



The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at [wvOASIS.gov](http://wvOASIS.gov). As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at [WVPurchasing.gov](http://WVPurchasing.gov) with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.

## Header 6

List View

- General Information
- Contact
- Default Values
- Discount
- Document Information
- Clarification Request

Procurement Folder: 758324

SO Doc Code: CRFQ

Procurement Type: Central Purchase Order

SO Dept: 0803

Vendor ID: VS0000022344

SO Doc ID: DOT2100000033

Legal Name: 4D Tech Solutions, Inc.

Published Date: 10/14/20

Alias/DBA: 4D Tech Solutions, Inc.

Close Date: 10/20/20

Total Bid: \$127,800.00

Close Time: 13:30

Response Date: 10/19/2020

Status: Closed

Response Time: 16:58

Solicitation Description: ADDENDUM NO\_1 Unmanned aerial vehicle UAV (6321012)

Responded By User ID: bbegley

Total of Header Attachments: 6

Total of All Attachments: 6



Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Option A or B - Unmanned Aerial Vehcile UAV	1.00000	EA	32800.000000	32800.00

Comm Code	Manufacturer	Specification	Model #
25131705			

**Commodity Line Comments:** UAV Option A is quoted at left. UAV Option B has been separately quoted as an attachment. Specification sheets for Option A and B have been attached to the bid package.

**Extended Description:**

Option A or B - Unmanned aerial vehicle UAV with hard protective case, spare battery and warranty

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	Option A or B - Flight Control System as outlined in 3.2.1.2	1.00000	EA	0.000000	0.00

Comm Code	Manufacturer	Specification	Model #
25131705			

**Commodity Line Comments:** Flight controls are included with the purchase of UAV. UAV Option A flight controls have been quoted and specifications have been attached. UAV Option B quote and specifications attached.

**Extended Description:**

Flight Controls

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	Lidar Sensor with dual GPS antenna	1.00000	EA	95000.000000	95000.00

Comm Code	Manufacturer	Specification	Model #
25131705			

**Commodity Line Comments:** RedTail LiDAR Systems RTL-400 system has an Applanix APX-18 GPS/IMU integrated both complete specification sheets are attached.

**Extended Description:**

Lidar Sensor with dual GPS antenna

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	Software	0.00000	EA	0.000000	0.00

Comm Code	Manufacturer	Specification	Model #
43232600			

**Commodity Line Comments:** RedTail LiDAR Systems provides point cloud generation software (RTL-PCG) and software to control the LiDAR sensor/Ground Control Station. Software suites are compatible with Windows 10 and RTL-PCG exports .las files.

**Extended Description:**

Unmanned aerial vehicle UAV operational software



RedTail LiDAR Systems  
 401 10th Street  
 Fairmont, WV 26554

# Quote

Date	Quote #
10/15/2020	20233.3

Customer
Department of Administration Purchasing Division 2019 Washington Street East Charleston, WV 25305-0130

Pricing is valid for 60 days	Lead Time (Subject to Change)	Terms	Rep
	30 Days	Net 30	BB

Item	Description	Qty	Total
RedTail LiDAR RTL-400 Package	RTL-400 MEMS mirror based LiDAR System, including additional components:  Ground Control Station, includes: - High brightness display - I/O connection cable  Applanix APX-18 IMU/GNSS, includes: - Dual antennas with universal mount - GPS Antenna Cables - Mounting Hardware - Applanix POSPac software and 12-month maintenance  Drone Mounting Kit, includes: - Universal dovetail mount - Locking pin  Field Case: - Ground control station battery charger - Ground control station battery (x2) - Optics cleaner - Operator's manual - Quick start guide - Quick card for point density calculations - Safety guide - Spare locking pin - AC/DC power adapter (x2)	1	95,000.00

RedTail LiDAR Systems is a business division of 4D Tech Solutions, Inc.

<b>Total</b>
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RedTail LiDAR Systems  
 401 10th Street  
 Fairmont, WV 26554

# Quote

Date	Quote #
10/15/2020	20233.3

Customer
Department of Administration Purchasing Division 2019 Washington Street East Charleston, WV 25305-0130

Pricing is valid for 60 days	Lead Time (Subject to Change) 60 days	Terms 50% Down/50% Prior to Ship	Rep BB
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Item	Description	Qty	Total
RedTail Software	RedTail LiDAR Point Cloud Generator (RTL-PCG) Software - Data processing to LAS file RedTail Installer - Lifetime license - 3 years of software updates	1	0.00
RTL Training	Training and Support - 2 days (16 hours) on-site, in-person, training with one member of 4D Tech Solutions staff at the 4D Tech Solutions site in Fairmont, WV. - 20 hours follow-up technical phone support which may be used within the first year after receipt of product.  Order subject to applicable sales tax and shipping charges.	1	0.00

RedTail LiDAR Systems is a business division of 4D Tech Solutions, Inc.

<b>Total</b>	\$95,000.00
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# REDTAIL

## LIDAR SYSTEMS

The RedTail LiDAR System – Scanning the way it was meant to be.™



### Applications



CONSTRUCTION



AGRICULTURE



INFRASTRUCTURE



RESOURCE  
MANAGEMENT

#### HIGH RESOLUTION IMAGES

The RedTail LiDAR System is designed to create high-resolution point clouds. The superior resolution provided by the RedTail LiDAR System allows customers to perform enhanced data analytics.

#### HIGH POINT DENSITY

The RedTail LiDAR System transmits all laser pulses to the ground to optimize point cloud density. LiDAR points are evenly spaced to provide superior mapping capability.

#### SUPERIOR RANGE

The RedTail LiDAR System allows customers to collect point clouds at increased altitudes to enhance operations in diverse flight environments.

