

80-0689 Cockpit Display System Data for NTSB Investigation CEN18FA259

August 2018

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1 Overview of the 80-0689 Cockpit Display System

The 80-0689 Cockpit Display System (CDS) is an electronic end item, with two LCD technology displays; one for crew alerting and one for aircraft instrumentation, which is responsible for monitoring non-critical and essential electrical inputs and for displaying the appropriate information to the flight crew.

The CDS stores two types of data in non-volatile memory (NVM) for later retrieval and analysis. Neither data type will be erased unless N1 I or N1 II increases above 20%. When one of these two signals increases over that level, the non-volatile memory device is erased of any previously stored codes and recording is allowed.

The CDS records all the cautions signals that were activated in the previous one minute in a non-volatile memory device. The CDS deletes events of more than one minute old and that are no longer active from the non-volatile memory.

The conditions for the start and end of caution state recording are as follows:

START: When either N1 I or N1 II increases above 20% the CDS erases previously stored caution states, test the integrity of the memory devices, and then commence recording (continuously) caution states which have been activated in the previous 60 seconds. The CDS deletes from memory those activated cautions which are older than 60 seconds and no longer active.

STOP: The CDS does not stop recording until both XMSN OIL P I and II cautions are turned on or when the CDS is powered down. The CDS retains the caution states which have been active in the last 60 seconds prior to this event indefinitely (including through power down periods). The CDS does not start recording caution states again until as specified in the previous paragraph.

The CDS stores up to 100 FADEC failure memory codes when the corresponding bit value received is equal to 1 (indicating fault condition) for one or more times. All NVM data is retrieved and displayed when the front rotary switch is placed at "M".

2 Review of the Returned Unit

2.1 Unit Information

Part Number: 80-0689-5-6 Rev K
 Serial Number: 0226
 Date of Manufacture: 1297
 Modified per Service Bulletin 80-0689-31-SB03

2.2 Witnesses

David Jeffery – Aviation Safety Inspector (MFG)



