

UAV and Laboratory Equipment/Materials Specification

1. Outrunner Brushless DC Motor Specifications

Multirotor Type	Motor Specification					Total Quantity Required (in pieces)	Unit Price (Final – in USD)	Brands
	KV Rating	Dimensions (mm x mm)	Weight (gm)	Max Current Draw	Thrust			
Bicopter	810KV	7335	156g	42A	2060g	16		Turnigy Turnigy
	2400KV	1423	21g	15A		10		ADH300S Turnigy
Tricopter – Y3, Y4, Y6, V-tail, A-tail	1800KV	2840A	93g	30A	800g	10		Turnigy PROPDRIVE
	2200KV	2836	87g	50A	1170kg	12		PROPDRIVE Turnigy
	2000KV	D2826	55g	25A	1000g	12		Turnigy DYS
	2700KV	2836	86g	50A	1200g	14		PROPDRIVE ZTW Spider PRO
Quadcopter – X, +, H, X8	1000KV	3730	130g	42A	1700g	26		Turnigy Air Turnigy
	900KV	3548	182g	55A		18		PROPDRIVE NTM Phantom
	700KV	L5055C	296g	60A		20		Turnigy Turnigy Turnigy MultiStar
	100KV	9235	674g	57A		11		Turnigy MultiStar DYS
	280KV	5055	369g	60A		16		Turnigy
Pentacopter	1400KV	3530	90g	37A		18		PROPDRIVE Turnigy
	450KV	5045	275g	58A		16		Turnigy
Hexacopter – X, +	980KV	2213	58g	15A		28		Turnigy MultiStar Turnigy
	850KV	3537	84g	28A	1140g	36		Turnigy Turnigy MultiStar
Heptacopter	1500KV	2836	76g	35A		15		Turnigy Turnigy
	650KV	4220	65g	17A		22		Turnigy MultiStar PROPDRIVE
Octoceptor – X, +	550KV	7650	309g	55A	2950g	22		Turnigy Duraflly
	950KV	7335	157g	34A	1400g	48		Turnigy SCM Turnigy
Nanocopter	1200KV	3551	140g	52A	2140g	28		Turnigy Turnigy
	4600KV	2852	86g	28A		16		TrackStar DYS
Decacopter	300KV	8150	366g	60A	1950g	26		Turnigy
	3800KV	2837	86g	24A		16		TrackStar Heli

2. Electronic Speed Controller Specifications

ESC Current Rating	ESC Specification				Total Quantity (in pieces)	Unit Price (Final – in USD)	Brands
	Constant Current	Burst Current	Battery Support	Weight			
40A ESC	40Amp	55Amp	2-6S Lipoly	68g	116		Turnigy HobbyKing HobbyKing
60A ESC	60Amp	80Amp	2-6S Lipoly	60g	108		Turnigy HobbyKing HobbyKing
80A ESC	80Amp	100Amp	2-6S Lipoly	95g	136		HobbyKing
100A ESC	100Amp	120Amp	4-12S Lipoly	109g	68		Turnigy HobbyKing

3. Carbon Fiber Propellers Specifications

Propeller Tag	Propeller Dimensions		Total Quantity in Pairs (CW/CCW)	Unit Price (Final – in USD)	Brands
	Diameter (in inches)	Pitch (in inches)			
3030	3 inch	3 inch	22 pairs		Unknown GemFan
3545	3.5 inch	4.5 inch	22 pairs		GemFan GemFan
4025	4 inch	4 inch	22 pairs		Unknown HobbyKing
4045	4 inch	4.5 inch	22 pairs		Quanam GemFan
5030	5 inch	3 inch	22 pairs		Unknown Quanam
5045	5 inch	4.5 inch	22 pairs		GemFan Unknown
6020	6 inch	2 inch	22 pairs		Quanam
6030	6 inch	3 inch	22 pairs		Unknown Unknown
6045	6 inch	4.5 inch	22 pairs		Quanam HobbyKing
7030	7 inch	3.5 inch	22 pairs		HobbyKing HobbyKing GemFan
7045	7 inch	4 inch	22 pairs		HobbyKing
8045	8 inch	4.5 inch	22 pairs		Turnigy HobbyKing
8055	8 inch	6 inch	22 pairs		Unknown
9047	9 inch	4.7 inch	22 pairs		MultiStar MultiStar
1047	10 inch	4.7 inch	22 pairs		MultiStar Unknown
1050	10 inch	5 inch	22 pairs		Quanam Unknown
1055	10 inch	5.5 inch	32 pairs		Quanam Unknown
1060	10 inch	6 inch	32 pairs		Dynam Aerostar
1147	11 inch	4.7 inch	22 pairs		Quanam Unknown