#### EASE OF USE

The RedTail LiDAR System is designed to be easy and intuitive to use. We've simplified all aspects of point cloud data collection – from drone integration to data analysis.



# About the RedTail LiDAR System

## RTL-400 Specifications

### General Characteristics

- Weight: 5.25 lbs
- Operating Temperature Range: -10 to 60 deg C
- Reconfigurable Scanning on the Fly
- Laser Wavelength: 1550 nm
- Beam Divergence: 0.5 mrad
- Field of View: 40 x 40 degrees

### Performance Characteristics

- Max Range 20% Reflective (e.g., trees, grass): 100 meters
- Max Range 80% Reflective: 120 meters
- Range Accuracy: 15mm
- Range Precision: 10mm

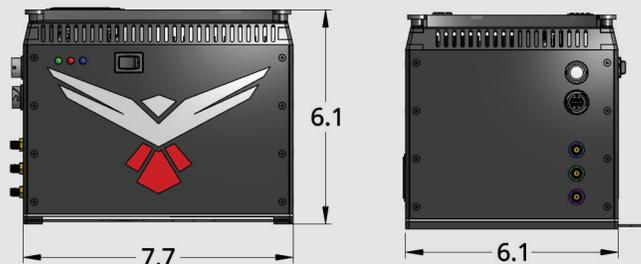
### System Operating Parameters

- Line Scans/Second: 400
- Max Pulse Repetition Rate: 400 kHz
- Max Returns per Pulse: 5
- Max Measurement Rate: 1 million (measurements/second on ground)

### Components

- Scanning Mechanism: Microelectromechanical Mirror (MEMS)
- IMU/GNSS: Applanix APX-18

### Dimensions



Phone **304.306.2396** Email **[sales@redtaillidar.com](mailto:sales@redtaillidar.com)**

Learn more at **[redtaillidar.com](http://redtaillidar.com)**



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# APX-18 UAV

## SINGLE BOARD DUAL ANTENNA GNSS-INERTIAL SOLUTION

The Trimble APX-18 UAV is an OEM GNSS-Inertial solution with dual GNSS antenna input, designed to georeference LiDAR and other imaging data when collected from Unmanned Aerial Vehicles (UAV) at low speeds or when hovering. Comprised of a small single OEM board containing a precision GNSS receiver with two antenna heading and inertial sensor components plus POSPac UAV Differential GNSS-Inertial office software, the Trimble APX-18 UAV produces a highly accurate position and orientation solution for directly georeferencing LiDAR point clouds and imagery.

### HIGH ACCURACY, EXTREMELY SMALL PACKAGE

Measuring just 100 x 60 mm and weighing only 62 grams, the APX-18 UAV provides unparalleled performance in an extremely small package. With the included POSPac UAV post-mission software, it produces a highly accurate position and orientation solution for direct georeferencing of cameras, LiDARs and other UAS sensors.

### THE APX-18 UAV BRINGS ALL THE BENEFITS OF DIRECT GEOREFERENCING TO UAV PLATFORMS:

- ▶ Turn your UAV into a professional mapping solution
- ▶ Ultra-fast image georeferencing for faster map production and delivery
- ▶ Reduced number of ground control points, saving time and money
- ▶ Consistent, reliable, highly accurate results
- ▶ Increased collection area per flight for greater productivity
- ▶ Redundant navigation solution to autopilot for enhanced safety

### Key Features

- ▶ High-performance Direct Georeferencing solution for improved efficiency and accuracy of mapping from small Unmanned Aerial Vehicles
  - Reduce/eliminate GCP's
  - Reduce sidelap
  - Accurate LiDAR georeferencing
  - Instant alignment through dual GNSS antenna heading
- ▶ Compact single-board OEM module complete with survey-grade multi-frequency GNSS receiver and MEMS inertial components
- ▶ Applanix IN-Fusion™ GNSS-Inertial and SmartCal™ compensation technology for superior position and orientation performance
- ▶ POSPac UAV Differential GNSS Inertial post-processing software for highest accuracy
- ▶ RTK real-time position for precision landing applications
- ▶ Supports all common RTK corrections such as CMR, CMR+, RTCM



## TECHNICAL SPECIFICATIONS

### System Summary

- Advanced Applanix IN-Fusion™ GNSS-Inertial integration technology
- Solid-state MEMS inertial sensors with Applanix SmartCal™ compensation technology
- Advanced Trimble Maxwell Custom GNSS survey technology with 2x336 tracking channels
- Primary Antenna
  - GPS: L1 C/A, L2C, L2E, L5
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA<sup>8</sup>
  - BeiDou: B1, B2, B3
  - Galileo<sup>9</sup>: E1, E5A, E5B, E5AltBOC, E6<sup>8</sup>
  - IRNSS: L5
  - QZSS: L1 C/A, L1S, L1C, L2C, L5, LEX
  - SBAS: L1 C/A, L5
  - MSS L-Band: Trimble RTX, OmniSTAR
- Secondary Antenna
  - GPS: L1 C/A, L2C, L2E, L5
  - GLONASS: L1 C/A, L2 C/A, L3 CDMA<sup>8</sup>
  - BeiDou: B1, B2, B3
  - Galileo<sup>9</sup>: E1, E5A, E5B, E5AltBOC, E6<sup>8</sup>
  - IRNSS: L5
  - QZSS: L1 C/A, L1S, L1C, L2C, L5, LEX
- High precision multiple correlator for GNSS pseudorange measurements
- Unfiltered, unsmoothed pseudorange measurements data for low noise, low multipath error, low time domain correlation and high dynamic response
- Very low noise GNSS carrier phase measurements with <1 mm precision in a 1 Hz bandwidth
- Proven Trimble low elevation tracking technology
- 100 Hz position, roll, pitch and heading output
- IMU data rate 200 Hz
- Navigation output format: ASCII (NMEA-0183), Binary (Trimble GSOF)
- Supported Reference input: CMR, CMR+, sCMRx, RTCM 2.1, 2.2, 2.3, 3.0, 3.1, 3.2
- Support for POSPac UAV post-processing software (included)
- No export permit required

### LAN INPUT/OUTPUT

All Ethernet functions are supported through dedicated IP address (Static or DNS) simultaneously including web based control GUI access and real time data streaming.

