

# NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division  
Washington, D.C. 20594

August 19, 2013

## Electronic Devices Factual Report

Specialist's Factual Report  
by Bill Tuccio

### 1. EVENT

Location: Jamestown, New York  
Date: June 20, 2013  
Aircraft: Israel Aircraft Industries Gulfstream 200  
Registration: N500AG  
Operator: Taughannock Aviation  
NTSB Number: ERA13IA294

On June 20, 2013, about 1410 eastern daylight time (EDT), an Israel Aircraft Industries Gulfstream 200, N500AG, overran the paved portion of the runway during landing at the Chautauqua County/Jamestown Airport (JHW), Jamestown, New York. The two airline transport pilots, two Federal Aviation Administration (FAA) inspectors, and the aircraft operator's chief pilot were not injured. The airplane sustained minor damage to the trailing edge of the left wing flap. The airplane was registered to a private individual and operated by Taughannock Aviation under the provision of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed for the instructional flight that originated from the Greater Rochester International Airport (ROC), Rochester, New York.

### 2. DETAILS OF DEVICE INVESTIGATION

The Safety Board's Vehicle Recorder Division received the following devices:

Device 1: Honeywell Mark V EGPWS  
Device 1 Serial Number: 24269  
Device 2: Pratt & Whitney (PW) Electronic Download of  
Engine Electronic Controls (EEC)

#### 2.1. Honeywell Mark V EGPWS Device Description

The Honeywell Mark V EGPWS is an Enhanced Ground Proximity Warning System (EGPWS) that provides aural and visual alerts and warnings of terrain proximity and low altitude windshear conditions.

The Mark V receives inputs from aircraft sensors and systems such as Air Data Inertial Reference Unit (ADIRU), GPS, and radio altimeter to calculate projected position and potentially unsafe conditions relative to terrain. If a potentially unsafe condition is detected, audio alert messages will sound over the flight deck speakers and visual warnings will appear on the Electronic Flight Indication System to the flight crew.

The EGPWS is designed to protect against seven different scenarios categorized by modes. Mode 1 is excessive descent rate, Mode 2 is excessive closure to terrain, Mode 3 is altitude loss after takeoff, Mode 4 is unsafe terrain clearance, Mode 5 is excessive deviation below glideslope, Mode 6 is advisory callouts, and Mode 7 is windshear protection. Each mode has soft and hard limit alert criteria with the hard limit requiring more urgent attention by the crew<sup>1</sup>.

The Mark V is designed to record events triggered by exceeding the hard and soft limits set by the device. Once a limit has been exceeded, a new event will be recorded at one sample per second that includes 20 seconds before and 10 seconds after the exceedance. Each record is identified by the unit's operating time, the mode that was exceeded, and a unique event number from the device. A status log is also recorded that contains each takeoff and landing.

### 2.1.1. Honeywell Mark V EGPWS Data Recovery

Upon arrival at the Vehicle Recorder Laboratory, an exterior examination revealed the unit had not sustained any damage. Information was extracted from the unit to a proprietary, Honeywell PCMCIA card using the manufacturer's procedures normally, without difficulty. The PCMCIA card was decoded by the manufacturer with NTSB oversight. The decoded files were sent to the NTSB's Vehicle Recorder Laboratory for analysis.

### 2.1.2. Honeywell Mark V EGPWS Data Description

The EGPWS unit recorded 640 flights, the incident flight being the last flight, flight 640. Table 1 shows the takeoff and landing records extracted from the EGPWS for flight 640. The takeoff was recorded by the EGPWS at 3044:01:48 EGPWS operating time and the landing was recorded by the EGPWS at 3044:26:33 EGPWS operating time. No EGPWS warnings were logged for the incident flight.