UAV Material Purchase List

1150	11 inch	5 inch	22 pairs	Quanam Unknown
1155	11 inch	5.5 inch	32 pairs	Multirotor Quanam Dynam
1245	12 inch	4.5 inch	32 pairs	Multirotor HobbyKing
1255	12 inch	5.5 inch	32 pairs	Multirotor
1340	13 inch	4 inch	22 pairs	Quanam Unknown
1355	13 inch	5.5 inch	22 pairs	Multirotor
1365	13 inch	5.5 inch	32 pairs	Unknown
1447	14 inch	4.7 inch	22 pairs	Multirotor Quanam Unknown
1455	14 inch	5.5 inch	32 pairs	Multirotor
1470	14 inch	7 inch	32 pairs	Unknown
1540	15 inch	4 inch	32 pairs	Multirotor
1555	15 inch	5.5 inch	32 pairs	Quanam Multirotor Multirotor
1638	16 inch	3.8 inch	32 pairs	Unknown
1655	16 inch	5.5 inch	32 pairs	Quanam Multirotor Dynam
1755	17 inch	5.5 inch	32 pairs	Multirotor
1855	18 inch	5.5 inch	32 pairs	Quanam Quanam
2055	20 inch	5.5 inch	32 pairs	Quanam
2255	22 inch	5.5 inch	24 pairs	Quanam
2655	26 inch	5.5 inch	24 pairs	Quanam
2892	28 inch	9.2 inch	18 pairs	Tiger eBay
30105	30 inch	10.5 inch	18 pairs	Tiger

4. LiPo Battery Specification

Battery S Number	Battery Specifications		Total Number of Batteries	Unit Price (Final – in USD)	Brands
	Battery Capacity (mAh)	Battery C-Rating			
3S LiPo	2200mAh	35C	8		Turnigy ZIPPY Turnigy
	2650mAh	30C	8		Turnigy Turnigy
	3000mAh	65C	10		Turnigy Turnigy Turnigy
	3600mAh	30C	8		Turnigy
	4000mAh	65C	12		Turnigy Turnigy Turnigy
	4500mAh	40C	8		ZIPPY Turnigy
	5000mAh	65C	14		Turnigy Turnigy Turnigy
	5800mAh	60C	20		ZIPPY ZIPPY
4S LiPo	4000mAh	65C	8		Turnigy Turnigy Turnigy
	4500mAh	35C	8		ZIPPY
	5000mAh	65C	10		Turnigy Turnigy ZIPPY
	5800mAh	60C	18		ZIPPY ZIPPY
	6000mAh	65C	20		Turnigy Turnigy ZIPPY
	8000mAh	10C	12		MultiStar
	10000mAh	15C	8		Turnigy MultiStar
5S LiPo	4000mAh	35C	8		Turnigy Turnigy Turnigy
	4500mAh	35C	10		Turnigy ZIPPY
	5000mAh	35C	14		Turnigy Turnigy ZIPPY
	6000mAh	65C	22		Turnigy
	8000mAh	30C	18		ZIPPY
6S LiPo	5000mAh	65C	8		Turnigy ZIPPY Turnigy
	5800mAh	25C	8		Turnigy ZIPPY
	6200mAh	40C	16		ZIPPY
	8000mAh	25C	20		Turnigy MultiStar
	10000mAh	15C	12		Turnigy MultiStar
	20000mAh	10C	8		MultiStar

5. RC Radio Tx/Rx
Transmitter Modules

Number of Channels	Transmitter Module Specifications				Total Number of Tx Modules	Unit Price (Final – in USD)	Brands
	Operating Frequency	Mode	LCD Display Availability	Number of Switches			
6 Channels	2.4GHz	2	Yes	4	4		FlySky FS-T6
	2.4GHz	2	Yes	4	4		FlySky FS-I6
	2.4GHz	2	Yes	7	4		Spektrum DX6e
	2.4GHz	2	Yes	8	4		Orange
8 Channels	2.4GHz	2	Yes	5	7		Turnigy 9X
	2.4GHz	2	Yes	1	7		Turnigy Evolution
	2.4GHz	2	Yes	7	4		Spektrum DX8
	2.4GHz	2	Yes	8	6		Tactic TTX850
	2.4GHz	2	Yes	8	4		Futaba 8J
9 Channels	2.4GHz	2	Yes	8	2		Spektrum DX9
10 Channels	2.4GHz	2	Yes	4	4		FlySky FS-i6S
14 Channels	2.4GHz	2	Yes	8	2		Futaba 14SGH
	2.4GHz	2	Yes	8	1		JR XG14
16 Channels	2.4GHz	2	Yes	8	5		FrSky Taranis X9D Plus
	2.4GHz	2	Yes	8	3		FrSky Horus X12S
	2.4GHz	2	Yes	6	4		FrSky Taranis Q X7
24 Channels	2.4GHz	2	Yes	10	1		Jeti Duplex DC-24

Receiver Modules

Channel Support	Receiver Module Specifications				Total Number of Rx Modules	Unit Price (Final – in USD)	Brands
	Operating Frequency	Receiver Protocol	Telemetry	Weight			
6 Channel Rx	2.4GHz	PCM	No	25g	10		FlySky FS-R6B
	2.4GHz	PPM	Yes	14.9g	12		FlySky FS-iA6B
	2.4GHz	DSMx	Yes	9g	8		Spektrum AR610
	2.4GHz	DSMx/PPM	No	12g	10		S603
8 Channel Rx	2.4GHz	PWM	No	18g	14		Turnigy
	2.4GHz	PPM/SBUS	Yes	7.9g	14		Turnigy iA6C
	2.4GHz	DSMx	No	9.4g	8		Spektrum AR800
	2.4GHz	SLT	Unknown	12g	10		Tactic TR826
	2.4GHz	SLT	Unknown	10.2g	10		Tactic TR825
	2.4GHz	S-FHSS	No	9.5g	10		Futaba R2008SB
9 Channel Rx	2.4GHz	DSMx	Yes	11.9g	6		Spektrum AR9020
10 Channel Rx	2.4GHz	PPM	No		6		FlySky FS-iA6B
14 Channel Rx	2.4GHz	TASSTest	Yes	10.9g	6		Futaba R7008SB
	2.4GHz	XBus	Yes	Unknown	6		JG RG731BX
16 Channel Rx	2.4GHz	SBUS	Yes	16.8g	44		FrSky X8R
	2.4GHz	SBUS	Yes	5.8g	18		FrSky X4R-SB
	2.4GHz	SBUS	Yes	3.8g	16		FrSky XSR
	2.4GHz	SBUS	No	1g	14		FrSky XM
	2.4GHz	SBUS	No	1.6g	18		FrSky XM+
	2.4GHz	CPPM	Yes	5g	16		FrSky D4R-II
	2.4GHz	ACCST	Yes	39g	16		FrSky D8R-II
	2.4GHz	ACCST	No	48g	18		FrSky V8FR-II
24 Channel Rx	2.4GHz	PPM	Yes	30g	4		Duplex EX R18
	2.4GHz	PPM	Yes	30g	4		Duplex EX R14
	2.4GHz	PPM	Yes	24g	4		Duplex EX R12

