Pitch	Scontrol,pitch =	0,069	m <sup>2</sup>
Control Surface Leaver Arm to CoG for Pitch	lcontrol,pitch =	1,386	m
Control Surface Area for Roll	Scontrol,roll =	0,042	m <sup>2</sup>
Control Surface Leaver Arm to CoG for Roll	lcontrol,roll =	0,997	m
Control Surface Area for Yaw	Scontrol,yaw =	0,069	m <sup>2</sup>
Control Surface Leaver Arm to CoG for Yaw	lcontrol,yaw =	1,386	m

### Mass and Balance Data:

Description	Symbol	Value	Unit
Structural Mass (wing, fuselage, empennage, nacelles, ...)	mstruct =	5,3	kg
Avionics Mass (see ignition kit)	mavionics =	3,4	kg
Flight Control Actuation	mactuation =	2	kg
Electric Motors and Controllers Mass (for hover)	mmotors,hover =	3,1	kg
Electric Motors and Controllers Mass (for cruise)	mmotors,cruise =	1,25	kg
Propellers Mass (for hover)	mpropeller,hover =	0,5	kg
Propellers Mass (for cruise)	mpropeller,cruise =	0,2	kg
Battery Mass	mbattery =	2,772	kg
Additional Mass for Installations	minstalltions =	1,4	kg
Empty Mass	m <sub>a</sub> empty =	19,922	kg
Payload Mass	$\Delta = m_{MTOM} - m_{empty}$ =	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
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
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
Battery Specific Energy	wbattery =	243,0	Wh/kg

**Aircraft Range Performance Estimation:**

Description	Symbol	Value	Unit
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 =	4552,8	W
Required Power for Avionics	PAvionics =	91,0	W
Cruise Time	tcruise =	50,5	min
Hover Time	thover =	2,0	min
Battery Energy	Ebattery =	538,9	Wh



..... V 2.00

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Comment

Shall stay below 25 kg  
@ 2000m MSL and ISA+20°C



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10 - 30 kg/m<sup>2</sup> recommendation  
10 - 50 kg/m<sup>2</sup> recommendation



Comment

KED-Direct 700XF-455Kv  
Leomotion L5038-0700

mass for wiring, installations, etc.



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including 5 min reserve 2 min Hover time is required