

September 18, 2020



# Hackaday Prize Dream Team Mechanical Design Specifications

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for Conservation X Labs

# Eja Ropeless Gear System



Hackaday.io Documentation:

<https://hackaday.io/project/173457-2020-hdp-dream-team-conservation-x-labs>

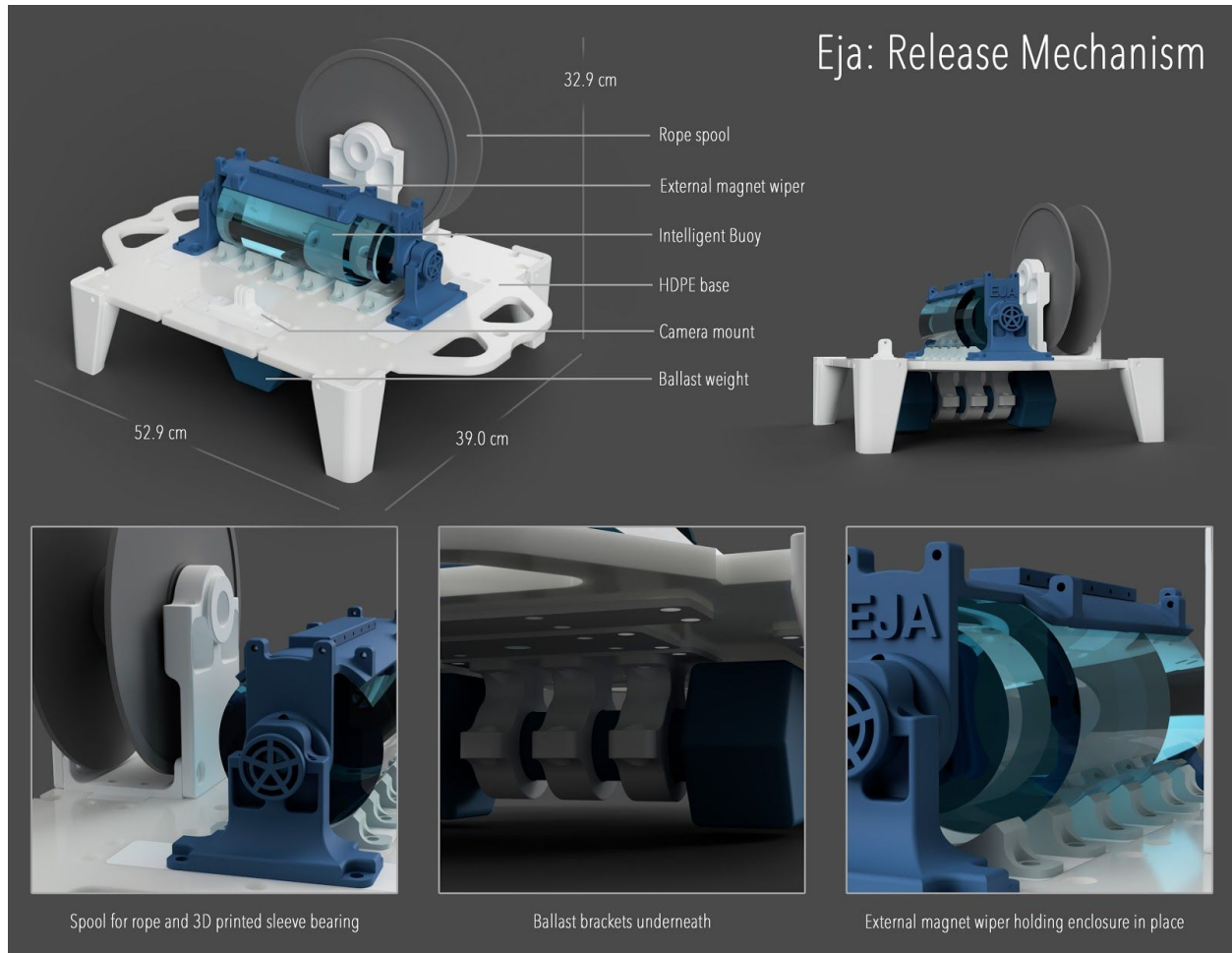
Files:

<https://github.com/RobotGrrl/Hackaday-CXL>

Functionality Demo:

<https://www.youtube.com/watch?v=s77ShUzPDeA>

# Release Mechanism



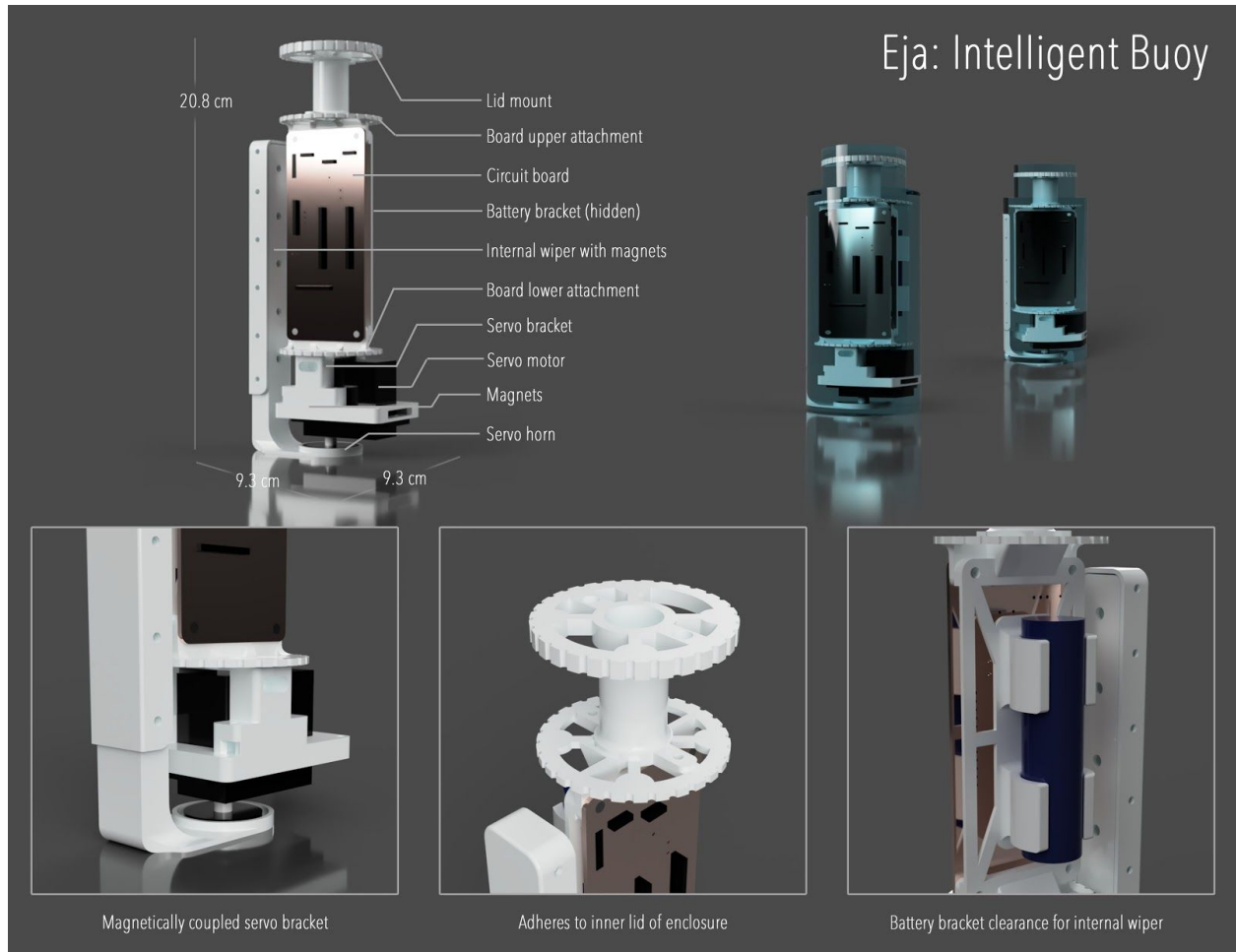
3D viewer: <https://a360.co/3msDSha>

Files: [https://github.com/RobotGrrl/Hackaday-CXL/tree/master/Design/release\\_mechanism](https://github.com/RobotGrrl/Hackaday-CXL/tree/master/Design/release_mechanism)

Length	52.9 cm
Width	39.0 cm
Height	32.9 cm
Approximate Weight	15 lbs / 6.8 kg (including ballast)
Materials	0.375 in HDPE base, PLA 3D printed pieces
Max Depth	TBD

<b>Eja Bill of Materials - Release Mechanism</b>						
<i>Last Updated: Sept. 18, 2020</i>						
<i>All fasteners for prototype are zinc-plated steel</i>						
Item	Qty	Cost (USD)		McMaster Part #	Source	Notes
M6 x 16 mm	32	3.32		90128A263		
M6 x 25 mm	30	3.97		90128A265		
M6 Washer	50	2.15		98688A116		
M6 Hex Nut	62	1.61		90591A151		
M3 x 10 mm	12	1.70		95263A134		
M3 x 16 mm	12	2.11		95263A158		
M3 Washer	28	0.96		98688A112		
M3 Hex Nut	24	0.56		90591A250		
Magnets N52 (large)	5	4.85		5862K116		
<b>TOTAL MECH COMPONENTS</b>		<b>21.22</b>				
0.375 in Natural HDPE 24 x 48 in	0.5	42.50			<a href="#">eplastics - San Diego</a>	Cost / in <sup>2</sup> = 0.04
1 kg 3D Printer Filament PLA	2	57.98			<a href="#">Amazon</a>	
Misc. rope, cord, carabiner	1	5.00			Random	
10 lbs Dumbbell	1	7.00			Canadian Tire	
Spool holder	1	1.00				
<b>TOTAL MATERIALS</b>		<b>113.48</b>				
CNC machine time	20	20			DesignLab	1 / min
3D printer time	1200	60			EK's 3D printer	0.05 / min
Injection moulding time	0	0				
Assembly time	90	22.5			EK	15 / h
<b>TOTAL MACHINE TIME</b>		<b>102.5</b>				
<b>GRAND TOTAL</b>		<b>237.20</b>				