6. Flight Controller Electronics Equipment
Electronics Development/Prototyping Boards

Board Family	Board Specifications				Total Number of Boards	Unit Price (Final – in USD)	Brands
	Processor	Frequency	Memory Size	Number of Pins			
Arduino	ATSAMW25	48MHz	32kB	8	12		Arduino/Genuino MKR1000
	Intel® Curie™	32MHz	24kB	14	12		Arduino 101/Genuino 101
	ATSAMD21G18A	48MHz	32kB	14	12		Arduino Zero OR
	ATSAM3X8E	84MHz	96kB	54	15		Arduino Due
	ATmega328P	16MHz	2kB	14	34		Arduino Uno
	ATmega2560	16MHz	8kB	54	34		Arduino Mega2560
	ATmega328	16MHz	2kB	14	4		Arduino Ethernet
	ATmega328P	8MHz	2kB	14	4		Arduino Fio
	ATmega328	16MHz	0.5kB	14	12		Arduino Nano
	ATmega328V	8MHz	1kB	14	12		LilyPad Arduino
	ATmega328	16MHz	0.5kB	14	12		Arduino Pro
	ATmega2560	16MHz	8kB	54	4		Arduino Mega ADK
ATmega32U4	16MHz	–	–	8		Arduino Esplora	
Raspberry Pi	ARM Cortex – A53	1.2GHz	1GB	40	34		Raspberry Pi 3 Model B
	ARM11	1GHz	512MB	40	12		Raspberry Pi Zero W
NVIDIA	ARM Cortex-A57	1.73GHz	4GB	400	5		Jetson TX1 Dev Kit
	ARM Cortex-A57	2GHz	8GB	400	14		Jetson TX2 Dev Kit
Intel	Intel Atom-Z34XX	500MHz	1GB	70	8		Edison Compute Module
	Intel Atom IA-32	500MHz	1GB	70	8		Edison Kit for Arduino
BeagleBoard	Dual ARM Cortex-A15	1.5GHz	2GB	–	8		BeagleBoard-x15
	Cortex-A8	1GHz	4GB	92	10		BeagleBone Green
	Cortex A8	1GHz	512MB	–	10		BeagleBone Black
Asus	ARM Cortex-A17	1.8GHz	2GB	–	4		Asus Tinker Board
Banana Pi	ARM Cortex-A7	1GHz	1GB	–	4		Banana Pi M2
	ARM Cortex-A7	1.8GHz	2GB	–	4		Banana Pi M3

GPS Module

Position Update Rate	GPS Module Specifications		Total GPS Modules Required	Unit Price (Final – in USD)	Brands
	Navigation Sensitivity	Channel			
1Hz	-167 dBm	50ch	16		Blue BN-800
	-167 dBm	27ch	12		CRIUS MultiWii MWC I2C-GPS
	-165 dBm	42ch	5		Ublox Neo-7M
	-167 dBm	54ch	8		Ublox NEO-6M
5Hz	-161 dBm	50ch	8		SMAKN R Pi GPS Module
	-167 dBm	72ch	12		Ublox NEO-M8N BN-800 GPS
	-161 dBm	14ch	16		GPS Module U-blox NEO-6M
10Hz	-167 dBm	50ch	8		Ublox Neo-M8N
	-165 dBm	66ch	10		Adafruit Ultimate GPS Breakout
20Hz	-165 dBm	14ch	8		Venus 634 GPS Module
	-165 dBm	21ch	5		Reach RTK Kit

MEMS Modules

Degree of Freedom	MEMS Specifications				Total Number of IMUs	Unit Price (Final – in USD)	Brands
	Accelerometer	Gyroscope	Compass	Barometer			
6DoF	ADXL345	ITG3200	None	None	10		SparkFun 6-DoF IMU
	ADXL345	ITG3200	None	None	6		MPU-6050
10DoF	ADXL345	ITG3200	HMC5883L	BMP085	14		DFRobot 10-DoF IMU
	ADXL345	ITG3205	HMC588L	None	10		GY-85 BMP085
	LSM303	L3GD20H	LSM303	BMP180	14		Adafruit 10-DoF IMU
	ADXL345	L3G4200D	HMC5883L	BMP280	10		BMP280 MPU9255
	ADXL345	L3G4200D	HMC5883L	BMP085	6		SUNKEE 10-DoF IMU
	ADXL345	ITG3205	HMC5883L	BMP085	6		BerryGPS-IMU
	ADXL345	L3G4200D	HMC5883L	BMP280	10		HiLetgo MPU-9250

