

National Transportation Safety Board

Office of Research and Engineering

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ANC17FA009

AIRPLANE PERFORMANCE STUDY

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A. ACCIDENT

Location: Fairbanks, Alaska
Date: December 7, 2016
Time: 1043 AST
1943 GMT
Airplane: Bellanca 7GCBC, N88452

B. SUMMARY

On December 7, 2016, about 1043 Alaska standard time (AST), a tailwheel, ski-equipped Bellanca Citabria 7GCBC airplane, N88452, was substantially damaged when it impacted terrain about 17 miles southeast of Fairbanks, Alaska. The airline transport pilot was fatally injured. The airplane was registered to and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 visual flight rules (VFR) personal flight. Visual meteorological conditions prevailed at the time of the accident, and a VFR flight plan was filed and activated. The local area flight departed Chena Marina Airport (AK28), Fairbanks, at 1026 AST.

The accident airplane was equipped with Micro AeroDynamics’s micro vortex generators (VG). Micro claims that the VG’s lower stall speeds, improve controllability, and improve stall characteristics. See Figures 1 and 2.

C. AIRPLANE PERFORMANCE STUDY

The data used in the airplane performance study were recovered from a Garmin GPSMAP 296 hand-portable GPS unit equipped with a detachable antenna, a 256 color TFT LCD display, a built-in base map and an internal Jeppesen aviation database. See the NTSB Global Positioning System Device Specialist's Factual Report for more details. In addition, weather information reported in the NTSB final accident report were used in the study.

The GPS data indicate that the airplane flew south at approximately 1,500 ft mean sea level (msl) for approximately 17 minutes after departing Chena Marina Airport and before impacting terrain. The calibrated airspeed was estimated using the GPS ground speed and surface winds reported at Fairbanks International Airport (PAFA) located approximately 16 nautical (NM) north of the accident site.

Figure 3 shows that the estimated airspeed remained between about 40 kt and 85 kt for most of the flight. However, in the final 90 seconds, the airplane began to slow while setting up a 500 feet per minute (fpm) descent. The airspeed slowed to less than 40 kt at 10:42:50 and reached a low of about 26 kt at 10:43:28.

Figure 4 includes the estimated airplane pitch, roll, and heading angles. The airplane began to pitch up while entering the 500 fpm descent. The descent rate increased to almost 4,000 fpm as the airspeed reached 26 kt at 10:43:28. The airplane abruptly rolled right to 24° at 10:43:28.

Finally, Figure 5 shows the accelerations estimated from the GPS data. The vertical load factor, n_z , shows a sudden decrease of approximately 0.5g's as the airspeed reached 26 kt.

D. SUMMARY AND CONCLUSIONS

The GPS data recovered from the accident airplane show the airplane slowing to approximately 26 kt when the GPS-derived acceleration data show a "stall break", an abrupt right roll, and a descent rate of almost 4,000 fpm. The wing likely reached the critical angle-of-attack, and the airplane stalled at 10:43:28.

The Bellanca Pilot's Operating Manual lists the flaps-down stall airspeed for the 7GCBC as 39 kt without the VG's. While Micro AeroDynamics does not provide specific stall speeds for any aircraft pre- or post-installation, its sales material claims their VGs achieve an 8 percent reduction in stall speed, which would equate to 36 kts with the VG's.

These speeds are for level flight at maximum gross weight and power off.

