Trimble APX-15 UAV

VERSION 2 - FREQUENTLY ASKED QUESTIONS

1) WHAT IS APX-15 UAV?

The Trimble APX-15 UAV is a GNSS-Inertial based OEM solution for increasing the efficiency of mapping from UAV's by providing highly accurate position and orientation of each image recorded from a camera or each range recorded from a LIDAR, which are then used to georeference images or ranges into map products – all without the need of extensive ground information. This process is referred to as Direct Georeferencing.

It is a complete HW and SW solution comprised of

- Trimble APX-15 Single board GNSS-Inertial hardware module
- POSPac UAV Office Software

The HW is a small, single-board OEM module containing both a survey grade multi-frequency GNSS receiver and high performance MEM's inertial sensors. The size of APX-15 UAV is 6 x 6.7cm, and it weighs only 60 grams, meaning the SWAP (size, weight and power) limitations of even the smallest UAVs are met.

2) HOW DOES APX-15 UAV WORK?

The APX-15 UAV tracks the RF signals to the GNSS satellites to determine its location on the Earth, and then blends this information with the angular rates and accelerations from its MEMs inertial sensors to compute high rate, high accuracy measurements of position and orientation (roll, pitch and true heading). The inertial sensors are calibrated using the Applanix SmartCal Compensation technology in order to achieve the high accuracy required for sensor georeferencing. In real time the position and orientation solution is available at up to 100 Hz, and a GNSS base station can be used to transmit corrections to the APX-15 UAV to produce an RTK solution that is accurate at the cm level. This can be used for real-time applications, like guidance and control, precision landing, or stabilization. Unlike an RTK only product, the APX-15 UAV position is computed exactly at the location of the camera perspective center or LIDAR reference point by translating the position from the GNSS antenna phase center using the orientation measurements. As well, the APX-15 UAV records the exact time of the camera exposure and LIDAR range measurements in GNSS time. The raw inertial sensor data at 200 Hz and the raw GNSS data at 5 Hz along with the event time are logged to internal memory or to an external USB device. After the mission, the POSPac UAV office software extracts the inertial and GNSS data, and uses this to generate a 200 Hz high accuracy DGNSS position and orientation solution by processing it with GNSS base station data recorded at the site or from a VRS in a forward and reverse time algorithm. As in real-time, the position is computed exactly at the camera perspective center or LIDAR reference point using the orientation. POSPac UAV then uses the 200 Hz solution to compute the position and orientation at each camera or LIDAR event time that has been recorded. The position can be transformed to different datums and projections, and the final output can be ASCII or binary. This output can then be used to Directly Georeference the imagery or create a LIDAR point cloud. It can also be used as input into a traditional Aerial Triangulation (AT) process to help speed up point matching and eliminate issues with auto-correlation.

3) IS APX-15 UAV RTK CAPABLE?

Yes, the APX-15 UAV supports all common corrections such as CMR, CMR+, RTCM.

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4) WHAT ARE THE MAIN BENEFITS OF APX-15 UAV?

The APX-15 UAV brings all the benefits of Direct Georeferencing to UAV platforms. With cameras it saves time and cost by not having to establish and survey extensive Ground Control Points (GCP's) for AT. Instead only one or two points are needed for Quality Control. It also allows the area flown per mission to be increased by reducing the need to fly extensive side lap (currently typically 80%) in order for the AT to converge, resulting in a significant increase in productivity. Depending upon flying height and accuracy requirements, it also enables the ability to fly single or dual strip corridor projects. For LIDAR it enables high-accuracy point cloud generation with little or any adjustments required.

5) HOW MUCH MONEY CAN I SAVE WHEN USING APX-15 UAV?

The overall saving is specific to the project, terrain configuration and post-processing time.

The cost of accessing the project area and establishing Ground Control Points for a traditional AT process is a key factor. By eliminating this, savings from just a few projects can pay off the entire cost of adding the APX-15 UAV. The high-accuracy orientation also enables missions to be flown with less sidelap, resulting in larger coverage or reduced time per flight.

6) CAN I USE IT AS BACK-UP FOR MY AUTOPILOT SYSTEM?

Yes. The real-time position and orientation computed by the APX-15 UAV can be used as back-up to the autopilot system. In RTK mode, it can also be used to provide the precise position to the autopilot for precision landings. In addition, once the system is aligned, the real-time heading from the APX-15 UAV is much more accurate than what can be obtained from a magnetometer, and is not affected by external objects.

7) WHAT GNSS RECEIVER IS USED IN APX-15 UAV?