7. Telemetry Components

LiPo Voltage Sensor

LiPo Battery Support	Total Number of Sensors	Unit Price (Final in USD)	Brands
2S – 6S	16		FrSky FLVSS LiPo Voltage Sensor
1S – 5S	16		FrSky Battery Voltage Sensor
2S – 6S	18		FrSky Mini LiPo Voltage Sensor
2S – 8S	10		HobbyKing LiPo Voltage Checker

Telemetry Transceiver

Operating Frequency	Total Number of Sensors	Unit Price (Final – in USD)	Brands
433MHz	24		HKPilot Telemetry Transceiver
915MHz	24		HKPilot Telemetry Transceiver

8. FPV Gears

FPV Component	Total Number of Items	Unit Price (Final – in USD)	Brands
5.8GHz Transceiver	16		FX797T
	16		WR832
	20		TS832+RC832
	12		FPV Tx/Rx
Camera Gimbal	14		2 Axis
	14		2 Axis

9. Frames and LiPo Chargers

DIY Multirotor Frames

Multirotor	Total Number of Frames	Unit Price (Final – in USD)	Brands
Quadcopter	12		S500
	14		F330
	20		F450
	10		220-RX
	10		HIPPO
	10		X210
	10		Martian II RX220
	10		GEP210 X210
	10		QAV-X 214
	10		GEP-LX5 X220
	10		H280
Hexacopter	10		RACER iX5
	10		HMF F550
	15		S550 F550
	20		F550
	5		Fy680 3k OR
	5		FY680PRO
Octocopter	5		FY690S
	15		F550
	15		HML 650
	3		HML850
	2		IRON MAN
2		TL8X000 X8	

LiPo Battery Chargers

LiPo Battery Support	Total Number of Chargers	Unit Price (Final – in USD)	Brands
2S – 4S	8		EV-Peak E4
2S – 6S	8		RCmall XT60
2S – 3S	8		GoolRC B3

10. UAV Frame/Airfoil Construction Materials

Structural Material	Material Properties	Remark	Required Quantity
Styrofoam	<ul style="list-style-type: none"> – Thermoplastic – Lightweight and shock absorber – Insulator – Buoyant 	Styrofoam is composed of 98% air, making it lightweight and buoyant. Due to these and other properties, Styrofoam is used in aircraft body construction.	
Plywood	<ul style="list-style-type: none"> – Increased stability – High impact resistance – Surface dimensional stability – High strength to weight ratio – Chemical resistant 	Plywood is a highly flexible type of wood that can resist bending forces before it gets to a point where it breaks. Hence, will all the properties it has, plywood is extensively used to build aircraft body and parts.	
Balsa wood	<ul style="list-style-type: none"> – Best strength-to-weight ratio – Can be shaped, sanded and glued easily – Non-toxic and biodegradable – Highly shock absorber – Known as “miracle material” 	Since balsa wood very light weight and can be shaped, sanded, glued and painted very easily, it has found a wide range of applications in building aircraft body and parts.	
Composite material	<ul style="list-style-type: none"> – High strength-to-weight ratio – Lightweight – Fire resistant – Chemical & weathering resistant – Flexible for design purposes – Low thermal conductivity 	Composite materials on an aircraft structure reduce weight. Fiber-reinforced matrix systems are stronger than traditional aluminum found in most aircraft, and they provide a smooth surface and increase fuel efficiency. Hence, preferable to build planes.	
Prepreg	<ul style="list-style-type: none"> – Maximum strength – Part uniformity and repeatability – Less mass & less waste – Less 	Prepreg is “pre-impregnated” composite fiber where a thermoset polymer matrix material; such as epoxy, is already present. Such a method makes aircraft construction easy.	

11. Workstation & Laptop Computers and Accessories

- **Workstation computers detailed specifications**

Case	– GX4 - Velocity Micro® Extended Depth ATX Chassis - Satin black pure aluminum, exclusive design with advanced cooling
Power Supply	– 750 Watt EVGA® SuperNOVA Power Supply, 80Plus Bronze Certified, > 80% efficiency
Motherboard	– Asus® PRIME X299-Deluxe Intel® X299 based chipset, ATX Motherboard
Processor	– Intel® Core® i9-7900X Processor, 10-core @ 3.3GHz (4.3GHz Turbo) with HT, 13.75MB L3 Cache, 140 watts
Cooling	– Phanteks PH-TC12LS Low Profile CPU Cooler with High Static Pressure fan, Plus 2 x 120mm side fans
Thermal Paste	– IC Diamond™ Thermal Interface Material - Contains 92% micronized synthetic diamond, the ultimate thermal conductor
DDR4 Memory	– 32GB Crucial® Ballistix™ DDR4-2400MHz (4 x 8GB), CAS 16 latency, low voltage
Tuning	– Advanced CPU Hyperclocking, Motherboard, and Memory Performance Optimization
Video Card	– 8GB EVGA® NVIDIA® GeForce GTX1080 Gaming GDDR5X video card
Video Tuning	– Advanced 3D Video Performance Tuning, Optimization, and Hyperclocking
Monitor	– 27" Asus® MX27AQ 1440P WQHD, 144Hz, 5MS
Audio	– On-board Integrated Realtek ALC1150 7.1+2 - Channel Audio with Optical Out
Speakers	– Creative Labs Gigaworks T20 Series II Stereo Speakers
Hard Drive 1	– 525GB Crucial® MX300 Solid State Drive - 530MBps Read/510MBps write speed (Great value)
Hard Drive 2	– 4TB SATA 600 with 64MB Cache
Optical Drive 1	– Asus® Blu-ray Reader, DVD-RW/CD-RW Drive - No Playback Software Included
Media Reader	– External USB 3.0 Multi Media Flash Memory Card Reader
Network 1	– Integrated 10/100/1000Mbps Gigabit Ethernet Network Adapter