# Intelligent Buoy



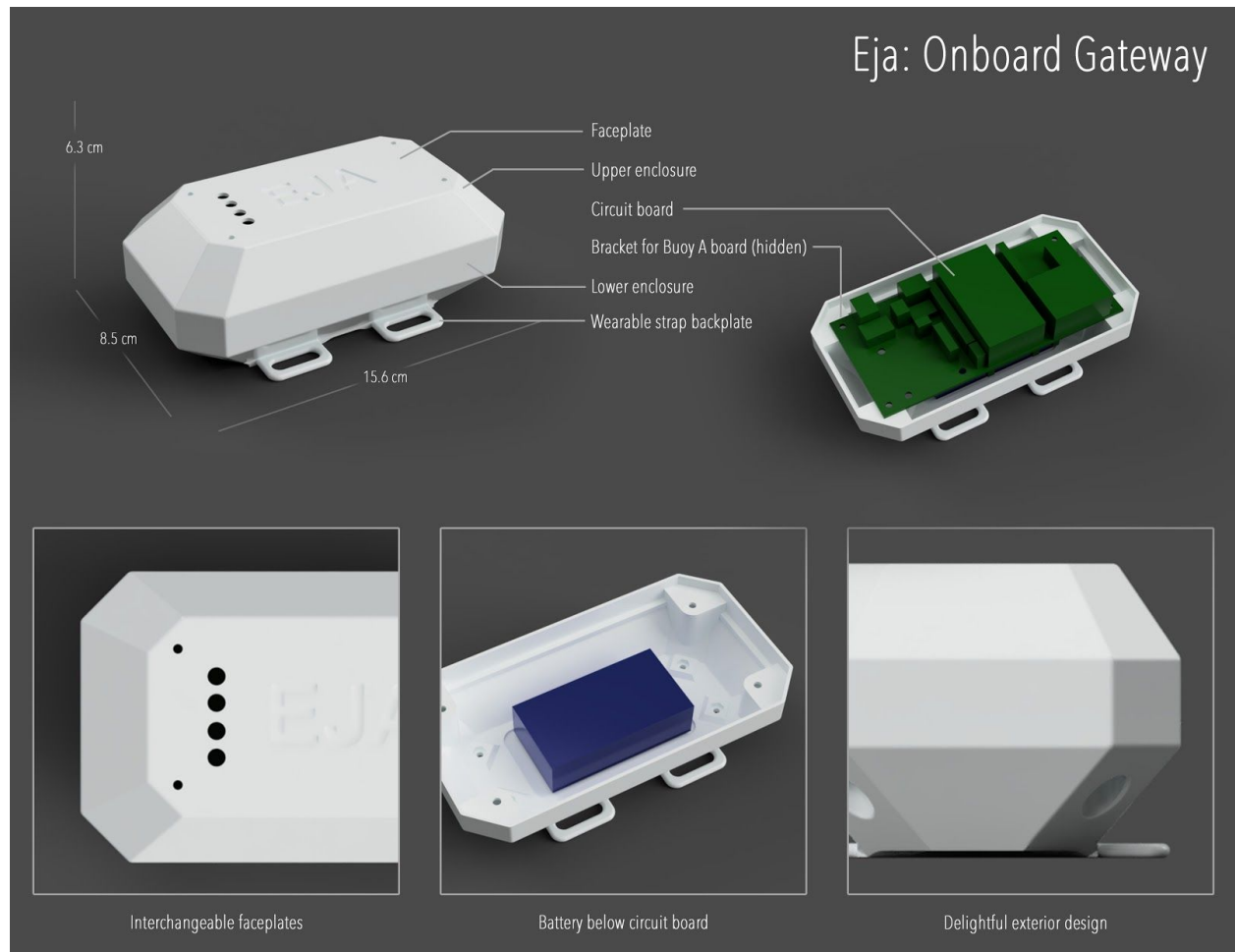
3D viewer: <https://a360.co/3hJjc0R>

Github: [https://github.com/RobotGrrl/Hackaday-CXL/tree/master/Design/intelligent\\_buoy](https://github.com/RobotGrrl/Hackaday-CXL/tree/master/Design/intelligent_buoy)

