Univ of Victoria

UVic Formula Motorsports

2023 Cost Report

UV23

Formula SAE (IC) – Car #17

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Cost Summary

System	Materials	Processes	Fasteners	Tooling	Totals
Brake System	2160.4700	80.1900	1.5800	0.0000	2242.2400
Engine & Drivetrain	3348.9200	1017.9100	40.7300	6.7800	4414.3400
Frame & Body	1563.3100	1375.7200	77.0900	33.2400	3049.3600
Instruments, Wiring & Accessories	1697.1000	300.4600	0.7700	0.0000	1998.3300
Miscellaneous, Safety, Finish and Assembly	268.8100	128.9900	3.1000	3.3400	404.2400
Steering System	148.0700	147.7900	6.7400	0.0000	302.6000
Suspension & Shocks	2239.1400	586.3000	12.5100	0.0000	2837.9500
Wheels, Wheel Bearings & Tires	1453.5200	289.4000	4.0000	0.0000	1746.9200
	12879.3400	3926.7600	146.5200	43.3600	16995.9800

Bill of Materials

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Brake System	SUC22-00960	A	Brake Rotors		Brake Rotor and locating components full assembly drawing found in hub upright assembly	2.41	4		2.26	0.15		9.64
Brake System	SUC22-00960	A		Brake rotor		9.10	4	1.69	7.41			36.40
Brake System	SUC19-00050	A		Rotor retainer	Locates rotor to hub	0.12	16	0.02	0.10			1.92
Brake System	OTH19-0032	A	Brake Lines			191.44	1	170.41	21.03			191.44
Brake System	OTS-00277	A	Brembo Billet Brake Caliper (2x34)			401.51	4	397.21	4.10	0.20		1606.04
Brake System	OTS-00512	A	Brake Master Cylinders			198.40	2	197.07	1.24	0.09		396.80
Brake System				**[Area Total:]**				**2160.47**	**80.19**	**1.58**		**2242.24**
Engine & Drivetrain	DRA22-00487	A	Driveshaft		Half shaft and stub axle assembly, including constant velocity joints. Oil is added to the differential after installation of the stub axles.	102.79	2	100.22	1.90	0.67		205.58
Engine & Drivetrain	DRA22-00487	A	Differential Assembly		Differential and support plate assembly. Chain and sprocket included. Note that oil is added to the differential after stub axle installation, and is included in the Driveshaft Assembly.	80.19	1	64.80	12.14	3.25		80.19
Engine & Drivetrain	22001	A		Half Shaft (Long)	Hollow half shaft, with splined ends for attachment to rzeppa and tripod constant velocity joint	6.40	2	1.62	4.78			12.80
Engine & Drivetrain	DRC19-00251	A		Diff Plate Left		26.77	1	6.26	20.51			26.77
Engine & Drivetrain	DRC19-00252	A		Right Differential Plate		30.61	1	6.95	23.66			30.61
Engine & Drivetrain	DRC23-0317	A		Chain Guard - Bolted	Chain guard	5.22	1	1.54	3.68			5.22
Engine & Drivetrain	DRC19-00254	A		Sprocket Adapter	Adapter to mount sprocket to differential assembly	22.65	1	6.12	16.53			22.65

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Engine & Drivetrain	OTS-00242	A		Drive Sprocket (Front)	Steel sprocket, 12 teeth using 520 chain	10.12	1	1.28	8.84			10.12
Engine & Drivetrain	OTS-00241	A		Driven Sprocket (Rear) (Vortex 520 Sprocket (NA))	7075 Aluminum sprocket with 44 teeth use with 520 chain	8.78	1	2.74	6.04			8.78
Engine & Drivetrain	OTS-00267	A		Tripod Housing (Long) (D4824)	Tripod bearing housing for driveshaft interaction with the differential and driven sprocket.	49.73	1	9.93	39.80			49.73
Engine & Drivetrain	OTS-00266	A		Tripod Housing (Short) (D4630)	Tripod bearing housing for driveshaft interaction with the differential and driven sprocket.	41.12	1	7.96	33.16			41.12
Engine & Drivetrain	DRC19-00255	A		RHS Bearing Spacer	Right hand side assembly bearing spacer	3.68	1	0.64	3.04			3.68
Engine & Drivetrain	DRC19-00256	A		LHS Bearing Spacer	A spacer for the sprocket adapter	2.58	1	0.31	2.27			2.58
Engine & Drivetrain	OTS-00264	A		Drexler Differential L1 (NA)	Differential assembly. Drexler L1 LSD differential, OTS	220.76	1	173.70	46.49	0.57		220.76
Engine & Drivetrain	DRC19-00259	A		Differential Plate Cross Brace	A structural brace connecting the two differential plates for torsional rigidity.	1.58	1	0.17	1.41			1.58
Engine & Drivetrain	DRA19-00022	A		Turnbuckle Assembly	Adjustment turnbuckles for chain tension and system height	6.05	2	3.86	2.13	0.06		12.10
Engine & Drivetrain	DRA23-00746	A	Pneumatic Shift System			133.22	1	118.15	12.89	2.18		133.22
Engine & Drivetrain	TAB23-04114	A		Air Tank Bracket		4.17	2	0.38	3.79			8.34
Engine & Drivetrain	OTSA-00007	A	Engine (CBR600RR)		Honda CBR600RR	1557.88	1	1499.75	54.56	3.57		1557.88
Engine & Drivetrain	PTC19-00034	A		EGR block off plate		1.06	2	0.14	0.92			2.12
Engine & Drivetrain	CHC23-03317	A		Front Left Engine Mount Spacer		0.79	1	0.07	0.72			0.79
Engine & Drivetrain	CHC23-03319	A		Front Right Engine Mount Spacer		0.95	1	0.15	0.80			0.95
Engine & Drivetrain	PTC22-02547	A		Rectifier Mounting Bracket		2.20	1	0.19	2.01			2.20

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Engine & Drivetrain	PTA19-00008	A	Fuel Rail and Fuel Lines		Fuel rail and fuel lines to the fuel tank. Mounting to intake manifold included.	266.22	1	229.34	36.55	0.33		266.22
Engine & Drivetrain	PTC19-00012	A		Fuel Rail		5.80	1	1.78	4.02			5.80
Engine & Drivetrain	PTC23-03082	A		Injector Mounting Bracket	Fastens fuel rail onto intake assembly, retains fuel rail and injectors	0.76	4	0.04	0.72			3.04
Engine & Drivetrain	PTC19-00013	A		Injector Extender		2.07	2	0.28	1.79			4.14
Engine & Drivetrain	PTC19-00028	A		Fuel rail mount		1.72	2	0.13	1.59			3.44
Engine & Drivetrain	PTA19-00509	A	Cooling system			658.09	1	576.56	79.63	1.90		658.09
Engine & Drivetrain	OTH-02829	A		Mishimoto Honda CRF450R Radiator Left		68.40	2	17.15	51.25			136.80
Engine & Drivetrain	PTC23-03667	A		Oil + Coolant Catch Can	3D printed coolant and oil overflow bottles with mirrored sides for ease of manufacture and assemble.	10.05	1	1.55	7.37	1.13		10.05
Engine & Drivetrain	PTC22-02509	A		Radiator Ducting Inlet	RHS and LHS are the same part	58.97	2	56.25	2.05		0.67	117.94
Engine & Drivetrain	PTC22-02507	A		Radiator Duct Exhaust		17.90	2	16.68	1.00		0.22	35.80
Engine & Drivetrain	PTC22-02542	A		Swirl Pot		38.37	1	21.54	16.83			38.37
Engine & Drivetrain	PTC22-02655	A		Radiator Fan Spacer		0.25	12	0.12	0.13			3.00
Engine & Drivetrain	PTC22-02650	A		Fan Gasket	Seals the interface between the radiator and radiator fans	1.23	4	0.05	1.18			4.92
Engine & Drivetrain	PTA19-00533	A	Intake			54.61	1	34.44	17.88	2.29		54.61
Engine & Drivetrain	PTC19-00003	A		Intake manifold top		14.41	1	1.35	13.06			14.41
Engine & Drivetrain	PTC19-00002	A		Intake manifold bottom	Lower section of the intake manifold	21.32	1	1.99	19.33			21.32
Engine & Drivetrain	PTC19-00033	A		Throttle body gasket	Gasket material between the throttle body and intake manifold top.	1.78	1	0.03	1.75			1.78
Engine & Drivetrain	OTS-00299	A		Bosch 32mm ETB (0280750148)	Bosch Throttle Body	90.54	1	42.60	46.69	1.25		90.54

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Engine & Drivetrain	PTA21-00107	A	Fuel tank		93 Octane rigid fuel tank	93.81	1	73.35	16.67	3.79		93.81
Engine & Drivetrain	PTC21-00107	A		Fuel Tank Body	Fuel tank body.	54.24	1	8.84	45.40			54.24
Engine & Drivetrain	PTC23-03573	A		Fuel Tank Bulkhead Tank Interface		15.23	1	4.86	10.37			15.23
Engine & Drivetrain	PTC21-01008	A		Fuel Pump Mounting Bracket	Bracket for mounting the fuel pump to.	2.68	1	0.03	2.65			2.68
Engine & Drivetrain	PTC22-01902	A		Fuel Tank Chassis Mount Bracket	Used to secure the fuel tank to the chassis floor pan and fire wall	2.32	2	0.07	2.25			4.64
Engine & Drivetrain	PTC23-03731	A		Fuel Tank Bulkhead Gasket	Seals bulkhead to bulkhead tank interface	1.93	1	0.07	1.86			1.93
Engine & Drivetrain	PTA21-00418	A	Exhaust			7.13	1		5.83	1.30		7.13
Engine & Drivetrain	PTA21-00418	A		Exhaust Manifold	Exhaust system containing 4-1 headers and detachable midpipe joined by a V-band.	267.88	1	40.72	205.71	16.45	5.00	267.88
Engine & Drivetrain	PTA23-00589	A		Custom Muffler	Custom built muffler with perforated inner tube and fiberglass packing. aluminum shell, steel internals	27.73	1	10.08	17.05	0.60		27.73
Engine & Drivetrain	PTA23-00781	A		Outlet Pipe		6.00	1	0.99	5.01			6.00
Engine & Drivetrain	PTA23-00754	A	Oil Pan			6.44	1	1.17	4.61	0.66		6.44
Engine & Drivetrain	PTC23-03902	A		Oil Pan (SLS Print)	SLS printed oil pan (CRP, Windform SP)	15.18	1	1.42	13.76			15.18
Engine & Drivetrain	PTC22-02834	A		Oil Pan Baffle - Left	SLS printed left oil pan baffle (CRP, Windform SP)	0.22	1	0.02	0.20			0.22
Engine & Drivetrain	PTC22-02835	A		Oil Pan Baffle - Right	SLS printed left oil pan baffle (CRP, Windform SP)	0.20	1	0.02	0.18			0.20
Engine & Drivetrain	PTC22-02836	A		Oil Pan Baffle Door Pin	Pin for baffle doors	0.07	2	0.01	0.06			0.14
Engine & Drivetrain	PTC19-00024	A		Oil Pickup Body		0.64	1	0.06	0.58			0.64
Engine & Drivetrain	PTC19-00025	A		Oil Pickup End		0.21	1	0.02	0.19			0.21
Engine & Drivetrain				**[Area Total:]**				**3348.92**	**1017.91**	**40.73**	**6.78**	**4414.34**

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Frame & Body	AEA22-00389	A	Front Wing		Curved main element with integrated mounting. Carbon fibre wing elements and endplates.	15.69	1		15.00	0.69		15.69
Frame & Body	AEA22-00555	A		Front Wing Splitter	Main splitter of front wing assembly	136.78	1	78.43	58.35			136.78
Frame & Body	AEA22-00544	A		Wing Element S1223 - 9c	1st Flap Element	38.42	2	24.65	13.77			76.84
Frame & Body	AEA22-00550	A		Front wing 2nd Flap	2nd Flap element of front wing	16.72	2	8.92	7.80			33.44
Frame & Body	AEC22-02790	A		Front wing outer endplate		28.60	2	23.92	4.64		0.04	57.20
Frame & Body	AEC22-02870	A		Front wing inner endplate	Front wing inner endplate for flap mounting	23.84	2	19.24	4.57		0.03	47.68
Frame & Body	AEC22-02872	A		Front wing middle endplate	Inner endplate used for 2nd flap mounting	23.80	2	20.52	3.25		0.03	47.60
Frame & Body	AEC22-02704	A		Front wing lower mounting bracket		5.99	2	1.35	4.64			11.98
Frame & Body	AEA22-00525	A		Front wing control rod	Carbon tube with inserts for front wing mounting	30.92	2	9.82	21.06	0.04		61.84
Frame & Body	AEA22-00548	A	Rear Wing		Foam core wing elements with carbon mounting tubes.	12.41	1	0.32	11.41	0.68		12.41
Frame & Body	AEC22-02849	A		Rear wing endplate		214.25	2	180.02	33.92		0.31	428.50
Frame & Body	AEA22-00469	A		Rear wing Slat Element	Slat element of rear wing	37.46	1	18.23	19.23			37.46
Frame & Body	AEC22-01835	A		Rear Wing Flap Element		74.47	3	30.70	43.77			223.41
Frame & Body	AEC22-01961	A		Rear Wing Endplate Clevis	CLEVIS USED FOR REAR WING MOUNTING	1.15	6	0.26	0.89			6.90
Frame & Body	AEA22-00556	A		Rear wing main element	Main element of rear wing with mounting points	99.05	1	70.40	28.65			99.05
Frame & Body	AEC22-01840	A		Carbon Mounting Tube Cross-member	Cross-member for mounting	33.12	2	20.22	12.86	0.04		66.24
Frame & Body	AEC19-00116	A		Carbon Tube, Lower Rear Mount	Lower rear wing mounting to frame	15.83	4	10.23	5.56	0.04		63.32
Frame & Body	AEC19-00113	A		Carbon tube upper mounting cross-member	Rear wing upper mounting cross member	13.18	1	10.74	2.40	0.04		13.18

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Frame & Body	AEC19-00114	A		Upper mounting carbon tube	Rear wing upper mounting tube	12.13	2	7.70	4.36	0.07		24.26
Frame & Body	AEA23-00626 Body Work	A	Body work		Carbon-fibre panels	6.80	1	0.04	6.33	0.43		6.80
Frame & Body	AEC23-03521	A		Nose Cone Smooth		124.18	1	100.80	14.71		8.67	124.18
Frame & Body	AEC23-03725	A		Side Panels	BODY WORK	165.75	2	145.15	17.97		2.63	331.50
Frame & Body	CHA23-00569	A	Chassis System		Chassis System contains the chromoly tube frame, all parts welded to it, and the front protection system (AIP & IA). Also included are the firewalls, floorpan, and 6 other aluminum sheet metal parts that are all waterjet at the same time.	265.64	1	33.55	214.37	9.05	8.67	265.64
Frame & Body	CHC23-02996	A		Frame	TIG welded chromoly spaceframe. Included bolted/detachable frame members and upper front wing tube mount.	494.29	1	68.96	415.10	0.56	9.67	494.29
Frame & Body	CHC23-03307	A		Floor Pan	Single piece sheet metal floorpan. Waterjet and bent.	15.19	1	5.96	8.36	0.87		15.19
Frame & Body	CHC23-03133	A		Engine Firewall Right	Sheet metal aluminum firewall. Waterjet, cut, and bent. This is the right section of the firewall	3.72	1	0.99	2.38	0.35		3.72
Frame & Body	CHC23-03131	A		Engine Firewall Left	Sheet metal aluminum firewall. Waterjet, cut, and bent. This is the left section of the firewall	3.92	1	0.98	2.84	0.10		3.92
Frame & Body	CHC23-03129	A		Engine Firewall Center	Sheet metal aluminum firewall. Waterjet, cut, and bent. This is the center section of the firewall	5.22	1	2.89	2.33			5.22
Frame & Body	CHC23-03359	A		Seatback Firewall Bottom		4.44	1	1.55	2.54	0.35		4.44
Frame & Body	CHC23-03509	A		Seatback Firewall Top		6.22	1	3.32	2.90			6.22
Frame & Body	PTC23-03514	A		Intake Cantilever Support Bracket	Sheet metal aluminum bracket that supports the cantilevered end of the air intake.	1.33	1	0.16	1.17			1.33
Frame & Body	PTC23-03794	A		Engine Steam Guard	Sheet metal aluminum bracket. Protects driver from escaping steam.	4.23	1	1.72	2.51			4.23
Frame & Body	CHC23-03104	A		Anti Intrusion Plate		7.36	1	5.56	1.80			7.36
Frame & Body	OTS-00233	A		Plascore IA	Plascore Crushlite aluminum honeycomb impact attenuator	20.00	1	20.00				20.00

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Frame & Body	DRC22-02788	A		Frame Chain Guard Permanent Section	Sections of chain guard, permanently attached to chassis	15.42	1	0.32	15.10			15.42
Frame & Body	AEC22-02690	A		Front Wing Upper Mount Post Tube Insert	Steel inserts welded into tubes located at top corners of front bulkhead. Threaded hole for bolting front wing rod end to chassis.	3.55	1	0.20	3.35			3.55
Frame & Body	AEC23-03739	A		Front Wing Lower Mount	Four position height adjustment lower front wing mount welded to frame. Identical part welded to either side of the front bulkhead.	3.88	1	0.17	3.71			3.88
Frame & Body	PTC23-03557	A		Radiator Mount Dowel Pins	Dowel pins welded to upper radiator mounts.	2.02	1	0.06	1.96			2.02
Frame & Body	ERA22-00438	A	Pedal box		Ergonomics System - Gas and Pedal Assembly excluding master cylinders	157.84	1	47.33	49.54	60.97		157.84
Frame & Body	ERC22-01437	A		Brake Pedal	7075 Aluminum CNC Machined Brake Pedal	19.12	1	4.77	14.35			19.12
Frame & Body	ERC19-00097	A		Brake Pedal Mount	Mounts that fasten into keys on the base plate and thread into it	1.38	2	0.18	1.20			2.76
Frame & Body	ERC19-00082	A		Brake Pedal Thrust Washers	Slippery delrin washer to fix the brake and allow a smooth pivot	0.74	2	0.03	0.71			1.48
Frame & Body	ERC22-02375	A		Brake and Throttle Foot Cup	Aluminum foot cup bent to fit close to the brake and throttle pedal	1.80	2	0.34	1.46			3.60
Frame & Body	ERC19-00515	A		Bias Bar Trunnion	17-4 PH stainless steel turned trunnion for balance bar	3.88	1	0.30	3.58			3.88
Frame & Body	ERC19-00516	A		Bias Bar Sleeve	Sleeve for balance bar shoulder bolt	3.94	1	0.13	3.81			3.94
Frame & Body	ERC19-00089	A		Gas Pedal	CCM Hockey sticks are very stiff and are reinforced quite heavily, working well for a gas pedal	18.86	1	16.33	2.38		0.15	18.86
Frame & Body	ERC19-00093	A		Throttle Pedal Mount	6061 Aluminum CNC gas pedal mounts with slot for torsion springs	3.34	2	0.47	2.87			6.68
Frame & Body	ERC19-0087	A		Throttle Spring Top Mount	Torsion spring attachment piece to the throttle pedal	2.22	2	0.08	2.14			4.44
Frame & Body	ERC21-01136	A		Pedal Box Base plate	Baseplate connecting the IGUS rails to the assembly	22.36	1	6.66	13.16	2.54		22.36
Frame & Body	ERC22-02712	A		Linear Potentiometer Mount	Levels linear potentiometers for better transmission angle	0.70	2	0.03	0.67			1.40
Frame & Body	ERC19-00085	A		Throttle Stopper top	Positive lock at 20 degrees for the throttle pedal	3.26	1	0.34	2.92			3.26

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Frame & Body	ERC19-00086	A		Throttle Stopper Bottom	6061 Aluminum angle cut to length for a resting throttle pedal stop	1.66	1	0.04	1.62			1.66
Frame & Body	ERC19-00092	A		Master Cylinder Mount	Steel mounts for master cylinders that fit into keyed slots in the base plate	2.87	2	0.29	2.58			5.74
Frame & Body	ERC22-01337	A		Brake Overtravel Switch Mount	3D Printed mount for the brake over travel switch	0.12	1	0.01	0.11			0.12
Frame & Body	ERC19-0035	A		Linear Sensor Spacer	Spacer between linear sensors	1.34	1	0.03	1.31			1.34
Frame & Body	ERC19-00083	A		Brake Pedal Pivot Sleeve	Pivot for the brake pedal bearing - to be pressed against the the brake pedal mounts to stop rotation so that the bearing will rotate about	1.66	1	0.11	1.55			1.66
Frame & Body	ERC19-00090	A		Throttle Pedal Pivot Sleeve	Pivot sleeve that gets pressed into the throttle pedal	1.67	1	0.03	1.64			1.67
Frame & Body	OTS-00510	A		Linear Rail	IGUS Slide Rail (TS-04-15-400)	2.43	2	0.72	1.71			4.86
Frame & Body				**[Area Total:]**				**1563.31**	**1375.72**	**77.09**	**33.24**	**3049.36**
Instruments, Wiring & Accessories	ELA22-00556	A	ECUs and Wiring Harness			975.00	1	975.00				975.00
Instruments, Wiring & Accessories	SEN-01906	A		Life Racing GPS-IMU	Life Racing GPS-AG50	49.00	1	49.00				49.00
Instruments, Wiring & Accessories	ELA23-00563	A		Main Wiring Harness	Central Wiring harness, separate from the rear of the car by 64 connector. See wiring harness diagram for details	361.67	1	207.14	154.42	0.11		361.67
Instruments, Wiring & Accessories	ELA22-00564	A		Brake Plausibility	Brake Plausibility PCB for ETC	36.76	1	21.79	14.87	0.10		36.76
Instruments, Wiring & Accessories	OTSA-00563 ECUMaster PMU16 (PMU1	A		PDU		92.55	1	73.20	19.35			92.55
Instruments, Wiring & Accessories	ELA22-00557	A	Battery and Battery Control Circuit		Power and harness components directly connected to the battery. Refer to Battery [6] connector on main diagram	66.11	1	58.95	6.60	0.56		66.11
Instruments, Wiring & Accessories	ELA22-00558	A	Engine Sensors and Wiring Harness			96.65	1	93.75	2.90			96.65

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Instruments, Wiring & Accessories	ELA22-00559	A		Engine Sensors		75.00	1	75.00				75.00
Instruments, Wiring & Accessories	ELA22-00560	A		Engine Wiring Harness		241.63	1	141.63	100.00			241.63
Instruments, Wiring & Accessories	ELA20-00561	A		Brake Light		3.96	1	1.64	2.32			3.96
Instruments, Wiring & Accessories				**[Area Total:]**				**1697.10**	**300.46**	**0.77**		**1998.33**
Miscellaneous, Safety, Finish and Assembly	ERA22-00541	A	Seat			13.90	1	0.05	13.48	0.37		13.90
Miscellaneous, Safety, Finish and Assembly	ERC23-03728	A		Seat	Carbon fiber seat	301.51	1	206.00	92.18		3.33	301.51
Miscellaneous, Safety, Finish and Assembly	ERC23-03475	A		Seat Mounts	Seat pin mounts consist of welded tube to the frame with a aluminium pin mounted the carbon seat	6.97	2	0.82	6.15			13.94
Miscellaneous, Safety, Finish and Assembly	SUC-03518	A		rear seat mount	Holds rear of seat up from chassis	3.48	1	0.36	3.12			3.48
Miscellaneous, Safety, Finish and Assembly	ERA22-00553	A	Head rest			2.35	1		2.18	0.17		2.35
Miscellaneous, Safety, Finish and Assembly	ERC22-02841	A		Carbon Headrest Panel	Pre-preg carbon fiber sandwich plate	5.78	1	4.50	1.27		0.01	5.78
Miscellaneous, Safety, Finish and Assembly	ERC22-02843	A		Foam Headrest		6.22	1	6.10	0.12			6.22
Miscellaneous, Safety, Finish and Assembly	ERC20-00600	A	Driver harness		The system entailing the safety restraints between the driver and the chassis of the vehicle	49.68	1	45.00	2.12	2.56		49.68
Miscellaneous, Safety, Finish and Assembly	CHC22-01820	A		Harness Spacer	A spacer used to secure the driver harness bracket	0.23	8	0.02	0.21			1.84
Miscellaneous, Safety, Finish and Assembly	OTH22-02845	A	Main hoop padding		Padding along roll hoop	2.77	2	2.50	0.27			5.54

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Miscellaneous, Safety, Finish and Assembly				**[Area Total:]**				**268.81**	**128.99**	**3.10**	**3.34**	**404.24**
Steering System	ERA22-00356	A	Steering Wheel		3D Printed steering wheel with replaceable grips	22.94	1	10.82	9.26	2.86		22.94
Steering System	ERC19-00522	A		Steering Wheel Body	3D Printed steering wheel	10.96	1	0.70	8.28	1.98		10.96
Steering System	ERC22-00427	A		Steering Wheel Front Panel	3D Printed front cover for steering wheel body	0.92	1	0.09	0.83			0.92
Steering System	ERC22-02798	A		Steering Wheel Shift Paddle	3D Printed part connects to steering wheel body via pin for shifting lever	0.11	2	0.01	0.10			0.22
Steering System	ERC19-00529	A		Paddle Steel Actuator	To actuate the paddles with magnets	1.09	2	0.04	1.05			2.18
Steering System	OTS-00524	A		Quick Release	LifeLine Formula electric 8-pin quick release	11.76	1	0.63	11.13			11.76
Steering System	ERC19-00525	A		Front Wheel Handles	3D Printed	2.24	2	0.21	2.03			4.48
Steering System	ERC19-00526	A		Rear Wheel Handles	3D Printed	2.24	2	0.21	2.03			4.48
Steering System	ERA23-00684	A	Dual Direction Clutch Handle		Used for actuating the engine clutch from the drivers cockpit	22.14	1	19.50	2.26	0.38		22.14
Steering System	ERC23-03846	A		Clutch Handle	Hockey stick section where driver grabs onto for actuating the clutch	7.05	1	6.35	0.70			7.05
Steering System	ERC23-03532	A		Clutch Lever Stick	Outer shell of carbon fiber for pivoting component	7.05	1	6.00	1.05			7.05
Steering System	ERC23-03848	A		Angle Insert	Angled insert to connect upper and lower hockey stick carbon fiber	2.49	1	0.35	2.14			2.49
Steering System	ERC23-03611	A		Dual Direction Clutch Insert		3.46	1	0.66	2.80			3.46
Steering System	ERC23-03613	A		Dual Direction Pivot Plate		3.25	1	0.41	2.84			3.25
Steering System	ERC23-03988	A		Clutch Support Tab	used to brace the clutch in the car for better acutation	1.01	1	0.37	0.64			1.01
Steering System	MFH-03615	A		SCW-HH-BRASS-ST-FT 0.3125-24X1.00 VENTED	Brass bolt with hole through centre for clutch cable tensioning	1.78	1	0.10	1.68			1.78

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Steering System	ERC22-00144	A	Steering Column and Rack		Steering column and rack	113.39	1	74.67	37.35	1.37		113.39
Steering System	ERC19-00211	A		Rack Weld Coupler	Coupling the steering rack to the bottom shaft through a weld and two spring pins in the rack	1.99	1	0.49	1.50			1.99
Steering System	ERC19-00213	A		Rack Spacer Tall	space steering rack for bump steer adjsutment	0.74	2	0.02	0.72			1.48
Steering System	ERC19-00215	A		Steering bearing holder	Holds the upper section of the steering rack, upper mount is steel and lower mount aluminium. Symmetrical parts	9.01	1	1.20	7.81			9.01
Steering System	ERC19-00216	A		Horizontal steering shaft		16.17	1	1.98	14.19			16.17
Steering System	OTSA-00072	A		Steering Rack	NARRco Steering Rack with Sensor (13T-14.4)	49.47	1	22.27	27.05	0.15		49.47
Steering System	ERC19-00212	A		Rack Spacer Short		0.40	2	0.01	0.39			0.80
Steering System	ERC19-00205	A		Rack split clamp		2.06	2	0.24	1.82			4.12
Steering System				**[Area Total:]**				**148.07**	**147.79**	**6.74**		**302.60**
Suspension & Shocks	SUA21-00179	A	Control Rod Assembly		Rods for controlling the angle of the upright relative to chassis	25.62	4	18.38	7.00	0.24		102.48
Suspension & Shocks	SUC20-00304	A		Carbon Tube Insert With Wrench Flat		0.55	8	0.12	0.43			4.40
Suspension & Shocks	SUA23-00617	A	Push Rods		all push rods were designed with the same components for adjustability and to simplify manufacturing	25.22	4	18.03	6.62	0.57		100.88
Suspension & Shocks	SUC20-00304	A		Carbon Tube Insert With Wrench Flat		0.69	4	0.12	0.57			2.76
Suspension & Shocks	SUC19-00899	A		Aluminum Shim Insert Nut Side	Shim interface to allow rapid adjustment of ride height and toe.	3.09	4	0.45	2.64			12.36
Suspension & Shocks	SUC19-00897	A		Pullrod Shims	Consists of 20 aluminum shims for 8 adjustable control arms. Waterjet from 1 sheet of aluminum.	0.64	4	0.16	0.48			2.56
Suspension & Shocks	SUC19-00898	A		Shim Interface Bolt Head Side	Bonded side of shim interface	3.11	4	0.45	2.66			12.44
Suspension & Shocks	OTSA-00050	A	Spring and shock			339.63	4	330.00	9.38	0.25		1358.52
Suspension & Shocks	SUA21-0006	A	Front Bellcrank Assembly		Quantity of shafts and thrust washers account for both front and rear bellcranks	1.06	2		0.87	0.19		2.12