- TCP/IP and UDP      ASCII and Binary data streaming (Time tag, PPS sync, status, position, attitude, velocity, track and speed, dynamics, performance metrics, GNSS data)
- HTTP                      Web based Control software (GUI) for easy system configuration and low rate display. Support for all common browsers (IE, Safari, Mozilla, Google Chrome, Firefox)

### SERIAL INPUT/OUTPUT

- 2 x RS232 ports (baud rates up to 460,800)
- Parameters              ASCII and Binary data streaming (Time tag, PPS sync, status, position, attitude, velocity, track and speed, dynamics, performance metrics, GNSS data), reference input (CMR, CMR+, sCMRx, RTCM), configuration messages

### OTHER INPUT/OUTPUT

- PPS (pulse-per-second) Time Sync Pulse output
- Event Input (2)              Two time mark of external events  
TTL 3.3 V pulses, max rate 50 Hz
- Digital I/O (3)              LED drivers with dedicated functionality for systems integrators

## LOGGING

- Internal Logging              6 GByte Flash memory
- External Logging              USB 2.0 Device port
- Parameters                      Time tag, status, position, attitude, velocity, track and speed, dynamics, performance metrics, raw IMU data (200 Hz), raw GNSS data (5 Hz)

## PERFORMANCE SPECIFICATIONS<sup>2</sup> (RMS ERROR)

### Unmanned Airborne Vehicle Applications

	SPS	RTK <sup>4</sup>	PP-RTX <sup>10</sup>	Post-Processed <sup>5</sup>
Position (m)	1.5 - 3.0	0.02 - 0.05	0.03 - 0.06	0.02 - 0.05
Velocity (m/s)	0.05	0.02	0.015	0.015
Roll & Pitch (deg)	0.04	0.03	0.025	0.025
True Heading <sup>3</sup> (deg)	0.15	0.10	0.08	0.080

## PHYSICAL CHARACTERISTICS

- Size                                      100 L x 60 W x 12 H mm (nominal)
- Weight                                      62 grams
- Power                                      3.3 V DC +5%/-3%, typical power consumption of 4W (L1/L2 GPS + L1/L2 GLONASS)
- Connectors                              I/O: 44 Pin Header Samtec TMM-122-03-S-S-MW (mating part FCI 90311-044LF)
- Antenna Port:                              Connector: 2 x MMCX receptacle  
Output Voltage: 3.3 V DC to 5 V DC  
Maximum Current: 400 mA  
Minimum Input Signal Strength: 32dB (>35 dB Recommended)

## ENVIRONMENTAL CHARACTERISTICS

- Temperature:                              -40 deg C to +75 deg C (Operational)  
-55 deg C to +85 deg C (Storage)
- Measurement Range:                      +/- 6g<sup>6</sup>, +/- 300 dps
- Mechanical Shock:                      +/- 75g Survival
- Operating Humidity:                      .5% to 95% R.H. non-condensing at +60 deg C
- Maximum Operating Limits:              .515 m/sec  
18,000 m

## ADDITIONAL ACCESSORIES<sup>7</sup>

Evaluation Kit (includes development board and power supply)

## POSPAC UAV OFFICE SOFTWARE

- Post-processed Differential GNSS-Inertial SW for APX-18
- 200 Hz Navigation solution (Position, Velocity, Orientation, Rates, Accelerations)
- Applanix IN-Fusion GNSS-Integration technology
- Full support for UAV dynamic models
- Single Base Differential GNSS-Inertial processing
- Support for Applanix SmartBase virtual reference station module<sup>7</sup>
- Forward and reverse processing with optimal Smoother
- Support for PP-RTX<sup>10</sup>

1 Developed under a License of the European Union and the European Space Agency  
 2 Typical performance. Actual results are dependent upon satellite configuration, atmospheric conditions and other environmental effects  
 3 Typical survey mission profile, max RMS error. The heading error assumes minimum of 1m antenna separation.  
 4 Requires base station and radio link, sold separately  
 5 POSPac UAV, short base line operation  
 6 Sensor bandwidth (-3 dB amplitude) ~ 50 Hz  
 7 Sold separately  
 8 There is no official GLONASS L3CDMA or Galileo E6 ICD. The current tracking capability is based on publicly available information. Full receiver compatibility cannot be guaranteed.  
 9 The hardware of this product is designed for BeiDou B3 compatibility (trial version) and its firmware will be enhanced to fully support such new signal as soon as officially published ICD becomes available.  
 10 POSPac UAV/MMS, Post-processed CenterPoint® RTX™, typical mission performance subscription sold separately. The accuracy is subject to quality of GNSS, durational data set, and regional coverage.

TRIMBLE APPLANIX  
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 Richmond Hill, Ontario  
 L4B 3B3, Canada  
 +1-289-695-6000 Phone

www.applanix.com  
 airborne@applanix.com





## RedTail LiDAR Systems- RTL – 400 Sensor Warranty

**Warranty Disclaimer:** This Limited Warranty is the sole and exclusive warranty applicable to Products. Company disclaims all other express warranties and all implied warranties of merchantability and fitness for a particular purpose, to the fullest extent permitted by applicable law. No representative, distributor, dealer or agent of Company has the authority to make any representation, warranty, or agreement on behalf of Company with respect to Products. No representation or warranty of any kind or nature is made by Company beyond those expressly stated herein. Whenever possible, each provision of the foregoing warranty shall be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this warranty shall be prohibited by or invalid under applicable law, such provision shall be ineffective only to the extent of such prohibition or invalidity without invalidating the remainder of such provision or the remaining provisions of this warranty.