- Network 2** – D-Link 802.11ac USB WiFi Adapter
- Bluetooth** – USB Bluetooth 4.0 Receiver
- Operating System** – Microsoft® Windows® 10 Home, including original OEM Disk
- Keyboard** – Corsair® K70 Gaming Keyboard
- Mouse** – Corsair® Vengeance M65 Laser FPS Gaming Mouse
- Microphone** – Cyber Acoustics ACM-1b Monitor Microphone - FREE Upgrade for a Limited Time
- Apparel** – Velocity Micro® Limited Edition T-shirt in Blue, size L
- Assembly** – Immaculate custom hand wiring by Senior Technicians in Richmond, Virginia, USA
- Quality Assurance** – Individual custom testing for complete system stability, signed by the system builder and QA inspector
- Documentation** – Velocity Micro manual, driver disks, and accessory pack
- Warranty** – 2 Yr Standard Parts & Labor Ltd Warranty, Lifetime Regular Business Hour Support, 2 Yr Depot Repair
- Upgrade Plan** – Lifetime Upgrade Plan allows you to return your system for maintenance, upgrades, and tuning

Workstation Specs	Number of Workstations Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	6	\$6,000.00	Velocity Micro Raptor Z95

Model	– Digital Storm Slade PRO
Processor	– Intel Xeon W-2155 (10-Core) 3.30 GHz (Up to 4.50 GHz)
Motherboard	– SuperMicro X11SRA-F (Dual 1GB LAN) (IPMI Access) (TPM Module) (Up to 3x PCI-E Devices)
System memory	– 128GB DDR4 2133MHz (ECC Registered)
Graphics card (s)	– 1x GeForce GTX 1080 Ti 11GB (Performance Edition) (VR Ready)
Sound card	– Creative Sound Blaster Zx (Includes Audio Control Module)
Display	– Asus 4K Ultra HD 28 inch PB287Q Series (10-bit Color) (1ms Response Time) (3840 x 2160)
Keyboard	– Corsair K95 RGB PLATINUM - Cherry MX Speed (Mechanical Gaming Keyboard) (Gunmetal Finish)
Audio	– Logitech 2 Piece (Black Edition) Amplified Speaker Set
Mouse	– ASUS ROG Gladius II Aura Sync USB Wired Optical Gaming Mouse
Airflow control	– Digital Storm Thermal Management Control Board & Software
Surge protector	– APC SurgeArrest Personal PER7 (7 Outlet) 120V Surge Protector
Power supply	– 1200W Cooler Master V1200
Storage set 1	– 1x SSD (1TB Samsung 850 EVO)
Storage set 2	– 1x Storage (4TB Western Digital - Gold Datacenter Edition)
Storage set 3	– 1x Storage (6TB Seagate / Toshiba)
Internet/network access	– Wired PCI-E Intel X540-T1 (10 GbE) (1x RJ45 Connector)
Expansion bay	– Dual SSD Hot Swap Bay (Internal)
Optical drive	– Blu-Ray & DVD Writer/Reader (Burn + Play Blu-Ray & DVDs) (12x BD-R) (Internal)
Chassis fans	– Corsair LL Series (RGB Fans) (Software Controlled Effects)

- Chassis mod's** – No thanks
- Noise reduction** – Noise Suppression Package Stage 1 (Optimized Airflow & Fan Speeds Only)
- Extreme cooling** – H20: Stage 2: Corsair H115i - 280mm Liquid CPU Cooler (Fully Sealed + No Maintenance)
- HydroLux tubing style** – Not Applicable, I do not have a custom HydroLux liquid cooling system selected
- HydroLux fluid color** – Not Applicable, I do not have a custom HydroLux liquid cooling system selected
- Cable management** – Exotic Cable Management - White - (Cable Combs with Custom Color Sleeved Extension Cables)
- CPU boost** – Stock Factory Turbo Boost Advanced Automatic Overclocking
- Graphics boost** – Yes, Overclock the video card(s) as much as possible with complete stability
- OS boost** – No Thanks, Please do not tweak the services on the operating system
- Internal lighting** – Remote Controlled LED Lighting System
- Exterior finish** – Standard Factory Finish
- Trim finish** – Standard Factory Finish
- Branded gear** – T-Shirt - Digital Storm - Black (Large) (L)
- Warranty plan** – Life-time Expert Care with 4 Year Limited Warranty (4 Year Labor & 2 Year Part Replacement)

Workstation Specs	Number of Workstations Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	10	\$9,000.00	Digital Storm Slade PRO