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Suspension & Shocks	SUC21-00311	A		Front Bellcrank		11.07	2	2.40	8.67			22.14
Suspension & Shocks	SUC21-00995	A		Thrust washer	Quantity accounts for front and rear thrust washers as they are identical.	0.21	4	0.02	0.19			0.84
Suspension & Shocks	SUC21-01043	A		Bellcrank shaft	Shaft for bellcrank bearing to pivot about. Quantity accounts for both front and rear shafts as they are identical.	1.20	2	0.43	0.77			2.40
Suspension & Shocks	SUC21-01124	A		Bellcrank Bushing		1.19	2	0.19	1.00			2.38
Suspension & Shocks	SUA21-00242	A	Rear Bellcrank Assembly		Thrust washers and shafts are accounted for in front bellcrank assembly.	1.06	2		0.87	0.19		2.12
Suspension & Shocks	SUC23-03648	A		Rear Bellcrank	7075 Bellcrank	8.27	2	1.49	6.78			16.54
Suspension & Shocks	SUC21-01124	A		Bushing		0.07	2	0.07				0.14
Suspension & Shocks	SUA22-00010	A	Corner Assembly		Uprights are identical with modular mounting brackets for A-Arms and control arms (includes hubs which are accounted for in the wheel system)	111.64	4	107.52	3.51	0.61		446.56
Suspension & Shocks	SUC19-00001	A		Upright	The uprights are mirrored right to left,. But remain the same between the front and rear Video of machining: https://www.youtube.com/watch?v=QVYncR9HXtE&t=3s	58.44	4	13.72	44.72			233.76
Suspension & Shocks	SUC19-00066	A		Upright top		3.09	4	0.48	2.61			12.36
Suspension & Shocks	SUC19-00067	A		Upright top shim (camber)	Camber adjustment	0.65	4	0.06	0.59			2.60
Suspension & Shocks	SUC19-00064	A		Front Tierod Pickup		3.65	4	0.44	3.21			14.60
Suspension & Shocks	SUC19-00316	A		Rear Upright Tierod Pickup		5.10	4	0.82	4.28			20.40
Suspension & Shocks	SUC19-00313	A		Rear Toe Pickup Spacer		2.23	4	0.18	2.05			8.92
Suspension & Shocks	SUA22-00355	A	Rear Anti-Roll		Rear rollbar for suspension. Note: Mounting blocks are the same as the front	9.51	1		8.77	0.74		9.51
Suspension & Shocks	SUA22-00443	A		Rear Rollbar Actuator	2 Force member links bellcrank to rollbar	15.04	2	12.42	2.56	0.06		30.08
Suspension & Shocks	SUC22-01414	A		Rear Anti-roll bar		2.05	1	0.37	1.68			2.05
Suspension & Shocks	SUC22-01411	A		Rear ARB Lever Arm		1.17	4	0.08	1.09			4.68

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Suspension & Shocks	SUA22-00473	A	Control Arms		Suspension A-Arms consisting of bonding carbon tube to aluminum nodes Identical nodes used for top and bottom of the front and rear corner assembly.	60.23	4	43.80	15.62	0.81		240.92
Suspension & Shocks	SUC19-00278	A		Threaded Inserts		0.52	16	0.10	0.42			8.32
Suspension & Shocks	SUC21-01094	A		Front A-Arm Node		10.56	4	2.27	8.29			42.24
Suspension & Shocks	SUC19-00078	A		Rear A-Arm Node		11.76	4	2.53	9.23			47.04
Suspension & Shocks	SUA23-00817	A	Front Arb Assembly		Front anti roll bar for car Note: Mounts for both the front and rear are costed here	1.95	1		1.06	0.89		1.95
Suspension & Shocks	SUC23-04180	A		FARB Lower Pillow Block		0.41	8	0.03	0.38			3.28
Suspension & Shocks	SUC23-04179	A		FARB Upper Pillow Block		0.46	8	0.03	0.43			3.68
Suspension & Shocks	SUC23-04150	A		Front ARB Bar		8.88	1	2.23	6.65			8.88
Suspension & Shocks	SUA23-00835	A		Front ARB Actuator		25.52	2	20.73	4.75	0.04		51.04
Suspension & Shocks				**[Area Total:]**				**2239.14**	**586.30**	**12.51**		**2837.95**
Wheels, Wheel Bearings & Tires	SUA19-00028	A	Wheel and Tire		10" OZ magnesium wheel set with Hoosier tires. Center-lock	238.94	4	236.00	2.94			955.76
Wheels, Wheel Bearings & Tires	SUA19-00010	A	Hub		Live spindle center-lock hubs with drive pins REFER TO CORNER ASSEMBLY DRAWING FOR ASSEMBLY DRAWING	112.04	4	107.52	3.52	1.00		448.16
Wheels, Wheel Bearings & Tires	SUC19-00046	A		Hub		61.38	4	15.01	46.37			245.52
Wheels, Wheel Bearings & Tires	SUC19-00048	A		Hub nut	Hook spanner driven 7075 nuts	4.19	4	2.14	2.05			16.76
Wheels, Wheel Bearings & Tires	SUC19-00047	A		Wheel nut		4.09	4	0.79	3.30			16.36
Wheels, Wheel Bearings & Tires	SUC19-00049	A		Lock Washer	Bearing lock washer	1.34	4	0.20	1.14			5.36

System	Asm/Part #	Rev. Lvl.	Assembly	Component	Description	Unit Cost	Quantity	Material Cost	Process Cost	Fastener Cost	Tooling Cost	Total Cost
Wheels, Wheel Bearings & Tires	SUC19-00051	A		Drive Pin	Stainless pin pressed into hub to drive wheel. Quantity on drawing includes 4 spares.	1.29	16	0.05	1.24			20.64
Wheels, Wheel Bearings & Tires	SUC19-00045	A		Wheelspeed Pickups		9.59	4	1.52	8.07			38.36
Wheels, Wheel Bearings & Tires				**[Area Total:]**				**1453.52**	**289.40**	**4.00**		**1746.92**
				[Vehicle Total:]				12879.34	3926.76	146.52	43.36	16995.98

Global Vehicle Drawings

Brake System Section

Brake System › Brake Rotors

P/N Base	Suffix	Details	Cost	Qty	Total
SUC22-00960	A	Brake Rotor and locating components full assembly drawing found in hub upright assembly	$11.99	4	$47.96

Part	Cost	Quantity	Subtotal
Brake rotor	9.1000	1	9.1000
Rotor retainer	0.1200	4	0.4800

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Rotor onto hub	1		1	0.06	0.06
Power Tool <= 6.35 mm	Rotor retainer and bolt	1	Repeat 4	4	0.25	1.00
Safety Wire, Install	Rotor retainer bolts	1	Repeat 2	2	0.60	1.20

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Rotor retainer bolts	6 mm	15 mm	4	0.04	0.15

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Brake System › Brake Rotors › Brake rotor

P/N Base	Suffix	Details	Cost	Qty	Total
SUC22-00960	A		$9.10	1	$9.10

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (per kg)	4130 plate	0.75 kg						1	1.69	1.69

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Waterjet Setup	0.25		1	1.30	0.32
Waterjet Cut	Cut Profile	98.317		1	0.01	0.98
Machining Setup, Install and remove	Into Mill	1		1	1.30	1.30
Machining	Machine face	1.06	Material - Steel	3	0.04	2.08
Machining Setup, Change	Flip	1		1	0.65	0.65
Machining	Machine 2nd face	1.06	Material - Steel	3	0.04	2.08

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Brake System › Brake Rotors › Rotor retainer

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00050	A	Locates rotor to hub	$0.12	4	$0.48

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	6061-T6 bar stock			.625 round bar	0.307 in^2	0.28 in	0.098 lb/in^3	1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Lathe 16 total all done at once for whole car	0.0625		1	1.30	0.08
Machining	Turn OD, drill and part	0.036		1	0.04	0.02

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Brake System › Brake Lines

P/N Base	Suffix	Details	Cost	Qty	Total
OTH19-0032	A		$191.44	1	$191.44

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Hose, High Pressure, Stainless Steel Braided Outer (per m)	Brake Soft Lines	0.325 in						6	17.68	106.08
Fluid, Oil	Brake Fluid	0.6 L						1	0.45	0.45
Adapter/L.P./Bulkhead Tee//Steel/	Tee for left/right wheels	0.1875 in	0.1875 in					2	13.25	26.50
Adapter/L.P./Female Pipe Tee//Aluminum/Anodized	Pressure sensor tee	0.1875 in	0.1875 in					2	14.69	29.38
Sensor, Fluid Pressure	Brake Pressure Sensor							2	4.00	8.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Line-on-Line	Route Brake Lines	1		1	0.13	0.13
Wrench <= 6.35 mm	Tighten Brake Fittings for entire section, 9 connections on each line	9	Repeat 2	2	1.00	18.00
Wrench <= 6.35 mm	Install Pressure Sensors into NPT tees	1	Repeat 2	2	1.00	2.00
Install Tie Wrap (Zip Tie, Cable Clamp)	Attach lines to chassis	10		1	0.09	0.90

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Brake System › Brembo Billet Brake Caliper (2x34)

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00277	A		$401.51	4	$1606.04

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Brake Pad, Iron or Steel Rotor		5517.6 mm^3						2	1.10	2.21
Brake Caliper, Brembo, 120.A441.30								1	395.00	395.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 25.4 mm	Fasten calipers to upright	1	Repeat 2	2	0.25	0.50
Safety Wire, Install	Secure Caliper	1		1	0.60	0.60
Ratchet <= 6.35 mm	fasten brake lines to caliper	1		1	0.50	0.50
Brake Bleed - Per Bleeder Valve		1		1	2.50	2.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)		8 mm	25 mm	2	0.10	0.20

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Brake System › Brake Master Cylinders

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00512	A		$198.40	2	$396.80

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Hydraulic Fluid Reservoir, Remote (Plastic)	Brake Reservoir							1	5.00	5.00
Banjo Fitting, 45 Deg., Aluminum		0.1875 in						2	7.83	15.66
Master Cylinder, AP, CP7855								1	174.50	174.50
Hose, Rubber (per m)	Reservoir hose	0.325 in						0.5	1.49	0.74
Crush Washer		0.25 in						4	0.29	1.17

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Fittings to Master Cylinders	1	Repeat 2	2	0.06	0.12
Ratchet <= 6.35 mm	Tighten fittings	1	Repeat 2	2	0.50	1.00
Assemble, 1 kg, Loose	Fittings on hose	1		1	0.06	0.06
Assemble, 1 kg, Loose	Fittings on reservoir	1		1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Hose Clamp, Spring Steel		0.25 in		1	0.09	0.09

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Brake System Drawings

Powertrain System Section

Engine & Drivetrain › Differential Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
DRA22-00487	A	Differential and support plate assembly. Chain and sprocket included. Note that oil is added to the differential after stub axle installation, and is included in the Driveshaft Assembly.	$515.89	1	$515.89

Part	Cost	Quantity	Subtotal
Diff Plate Left	26.7700	1	26.7700
Right Differential Plate	30.6100	1	30.6100
Chain Guard - Bolted	5.2200	1	5.2200
Sprocket Adapter	22.6500	1	22.6500
Drive Sprocket (Front)	10.1200	1	10.1200
Driven Sprocket (Rear) (Vortex 520 Sprocket (NA))	8.7800	1	8.7800
Tripod Housing (Long) (D4824)	49.7300	1	49.7300
Tripod Housing (Short) (D4630)	41.1200	1	41.1200
RHS Bearing Spacer	3.6800	1	3.6800
LHS Bearing Spacer	2.5800	1	2.5800
Drexler Differential L1 (NA)	220.7600	1	220.7600
Differential Plate Cross Brace	1.5800	1	1.5800
Turnbuckle Assembly	6.0500	2	12.1000

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Seal, Radial Lip Seal	Oil containment at stub axles	1						2	1.00	2.00
Bearing, Cylindrical Roller	Rotating Bearing Plate (90mm OD)	90 mm	20 mm					1	11.70	11.70
Bearing, Cylindrical Roller	Rotating Bearing Plate (78mm OD)	78 mm	20 mm					1	10.62	10.62
Chain	520 drive chain	31.875 in						1	40.48	40.48

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Line-on-Line	Install bearing spacers on differential plates	1	Repeat 2	2	0.13	0.26
Assemble, 1 kg, Interference	Press bearing in to rotating bearing plate	1	Repeat 2	2	0.19	0.38
Assemble, 1 kg, Interference	Press diff plates with bearings onto diff	1	Repeat 2	2	0.19	0.38
Power Tool <= 25.4 mm	Attach turnbuckles to diff plates	1	Repeat 2	2	0.25	0.50
Assemble, 1 kg, Loose	Put diff plate cross brace between plates	1		1	0.06	0.06
Assemble, 1 kg, Line-on-Line	Install driven sprocket to sprocket adapter	1		1	0.13	0.13
Power Tool <= 25.4 mm	Install driven sprocket to adapter	1	Repeat 6	6	0.25	1.50
Reaction Tool <= 25.4 mm	Sprocket bolts	1	Repeat 6	6	0.25	1.50
Power Tool <= 6.35 mm	Install chain guard chassis mounts	1	Repeat 2	2	0.25	0.50
Ratchet <= 6.35 mm	Install chain guard engine mount	1		1	0.50	0.50
Ratchet <= 25.4 mm	Install differential assembly onto car	1	Repeat 4	4	0.75	3.00
Reaction Tool <= 25.4 mm	Assembly onto car	1	Repeat 4	4	0.25	1.00
Assemble, 10 kg, Line-on-Line	Slide sprocket adapter onto diff	1		1	1.25	1.25
Assemble, 1 kg, Interference	Install snap ring to hold adapter	1		1	0.19	0.19
Power Tool <= 25.4 mm	Bolt drive sprocket	1	Fastener Engagement Length > 2D	1.25	0.25	0.31
Assemble, 1 kg, Loose	Install 520 drive chain	1		1	0.06	0.06
Assemble, 1 kg, Loose	Place tripod housings into diff	1	Repeat 2	2	0.06	0.12
Power Tool <= 6.35 mm	Install tripod housings onto diff	1	Repeat 2	2	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 8.8 (SAE 5)	Sprocket adapter to sprocket	10 mm	10 mm	6	0.07	0.40
Bolt, Grade 8.8 (SAE 5)	Sprocket adapter to sprocket	10 mm	30 mm	6	0.20	1.19
Washer, Grade 8.8 (SAE 5)	Sprocket adapter to sprocket	20 mm		12	0.01	0.12
Bolt, Grade 8.8 (SAE 5)	Turnbuckle mounting	8 mm	30 mm	4	0.12	0.47
Nut, Grade 8.8 (SAE 5)	Turnbuckle mounting	8 mm	8 mm	4	0.04	0.18
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Turnbuckle adjustment	0.5 in	0.25 in	4	0.09	0.36
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Chain guard chassis mounting	5 mm	20 mm	2	0.02	0.05
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Chain guard chassis mounting	5 mm	5 mm	2	0.02	0.04
Bolt, Grade 8.8 (SAE 5)	Diff plate cross member	10 mm	30 mm	2	0.20	0.40
Bolt, Grade 8.8 (SAE 5)	Tripod housing bolts	5 mm	10 mm	2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Diff Plate Left

P/N Base	Suffix	Details	Cost	Qty	Total
DRC19-00251	A		$26.77	1	$26.77

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Diff plate material			Bar Stock	31.442 in^2	1.066 in	0.098 lb/in^3	1	6.26	6.26

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up material on CNC mill	1		1	1.30	1.30
Machining	Machine top face of differential plate	14.154	Material - Aluminum	1	0.04	9.28
Machining Setup, Change	Flip over material	1		1	0.65	0.65
Machining	Machining bottom face of differential plate	14.154	Material - Aluminum	1	0.04	9.28
Anodizing	Anodize the plate black	290		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Right Differential Plate

P/N Base	Suffix	Details	Cost	Qty	Total
DRC19-00252	A		$30.61	1	$30.61

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Material for diff plate			Bar Stock	30.155 in^2	1.234 in	0.098 lb/in^3	1	6.95	6.95

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Maching top face of the plate	26.506	Material - Aluminum	1	0.04	17.37
Machining Setup, Install and remove	Set up material on CNC mill	1		1	1.30	1.30
Machining Setup, Change	Flip over material	1		1	0.65	0.65
Machining	Machining bottom face of the plate	6.626	Material - Aluminum	1	0.04	4.34
Anodizing	Anodize plate black	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Chain Guard - Bolted

P/N Base	Suffix	Details	Cost	Qty	Total
DRC23-0317	A	Chain guard	$5.22	1	$5.22

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	Chain Guard Top			Sheet	38.22 in^2	0.11 in	0.284 lb/in^3	1	1.22	1.22
Steel, Mild (by Dimensions)	Chain Guard Tab B			1.08x1.28" rectangle	1.38 in^2	0.06 in	0.284 lb/in^3	1	0.02	0.02
Steel, Mild (by Dimensions)	Chain Guard Lower			3.48x2.68" rectangle	9.33 in^2	0.11 in	0.284 lb/in^3	1	0.30	0.30

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Mount material to waterjet	1		1	1.30	1.30
Waterjet Cut	Waterjet shape of guard	48		1	0.01	1.22
Weld	Weld plates together at 222 degrees	2		1	0.15	0.76
Weld	Weld engine mount tab	1		1	0.15	0.15
Sheet metal bends	Bend Lower Chain Guard Tab 120 degrees	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Sprocket Adapter

P/N Base	Suffix	Details	Cost	Qty	Total
DRC19-00254	A	Adapter to mount sprocket to differential assembly	$22.65	1	$22.65

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Sprocket adapter			Round Stock	28.828 in^2	1.138 in	0.098 lb/in^3	1	6.12	6.12

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install material on CNC lathe w/ live tooling	1		1	1.30	1.30
Machining Setup, Change	Flip	1		1	0.65	0.65
Machining	Machine top face (all machine volume inc. here)	20	Material - Aluminum	1	0.04	13.11
Broach, Internal	Internal spline creation for differential interaction	0.94	Material - Aluminum	1	0.50	1.19
Machining	Machine bottom face	7	Material - Aluminum	1	0.04	0.28
Anodizing	Anodize adapter black	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Drive Sprocket (Front)

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00242	A	Steel sprocket, 12 teeth using 520 chain	$10.12	1	$10.12

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	12-tooth drive sprocket			Round plate	5.241 in^2	0.84 in	0.284 lb/in^3	1	1.28	1.28

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Mount to waterjet	1		1	1.30	1.30
Waterjet Cut	Cut out features	13.283		1	0.01	0.34
Machining Setup, Install and remove	Into lathe	1		1	1.30	1.30
Machining		3	Material - Steel	3	0.04	5.90

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Driven Sprocket (Rear) (Vortex 520 Sprocket (NA))

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00241	A	7075 Aluminum sprocket with 44 teeth use with 520 chain	$8.78	1	$8.78

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	44-tooth drive sprocket			Round	47.784 in^2	0.307 in	0.098 lb/in^3	1	2.74	2.74

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Mount stock to waterjet	1		1	1.30	1.30
Waterjet Cut	Cut all through features and teeth	79.154		1	0.01	2.01
Machining Setup, Change	Move to CNC to machine features for both sides	1	Repeat 2	2	0.65	1.30
Machining	Mill center, bolt holes, profile	2.184	Material - Aluminum	1	0.04	1.43
Anodizing	Anodize the sprocket blue	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Tripod Housing (Long) (D4824)

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00267	A	Tripod bearing housing for driveshaft interaction with the differential and driven sprocket.	$49.73	1	$49.73

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	Material for housing			Round Stock	5.538 in^2	6.185 in	0.284 lb/in^3	1	9.93	9.93

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	machine 5 axis	19.58	Material - Steel	3	0.04	38.50
Machining Setup, Install and remove	mount stock	1		1	1.30	1.30

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Tripod Housing (Short) (D4630)

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00266	A	Tripod bearing housing for driveshaft interaction with the differential and driven sprocket.	$41.12	1	$41.12

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	For short tripod housing			Round Stock	5.538 in^2	4.961 in	0.284 lb/in^3	1	7.96	7.96

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	machine part	16.2	Material - Steel	3	0.04	31.86
Machining Setup, Install and remove	CNC lathe with live tooling 5 axis	1		1	1.30	1.30

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › RHS Bearing Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
DRC19-00255	A	Right hand side assembly bearing spacer	$3.68	1	$3.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Material for spacer			Round Stock	4.674 in^2	0.734 in	0.098 lb/in^3	1	0.64	0.64

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Turn part	1		1	1.30	1.30
Machining	Turn OD, bore, part	2.66	Material - Aluminum	1	0.04	1.74

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › LHS Bearing Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
DRC19-00256	A	A spacer for the sprocket adapter	$2.58	1	$2.58

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Material for spacer			Tube Stock	4.674 in^2	0.359 in	0.098 lb/in^3	1	0.31	0.31

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Turn OD, bore, part	1.484	Material - Aluminum	1	0.04	0.97
Machining Setup, Install and remove	Install round stock onto a lathe	1		1	1.30	1.30

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Drexler Differential L1 (NA)

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00264	A	Differential assembly. Drexler L1 LSD differential, OTS	$220.76	1	$220.76

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Gear Carrier			Round	18146 mm^2	256.1 mm	2712 kg/m^3	1	52.93	52.93
Differential Internals, Limited Slip, Salisbury or Powerflow or Clutch Style	Drexler Differential Gearing							1	110.00	110.00
Plug/L.P./Pipe/Allen Head/Aluminum/Anodized	1/8" NPT Plug	3.175 mm						3	2.92	8.77
Seal, Radial Lip Seal	Axle Seal							2	1.00	2.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Differential material set up on CNC lathe for 3 casing parts	1	Repeat 3	3	1.30	3.90
Machining	All machining of housing	52.3	Material - Aluminum	1	0.04	34.28
Assemble, 1 kg, Line-on-Line	Gears in, parts together	1	Repeat 3	3	0.13	0.39
Tapping holes	Differential NPT plug holes	1	Repeat 3	3	0.35	1.05
Power Tool <= 25.4 mm	Diff case bolts	1	Repeat 24	24	0.25	6.00
Assemble, 1 kg, Loose	Placing piece of diff case together	1	Repeat 2	2	0.06	0.12
Power Tool <= 25.4 mm	NPT plugs	1	Repeat 3	3	0.25	0.75

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Fasten diff case together	0.19 in	0.5625 in	24	0.02	0.57

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Differential Plate Cross Brace

P/N Base	Suffix	Details	Cost	Qty	Total
DRC19-00259	A	A structural brace connecting the two differential plates for torsional rigidity.	$1.58	1	$1.58

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	For cross brace			Tube	0.147 in^2	6.191 in	0.098 lb/in^3	1	0.17	0.17

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Saw or tubing cuts	Cut cross brace off of stock	0.5		1	0.40	0.51
Threading, Internal (machining)	Thread the ends of the brace	1	Repeat 2	2	0.10	0.20
Drilled holes < 25.4 mm dia.	Drill out for tapping	2	Material - Aluminum	1	0.35	0.70
Anodizing	Anodize the brace black	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Differential Assembly › Turnbuckle Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
DRA19-00022	A	Adjustment turnbuckles for chain tension and system height	$6.05	2	$12.10

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Clevis	Mounting clevis	0.3125 in						1	1.24	1.24
Rod End, Industrial		0.3125 in						1	2.48	2.48
Aluminum, Normal (by Dimensions)	Body of the turnbuckle			Round Stock	0.264 in^2	2.83 in	0.098 lb/in^3	1	0.14	0.14

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up mill for body	1		1	1.30	1.30
Anodizing	Anodize the body black	1		1		
Machining	Mill body (all material removed)	0.357	Material - Aluminum	1	0.04	0.01
Tapping holes	Threading the body	2	Material - Aluminum	1	0.35	0.70
Hand - Start Only	Install clevis and rod end and both nuts onto body	1		1	0.12	0.12

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 10.9 (SAE 8)	Locking nut for turnbuckle adjustment	0.3125 in		1	0.06	0.06

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Driveshaft

P/N Base	Suffix	Details	Cost	Qty	Total
DRA22-00487	A	Half shaft and stub axle assembly, including constant velocity joints. Oil is added to the differential after installation of the stub axles.	$109.19	2	$218.38

Part	Cost	Quantity	Subtotal
Half Shaft (Long)	6.4000	1	6.4000

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Constant Velocity Joint, Boot	Inboard and outboard							2	5.00	10.00
Constant Velocity Joint, Tripod	Inboard and outboard							2	45.00	90.00
Fluid, Oil	Differential gearing lubrication (75W140)	0.3 L						1	0.23	0.22

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Line-on-Line	Install CV boots on half shafts	2		1	0.13	0.26
Assemble, 1 kg, Interference	Install tripod snap ring	4		1	0.19	0.76
Assemble, 1 kg, Line-on-Line	Install tripod on half shaft	2		1	0.13	0.26
Assemble, 3 kg, Line-on-Line	Install subassembly into hub/differential	1		1	0.38	0.38
Install Tie Wrap (Zip Tie, Cable Clamp)	Fasten CV boots	2		1	0.09	0.18
Assemble, 1 kg, Loose	Fill differential with oil	1		1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Retaining Ring, External	Tripod snap ring	24 mm		4	0.13	0.51
Tie Wrap	Fastened CV boots to housing			4	0.04	0.16

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Driveshaft › Half Shaft (Long)

P/N Base	Suffix	Details	Cost	Qty	Total
22001	A	Hollow half shaft, with splined ends for attachment to rzeppa and tripod constant velocity joint	$6.40	1	$6.40

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	Half shaft cross sectional area of tube			Round	200 mm^2	460 mm	7850 kg/m^3	1	1.62	1.62

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Shaft profile, center hole, splines with live tooling	29.04	Material - Steel	3	0.04	3.48
Machining Setup, Install and remove	Setup lathe	1		1	1.30	1.30
Heat Treatment	Case Hardened drive shaft	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Pneumatic Shift System

P/N Base	Suffix	Details	Cost	Qty	Total
DRA23-00746	A		$141.56	1	$141.56

Part	Cost	Quantity	Subtotal
Air Tank Bracket	4.1700	2	8.3400

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
CO2 Tank, Composite	High Pressure Air Tank	68 in^3						1	56.57	56.57
Air Pressure Regulator	Regulate pressure from air tank							1	10.00	10.00
Sensor, Fluid Pressure	Measures air pressure at regulator							1	4.00	4.00
Pneumatic Cylinder, Single Acting	Shift Cylinder							1	20.00	20.00
Solenoid, 12 Volt	Actuates up/down shifts							2	7.50	15.00
Fitting, Push-to-Connect, Plastic, Straight	Between Bottle, solenoids, and cylnider	0.125 in						7	1.19	8.36
Hose, Polyurethane (per m)	Nylon Tubing for air delivery to piston	0.125 in						0.71	0.22	0.16
Fitting, Push-to-Connect, Plastic, Wye		0.125 in						1	1.58	1.58
Rod End, Industrial	Rod end for shifter linkage	0.3125 in						1	2.48	2.48

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 6.35 mm	Fasten air tank mounts to firewall	4		1	0.25	1.00
Reaction Tool <= 6.35 mm	Fasten air tank mounts to firewall	4		1	0.25	1.00
Power Tool <= 25.4 mm	Tighten hose clamps around air tank	2		1	0.25	0.50
Hand, Tight <= 6.35 mm	connect air tank to regulator	1		1	0.50	0.50
Wrench > 25.4 mm	fasten pressure sensor to regulator	1		1	2.00	2.00
Power Tool <= 6.35 mm	Fasten shift piston to chassis	1		1	0.25	0.25
Reaction Tool <= 6.35 mm	Fasten shift piston to chassis	1		1	0.25	0.25
Power Tool <= 6.35 mm	Fasten Solenoids to Chassis	4		1	0.25	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Reaction Tool <= 6.35 mm	Fasten Solenoids to Chassis	4		1	0.25	1.00
Power Tool <= 25.4 mm	fasten piston to shifter spline	1		1	0.25	0.25
Reaction Tool <= 6.35 mm	fasten piston to shifter spline	1		1	0.25	0.25
Assemble, 1 kg, Line-on-Line	Plumb push to connect fittings onto piston, regulator, and solenoids	9		1	0.13	1.17
Saw or tubing cuts	cut air lines to size	5		1	0.40	2.00
Assemble, 1 kg, Loose	connect air hoses to regulator, solenoids, and piston	9		1	0.06	0.54
Assemble, 1 kg, Loose	attach push to connect wye fitting	1		1	0.06	0.06
Hand - Start Only	Thread rod end onto piston	1		1	0.12	0.12
Wrench <= 6.35 mm	Tighten rod end onto piston	1		1	1.00	1.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Piston Mounting	0.25 in	0.75 in	1	0.05	0.05
Nut, Grade 8.8 (SAE 5)	Piston Mounting	0.25 in		1	0.03	0.03
Bolt, Grade 8.8 (SAE 5)	Air Tank Bracket Mounting	0.25 in	0.75 in	4	0.05	0.19
Hose Clamp, Worm Drive	Securing Air Tank	4.5 in		2	0.96	1.91

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Pneumatic Shift System › Air Tank Bracket

P/N Base	Suffix	Details	Cost	Qty	Total
TAB23-04114	A		$4.17	2	$8.34

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	Stock to waterjet bracket			Sheet Steel	21.82 in^2	0.06 in	0.284 lb/in^3	1	0.38	0.38

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Mount stock to machine	0.5		1	1.30	0.65
Waterjet Cut	Waterjet profile and holes	21.5	Material - Steel	3	0.01	1.64
Sheet metal bends	bend hose clamp/mounting tabs	2	Material - Steel	3	0.25	1.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Engine (CBR600RR)

P/N Base	Suffix	Details	Cost	Qty	Total
OTSA-00007	A	Honda CBR600RR	$1563.94	1	$1563.94

Part	Cost	Quantity	Subtotal
EGR block off plate	1.0600	2	2.1200
Front Left Engine Mount Spacer	0.7900	1	0.7900
Front Right Engine Mount Spacer	0.9500	1	0.9500
Rectifier Mounting Bracket	2.2000	1	2.2000

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Engine and Transmission, Ultra High Performance (>10 HP/100 cc)	Honda CBR600RR engine	599 cc						1	1497.50	1497.50
Fluid, Oil	5W-40 Synthetic Diesel Oil	3 L						1	2.25	2.25
Fluid, Coolant	Deionized Water	2 L						1	0.00	

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, >20 kg, Loose	Position engine with the frame	1		1	1.88	1.88
Assemble, 1 kg, Loose	Place engine spacer into position	1	Repeat 2	2	0.06	0.12
Power Tool <= 25.4 mm	Install front engine mount bolts	1	Repeat 2	2	0.25	0.50
Power Tool <= 25.4 mm	Install rear engine mount bolts	1	Repeat 4	4	0.25	1.00
Engine first start, includes fuel	Starting the engine for the first time	1		1	50.00	50.00
Assemble, 1 kg, Loose	Place rectifier bracket into position	1		1	0.06	0.06
Hand, Loose <= 6.35 mm	remove 2 engine cover bolts	1	Repeat 2	2	0.25	0.50
Power Tool <= 6.35 mm	Install rectifier mounting bolt	1	Repeat 2	2	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Front engine mount	12 mm	60 mm	2	0.65	1.29

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Rear engine mount bolts	14 mm	35 mm	4	0.57	2.28

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Engine (CBR600RR) › EGR block off plate

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00034	A		$1.06	2	$2.12

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Stock material			Square	6.11 in^2	0.125 in	0.098 lb/in^3	1	0.14	0.14

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install material into waterjet	0.5		1	1.30	0.65
Waterjet Cut	Waterjet part	27.454	Material - Aluminum	1	0.01	0.27

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Engine (CBR600RR) › Front Left Engine Mount Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03317	A		$0.79	1	$0.79

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	6061-T6 1" Round Bar				0.785 in^2	0.49 in	0.098 lb/in^3	1	0.07	0.07

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Place raw material in machine along with other engine mount spacer	0.5		1	1.30	0.65
Machining	Drilling 9/16" hole	0.101	Material - Aluminum	1	0.04	0.07

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Engine (CBR600RR) › Front Right Engine Mount Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03319	A		$0.95	1	$0.95

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	6061-T6 1" Round			Round Bar	0.785 in^2	0.99 in	0.098 lb/in^3	1	0.15	0.15