**Limitation of Liability:** Regardless of the basis on which Purchaser is entitled to claim damages from Company (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), Company's entire liability for all claims in the aggregate arising from or related to each Product purchased by Purchaser, or otherwise arising, under this Agreement will not exceed the amount of actual direct damages up to the total amounts paid by Purchaser to Company for the Product that is the subject of the claim. This limit also applies to Company, all Company's Affiliates and suppliers and is the maximum for which Company, its Affiliates and suppliers are collectively responsible. UNDER NO CIRCUMSTANCES SHALL COMPANY, ITS AFFILIATES OR SUPPLIERS BE LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: DAMAGES CLAIMS BY ANY THIRD PARTY, WHETHER OR NOT THE CLAIMS ARE BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHERWISE; LOSS OF, OR DAMAGE TO, DATA; SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY, PUNITIVE OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR LOST PROFITS, BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS

**Extended Warranty:** Sensor maintenance and calibration warranty period will be extended to three years. Under the maintenance and calibration warranty all needed calibrations and bore-sightings will be completed by RedTail LiDAR Systems. RedTail LiDAR will also provide contact information for a 24-hour troubleshooting line and will guarantee a one-hour response time.

**Release for Damage:** Purchaser and anyone claiming on behalf of Purchaser releases and forever discharges Company and its affiliates, successors and assigns, officers, employees, representatives, partners, agents and anyone claiming through them (collectively, the "Released Parties"), in their individual and/or corporate capacities from any and all claims, liabilities, obligations, promises, agreements, disputes, demands, damages, causes of action of any nature and kind, known or unknown, which Purchaser has or ever had or may in the future have against Company or any of the Released Parties arising out of or relating to: Release for Damage to Property, Personal / Bodily Injury, UAV and RTL-400 LiDAR System. This Release shall not be in any way construed as an admission by the Company that it has acted wrongfully with respect to Purchaser or any other person, that it admits liability or responsibility at any time for any purpose, or that Purchaser has any rights whatsoever against the Company.



**SIGNATURES:**

\_\_\_\_\_  
(Signature of Purchaser)

\_\_\_\_\_  
(Printed Name of Purchaser)

\_\_\_\_\_  
(Date)

*Bryson Begley*  
\_\_\_\_\_  
(Signature of Company Representative)

**Bryson Begley**  
\_\_\_\_\_  
(Printed Name of Company Representative)

**10/19/2020**  
\_\_\_\_\_  
(Date)



RedTail LiDAR Systems  
 401 10th Street  
 Fairmont, WV 26554

# Quote

Date	Quote #
10/15/2020	20233.1

Customer
Department of Administration Purchasing Division 2019 Washington Street East Charleston, WV 25305-0130

Pricing is valid for 60 days	Lead Time (Subject to Change)	Terms	Rep
	30 Days	Net 30	BB

Item	Description	Qty	Total
DJI Matrice 300 (M300) RTK Co...	DJI Matrice 300 (M300) RTK Combo (Shield Kit) -Matrice 300 RTK System x 1 -TB60 Batteries x 2 -BS60 Battery Station x 1 -Enterprise Shield Plus x 1 -Dovetail mount -Mounting plate and hardware -Antenna mount	1	22,500.00
RTL Integration & Calibration	RTL will perform complete system integration and bore-sighting calibration as well as quality testing of unit	1	2,000.00
Custom UAV Testing & Research	RTL will perform custom flight test and engineer all new components for system integration	1	5,000.00
DJI Matrice 300 (M300) Hard Cas	DJI Matrice 300 (M300) Hard Case	1	800.00
DJI Matrice 300 Full Warranty	DJI Matrice 300 Full Warranty	1	2,500.00

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<b>Total</b>	<b>\$32,800.00</b>
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# Matrice 300 RTK Specs

## Aircraft

### Dimensions

Unfolded, propellers excluded, 810×670×430 mm (L×W×H)

Folded, propellers included, 430×420×430 mm (L×W×H)

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### Diagonal Wheelbase

895 mm

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### Weight (with single downward gimbal)

Approx. 3.6 kg (without batteries)

Approx. 6.3 kg (with two TB60 batteries)

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### Max Payload

2.7 kg

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### Max Takeoff Weight

9 kg

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### Operating Frequency

2.4000-2.4835 GHz

5.725-5.850 GHz

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### EIRP

2.4000-2.4835 GHz:

29.5 dBm (FCC); 18.5dBm (CE)

18.5 dBm (SRRC); 18.5dBm (MIC)

5.725-5.850 GHz:

28.5 dBm (FCC); 12.5dBm (CE)

28.5 dBm (SRRC)

---

### Hovering Accuracy (P-mode with GPS)

Vertical:

±0.1 m (Vision System enabled)

±0.5 m (GPS enabled)

±0.1 m (RTK enabled)

Horizontal:

±0.3 m (Vision System enabled)

±1.5 m (GPS enabled)

±0.1 m (RTK enabled)

---

### RTK Positioning Accuracy

When RTK enabled and fixed:

1 cm+1 ppm (Horizontal)

1.5 cm + 1 ppm (Vertical)

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### Max Angular Velocity

Pitch: 300°/s, Yaw: 100°/s

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### Max Pitch Angle

30° (P-mode, Forward Vision System enabled: 25°)