**Table 1. EGPWS Takeoff/Landing records.**

<b>Takeoff</b>	<b>Landing</b>
FLIGHT LEG 640: ( 3044:01:48) Lat/Long: 43.11535 / -77.68060 Geometric Alt: 578.00 True Hdg: -147.66 GPS Alt: 564.00 VFOM: 66.00 Pos. Uncert: 0.0103 Pos. Source: GPS2 Airport: KROC	FLIGHT LEG 640: ( 3044:26:33) Lat/Long: 42.15596 / -79.25065 Geometric Alt: 1802.00 True Hdg: -120.94 GPS Alt: 1778.00 VFOM: 90.00 Pos. Uncert: 0.0127 Pos. Source: GPS1 Airport: KJHW

<sup>1</sup> More information about the Honeywell Mark V can found on the manufacturer's website: <http://honeywell.com/>

## **2.2. PW EEC Device Description**

The PW EEC provides control of the PW PW306A engines installed on the incident aircraft. Certain events are designed to trigger 5 minutes of recording to non-volatile, EEC memory: 4 minutes prior to the triggering event and 1 minute after the triggering event. The triggering events documented by PW are: (a) manual request by the pilot; (b) exceedances; (c) faults; (d) automatic power reserve (APR) event; (e) flameout detected; and (f) commanded shutdown in the air. Additionally, PW confirmed that under certain circumstances, for some versions of the EEC software, a normal engine shutdown may trigger a logically unwanted recording event.

### **2.2.1. PW EEC Device Data Recovery**

Following the incident, the operator downloaded the EEC data normally, using standard maintenance download procedures. The download included a history of faults related to the engines, and binary data recorded for the incident flight based on EEC triggering logic. The binary data was sent to PW Canada for decode. The decoded data was provided to the NTSB.

### **2.2.2. PW EEC Device Data Description**

The downloaded fault history did not record any pertinent faults related to the incident flight.

The EEC recorded data decoded by PW Canada covered approximately 220 seconds of data sampled every .08 seconds (12.5 Hz). The recording began approximately 96 seconds before weight-on-wheels. According to PW Canada, the recording was triggered by the normal engine shutdown after landing.

### **2.2.3. PW EEC Device Time Correlation**

The EEC device only records relative time of recording. The time of the first recorded weight-on-wheels was assumed to be 1410:00 EDT. The EEC recorded the time of first weight-on-wheels at -67.20 seconds. Accordingly, 1411:07.2 was added to all EEC times to convert to EDT.

### **2.2.4. PW EEC Device Plots and Corresponding Tabular Data**

Table 1 describes EEC data parameters verified and provided in this report.

Figure 1 shows the entire 220 seconds of data recorded by the left and right engine EECs during touchdown. Figure 2 provides an expanded view of the same data around the time of touchdown and thrust reverser deployment.

The aircraft touched down at 1410:00 EDT, as indicated by the weight-on-wheels state. At 1410:03 EDT, the thrust reversers were first deployed at a Throttle Lever Angle (TLA) Rating Code of 15 degrees. According to PW, a TLA Rating Code of 15 degrees corresponds to a thrust reverser (T/R) idle power lever selection. At 1410:20 EDT,

about 17 seconds after thrust reversers were first deployed and about 20 seconds after touchdown, the TLA Rating Code increased to 20 degrees. According to PW, a TLA Rating Code of 20 degrees corresponds to maximum T/R power lever selection. By 1410:24 EDT, N1 increased on both engines to a maximum value during the rollout of about 55%.

Thrust reversers began to be stowed around 1410:32 EDT, as N1 began to decrease.

Tabular data used to generate figures 1 and 2 is included as Attachment 1. This attachment is provided in electronic comma-delimited (.CSV) format.

**Table 2: PW EEC Data Parameters**

Parameter Name	Parameter Description
L-01_HW_SHTDWN (discrete)	Left Engine Shutdown Switch
L-02_REV1 (discrete)	Left Engine Thrust Reverser Stowed Switch
L-02_REV2 (discrete)	Left Engine Thrust Reverser Deployed Switch
L-03_QBWOW (discrete)	Left Engine Recording – Raw Weight-on-Wheels
L-07_WOWF (discrete)	Left Engine Recording – Processed Weight-on-Wheels
L-N1 (%)	Left Engine N1
L-TLAIN (degrees)	Left Engine Throttle Lever Angle Feedback
L-TLARC (degrees)	Left Engine Throttle Lever Angle Rating Code
R-01_HW_SHTDWN (discrete)	Right Engine Shutdown Switch
R-02_REV1 (discrete)	Right Engine Thrust Reverser Stowed Switch
R-02_REV2 (discrete)	Right Engine Thrust Reverser Deployed Switch
R-03_QBWOW (discrete)	Right Engine Recording – Raw Weight-on-Wheels
R-07_WOWF (discrete)	Right Engine Recording – Processed Weight-on-Wheels
R-N1 (%)	Right Engine N1
R-TLAIN (degrees)	Right Engine Throttle Lever Angle Feedback
R-TLARC (degrees)	Right Engine Throttle Lever Angle Rating Code