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Place raw material in machine along with material for left side spacer	0.5		1	1.30	0.65
Machining	Drilling 9/16" Hole	0.226	Material - Aluminum	1	0.04	0.15

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Engine (CBR600RR) › Rectifier Mounting Bracket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02547	A		$2.20	1	$2.20

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Rectifier bracket stock			Flat area to cut part out	11.52 in^2	0.09 in	0.098 lb/in^3	1	0.19	0.19

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Place material into waterjet	1		1	1.30	1.30
Waterjet Cut	Waterjet profile	28.03	Material - Aluminum	1	0.01	0.71

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel Rail and Fuel Lines

P/N Base	Suffix	Details	Cost	Qty	Total
PTA19-00008	A	Fuel rail and fuel lines to the fuel tank. Mounting to intake manifold included.	$282.64	1	$282.64

Part	Cost	Quantity	Subtotal
Fuel Rail	5.8000	1	5.8000
Injector Mounting Bracket	0.7600	4	3.0400
Injector Extender	2.0700	2	4.1400
Fuel rail mount	1.7200	2	3.4400

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Fuel Pressure Regulator, Gasoline	Radium Fuel Pressure Regulator							1	15.00	15.00
Fuel Injector, Gasoline	Bosch EV14XK Fuel Injector							4	10.00	40.00
Fitting/L.P./Straight/Aluminum/Anodized	Fuel Fitting	0.375 in						7	6.49	45.45
Fitting/L.P./Elbow/90 deg./Aluminum/Anodized	Fuel Fitting	0.375 in						1	19.76	19.76
Hose, Low Pressure, Fabric Outer (per m)	Fuel line hose	0.45 in						1.19	46.75	55.64
Adapter/L.P./Bulkhead Union/90 deg./Aluminum/Anodized	Fuel Line Bulkhead Fitting	0.375 in	0.375 in					2	7.65	15.30
Fitting/L.P./Tube Nut//Aluminum/Anodized	Fuel Link Bulkhead Fitting	0.375 in						2	2.17	4.33
Crush Washer	Fuel Line Bulkhead Fitting	0.5 in						2	0.46	0.93
Fitting/L.P./Male Flare to Pipe//Aluminum/Anodized	Fuel Rail Fitting	0.375 in	0.375 in					2	4.23	8.47
Sensor, Fluid Pressure & Temperature	Fuel temperature sensor							1	10.00	10.00
Adapter/L.P./Union/90 deg./Aluminum/Anodized	Fuel pressure regulator fitting	0.375 in	0.375 in					1	10.46	10.46
Sensor, Fluid Pressure	Fuel pressure sensor							1	4.00	4.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	install Fuel rail mounts	4		1	0.06	0.24
Wrench <= 25.4 mm	Thread fuel fittings together	1	Repeat 8	8	1.50	12.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Place fuel rail mounting brackets onto fuel rail	1	Repeat 3	3	0.06	0.18
Power Tool <= 6.35 mm	Bolt 10-32 fasteners into fuel rail	1	Repeat 8	8	0.25	2.00
Power Tool <= 6.35 mm	Bolt fasteners to hold fuel rail to intake manifold	1	Repeat 4	4	0.25	1.00
Safety Wire, Install	Safety wire fuel rail mounts to intake	8		1	0.60	4.80
Wrench <= 25.4 mm	Tighten fuel temperature sensor to regulator	1		1	1.50	1.50
Ratchet <= 25.4 mm	Tighten union into fuel pressure regulator	1		1	0.75	0.75
Wrench <= 25.4 mm	Thread fuel pressure sensor into regulator	1		1	1.50	1.50
Assemble, 3 kg, Line-on-Line	Install fuel pressure regulator to fuel rail	1		1	0.38	0.38
Assemble, 1 kg, Line-on-Line	Insert fuel injectors into fuel rail	1	Repeat 4	4	0.13	0.52
Non-metallic cutting <= 25.4 mm	Cut Fuel Hose to Length	1	Repeat 4	4	0.35	1.40
Assemble, 1 kg, Interference	Attach fuel fittings to hose	1	Repeat 8	8	0.19	1.52
Reaction Tool <= 25.4 mm	Thread fuel fittings together (Creating AN fitting seal)	1	Repeat 8	8	0.25	2.00
Wrench <= 25.4 mm	Tighten fuel line bulkhead fitting into firewall	1	Repeat 2	2	1.50	3.00
Wrench <= 25.4 mm	Tighten fittings onto fuel rail	1	Repeat 2	2	1.50	3.00
Reaction Tool <= 25.4 mm	Tighten fuel line bulkhead fitting into firewall	1	Repeat 2	2	0.25	0.50
Assemble, 1 kg, Line-on-Line	Install injector extenders	2		1	0.13	0.26

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	10-32 x 0.375 Wire Lock	0.197 in	0.375 in	12	0.02	0.24
Bolt, Grade 8.8 (SAE 5)	M6 x 20mm Mounting Intake	6 mm	20 mm	2	0.04	0.09

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel Rail and Fuel Lines › Fuel Rail

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00012	A		$5.80	1	$5.80

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Fuel Rail Bar Stock				0.82670926 in^2	11.535 in	0.098 lb/in^3	1	1.78	1.78

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Threading, Internal (machining)	9/16-18 Thread	0.5	Repeat 2	2	0.10	0.25
Machining	Machine fuel rail on 5-axis CNC	40	Material - Aluminum	1	0.04	1.60
Machining Setup, Install and remove	Install Bar Stock	1		1	1.30	1.30
Threading, Internal (machining)	10-32 Thread	0.43	Repeat 8	8	0.10	0.87

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel Rail and Fuel Lines › Injector Mounting Bracket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03082	A	Fastens fuel rail onto intake assembly, retains fuel rail and injectors	$0.76	4	$3.04

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Fuel rail middle mount material			1.48X1.45 plate (0.04" added to each side for ma	2.146 in^2	0.09 in	0.098 lb/in^3	1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Sheet metal bends	Bend middle mount	1	Material - Aluminum	1	0.25	0.25
Machining Setup, Install and remove	Install Aluminum stock into waterjet	0.25		1	1.30	0.32
Waterjet Cut	Waterjet fuel rail middle mount	6	Material - Aluminum	1	0.01	0.15

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel Rail and Fuel Lines › Injector Extender

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00013	A		$2.07	2	$4.14

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Circular Cross Section	0.464 in^2	3.18 in	0.098 lb/in^3	1	0.28	0.28

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into Lathe	1		1	1.30	1.30
Machining		0.747		1	0.04	0.49

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel Rail and Fuel Lines › Fuel rail mount

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00028	A		$1.72	2	$3.44

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Rectangular cross section	11.33 in^2	0.06 in	0.098 lb/in^3	1	0.13	0.13

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		0.5		1	1.30	0.65
Waterjet Cut		17.4		1	0.01	0.44
Sheet metal bends		2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Cooling system

P/N Base	Suffix	Details	Cost	Qty	Total
PTA19-00509	A		$1004.97	1	$1004.97

Part	Cost	Quantity	Subtotal
Mishimoto Honda CRF450R Radiator Left	68.4000	2	136.8000
Oil + Coolant Catch Can	10.0500	1	10.0500
Radiator Ducting Inlet	58.9700	2	117.9400
Radiator Duct Exhaust	17.9000	2	35.8000
Swirl Pot	38.3700	1	38.3700
Radiator Fan Spacer	0.2500	12	3.0000
Fan Gasket	1.2300	4	4.9200

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Heat Exchanger Fan	Radiator Fan							4	30.00	120.00
Hose, Low Pressure, Fabric Outer (per m)	8AN Coolant Line	0.625 in						1	61.16	61.16
Fitting/L.P./Elbow/45 deg./Aluminum/Anodized	8AN Coolant Fitting	0.43 in						4	20.37	81.46
Fitting/L.P./Elbow/90 deg./Aluminum/Anodized	8AN Coolant Fitting	0.43 in						4	21.80	87.18
Hose, Low Pressure, Fabric Outer (per m)	12 AN Coolant Line	0.87 in						1	81.32	81.32
Fitting/L.P./Straight/Aluminum/Anodized	12 AN Coolant Fitting	0.64 in						2	15.38	30.76
Fitting/L.P./Elbow/90 deg./Aluminum/Anodized	12 AN Coolant Fitting	0.64 in						3	29.58	88.75
Adapter/L.P./Union Tee//Aluminum/Anodized	8AN to 12AN tee fitting	0.64 in	0.43 in					1	9.26	9.26
Fitting/L.P./Straight/Aluminum/Anodized	8AN Coolant Fitting	0.43 in						2	8.34	16.67

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 5 kg, Loose	Place radiator on car	1	Repeat 2	2	0.31	0.62
Power Tool <= 6.35 mm	Mount Radiator to frame	2	Repeat 2	2	0.25	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Mount radiator duct to radiator	1	Repeat 4	4	0.06	0.24
Reaction Tool <= 6.35 mm	Mount radiator to frame	2	Repeat 2	2	0.25	1.00
Reaction Tool <= 6.35 mm	Mount radiator ducting to radiator	6	Repeat 4	4	0.25	6.00
Assemble, 1 kg, Loose	Place radiator fan spacers onto duct	3	Repeat 4	4	0.06	0.72
Assemble, 1 kg, Loose	Place fan gasket onto exhaust ducting	1	Repeat 4	4	0.06	0.24
Assemble, 1 kg, Loose	Place radiator fan onto duct	1	Repeat 4	4	0.06	0.24
Power Tool <= 6.35 mm	Mount radiator ducting to radaitor	6	Repeat 4	4	0.25	6.00
Power Tool <= 6.35 mm	Mount Radiator fans to ducting	3	Repeat 4	4	0.25	3.00
Non-metallic cutting <= 25.4 mm	Cut 12AN hose to length	3		1	0.35	1.05
Assemble, 1 kg, Interference	Attach 12AN fuel fittings to hose	6		1	0.19	1.14
Wrench <= 25.4 mm	Thread 12AN fuel fitting halves together	6		1	1.50	9.00
Wrench <= 25.4 mm	Secure 12AN hose connections	6		1	1.50	9.00
Non-metallic cutting <= 25.4 mm	Cut 8AN hose to length	6		1	0.35	2.10
Assemble, 1 kg, Interference	Attach 8AN fuel fittings to hose	12		1	0.19	2.28
Wrench <= 25.4 mm	Thread 8AN fuel fitting halves together	12		1	1.50	18.00
Wrench <= 25.4 mm	Secure 8AN hose connections	12		1	1.50	18.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	10-32 x 0.500" Swirl Pot	0.197 in	0.5 in	2	0.02	0.04
Nut, Grade 8.8 (SAE 5)	10-32 Swirl Pot, Radiator Mounting, Ducting	0.197 in		30	0.02	0.74
Bolt, Grade 8.8 (SAE 5)	10-32 x 1.00" Radiator Fan	0.197 in	1 in	12	0.04	0.47
Bolt, Grade 8.8 (SAE 5)	10-32 x 0.500" Ducting	0.197 in	0.5 in	24	0.02	0.56
Bolt, Grade 8.8 (SAE 5)	10-32 x 0.500" Radiator Mounting	0.197 in	0.5 in	4	0.02	0.09

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Cooling system › Mishimoto Honda CRF450R Radiator Left

P/N Base	Suffix	Details	Cost	Qty	Total
OTH-02829	A		$68.40	2	$136.80

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Heat Exchanger, Air-to-Liquid	Radiator 4.63" x 9.31" Face x 1.578" Thickness	68.1 in^3						1	3.91	3.91
Aluminum, Normal (by Dimensions)	L-Brackets for mounting 4ft length			Angle Extrude	0.0664 in^2	48 in	0.098 lb/in^3	1	0.60	0.60
Fitting, Weld-in, Male, Aluminum	-8AN Aluminum Fitting	0.75 in						2	3.01	6.01
Aluminum, Normal (by Dimensions)	Bar stock for bottom end cap			Square Area	3.075 in^2	4.93 in	0.098 lb/in^3	1	2.83	2.83
Aluminum, Normal (by Dimensions)	Bar stock for top end cap			Square Area	2.173 in^2	4.93 in	0.098 lb/in^3	1	2.00	2.00
Aluminum, Normal (by Dimensions)	Core side panels 2ft length			Cross Section	0.173 in^2	24 in	0.098 lb/in^3	1	0.78	0.78
Aluminum, Normal (by Dimensions)	Core end piece (2x in stock)			Small Cross Section	0.5525 in^2	9.86 in	0.098 lb/in^3	1	1.02	1.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Saw or tubing cuts	Cut L-Brackets to length	0.5	Repeat 6	6	0.40	3.05
Drilled holes < 25.4 mm dia.	Drill holes for mounting	14		1	0.35	4.90
Sheet Metal Saw Cut	Cut core side panel to length	1.58	Repeat 2	2	0.20	1.61
Tube end preperation for welding	Prep core side panels to be welded	2	Repeat 2	2	0.75	3.00
Machining Setup, Install and remove	Install bottom end cap material in 5-axis	1		1	1.30	1.30
Machining	Machine bottom end cap	12.64		1	0.04	8.29
Machining Setup, Install and remove	Install top end cap material in 5-axis	1		1	1.30	1.30
Machining Setup, Install and remove	Install 0.25 stock material for core end pieces	0.5		1	1.30	0.65
Machining	Machine top end cap	10.71		1	0.04	7.02
Waterjet Cut	Waterjet core end pieces	50.57	Repeat 2	2	0.01	2.57
Weld	Weld end caps to core end pieces	12.11	Repeat 2	2	0.15	9.23
Weld	Weld long L-bracket to radiator	2	Repeat 4	4	0.15	3.05

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Weld	Weld core side panels to core end pieces	1.58	Repeat 4	4	0.15	2.41
Weld	Weld side mount onto radiator	1.125		1	0.15	0.43
Weld	Weld bottom mount onto radiator	2.15		1	0.15	0.82
Weld	Weld AN fitting to radiator	2.12	Repeat 2	2	0.15	1.62

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Cooling system › Oil + Coolant Catch Can

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03667	A	3D printed coolant and oil overflow bottles with mirrored sides for ease of manufacture and assemble.	$10.05	1	$10.05

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Hose, Rubber (per m)		10 mm						0.5	1.80	0.90
Plastic, Nylon (per kg)		0.197 kg						1	0.65	0.65

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Print catch can body	0.197		1	32.00	6.30
Assemble, 1 kg, Interference	Insert Barb fitting	3		1	0.19	0.57
Power Tool <= 6.35 mm	Tighten hose clamp	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Hose Clamp, Worm Drive	Clamp ends of hose	15.8 mm		2	0.56	1.13

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Cooling system › Radiator Ducting Inlet

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02509	A	RHS and LHS are the same part	$58.97	2	$117.94

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Dry carbon	0.31 lb					0.057 lb/in^3	2	28.12	56.25

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Cure, Room Temperature	Vacuum and cure laminate	0.13		1	10.00	1.30
Resin application, Infusion Molding	Resin infusion to carbon	0.15	Repeat 2	2	2.50	0.75

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Mold Tool	Front radiator ducting mould	0.2	3000	2	20000.00	0.67

Engine & Drivetrain › Cooling system › Radiator Duct Exhaust

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02507	A		$17.90	2	$35.80

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Dry Carbon	0.0278 kg					1580 kg/m^3	3	5.56	16.68

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Cure, Room Temperature	Vacuum and cure laminate	0.057		1	10.00	0.57
Resin application, Infusion Molding	Resin infused to carbon	0.0573	Repeat 3	3	2.50	0.43

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Mold Tool	Rear radiator ducting mould	0.065	3000	2	20000.00	0.22

Engine & Drivetrain › Cooling system › Swirl Pot

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02542	A		$38.37	1	$38.37

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Round 1.5" x 0.065"			Tube Cross Section	1.767 in^2	2 in	0.098 lb/in^3	1	0.66	0.66
Aluminum, Normal (by Dimensions)	Round 0.875" x 0.065"			Tube Cross Section	0.601 in^2	1.5 in	0.098 lb/in^3	1	0.17	0.17
Aluminum, Normal (by Dimensions)	0.063" Sheet Metal			Large Face 3.5" x 1.5"	5.25 in^2	0.063 in	0.098 lb/in^3	1	0.06	0.06
Aluminum, Normal (by Dimensions)	Solid Round 1.75"			Circular Cross Section	2.405 in^2	1.1 in	0.098 lb/in^3	1	0.49	0.49
Fitting, Weld-in, Male, Aluminum	-12 AN weld fitting	0.93 in						1	3.68	3.68
Fitting, Weld-in, Male, Aluminum	-8 AN weld fitting	0.75 in						2	3.01	6.01
Adapter/L.P./FemAle Pipe to Male Flare//Steel/	hose fitting	0.315 in	0.278 in					1	7.47	7.47
Filler Cap	Radiator Fill Cap							1	3.00	3.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut Round 0.875" x 0.065"	0.875		1	0.15	0.33
Tube cut	Cut Round 1.5" x 0.065"	1.5		1	0.15	0.57
Tube end preperation for welding	Prep Round 1.5" x 0.065"	2		1	0.75	1.50
Tube end preperation for welding	Prep Round 1.5" x 0.065"	2		1	0.75	1.50
Machining Setup, Install and remove	Install Round 1.75" into lathe	1		1	1.30	1.30
Machining	Machine Round 1.75" into fill interface	2.0855		1	0.04	1.37
Machining Setup, Install and remove	Install 0.063" material into waterjet	1		1	1.30	1.30
Waterjet Cut	Waterjet bottom cap and tab	28.7		1	0.01	0.29
Weld	Weld components together	56.9		1	0.15	8.54
Assemble, 1 kg, Line-on-Line	Install filler cap onto swirl pot body	1		1	0.13	0.13

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Cooling system › Radiator Fan Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02655	A		$0.25	12	$3.00

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	0.5" Round Stock			Circular Area	0.196 in^2	3.36 in	0.098 lb/in^3	1	0.12	0.12

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Machine parts	0.025	Material - Aluminum	1	0.04	0.02
Machining Setup, Install and remove	Install round stock into lathe	0.0833		1	1.30	0.11

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Cooling system › Fan Gasket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02650	A	Seals the interface between the radiator and radiator fans	$1.23	4	$4.92

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rubber (by Dimensions)	Gasket Material 1/32" thick			Large Area	24.6 in^2	0.03125 in	0.04 lb/in^3	1	0.05	0.05

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Laser Cut	Laser cut part from rubber sheet	33.93		1	0.01	0.86
Machining Setup, Install and remove	Place material into laser cutter	0.25		1	1.30	0.32

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Intake

P/N Base	Suffix	Details	Cost	Qty	Total
PTA19-00533	A		$182.66	1	$182.66

Part	Cost	Quantity	Subtotal
Intake manifold top	14.4100	1	14.4100
Intake manifold bottom	21.3200	1	21.3200
Throttle body gasket	1.7800	1	1.7800
Bosch 32mm ETB (0280750148)	90.5400	1	90.5400

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Seal, O-Ring, Elastomer	Seal upper and lower sections of intake together							1	0.05	0.05
Air Filter	Intake Air Filter	25 in^2						1	24.19	24.19
Seal, O-Ring, Elastomer	Seal Intake to engine block & throttle							4	0.05	0.20
Sensor, Fluid Pressure & Temperature	Manifold Absolute Pressure and Temperature Sensor							1	10.00	10.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Line up throttle body gasket on top of intake manifold	1		1	0.06	0.06
Assemble, 1 kg, Loose	Line up throttle body on top of throttle body o-ring	1		1	0.06	0.06
Power Tool <= 6.35 mm	1/4-28 Bolt throttle body and gakset to intake manifold top	1	Repeat 4	4	0.25	1.00
Reaction Tool <= 6.35 mm	1/4-28 Bolt throttle body and gakset to intake manifold top	1	Repeat 4	4	0.25	1.00
Assemble, 1 kg, Loose	Place gasket onto intake manifold bottom and place intake manifold top	1		1	0.06	0.06
Power Tool <= 6.35 mm	8-32 Bolt Intake manifold top to intake manifold bottom	1	Repeat 16	16	0.25	4.00
Reaction Tool <= 6.35 mm	Bolt intake manifold top to inake manifold bottom	1	Repeat 16	16	0.25	4.00
Assemble, 1 kg, Loose	Place O-ring onto intake manifold bottom	1	Repeat 4	4	0.06	0.24
Hand - Start Only	install intake manifold to engine	1	Repeat 5	5	0.12	0.60
Ratchet <= 6.35 mm	Install intake manifold to engine	1	Repeat 5	5	0.50	2.50

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Safety Wire, Install	safety wire engine-intake bolts	6		1	0.60	3.60
Assemble, 1 kg, Line-on-Line	Install MAFT Sensor	1		1	0.13	0.13
Power Tool <= 6.35 mm	Secure bolt for MAFT sensor	1		1	0.25	0.25
Assemble, 1 kg, Line-on-Line	install air filter with worm clamp	1		1	0.13	0.13
Power Tool <= 6.35 mm	Tight worm clamp on air filter	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Bolting throttle body to intake manifold top 1/4-28 x 2in	0.25 in	2 in	4	0.13	0.54
Nut, Grade 8.8 (SAE 5)	Bolting throttle body to intake manifold top 1/4-28	0.25 in		4	0.03	0.13
Bolt, Grade 8.8 (SAE 5)	Bolting intake manifold top to intake manifold bottom 8-32 x 0.875in	0.164 in	0.875 in	16	0.03	0.40
Nut, Grade 8.8 (SAE 5)	Bolting intake manifold top to intake manifold bottom	0.164 in		16	0.02	0.33
Bolt, Grade 8.8 (SAE 5)	Bolting for intake manifold to engine	6 mm	18 mm	5	0.04	0.21
Hose Clamp, Worm Drive	Air Filter Attachment	1.6 in		1	0.66	0.66
Bolt, Grade 8.8 (SAE 5)	Bolting MAPT sensor to intake manifold #10-32	0.19 in	0.5 in	1	0.02	0.02

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Intake › Intake manifold top

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00003	A		$14.41	1	$14.41

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Upper intake manifold material	0.408 kg						1	1.35	1.35

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic		0.408		1	32.00	13.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Intake › Intake manifold bottom

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00002	A	Lower section of the intake manifold	$21.32	1	$21.32

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Lower Intake Manifold Material	0.604 kg						1	1.99	1.99

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	SLS 3D Printing	0.604		1	32.00	19.33

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Intake › Throttle body gasket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00033	A	Gasket material between the throttle body and intake manifold top.	$1.78	1	$1.78

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rubber (by Dimensions)	Throttle body gasket			Square Sheet	4356 mm^2	1.588 mm	1100 kg/m^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	install gasket material laser cutter	1		1	1.30	1.30
Laser Cut	Cut out throttle body gasket	17.75		1	0.01	0.45

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Intake › Bosch 32mm ETB (0280750148)

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00299	A	Bosch Throttle Body	$90.54	1	$90.54

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Spring, Compression (General)	return springs for throttle body							2	1.00	2.00
Aluminum, Normal (by Dimensions)	Material for Throttle body 4.45in x 3.97in			Front face	17.67 in^2	2.84 in	0.098 lb/in^3	1	9.37	9.37
Plastic, ABS (per kg)	Motor Cover	0.9 kg						1	2.97	2.97
Motor, 12 Volt, DC Brush	Electronic throttle motor							1	20.00	20.00
Sensor, Angular Position	TPS Sensors							2	4.00	8.00
Brass (by Dimensions)	Throttle body blade			circular cross section	1.58 in^2	0.16 in	0.307 lb/in^3	1	0.08	0.08
Steel, Alloy (by Dimensions)	Throttle body shaft			Circular cross section	0.176 in^2	3.61 in	0.284 lb/in^3	1	0.18	0.18

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install stock into 5-axis CNC	1		1	1.30	1.30
Machining	Machine throttle body	25.2	Material - Aluminum	1	0.04	16.52
Rapid Prototype - Plastic	Manufacture motor cover	0.9	Material - Plastic	0.5	32.00	14.40
Machining Setup, Install and remove	Install stock into CNC Lathe	1		1	1.30	1.30
Machining	Machine throttle body plane	0.153	Material - Brass	0.8	0.04	0.08
Machining Setup, Install and remove	Install stock into CNC Lathe	1		1	1.30	1.30
Threading, Internal (machining)	machine threads into shaft	0.3	Repeat 2	2	0.10	0.06
Machining	Machine throttle body shaft	5	Material - Steel	3	0.04	9.83
Assemble, 1 kg, Loose	place throttle shaft and blade into body	2		1	0.06	0.12
Power Tool <= 6.35 mm	Secure fasteners through blade and shaft	2		1	0.25	0.50
Assemble, 1 kg, Loose	install motor and TPS sensors into body	3		1	0.06	0.18
Assemble, 1 kg, Line-on-Line	Install return springs into body	1		1	0.13	0.13
Assemble, 1 kg, Loose	place plastic cover onto body	1		1	0.06	0.06
Assemble, 1 kg, Line-on-Line	install retaining clips onto throttle body	7		1	0.13	0.91

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nutsert (J-Nut)	To retain plastic cover on throttle body	5 mm	5 mm	7	0.17	1.22
Bolt, Grade 8.8 (SAE 5)	throttle body blade bolt	4 mm	8 mm	2	0.01	0.03

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel tank

P/N Base	Suffix	Details	Cost	Qty	Total
PTA21-00107	A	93 Octane rigid fuel tank	$172.53	1	$172.53

Part	Cost	Quantity	Subtotal
Fuel Tank Body	54.2400	1	54.2400
Fuel Tank Bulkhead Tank Interface	15.2300	1	15.2300
Fuel Pump Mounting Bracket	2.6800	1	2.6800
Fuel Tank Chassis Mount Bracket	2.3200	2	4.6400
Fuel Tank Bulkhead Gasket	1.9300	1	1.9300

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Hose, Rubber (per m)	Fuel Pump Rubber Hose	9 mm						0.13	1.62	0.21
Adapter/L.P./Bulkhead Union//Aluminum/Anodized	Fuel tank bulkhead fittings	8 mm	8 mm					2	3.81	7.62
Hose, Rubber (per m)	Clear rubber hose for sight tube	6 mm						0.2	1.08	0.22
Fitting/H.P./MAluminume Pipe//Brass/	Elbow fitting	5 mm						2	1.25	2.50
Fuel Check Valve, In-line, Aluminum Rollover	Rollover vent valve							1	15.00	15.00
Fuel Pump, Fuel Injected, Gasoline	Deatschwerks Fuel Pump (9-101-1000)							1	35.00	35.00
Fuel Filter	Holley Hydramat (PN16-116)							1	8.00	8.00
Structural Foam	Foam between floor pan and tank to prevent vibration noise	0.0045 kg						2	0.56	1.12
Structural Foam	Foam between fire wall and tank to prevent vibration noise	0.0027 kg						2	0.34	0.68
Filler Cap	Holley fuel cap, part #: 166018ERL							1	3.00	3.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Hand - Start Only	Thread on brass sight tube fittings	1	Repeat 2	2	0.12	0.24
Wrench <= 25.4 mm	Install brass sight tube fittings	1	Repeat 2	2	1.50	3.00
Assemble, 1 kg, Line-on-Line	Install sight tube onto brass fittings	1	Repeat 2	2	0.13	0.26

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Put small hose clamps onto sight tube and fittings	1	Repeat 2	2	0.06	0.12
Power Tool <= 6.35 mm	Tighten sight tube hose clamps	1	Repeat 2	2	0.25	0.50
Wrench <= 25.4 mm	Install vent valve onto fill cap	1		1	1.50	1.50
Hand, Tight <= 6.35 mm	install fuel filler cap	1		1	0.50	0.50
Assemble, 1 kg, Loose	Stick on bottom and rear foam strips	1	Repeat 4	4	0.06	0.24
Assemble, 1 kg, Line-on-Line	Put fuel foam into tank body	1		1	0.13	0.13
Power Tool <= 25.4 mm	Bolt pump bracket to fuel pump bulkhead	1	Repeat 2	2	0.25	0.50
Hand - Start Only	thread fuel tank bulkhead fittings into fuel bulkhead	1	Repeat 2	2	0.12	0.24
Wrench <= 25.4 mm	Tighten bulkhead fittings	1	Repeat 2	2	1.50	3.00
Power Tool <= 25.4 mm	Install bulkhead electrical studs onto bulkhead	1	Repeat 4	4	0.25	1.00
Assemble, 1 kg, Line-on-Line	Put hose onto fuel pump and send fitting	1	Repeat 2	2	0.13	0.26
Power Tool <= 25.4 mm	Tighten hose clamps around fuel pump and bracket	1	Repeat 2	2	0.25	0.50
Assemble, 1 kg, Line-on-Line	Install fuel mat onto fuel pump	1		1	0.13	0.13
Assemble, 1 kg, Loose	Place bulkhead gasket on tank interface	1		1	0.06	0.06
Assemble, 1 kg, Loose	Place bulkhead assembly into fuel tank	1		1	0.06	0.06
Power Tool <= 25.4 mm	Bolt down bulkhead	1	Repeat 12	12	0.25	3.00
Assemble, 5 kg, Loose	Place tank into car	1		1	0.31	0.31
Assemble, 1 kg, Loose	Place chassis mount straps onto tank	1	Repeat 2	2	0.06	0.12
Power Tool <= 25.4 mm	Bolt down chassis tank with chassis mount straps	1	Repeat 4	4	0.25	1.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Bolt Fuel Pump Bracket to Fuel Pump Bulkhead3	0.195 in	0.25 in	2	0.01	0.03
Bolt, Grade 8.8 (SAE 5)	Bolt Fuel Pump Bulkhead to Fuel Tank	0.195 in	0.375 in	12	0.02	0.24
Bolt, Grade 8.8 (SAE 5)	Chassis Mount Brackets to Fire Wall and Floor Pan (Mounting Fuel Tank Assembly to Car)	0.195 in	0.5 in	4	0.02	0.09
Nut, Panel Retained	Rivnut for Chassis Mount Brackets to Bolt to	0.195 in	0.785 in	4	0.17	0.69
Hose Clamp, Worm Drive	sight tube hose clamp	9 mm		2	0.54	1.07
Hose Clamp, Worm Drive	Fuel Pump to Fuel Pump Bracket	40 mm		2	0.66	1.32
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Radium Electrical Bulkhead Stud (17-0048)	0.195 in	1 in	4	0.03	0.12
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Radium Electrical Bulkhead Stud (17-0048)	0.195 in	0.25 in	12	0.02	0.23

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel tank › Fuel Tank Body

P/N Base	Suffix	Details	Cost	Qty	Total
PTC21-00107	A	Fuel tank body.	$54.24	1	$54.24

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Sheet Metal For Fuel Tank Body			Square Sheet	355.362 in^2	0.04 in	0.098 lb/in^3	1	2.65	2.65
Aluminum, Normal (by Dimensions)	Fuel Bulkhead Interface			Square Stock	8000 mm^2	35 mm	2712 kg/m^3	1	3.19	3.19
Aluminum, Normal (by Dimensions)	Fill Neck			Round Pipe (1 1/4 Schd. 40)	0.771 in^2	17.34 in	0.098 lb/in^3	1	2.50	2.50
Aluminum, Normal (by Dimensions)	Sight Tube Bung			Round Stock	0.39 in^2	0.58 in	0.098 lb/in^3	2	0.04	0.08
Aluminum, Normal (by Dimensions)	Fuel Fill Neck Weld Bung			Round Stock	3.236 in^2	0.7 in	0.098 lb/in^3	1	0.42	0.42

