

# Brican Flight Systems

## TD100E - Meteorological Survey / Weather Mapping



### Product Overview

Using commercial aircraft can be expensive, using remotely piloted aircraft systems to gather local weather conditions aloft can be tremendously cost effective, efficient, and safe. The ability to accurately define and forecast such local conditions depends on the quality of available upper-air data. Because of this, local weather measurements are required to determine weather forecasts. The ARIM320 is a weather-sensing solution for measuring mission-critical data, which is able to deliver that data to ground personnel using satellite telemetry.

Accurate wind measurement from an airborne platform poses a challenging problem given the fact that the aircraft is moving many times faster than the wind being measured. As a result, the wind signal of interest is only a small portion of the measured air-motion data and is dominated by the motion of the aircraft itself. Under these circumstances, precision wind measurement to an accuracy better than 0.5 m/s (1 knot) requires acquisition of the true airspeed to better than 0.7 knots accuracy, flow direction (sideslip) to better than 0.1 degree accuracy and true heading to better than 0.2 degree accuracy. The ARIM320 system delivers this level of performance in a small, integrated, light-weight package that is easy to calibrate with the pressure boom molded directly into the airframe and the electronics safely sealed within the electronics bay.

The TD100E & M Microclimatology Mission Configuration uses Brican's high performance composite aircraft platform fitted with an electric motor and LiPo batteries for extended duration flight of approximately 4 hours in the air. The TD100 aircraft carries a modified version of Aventech's ARIM320 Digital Air Probe sensor suite. The climatology payload package provides the user with the ability to review and react to sampled data in real-time via an online interface (in the form of a Ground Station readout). This will allow the Ground Station Operator to interact with the aircraft in-situ and add additional waypoints based on real-time data feedback and therefore re-task or extend the scope of the mission or survey area while the aircraft is still in flight.

### Payload Description

The ARIM320 is an air data measurement system capable of providing:

- Static Pressure (Ps)
- Total Pressure (Pt)
- Indicated Air Speed (IAS) / Altitude (IA)
- Calibrated Air Speed (CAS) / Altitude (CA)
- True Air Speed (TAS) / Altitude (TA)
- Equivalent Air Speed (EAS) / Altitude (EA)
- Angle of Attack (AOA)
- Angle of Sideslip (AOS)
- Total Air Temperature (TAT)
- Outside Air Temperature (OAT)
- And Impact Pressure

The ARIM320 evaluates the parameters listed above from a base set of aerodynamic, meteorological, GPS code and carrier-phase, and inertial measurements which include:

- Pitot Pressure
- Static Pressure
- AOA Differential Pressure
- AOS Differential Pressure
- Temperature
- Humidity
- GPS Time

- GPS Position (Latitude, Longitude, and Altitude)
- GPS Velocity
- Three-axis Accelerations (X, Y, Z)
- Three-axis Rates (Roll, Pitch, Yaw)

Combining the GPS carrier-phase information with the acceleration and rate information using Aventech's proprietary Extended Kalman Filter (EKF) algorithm subsequently provides:

- Airframe Attitude (Roll, Pitch, Yaw)
- True Heading (TH)
- Course Heading (CH)
- Three-Dimensional Winds.

### Integrated inertially-aided GPS attitude system provides:

- Aircraft Attitude (Roll, Pitch, and Yaw)
- Inertial Velocity
- Wind Speed and Wind Direction
- Rate of Climb (ROC)
- Flight Path Angle (FPA)

The air-data, GPS, inertial sensors and all analog and digital processing electronics are all fully integrated into a single miniature Air Data Probe enclosure which is mounted within the fuselage of the airframe. The probe only requires power in, and provides all acquired air data measurements via a digital communications interface.



## TD100E & M series Remote Piloted Aircraft

### Aircraft

• Air Frame	Composite Carbon Fibre
• Wing Span	16' 3" (488.95 cm)
• Length	6' 7" (200.25 cm)
• Propulsion	4.5 hp Electric motor (995 gram)
• Motor Spec E	90 A, 195 RPM/V
• Motor Spec M	Bio Fuel
• Power Supply	8 x 37 V, 4500 mAh LiPo batteries
• Dry Weight	34.6 lbs (15.7 kg)
• Max Weight	50 lbs (22.7 kg)
• Max Speed	120 mph (193 kph)
• Cruise Speed	75 mph (120 kph)
• Endurance E	4 hrs
• Endurance M	30 hrs
• Auto Pilot	Spektrum 2.4 GHz DSM2 RC control sys
• Maximum Altitude	14,763 feet (4,500 meters)
• Operating Temperature	-40° C to 45° C (-40° F to 113° F)

### Benefits

- Provides real-time measurement of mean winds and RMS turbulence metrics
- Provides temperature, humidity and pressure data
- Includes output of high-precision aircraft attitude data (bank angle, pitch angle and true heading)
- Is a fully integrated package with all components engineered and integrated directly into the TD100 Series UAV providing a "turn-key" FAA certified weather sampling solution
- Full support for aerodynamic calibration to minimize the time and effort necessary to analyze flight-calibration data
- Unrivalled price-performance ratio for airborne meteorological observation
- Easily integrated with other data systems, or operates independently using an internal data log

### Applications

- Support for aerial application of pesticides
- Atmospheric observation for scientific research
- Airborne observation
- Pollution transport studies
- Acquisition of environmental parameters to aid in the analysis of remote sensing data