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**Max Ascent Speed**

S mode: 6 m/s

P mode: 5 m/s

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**Max Descent Speed (vertical)**

S mode: 5 m/s

P mode: 4 m/s

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**Max Descent Speed (tilt)**

S Mode: 7 m/s

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**Max Speed**

S mode: 23 m/s

P mode: 17 m/s

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**Service Ceiling Above Sea Level**

5000 m (with 2110 propellers, takeoff weight  $\leq$  7 kg) / 7000 m (with 2195 propellers, takeoff weight  $\leq$  7 kg)

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**Max Wind Resistance**

15 m/s

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**Max Flight Time**

55 min

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**Supported DJI Gimbals**

Zenmuse XT2/XT S/Z30/H20/H20T

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**Supported Gimbal****Configurations**

Single Downward Gimbal, Dual Downward Gimbals, Single Upward Gimbal, Upward and Downward Gimbals, Triple Gimbals

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**Ingress Protection Rating**

IP45

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**GNSS**

GPS+GLONASS+BeiDou+Galileo

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**Operating Temperature**

-20°C to 50°C (-4°F to 122° F)

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## Remote Controller

**Operating Frequency**

2.4000-2.4835 GHz

5.725-5.850 GHz

---

**Max Transmitting Distance**

**(unobstructed, free of interference)**

NCC/FCC: 15 km

CE/MIC: 8 km

SRRC: 8 km

---

**EIRP**

2.4000-2.4835 GHz:

29.5 dBm (FCC) 18.5dBm (CE)

18.5 dBm (SRRC); 18.5dBm (MIC)

5.725-5.850 GHz:

28.5 dBm (FCC); 12.5dBm (CE)  
20.5 dBm (SRRC)

---

### **External battery**

Name: WB37 Intelligent Battery

Capacity: 4920 mAh

Voltage: 7.6V

Type: LiPo

Energy: 37.39Wh

Charging time (using BS60 Intelligent Battery Station): 70 minutes (15°C to 45°C); 130 minutes (0°C to 15°C)

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### **Built-in battery**

Type: 18650 lithium ion battery (5000 mAh @ 7.2 V)

Charging: Use a USB charger with specification of 12V / 2A

Rated power: 17 W

Charging time: 2 hours and 15 minutes (Using a USB charger with specification of 12V / 2A)

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### **Battery Life**

Built-in battery: Approx. 2.5h

Built-in battery+External battery: Approx. 4.5h

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### **USB Power Supply**

5 V / 1.5 A

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### **Operating Temperature**

-20°C to 40°C (-4 °F to 104 °F)

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## **Vision System**

### **Obstacle Sensing Range**

Forward/Backward/Left/Right: 0.7-40m

Upward/Downward: 0.6-30m

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### **FOV**

Forward/Backward/Downward: 65° (H), 50° (V)

Left/Right/Upward: 75°(H), 60°(V)

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### **Operating Environment**

Surfaces with clear patterns and adequate lighting (> 15 lux)

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## **Infrared ToF Sensing System**

### **Obstacle Sensing Range**

0.1-8m

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### **FOV**

30° (±15°)

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### **Operating Environment**

Large, diffuse and reflective obstacles (reflectivity > 10%)

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## **Top and bottom auxiliary light**

### **Effective lighting distance**

5 m

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## **FPV Camera**

**Resolution**

960p

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**FOV**

145°

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**Frame rate**

30 fps

---

## Intelligent Flight Battery

**Name**

TB60

---

**Capacity**

5935 mAh

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**Voltage**

52.8 V

---

**Battery Type**

LiPo 12S

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**Energy**

274 Wh

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**Net Weight**

Approx. 1.35 kg

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**Operating Temperature**

-4°F to 122°F (-20°C to 50°C)

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**Ideal storage temperature**

71.6°F to 86°F (22°C to 30°C)

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**Charging Temperature**

-4°F to 104°F (-20°C to 40°C)

(When the temperature is lower than 5°C, the self-heating function will be automatically enabled. Charging in a low temperature may shorten the life of the battery)

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**Charging time**

Using BS60 Intelligent Battery Station:

220V input: 60 minutes (fully charging two TB60 batteries), 30 minutes (charging two TB60 batteries from 20% to 90%)

110V input: 70 minutes (fully charging two TB60 batteries), 40 minutes (charging two TB60 batteries from 20% to 90%)

---

## BS60 Intelligent Battery Station

**Dimensions**

501\*403\*252mm

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**Net Weight**

8.37kg

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**Maximum Capacity**

TB60 Intelligent Flight Battery × 8

WB37 Intelligent Battery × 4

---

**Input**

100-120 VAC, 50-60 Hz / 220-240 VAC, 50-60 Hz

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**Max. Input Power**

1070W

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**Output Power**

100-120 V: 750 W

220-240 V: 992 W

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**Operating Temperature**

-4°F to 104°F (-20°C to 40°C)

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## RedTail LiDAR Systems- UAV Warranty

**Warranty Disclaimer:** This Limited Warranty is the sole and exclusive warranty applicable to Products. Company disclaims all other express warranties and all implied warranties of merchantability and fitness for a particular purpose, to the fullest extent permitted by applicable law. No representative, distributor, dealer or agent of Company has the authority to make any representation, warranty, or agreement on behalf of Company with respect to Products. No representation or warranty of any kind or nature is made by Company beyond those expressly stated herein. Whenever possible, each provision of the foregoing warranty shall be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this warranty shall be prohibited by or invalid under applicable law, such provision shall be ineffective only to the extent of such prohibition or invalidity without invalidating the remainder of such provision or the remaining provisions of this warranty.