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Sheet metal bends	Bend top and bottom sheet metal for fuel tank body (2 bends per piece)	4		1	0.25	1.00
Machining Setup, Install and remove	Mount stock for bulkhead interface in CNC Mill	1		1	1.30	1.30
Machining Setup, Install and remove	Mount alum. sheet for waterjet	0.5		1	1.30	0.65
Machining	Machining bulkhead interface	1		1	0.04	0.04
Waterjet Cut	Cut out top and bottom pieces of fuel tank body	132.998	Material - Aluminum	1	0.01	3.38
Tapping holes	Tapping bulkhead mounting holes	12		1	0.35	4.20
Tube cut	Cut filler neck alum. pipe to size	1.46		1	0.15	0.56
Machining Setup, Install and remove	Setup round stock for sight tube bungs on lathe	1		1	1.30	1.30
Machining Setup, Install and remove	Setup round stock for fuel fill neck weld bung on lathe	1		1	1.30	1.30
Tapping holes	Tapping 1/8 NPT in sight tube bungs	2		1	0.35	0.70
Machining	Machining sight tube bungs	0.252	Material - Aluminum	1	0.04	0.01
Machining	Machine fuel fill neck weld bung	1.258	Material - Aluminum	1	0.04	0.82
Threading, Internal (machining)	Machine internal fill neck weld bung threads	0.46	Material - Aluminum	1	0.10	0.12
Hand Finish - Surface Preperation	Preparing fuel tank bulkhead interface for welding	1		1	0.02	0.02
Hand Finish - Surface Preperation	Prepare fuel tank body for welding	1		1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Hand Finish - Surface Preperation	Prepare Sight Tube Bungs for Welding	1		1	0.02	0.02
Hand Finish - Surface Preperation	Prepare filler neck weld bung for welding	1		1	0.02	0.02
Weld	Weld Tank Body	43.56		1	0.15	16.60
Weld	Weld Sight Tube Bungs to Filler Neck	3.95		1	0.15	1.50
Weld	Weld Fuel Cap Weld Bung to Filler Neck	4.62		1	0.15	1.76
Weld	Weld Filler Neck to Tank	6.172		1	0.15	2.35
Weld	Weld Fuel Pump Bulkhead Interface to Fuel Tank Body	20.287		1	0.15	7.73

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel tank › Fuel Tank Bulkhead Tank Interface

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03573	A		$15.23	1	$15.23

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Fuel Pump Bulkhead			Rectangle Bar Stock	34.716 in^2	0.75 in	0.098 lb/in^3	1	4.86	4.86

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install into CNC Mill	1		1	1.30	1.30
Machining	Machine Fuel Pump Bulkhead	9.039	Material - Aluminum	1	0.04	5.92
Tapping holes	Mounting and Fitting Holes	9		1	0.35	3.15

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel tank › Fuel Pump Mounting Bracket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC21-01008	A	Bracket for mounting the fuel pump to.	$2.68	1	$2.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Sheet Metal Aluminum			Sheet Metal	3.416 in^2	0.04 in	0.098 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Waterjet Cut	Waterjet Fuel Pump Bracket	13.608	Material - Aluminum	1	0.01	0.35
Machining Setup, Install and remove	Setup material on waterjet	1		1	1.30	1.30
Sheet metal bends	Bend up Fuel Pump Bracket	4		1	0.25	1.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel tank › Fuel Tank Chassis Mount Bracket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-01902	A	Used to secure the fuel tank to the chassis floor pan and fire wall	$2.32	2	$4.64

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	5052 Aluminum-H32			Sheet Metal	9.96 in^2	0.04 in	0.098 lb/in^3	1	0.07	0.07

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Setup material in waterjet	0.5		1	1.30	0.65
Sheet metal bends	Bend flat part as specified	3		1	0.25	0.75
Waterjet Cut	Cut part out	33.485	Material - Aluminum	1	0.01	0.85

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Fuel tank › Fuel Tank Bulkhead Gasket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03731	A	Seals bulkhead to bulkhead tank interface	$1.93	1	$1.93

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rubber (by Dimensions)	Rubber sheet for gasket			Sheet	18.158 in^2	0.0625 in	0.04 lb/in^3	1	0.07	0.07

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into Laser cutter	1		1	1.30	1.30
Laser Cut	laser cut gasket out of material	44.201	Material - Plastic	0.5	0.01	0.56

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Exhaust

P/N Base	Suffix	Details	Cost	Qty	Total
PTA21-00418	A		$308.74	1	$308.74

Part	Cost	Quantity	Subtotal
Exhaust Manifold	267.8800	1	267.8800
Custom Muffler	27.7300	1	27.7300
Outlet Pipe	6.0000	1	6.0000

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 5 kg, Loose	Assemble exhaust headers to engine	1		1	0.31	0.31
Power Tool <= 25.4 mm	Bolting exhaust headers to engine	1	Repeat 8	8	0.25	2.00
Assemble, 5 kg, Loose	Install midpipe onto collector	1		1	0.31	0.31
Ratchet <= 25.4 mm	bolt midpipe hangers to frame tabs	1	Repeat 2	2	0.75	1.50
Reaction Tool <= 25.4 mm	Box wrench on midpipe hangers	1	Repeat 2	2	0.25	0.50
Assemble, 3 kg, Loose	Fit muffler to exhaust midpipe	1	Repeat 2	2	0.19	0.38
Power Tool <= 25.4 mm	Fasten muffler to chassis	1		1	0.25	0.25
Assemble, 1 kg, Line-on-Line	Install exhaust springs	1	Repeat 2	2	0.13	0.26
Assemble, 1 kg, Loose	Fit up outlet pipe	1		1	0.06	0.06
Assemble, 1 kg, Line-on-Line	Install exhaust springs	1	Repeat 2	2	0.13	0.26

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Exhaust manifold mounting bolts	8 mm	20 mm	8	0.08	0.66
Bolt, Grade 8.8 (SAE 5)	Midpipe hanger tabs	0.375 in	1.5 in	2	0.22	0.45
Nut, Grade 8.8 (SAE 5)	Midpipe hanger tabs	0.375 in		2	0.06	0.12

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Muffler mounting bolt	0.25 in	0.5 in	1	0.04	0.04
Nut, Grade 8.8 (SAE 5)	Muffler mounting nut	0.25 in		1	0.03	0.03

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Exhaust › Exhaust Manifold

P/N Base	Suffix	Details	Cost	Qty	Total
PTA21-00418	A	Exhaust system containing 4-1 headers and detachable midpipe joined by a V-band.	$267.88	1	$267.88

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)	1.5" Straight Tubing for exhaust runners			Round Tube	0.271 in^2	78.228 in	0.284 lb/in^3	4	6.14	24.58
Steel, Stainless (by Dimensions)	2" Straight Tubing for midpipe			Round Tube	0.365 in^2	39.2 in	0.284 lb/in^3	2	4.15	8.29
Steel, Stainless (per kg)	Exhaust Collector	2.7 lb						2	2.76	5.51
Steel, Stainless (by Dimensions)	Lambda Sensor Bungs			Round Stock	540 mm^2	14 mm	7850 kg/m^3	2	0.13	0.27
Steel, Stainless (by Dimensions)	Exhaust Flange			Square Plate	15400 mm^2	4.763 mm	7850 kg/m^3	1	1.30	1.30
Steel, Stainless (by Dimensions)	Exhaust Flange Spacer			Round Tube	431 mm^2	100 mm	7850 kg/m^3	1	0.76	0.76
Exhaust Pipe, Flexible	Midpipe Bellows 2in ID x 3in length	2	3					1	0.01	0.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube bends	Bend exhaust primaries	13		1	0.75	9.75
Tube cut	Cut Primary tube pieces to length	1.5	Repeat 26	26	0.15	14.86
Tube bends	Midpipe tube bends	4		1	0.75	3.00
Tube cut	Cut midpipe sections	2	Repeat 14	14	0.15	10.67
Tube end preperation for welding	Prepare tubes and collector for welding	40		1	0.75	30.00
Weld	Weld header runners	4.71	Repeat 13	13	0.15	23.33
Weld - Round Tubing	Weld runners to exhaust collector	4.71	Repeat 4	4	0.50	23.93
Weld - Round Tubing	Weld 2" tube for midpipe, v-band, and bellows	6.28	Repeat 9	9	0.50	71.78
Drilled holes < 25.4 mm dia.	Lambda Sensor Bung	1	Repeat 2	2	0.35	0.70
Machining Setup, Install and remove	Set up lambda sensor bung material	1		1	1.30	1.30
Machining	Machine Lambda Sensor Bungs	10	Material - Stainless Steel	3.75	0.04	1.50
Threading, Internal (machining)	M12x1.25 internal threading on sensor bungs	1.5	Repeat 2	2	0.10	0.30
Weld	Lambda Sensor Bung	1.55	Repeat 2	2	0.15	1.18
Machining Setup, Install and remove	Set up exhaust flange material in waterjet	1		1	1.30	1.30

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up exhaust flange spacer material	1		1	1.30	1.30
Machining	Machine 4 exhaust flange spacers	18.4	Material - Stainless Steel	3.75	0.04	2.76
Waterjet Cut	waterjet four exhaust flanges	147	Material - Stainless Steel	3.75	0.01	5.51
Assemble, 1 kg, Loose	Assemble exhaust flanges onto exhaust runners	1	Repeat 4	4	0.06	0.24
Weld	Weld exhaust flange spacer onto exhaust runner	15.30096		1	0.15	2.30

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Hose Clamp, V-Band Quick Release	Midpipe clamp	2 in		1	16.45	16.45

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Welds - Welding Fixture	Welding Fixture for exhaust manifold	30	3000	1	500.00	5.00

Engine & Drivetrain › Exhaust › Custom Muffler

P/N Base	Suffix	Details	Cost	Qty	Total
PTA23-00589	A	Custom built muffler with perforated inner tube and fiberglass packing. aluminum shell, steel internals	$27.73	1	$27.73

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	End caps			Sheet	17.137 in^2	0.036 in	0.284 lb/in^3	2	0.18	0.36
Aluminum, Normal (by Dimensions)	Casing			Sheet	186.937 in^2	0.05 in	0.098 lb/in^3	1	1.75	1.75
Steel, Mild (by Dimensions)	Perforated Tube			Perf. Sheet	62.485 in^2	0.036 in	0.284 lb/in^3	1	0.65	0.65
Muffler Batting	Muffler packing	145.5 in^3						1	7.15	7.15
Tubing, Steel	Inlet adapter	0.06 lb						1	0.06	0.06
Tubing, Steel	Outlet adapter	0.05 lb						1	0.05	0.05
Steel, Mild (by Dimensions)	Spring tabs			Sheet	0.112 in^2	0.0625 in	0.284 lb/in^3	4	0.00	0.01
Steel, Mild (by Dimensions)	Mounting tab			Sheet	0.293 in^2	0.625 in	0.284 lb/in^3	1	0.05	0.05

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Change	Mount casing material to waterjet	1		1	0.65	0.65
Waterjet Cut	Cut out casing	52.4	Material - Aluminum	1	0.01	1.33
Waterjet Cut	Cut steel parts out	76	Material - Steel	3	0.01	5.79
Sheet metal bends	Roll muffler case	1	Material - Aluminum	1	0.25	0.25
Weld	Weld adapters, tac perf. tube and weld tabs	10.42	Material - Aluminum	1	0.15	3.97
Assemble, 1 kg, Loose	Pack muffler	1		1	0.06	0.06
Riveting	Rivet casing	1	Repeat 20	20	0.25	5.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Rivet, Pop	Casing to faceplate			20	0.03	0.60

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Exhaust › Outlet Pipe

P/N Base	Suffix	Details	Cost	Qty	Total
PTA23-00781	A		$6.00	1	$6.00

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Tubing, Steel	Outlet tube	0.97 lb						1	0.99	0.99

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut		1.5	Repeat 3	3	0.15	1.71
Tube end preperation for welding		1	Repeat 2	2	0.75	1.50
Weld		4.712		1	0.15	1.80

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan

P/N Base	Suffix	Details	Cost	Qty	Total
PTA23-00754	A		$23.03	1	$23.03

Part	Cost	Quantity	Subtotal
Oil Pan (SLS Print)	15.1800	1	15.1800
Oil Pan Baffle - Left	0.2200	1	0.2200
Oil Pan Baffle - Right	0.2000	1	0.2000
Oil Pan Baffle Door Pin	0.0700	2	0.1400
Oil Pickup Body	0.6400	1	0.6400
Oil Pickup End	0.2100	1	0.2100

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Drain Plug, Hex Head, Magnetic	Oil pan drain plug	12 mm						1	1.17	1.17

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Line-on-Line	Install pick up end to pick up body with mesh filter in between	1		1	0.13	0.13
Assemble, 1 kg, Line-on-Line	Install pick up to oil pump	1		1	0.13	0.13
Assemble, 1 kg, Loose	Install baffle pins into doors	1	Repeat 2	2	0.06	0.12
Assemble, 1 kg, Line-on-Line	Snap oil pan baffle doors and pins into pan body baffles	1	Repeat 2	2	0.13	0.26
Assemble, 1 kg, Loose	Place bolt spacers into oil pan	1	Repeat 12	12	0.06	0.72
Power Tool <= 25.4 mm	Bolt oil pan to engine block	1	Repeat 12	12	0.25	3.00
Power Tool <= 25.4 mm	Install oil drain plug into oil pan	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Oil pan mounting bolts	6 mm	25 mm	12	0.05	0.66

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan › Oil Pan (SLS Print)

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03902	A	SLS printed oil pan (CRP, Windform SP)	$15.18	1	$15.18

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Oil Pan	0.43 kg						1	1.42	1.42

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	SLS 3D printed oil pan	0.43		1	32.00	13.76

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan › Oil Pan Baffle - Left

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02834	A	SLS printed left oil pan baffle (CRP, Windform SP)	$0.22	1	$0.22

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Left oil pan baffle	0.00635 kg						1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	SLS 3D print left baffle door	0.00635		1	32.00	0.20

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan › Oil Pan Baffle - Right

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02835	A	SLS printed left oil pan baffle (CRP, Windform SP)	$0.20	1	$0.20

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Right oil pan baffle door	0.00578 kg						1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	SLS 3D printed oil pan right baffle door	0.00578		1	32.00	0.18

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan › Oil Pan Baffle Door Pin

P/N Base	Suffix	Details	Cost	Qty	Total
PTC22-02836	A	Pin for baffle doors	$0.07	2	$0.14

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Oil pan baffle door pin			Round Rod	0.005 in^2	2.706 in	0.098 lb/in^3	2	0.00	0.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Cut (scissors, knife)	cut oil baffle rods to length	1	Material - Aluminum	1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan › Oil Pickup Body

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00024	A		$0.64	1	$0.64

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	SLS oil pickup body (CRP, Windform SP)	0.018 kg						1	0.06	0.06

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Body of oil pickup	0.018		1	32.00	0.58

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Engine & Drivetrain › Oil Pan › Oil Pickup End

P/N Base	Suffix	Details	Cost	Qty	Total
PTC19-00025	A		$0.21	1	$0.21

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Oil pickup end	0.006 kg						1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic		0.006		1	32.00	0.19

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Powertrain System Drawings

Frame System Section

Frame & Body › Front Wing

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00389	A	Curved main element with integrated mounting. Carbon fibre wing elements and endplates.	$489.05	1	$489.05

Part	Cost	Quantity	Subtotal
Front Wing Splitter	136.7800	1	136.7800
Wing Element S1223 - 9c	38.4200	2	76.8400
Front wing 2nd Flap	16.7200	2	33.4400
Front wing outer endplate	28.6000	2	57.2000
Front wing inner endplate	23.8400	2	47.6800
Front wing middle endplate	23.8000	2	47.6000
Front wing lower mounting bracket	5.9900	2	11.9800
Front wing control rod	30.9200	2	61.8400

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 25.4 mm	Mounting rod - install to curved main element	2		1	0.25	0.50
Reaction Tool <= 25.4 mm	Mounting rod - install to curved main element	2		1	0.25	0.50
Power Tool <= 25.4 mm	Lower mounting bracket - install to curved main element	4		1	0.25	1.00
Power Tool <= 25.4 mm	Wing elements - attach to endplates	20		1	0.25	5.00
Ratchet <= 25.4 mm	Inner endplates - attach to curved main element	4		1	0.75	3.00
Reaction Tool <= 25.4 mm	Inner endplates - attach to curved main element	4		1	0.25	1.00
Power Tool > 25.4 mm	Wing element 2nd flap - attach to middle endplate	8		1	0.50	4.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Mounting rod, bottom	4.825 mm	25.4 mm	2	0.03	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Mounting rod, bottom	4.825 mm		2	0.02	0.04
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Lower mounting bracket	4.825 mm	19 mm	4	0.02	0.09
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Wing element fasteners	4.825 mm	19 mm	16	0.02	0.36
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Inner endplate	4.825 mm	12.7 mm	4	0.02	0.07
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Inner endplate	4.825 mm	12.7 mm	4	0.02	0.07

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Front Wing › Front Wing Splitter

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00555	A	Main splitter of front wing assembly	$136.78	1	$136.78

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Outer surface of wing	0.32 kg					1580 kg/m^3	1	64.00	64.00
Structural Foam	Foam core for strength	0.094 kg						1	11.75	11.75
Plastic, Nylon (per kg)	Curved section	0.255 kg						2	0.84	1.68
Plastic, Nylon (per kg)	Wing endcaps	0.152 kg						2	0.50	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Endcaps	0.152	Repeat 2	2	32.00	9.73
Rapid Prototype - Plastic	Curved Sections	0.255	Repeat 2	2	32.00	16.32
Lamination, Manual	Carbon application	0.68		1	35.00	23.80
Resin application, Infusion Molding	Carbon Layup and bonding	0.68		1	2.50	1.70
Cure, Room Temperature	Carbon curing	0.68		1	10.00	6.80

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Front Wing › Wing Element S1223 - 9c

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00544	A	1st Flap Element	$38.42	2	$76.84

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Foam core - 1lb density	0.024 kg						1	3.00	3.00
Carbon Fiber, 1 Ply	Carbon Wrap	0.108 kg					1580 kg/m^3	1	21.60	21.60
Plastic, Acrylic (per kg)	Endcaps	0.015 kg						1	0.05	0.05

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon skin application	0.21		1	35.00	7.35
Resin application, Infusion Molding	Carbon wetting	0.21		1	2.50	0.52
Cure, Room Temperature	Carbon curing	0.21		1	10.00	2.10
Machining Setup, Install and remove	Wing endcaps setup	1		1	1.30	1.30
Laser Cut	Wing endcaps	85.6	Repeat 2	2	0.01	1.71
Tapping holes	Wing endcap tapping	2		1	0.35	0.70
Brush Apply	Wing endcaps bonding to wing	22	Repeat 2	2	0.00	0.09

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Front Wing › Front wing 2nd Flap

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00550	A	2nd Flap element of front wing	$16.72	2	$33.44

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Foam core	0.01 kg						1	1.25	1.25
Carbon Fiber, 1 Ply	Wing skin	0.038 kg					1580 kg/m^3	1	7.60	7.60
Plastic, Acetal (per kg)	Front wing endcaps for mounting (for 2)	0.02 kg						1	0.07	0.07

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon skin application	0.071	Material - Composite	2	35.00	4.97
Resin application, Infusion Molding	Carbon wetting	0.071		1	2.50	0.18
Cure, Room Temperature	Carbon curing	0.071		1	10.00	0.71
Machining Setup, Install and remove	Endcap laser cutting	1	Material - Plastic	0.5	1.30	0.65
Laser Cut	Mounting endcaps (for 2 endcaps)	106.7	Material - Plastic	0.5	0.01	0.53
Tapping holes	Wind endcap tapping	2		1	0.35	0.70
Brush Apply	Endcap bonding	15.6	Repeat 2	2	0.00	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Front Wing › Front wing outer endplate

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-02790	A		$28.60	2	$57.20

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Foam core	0.055 kg						1	6.88	6.88
Carbon Fiber, 1 Ply	Carbon wrap	0.085 kg					1580 kg/m^3	1	17.00	17.00
Aluminum, Normal (per kg)	Endplate insert	0.01 kg						1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Cut shape of foam	0.125	Material - Foam	0.33	1.30	0.05
Laser Cut	Cut Foam	161	Material - Foam	0.33	0.01	0.53
Machining Setup, Install and remove	Insert making waterjet	1	Material - Aluminum	1	1.30	1.30
Waterjet Cut	Insert making	15.8	Material - Aluminum	1	0.01	0.16
Resin application, Infusion Molding	Carbon - wetting	0.18		1	2.50	0.45
Cure, Room Temperature	Carbon curing	0.18		1	10.00	1.80
Drilled holes < 25.4 mm dia.	Mounting holes	3	Material - Foam	0.33	0.35	0.35

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Flat Panel Tool	Endplate	0.09	3000	1	1500.00	0.04

Frame & Body › Front Wing › Front wing inner endplate

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-02870	A	Front wing inner endplate for flap mounting	$23.84	2	$47.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Foam core	0.04 kg						1	5.00	5.00
Carbon Fiber, 1 Ply	Carbon wrapping of core	0.071 kg					1580 kg/m^3	1	14.20	14.20
Aluminum, Normal (per kg)	Adjustable insert	0.01 kg						1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Foam shaping set up	0.125	Material - Foam	0.33	1.30	0.05
Laser Cut	Foam cutting	145	Material - Foam	0.33	0.01	0.48
Machining Setup, Install and remove	Aluminum insert	1	Material - Aluminum	1	1.30	1.30
Waterjet Cut	Aluminum insert	15.8	Material - Aluminum	1	0.01	0.16
Resin application, Infusion Molding	Carbon - wetting	0.123		1	2.50	0.31
Cure, Room Temperature	Carbon curing	0.123		1	10.00	1.23
Drilled holes < 25.4 mm dia.	Mounting holes	9	Material - Foam	0.33	0.35	1.04

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Flat Panel Tool		0.06	3000	1	1500.00	0.03

Frame & Body › Front Wing › Front wing middle endplate

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-02872	A	Inner endplate used for 2nd flap mounting	$23.80	2	$47.60

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Foam core	0.09 lb						1	5.10	5.10
Carbon Fiber, 1 Ply	Carbon wrapping	0.17 lb					0.057 lb/in^3	1	15.42	15.42

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Foam shaping	0.125	Material - Foam	0.33	1.30	0.05
Laser Cut	Foam cutting	270	Material - Foam	0.33	0.01	0.89
Resin application, Infusion Molding	Carbon application around foam	0.13		1	2.50	0.32
Cure, Room Temperature	Carbon curing	0.13		1	10.00	1.30
Drilled holes < 25.4 mm dia.	Mounting hole drilling	6	Material - Foam	0.33	0.35	0.69

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Flat Panel Tool	Endplate template	0.066	3000	1	1500.00	0.03

Frame & Body › Front Wing › Front wing lower mounting bracket

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-02704	A		$5.99	2	$11.98

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (per kg)	Lower bracket	0.71 lb						1	1.35	1.35

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up for machining	1	Material - Aluminum	1	1.30	1.30
Machining	Machine Bracket	5.1	Material - Aluminum	1	0.04	3.34

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Front Wing › Front wing control rod

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00525	A	Carbon tube with inserts for front wing mounting	$30.92	2	$61.84

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Front wing mounting tube (Purchased)	0.032 kg					1580 kg/m^3	1	6.40	6.40
Aluminum, Normal (per kg)	Tube inserts	0.016 lb						2	0.03	0.06
Rod End, Industrial	Mounting rod, connection	0.19 in						2	1.68	3.36

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut carbon tube to length	23.75	Repeat 2	2	0.15	18.10
Machining Setup, Install and remove	Tube inserts machining setup	0.2	Material - Aluminum	1	1.30	0.26
Machining	Tube insert machining	0.204	Material - Aluminum	1	0.04	0.13
Threading, Internal (machining)	Insert threading	0.625	Repeat 2	2	0.10	0.32
Brush Apply	Insert bonding	3.53	Repeat 2	2	0.00	0.01
Hand - Start Only	Thread rod ends in	2		1	0.12	0.24
Wrench <= 6.35 mm	Tighten jam nuts	2		1	1.00	2.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Jam nut	0.19 in		2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00548	A	Foam core wing elements with carbon mounting tubes.	$974.73	1	$974.73

Part	Cost	Quantity	Subtotal
Rear wing endplate	214.2500	2	428.5000
Rear wing Slat Element	37.4600	1	37.4600
Rear Wing Flap Element	74.4700	3	223.4100
Rear Wing Endplate Clevis	1.1500	6	6.9000
Rear wing main element	99.0500	1	99.0500
Carbon Mounting Tube Cross-member	33.1200	2	66.2400
Carbon Tube, Lower Rear Mount	15.8300	4	63.3200
Carbon tube upper mounting cross-member	13.1800	1	13.1800
Upper mounting carbon tube	12.1300	2	24.2600

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Acetal (by Dimensions)				1" round	0.785 in^2	0.24 in	0.051 lb/in^3	22	0.01	0.32

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Align endplates to wing elements	5		1	0.06	0.30
Power Tool <= 25.4 mm	Wing elements - attach to endplates	12		1	0.25	3.00
Power Tool <= 25.4 mm	Mounting rods and clevises (top and bottom) - install fasteners	10		1	0.25	2.50
Reaction Tool <= 25.4 mm	Mounting rods and clevises (top and bottom) - install fasteners	10		1	0.25	2.50
Machining Setup, Install and remove	Delrin into lathe	1		1	1.30	1.30
Machining	Delrin washer machining	2.76		1	0.04	1.81

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Wing endcap screws	4.625 mm	12.7 mm	8	0.02	0.13
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Flap wing element endcap, pivot screw	6.35 mm	12.7 mm	4	0.03	0.11
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Wing mounting clevis insert screw (left)	4.825 mm	31.75 mm	1	0.04	0.04
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Wing mounting clevis insert screw (right)	4.825 mm	25.4 mm	1	0.03	0.03
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Wing mounting clevis insert nut	4.825 mm		2	0.02	0.04
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Mounting clevis screws - thru endplates	4.825 mm	19 mm	8	0.02	0.18
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Mounting clevis nuts - thru endplates	4.825 mm		8	0.02	0.15

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Rear wing endplate

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-02849	A		$214.25	2	$428.50

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Endplates, dry carbon	0.667 kg					1580 kg/m^3	1	133.40	133.40
Structural Foam	Endplates, foam core	0.373 kg						1	46.63	46.62

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon layup	0.611		1	35.00	21.38
Resin application, Infusion Molding	Endplate - wetting	0.611		1	2.50	1.53
Cure, Room Temperature	Endplate - curing	0.611		1	10.00	6.11
Drilled holes < 25.4 mm dia.	Mounting Holes	14		1	0.35	4.90

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Flat Panel Tool	Endplates	0.611	3000	1	1500.00	0.31

Frame & Body › Rear Wing › Rear wing Slat Element

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00469	A	Slat element of rear wing	$37.46	1	$37.46

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Slat wing element, foam core	0.0018 kg						1	0.23	0.22
Carbon Fiber, 1 Ply	Core wrapping	0.09 kg					1580 kg/m^3	1	18.00	18.00
Plastic, Acrylic (per kg)	Slat wing endcaps	0.0042 kg						1	0.01	0.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon application	0.378		1	35.00	13.23
Resin application, Infusion Molding	Carbon wetting	0.378		1	2.50	0.94
Cure, Room Temperature	Cure carbon	0.378		1	10.00	3.78
Machining Setup, Install and remove	Wing slat endcaps	0.5		1	1.30	0.65
Laser Cut	Wing slat endcaps	28.13	Repeat 2	2	0.01	0.56
Threading, Internal (machining)	Wing slat endcap tapping	0.25	Repeat 2	2	0.10	0.05
Brush Apply	Wing slat endcap bonding to wing slat	4.77	Repeat 2	2	0.00	0.02

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Rear Wing Flap Element

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-01835	A		$74.47	3	$223.41

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Structural Foam	Foam Core	0.0277 kg						1	3.46	3.46
Carbon Fiber, 1 Ply	Carbon wrap	0.136 kg					1580 kg/m^3	1	27.20	27.20
Plastic, Acrylic (per kg)	Endcaps	0.013 kg						1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon application	0.844		1	35.00	29.54
Resin application, Manual	Carbon wetting	0.844		1	5.00	4.22
Cure, Room Temperature	Cure carbon	0.844		1	10.00	8.44
Machining Setup, Install and remove	Endcaps setup (All six complete)	0.167		1	1.30	0.22
Laser Cut	Flap Endcaps	53.3	Repeat 2	2	0.01	1.07
Threading, Internal (machining)	Flap endcaps tapping	0.25	Repeat 2	2	0.10	0.05
Brush Apply	Flap endcaps bonding to flap	57.24	Repeat 2	2	0.00	0.23

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Rear Wing Endplate Clevis

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-01961	A	CLEVIS USED FOR REAR WING MOUNTING	$1.15	6	$6.90

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Rectangular cross section	1.71 in^2	0.83 in	0.098 lb/in^3	1	0.27	0.26

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Setup part, 6 in a row	0.17	Material - Aluminum	1	1.30	0.22
Machining	Machine part	1.02	Material - Aluminum	1	0.04	0.67

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Rear wing main element

P/N Base	Suffix	Details	Cost	Qty	Total
AEA22-00556	A	Main element of rear wing with mounting points	$99.05	1	$99.05

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Main element carbon skin	0.298 kg					1580 kg/m^3	1	59.60	59.60
Structural Foam	Foam core of wing	0.0864 kg						1	10.80	10.80

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon endcaps	0.016	Repeat 2	2	35.00	1.12
Resin application, Manual	Carbon endcap wetting	0.016	Repeat 2	2	5.00	0.16
Cure, Room Temperature	Carbon curing	0.016	Repeat 2	2	10.00	0.32
Lamination, Manual	Wing skin layup	0.5694		1	35.00	19.93
Resin application, Infusion Molding	Wing skin carbon wetting	0.5695		1	2.50	1.42
Cure, Room Temperature	Wing skin curing	0.5695		1	10.00	5.70

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Carbon Mounting Tube Cross-member

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-01840	A	Cross-member for mounting	$33.12	2	$66.24

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Rear wing lower mounting cross-member (purchased)	0.0837 kg					1580 kg/m^3	1	16.74	16.74
Aluminum, Normal (per kg)	Tube inserts	0.032 lb						2	0.06	0.12
Rod End, Industrial	Mounting tube, connection	0.19 in						2	1.68	3.36