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E. FIGURES



1.0 Micro AeroDynamics, Inc, VG Installation on a Comparable Airplane

Without VG's

With VG's

CRUISE AIRSPEED

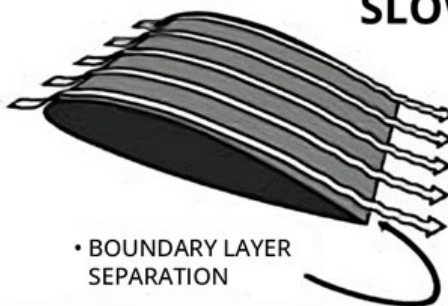


• SMOOTH AIRFLOW

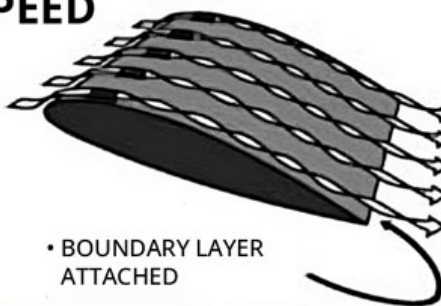


• VORTEX AIRFLOW
• NO REDUCTION IN CRUISE SPEED

SLOW AIRSPEED

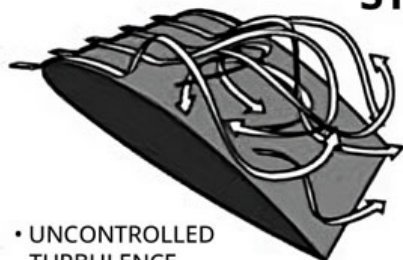


• BOUNDARY LAYER
SEPARATION