**Limitation of Liability:** Regardless of the basis on which Purchaser is entitled to claim damages from Company (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), Company's entire liability for all claims in the aggregate arising from or related to each Product purchased by Purchaser, or otherwise arising, under this Agreement will not exceed the amount of actual direct damages up to the total amounts paid by Purchaser to Company for the Product that is the subject of the claim. This limit also applies to Company, all Company's Affiliates and suppliers and is the maximum for which Company, its Affiliates and suppliers are collectively responsible. UNDER NO CIRCUMSTANCES SHALL COMPANY, ITS AFFILIATES OR SUPPLIERS BE LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: DAMAGES CLAIMS BY ANY THIRD PARTY, WHETHER OR NOT THE CLAIMS ARE BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHERWISE; LOSS OF, OR DAMAGE TO, DATA; SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY, PUNITIVE OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR LOST PROFITS, BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS

**Full Warranty:** Warranty will cover all UAV repairs and maintenance and at a maximum one full replacement if requested by the agency.

**Release for Damage:** Purchaser and anyone claiming on behalf of Purchaser releases and forever discharges Company and its affiliates, successors and assigns, officers, employees, representatives, partners, agents and anyone claiming through them (collectively, the "Released Parties"), in their individual and/or corporate capacities from any and all claims, liabilities, obligations, promises, agreements, disputes, demands, damages, causes of action of any nature and kind, known or unknown, which Purchaser has or ever had or may in the future have against Company or any of the Released Parties arising out of or relating to: Release for Damage to Property, Personal / Bodily Injury, UAV and RTL-400 LiDAR System. This Release shall not be in any way construed as an admission by the Company that it has acted wrongfully with respect to Purchaser or any other person, that it admits liability or responsibility at any time for any purpose, or that Purchaser has any rights whatsoever against the Company.



**SIGNATURES:**

\_\_\_\_\_  
(Signature of Purchaser)

\_\_\_\_\_  
(Printed Name of Purchaser)

\_\_\_\_\_  
(Date)

*Bryson Begley*  
\_\_\_\_\_  
(Signature of Company Representative)

**Bryson Begley**  
\_\_\_\_\_  
(Printed Name of Company Representative)

**10/19/2020**  
\_\_\_\_\_  
(Date)



# RedTail LiDAR Systems

401 10th Street  
Fairmont, WV 26554

# Quote

Date	Quote #
10/15/2020	20233.2

Customer
Department of Administration Purchasing Division 2019 Washington Street East Charleston, WV 25305-0130

Pricing is valid for 60 days	Lead Time (Subject to Change)	Terms	Rep
	30 Days	Net 30	BB

Item	Description	Qty	Total
DJI Matrice 600 Pro Package	DJI Matrice 600 (M600) Pro Drone Kit: - Aircraft body, landing gear (x2), landing skid (x2), spring (x2) - Remote controller - Intelligent flight battery (TBS47S) (x6) - Hex battery charger - Inner foam case - Power cable, RC cable (x2), Micro-USB cable - Knob with gasket (x6) - Tape, battery stickers, required fasteners - Dovetail mount - Mounting plate and hardware - Antenna mounting kit - Hard protection case	1	15,000.00
RTL Integration & Calibration	RTL will perform complete system integration and bore-sighting calibration as well as quality testing of unit	1	2,000.00
DJI Matrice 600 Batteries	Matrice 600 Series TB47S Intelligent Flight Batteries (x6)	1	1,150.00
DJI Matrice 600 Full Warranty	DJI Matrice 600 Full Warranty	1	2,000.00

RedTail LiDAR Systems is a business division of 4D Tech Solutions, Inc.

<b>Total</b>	<b>\$20,150.00</b>
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# MATRICE 600 Specs

HomeProductsMatrice 600Specs

## Aircraft

### Structure

Diagonal Wheelbase	1133 mm
Aircraft Dimensions	<ul style="list-style-type: none"><li>1668 mm x 1518 mm x 759 mm (Propellers, frame arms and GPS mount unfolded)</li><li>640 mm x 582 mm x 623 mm (Frame arms and GPS mount folded)</li></ul>
Package Dimensions	620 mm x 320 mm x 505 mm
Intelligent Flight Battery Quantity	6
Weight (with six TB47S batteries)	9.1 kg
Weight (with six TB48S batteries)	9.6 kg
Max Takeoff Weight	15.1 kg

### Propulsion System

Motor Model	DJI 6010
Propeller Model	DJI 2170

### Other

Supported DJI Gimbals	Zenmuse X3; Zenmuse X5 series; Zenmuse XT; Ronin-MX; Zenmuse Z15 series HD gimbals: Z15-A7, Z15-BMP Z15-GH4
Retractable Landing Gear	Standard
Operating Temperature	14° to 104° F (-10° to 40° C)

### Charger

Model	A14-100P1A
Voltage Output	26.3 V
Power Rating	100 W

### Battery (Optional)

Model	TB48S
Capacity	5700 mAh
Voltage	22.8 V
Type	LiPo 6S
Energy	129.96 Wh
Net Weight	680 g
Operating Temperature	14° to 104° F (-10° to 40° C)
Storage Temperature	<ul style="list-style-type: none"><li>Less than 3 months: -4° to 113° F (-20° to 45° C)</li><li>More than 3 months: 72° to 82° F (22° to 28° C)</li></ul>
Charge Temperature	41° to 104° F (5° to 40° C)
Max Charging Power	180 W

### Performance

Hovering Accuracy (P-Mode, with GPS)	Vertical: ±0.5 m, Horizontal: ±1.5 m
Max Angular Velocity	Pitch: 300°/s, Yaw: 150°/s