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut carbon to length	32.15		1	0.15	12.25
Machining Setup, Install and remove	Tube insert set up	0.0833		1	1.30	0.11
Machining	Tube inserts machining	0.314	Material - Aluminum	1	0.04	0.21
Threading, Internal (machining)	Insert threading	1.05	Material - Aluminum	1	0.10	0.27
Brush Apply	Inserts bonding	0.6837	Repeat 2	2	0.00	0.02

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Rod end lock nut	0.19 in		2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Carbon Tube, Lower Rear Mount

P/N Base	Suffix	Details	Cost	Qty	Total
AEC19-00116	A	Lower rear wing mounting to frame	$15.83	4	$63.32

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Rear wing lower mounting to frame (purchased tube)	0.0746 lb					0.057 lb/in^3	1	6.77	6.77
Aluminum, Normal (by Dimensions)	Tube inserts			0.75"OD Cross sectional area	0.44 in^2	0.6 in	0.098 lb/in^3	2	0.05	0.10
Rod End, Industrial	Mounting tube, connector	0.19 in						2	1.68	3.36

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut carbon tube to lenght	13		1	0.15	4.95
Machining Setup, Install and remove	Tube insert setup	0.0833		1	1.30	0.11
Machining	Tube insert turning	0.314	Material - Aluminum	1	0.04	0.21
Threading, Internal (machining)	Insert threading	1.05	Material - Aluminum	1	0.10	0.27
Brush Apply	Insert bonding	0.6837	Repeat 2	2	0.00	0.02

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Rid end lock nut	0.19 in		2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Carbon tube upper mounting cross-member

P/N Base	Suffix	Details	Cost	Qty	Total
AEC19-00113	A	Rear wing upper mounting cross member	$13.18	1	$13.18

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Carbon tube (purchased)	0.0807 lb					0.057 lb/in^3	1	7.32	7.32
Aluminum, Normal (per kg)	Tube inserts	0.016 lb						2	0.03	0.06
Rod End, Industrial	Mounting rod, connection	0.19 in						2	1.68	3.36

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut		0.465	Repeat 2	2	0.15	0.35
Machining Setup, Change	Setup included with upper mounting tubes	0.16		1	0.65	0.10
Machining		0.204		1	0.04	0.13
Threading, Internal (machining)	Insert threading	0.625	Repeat 2	2	0.10	0.32
Brush Apply	Insert bonding, epoxy cures without vaccum at room temp	0.57	Repeat 2	2	0.00	0.01
Hand - Start Only	Thread rod end inserts and jamnuts	1	Repeat 2	2	0.12	0.24
Wrench <= 6.35 mm	Jam nut tighten	1		1	1.00	1.00
Reaction Tool <= 6.35 mm	Jam nut tighten	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8		0.19 in		2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Rear Wing › Upper mounting carbon tube

P/N Base	Suffix	Details	Cost	Qty	Total
AEC19-00114	A	Rear wing upper mounting tube	$12.13	2	$24.26

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Rear wing upper mounting carbon tube (purchased tube)	0.0472 lb					0.057 lb/in^3	1	4.28	4.28
Aluminum, Normal (per kg)	Tube inserts	0.016 lb						2	0.03	0.06
Rod End, Industrial	Mounting rod, connection	0.19 in						2	1.68	3.36

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut carbon tube to length	0.465	Repeat 4	4	0.15	0.71
Machining Setup, Install and remove	Insert setup (Includes cross member setup parts)	0.16	Material - Aluminum	1	1.30	0.21
Machining	Tube insert turning	0.204	Material - Aluminum	1	0.04	0.13
Threading, Internal (machining)	Insert threading	0.625	Repeat 2	2	0.10	0.32
Brush Apply	Insert bonding, epoxy cures without vaccum at room temp	0.57	Repeat 2	2	0.00	0.01
Hand - Start Only	Thread rod end inserts and jamnuts	1	Repeat 4	4	0.12	0.48
Wrench <= 6.35 mm	Jam nut tighten	1	Repeat 2	2	1.00	2.00
Reaction Tool <= 6.35 mm	Jam nut tighten	1	Repeat 2	2	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Lock nut	0.19 in		4	0.02	0.07

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Body work

P/N Base	Suffix	Details	Cost	Qty	Total
AEA23-00626 Body Work	A	Carbon-fibre panels	$462.48	1	$462.48

Part	Cost	Quantity	Subtotal
Nose Cone Smooth	124.1800	1	124.1800
Side Panels	165.7500	2	331.5000

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (per kg)	Mounting tabs	0.018 kg						1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Waterjet Cut	Mounting tabs	47		1	0.01	1.19
Weld	Mounting tabs - weld (self-jigging)	4.3		1	0.15	0.64
Riveting	Install rivet nuts to mounting tabs	9		1	0.25	2.25
Power Tool <= 25.4 mm	Secure sidepanel and cowl-nose to tabs	9		1	0.25	2.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Rivet, Pop	Sidepanel mounting, rivet nuts			4	0.03	0.12
Rivet, Pop	Cowl-nose mounting, rivet nuts			5	0.03	0.15
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Cowl-nose mounting, screws	4.825 mm	12.7 mm	5	0.02	0.09
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Sidepanel mounting, screws	4.825 mm	12.7 mm	4	0.02	0.07

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Body work › Nose Cone Smooth

P/N Base	Suffix	Details	Cost	Qty	Total
AEC23-03521	A		$124.18	1	$124.18

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Cowl-nose	0.504 kg					1580 kg/m^3	1	100.80	100.80

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Resin application, Infusion Molding	Appy epoxy	1.205		1	2.50	3.01
Cure, Room Temperature	Curing carbon	1.17		1	10.00	11.70

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Mold Tool	Cowl-nose mould	1.3	3000	1	20000.00	8.67

Frame & Body › Body work › Side Panels

P/N Base	Suffix	Details	Cost	Qty	Total
AEC23-03725	A	BODY WORK	$165.75	2	$331.50

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Side panel bodywork	1.6 lb					0.057 lb/in^3	1	145.15	145.15

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Side panel laying carbon	0.3783		1	35.00	13.24
Resin application, Infusion Molding	Carbon wetting	0.3783		1	2.50	0.95
Cure, Room Temperature	Carbon curing	0.3783		1	10.00	3.78

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Mold Tool	Left hand side panel	0.394	3000	1	20000.00	2.63

Frame & Body › Chassis System

P/N Base	Suffix	Details	Cost	Qty	Total
CHA23-00569	A	Chassis System contains the chromoly tube frame, all parts welded to it, and the front protection system (AIP & IA). Also included are the firewalls, floorpan, and 6 other aluminum sheet metal parts that are all waterjet at the same time.	$856.43	1	$856.43

Part	Cost	Quantity	Subtotal
Frame	494.2900	1	494.2900
Floor Pan	15.1900	1	15.1900
Engine Firewall Right	3.7200	1	3.7200
Engine Firewall Left	3.9200	1	3.9200
Engine Firewall Center	5.2200	1	5.2200
Seatback Firewall Bottom	4.4400	1	4.4400
Seatback Firewall Top	6.2200	1	6.2200
Intake Cantilever Support Bracket	1.3300	1	1.3300
Engine Steam Guard	4.2300	1	4.2300
Anti Intrusion Plate	7.3600	1	7.3600
Plascore IA	20.0000	1	20.0000
Frame Chain Guard Permanent Section	15.4200	1	15.4200
Front Wing Upper Mount Post Tube Insert	3.5500	1	3.5500
Front Wing Lower Mount	3.8800	1	3.8800
Radiator Mount Dowel Pins	2.0200	1	2.0200

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	0.625" x 0.060" Tube			Cross section	0.10649999 in^2	17.69 in	0.284 lb/in^3	1	0.55	0.55
Steel, Alloy (by Dimensions)	0.375" x 0.035" Tube			Cross Section	0.03738495 in^2	13.54 in	0.284 lb/in^3	1	0.15	0.15
Steel, Alloy (by Dimensions)	Bar Stock			Large Area	3.8192 in^2	0.81 in	0.284 lb/in^3	1	0.90	0.90
Steel, Alloy (by Dimensions)	90° Angle			Cross Sectional Area	0.168 in^2	13.87 in	0.284 lb/in^3	1	0.68	0.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	0.125" Sheet 12" x 6"			Large Area	42 in^2	0.125 in	0.284 lb/in^3	1	1.52	1.52
Steel, Mild (by Dimensions)	0.063" Sheet 2ft x 2ft			Large Area	576 in^2	0.063 in	0.284 lb/in^3	1	10.52	10.52
Steel, Mild (by Dimensions)	0.090" Sheet 2ft x 2ft			Large Area	576 in^2	0.09 in	0.284 lb/in^3	1	15.03	15.03
Steel, Alloy (by Dimensions)	5/8" x0.063" Strips			Cross Section	0.039375 in^2	122.5675 in	0.284 lb/in^3	3	1.40	4.20

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Primary Steering Support Tubes and Seat Mounts	0.625	Repeat 8	8	0.15	1.90
Tube end preperation for welding	Primary Steering Support Tubes and Seat Mounts	12		1	0.75	9.00
Weld	Primary Steering Support Tubes	5.88		1	0.15	2.24
Weld	Front Seat Mounts	1.96	Repeat 2	2	0.15	1.49
Weld	Rear Seat Mounts	7.36		1	0.15	2.80
Tube cut	Secondary Steering Support Tubes	0.375	Repeat 4	4	0.15	0.57
Tube end preperation for welding	Secondary Steering Support Tubes	6		1	0.75	4.50
Weld	Secondary Steering Support Tubes	5.92		1	0.15	2.26
Machining Setup, Install and remove	Steering Bearing Holder Bar Stock	1		1	1.30	1.30
Machining	Steering Bearing Holder	2.54		1	0.04	1.66
Weld	Steering Bearing Holder to Steering Support Tubes	6.17		1	0.15	2.35
Machining Setup, Install and remove	Pedal Box Mounting Rails 90° Angle	1		1	1.30	1.30
Machining	Pedal Box Mounting Rails	0.132		1	0.04	0.09
Machining Setup, Install and remove	Install 0.125" material into waterjet	1		1	1.30	1.30
Waterjet Cut	0.125" Anti-Submarine Belt Tabs	14	Repeat 2	2	0.01	0.71
Weld	0.125" Anti-Submarine Belt Tabs	5.3	Repeat 2	2	0.15	1.59
Waterjet Cut	0.125" Lap Belt Tabs	12.5	Repeat 2	2	0.01	0.64
Weld	0.125" Lap Belt Tabs	5	Repeat 2	2	0.15	1.50
Waterjet Cut	0.125" Lower Diff Tabs	10.483	Repeat 2	2	0.01	0.53
Weld	0.125" Lower Diff Tabs	3.236	Repeat 4	4	0.15	4.93
Waterjet Cut	0.125" Upper Diff Tabs	6.44	Repeat 4	4	0.01	0.65
Weld	0.125" Upper Diff Tabs	1.27	Repeat 4	4	0.15	1.94
Machining Setup, Install and remove	Install 0.063" material into waterjet	1		1	1.30	1.30
Waterjet Cut	0.063" Clutch Pivot	21.3		1	0.01	0.54
Weld	0.063" Clutch Pivot	2		1	0.15	0.76
Waterjet Cut	0.063" AIP Gusseted Tab	8.34	Repeat 8	8	0.01	1.69

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Weld	0.063" AIP Gusseted Tab	3.18	Repeat 8	8	0.15	9.69
Waterjet Cut	0.063" Engine Firewall Tabs	2.92	Repeat 8	8	0.01	0.59
Weld	0.063" Engine Firewall Tabs	0.6	Repeat 8	8	0.15	1.83
Waterjet Cut	0.063" Seatback Firewall Tabs	3.5	Repeat 2	2	0.01	0.18
Weld	0.063" Seatback Firewall Tabs	0.6	Repeat 2	2	0.15	0.46
Waterjet Cut	0.063" Front Hoop End Caps	3.36	Repeat 2	2	0.01	0.17
Weld	0.063" Front Hoop End Caps	3.36	Repeat 2	2	0.15	2.56
Waterjet Cut	0.063" Main Hoop End Caps	3.35	Repeat 2	2	0.01	0.17
Weld	0.063" Main Hoop End Caps	3.35	Repeat 2	2	0.15	2.55
Waterjet Cut	0.063" x Ø.75" Chassis Tube End Caps	2.36	Repeat 2	2	0.01	0.12
Weld	0.063" x Ø.75" Chassis Tube End Caps	2.36	Repeat 2	2	0.15	1.80
Waterjet Cut	0.063" x Ø1" Chassis Tube End Caps	3.14	Repeat 4	4	0.01	0.32
Weld	0.063" x Ø1" Chassis Tube End Caps	3.14	Repeat 4	4	0.15	1.88
Waterjet Cut	0.063" Steering Column U Mount	15.5		1	0.01	0.39
Weld	0.063" Steering Column U Mount	2.45		1	0.15	0.93
Waterjet Cut	0.063" AEM Dash Mount Tab	13		1	0.01	0.33
Weld	0.063" AEM Dash Mount Tab	0.8		1	0.15	0.30
Waterjet Cut	0.063" Brake Reservoir Tab	2.5	Repeat 2	2	0.01	0.13
Weld	0.063" Brake Reservoir Tab	0.59	Repeat 2	2	0.15	0.45
Waterjet Cut	0.063" Steering Rack Tab	10.091	Repeat 2	2	0.01	0.51
Sheet metal bends	0.063" Steering Rack Tab	2	Repeat 2	2	0.25	1.00
Weld	0.063" Steering Rack Tab	3.722	Repeat 2	2	0.15	2.84
Waterjet Cut	0.063" Headrest Tabs	9.6	Repeat 2	2	0.01	0.49
Weld	0.063" Headrest Tabs	1.6	Repeat 2	2	0.15	1.22
Waterjet Cut	0.063" Rear ARB Tabs	10.65	Repeat 2	2	0.01	0.54
Weld	0.063" Rear ARB Tabs	1.97	Repeat 2	2	0.15	1.50
Waterjet Cut	0.063" Ground Connections	3	Repeat 3	3	0.01	0.23
Weld	0.063" Ground Connections	0.5	Repeat 3	3	0.15	0.57
Waterjet Cut	0.063" Start Shutdown Tab	11		1	0.01	0.28
Weld	0.063" Start Shutdown Tab	2.24		1	0.15	0.85
Waterjet Cut	0.063" Swirl Pot Tab	5.807		1	0.01	0.15
Weld	0.063" Swirl Pot Tab	0.25		1	0.15	0.10
Waterjet Cut	0.063" Shifting Piston Tabs	4.09	Repeat 2	2	0.01	0.21

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Weld	0.063" Shifting Piston Tabs	0.8	Repeat 2	2	0.15	0.61
Waterjet Cut	0.063" Muffler Tabs	5.13	Repeat 4	4	0.01	0.52
Sheet metal bends	0.063" Muffler Tabs	1	Repeat 4	4	0.25	1.00
Weld	0.063" Muffler Tabs	0.5	Repeat 4	4	0.15	0.76
Waterjet Cut	0.063" Midpipe Exhaust Tab	6.55		1	0.01	0.17
Sheet metal bends	0.063" Midpipe Exhaust Tab	2		1	0.25	0.50
Weld	0.063" Midpipe Exhaust Tab	1.37		1	0.15	0.52
Waterjet Cut	0.063" Upper Rear Wing Tabs	2	Repeat 4	4	0.01	0.20
Weld	0.063" Upper Rear Wing Tabs	0.8	Repeat 4	4	0.15	1.22
Waterjet Cut	0.063" Rear Wing Lower Outboard Tabs	3.9838	Repeat 2	2	0.01	0.20
Weld	0.063" Rear Wing Lower Outboard Tabs	0.89	Repeat 2	2	0.15	0.68
Waterjet Cut	0.063" Rear Wing Lower Inboard Mounting Tabs	3.5	Repeat 2	2	0.01	0.18
Waterjet Cut	0.063" Brakeline Hooked Tabs	7	Repeat 2	2	0.01	0.36
Weld	0.063" Brakeline Hooked Tabs	1.5	Repeat 2	2	0.15	1.14
Waterjet Cut	0.063" RFID Tabs	2.5	Repeat 2	2	0.01	0.13
Weld	0.063" RFID Tabs	0.35	Repeat 2	2	0.15	0.27
Waterjet Cut	0.063" Cowl Tabs	5.3	Repeat 14	14	0.01	1.88
Weld	0.063" Cowl Tabs	1.26	Repeat 14	14	0.15	6.72
Waterjet Cut	0.063" Upper Radiator Tabs	6.4	Repeat 2	2	0.01	0.33
Waterjet Cut	0.063" Lower Radiator Tabs	6.04	Repeat 2	2	0.01	0.31
Sheet metal bends	0.063" Radiator Tabs	4		1	0.25	1.00
Weld	0.063" Radiator Tabs	0.94	Repeat 4	4	0.15	1.43
Machining Setup, Install and remove	Install 0.090" material into waterjet	1		1	1.30	1.30
Weld	0.090" Suspension Tabs	0.8	Repeat 56	56	0.15	17.07
Waterjet Cut	0.090" Suspension Tabs	114		1	0.01	2.90
Waterjet Cut	0.090" Seat Backing Plate	11.42		1	0.01	0.29
Weld	0.090" Seat Backing Plate	7.82		1	0.15	2.98
Waterjet Cut	0.090" Front ARB Tabs	12.5	Repeat 2	2	0.01	0.64
Weld	0.090" Front ARB Tabs	3.26	Repeat 2	2	0.15	2.48
Sheet Metal Saw Cut	5/8" x 0.063" Strip Floor Pan Tabs	0.625	Repeat 12	12	0.20	3.81
Weld	Floor Pan Tabs Welded at Ends and Tacked Every Inch	3	Repeat 11	11	0.15	12.57
Assemble, 1 kg, Loose	Hold Floorpan up to Chassis	1		1	0.06	0.06
Riveting	Rivet Floorpan to Welded Tabs	165		1	0.25	41.25

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Liquid Applicator Gun	Apply epoxy to IA surface for AIP bonding	81.69		1	0.02	4.15
Assemble, 1 kg, Loose	Attach AIP to IA	1		1	0.06	0.06
Assemble, 1 kg, Loose	Hold AIP/IA up to front bulkhead	1		1	0.06	0.06
Assemble, 1 kg, Loose	Install AIP bolts	8		1	0.06	0.48
Hand - Start Only	Attach nuts to AIP bolts	8		1	0.12	0.96
Wrench <= 25.4 mm	Tighten nuts to AIP bolts	8		1	1.50	12.00
Reaction Tool <= 25.4 mm	Hold AIP bolts	8		1	0.25	2.00
Riveting	Install rivet nuts for Right Firewall	3		1	0.25	0.75
Assemble, 1 kg, Loose	Install Right Firewall	1		1	0.06	0.06
Riveting	Install rivet nuts for Left Firewall	3		1	0.25	0.75
Assemble, 1 kg, Loose	Install Left Firewall	1		1	0.06	0.06
Riveting	Install rivet nuts for Center Firewall	4		1	0.25	1.00
Assemble, 1 kg, Loose	Install Center Firewall	1		1	0.06	0.06
Riveting	Install rivet nuts for Bottom Firewall	4		1	0.25	1.00
Assemble, 1 kg, Loose	Install Bottom Firewall	1		1	0.06	0.06
Riveting	Install rivet nuts for Top Firewall	2		1	0.25	0.50
Assemble, 1 kg, Loose	Install Top Firewall	1		1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Rivet, Pop	Riveting floorpan to frame			165	0.03	4.95
Bolt, Grade 8.8 (SAE 5)	5/16-24 for AIP mounting	0.3125 in	0.75 in	8	0.08	0.62
Nut, Grade 8.8 (SAE 5)	5/16-24 for AIP mounting	0.3125 in		8	0.04	0.35
Nut, Panel Retained	10-32 Rivet Nut	0.197 in		16	0.17	2.80
Bolt, Grade 8.8 (SAE 5)	10-32 Fire wall mounting	0.197 in	0.375 in	16	0.02	0.33

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Welds - Welding Fixture	Tab locating/jigging	52	3000	1	500.00	8.67

Frame & Body › Chassis System › Frame

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-02996	A	TIG welded chromoly spaceframe. Included bolted/detachable frame members and upper front wing tube mount.	$494.29	1	$494.29

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	Round 0.75" x 0.049" x length			circular cross section	0.1079 in^2	626.101 in	0.284 lb/in^3	1	19.58	19.58
Steel, Alloy (by Dimensions)	Round 1.00" x 0.095" x length			circular cross section	0.2701 in^2	183.005 in	0.284 lb/in^3	1	14.33	14.33
Steel, Alloy (by Dimensions)	Round 1.00" x 0.065" x length			circular cross section	0.19093 in^2	304.412 in	0.284 lb/in^3	1	16.85	16.85
Steel, Alloy (by Dimensions)	Round 1.00" x 0.049" x length			circular cross section	0.1464 in^2	267.031 in	0.284 lb/in^3	1	11.33	11.33
Steel, Alloy (by Dimensions)	Square 0.75" x 0.049" x length			hollow square	0.1374 in^2	66.893 in	0.284 lb/in^3	1	2.66	2.66
Steel, Alloy (by Dimensions)	Square 1.00" x 0.049" x length			hollow square	0.1864 in^2	46.33 in	0.284 lb/in^3	1	2.50	2.50
Steel, Alloy (by Dimensions)	Round 0.25" x 0.049"			circular cross section	0.05018 in^2	60.29 in	0.284 lb/in^3	1	0.88	0.88
Aluminum, Normal (by Dimensions)	Plate 0.500"			plate	6.916 in^2	0.5 in	0.098 lb/in^3	1	0.65	0.65
Steel, Alloy (by Dimensions)	Sheet 0.090"			sheet metal	6.916 in^2	0.09 in	0.284 lb/in^3	1	0.18	0.18

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Round 0.75" x 0.049"	0.75	Repeat 60	60	0.15	17.14
Tube end preperation for welding	Round 0.75" x 0.049"	2	Repeat 59	59	0.75	88.50
Tube bends	Rear bottom (drw pg 9)	1	Repeat 2	2	0.75	1.50
Weld	Round 0.75" x 0.049"	302.93		1	0.15	115.42
Tube cut	Round 1.00" x 0.095"	1	Repeat 4	4	0.15	1.52
Tube end preperation for welding	Round 1.00" x 0.095"	1	Repeat 6	6	0.75	4.50
Tube bends	Main roll hoop (drw pg 4)	5		1	0.75	3.75
Tube bends	Front roll hoop (drw pg 4)	5		1	0.75	3.75
Weld	Round 1.00" x 0.095"	4.2		1	0.15	1.60
Tube bends	Lower SIS (drw pg 9)	1	Repeat 2	2	0.75	1.50
Tube end preperation for welding	Round 1.00" x 0.065"	1	Repeat 24	24	0.75	18.00
Tube cut	Round 1.00" x 0.065"	1	Repeat 13	13	0.15	4.95

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube end preperation for welding	Square 0.75" x 0.049"	1	Repeat 10	10	0.75	7.50
Weld	Round 1.00" x 0.049"	58.35		1	0.15	22.23
Tube cut	Round 1.00" x 0.049"	1	Repeat 21	21	0.15	8.00
Weld	Round 1.00" x 0.065"	104.38		1	0.15	39.77
Tube end preperation for welding	Round 1.00" x 0.049"	1	Repeat 40	40	0.75	30.00
Tube cut	Round 0.25" x 0.049"	0.25	Repeat 7	7	0.15	0.67
Weld	Round 0.25" x 0.049"	11.46		1	0.15	4.37
Weld	Square 1.00" x 0.049"	12.84		1	0.15	4.89
Non-functional Coating or Finishing	Powdercoat black	1		1		
Weld	Square 0.75" x 0.049"	23.83		1	0.15	9.08
Tube bends	Head and Harness restraint	3	Repeat 2	2	0.75	4.50
Tube end preperation for welding	Square 1.00" x 0.049"	1	Repeat 6	6	0.75	4.50
Machining	Detachable Mount Spacers	1.06	Repeat 2	2	0.04	1.39
Machining Setup, Install and remove	Detachable Mount Spacers	0.5	Repeat 2	2	1.30	1.30
Reaction Tool <= 6.35 mm	Detachable Mounts	1	Repeat 6	6	0.25	1.50
Hand - Start Only	Detachable Mount	1	Repeat 6	6	0.12	0.72
Wrench <= 6.35 mm	Detachable Mounts	1	Repeat 6	6	1.00	6.00
Tube cut	Square 0.75" x 0.049"	0.75	Repeat 6	6	0.15	0.68
Tube cut	Square 1.00" x 0.049"	1	Repeat 5	5	0.15	0.75
Waterjet Cut	Detachable Mount Flanges	8.07	Repeat 4	4	0.01	0.82
Machining Setup, Install and remove	Detachable Mount Flanges	0.25	Repeat 4	4	1.30	1.30
Tube end preperation for welding	Round 0.25" x 0.049"	1	Repeat 4	4	0.75	3.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Detachable Mounts	0.25 in	1 in	6	0.06	0.37
Nut, Grade 8.8 (SAE 5)	Detachable Mounts	0.25 in		6	0.03	0.19

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Welds - Welding Fixture	Frame jig	58	3000	1	500.00	9.67

Frame & Body › Chassis System › Floor Pan

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03307	A	Single piece sheet metal floorpan. Waterjet and bent.	$15.19	1	$15.19

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (per kg)	5052-H32 0.040" sheet	1.42 kg						1	5.96	5.96

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in cutter (with other parts)	0.125		1	1.30	0.16
Waterjet Cut	Cut external profile and internal holes	254.073	Material - Aluminum	1	0.01	6.45
Sheet metal bends	To follow profile of chassis bottom	2	Material - Aluminum	1	0.25	0.50
Riveting	Rivet 10-32 rivet nuts into floor pan	5	Material - Aluminum	1	0.25	1.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Panel Retained	10-32 Rivet Nut	0.197 in		5	0.17	0.87

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Engine Firewall Right

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03133	A	Sheet metal aluminum firewall. Waterjet, cut, and bent. This is the right section of the firewall	$3.72	1	$3.72

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	5052-H32 sheet			Face	132.4 in^2	0.04 in	0.098 lb/in^3	1	0.99	0.99

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in waterjet (with other parts)	0.125		1	1.30	0.16
Waterjet Cut	External profile and internal holes	58	Material - Aluminum	1	0.01	1.47
Sheet metal bends	Top flange	1		1	0.25	0.25
Riveting	Rivet 10-32 Rivet Nuts	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Panel Retained	10-32 Rivet Nut	0.197 in		2	0.17	0.35

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Engine Firewall Left

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03131	A	Sheet metal aluminum firewall. Waterjet, cut, and bent. This is the left section of the firewall	$3.92	1	$3.92

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	5052-H32 sheet			Face	131.4 in^2	0.04 in	0.098 lb/in^3	1	0.98	0.98

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install sheet metal sheet into waterjet	0.125		1	1.30	0.16
Waterjet Cut	waterjet part	46.5		1	0.01	1.18
Sheet metal bends	Bend sheet metal part	4		1	0.25	1.00
Riveting	Rivet 10-32 Rivet Nuts	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Panel Retained	10-32 Rivet Nut	0.197 mm		2	0.05	0.10

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Engine Firewall Center

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03129	A	Sheet metal aluminum firewall. Waterjet, cut, and bent. This is the center section of the firewall	$5.22	1	$5.22

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	5052-H32 sheet			Face	386.99 in^2	0.04 in	0.098 lb/in^3	1	2.89	2.89

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in waterjet (with other parts)	0.125		1	1.30	0.16
Waterjet Cut	External profile and internal holes	75.5		1	0.01	1.92
Sheet metal bends	Top Flange	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Seatback Firewall Bottom

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03359	A		$4.44	1	$4.44

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	0.040 Sheet Metal Aluminum			Flat Face	208 in^2	0.04 in	0.098 lb/in^3	1	1.55	1.55

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in waterjet (with othe	0.125		1	1.30	0.16
Waterjet Cut	Waterjet part	54.5		1	0.01	1.38
Sheet metal bends	Bend part	2		1	0.25	0.50
Riveting	Rivet 10-32 Rivet Nuts	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Panel Retained	10-32 Rivet Nut	0.197 in		2	0.17	0.35

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Seatback Firewall Top

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03509	A		$6.22	1	$6.22

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Sheet metal aluminum			Flat Face	444.6 in^2	0.04 in	0.098 lb/in^3	1	3.32	3.32

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in waterjet (with othe	0.125		1	1.30	0.16
Waterjet Cut	Machine profile	78.5		1	0.01	1.99
Sheet metal bends	Bend part	3		1	0.25	0.75

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Intake Cantilever Support Bracket

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03514	A	Sheet metal aluminum bracket that supports the cantilevered end of the air intake.	$1.33	1	$1.33

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	5052-H32 sheet			Face	21.86 in^2	0.04 in	0.098 lb/in^3	1	0.16	0.16

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in waterjet (with other parts)	0.125		1	1.30	0.16
Waterjet Cut	External profile and internal holes	20		1	0.01	0.51
Sheet metal bends	Bolting Flanges	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Engine Steam Guard

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03794	A	Sheet metal aluminum bracket. Protects driver from escaping steam.	$4.23	1	$4.23

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	5052-H32 sheet			Face	230.325 in^2	0.04 in	0.098 lb/in^3	1	1.72	1.72

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Sheet in waterjet (with other parts)	0.125		1	1.30	0.16
Waterjet Cut	External profile and internal holes	72.84		1	0.01	1.85
Sheet metal bends	Intake and Chassis Flanges	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Anti Intrusion Plate

P/N Base	Suffix	Details	Cost	Qty	Total
CHC23-03104	A		$7.36	1	$7.36

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	AIP			Flat face 12" NOM x 13.16" + 0.04" for uncut edg	158.4 in^2	0.188 in	0.098 lb/in^3	1	5.56	5.56

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install stock into waterjet	1		1	1.30	1.30
Waterjet Cut	Waterjet holes and one edge	19.8539816		1	0.01	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Plascore IA

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00233	A	Plascore Crushlite aluminum honeycomb impact attenuator	$20.00	1	$20.00

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Honeycomb, Aluminum	Purchased at finished size	0.4 kg						1	20.00	20.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Frame Chain Guard Permanent Section

P/N Base	Suffix	Details	Cost	Qty	Total
DRC22-02788	A	Sections of chain guard, permanently attached to chassis	$15.42	1	$15.42

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	Plate for water jetting both parts			Hot Rolled, 12 GA Sheet	10 in^2	0.109 in	0.284 lb/in^3	1	0.32	0.32

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Mount sheet in waterjet for all three parts	1		1	1.30	1.30
Waterjet Cut	Cut out three parts	18.755		1	0.01	0.48
Hand Finish - Surface Preperation	Prep parts to be welded to chassis	1	Repeat 3	3	0.02	0.06
Sheet metal bends	Bend one of the permanent parts	1		1	0.25	0.25
Weld	Attach to chassis	11.382	Repeat 3	3	0.15	13.01

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Front Wing Upper Mount Post Tube Insert

P/N Base	Suffix	Details	Cost	Qty	Total
AEC22-02690	A	Steel inserts welded into tubes located at top corners of front bulkhead. Threaded hole for bolting front wing rod end to chassis.	$3.55	1	$3.55