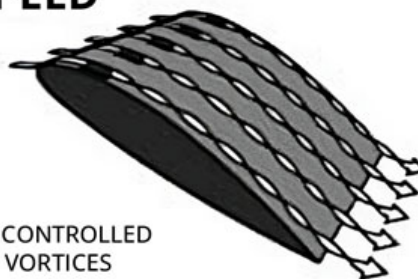


• BOUNDARY LAYER
ATTACHED

STALL AIRSPEED



• UNCONTROLLED
TURBULENCE

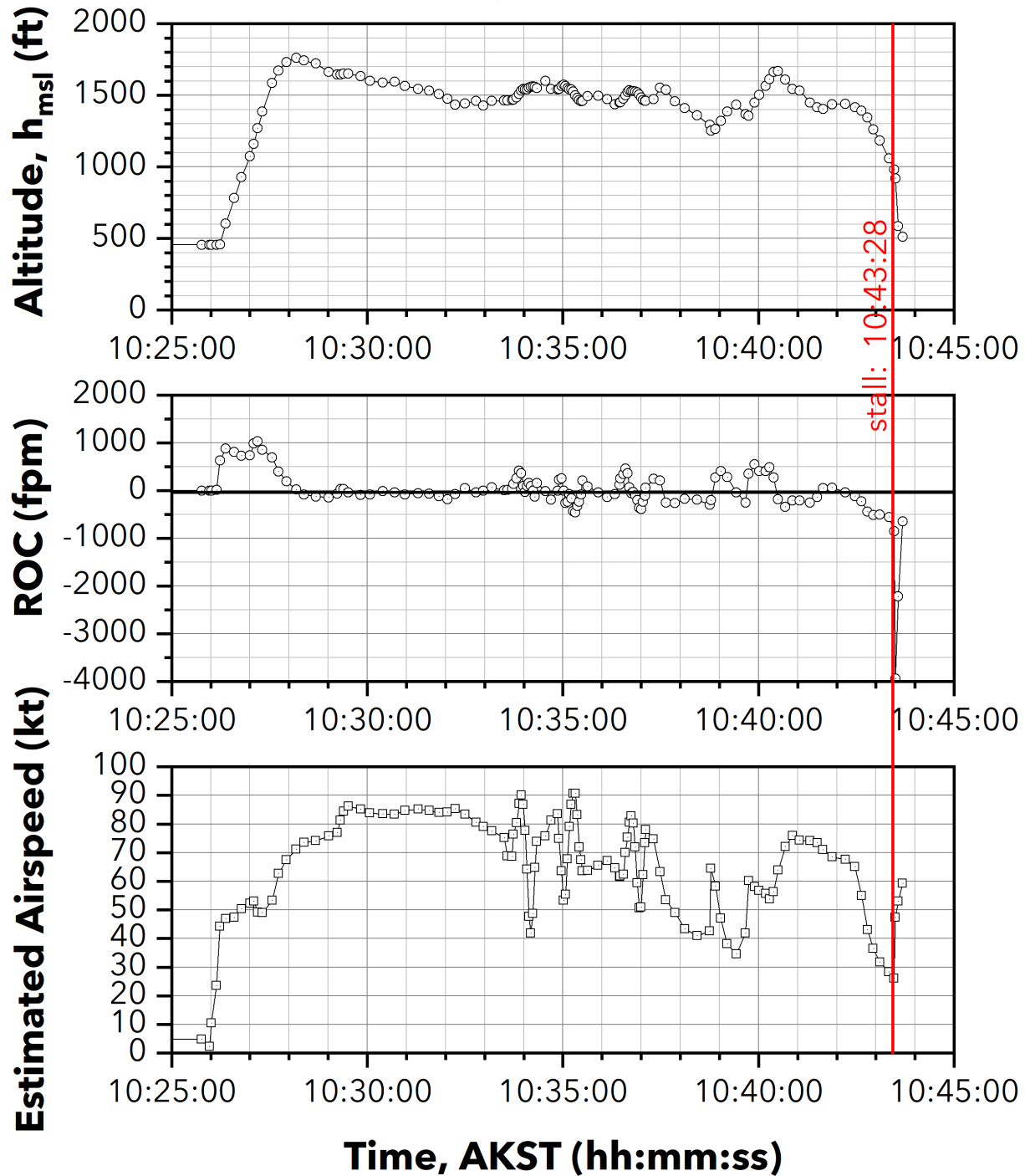


• CONTROLLED
VORTICES

NOTE: AN AIRCRAFT EQUIPPED WITH VORTEX GENERATORS WILL STALL,
BUT AT LOWER AIRSPEED THAN THE SAME AIRCRAFT WITHOUT VORTEX GENERATORS.

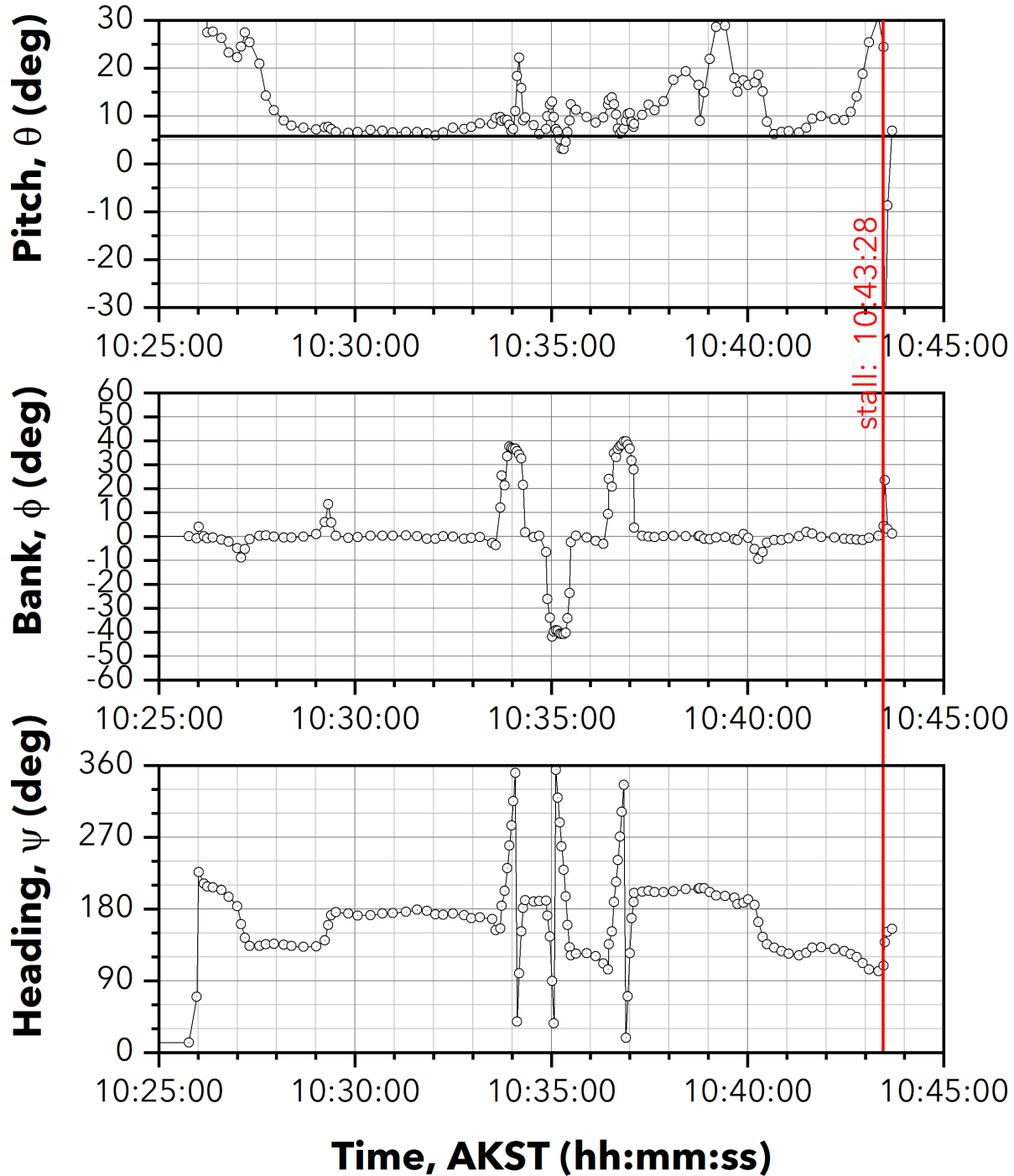
2.0 "How VG's Work" from Micro AeroDynamics, Inc, Website