Max Pitch Angle	25°
Max Speed of Ascent	5 m/s
Max Speed of Descent	3 m/s
Max Wind Resistance	8 m/s
Max Flight Altitude above Sea Level	2500 m
Max Speed	18 m/s (No wind)
Hovering Time (with six TB47S batteries)*	No payload: 35 min, 6 kg payload: 16 min
Hovering Time (with six TB48S batteries)*	No payload: 40 min, 5.5 kg payload: 18 min * The hovering time is based on flying at 10 m above sea level in a no-wind environment and landing with 10°

## Flight Control System

Model	A3
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## Remote Controller

Operating Frequency	<ul style="list-style-type: none"> <li>920.6 MHz to 928 MHz (Japan)</li> <li>5.725 GHz to 5.825 GHz</li> <li>2.400 GHz to 2.483 GHz</li> </ul>
Max Transmission Distance (unobstructed, free of interference)	<ul style="list-style-type: none"> <li>FCC Compliant: 3.1 miles (5 km)</li> <li>CE Compliant: 2.1 miles (3.5 km)</li> </ul>
EIRP	<ul style="list-style-type: none"> <li>10 dBm @ 900 M/1i&gt;</li> <li>13 dBm @ 5.8 G</li> <li>20 dBm @ 2.4 G</li> </ul>
Video Output Port	HDMI, SDI, USB
Dual Users Capability	Master-and-Slave control
Mobile Device Holder	Supports smartphones and tablets
Output Power	9 W
Operating Temperature	14° to 104° F (-10° to 40° C)
Storage Temperature	<ul style="list-style-type: none"> <li>Less than 3 months: -4° to 113° F (-20° to 45° C)</li> <li>More than 3 months: 72° to 82° F (22° to 28° C)</li> </ul>
Charge Temperature	32° to 104° F (0° to 40° C)
Built-in Battery	6000 mAh, 2S LiPo
Max Tablet Width	170 mm

## Battery (Standard)

Model	TB47S
Capacity	4500 mAh
Voltage	22.2 V
Type	LiPo 6S
Energy	99.9 Wh
Net Weight	595 g
Operating Temperature	14° to 104° F (-10° to 40° C)
Storage Temperature	<ul style="list-style-type: none"> <li>Less than 3 months: -4° to 113° F (-20° to 45° C)</li> <li>More than 3 months: 72° to 82° F (22° to 28° C)</li> </ul>
Charge Temperature	41° to 104° F (5° to 40° C)
Max Charging Power	180 W



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**Limitation of Liability:** Regardless of the basis on which Purchaser is entitled to claim damages from Company (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), Company's entire liability for all claims in the aggregate arising from or related to each Product purchased by Purchaser, or otherwise arising, under this Agreement will not exceed the amount of actual direct damages up to the total amounts paid by Purchaser to Company for the Product that is the subject of the claim. This limit also applies to Company, all Company's Affiliates and suppliers and is the maximum for which Company, its Affiliates and suppliers are collectively responsible. UNDER NO CIRCUMSTANCES SHALL COMPANY, ITS AFFILIATES OR SUPPLIERS BE LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: DAMAGES CLAIMS BY ANY THIRD PARTY, WHETHER OR NOT THE CLAIMS ARE BASED IN CONTRACT, TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY) OR OTHERWISE; LOSS OF, OR DAMAGE TO, DATA; SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY, PUNITIVE OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR LOST PROFITS, BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS

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**SIGNATURES:**

\_\_\_\_\_  
(Signature of Purchaser)

\_\_\_\_\_  
(Printed Name of Purchaser)

\_\_\_\_\_  
(Date)

*Bryson Begley*  
\_\_\_\_\_  
(Signature of Company Representative)

**Bryson Begley**  
\_\_\_\_\_  
(Printed Name of Company Representative)

**10/19/2020**  
\_\_\_\_\_  
(Date)



## RedTail LiDAR Software

### **RedTail LiDAR - Point Cloud Generator (RTL-PCG)**

RedTail LiDAR developed the RTL-PCG to deliver our customers easy to use software that processes LiDAR data quickly and accurately. The proprietary RTL-PCG combines data collected by the time of flight LiDAR sensor and a Smooth Best Estimate of Trajectory (SBET) of data collected by the GPS/IMU unit, the Applanix APX-18. The two data sets are synced together by GPS time to create a high resolution, georeferenced point cloud data.

The RTL-PCG offers compatibility and installation on Windows 10 devices allowing customers to integrate with existing hardware. End users are also able to adjust various LiDAR system settings in the software allowing for flight specific customizations. RTL-PCG also provides common coordinate systems from a simple drop-down menu for georeferencing a point cloud which allows end users to easily meet customer demands. Finally, end-users can export in an industry standard .LAS file format.

### **RedTail LiDAR Ground Control Station Software**

RedTail LiDAR Systems also provides a ground control station with the purchase of each RTL-400 system. The ground control station is self-contained in a hard transport case. The Ground Control Station is independent from UAV flight controls allowing the RTL-400 to remain system agnostic. End-users are able to interact with the RTL-400 sensor from the ground control station, encouraging proper system set up and breakdown. The Ground Control station also provides real time system feedback during flight, these features include RTL-400 sensor health, and LiDAR data return quality.



**ADDITIONAL INFORMATION****ADDENDUM NO\_1**

Addendum No.1 issued to publish and distribute the attached information to the Vendor Community.

**Request for Quotation:**

The West Virginia Purchasing Division is soliciting bids on behalf of WV Department of Transportation (WVDOT) to establish a contract for the one-time purchase of an unmanned aerial system with LiDAR. The system will include aircraft, LiDAR sensor and accompanying software.

Per the Bid Requirements, Specifications, Terms and Conditions attached to this Solicitation.