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	Round Bar			Circular Cross Section	0.58 in^2	1.18 in	0.284 lb/in^3	1	0.20	0.20

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	0.75" round bar in lathe	1		1	1.30	1.30
Machining	Machine both parts with single hold	0.395		1	0.04	0.26
Weld	Weld to Frame Mount Tube	2.35	Repeat 2	2	0.15	1.79

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Front Wing Lower Mount

P/N Base	Suffix	Details	Cost	Qty	Total
AEC23-03739	A	Four position height adjustment lower front wing mount welded to frame. Identical part welded to either side of the front bulkhead.	$3.88	1	$3.88

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	Bar Stock			Rectangular Cross Section	0.178 in^2	3.32 in	0.284 lb/in^3	1	0.17	0.17

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into mill	1		1	1.30	1.30
Machining	Machine rectangular shape and tapped holes for both identical L&R parts	0.18		1	0.04	0.12
Weld	Weld to lower front bulkhead	3	Repeat 2	2	0.15	2.29

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Chassis System › Radiator Mount Dowel Pins

P/N Base	Suffix	Details	Cost	Qty	Total
PTC23-03557	A	Dowel pins welded to upper radiator mounts.	$2.02	1	$2.02

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	0.5" Round Bar			Cross Section	0.19 in^2	1.13 in	0.284 lb/in^3	1	0.06	0.06

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install round bar in lathe	1		1	1.30	1.30
Machining	Turn and part off both pins in one hold	0.1		1	0.04	0.07
Weld	Weld pins to upper radiator mounts	0.78	Repeat 2	2	0.15	0.59

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box

P/N Base	Suffix	Details	Cost	Qty	Total
ERA22-00438	A	Ergonomics System - Gas and Pedal Assembly excluding master cylinders	$266.67	1	$266.67

Part	Cost	Quantity	Subtotal
Brake Pedal	19.1200	1	19.1200
Brake Pedal Mount	1.3800	2	2.7600
Brake Pedal Thrust Washers	0.7400	2	1.4800
Brake and Throttle Foot Cup	1.8000	2	3.6000
Bias Bar Trunnion	3.8800	1	3.8800
Bias Bar Sleeve	3.9400	1	3.9400
Gas Pedal	18.8600	1	18.8600
Throttle Pedal Mount	3.3400	2	6.6800
Throttle Spring Top Mount	2.2200	2	4.4400
Pedal Box Base plate	22.3600	1	22.3600
Linear Potentiometer Mount	0.7000	2	1.4000
Throttle Stopper top	3.2600	1	3.2600
Throttle Stopper Bottom	1.6600	1	1.6600
Master Cylinder Mount	2.8700	2	5.7400
Brake Overtravel Switch Mount	0.1200	1	0.1200
Linear Sensor Spacer	1.3400	1	1.3400
Brake Pedal Pivot Sleeve	1.6600	1	1.6600
Throttle Pedal Pivot Sleeve	1.6700	1	1.6700
Linear Rail	2.4300	2	4.8600

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rod End, Industrial	Attaching master cylinder to balance bar	0.3125 in						1	2.48	2.48
Bearing, Cylindrical Roller	Brake pedal pivot	0.8125 in	0.625 in					1	5.07	5.07

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Bearing, Cylindrical Roller	Upper trunnion pivot	0.6875 in	0.5 in					1	4.60	4.60
Bearing, Cylindrical Roller	Lower trunnion pivot	0.8125 in	0.625 in					1	5.07	5.07
Bearing, Linear, Open	Pedalbox slider	0.67 in	1.65 in					2	14.56	29.11
Switch, Toggle	Brake overtravel							1	1.00	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Interference	Press upper bearing in for balance bar	1		1	0.19	0.19
Assemble, 1 kg, Loose	Insert balance bar trunnion and thrust washers	1		1	0.06	0.06
Assemble, 1 kg, Interference	Press lower bearing in for balance bar	1		1	0.19	0.19
Assemble, 1 kg, Interference	Press pivot bearing into pedal	1		1	0.19	0.19
Assemble, 1 kg, Interference	Insert snap ring into brake pedal	1		1	0.19	0.19
Assemble, 1 kg, Loose	Locate brake pedal mounts	2		1	0.06	0.12
Power Tool <= 25.4 mm	Insert brake pedal mount bolts into pedal and fasten (helicoil in baseplate)	4		1	0.25	1.00
Assemble, 1 kg, Line-on-Line	Insert brake pedal sleeve into brake pedal	1		1	0.13	0.13
Assemble, 1 kg, Loose	Insert brake pedal with delrin washers into baseplate and put brake pedal bolt through	1		1	0.06	0.06
Ratchet <= 25.4 mm	Brake pedal pivot	1		1	0.75	0.75
Reaction Tool <= 25.4 mm	Brake pedal pivot	1		1	0.25	0.25
Hand, Loose > 25.4 mm	Balance bar into trunnion	1		1	0.75	0.75
Assemble, 1 kg, Loose	Balance bar shoulder bolt through: washer, rod end, balance bar sleeve, rod end, washer	1		1	0.06	0.06
Ratchet <= 25.4 mm	Balance bar shoulder bolt	1		1	0.75	0.75
Reaction Tool <= 25.4 mm	Balance bar shoulder bolt	1		1	0.25	0.25
Ratchet <= 25.4 mm	Master cylinder mounts	4		1	0.75	3.00
Reaction Tool <= 25.4 mm	Master cylinder mounts	4		1	0.25	1.00
Power Tool <= 6.35 mm	Carriages to baseplate	16		1	0.25	4.00
Reaction Tool <= 25.4 mm	Carriages to baseplate	16		1	0.25	4.00
Hand - Start Only	Nut on quick release pin	4		1	0.12	0.48
Reaction Tool <= 25.4 mm	Nut on quick release pin	4		1	0.25	1.00
Wrench <= 25.4 mm	Nut on quick release pin and into baseplate	4		1	1.50	6.00
Power Tool <= 6.35 mm	IGUS Rails to welded angle	18		1	0.25	4.50
Reaction Tool <= 6.35 mm	IGUS Rails to welded angle	18		1	0.25	4.50
Ratchet <= 25.4 mm	Throttle pedal mounts	4		1	0.75	3.00
Reaction Tool <= 25.4 mm	Throttle pedal mounts	4		1	0.25	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Interference	Press throttle sleeve into pedal	1		1	0.19	0.19
Assemble, 1 kg, Loose	Bottom and top throttle pedal stop	1		1	0.06	0.06
Wrench <= 25.4 mm	Throttle pedal stops	2		1	1.50	3.00
Reaction Tool <= 25.4 mm	Throttle pedal stops	2		1	0.25	0.50
Assemble, 1 kg, Loose	Throttle pedal bolt through: throttle pedal mount, throttle spacer and spring, throttle pedal sleeve, then other throttle spacer	1		1	0.06	0.06
Ratchet <= 25.4 mm	Throttle pedal bolt	1		1	0.75	0.75
Reaction Tool <= 25.4 mm	Throttle pedal bolt	1		1	0.25	0.25
Assemble, 10 kg, Line-on-Line	Fit the springs into the spring mounts and put both bolts through the mounts	2		1	1.25	2.50
Power Tool <= 25.4 mm	Spring mount fasteners	2		1	0.25	0.50
Reaction Tool <= 25.4 mm	Spring mount fasteners	2		1	0.25	0.50
Assemble, 1 kg, Interference	Bolt through: throttle pedal, linear sensor, spacer, linear sensor, pedal again	1		1	0.19	0.19
Ratchet <= 25.4 mm	Linear sensor bolt on pedal	1		1	0.75	0.75
Reaction Tool <= 25.4 mm	Linear sensor bolt on pedal	1		1	0.25	0.25
Assemble, 1 kg, Loose	Linear sensors to baseplate	2		1	0.06	0.12
Power Tool <= 25.4 mm	Linear sensor to baseplate	2		1	0.25	0.50
Reaction Tool <= 25.4 mm	Linear sensor to baseplate	2		1	0.25	0.50
Power Tool <= 25.4 mm	Foot cup to brake pedal	2		1	0.25	0.50
Power Tool <= 25.4 mm	Foot cup to gas pedal	2		1	0.25	0.50
Reaction Tool <= 25.4 mm	Foot cup to gas pedal	2		1	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Pin, Quick Release	Fastening the pedal box to the linear rails	0.233 in	0.35 in	4	14.31	57.25
Bolt, Grade 10.9 (SAE 8)	Brake pedal mounting bolts	0.25 in	1 in	4	0.08	0.32
Bolt, Grade 10.9 (SAE 8)	Brake pedal pivot	0.3125 in	2.75 in	1	0.40	0.40
Nut, Grade 10.9 (SAE 8)	Brake pedal pivot	0.3125 in	0.35 in	1	0.06	0.06
Bolt, Shoulder Bolt	Balance bar	0.3125 in	3 in	1	1.05	1.05
Nut, Grade 10.9 (SAE 8)	Balance bar	0.25 in	0.3125 in	1	0.04	0.04
Washer, Grade 10.9 (SAE 8)	Single shear shoulder bolt for balance bar	0.75 in		2	0.02	0.04
Pin, Cotter, Hairpin	Sleeve to balance bar shoulder bolt			1	0.05	0.05
Bolt, Grade 10.9 (SAE 8)	Master cylinder mount	0.25 in	0.75 in	2	0.06	0.12
Bolt, Grade 10.9 (SAE 8)	Master Cylinder mount	0.25 in	1.875 in	2	0.16	0.31

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Washer, Grade 10.9 (SAE 8)	Single shear master cylinder mount	0.625 in		2	0.02	0.04
Nut, Grade 10.9 (SAE 8)	Master cylinder mounts	0.25 in	0.3125 in	4	0.04	0.17
Bolt, Grade 10.9 (SAE 8)	Throttle pedal mounts	0.1875 in	0.75 in	4	0.04	0.14
Bolt, Grade 10.9 (SAE 8)	Throttle pedal bolt	0.25 in	4.5 in	1	0.50	0.50
Nut, Grade 10.9 (SAE 8)	Throttle pedal bolt	0.25 in	0.3125 in	1	0.04	0.04
Bolt, Grade 10.9 (SAE 8)	Throttle spring mounts	0.1875 in	2.25 in	1	0.11	0.11
Nut, Grade 10.9 (SAE 8)	Throttle spring mounts	0.1875 in	0.1875 in	1	0.03	0.03
Bolt, Grade 10.9 (SAE 8)	Linear sensor to pedal bolt	0.13 in	1.375 in	1	0.03	0.03
Nut, Grade 10.9 (SAE 8)	Linear sensor to pedal nut	0.13 in	0.125 in	1	0.02	0.02
Bolt, Grade 10.9 (SAE 8)	Linear sensor to baseplate	0.13 in	1.75 in	2	0.04	0.08
Nut, Grade 10.9 (SAE 8)	Linear sensor to baseplate	0.13 in	0.125 in	2	0.02	0.05
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Foot cup to brake pedal	0.1875 in	0.25 in	2	0.01	0.03
Bolt, Grade 12.9	Foot cup to gas pedal	0.1875 in	1.25 in	1	0.07	0.07
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Foot cup to gas pedal	0.1875 in	0.1875 in	1	0.02	0.02

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Brake Pedal

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-01437	A	7075 Aluminum CNC Machined Brake Pedal	$19.12	1	$19.12

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Brake Pedal			rectengular cross section with additional materi	2.16 in^2	11.84 in	0.098 lb/in^3	1	4.77	4.77

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	5-axis mill	1		1	1.30	1.30
Machining	Machine all features	9.457	Material - Aluminum	1	0.04	6.20
Machining Setup, Change	Flip Part	1		1	0.65	0.65
Machining	Machine other side	9.457	Material - Aluminum	1	0.04	6.20
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Brake Pedal Mount

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00097	A	Mounts that fasten into keys on the base plate and thread into it	$1.38	2	$2.76

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Extrude view	1.7 in^2	0.58 in	0.098 lb/in^3	1	0.18	0.18

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up in 4-axis mill	0.5		1	1.30	0.65
Machining	Mil profile top down, mill holes and counterbore	0.2	Material - Aluminum	1	0.04	0.13
Machining Setup, Change	Flip to face	0.5		1	0.65	0.32
Machining	Face to finish	0.15	Material - Aluminum	1	0.04	0.10
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Brake Pedal Thrust Washers

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00082	A	Slippery delrin washer to fix the brake and allow a smooth pivot	$0.74	2	$1.48

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Acetal (by Dimensions)				circular cross section	1.23 in^2	0.325 in	0.051 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Put in lathe	1	Material - Plastic	0.5	1.30	0.65
Machining	Face, turn ID, cut off	0.18	Material - Plastic	0.5	0.04	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Brake and Throttle Foot Cup

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-02375	A	Aluminum foot cup bent to fit close to the brake and throttle pedal	$1.80	2	$3.60

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Shear size	20.33 in^2	0.09 in	0.098 lb/in^3	1	0.34	0.34

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Waterjet Cut	Cutting profile and holes	18.25		1	0.01	0.46
Sheet metal bends	Bend edges	4		1	0.25	1.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Bias Bar Trunnion

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00515	A	17-4 PH stainless steel turned trunnion for balance bar	$3.88	1	$3.88

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)	17-4PH bar stock			Cylindrical	0.55 in^2	1.86 in	0.284 lb/in^3	1	0.30	0.30

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up in lathe with live tooling	1		1	1.30	1.30
Machining	Turn OD and drill	0.617	Material - Stainless Steel	3.75	0.04	1.52
Threading, Internal (machining)	Thread centre of trunion	0.8	Material - Stainless Steel	3.75	0.10	0.76

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Bias Bar Sleeve

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00516	A	Sleeve for balance bar shoulder bolt	$3.94	1	$3.94

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)	17-4PH H900 0.5" bar stock			Diameter	0.2 in^2	2.2 in	0.284 lb/in^3	1	0.13	0.13

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	CNC lathe with live radial tooling	1		1	1.30	1.30
Machining	mill radial slot drill center	0.25	Material - Stainless Steel	3.75	0.04	0.61
Threading, External (machining)		2	Material - Stainless Steel	3.75	0.10	1.90

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Gas Pedal

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00089	A	CCM Hockey sticks are very stiff and are reinforced quite heavily, working well for a gas pedal	$18.86	1	$18.86

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Hockey stick	0.18 lb					0.057 lb/in^3	1	16.33	16.33

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	into mill	1		1	1.30	1.30
Machining		0.46		1	0.04	0.30
Machining Setup, Change	Flip Part	1		1	0.65	0.65
Machining		0.2		1	0.04	0.13

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Mold Tool	Rectangle	0.023	3000	1	20000.00	0.15

Frame & Body › Pedal box › Throttle Pedal Mount

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00093	A	6061 Aluminum CNC gas pedal mounts with slot for torsion springs	$3.34	2	$6.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Front	2 in^2	1.25 in	0.098 lb/in^3	1	0.47	0.47

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Fixture stock	1	Material - Aluminum	1	1.30	1.30
Machining	Do all top down and holes	1.1		1	0.04	0.72
Machining Setup, Change	Flip	1		1	0.65	0.65
Anodizing		1		1		
Machining		0.3		1	0.04	0.20

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Throttle Spring Top Mount

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-0087	A	Torsion spring attachment piece to the throttle pedal	$2.22	2	$4.44

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				rectangular cross section with additional side f	0.78 in^2	0.53 in	0.098 lb/in^3	1	0.08	0.08

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		1		1	1.30	1.30
Machining	Drill fastening holes	0.15		1	0.04	0.10
Machining Setup, Change		1		1	0.65	0.65
Machining	Drill spring hole	0.143		1	0.04	0.09
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Pedal Box Base plate

P/N Base	Suffix	Details	Cost	Qty	Total
ERC21-01136	A	Baseplate connecting the IGUS rails to the assembly	$22.36	1	$22.36

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)				Top	111.4 in^2	0.32 in	0.098 lb/in^3	1	6.66	6.66

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Fixture baseplate	1		1	1.30	1.30
Machining	Face, pocket, mill holes, threadmill	7	Material - Aluminum	1	0.04	4.59
Machining Setup, Change	Flip baseplate	1		1	0.65	0.65
Machining	Face, pocket	10.1	Material - Aluminum	1	0.04	6.62
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Thread Insert	1/4-28 helicoils for inset brake pedal mounting holes	0.25 in		4	0.64	2.54

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Linear Potentiometer Mount

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-02712	A	Levels linear potentiometers for better transmission angle	$0.70	2	$1.40

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				.38" cross section	0.113 in^2	1.52 in	0.098 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Change	Put in lathe	1		1	0.65	0.65
Machining	drill, cut off	0.025		1	0.04	0.02

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Throttle Stopper top

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00085	A	Positive lock at 20 degrees for the throttle pedal	$3.26	1	$3.26

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Top down	1.7 in^2	1.08 in	0.098 lb/in^3	1	0.34	0.34

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Fixture the bar stock	1		1	1.30	1.30
Machining	Machine profile	0.94		1	0.04	0.62
Machining Setup, Change	Flip	1		1	0.65	0.65
Tapping holes	Drill and tap bottom holes	1		1	0.35	0.35
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Throttle Stopper Bottom

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00086	A	6061 Aluminum angle cut to length for a resting throttle pedal stop	$1.66	1	$1.66

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Bar Stock			Small cross section	0.125 in^2	1.55 in	0.098 lb/in^3	1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Fixture	1		1	1.30	1.30
Machining	Cut to length and Drill holes	0.1		1	0.04	0.07
Sheet metal bends		1		1	0.25	0.25
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Master Cylinder Mount

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00092	A	Steel mounts for master cylinders that fit into keyed slots in the base plate	$2.87	2	$5.74

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)	17-4PH bar			Top down	1.2 in^2	0.82 in	0.284 lb/in^3	1	0.29	0.29

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up for top down	1		1	1.30	1.30
Machining	Outer profile	0.25	Material - Stainless Steel	3.75	0.04	0.61
Machining Setup, Change	Flip	1		1	0.65	0.65
Machining	Counterbore and make holes	0.15	Material - Stainless Steel	3.75	0.04	0.02

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Brake Overtravel Switch Mount

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-01337	A	3D Printed mount for the brake over travel switch	$0.12	1	$0.12

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, ABS (per kg)		0.0035 kg						1	0.01	0.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Create Part	0.0035		1	32.00	0.11

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Linear Sensor Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-0035	A	Spacer between linear sensors	$1.34	1	$1.34

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)					0.307 in^2	0.5 in	0.098 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set up in lathe	1	Material - Aluminum	1	1.30	1.30
Machining	Drill hole	0.008		1	0.04	0.01

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Brake Pedal Pivot Sleeve

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00083	A	Pivot for the brake pedal bearing - to be pressed against the the brake pedal mounts to stop rotation so that the bearing will rotate about	$1.66	1	$1.66

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)				Front	0.307 in^2	1.2 in	0.284 lb/in^3	1	0.11	0.11

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set in lathe	1		1	1.30	1.30
Machining	Drill hole, cut off	0.1	Material - Stainless Steel	3.75	0.04	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Throttle Pedal Pivot Sleeve

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00090	A	Pivot sleeve that gets pressed into the throttle pedal	$1.67	1	$1.67

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Diameter	0.15 in^2	1.2 in	0.098 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Set in lathe	1	Material - Aluminum	1	1.30	1.30
Machining	drill, turn down, part	0.52	Material - Aluminum	1	0.04	0.34

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame & Body › Pedal box › Linear Rail

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00510	A	IGUS Slide Rail (TS-04-15-400)	$2.43	2	$4.86

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Rectangular Cross Section	0.28 in^2	13.83 in	0.098 lb/in^3	1	0.72	0.72

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into Mill	0.5		1	1.30	0.65
Machining		1.61		1	0.04	1.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Frame System Drawings

Electrical System Section

Instruments, Wiring & Accessories › ECUs and Wiring Harness

P/N Base	Suffix	Details	Cost	Qty	Total
ELA22-00556	A		$1514.98	1	$1514.98

Part	Cost	Quantity	Subtotal
Life Racing GPS-IMU	49.0000	1	49.0000
Main Wiring Harness	361.6700	1	361.6700
Brake Plausibility	36.7600	1	36.7600
PDU	92.5500	1	92.5500

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
ECU, Link, G4X FuryX	ECU	1 unit						1	975.00	975.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › ECUs and Wiring Harness › Life Racing GPS-IMU

P/N Base	Suffix	Details	Cost	Qty	Total
SEN-01906	A	Life Racing GPS-AG50	$49.00	1	$49.00

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Sensor, GPS	Tracking location of car							1	20.00	20.00
Sensor, Accelerometer, 3 Axis	VD data							1	8.00	8.00
Sensor, Gyroscope	VD data							1	15.00	15.00
Connector, Aerospace Quality		6 pin						1	6.00	6.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › ECUs and Wiring Harness › Main Wiring Harness

P/N Base	Suffix	Details	Cost	Qty	Total
ELA23-00563	A	Central Wiring harness, separate from the rear of the car by 64 connector. See wiring harness diagram for details	$361.67	1	$361.67

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Connector, OEM Quality	ECU Connectors	68 pin						1	34.00	34.00
Connector, OEM Quality	PDU Connector	39 pin						1	19.50	19.50
Connector, OEM Quality	Firewall Connector	64 pin						1	32.00	32.00
Connector, OEM Quality	Brake Plaus & Dash	12 pin						2	6.00	12.00
Connector, OEM Quality	Steering wheel	6 pin						1	3.00	3.00
Connector, OEM Quality	Sensors	3 pin						12	1.50	18.00
Connector, OEM Quality	Fuel Tank & Brake Plaus & CAN	4 pin						3	2.00	6.00
Connector, Aerospace Quality	GPS/IMU Connector	6 pin						1	6.00	6.00
Wire, Power	PDU -> Battery	3 ft						1	2.74	2.74
Wire, Signal and Control	ECU and PDU	30 ft						1	9.14	9.14
Connector, Single Wire	Ground node	10 wire						1	0.50	0.50
Wire, Signal and Control	approx 372' total on car split between front and back	186 ft						1	56.69	56.69
Wire, Power	PMU -> kill switch -> Battery	5 ft						1	4.57	4.57
Switch, Kill								1	3.00	3.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Wire Dressing (Install and route)	Place wiring harness in car	3		1	1.00	3.00
Cut wire	Prepare for connector	272		1	0.08	21.76
Strip Wire	Prepare for connector	272		1	0.08	21.76
Connector Install, Individual Quick Connect	brake plaus, fuel tank, imu, ground node	25		1	0.10	2.50
Lay Wire	ECU and PDU	186		1	0.02	1.13

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Insert Bundle Into Tube or Sleeve		5		1	0.02	0.10
Install Tie Wrap (Zip Tie, Cable Clamp)	Secure wiring harness	5		1	0.09	0.45
Tape	Harness tape	1		1	0.80	0.80
Connector Install, With Fasteners	Ground node, kill switch	7		1	0.50	3.50
Power Tool <= 6.35 mm	fasten kill switch and ground node	3		1	0.25	0.75
Connector Assembly, Crimp		272		1	0.36	97.92
Reaction Tool <= 6.35 mm	fasten kill switch, ground node	3		1	0.25	0.75

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	10-32 for kill switch & ground lug	0.19 in	0.5 in	3	0.02	0.05
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8		0.19 in		3	0.02	0.06

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › ECUs and Wiring Harness › Brake Plausibility

P/N Base	Suffix	Details	Cost	Qty	Total
ELA22-00564	A	Brake Plausibility PCB for ETC	$36.76	1	$36.76

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Relay, Power								2	4.00	8.00
Circuit Card Assembly (2 layer)		1936 mm^2						1	7.74	7.74
Connector, Wire to Board, OEM Quality		6 pin						1	3.00	3.00
Simple PCB component		64 unit						1		
Wire, Signal and Control		4 ft						1	1.22	1.22
Wire, Power		2 ft						1	1.83	1.83

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Reaction Tool <= 6.35 mm	Hold Nut	2		1	0.25	0.50
Power Tool <= 6.35 mm	Install Bolt	2		1	0.25	0.50
Assemble, 1 kg, Loose	components onto pcb	1		1	0.06	0.06
Circuit Card Assembly Labor - Hand Soldering		64		1	0.05	3.20
Cut wire		12		1	0.08	0.96
Strip Wire		12		1	0.08	0.96
Connector Assembly, Crimp		24		1	0.36	8.64
Lay Wire		6		1	0.02	0.04
Insert Bundle Into Tube or Sleeve		1		1	0.02	0.01

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 8.8 (SAE 5)	Secure Brake Plausibility Device	6 mm		2	0.03	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Secure Brake Plausibility Device	6 mm		2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › ECUs and Wiring Harness › PDU

P/N Base	Suffix	Details	Cost	Qty	Total
OTSA-00563 ECUMaster PMU16 (PMU1	A		$92.55	1	$92.55

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Complex Integrated Circuit		1 unit						1	10.00	10.00
Circuit Card Assembly (multilayer)		10 in^2						1	38.71	38.71
Simple PCB component		100						1		
Connector, OEM Quality		39 pin						1	19.50	19.50
Aluminum, Normal (by Dimensions)				Rectangular Cross Section	19.65 in^2	1.36 in	0.098 lb/in^3	1	4.99	4.99

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Circuit Card Assembly Labor - Pick and Place		100		1	0.01	1.00
Solder Paste Apply		2		1	1.00	2.00
Conformal Coat Apply		2		1	5.00	10.00
Machining Setup, Install and remove	Aluminium into the mill	1		1	1.30	1.30
Machining		7.5		1	0.04	4.92
Assemble, 1 kg, Line-on-Line	Install circuit board into case	1		1	0.13	0.13

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › Battery and Battery Control Circuit

P/N Base	Suffix	Details	Cost	Qty	Total
ELA22-00557	A	Power and harness components directly connected to the battery. Refer to Battery [6] connector on main diagram	$66.11	1	$66.11

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Battery, Advanced Chemistry (NiMH, Li-Ion, etc.)	Battery	0.5 kg						1	32.50	32.50
Switch, Kill								1	3.00	3.00
Relay, Power	Starter							1	4.00	4.00
Wire, Power	Starter & Killswitch	1 m						1	3.00	3.00
Wire, Power	Battery Ground	0.15 m						1	0.45	0.45
Wire, Power	Battery charger cable	1 m						1	3.00	3.00
Connector, High Power, > 2 Amps	Lugs GND, Shift, & killswitch	1 pin						6	2.00	12.00
Connector, OEM Quality	Charger connector	1 pin						2	0.50	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Strip Wire	Strip Power Wires	8		1	0.08	0.64
Attach Wire, Ring	Starter	2		1	0.48	0.96
Attach Wire, Ring	Ground	2		1	0.48	0.96
Attach Wire, Ring	Charger	2		1	0.48	0.96
Crimp Wire	Crimp Lugs to Wires	6		1	0.17	1.02
Crimp Wire	Charger ring connector	2		1	0.17	0.34
Connector Assembly, Crimp	Charger connector	2		1	0.36	0.72
Power Tool <= 6.35 mm	Fasten Bolt	2		1	0.25	0.50
Power Tool <= 6.35 mm	Tighten starter lug	1		1	0.25	0.25
Power Tool <= 25.4 mm	tighten killswitch lug	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Secure Battery and battery lugs	0.25 in	0.5 in	3	0.03	0.09
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Starter	0.25 in		1	0.02	0.02
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Killswitch	0.25 in		2	0.02	0.05
Nut, Lug	Battery Mount			1	0.40	0.40

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › Engine Sensors and Wiring Harness

P/N Base	Suffix	Details	Cost	Qty	Total
ELA22-00558	A		$417.24	1	$417.24

Part	Cost	Quantity	Subtotal
Engine Sensors	75.0000	1	75.0000
Engine Wiring Harness	241.6300	1	241.6300
Brake Light	3.9600	1	3.9600

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
ECU, AEM, Coil driver 30-2840	4-Channel Coil Driver							1	93.75	93.75

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Connector Install, With Fasteners	Firewall Connector	4		1	0.50	2.00
Install Tie Wrap (Zip Tie, Cable Clamp)	Secure harness to frame	10		1	0.09	0.90

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › Engine Sensors and Wiring Harness › Engine Sensors

P/N Base	Suffix	Details	Cost	Qty	Total
ELA22-00559	A		$75.00	1	$75.00

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Sensor, Wide Band Air Fuel Raito	Wideband O2							1	35.00	35.00
Sensor, Hall Effect	Cam, Crank Position							2	4.00	8.00
Sensor, Manifold Absolute Pressure (MAP)	Manifold Air Pressure							1	4.00	4.00
Sensor, Air Temperature	Manifold Air Temperature							1	4.00	4.00
Sensor, Temperature	Coolant, Oil Temperature							2	8.00	16.00
Sensor, Fluid Pressure	Fuel, Oil Pressure							2	4.00	8.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › Engine Sensors and Wiring Harness › Engine Wiring Harness

P/N Base	Suffix	Details	Cost	Qty	Total
ELA22-00560	A		$241.63	1	$241.63

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Connector, OEM Quality	Firewall Connector	64 pin						1	32.00	32.00
Connector, OEM Quality	Coil driver 5 pin	5 pin						1	2.50	2.50
Connector, OEM Quality	MAPT, CAN, Coil Driver,	4 pin						3	2.00	6.00
Connector, OEM Quality	Wideband O2, ETB, Fuel Rail	6 pin						2	3.00	6.00
Connector, OEM Quality	Injectors & Coils	2 pin						8	1.00	8.00
Connector, OEM Quality	Coolant, Oil Temperature	2 pin						9	1.00	9.00
Connector, OEM Quality	Cam, Crank, Throttle Position, Wheelspeed sensors, fuel pressure, oil pressure, damper position	3 pin						8	1.50	12.00
Wire, Signal and Control	All sensors controlled by ECU/PDU	186 ft						1	56.69	56.69
Wire, Power	Starter, coil drivers	10 ft						1	9.14	9.14
Connector, Single Wire	ground crimp	6 wire						1	0.30	0.30

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Strip Wire	Prepare for sensors and connectors	187		1	0.08	14.96
Cut wire	Prepare for sensors and connectors	187		1	0.08	14.96
Crimp Wire	Prepare for connectors	36		1	0.17	6.12

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Connector Assembly, Crimp	Crimping contacts	151		1	0.36	54.36
Insert Bundle Into Tube or Sleeve		5		1	0.02	0.10
Wire Dressing (Install and route)	Place harness into car	4		1	1.00	4.00
Tape	Harness taping	2		1	0.80	1.60
Connector Install, Individual Quick Connect		34		1	0.10	3.40
Connector Install, With Fasteners	Ring termincal gnd	1		1	0.50	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Instruments, Wiring & Accessories › Engine Sensors and Wiring Harness › Brake Light