- **Laptop computer detailed specs**

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- Touch Bar** – Touch Bar with integrated Touch ID sensor
 - Finish** – Space Gray
 - Display** – Retina display; 15.4-inch (diagonal) LED-backlit display with IPS technology; 2880-by-1800 native resolution.
 - Processor** – 2.9GHz quad-core Intel Core i7, Turbo Boost up to 3.9GHz, with 8MB shared L3 cache
 - Storage** – 512GB PCIe-based onboard SSD
 - Memory** – 16GB of 2133MHz LPDDR3 onboard memory
 - Graphics** – Radeon Pro 560 with 4GB of GDDR5 memory and automatic graphics switching; Intel HD Graphics 630
 - Charging & Expansion** – Four Thunderbolt 3 (USB-C) ports with support for: Charging, DisplayPort, Thunderbolt (up to 40 Gbps) and USB 3.1 Gen 2 (up to 10 Gbps)
 - Wireless** – Wi-Fi; 802.11ac Wi-Fi wireless networking; IEEE 802.11a/b/g/n compatible; Bluetooth; Bluetooth 4.2 wireless technology
 - Camera** – 720p FaceTime HD camera
 - Audio** – Stereo speakers with high dynamic range; three microphones; 3.5 mm headphone jack
 - Size & Weight** – Height: 1.55 cm; Width: 34.93 cm; Depth: 24.07 cm; Weight: 1.83 kg
 - Operating System** – macOS High Sierra

Laptop Specs	Number of Laptops Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	1		Apple MacBook Pro

- **Mechanical Keyboard detailed specs**

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- Weight** – 2.65lbs
 - Key switches** – Cherry® MX Red Mechanical
 - Keyboard backlight** – RGB LED
 - Dimensions** – 502mm x 163mm x 24mm
 - Macro keys** – 18 dedicated / All Keys
 - Report rate** – Selectable 8ms, 4ms, 2ms, 1ms and BIOS mode
 - Matrix** – 100% anti-ghosting and 122 Key Rollover
 - Keyboard size** – Extended

- On-board memory** – Yes
- Media keys** – Six dedicated multimedia keys
- Wrist rest** – Full length detachable with soft touch finish
- CUE software** – Enabled
- Cable type** – Braided fiber
- WIN lock** – Yes

Mechanical Keyboard Specs	Number of Keyboards Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	8		Corsair Vengeance K95 RGB

- **Workstation monitor/display detailed specs**

-
- Panel size** – Wide Screen 28"(71.12cm) 16:9
 - True resolution** – 3840x2160 at 60Hz (DisplayPort), 3840x2160 at 30Hz (HDMI)
 - Pixel pitch** – 0.16mm
 - Brightness (Max)** – 300 cd/m²
 - Viewing angle (CR>10)** – 170° (H)/160° (V)
 - Response time** – 1ms (Gray to Gray)
 - Display colors** – 1073.7M (10bit)
 - Stereo speakers** – 2W x 2 Stereo RMS
 - Signal input** – HDMI, HDMI/MHL, DisplayPort
 - PC audio input** – 3.5mm Mini-Jack
 - Earphone jack** – 3.5mm Mini-Jack (for HDMI & DisplayPort Only)
 - Digital signal frequency** – 24~99KHz (H) / 30~75Hz (V)
 - Chassis color** – Black
 - Tilt** – +20°~-5°
 - Swivel** – Yes
 - Pivot** – Yes
 - Height adjustment** – Yes

- VESA wall mounting** – 100x100mm
- Net weight (esti.)** – 7.9kg
- Gross weight (esti.)** – 10.6kg

Workstation Display/Monitor Specs	Number of Monitors Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	10		Asus 4K Ultra HD 28 inch PB287Q Series

- **75” Class Q7F QLED 4K TV**

Product

Type – QLED TV

Series

Series – Q Series

Design

Type – Boundless 360 with Clean Back Finish

Screen type – Flat panel

Backlighting – Edge-lit LED

Stand type – T-type real stainless (sterling silver)

4K Ultra HD connected – Yes

Style – Flat

TV type – QLED

Video

Screen size	– 74.5” measured diagonally
Resolution	– 3840 x 2160, 4K Ultra HD
Motion rate	– 240
Color	– Q 4K color drive elite
10bit support	– Yes
HDR	– Q 4K HDR elite
Blacks	– Q 4K elite black
Picture engine	– Q engine
Quantum dot color	– Yes
UHD upscaling	– Yes
Depth enhancing tech.	– Contrast enhancer

Audio

Dolby	– Dolby digital plus
DTS premium sound	– DTS premium sound 5.1
Sound output (RMS)	– 40W
Speaker type	– Front firing (4.2CH)
Multiroom link	– Yes
Bluetooth headset support	– Yes

Wireless Connectivity

- Wi-Fi** – Yes
- Wi-Fi direct** – Yes
- Bluetooth** – Yes

Features

- Smart hub** – Yes (incl. Sports, Music and TV Plus)
- Processor** – Quad-core
- Apps platform** – Smart TV with Apps and full web browser
- Voice interaction** – Yes
- Ultra clear panel** – Yes
- Ultra black** – Yes
- Dimming Technology** – Supreme UHD dimming
- Precision black** – Precision Black Pro
- ConnectShare™** – Yes
- RVU** – Yes (DIRECTTV Ready)
- OSD language** – English, Spanish, French
- Anynet+™ (HDMI-CEC)** – Yes
- Closed captioning** – Yes
- Electronic program guide** – Yes
- V-Chip** – Yes

Inputs & Outputs

HDMI	– 4
USB	– 3
Ethernet	– 1
RF In (Terrestrial/Cable Input)	– 1/1(Common Use for Terrestrial)/0
Digital Audio Out (Optical)	– 1
Audio Return Channel Support	– Yes
RS232C	– 1