Diameter	9.3 cm
Height	20.8 cm
Approximate Weight	500 g
Materials	Polycarbonate ('Tritan'), PLA 3D printed pieces, Neodymium magnets, FR4 circuit board for structural strength
Waterproof Rating	Waterproof* <i>*Further testing is needed to determine depth</i>

<b>Eja Bill of Materials - Intelligent Buoy B</b>						
<i>Last Updated: Sept. 18, 2020</i>						
<i>All fasteners for prototype are zinc-plated steel</i>						
Item	Qty	Cost (USD)		McMaster Part #	Source	Notes
M2.5 x 8 mm	4	0.54		90128A184		
M2.5 x 6 mm	14	1.85		90128A183		
M2.5 Washer	4	0.13		98688A111		
M2.5 Hex Nut	8	0.18		90591A270		
M3 x 10 mm	4	0.57		95263A134		
M3 Washer	0	0.00		98688A112		
M3 Hex Nut	4	0.09		90591A250		
Magnets N52 (small)	4	3.04		5862K103		
Magnets N52 (large)	5	4.85		5862K116		
<b>TOTAL MECH COMPONENTS</b>		<b>11.24</b>				
Nalgene 1L wide mouth enclosure	1	20.00			SportChek	
1 kg 3D Printer Filament PLA	0.25	7.25			<a href="#">Amazon</a>	
Misc. glue, wires	1	1.50			Random	
<b>TOTAL MATERIALS</b>		<b>28.75</b>				
3D printer time	60	3			EK's 3D printer	0.05 / min
Injection moulding time	0	0				
Assembly time	20	5			EK	15 / h
<b>TOTAL MACHINE TIME</b>		<b>8</b>				
<b>GRAND TOTAL</b>		<b>47.99</b>				

# Onboard Gateway



3D viewer: <https://a360.co/32DGUHE>

Files: [https://github.com/RobotGrrl/Hackaday-CXL/tree/master/Design/onboard\\_gateway](https://github.com/RobotGrrl/Hackaday-CXL/tree/master/Design/onboard_gateway)

Length	15.6 cm
Width	8.5 cm
Height	6.3 cm
Approximate Weight	300 g
Materials	PLA 3D printed pieces
Waterproof Rating	Not waterproof

<b>Eja Bill of Materials - Onboard Gateway</b>						
<i>Last Updated: Sept. 18, 2020</i>						
<i>All fasteners for prototype are zinc-plated steel</i>						
Item	Qty	Cost (USD)		McMaster Part #	Source	Notes
M2.5 x 8 mm	8	1.07		90128A184		
M2.5 x 6 mm	0	0.00		90128A183		
M2.5 Washer	0	0.00		98688A111		
M2.5 Hex Nut	8	0.18		90591A270		
M3 x 10 mm	4	0.57		95263A134		
M3 Washer	0	0.00		98688A112		
M3 Hex Nut	4	0.09		90591A250		
<b>TOTAL MECH COMPONENTS</b>		<b>1.91</b>				
1 kg 3D Printer Filament PLA	0.75	21.74			<a href="#">Amazon</a>	
<b>TOTAL MATERIALS</b>		<b>21.74</b>				
3D printer time	180	9			EK's 3D printer	0.05 / min
Injection moulding time	0	0				
Assembly time	10	2.5			EK	15 / h
<b>TOTAL MACHINE TIME</b>		<b>11.5</b>				
<b>GRAND TOTAL</b>		<b>35.15</b>				



## Parametric Design

param	value
k	0.4 mm
mat	0.375 in
mag_a	6.35 mm + 0.65 mm
mag_a_depth	3.175 mm + 0.6 mm
mag_b	6.35 mm + 0.8 mm
mag_b_depth	7.65 mm + 0.6 mm
m3_loose	3 mm + 0.6 mm
m3_tight	3.0 mm + 0.2 mm
m3_hex	5.43 mm + 0.45 mm
m3_hex_depth	2.35 mm + 0.3 mm
m3_head	5.40 mm + 0.6 mm
m3_head_depth	3.07 mm + 0.4 mm
m3_heatset	
m3_heatset_depth	
m25_loose	2.35 mm + 0.6 mm
m25_tight	2.35 mm + 0.3 mm
m25_hex	4.91 mm + 0.4 mm
m25_hex_depth	1.86 mm + 0.3 mm
m25_head	4.46 mm + 0.6 mm
m25_head_depth	2.40 mm + 0.4 mm
m25_heatset	
m25_heatset_depth	
m6_loose	6.0 mm + 0.8 mm
m6_tight	
m6_hex	
m6_hex_depth	
m6_head	12.0 mm
m6_head_depth	6.0 mm + 0.2 mm
m6_heatset	
m6_heatset_depth	