P/N Base	Suffix	Details	Cost	Qty	Total
ELA20-00561	A		$3.96	1	$3.96

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Lamp, LED	Brake light strip LED							1	0.50	0.50
Heat Shrink Tubing	Waterproofing LED	0.25 m						1	0.13	0.12
Wire, Signal and Control	Brake signal, power	0.01 m						2	0.01	0.02
Connector, OEM Quality	Connect LED	2 pin						1	1.00	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lay Wire	Prepare wire for LED	0.02		1	0.02	
Cut wire	Prepare for LED and connector	4		1	0.08	0.32
Strip Wire	Prepare for LED and connector	4		1	0.08	0.32
Connector Assembly, Crimp	Prepare for connector	2		1	0.36	0.72
Connector Install, Individual Quick Connect	Attach connector	1		1	0.10	0.10
Attach Wire, Solder	Connect wires to LED	2		1	0.43	0.86

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Electrical System Drawings

Miscellaneous System Section

Miscellaneous, Safety, Finish and Assembly › Seat

P/N Base	Suffix	Details	Cost	Qty	Total
ERA22-00541	A		$332.83	1	$332.83

Part	Cost	Quantity	Subtotal
Seat	301.5100	1	301.5100
Seat Mounts	6.9700	2	13.9400
rear seat mount	3.4800	1	3.4800

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rubber (by Dimensions)				Rectangular Area	8 in^2	0.1 in	0.04 lb/in^3	1	0.05	0.05

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Weld	Weld Inner seat mount nuts to chassis, length based on size of weld nut (1" diameter)	3.14	Repeat 4	4	0.15	4.79
Power Tool <= 6.35 mm	Fasten the mounting plates onto the seat	1	Repeat 16	16	0.25	4.00
Reaction Tool <= 6.35 mm	Fasten the mounting plates onto the seat	1	Repeat 16	16	0.25	4.00
Assemble, 1 kg, Loose	Stick rubber onto rear seat mount	1		1	0.06	0.06
Assemble, 10 kg, Loose	Install seat into car	1		1	0.63	0.63

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Seat mount bolts 10-32	0.19 in	0.5 in	8	0.02	0.18
Nut, Grade 8.8 (SAE 5)	10-32	0.19 in		8	0.02	0.19

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Seat › Seat

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03728	A	Carbon fiber seat	$301.51	1	$301.51

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Seat	1 kg					1580 kg/m^3	1	200.00	200.00
Edge protection	Cover carbon edges	2 m						1	6.00	6.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	Carbon application to mold	0.47	Repeat 5	5	35.00	82.25
Resin application, Infusion Molding	Carbon wetting	0.47		1	2.50	1.17
Cure, Room Temperature	cure seat	0.47		1	10.00	4.70
Hand Finish - Material Removal	clean edges	10	Material - Composite	2	0.20	4.00
Assemble, 1 kg, Loose	Add trim to edges	1		1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Mold Tool	seat mold	0.5	3000	1	20000.00	3.33

Miscellaneous, Safety, Finish and Assembly › Seat › Seat Mounts

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03475	A	Seat pin mounts consist of welded tube to the frame with a aluminium pin mounted the carbon seat	$6.97	2	$13.94

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Sheet			Plate area	6.5 in^2	0.09 in	0.098 lb/in^3	1	0.11	0.11
Aluminum, Normal (by Dimensions)	Tube .75" OD			Cross sectional area	1.77 in^2	2.03 in	0.098 lb/in^3	1	0.67	0.67
Tubing, Steel	Pin inserts .625" OD X 1.25" 0.065" wall	0.04 lb						1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	sheet into waterjet	0.5		1	1.30	0.65
Waterjet Cut	Cut out profile	11.75	Material - Aluminum	1	0.01	0.30
Machining Setup, Install and remove	Into lathe	0.5		1	1.30	0.65
Machining	Face, drill 5/8" hole, turn down pin	0.37	Material - Aluminum	1	0.04	0.24
Weld	Weld pin to sheet	2.7	Material - Aluminum	1	0.15	1.03
Tube end preperation for welding	Prep pin for welding to plate	1		1	0.75	0.75
Tube end preperation for welding	Prep tube for welding to chassis	1	Material - Steel	3	0.75	2.25
Weld	Weld pin to chassis	0.625	Material - Steel	3	0.15	0.28

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Seat › rear seat mount

P/N Base	Suffix	Details	Cost	Qty	Total
SUC-03518	A	Holds rear of seat up from chassis	$3.48	1	$3.48

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	Steel sheet 14Ga			Rectangular cross section	10 in^2	0.0747 in	0.284 lb/in^3	1	0.22	0.22
Tubing, Steel	3/4" 0.049" Tube 3.75" Long	0.07 lb						2	0.07	0.14

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut tube to lenth	0.75		1	0.15	0.29
Tube end preperation for welding	Prep tube for welding	1	Repeat 2	2	0.75	1.50
Weld	weld tubes to plate & chassis	3.5		1	0.15	1.33

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Head rest

P/N Base	Suffix	Details	Cost	Qty	Total
ERA22-00553	A		$14.35	1	$14.35

Part	Cost	Quantity	Subtotal
Carbon Headrest Panel	5.7800	1	5.7800
Foam Headrest	6.2200	1	6.2200

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 6.35 mm	Mount back plate	1	Repeat 4	4	0.25	1.00
Reaction Tool <= 6.35 mm	back plate	1	Repeat 4	4	0.25	1.00
Tape	apply velcro backing	0.5		1	0.80	0.12
Assemble, 1 kg, Loose	install foam pad onto plate	1		1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Back plate mounts	0.197 in	0.75 in	4	0.02	0.09
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	back plate mounts	0.197 in		4	0.02	0.08

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Head rest › Carbon Headrest Panel

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-02841	A	Pre-preg carbon fiber sandwich plate	$5.78	1	$5.78

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply	Carbon skin	0.01 kg					1580 kg/m^3	1	2.00	2.00
Honeycomb, Nomex	Sandwich core	0.02 kg						1	2.50	2.50

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Cure, Autoclave	Cure plate	0.023		1	50.00	1.15
Tape	hook and loop	0.5		1	0.80	0.12

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal
Lamination - Flat Panel Tool		0.0074	1000	1	1500.00	0.01

Miscellaneous, Safety, Finish and Assembly › Head rest › Foam Headrest

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-02843	A		$6.22	1	$6.22

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Head Rest Padding		74.4 in^3						1	6.10	6.10

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Attach adhesive velcro	1	Repeat 2	2	0.06	0.12

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Driver harness

P/N Base	Suffix	Details	Cost	Qty	Total
ERC20-00600	A	The system entailing the safety restraints between the driver and the chassis of the vehicle	$51.52	1	$51.52

Part	Cost	Quantity	Subtotal
Harness Spacer	0.2300	8	1.8400

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Harness, Driver								1	45.00	45.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 25.4 mm	Install lower harness bolts	1	Repeat 4	4	0.25	1.00
Reaction Tool <= 25.4 mm	Nylock	1	Repeat 4	4	0.25	1.00
Assemble, 1 kg, Loose	Install shoulder harness	1	Repeat 2	2	0.06	0.12

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 10.9 (SAE 8)	Lower harness	0.375 in	0.25 in	4	0.08	0.32
Bolt, Shoulder Bolt		0.375 in	0.75 in	4	0.56	2.24

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Driver harness › Harness Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
CHC22-01820	A	A spacer used to secure the driver harness bracket	$0.23	8	$1.84

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				.75" Nom roundstock area	0.442 in^2	0.24 in	0.098 lb/in^3	1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	into lathe, all machined with same stock	0.125		1	1.30	0.16
Machining	machine features and part	0.075		1	0.04	0.05

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous, Safety, Finish and Assembly › Main hoop padding

P/N Base	Suffix	Details	Cost	Qty	Total
OTH22-02845	A	Padding along roll hoop	$2.77	2	$5.54

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Roll Hoop Padding		50 cm						1	2.50	2.50

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Install Tie Wrap (Zip Tie, Cable Clamp)	Attach to main hoop	1	Repeat 3	3	0.09	0.27

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Miscellaneous System Drawings

Steering System Section

Steering System › Steering Wheel

P/N Base	Suffix	Details	Cost	Qty	Total
ERA22-00356	A	3D Printed steering wheel with replaceable grips	$57.94	1	$57.94

Part	Cost	Quantity	Subtotal
Steering Wheel Body	10.9600	1	10.9600
Steering Wheel Front Panel	0.9200	1	0.9200
Steering Wheel Shift Paddle	0.1100	2	0.2200
Paddle Steel Actuator	1.0900	2	2.1800
Quick Release	11.7600	1	11.7600
Front Wheel Handles	2.2400	2	4.4800
Rear Wheel Handles	2.2400	2	4.4800

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Magnet, neodymium high strength	Paddle Shifter Magnets	0.002 kg					7850 kg/m^3	2	0.16	0.32
Spring, Tension (General)	Resists Quick Release Pull							1	1.00	1.00
Switch, Pushbutton	Steering Wheel Buttons and Microswitches							5	1.00	5.00
Wire, Signal and Control	Quick Release wire	0.25 m						6	0.25	1.50
Connector, OEM Quality	Quick release connection	6 pin						1	3.00	3.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 6.35 mm	Bolt Steering Wheel To Quick Release	3		1	0.25	0.75
Reaction Tool <= 25.4 mm	Quick release to wheel	3		1	0.25	0.75
Power Tool <= 6.35 mm	Steering wheel buttons	8		1	0.25	2.00
Reaction Tool <= 6.35 mm	Steering wheel buttons	8		1	0.25	2.00
Power Tool <= 6.35 mm	Bolt paddles to brackets	4		1	0.25	1.00
Power Tool <= 6.35 mm	Bolt steering wheel front panel to body	4		1	0.25	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 6.35 mm	Bolt Steering wheel handle to steering wheel	6		1	0.25	1.50
Assemble, 1 kg, Line-on-Line	paddles into clevice pins	2		1	0.13	0.26

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Steering Wheel to Quick Release Bolts	0.1875 in	1 in	3	0.04	0.11
Washer, Grade 10.9 (SAE 8)	Steering Wheel to Quick Release Washers	0.1875 in		3	0.02	0.06
Nut, Grade 8.8 (SAE 5)	Steering Wheel to Quick Release Nuts	0.1875 in		3	0.02	0.07
Bolt, Grade 8.8 (SAE 5)	Steering Wheel Front Panel Bolts	0.11 in	0.375 in	4	0.01	0.04
Bolt, Grade 8.8 (SAE 5)	Paddle Shifter Bolts	0.136 in	0.375 in	4	0.01	0.05
Bolt, Grade 8.8 (SAE 5)	Steering wheel handle bolts	0.136 in	0.375 in	6	0.01	0.07
Bolt, Grade 8.8 (SAE 5)	Steering wheel paddle microswitch bolts	0.1 in	1 in	4	0.01	0.05
Nut, Grade 8.8 (SAE 5)	Nuts for Microswitch	0.1 in		4	0.01	0.06
Pin, Safety, Square Retainer Snap	Shifter paddle pivots	0.1875 in	1.25 in	2	1.15	2.30
Retaining Ring, External		0.1875 mm		4	0.01	0.05

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Steering Wheel Body

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00522	A	3D Printed steering wheel	$10.96	1	$10.96

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Steering wheel body material	0.212 kg						1	0.70	0.70

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Rapid prototype steering wheel body	0.212		1	32.00	6.78
Power Tool <= 6.35 mm	Install thread inserts	6		1	0.25	1.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Thread Insert		0.12 in		4	0.30	1.22
Thread Insert		0.15 in		2	0.38	0.76

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Steering Wheel Front Panel

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-00427	A	3D Printed front cover for steering wheel body	$0.92	1	$0.92

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Steering wheel front panel material	0.026 kg						1	0.09	0.09

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Rapid prototype steering wheel front panel	0.026		1	32.00	0.83

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Steering Wheel Shift Paddle

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-02798	A	3D Printed part connects to steering wheel body via pin for shifting lever	$0.11	2	$0.22

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Nylon (per kg)	Paddle shifting bracket material	0.003 kg						1	0.01	0.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Printing wheel	0.003		1	32.00	0.10

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Paddle Steel Actuator

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00529	A	To actuate the paddles with magnets	$1.09	2	$2.18

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (per kg)	Paddle material	0.04 lb						1	0.04	0.04

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Place in waterjet	0.5		1	1.30	0.65
Waterjet Cut	Waterjet profile and holes	5.31	Material - Steel	3	0.01	0.40

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Quick Release

P/N Base	Suffix	Details	Cost	Qty	Total
OTS-00524	A	LifeLine Formula electric 8-pin quick release	$11.76	1	$11.76

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (per kg)	Quick release material	0.15 kg						1	0.63	0.63

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		1		1	1.30	1.30
Machining	Machine quick release	15		1	0.04	9.83

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Front Wheel Handles

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00525	A	3D Printed	$2.24	2	$4.48

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, ABS (per kg)	Steering wheel handle material	0.14 lb						1	0.21	0.21

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic		0.14		1	32.00	2.03

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Wheel › Rear Wheel Handles

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00526	A	3D Printed	$2.24	2	$4.48

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, ABS (per kg)		0.14 lb						1	0.21	0.21

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Rapid Prototype - Plastic	Making handles	0.14		1	32.00	2.03

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle

P/N Base	Suffix	Details	Cost	Qty	Total
ERA23-00684	A	Used for actuating the engine clutch from the drivers cockpit	$48.23	1	$48.23

Part	Cost	Quantity	Subtotal
Clutch Handle	7.0500	1	7.0500
Clutch Lever Stick	7.0500	1	7.0500
Angle Insert	2.4900	1	2.4900
Dual Direction Clutch Insert	3.4600	1	3.4600
Dual Direction Pivot Plate	3.2500	1	3.2500
Clutch Support Tab	1.0100	1	1.0100
SCW-HH-BRASS-ST-FT 0.3125-24X1.00 VENTED	1.7800	1	1.7800

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Cable, Pull	Clutch Cable	1.3 m						1	19.50	19.50

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Lamination, Manual	epoxy carbon for inserts, cured without bagging or other forms of air removal	0.009		1	35.00	0.26
Assemble, 1 kg, Interference	Attach inserted into epoxy	1		1	0.19	0.19
Tape	Tape top of handle for grip	1		1	0.80	0.24
Weld	Weld pivot plate and supports to chassis	2		1	0.15	0.76
Riveting	Install rivnut	1		1	0.25	0.25
Hand - Start Only	Insert clutch adjustment bolt	1		1	0.12	0.12
Assemble, 1 kg, Interference	Put cable into clutch and pull to tension	1		1	0.19	0.19
Power Tool <= 6.35 mm	screw in cable clamp	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Clamp cable into handle 10-32	0.19 in	0.375 in	1	0.02	0.02
Nut, Panel Retained	Clutch cable tensioner	0.313 in		1	0.36	0.36

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › Clutch Handle

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03846	A	Hockey stick section where driver grabs onto for actuating the clutch	$7.05	1	$7.05

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply		0.07 lb					0.057 lb/in^3	1	6.35	6.35

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Non-metallic cutting <= 50.8 mm	Cut stick to length	1		1	0.70	0.70

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › Clutch Lever Stick

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03532	A	Outer shell of carbon fiber for pivoting component	$7.05	1	$7.05

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply		0.03 kg					1580 kg/m^3	1	6.00	6.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Non-metallic cutting <= 76.2 mm	Cut pockets for insert	1		1	1.05	1.05

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › Angle Insert

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03848	A	Angled insert to connect upper and lower hockey stick carbon fiber	$2.49	1	$2.49

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				20x57 mm Rectangle Cross Section	1140 mm^2	27 mm	2712 kg/m^3	1	0.35	0.35

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	into 3-axis	1		1	1.30	1.30
Hand Finish - Material Removal	Deburr edges	2		1	0.20	0.40
Machining	Machine profile and part off	11		1	0.04	0.44

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › Dual Direction Clutch Insert

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03611	A		$3.46	1	$3.46

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				rectangle cross section 4.33x1.3	5.629 in^2	0.625 in	0.098 lb/in^3	1	0.66	0.66

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into 5 axis machine	1		1	1.30	1.30
Machining	machine profile & holes	2.29		1	0.04	1.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › Dual Direction Pivot Plate

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03613	A		$3.25	1	$3.25

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)				Plate rectangle area 4.42x5.26"	22.48 in^2	0.063 in	0.284 lb/in^3	1	0.41	0.41

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	into waterjet	1		1	1.30	1.30
Sheet metal bends	Bend along bend lines	4		1	0.25	1.00
Waterjet Cut		21.3		1	0.01	0.54

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › Clutch Support Tab

P/N Base	Suffix	Details	Cost	Qty	Total
ERC23-03988	A	used to brace the clutch in the car for better acutation	$1.01	1	$1.01

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)				Sheet rectangle 3.35x0.6"	2 in^2	0.63 in	0.284 lb/in^3	1	0.37	0.37

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Sheet Metal Saw Cut	Cut strip to size	1.25		1	0.20	0.64

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Dual Direction Clutch Handle › SCW-HH-BRASS-ST-FT 0.3125-24X1.00 VENTED

P/N Base	Suffix	Details	Cost	Qty	Total
MFH-03615	A	Brass bolt with hole through centre for clutch cable tensioning	$1.78	1	$1.78

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Brass (by Dimensions)				Round stock .56" OD	0.25 in^2	1.28 in	0.307 lb/in^3	1	0.10	0.10

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into 4axis lathe	1		1	1.30	1.30
Threading, External (machining)		1		1	0.10	0.25
Machining	create hex, turn down sections and hole	0.2		1	0.04	0.13

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack

P/N Base	Suffix	Details	Cost	Qty	Total
ERC22-00144	A	Steering column and rack	$196.43	1	$196.43

Part	Cost	Quantity	Subtotal
Rack Weld Coupler	1.9900	1	1.9900
Rack Spacer Tall	0.7400	2	1.4800
Steering bearing holder	9.0100	1	9.0100
Horizontal steering shaft	16.1700	1	16.1700
Steering Rack	49.4700	1	49.4700
Rack Spacer Short	0.4000	2	0.8000
Rack split clamp	2.0600	2	4.1200

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Bearing, Ball, Deep Groove	For Bearing Holder	25 mm	7 mm					2	6.61	13.23
Steering Column Universal Joint	For transmitting the steering wheel motion to the rack							2	20.00	40.00
Steel, Mild (by Dimensions)	Steering Column Shafts 5/8" x 0.065in x 12in			Tube Cross section	0.114 in^2	12 in	0.284 lb/in^3	1	0.40	0.40
Steel, Mild (by Dimensions)	Steering Column Support Tubes 3/8 x 0.035in x 18in			Tube Cross section	0.0374 in^2	18 in	0.284 lb/in^3	1	0.20	0.20
Steel, Alloy (by Dimensions)	Steering Support Tubes 5/8" x 0.060in x 24in			Tube Cross Section	0.1065 in^2	24 in	0.284 lb/in^3	1	0.74	0.74
Bearing, Spherical	Plastic spherical bearing	0.625 in						1	12.56	12.56
Carbon Fiber Reinf Carbon	Carbon fiber steering rack cover	0.05 in^3						1	7.54	7.54

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut tube for steering column shafts	0.625	Repeat 2	2	0.15	0.48
Tube cut	Cut tube for steering column support tubes	0.375	Repeat 3	3	0.15	0.43
Tube cut	Cut tube for steering support tubes	0.625	Repeat 3	3	0.15	0.71
Tube end preperation for welding	Prep tube ends for welds	4		1	0.75	3.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube end preperation for welding	Prep tube ends for welds	6		1	0.75	4.50
Tube end preperation for welding	Prep tube ends for welds	6		1	0.75	4.50
Weld	Weld horizontal steering shaft to U-Joint	2.34		1	0.15	0.89
Weld	Weld middle steering shaft to u-joint	1.96	Repeat 2	2	0.15	1.49
Weld	Weld vertical steering shaft to U-joint and rack weld coupler	1.96	Repeat 2	2	0.15	1.49
Weld	weld 3/8 steering column support tubes	8.25		1	0.15	3.14
Weld	weld 5/8 steering column support tubes	10		1	0.15	3.81
Power Tool <= 6.35 mm	fasten 0.25in bolts	6		1	0.25	1.50
Reaction Tool <= 6.35 mm	fasten 0.25in bolts	6		1	0.25	1.50
Power Tool <= 6.35 mm	fasten 0.197in bolts	4		1	0.25	1.00
Reaction Tool <= 6.35 mm	fasten 0.197in bolts	4		1	0.25	1.00
Assemble, 3 kg, Loose	assemble all components loosely	14		1	0.19	2.66
Safety Wire, Install	safety wire cotter pins	5		1	0.60	3.00
Lamination, Manual		0.05		1	35.00	1.75
Cure, Room Temperature		0.05		1	10.00	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Pin, Cotter, Straight	rack to shaft, splines to shaft			2	0.05	0.10
Bolt, Grade 8.8 (SAE 5)	steering rack mounting	0.25 in	2.25 in	4	0.16	0.62
Nut, Grade 8.8 (SAE 5)	steering rack, steering column	0.25 in		6	0.03	0.19
Bolt, Grade 8.8 (SAE 5)	steering column spherical bearing holder	0.25 in	2 in	2	0.13	0.27
Bolt, Grade 8.8 (SAE 5)	steering bearing holder	0.197 in	0.5 in	4	0.02	0.09
Nut, Grade 8.8 (SAE 5)	steering bearing holder	0.197 in		4	0.02	0.10

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Rack Weld Coupler

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00211	A	Coupling the steering rack to the bottom shaft through a weld and two spring pins in the rack	$1.99	1	$1.99

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	Tube 0.75 x 0.065 x 12in			circular face	0.14 in^2	12 in	0.284 lb/in^3	1	0.49	0.49

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install on 4-axis lathe	1		1	1.30	1.30
Machining	Drilled holes, face	0.1	Material - Steel	3	0.04	0.20

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Rack Spacer Tall

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00213	A	space steering rack for bump steer adjsutment	$0.74	2	$1.48

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Polyoxymethylene (POM) (by Dimensions)	Derlin 0.25in thick			Top face	1.137 in^2	0.25 in	0.051 lb/in^3	1	0.02	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	install into laser cutters	0.5		1	1.30	0.65
Laser Cut	cut profile	14.965	Material - Plastic	0.5	0.01	0.07

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Steering bearing holder

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00215	A	Holds the upper section of the steering rack, upper mount is steel and lower mount aluminium. Symmetrical parts	$9.01	1	$9.01

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)				Cross-Section	3.12 in^2	0.81 in	0.284 lb/in^3	1	0.73	0.73
Aluminum, Normal (by Dimensions)				Cross-Section	3.12 in^2	0.81 in	0.098 lb/in^3	1	0.47	0.47

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install stock material into 5-axis CNC	1		1	1.30	1.30
Machining	machine steel stock into part	1.986	Material - Steel	3	0.04	3.91
Machining Setup, Install and remove	install stock into 5-axis CNC	1		1	1.30	1.30
Machining	machine aluminum sotck into part	1.986	Material - Aluminum	1	0.04	1.30

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Horizontal steering shaft

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00216	A		$16.17	1	$16.17

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	Raw Stock			Cross Section	3.14 in^2	2.18 in	0.284 lb/in^3	1	1.98	1.98

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Put stock material into CNC lathe	1		1	1.30	1.30
Machining	remove material	6.554	Material - Steel	3	0.04	12.89

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Steering Rack

P/N Base	Suffix	Details	Cost	Qty	Total
OTSA-00072	A	NARRco Steering Rack with Sensor (13T-14.4)	$49.47	1	$49.47

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Steering Rack Body			Rectangular Cross Section	3.34 in^2	9.76 in	0.098 lb/in^3	1	6.09	6.09
Aluminum, Normal (by Dimensions)	Steering Rack			Circular Cross Section 0.7" diameter	0.385 in^2	13.02 in	0.098 lb/in^3	1	0.94	0.94
Steel, Mild (by Dimensions)	Steering rack pinion			Circular cross section 1.34" diameter	1.41 in^2	3.1 in	0.284 lb/in^3	1	1.27	1.27
Plastic, Acetal (by Dimensions)	steering rack stops			Circular cross section 0.96" diameter	0.724 in^2	0.76 in	0.051 lb/in^3	1	0.04	0.04
Clevis	steering rack clevis	0.25 in						2	1.01	2.03
Bearing, Ball, Deep Groove	Steering rack bearing	1.378 in	0.315 in					1	9.90	9.90
Seal, Radial Lip Seal	Steering rack seal							2	1.00	2.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install Aluminum stock into 5-axis CNC	1		1	1.30	1.30
Machining	Machine steering rack body	20.08	Material - Aluminum	1	0.04	13.16
Machining Setup, Install and remove	Install Aluminum stock into CNC lathe	1		1	1.30	1.30
Machining	maching steering rack	1.3527	Material - Aluminum	1	0.04	0.89
Tapping holes	tap ends of steering rack	1	Repeat 2	2	0.35	0.70
Machining Setup, Install and remove	Install steel stock into CNC lathe	1		1	1.30	1.30
Machining	machine steering pinion	3.241	Material - Steel	3	0.04	6.37
Machining Setup, Install and remove	install plastic stock into CNC lathe	0.5		1	1.30	0.65
Machining	machine steering rack stops	0.41	Material - Plastic	0.5	0.04	0.13
Assemble, 1 kg, Line-on-Line	install steering rack seals	2		1	0.13	0.26
Assemble, 1 kg, Loose	install steering rack	1		1	0.06	0.06
Assemble, 1 kg, Loose	install steering rack pinion	1		1	0.06	0.06
Assemble, 1 kg, Loose	install steering rack stops	2		1	0.06	0.12
Assemble, 1 kg, Loose	install steering rack clevis	2		1	0.06	0.12

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 25.4 mm	install steering rack end bolt	2		1	0.25	0.50
Assemble, 1 kg, Line-on-Line	install steering rack bearing	1		1	0.13	0.13

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Steering rack end bolt	0.375 in	1 in	1	0.15	0.15

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Rack Spacer Short

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00212	A		$0.40	2	$0.80

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Polyoxymethylene (POM) (by Dimensions)	Stock Material			Flat Face	1.137 in^2	0.06 in	0.051 lb/in^3	1	0.01	0.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install material into laser cutter	0.25		1	1.30	0.32
Laser Cut	Laser cut part	14.965	Material - Plastic	0.5	0.01	0.07

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System › Steering Column and Rack › Rack split clamp

P/N Base	Suffix	Details	Cost	Qty	Total
ERC19-00205	A		$2.06	2	$4.12

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	0.53" x 1.83" x 1.33"			Square Area	2.43 in^2	0.53 in	0.098 lb/in^3	1	0.24	0.24

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install stock into CNC machine	1		1	1.30	1.30
Machining	machine part	0.8	Material - Aluminum	1	0.04	0.52

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Steering System Drawings

Suspension System Section

Suspension & Shocks › Control Rod Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
SUA21-00179	A	Rods for controlling the angle of the upright relative to chassis	$26.72	4	$106.88

Part	Cost	Quantity	Subtotal
Carbon Tube Insert With Wrench Flat	0.5500	2	1.1000

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rod End, Suspension	Suspension attachment	0.25 in						2	7.02	14.03
Carbon Fiber, 1 Ply	Carbon tube, enough for 4 control rods	0.087 kg					1580 kg/m^3	0.25	17.40	4.35

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Resin application, Manual		0.052	Repeat 2	2	5.00	0.43
Cure, Room Temperature		0.052	Repeat 2	2	10.00	0.87
Tube cut	Cut carbon tube to length 0.71" OD	4.46		1	0.15	1.70
Hand, Loose <= 6.35 mm	Rod ends into end of tubing	1	Repeat 2	2	0.25	0.50
Power Tool <= 6.35 mm	Fasten from upright to steering rack	1	Repeat 2	2	0.25	0.50
Reaction Tool <= 6.35 mm	Fasten from upright to steering rack	1	Repeat 2	2	0.25	0.50
Wrench <= 6.35 mm	Install jam nuts	1	Repeat 2	2	1.00	2.00
Reaction Tool <= 25.4 mm	Jam Nut Flats	1	Repeat 2	2	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Control rod to steering rack and upright 1/4-28	0.25 in	1 in	2	0.06	0.12
Nut, Grade 8.8 (SAE 5)	Control rod to steering rack and upright	0.25 in	1 in	2	0.03	0.06
Nut, Grade 8.8 (SAE 5)	Jam nut	0.25 in		2	0.03	0.06

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Control Rod Assembly › Carbon Tube Insert With Wrench Flat

P/N Base	Suffix	Details	Cost	Qty	Total
SUC20-00304	A		$0.55	2	$1.10

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Raw Material .75" OD			circular cross sect.	0.44 in^2	1.46 in	0.098 lb/in^3	1	0.12	0.12

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Setup material on lathe	0.03125		1	1.30	0.04
Machining	Lathe shoulder and hole	0.375	Material - Aluminum	1	0.04	0.25
Threading, Internal (machining)	Thread Insert	0.5	Material - Aluminum	1	0.10	0.13
Machining	Machine flats	0.011	Material - Aluminum	1	0.04	0.01
Anodizing	Phosphoric	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Push Rods

P/N Base	Suffix	Details	Cost	Qty	Total
SUA23-00617	A	all push rods were designed with the same components for adjustability and to simplify manufacturing	$32.75	4	$131.00

Part	Cost	Quantity	Subtotal
Carbon Tube Insert With Wrench Flat	0.6900	1	0.6900
Aluminum Shim Insert Nut Side	3.0900	1	3.0900
Pullrod Shims	0.6400	1	0.6400
Shim Interface Bolt Head Side	3.1100	1	3.1100

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rod End, Suspension	Suspension attachment	0.25 in						2	7.02	14.03
Carbon Fiber, 1 Ply	Carbon tube, enough for 8 control arms	0.16 kg					1580 kg/m^3	0.125	32.00	4.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut carbon tube to length	1		1	0.15	0.15
Resin application, Manual	Cover inserts with epoxy resin for bonding	0.053	Repeat 2	2	5.00	0.44
Cure, Room Temperature		0.053	Repeat 2	2	10.00	0.89
Assemble, 1 kg, Loose	Bond inserts into CFRP tubing	1	Repeat 2	2	0.06	0.12
Assemble, 1 kg, Line-on-Line	Rod ends into end of tubing	1	Repeat 2	2	0.13	0.26
Ratchet <= 6.35 mm	fasten from upright to bellcrank/chassis/steering rack	1	Repeat 4	4	0.50	2.00
Reaction Tool <= 6.35 mm	fasten from upright to bellcrank/chassis/steering rack	1	Repeat 4	4	0.25	1.00
Assemble, 1 kg, Line-on-Line	Install jam nuts	1	Repeat 2	2	0.13	0.26
Ratchet <= 6.35 mm	Fasten Shims	1	Repeat 2	2	0.50	1.00
Reaction Tool <= 6.35 mm	Fasten Shims	1	Repeat 2	2	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	push/pull rod shims	0.25 in	2 in	2	0.13	0.27
Nut, Grade 8.8 (SAE 5)	push/pull rod shims	0.25 in		2	0.03	0.06
Nut, Grade 8.8 (SAE 5)	Jam nut	0.25 in		2	0.03	0.06
Bolt, Grade 8.8 (SAE 5)	Control rod to chassis and upright	0.25 in	1 in	2	0.06	0.12
Nut, Grade 8.8 (SAE 5)	Control rod to chassis and upright	0.25 in	1 in	2	0.03	0.06