Dimensions

Product size (WxHxD)	
Without Stand	– 65.8 x 37.7 x 2.1
Product size (WxHxD)	
With Stand	– 65.8 x 41.2 x 16.1
Stand size (WxHxD)	– 40.2 x 22.7 x 16.1

Power

Powers supply (V)	– AC110-120V 50/60Hz
Typical power consumption	– 140W
Maximum power consumption	– 290W
Standby power consumption	– Under 0.4W

System

DTV Tuner – ATSC / Clear QAM

Installation Features

Optical cable – Yes

No gap wall mount ready – Yes

Accessory

Remote – Samsung OneRemote (TM1750A)

Remote control battery – Yes

Vesa wall mount compatibility – Yes (400 x 400)

Power cable – Yes

User manual – Yes

E-manual – Yes

Key Features

Quantum dot color – Yes

Flat TV – Yes

Smart TV – Yes

360 Design – Yes

75" Class QLED 4K TV	Number of TVs Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	1		Samsung 75" QLED 4K Screen OR

12. 3D Printers, 3D scanners and CNC machines

- **3D printers detailed specs**

Technology	– Fused Deposition Modeling (FDM)
Material	– Nylon, PLA, ABS, CPE and PVA
Build volume	– 215 x 215 x 200 mm
Layer resolution	– 200 to 20 microns
Extruder head	– Dual extrusion print head
Open source	– software
Heated platform	– Yes
Filament diameter	– 2.85 mm
Onboard control panel	– Yes
Connectivity	– WiFi, LAN or USB
Compatible with 3rd party material	– Yes
Weight	– 10.6kg

3D Printer Specs	Number of 3D Printers Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	2		Ultimaker 3

Technology	– Fused Deposition Modeling (FDM)
Material	– 3.0mm ABS, PLA, HIPS, PVA, wood, polyester etc.
Build volume	– 280 x 280 x 250 mm
Highest resolution	– 50 microns
Extruder head	– Dual extrusion compatible
Heated platform	– Yes
Filament diameter	– 3.0 mm
Onboard control panel	– Yes
Connectivity	– SD card

Compatible with 3rd party material – Yes
Weight – 10.99kg

3D Printer Specs	Number of 3D Printers Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	2		LulzBot TAZ 6

Technology – Stereolithography (SLA)
Material – Resin
Build volume – 145 x 145 x 175 mm
Highest resolution – 100 to 25 microns
Heated platform – Yes
Onboard control panel – Yes
Connectivity – WiFi, USB or Ethernet
Compatible with 3rd party material – Yes

3D Printer Specs	Number of 3D Printers Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	2		Formlabs Form 2

• **3D scanners detailed specs**

Category	3D Scanner		Total Number of Scanners Required	Unit Price (Final – in USD)	Brands
	Technology	Resolution			
DIY Options	RGB camera, depth sensor	Varies	2		Kinect Sensor
	Laser triangulation	0.5 mm	1		BQ Ciclop 3D Scanner
Low-Cost Handheld	Structured light	1.5mm	1		XYZprinting Handheld 3D Scanner
	Structured light	0.9mm	1		Cubify Sense OR

- **CNC machine detailed specs**

General

– The CNC router is suitable for Industry, Technology Research, Advertising Design, Arts Creation, Teaching, Student Project and Hobby Purposes. The CNC router is designed for large area engraving work such as Industrial or Hobby Prototype Building, Building Model Making, PCB, Advertising Signs, Artwork, Crafts, Aircraft Models, RC Model parts, etc. So, you can do engraving work at office or home. In addition, it can be upgraded to be installed a rotational axis.

Stepping Motor

– The engraving process is visible as controlled by computer; Simple operation and installation; Technical Parameters ; 1.5KW 3axis engraving machine parameters: Machine Dimensions; 1200X780X580mm; Rack material; 6061 and 6063 Hard aluminum alloy; (The unique and dedicated mold extrusion profiles, Let counterfeiter dwarfs.); Engraving area; 900X600mm; Z-Axis Stroke; 125mm,

Engraving

– Engraving depth depends on the length of the tool edge; Acceptable material thickness: ≤125mm; Rail type; Chrome plate shaft + Linear Bearings, Surface hardening 61HRC; Type of screw; Ball screw 1605, Pitch 4mm; Spindle motor; 1.5KW VFD water cooling spindle , 0-24000r/min; Collet type; ER11,1/8"(3.175mm) Collet; Stepper motor and drive; two-phase hybrid stepping motor 57BYGH56-4011YD, 8 segments drive.

Maximum operating speed

– 4000mm/min (Engraving speed :300-3000mm/min); Repeat positioning Accuracy:0.03mm; Communication interface; Parallel port; Software Compatibility; Mach3/Emc2/Kcam, (Type3,Wentai, ArtCAM, coppercam); Command code; G code/.nc/.ncc/.tab/.txt; Machine weight; 110kg; Feature: Can add the 4th axis, and upgrade to 2.2kw spindle.