The APX-15 UAV uses a survey grade 336 channel Trimble receiver based on Maxwell technology that supports GPS, GLONASS, BeiDou, Galileo, SBAS, QZSS.

8) WHAT INERTIAL MEASUREMENT UNIT (IMU) ARE YOU USING FOR THE APX-15 UAV?

The APX-15 UAV uses a custom-made IMU designed and built by Trimble integrated directly onto the board itself. There is no separate IMU hardware.

9) WHAT ANTENNA SHOULD I USE WITH APX-15 UAV?

The antenna choice is subject to platform and integration needs that dictate the size and weight. Trimble can help you to choose the antenna that best fits your platform. In general, the APX-15 can support active antenna with minimum LNA of 28.5dB.

10) CAN APX-15 UAV SUPPORT MUTLIPLE SENSOR PAYLOADS SIMULTANEOUSLY?

Yes.

11) WHAT ARE THE MOST COMMON SENSORS THAT CAN BE INTEGRATED WITH APX-15 UAV?

Most aerial sensors can be seamlessly integrated with APX-15 UAV (photogrammetric, thermal, hyperspectral, multispectral cameras, LIDARs).

12) WHAT'S THE DIFFERENCE BETWEEN APX-15 UAV AND AP-15 BESIDES THE SIZE?

The Applanix AP-15 is an Applanix POS product designed for use on larger platforms. It is fully upgradable to higher accuracy products (AP20/40/50/60), supports Trimble RTX, has a dual antenna system with GNSS heading support, and offers control of additional sensors. It has full POS ICD that is common across all AP and POS platforms.

The APX-15 UAV is tailored specifically for addressing the needs of small, light UAVs.

13) CAN I USE APX-15 UAV ON ANY AIRCRAFT?

The APX-15 UAV can be used on any aerial platform if it meets your requirements, but the hardware cannot be upgraded to more accurate POS and AP products.

14) WHAT BENEFITS DOES POSPAC UAV PROVIDE?

POSPac UAV provides the following benefits:

i.   It produces a higher level of position and orientation accuracy than can be achieved in real-time, resulting in more accurate map products;

ii.   It generates a solution at 200 times a second, which virtually eliminates interpolation errors;

iii.   It has automatic base station search and download capabilities which can be used to find a free local base station to avoid the need to set up one (where applicable);

iv.   It has support for the Applanix SmartBase module (sold separately) which can be used to achieve higher positioning accuracy from the free local base station networks (where applicable);

v.   It can help improve the positioning accuracy from GNSS in areas of poor signal reception.

15) WHAT IS THE DIFFERENCE BETWEEN POSPAC MMS AND POSPAC UAV?

The POSPac UAV supports only the APX-15 UAV platform, while POSPac MMS supports all Applanix POS, POSTrack and AP products including APX-15 UAV. It is also only available with a locked to a single computer SW license.

16) IS POSPAC UAV UPGRADABLE TO POSPAC MMS?

Yes, POSPac UAV can be upgraded to POSPac MMS.

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17) WHAT BASE STATION DATA ARE REQUIRED TO BE USED WITH POSPAC?

POSPac requires raw phase and code observables logged from a survey grade base station. At a minimum the Base station should be capable of tracking and logging GPS L1 and L2 observables. For highest accuracy the Base station should also track and log additional observables from GLONASS, BDS and QZSS (where applicable)

18) WHAT BASE STATION FORMATS CAN POSPAC READ?

POSPac supports the RINEX standard format and the Trimble T02 format.

19) I WOULD LIKE TO PURCHASE A BASE STATION. WHAT DO YOU RECOMMEND?

We recommends the Trimble SPS855 Base station which can be purchased through a local Sitech dealer: http://sitech-locator.com/locator

20) HOW CAN I SURVEY IN THE COORDINATES OF MY BASE STATION?

Any standard survey technique can be used. However a convenient method is to use the Trimble RTX service. This is a free service that uses the Trimble Centerpoint RTX technology to calculate the coordinates of a static Base station to better than 2 cm accuracy simply by uploading a file of GNSS observables. For more details please see http://www.trimblertx.com/.

21) CAN I USE APPLANIX SMARTBASE IF I USE POSPAC UAV?

Yes. Applanix SmartBase can be added as a separate option.

22) DOES POSPAC UAV SUPPORT APPLANIX PHOTOTOOLS?

PhotoTools are available as an option for specific camera types.

Please contact Applanix for list of supported cameras.

23) DO YOU PROVIDE SERVICE AND SUPPORT FOR APX-15 UAV?

Integration services are not included in price except under valid OEM agreement. We will provide customer support as per the standard POS AV support channels and mechanisms.

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