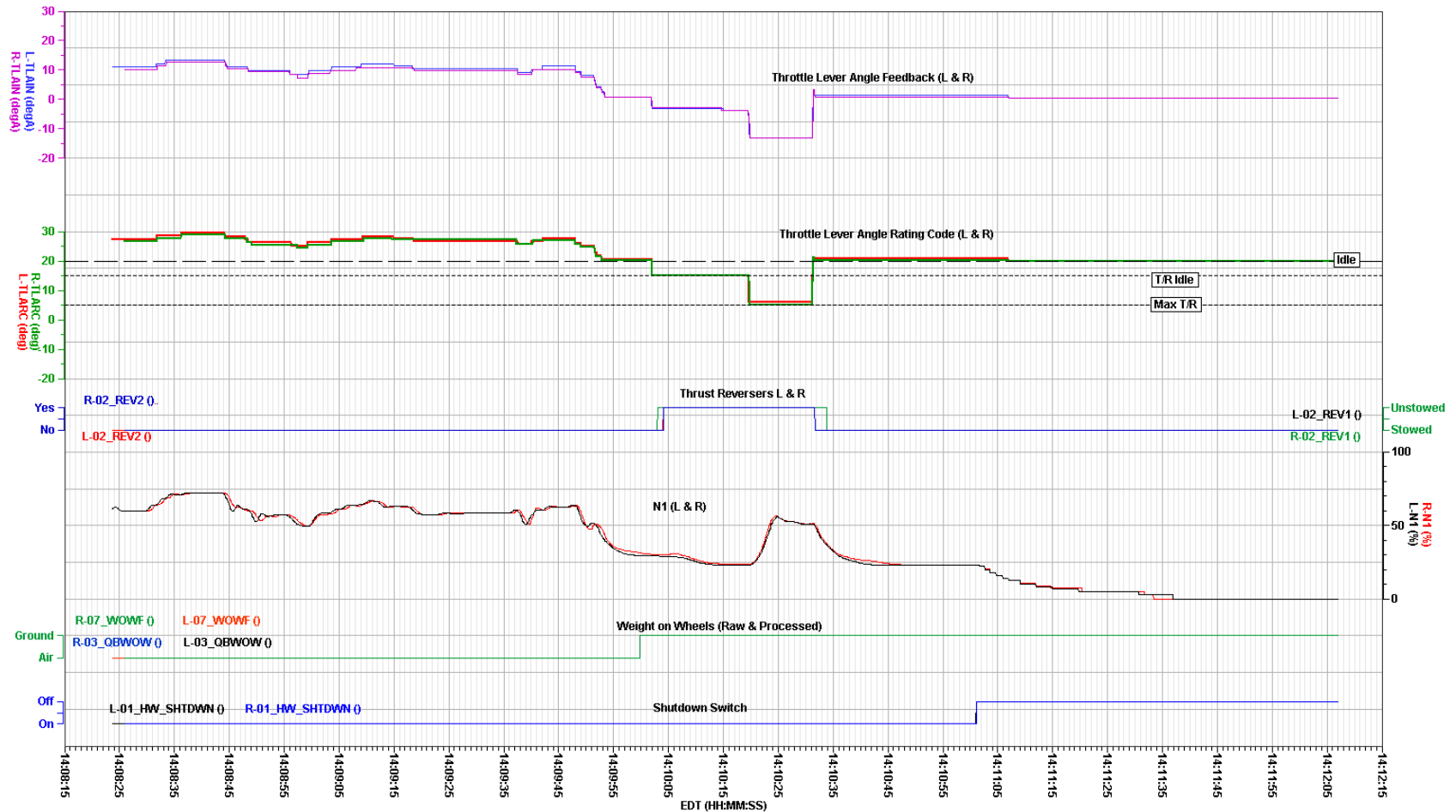
NOTE: For parameters with a unit description of discrete, a discrete is typically a 1-bit parameter that is either a 0 state or a 1 state where each state is uniquely defined for each parameter.

Figure 1. All recorded EEC data at JHW.