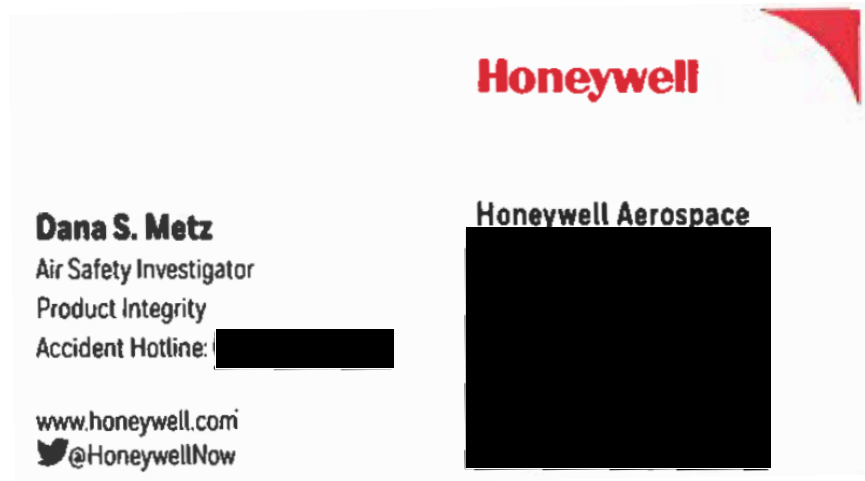
Jon Nowaczyk – Assistant Chief Pilot

Jon Nowaczyk
 Assistant Chief Pilot

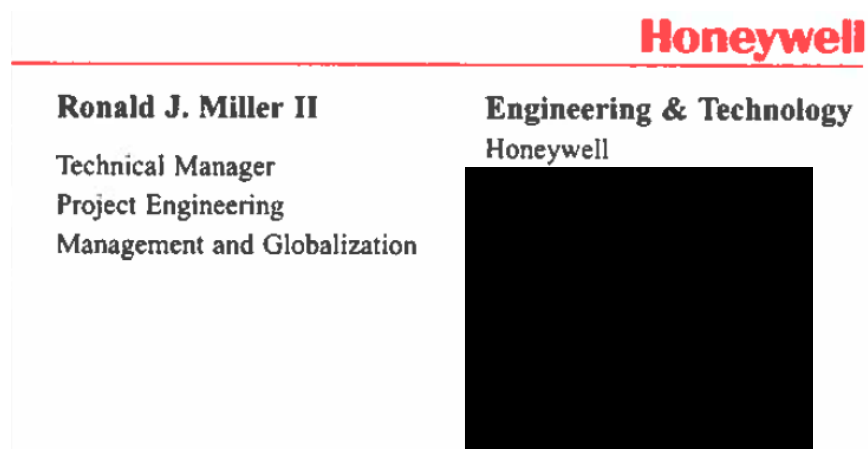
Pentastar Aviation

[Redacted]
 [Redacted]
 [Redacted]

Dana Metz – Air Safety Investigator



Ronald Miller – Sr. Technical Manager Engineering



2.3 Unboxing the Unit

Serial number 0226, which was associated with a crash on July 7th 2018, was received by Honeywell Urbana and reviewed with NTSB/FAA representatives on August 14th 2018. The following photographs detail the unit as received:



Fig. 1. Sealed Box



Fig. 2. Opened Box



Fig. 3. Side of Unit



Fig. 4. Front of Unit

2.4 Findings

After removing the unit from the shipping container, power was applied to the unit while ensuring the failure data would not be affected and with the setup configured for Pratt and Whitney engines. The unit was functional and did not appear to have any damage.

The upper display revealed several cautions that were present during the last 60 seconds of operation, see Fig. 5. , Fig. 6. , and Table. 1. . It is important to note the 60 second period is prior to both System I and II XMSN Oil Pressure failing or the CDS having had power removed, which ever occurred first.

The order the cautions appear on the screen is chronological from top to bottom, with the oldest caution on the top and the most recent caution on the bottom. This order is based on when the caution is received. If more than one caution is received in the same data packet, those cautions will be listed in bit order, which may differ from the true chronological order.

The MMEXC indication, shown in the center bottom of the upper display, lists the number of 200 ms occurrences where the MM Limit was exceeded (78% limit). For this unit, the MMEXC was 0020, which represents 4 seconds.

The top line in the lower display is used to review the FADEC failure codes, which are stored in numerical order and have no correlation to the sequence in which they occurred. The first code defaults to 0000, as seen in Fig. 5. . The line cycles through the stored codes with each press of the Scroll Up/Down buttons. Table. 2. shows a summary of the Pratt and Whitney FADEC Failure codes found in the unit.

The operating timers, which are displayed when the switch position is set to "T", were 374.3 and 373.9 for engine I and II respectively (No photos was captured showing the timers).



Fig. 5. Caution Page 1



Fig. 6. Caution Page 2

Table. 1. NVM DATA - Summary of Cautions

Left Column	Center Column	Right Column
ENG MANUAL	ROTOR BRK	ENG MANUAL
TWIST GRIP	EPU DOOR	TWIST GRIP
FADEC FAIL	YAW SAS	FADEC FAIL
FADEC MINR		FADEC MINR
HYD PRESS		ENG FAIL
GEN DISCON		ENG CHIP
BUSTIE OPN		HYD PRESS
		BUSTIE OPN

Table. 2. NVM DATA - Summary of Pratt and Whitney FADEC Memory Codes

Memory Code	Description	Nomenclature
24	NPT/Q_A Input Fault	N2/Q_A
25	NPT/Q_B Input Fault	N2/Q_B
30	LCF Counting Disabled Fault	LCF_FLT
32	TQ/NPT Input Fault	N2_IN

2.5 Returning the Unit to the Box

After recording the data, the unit was returned to the box for storage until direction is received to ship the unit. Static protective dust caps were placed on the connectors prior to placing the unit in the box as they were missing when the unit was received.



Fig. 7. Unit Returned to Box

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