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	Option A or B - Unmanned Aerial Vehcile UAV	1.00000	EA		

Comm Code	Manufacturer	Specification	Model #
25131705			

**Extended Description:**

Option A or B - Unmanned aerial vehicle UAV with hard protective case, spare battery and warranty

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	Option A or B - Flight Control System as outlined in 3.2.1.2	1.00000	EA		

Comm Code	Manufacturer	Specification	Model #
25131705			

**Extended Description:**

Flight Controls

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	Lidar Sensor with dual GPS antenna	1.00000	EA		

Comm Code	Manufacturer	Specification	Model #
25131705			

**Extended Description:**  
Lidar Sensor with dual GPS antenna

INVOICE TO	SHIP TO
DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US	DIVISION OF HIGHWAYS INFORMATION SERVICE DIVISION 1900 KANAWHA BLVD E, BLDG 5 RM 920 CHARLESTON WV 25305-0430 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	Software	0.00000	EA		

Comm Code	Manufacturer	Specification	Model #
43232600			

**Extended Description:**  
Unmanned aerial vehicle UAV operational software

**SCHEDULE OF EVENTS**

Line	Event	Event Date
1	Tech Questions Due by 10:00am	2020-10-09

	Document Phase	Document Description	Page
DOT2100000033	Draft	ADDENDUM NO_1 Unmanned aerial vehicle UAV (6321012)	4

**ADDITIONAL TERMS AND CONDITIONS**

See attached document(s) for additional Terms and Conditions

**SOLICITATION NUMBER: CRFQ DOT2100000033**  
**Addendum Number: 1**

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The purpose of this addendum is to modify the solicitation identified as CRFQ DOT2100000033 (“Solicitation”) to reflect the change(s) identified and described below.

**Applicable Addendum Category:**

- Modify bid opening date and time
- Modify specifications of product or service being sought
- Attachment of vendor questions and responses
- Attachment of pre-bid sign-in sheet
- Correction of error
- Other-

**Additional Documentation:**

1. Vendor Questions and responses.

**Terms and Conditions:**

1. All provisions of the Solicitation and other addenda not modified herein shall remain in full force and effect.
2. Vendor should acknowledge receipt of all addenda issued for this Solicitation by completing an Addendum Acknowledgment, a copy of which is included herewith. Failure to acknowledge addenda may result in bid disqualification. The addendum acknowledgement should be submitted with the bid to expedite document processing.

**Unmanned Aerial Vehicle (6321012)**  
**Addendum #1                      CRFQ DOT21\*33**

- 1. In the specification document section 3.2.1.1 “Performance”, UAV option A has a minimum 45 minutes “Hover Time for a single charge (6kg payload)”. We have identified a UAV that meets all specifications required for UAV option A, but has a 45 minute hover time for a single charge with a 0.6kg payload. Would it be acceptable to bid this UAV as our option A contract item? **3.2.1.1 – 6kg is a typo. The number should be 0.6kg****
- 2. In specification document section 3.3.2 “Navigation Performance” defines both RTK and Post Processed. The navigation sensor that is integrated into our LiDAR system meets both specifications. However, users will only be able to receive data in the post processed (more accurate) form. Is this acceptable? **Using post process or real time is acceptable****

**ADDENDUM ACKNOWLEDGEMENT FORM**  
**SOLICITATION NO.: CRFQ DOT2100000033**

**Instructions:** Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification.

**Acknowledgment:** I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

**Addendum Numbers Received:**

(Check the box next to each addendum received)

<input checked="" type="checkbox"/> Addendum No. 1	<input type="checkbox"/> Addendum No. 6
<input type="checkbox"/> Addendum No. 2	<input type="checkbox"/> Addendum No. 7
<input type="checkbox"/> Addendum No. 3	<input type="checkbox"/> Addendum No. 8
<input type="checkbox"/> Addendum No. 4	<input type="checkbox"/> Addendum No. 9
<input type="checkbox"/> Addendum No. 5	<input type="checkbox"/> Addendum No. 10

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that that any verbal representation made or assumed to be made during any oral discussion held between Vendor's representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

4D Tech Solutions Inc.

\_\_\_\_\_  
Company

*Bryson Begley*  
\_\_\_\_\_  
Authorized Signature

10/19/20  
\_\_\_\_\_  
Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.

STATE OF WEST VIRGINIA  
Purchasing Division

# PURCHASING AFFIDAVIT

**CONSTRUCTION CONTRACTS:** Under W. Va. Code § 5-22-1(i), the contracting public entity shall not award a construction contract to any bidder that is known to be in default on any monetary obligation owed to the state or a political subdivision of the state, including, but not limited to, obligations related to payroll taxes, property taxes, sales and use taxes, fire service fees, or other fines or fees.

**ALL CONTRACTS:** Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

**EXCEPTION:** The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

**DEFINITIONS:**

**"Debt"** means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

**"Employer default"** means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

**"Related party"** means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceeds five percent of the total contract amount.

**AFFIRMATION:** By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code §61-5-3*) that: (1) for construction contracts, the vendor is not in default on any monetary obligation owed to the state or a political subdivision of the state, and (2) for all other contracts, that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

**WITNESS THE FOLLOWING SIGNATURE:**

Vendor's Name: 4D Tech Solutions Inc.

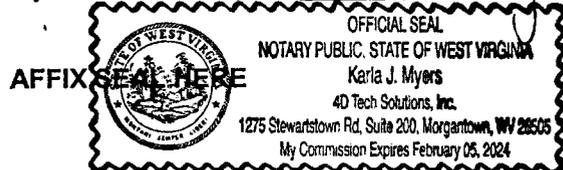
Authorized Signature: [Signature] Date: 10/19/20

State of West Virginia

County of Marion, to-wit:

Taken, subscribed, and sworn to before me this 19<sup>th</sup> day of October, 2020

My Commission expires February 5, 2024.



NOTARY PUBLIC [Signature]