Taughannock Aviation, Israel Aircraft Industries G200, N500AG

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Revised: 22 July 2013

All Recorded Data - JHW

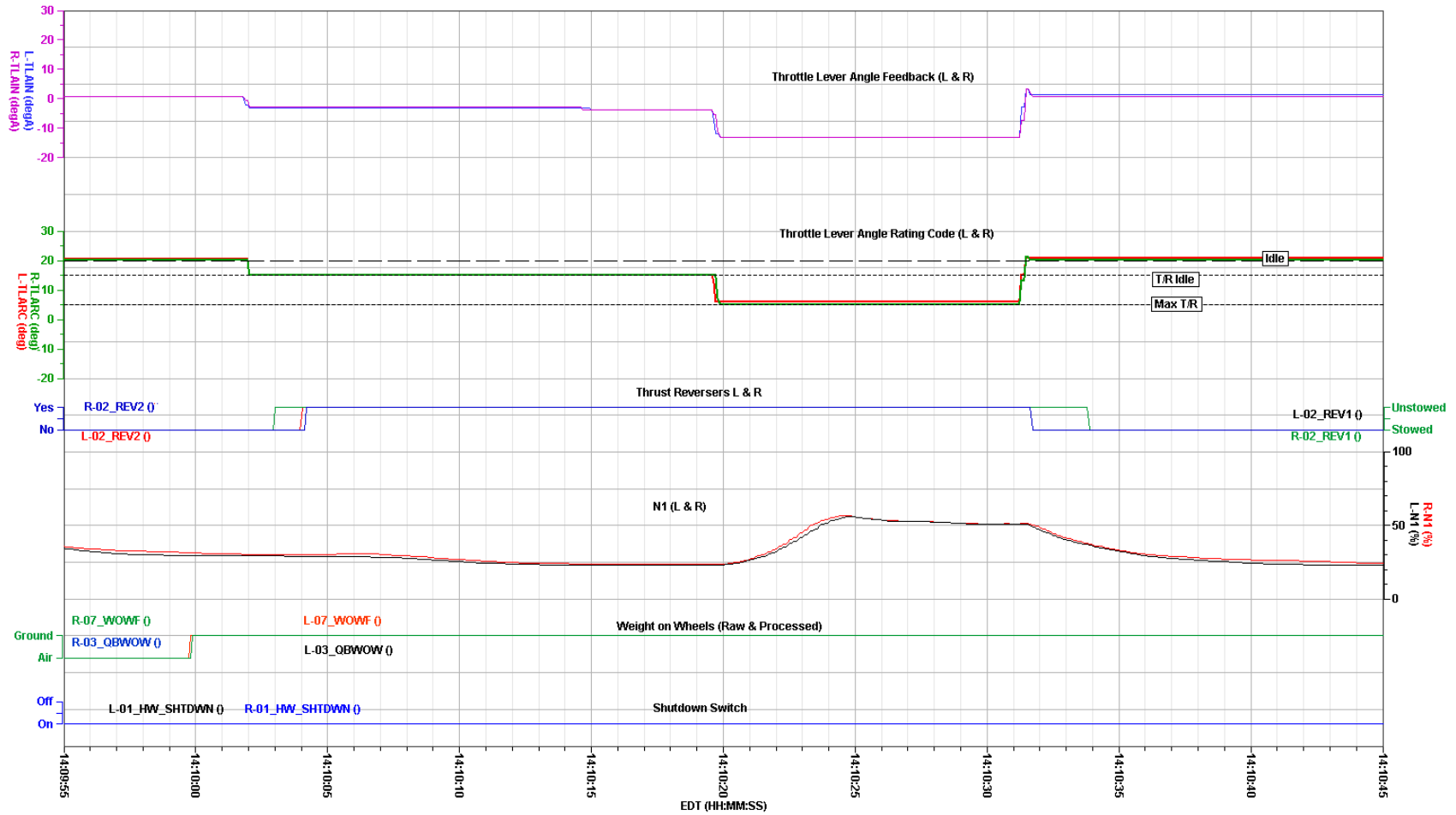
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Figure 2. Focus on touchdown - JHW.

Taughannock Aviation, Israel Aircraft Industries G200, N500AG

Location, Date: Jamestown, New York, 06/20/13

NTSB No. ERA13IA294



Revised: 22 July 2013

Focus on Touchdown - JHW

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