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Push Rods › Carbon Tube Insert With Wrench Flat

P/N Base	Suffix	Details	Cost	Qty	Total
SUC20-00304	A		$0.69	1	$0.69

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Raw material .75" OD			circular cross sect.	0.44 in^2	1.46 in	0.098 lb/in^3	1	0.12	0.12

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Setup material on lathe, all machined at same time from stock	0.25		1	1.30	0.32
Machining	Lathe shoulder and hole	0.17	Material - Aluminum	1	0.04	0.11
Threading, Internal (machining)	Thread insert	0.5	Material - Aluminum	1	0.10	0.13
Machining	Mill flats	0.02		1	0.04	0.01
Anodizing	Phosphoric	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Push Rods › Aluminum Shim Insert Nut Side

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00899	A	Shim interface to allow rapid adjustment of ride height and toe.	$3.09	1	$3.09

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Aluminum shim inserts			Rectangular cross section, with additional mater	1.6 in^2	1.5 in	0.098 lb/in^3	1	0.45	0.45

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		1		1	1.30	1.30
Machining	Mill profile	1.8	Material - Aluminum	1	0.04	1.18
Threading, Internal (machining)	thread 1/4-28 hole	0.62	Material - Aluminum	1	0.10	0.16
Anodizing	black	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Push Rods › Pullrod Shims

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00897	A	Consists of 20 aluminum shims for 8 adjustable control arms. Waterjet from 1 sheet of aluminum.	$0.64	1	$0.64

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (per kg)	Raw material (20 shims/8 control rods)	0.0375 kg						1	0.16	0.16

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	1 sheet for all 8 control rods	0.125		1	1.30	0.16
Waterjet Cut	Waterjet Shim profile (20 total)	12.5	Material - Aluminum	1	0.01	0.32

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Push Rods › Shim Interface Bolt Head Side

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00898	A	Bonded side of shim interface	$3.11	1	$3.11

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)				Bar dimensions	1.6 in^2	1.5 in	0.098 lb/in^3	1	0.45	0.45

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	into mill	1		1	1.30	1.30
Machining	Mill profile	2.08		1	0.04	1.36
Anodizing	Phosphoric for bonding	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Spring and shock

P/N Base	Suffix	Details	Cost	Qty	Total
OTSA-00050	A		$339.63	4	$1358.52

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Damper, Ohlins TTX 25								1	305.00	305.00
Suspension Springs, Coil Spring, Steel								1	25.00	25.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Line-on-Line	Spring onto shock and preload shock	1		1	0.13	0.13
Power Tool <= 25.4 mm	Shock to chassis and shock to bellcrank	1		1	0.25	0.25
Reaction Tool <= 25.4 mm	Shock to chassis and shock to bellcrank	1		1	0.25	0.25
Suspension Setup-Independent Susp. (per corner)	Includes setup for dampers, corner weight balancing, toe, camber alignment etc.	1		1	8.75	8.75

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 10.9 (SAE 8)	Shock to chassis	0.3125 in	1.5 in	1	0.19	0.19
Nut, Grade 10.9 (SAE 8)	Shock to bellcrank	0.3125 in	1.5 in	1	0.06	0.06

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Bellcrank Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
SUA21-0006	A	Quantity of shafts and thrust washers account for both front and rear bellcranks	$14.94	2	$29.88

Part	Cost	Quantity	Subtotal
Front Bellcrank	11.0700	1	11.0700
Thrust washer	0.2100	2	0.4200
Bellcrank shaft	1.2000	1	1.2000
Bellcrank Bushing	1.1900	1	1.1900

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Interference	Press bearing into bell crank	1		1	0.19	0.19
Assemble, 1 kg, Loose	Shaft into bearing race	1		1	0.06	0.06
Assemble, 1 kg, Loose	Washers onto bellcrank	1	Repeat 2	2	0.06	0.12
Power Tool <= 25.4 mm	Attach bell crank to chassis	1		1	0.25	0.25
Reaction Tool <= 6.35 mm	Attach bell crank to chassis	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 8.8 (SAE 5)	Fasten bell crank to chassis	0.3125 in	0.25 in	1	0.04	0.04
Bolt, Grade 8.8 (SAE 5)	Fasten bell crank to chassis	0.3125 in	1.5 in	1	0.15	0.15

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Bellcrank Assembly › Front Bellcrank

P/N Base	Suffix	Details	Cost	Qty	Total
SUC21-00311	A		$11.07	1	$11.07

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Material for bell crank			Cross section with 80 thou	8.675 in^2	1.48 in	0.098 lb/in^3	1	2.40	2.40

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Put material into 4 axis	1		1	1.30	1.30
Machining	First face and outer perimeter	5.13	Material - Aluminum	1	0.04	3.36
Machining Setup, Change	Flip part	1		1	0.65	0.65
Machining	Second face	5.13	Material - Aluminum	1	0.04	3.36
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Bellcrank Assembly › Thrust washer

P/N Base	Suffix	Details	Cost	Qty	Total
SUC21-00995	A	Quantity accounts for front and rear thrust washers as they are identical.	$0.21	2	$0.42

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Acetal (by Dimensions)	30mm Solid roundstock			Nominal cross section and length plus 2mm for fa	706.86 mm^2	4.54 mm	1420 kg/m^3	1	0.01	0.02

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	machine hole and part	1.575	Material - Plastic	0.5	0.04	0.03
Machining Setup, Install and remove	Install on lathe	0.125		1	1.30	0.16

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Bellcrank Assembly › Bellcrank shaft

P/N Base	Suffix	Details	Cost	Qty	Total
SUC21-01043	A	Shaft for bellcrank bearing to pivot about. Quantity accounts for both front and rear shafts as they are identical.	$1.20	1	$1.20

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)	Solid roundstock			Nominal cross section and length plus 2mm for fa	804 mm^2	30 mm	7850 kg/m^3	1	0.43	0.43

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		0.25		1	1.30	0.32
Machining	Face and drill hole	3	Material - Stainless Steel	3.75	0.04	0.45

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Bellcrank Assembly › Bellcrank Bushing

P/N Base	Suffix	Details	Cost	Qty	Total
SUC21-01124	A		$1.19	1	$1.19

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Bronze (by Dimensions)	Bronze rod stock			Circular Area	0.7 in^2	0.867 in	0.307 lb/in^3	1	0.19	0.19

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Lathe	0.5		1	1.30	0.65
Machining	Turn to finish length, drill, and add grease groove	0.397	Material - Bronze	1.33	0.04	0.35

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Bellcrank Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
SUA21-00242	A	Thrust washers and shafts are accounted for in front bellcrank assembly.	$9.40	2	$18.80

Part	Cost	Quantity	Subtotal
Rear Bellcrank	8.2700	1	8.2700
Bushing	0.0700	1	0.0700

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Interference	Press bearing into bellcrank	1		1	0.19	0.19
Assemble, 1 kg, Loose	Shaft into bearing race	1		1	0.06	0.06
Assemble, 1 kg, Loose	washers onto bellcrank	1	Repeat 2	2	0.06	0.12
Power Tool <= 25.4 mm	bellcrank to chassis	1		1	0.25	0.25
Reaction Tool <= 25.4 mm	bellcrank to chassis	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 8.8 (SAE 5)	fasten bellcrank to chassis	0.3125 in	0.25 in	1	0.04	0.04
Bolt, Grade 8.8 (SAE 5)	fasten bellcrank to chassis	0.3125 in	1.5 in	1	0.15	0.15

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Bellcrank Assembly › Rear Bellcrank

P/N Base	Suffix	Details	Cost	Qty	Total
SUC23-03648	A	7075 Bellcrank	$8.27	1	$8.27

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Bellcrank raw stock			Cross section area, with 80thou	8.0837 in^2	0.99 in	0.098 lb/in^3	1	1.49	1.49

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Setup on a 3 axis mill	1		1	1.30	1.30
Machining	Mill	4.522	Material - Aluminum	1	0.04	2.96
Machining Setup, Change	Flip bellcrank for channels	1		1	0.65	0.65
Machining	Mill channels	2.852	Material - Aluminum	1	0.04	1.87

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Bellcrank Assembly › Bushing

P/N Base	Suffix	Details	Cost	Qty	Total
SUC21-01124	A		$0.07	1	$0.07

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Bronze (by Dimensions)	Bellcrank Bushing				0.2743 in^2	0.787 in	0.307 lb/in^3	1	0.07	0.07

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
SUA22-00010	A	Uprights are identical with modular mounting brackets for A-Arms and control arms (includes hubs which are accounted for in the wheel system)	$184.80	4	$739.20

Part	Cost	Quantity	Subtotal
Upright	58.4400	1	58.4400
Upright top	3.0900	1	3.0900
Upright top shim (camber)	0.6500	1	0.6500
Front Tierod Pickup	3.6500	1	3.6500
Rear Upright Tierod Pickup	5.1000	1	5.1000
Rear Toe Pickup Spacer	2.2300	1	2.2300

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Wheel Bearing, Ball, Deep Groove		85 mm	10 mm					1	107.52	107.52

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Install camber shim	2		1	0.06	0.12
Power Tool <= 6.35 mm	Upright top to upright nut held in place by upright, no reaction tool required	1	Repeat 2	2	0.25	0.50
Safety Wire, Install	Safety wire toe pickup	2		1	0.60	1.20
Power Tool <= 6.35 mm	Toe pickup to upright and upright to control rod	1	Repeat 2	2	0.25	0.50
Assemble, 1 kg, Interference	Press wheel bearing into uprights	1		1	0.19	0.19
Power Tool <= 6.35 mm	A-Arm pickup point attachment	1	Repeat 2	2	0.25	0.50
Reaction Tool <= 6.35 mm	A-Arm Pickup point attachment	1	Repeat 2	2	0.25	0.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Upright top, toe pickup, a-arms, and control rod to upright	0.25 in	1.5 in	4	0.09	0.38

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 8.8 (SAE 5)	Upright top, toe pickup, a-arms, and control rod to upright	0.25 in		4	0.03	0.13
Bolt, Grade 8.8 (SAE 5)	Tow pickup	0.25 in	0.75 in	2	0.05	0.10

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly › Upright

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00001	A	The uprights are mirrored right to left,. But remain the same between the front and rear Video of machining: https://www.youtube.com/watch?v=QVYncR9HXtE&t=3s	$58.44	1	$58.44

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Upright			Rect cross section plus 1mm all sides for materi	36.75 in^2	2 in	0.098 lb/in^3	1	13.72	13.72

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Mill pockets and holes (Both sides)	45.25	Material - Aluminum	1	0.04	29.66
Machining Setup, Install and remove	set up 5-axis cnc	1		1	1.30	1.30
Machining		20		1	0.04	13.11
Machining Setup, Change	Flip to other side for machining	1		1	0.65	0.65
Anodizing	Black	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly › Upright top

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00066	A		$3.09	1	$3.09

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Upright top			Rect cross section plus 0.08" for facing operati	2.06 in^2	1.26 in	0.098 lb/in^3	1	0.48	0.48

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install on cnc mill	0.5		1	1.30	0.65
Machining	Mill pocket	1.985	Material - Aluminum	1	0.04	1.30
Machining	Drill 1/4" holes	0.0177	Material - Aluminum	1	0.04	0.01
Machining Setup, Change	Flip to drill holes	1		1	0.65	0.65
Anodizing	Black	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly › Upright top shim (camber)

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00067	A	Camber adjustment	$0.65	1	$0.65

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Camber shim			Face	2.44 in^2	0.125 in	0.098 lb/in^3	1	0.06	0.06

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Waterjet Cut	Cut shims	10.74	Material - Aluminum	1	0.01	0.27
Machining Setup, Install and remove	Waterjet cut the shims. Quantity includes all shims	0.25		1	1.30	0.32

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly › Front Tierod Pickup

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00064	A		$3.65	1	$3.65

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)				Rectangle face	2.79 in^2	0.85 in	0.098 lb/in^3	1	0.44	0.44

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Mill pockets (including hole volume)	1.86	Material - Aluminum	1	0.04	1.22
Machining Setup, Install and remove	set up on CNC mill	1		1	1.30	1.30
Machining Setup, Change	flip to drill holes	1		1	0.65	0.65
Anodizing	Anodized Black	1		1		
Machining	Machine interface and holes	0.062	Material - Aluminum	1	0.04	0.04

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly › Rear Upright Tierod Pickup

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00316	A		$5.10	1	$5.10

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)				Rectangle Cross section	1.93 in^2	2.28 in	0.098 lb/in^3	1	0.82	0.82

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining	Including interface and hole volume	3.55	Material - Aluminum	1	0.04	2.33
Machining Setup, Install and remove	set up on CNC Mill	1		1	1.30	1.30
Machining Setup, Change	Flip to drill holes and interface	1		1	0.65	0.65

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Corner Assembly › Rear Toe Pickup Spacer

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00313	A		$2.23	1	$2.23

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)				rectangle cross	1.13 in^2	0.83 in	0.098 lb/in^3	1	0.18	0.18

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining		0.107		1	0.04	0.07
Machining Setup, Install and remove		1		1	1.30	1.30
Machining Setup, Change	Flip for other side interface	1		1	0.65	0.65
Machining		0.041		1	0.04	0.03

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Anti-Roll

P/N Base	Suffix	Details	Cost	Qty	Total
SUA22-00355	A	Rear rollbar for suspension. Note: Mounting blocks are the same as the front	$46.32	1	$46.32

Part	Cost	Quantity	Subtotal
Rear Rollbar Actuator	15.0400	2	30.0800
Rear Anti-roll bar	2.0500	1	2.0500
Rear ARB Lever Arm	1.1700	4	4.6800

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Put lever arms onto bar	1	Repeat 4	4	0.06	0.24
Weld	Weld lever arm onto tubes	2.5	Repeat 4	4	0.15	3.81
Assemble, 1 kg, Loose	Bushings onto Rear ARB	1	Repeat 8	8	0.06	0.48
Assemble, 1 kg, Loose	spacers into actuation linkages	1	Repeat 4	4	0.06	0.24
Power Tool <= 6.35 mm	Fasten actuator linkages to bellcranks and rollbar lever	4		1	0.25	1.00
Reaction Tool <= 6.35 mm	Fasten rod ends to actuation linkages	4		1	0.25	1.00
Power Tool <= 6.35 mm	Fasten bar to bushing linkages	8		1	0.25	2.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	Lever arm fasteners	0.25 in	1.25 in	2	0.08	0.16
Bolt, Grade 8.8 (SAE 5)	Bushing fasteners	0.19 in	1.5 in	8	0.06	0.45
Nut, Grade 8.8 (SAE 5)		0.25 in		4	0.03	0.13

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Anti-Roll › Rear Rollbar Actuator

P/N Base	Suffix	Details	Cost	Qty	Total
SUA22-00443	A	2 Force member links bellcrank to rollbar	$15.04	2	$30.08

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Adjustable actuation linkage			Round stock face	0.2 in^2	5 in	0.098 lb/in^3	0.5	0.19	0.09
Rod End, Suspension	Connects to anti-roll bar and rear bellcranks	0.19 in						2	6.16	12.33

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	set up on lathe	0.5		1	1.30	0.65
Machining	Hole for tap	0.352		1	0.04	0.23
Threading, Internal (machining)	1/4-28 thread, one side LH, one side RH	0.38	Repeat 2	2	0.10	0.19
Hand - Start Only	Install rod ends and jam nuts	1	Repeat 2	2	0.12	0.24
Wrench <= 6.35 mm	Tighten jam nuts	1		1	1.00	1.00
Reaction Tool <= 6.35 mm	Tighten jam nuts	1		1	0.25	0.25

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 8.8 (SAE 5)	Jam nut for 1/4" Rod end	0.25 in		2	0.03	0.06

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Anti-Roll › Rear Anti-roll bar

P/N Base	Suffix	Details	Cost	Qty	Total
SUC22-01414	A		$2.05	1	$2.05

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	2' long Steel Tube for torsion bar			Tube Face	34.5 mm^2	609.6 mm	7850 kg/m^3	1	0.37	0.37

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut Tube to length	1.2		1	0.15	0.18
Tube end preperation for welding	Clean ends for weld prep	2		1	0.75	1.50

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Rear Anti-Roll › Rear ARB Lever Arm

P/N Base	Suffix	Details	Cost	Qty	Total
SUC22-01411	A		$1.17	4	$4.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)	4130 sheet			Rectangular area of tab including 80thou gap	2.88 in^2	0.09 in	0.284 lb/in^3	1	0.08	0.08

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	waterjet	0.25		1	1.30	0.32
Waterjet Cut		10.15	Material - Steel	3	0.01	0.77

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Control Arms

P/N Base	Suffix	Details	Cost	Qty	Total
SUA22-00473	A	Suspension A-Arms consisting of bonding carbon tube to aluminum nodes Identical nodes used for top and bottom of the front and rear corner assembly.	$84.63	4	$338.52

Part	Cost	Quantity	Subtotal
Threaded Inserts	0.5200	4	2.0800
Front A-Arm Node	10.5600	1	10.5600
Rear A-Arm Node	11.7600	1	11.7600

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Rod End, Suspension	Attach a-arms to the frame	0.25 in						4	7.02	28.06
Bearing, Spherical	Ball joint to upright	0.25 in						2	6.21	12.42
Carbon Fiber, 1 Ply	A-Arm Tubes (enough for all 8 a-arms 0.71"OD 0.256" ID)	0.133 kg					1580 kg/m^3	0.125	26.60	3.32

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut	Cut Carbon tube to length all ends (0.71 Diameter)	0.71	Repeat 8	8	0.15	2.16
Resin application, Manual	Cover inserts with epoxy for bonding	0.052	Repeat 8	8	5.00	1.74
Cure, Room Temperature		0.052	Repeat 8	8	10.00	3.48
Assemble, 1 kg, Loose	Bond inserts into tubing	1	Repeat 8	8	0.06	0.48
Hand, Loose <= 6.35 mm	Thread rod-ends into a-arms	1	Repeat 4	4	0.25	1.00
Wrench <= 6.35 mm	Tighten Jam Nuts	1	Repeat 4	4	1.00	4.00
Assemble, 1 kg, Interference	Press spherical into housing	1	Repeat 2	2	0.19	0.38
Assemble, 1 kg, Interference	Install retaining clip	1	Repeat 2	2	0.19	0.38
Power Tool <= 6.35 mm	install a-arm to car fasteners	1	Repeat 4	4	0.25	1.00
Reaction Tool <= 6.35 mm	Install a-arm to car fasteners	1	Repeat 4	4	0.25	1.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Retaining Ring, Internal	Hold spherical in place	0.75 in		2	0.09	0.17
Bolt, Grade 8.8 (SAE 5)	A-arm to car	0.25 in	1.5 in	4	0.09	0.38
Nut, Grade 8.8 (SAE 5)	A-arm to car	0.25 in		4	0.03	0.13
Nut, Grade 8.8 (SAE 5)	Jam Nut	0.25 in		4	0.03	0.13

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Control Arms › Threaded Inserts

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00278	A		$0.52	4	$2.08

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Normal (by Dimensions)	Raw material .75" round			Circular Cross Section	0.442 in^2	1.21 in	0.098 lb/in^3	1	0.10	0.10

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Install material on lathe	0.0625		1	1.30	0.08
Machining	Turn material for shape of inserts	0.314	Material - Aluminum	1	0.04	0.21
Threading, Internal (machining)	Thread threaded fasteners	0.5	Material - Aluminum	1	0.10	0.13
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Control Arms › Front A-Arm Node

P/N Base	Suffix	Details	Cost	Qty	Total
SUC21-01094	A		$10.56	1	$10.56

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Raw material			Cross section area	9.352 in^2	1.3 in	0.098 lb/in^3	1	2.27	2.27

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		1		1	1.30	1.30
Machining	5-axis Mill	10.66	Material - Aluminum	1	0.04	6.99
Anodizing	phosphoric anodizing	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Control Arms › Rear A-Arm Node

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00078	A		$11.76	1	$11.76

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)					10.1 in^2	1.34 in	0.098 lb/in^3	1	2.53	2.53

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove		1		1	1.30	1.30
Machining	5-Axis Mill	12.1	Material - Aluminum	1	0.04	7.93
Anodizing	phosphoric anodizing	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Arb Assembly

P/N Base	Suffix	Details	Cost	Qty	Total
SUA23-00817	A	Front anti roll bar for car Note: Mounts for both the front and rear are costed here	$68.83	1	$68.83

Part	Cost	Quantity	Subtotal
FARB Lower Pillow Block	0.4100	8	3.2800
FARB Upper Pillow Block	0.4600	8	3.6800
Front ARB Bar	8.8800	1	8.8800
Front ARB Actuator	25.5200	2	51.0400

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Loose	Assembly pillowblocks and rollbar onto bottom of chassis	1		1	0.06	0.06
Power Tool <= 6.35 mm	Screw pillowblocks onto chassis	4		1	0.25	1.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)		0.19 in	1.5 in	4	0.06	0.22
Nut, Panel Retained	Rivnut	0.19 in		4	0.17	0.67

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Arb Assembly › FARB Lower Pillow Block

P/N Base	Suffix	Details	Cost	Qty	Total
SUC23-04180	A		$0.41	8	$3.28

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Acetal (by Dimensions)				Rectangle cross section 1.5X.5	0.75 in^2	0.58 in	0.051 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into mill	0.25		1	1.30	0.32
Machining		0.171	Material - Plastic	0.5	0.04	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Arb Assembly › FARB Upper Pillow Block

P/N Base	Suffix	Details	Cost	Qty	Total
SUC23-04179	A		$0.46	8	$3.68

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Plastic, Acetal (by Dimensions)				rectangle cross section 1.5x0.5"	0.75 in^2	0.58 in	0.051 lb/in^3	1	0.03	0.03

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	into mill	0.25		1	1.30	0.32
Machining		0.171		1	0.04	0.11

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Arb Assembly › Front ARB Bar

P/N Base	Suffix	Details	Cost	Qty	Total
SUC23-04150	A		$8.88	1	$8.88

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Alloy (by Dimensions)				.5" OD 1/16" Wall	0.307 in^2	19.08 in	0.284 lb/in^3	1	1.70	1.70
Steel, Mild (by Dimensions)	Lever arm tabs Inboard			Rectangle Cross Section	5.27 in^2	0.09 in	0.284 lb/in^3	2	0.14	0.27
Steel, Mild (by Dimensions)	Lever arm tabs outboard			Rectangle Cross Section	4.95 in^2	0.09 in	0.284 lb/in^3	2	0.13	0.26

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Into waterjet for cutting	1		1	1.30	1.30
Waterjet Cut		42.25		1	0.01	1.07
Tube cut	Cut tube to size	0.5	Repeat 2	2	0.15	0.38
Tube end preperation for welding	Prep tube for welding	2		1	0.75	1.50
Weld	Weld around lever arms	6.3		1	0.15	2.40

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension & Shocks › Front Arb Assembly › Front ARB Actuator

P/N Base	Suffix	Details	Cost	Qty	Total
SUA23-00835	A		$25.52	2	$51.04

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Carbon Fiber, 1 Ply		0.041 kg					1580 kg/m^3	1	8.20	8.20
Aluminum, Normal (by Dimensions)				Circular Cross Section	0.442 in^2	1.21 in	0.098 lb/in^3	2	0.10	0.20
Rod End, Suspension		0.19 in						2	6.16	12.33

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Tube cut		0.71	Repeat 2	2	0.15	0.54
Machining Setup, Install and remove	Into lathe	1		1	1.30	1.30
Machining		0.375		1	0.04	0.25
Threading, Internal (machining)		0.5		1	0.10	0.13
Brush Apply	Epoxy insert	2		1	0.00	0.03
Assemble, 1 kg, Line-on-Line	Put inserts into carbon tube and allow to cure at room temp	2		1	0.13	0.26
Hand - Start Only	Install rod ends	2		1	0.12	0.24
Wrench <= 6.35 mm	Tighten jam nuts	2		1	1.00	2.00

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Nut, Grade 6.8 (SAE 3) and All Grades less than Metric 8.8	Jam Nut	0.19 in		2	0.02	0.04

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Suspension System Drawings

Wheels System Section

Wheels, Wheel Bearings & Tires › Wheel and Tire

P/N Base	Suffix	Details	Cost	Qty	Total
SUA19-00028	A	10" OZ magnesium wheel set with Hoosier tires. Center-lock	$238.94	4	$955.76

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Wheel, 10", 1 Piece OZ, Magnesium								1	150.00	150.00
Tire, Hoosier, R20, 10" - 18.0 x 7.5								1	85.00	85.00
Valve Stem (and Tire Inflation)								1	1.00	1.00

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Assemble, 1 kg, Line-on-Line	Install valve stems	1	No Multiplier	1	0.13	0.13
Assemble, 5 kg, Interference	Mount tire to wheel	1	No Multiplier	1	0.94	0.94
Assemble, 5 kg, Loose	Mount wheels to hubs	1	No Multiplier	1	0.31	0.31
Ratchet > 25.4 mm	Fasten wheel nut	1	No Multiplier	1	1.50	1.50
Assemble, 1 kg, Loose	Install wheel nut retaining clip	1		1	0.06	0.06

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub

P/N Base	Suffix	Details	Cost	Qty	Total
SUA19-00010	A	Live spindle center-lock hubs with drive pins REFER TO CORNER ASSEMBLY DRAWING FOR ASSEMBLY DRAWING	$197.79	4	$791.16

Part	Cost	Quantity	Subtotal
Hub	61.3800	1	61.3800
Hub nut	4.1900	1	4.1900
Wheel nut	4.0900	1	4.0900
Lock Washer	1.3400	1	1.3400
Drive Pin	1.2900	4	5.1600
Wheelspeed Pickups	9.5900	1	9.5900

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Wheel Bearing, Ball, Deep Groove	SKF 61813-2RZ. Other four pressed into upright assembly	85 mm	10 mm					1	107.52	107.52

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Power Tool <= 6.35 mm	Tighten wheelspeed pickup screws	3		1	0.25	0.75
Assemble, 1 kg, Interference	Press drive pins into hub	4		1	0.19	0.76
Assemble, 1 kg, Interference	Press bearing onto hub	1		1	0.19	0.19
Assemble, 1 kg, Loose	Attach wheelspeed pickup onto hub	1		1	0.06	0.06
Assemble, 1 kg, Line-on-Line	Install upright onto hub assembly	1		1	0.13	0.13
Ratchet > 25.4 mm	Tighten hub nut	1		1	1.50	1.50
Assemble, 1 kg, Line-on-Line	Bend hub nut lock washer tab	1		1	0.13	0.13

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Bolt, Grade 8.8 (SAE 5)	(6-32) Used for retaining wheelspeed pickup on hub	3.51 mm	6 mm	3	0.01	0.03

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal
Pin, Safety, Coiled Wire	Positively locks wheel nut onto hub	2.5 in		1	0.97	0.97

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub › Hub

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00046	A		$61.38	1	$61.38

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	Raw billet 7075			4" OD Stock with 0.08 added to ends for cutting	12.6 in^2	6.38 in	0.098 lb/in^3	1	15.01	15.01

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Lathe	1		1	1.30	1.30
Machining	Turn to profile	31	Material - Aluminum	1	0.04	20.32
Threading, External (machining)	For hub/wheel nuts	2		1	0.10	0.51
Machining Setup, Change	Mill	1		1	0.65	0.65
Machining Setup, Change	Flip side	1		1	0.65	0.65
Machining	Mill hub face, mill pockets	20	Material - Aluminum	1	0.04	13.11
Machining	Mill pockets	15	Material - Aluminum	1	0.04	9.83
Anodizing		1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub › Hub nut

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00048	A	Hook spanner driven 7075 nuts	$4.19	1	$4.19

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	7075 round			circular cross section 3.41"	8.8 in^2	1.3 in	0.098 lb/in^3	1	2.14	2.14

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Lathe	0.17		1	1.30	0.22
Machining	Turn profile, bore center	1.4		1	0.04	0.92
Threading, Internal (machining)	To fit hubs	0.65		1	0.10	0.17
Machining Setup, Change	Mill	1		1	0.65	0.65
Machining	Cutting spanner slots	0.14		1	0.04	0.09
Anodizing	Black anodized	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub › Wheel nut

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00047	A		$4.09	1	$4.09

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Aluminum, Premium (by Dimensions)	7075 round			2.56 +0.04" for machining	5.3 in^2	3.2 in	0.098 lb/in^3	0.25	3.17	0.79

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	lathe	0.25		1	1.30	0.32
Machining	bore hole, lathe profile	2.75	Material - Aluminum	1	0.04	1.80
Threading, Internal (machining)		0.8	Material - Aluminum	1	0.10	0.20
Machining Setup, Change	mill	1		1	0.65	0.65
Machining	mill grooves for wrench	0.5	Material - Aluminum	1	0.04	0.33
Anodizing	Hardcoating	1		1		

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub › Lock Washer

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00049	A	Bearing lock washer	$1.34	1	$1.34

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)				Sheet Metal Square Area	8700 mm^2	1.27 mm	7850 kg/m^3	1	0.20	0.20

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Waterjet 4-at-a-time	0.25		1	1.30	0.32
Waterjet Cut	External and internal profiles	31.2		1	0.01	0.79
Sheet metal stamping	Conical bend	1		1	0.03	0.03

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub › Drive Pin

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00051	A	Stainless pin pressed into hub to drive wheel. Quantity on drawing includes 4 spares.	$1.29	4	$5.16

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Stainless (by Dimensions)				Circular Cross Section	113.1 mm^2	24 mm	7850 kg/m^3	1	0.05	0.05

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	Lathe	0.25		1	1.30	0.32
Machining	Drill, part, chamfer	0.04	Material - Stainless Steel	3.75	0.04	0.10
Threading, Internal (machining)	5/16-24 Tap (Threads for removal of pin)	2.2	Material - Stainless Steel	3.75	0.10	0.82

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels, Wheel Bearings & Tires › Hub › Wheelspeed Pickups

P/N Base	Suffix	Details	Cost	Qty	Total
SUC19-00045	A		$9.59	1	$9.59

Material	Use	Size 1	Size 2	Area Name	Area	Length	Density	Qty	Unit Cost	Subtotal
Steel, Mild (by Dimensions)	3in round stock				7 in^2	3 in	0.284 lb/in^3	0.25	6.09	1.52

Process	Use	Qty	Multiplier	Mult. Val	Unit Cost	Subtotal
Machining Setup, Install and remove	mill	0.25		1	1.30	0.32
Machining	bore hole, cut profile	3	Material - Steel	3	0.04	5.90
Machining Setup, Change	Lathe	1		1	0.65	0.65
Machining	part off pickup	10	Material - Steel	3	0.04	1.20

Fastener	Use	Size 1	Size 2	Qty	Unit Cost	Subtotal

Tooling	Use	Qty	PVF	Frac. Incl.	Unit Cost	Subtotal

Wheels System Drawings