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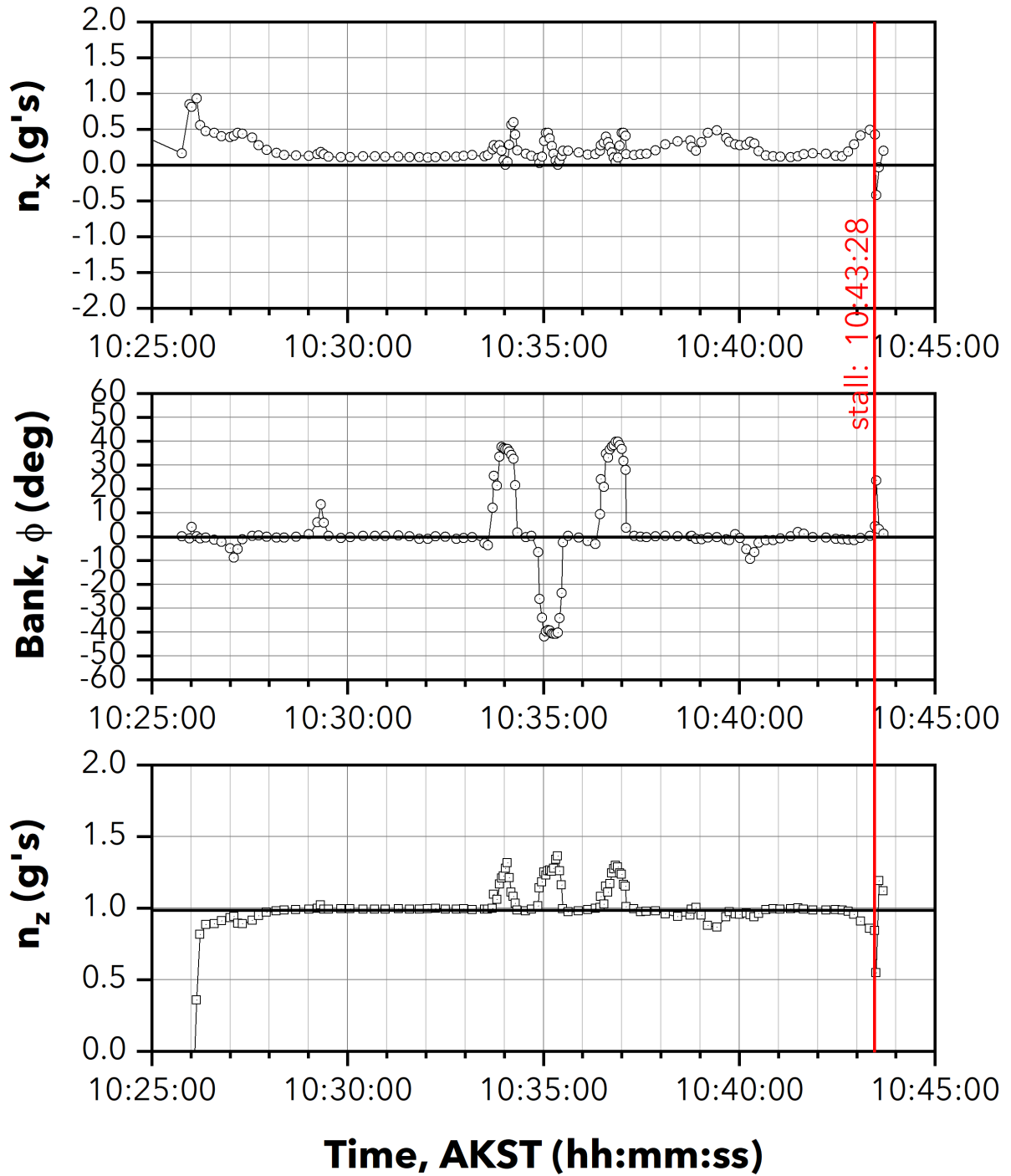
3.0 GPS-Derived Altitude, ROC, and Airspeed for Accident Flight

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4.0 GPS-Derived Euler Angles for Accident Flight

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5.0 GPS-Derived Airplane Accelerations for Accident Flight