Packing List

– 1× Engraving machine; 1× Control box; 1× Power cable; 1× control line; 1× Parallel port cable 25pin; 1× Tool package (include tools 5 pcs, wrench 2pcs, clamp 4pcs); 1× tool auto-checking instrument; 1x water pump; 1× Rotation axis; 1× CD of manual and software MACH3

CNC Machine Specs	Number of 3D Printers Required	Unit Price (Final – in USD)	Brands
All of the above listed specs.	1		GOWE 1.5KW CNC Engraving Machine

13. Miscellaneous

Material Type	Number of Units	Unit Price (Final – in USD)	Name
Hot glue guns	10		Blusmart 100-Watt Industrial Glue Gun
Standard pliers Needle nose pliers	10		Stanley 84-096 5-Inch Needle Nose Plier
Soldering iron including de-soldering and other material as full pack	10		Soldering Iron Kit
Soldering Paste	10		Oatey 30013
Screwdrivers set -20 piece	10		Stanley 60-220 Standard Fluted Screwdriver Set
Small vise	5		SE 8436MVC 3" Universal Table Vise
Digital Multi-meter	7		Digital Multimeter
Duct tape 4x,5pack	5		T-Rex Tape
0.8mm Tin Lead Welding 2x	10		200g 1mm Lead
Electric wire	10		Southwire 55667423 Primary Wire
Prototyping small breadboard	20		Ocr TM 15PCs PCB Board
Prototyping large breadboard	10		Tektrum Solderless Breadboard
USB to TTL converter	20		KEDSUM CP2102 Module
Wire Stripper	7		IRWIN VISE-GRIP
Gauge White Hook-Up Wire	3		Remington Industries
Wide Angle FPV Camera	15		Crazepony 700TVL Wide Angle FPV
2000M Range Audio Video Transmitter and Receiver	15		AKK 5.8G FPV 2000M Range
Digilent FPGA Nexys 4 DDR Artix-7 FPGA	6		Nexys4 DDR Atrix-7
Altera DE2-115 Development and Education Board	6		Terasic Technologies P0059
Wifi module	25		DIYmall ESP8266 ESP-01S
2x5 way Motherboard USB pin header connector	10		Adapter Cable
Crimp Connector Housing: 2x20-Pin 5-Pack	20		Battery Quick Connect/Disconnect
Cobbler Plus Breakout Board Kit with 20cm 40 Pin Ribbon Cable	5		RPI GPIO

UAV Material Purchase List

USB To DB25 Parallel Printer Adapter Cable	7	C2G/Cables
Alligator Tipped Connector	10	Elenco TL-6 Alligator Lead Set
Probes and Hooks	3	Extech TL809 Electronic Test Lead Kit
Welder	3	Goplus MIG 130 Welder Flux Core Wire
Welding Gloves	5	US Forge 400 Welding Gloves
Benchtop Lathe	2	SHOP FOX W1704 1/3-Horsepower
Caliper Set	2	Big Horn 1 9053 8-Inch, 3-Piece
Drill Press	3	Dremel 220-01 Drill Press
Digital Oscilloscope	3	Hantek DSO5072P, 70 MHz Bandwidth
Band Saw	3	Olson 10093 Band Saw Blade
Circular Saw	3	PORTER-CABLE PC15TCS
Pipe Bender	3	Goplus 12 Ton Heavy Duty Pipe Bender
Belt Sander	6	Black & Decker DS321 Dragster
Mini Milling Machine	4	Multipurpose 6 In1 Lathe Kit Jig-saw
Grinder	4	WIN 4276 6-Inch Bench Grinder
Vertical Milling Machine	3	Jet 690036 JVM-836-1 115/230-Volt
Programmable DC Power Supply	2	E3631A
Hand Tools	3	UbiGear Cable Tester+Crimp+Crimper
IC Programmer	3	Signstek TL866CS
PCB Reflow Oven/ Stencil Printer	2	Popsport Infrared Reflow Oven
Hot-Air Rework Station	2	X-TRONIC XTR-4040-XTS
Desktop 3D Scanner	3	MakerBot Digitizer
ABS Filament (Black)	10	MakerBot ABS Filament Black
ABS Filament (Purple)	10	MakerBot ABS Filament Purple
Dissolvable Filament	10	MakerBot Dissolvable Filament
Helping Hand	10	Helping Hand with Magnifying glass
Servo Motor	20	Continuous Rotation Robotics Servo
Servo Motor	20	TowerPro MG90s
Servo Motor	25	SG90 9G Mini Servo with Accessories
Servo Motor	10	SR318

UAV Material Purchase List

Servo Motor	10	HS-311 Servo Standard Universal
DC Motor	10	Hybrid Stepper Motor
DC Motor	10	Magnetic Mini Motor
DC Motor	10	Mini Electric Motor
DC Motor	10	carbon brush copper gear Biaxial
DC Motor	5	DC Gear Motor with Encoder
Stepper Motor	10	CNC Stepper Motor Shaft Coupling Coupler for Encoder
Encoder Motor	10	Micro Gear Box Motor Speed Reduction Electric Gearbox Centric Output S
Motor Speed Measuring	10	Double Speed Measuring Module with Photoelectric Encoders For Experim
Wireless Audio Video Receiver Sender kit	10	Camecho 1.2GHz 16CH 700mw
iEachine TX03 Mini AIO 5.8G 72CH VTX 600TVL 1/3 Cmos FPV Camera Power Transmitter	10	Eachine TX03 NTSC
Eachine E010 Frame Beecore F3 Flight Controller Chaoli 615 59000RPM Motor TX03 72CH VTX Camera Set	6	Eachine E010 Frame Beecore F3 Flight Controller
Vinsic 20000mAh Power Bank Portable Cell Phone External Battery Charger Dual USB	10	20000mAh Power Bank
Sale Powerful Iduino Yun Shield Linux WiFi Ethernet USB for Arduino Project	5	Sale Powerful Iduino Yun Shield
I2C BUS INTERFACE	6	AuBreey TCS230 TCS3200D