

Technical document

EPM examination

Restricted release to the safety investigation members

Document ID: **BEA2019-0208_tec02**
Registration number: **N572MD**
Aircraft type: GUIMBAL - CABRI - G2
Date of occurrence: 4th May 2019
Place of occurrence: Near Kent Island (Maryland)
Equipment examined:



The EPM is a multifunction display enabling to monitor flight and engine parameters. For the last 36 flights, it records in a non-volatile memory the following parameters: the date, the technical time¹, the flight time², the average fuel consumption³ and the fuel refuelled between the last flight and the power-on. It also records the state of the different sensors and the associated failures during the last flight.

Note: for this device, a flight is detected when the power is on and when the detected NR is greater than a specific threshold. The last recorded failures and sensor states are erased only when a new flight starts and not once the device is powered.

The software of the display is located on a Compact Flash card. If this Compact Flash card is missing, the device does not boot and does not record any data in the non-volatile memory.

Work performed:

The EPM was inspected at the BEA to check its external and internal condition. The screen was broken and the casing was damaged. The seal on top of the Compact Flash card was broken. The main board was corroded, but the memory component was in good condition. The Compact Flash card was missing. The memory component was unsoldered using BEA infrared unsoldering machine under temperature monitoring. It was then soldered on a surrogate device at Véga Industrie facilities on November, 28th 2019. All the recorded data were directly displayed on its screen and were photographed.

¹ Technical time: corresponds to the hour measured by the hour meter

² Flight time: corresponds to rotor turning time above 100 rpm

³ Fuel quantity is in gal.

Three power-ups were performed with different software versions embedded in a surrogate Compact Flash card, as the Compact Flash card of the event was missing and as the software version embedded in the EPM of the event was unknown:

- Power-up with a Compact Flash formatted in V1.5 software version without writing capability. The date and time were not consistent using this software version. It was decided to update the software version.
- Power-up with a Compact Flash formatted in V1.7.1 software version without writing capability. The format and the flight hours were consistent. Two pictures of the flight log are available in Appendix 1.
- Power-up with a Compact Flash formatted in V1.6 software version without writing capability. The displayed data was the same as the 1.7.1 version.

At the end of the examination, the memory component of the EPM was unsoldered from the surrogate device.

Results:

The following results were obtained by using the V1.6 software version embedded in the Compact Flash card.

The alarms and sensors page was labelled “OK” for every sensor that is monitored by the EPM. Thus, no sensors failure was recorded during the last power-on of the device (see Appendix 2).

The flight log contained the last 36 flights recorded in a non-volatile memory. The flight were dated from November, 12th 2018 to January, 5th 2019 (see Appendix 1).

To confirm the integrity of the memory component, two operations were performed at the end of the power-up operation with a Compact Flash programmed with writing capability:

- The time format was changed from a 12h format to a 24h format. This operation ensured that the memory date and time was recorded without failure.
- A new flight was simulated to be sure that the memory component could record new data. A flight was successfully created at the date of the power-up in the flight logs.

Conclusion:

The power-up of the EPM showed that the memory component was functioning properly at the time of the event. No failure of the different sensors was recorded for the last flight.

Regarding the date in the flight logs, the last flight was recorded to be on January, 5th 2019. As the date can be set manually by the pilot by entering the “Config.” menu, it is possible that these dates were recorded with an offset. A comparison between the flight time recorded in the EPM and the flight time recorded in the flight book should be done to confirm the date of the different flight logs.

Appendix 1:

Start	Tech. time	Flight time	Average cons.	Added fuel	(gal)
01/05/19	10:06 am	0:40	0:45	10.3	+12
01/04/19	03:59 pm	1:18	1:23	9.2	+13
01/03/19	05:06 pm	1:22	1:27	9.7	+8
01/02/19	08:36 pm	0:20	0:24	8.1	+15
01/01/19	09:51 am	1:27	1:35	8.8	-
12/31/18	11:51 am	0:51	0:55	9.2	+8
12/31/18	11:41 am	0:01	0:02	-	-
12/31/18	11:09 am	0:03	0:12	4.7	-
12/30/18	02:17 pm	1:32	1:36	9.9	-5
12/30/18	11:43 am	2:02	2:08	10.4	+20
12/30/18	10:42 am	0:35	0:38	9.5	+30
12/30/18	10:19 am	0:12	0:17	8.0	-
12/29/18	04:21 pm	0:22	0:24	9.6	-
12/29/18	04:14 pm	0:03	0:05	8.1	-
12/29/18	04:06 pm	0:03	0:06	5.6	-
12/29/18	02:02 pm	1:15	1:18	9.6	-
12/29/18	11:24 am	2:12	2:17	10.2	+14
12/29/18	08:40 am	2:01	2:07	9.9	+19

Config.

Exit

Start	Tech. time	Flight time	Average cons.	Added fuel	(gal)
12/29/18	06:07 am	0:26	0:28	10.2	+11
12/29/18	05:01 am	0:46	0:54	8.6	-
12/28/18	11:21 am	0:59	1:06	8.1	+34
12/27/18	02:08 pm	1:10	1:14	9.1	+5
12/26/18	04:12 pm	1:05	1:12	8.7	+9
12/26/18	11:39 am	1:02	1:07	9.1	+8
12/25/18	09:53 am	1:40	1:46	8.9	+14
12/24/18	01:55 pm	0:26	0:32	8.2	+16
12/20/18	04:06 pm	1:10	1:17	9.1	-
12/20/18	00:25 pm	1:12	1:17	8.9	+11
12/19/18	02:44 pm	1:20	1:25	9.1	+10
12/19/18	10:39 am	0:28	0:33	8.9	+9
12/18/18	10:06 am	0:28	0:35	8.1	-
12/16/18	11:47 am	0:43	0:47	9.0	+14
12/15/18	02:56 pm	1:18	1:22	9.3	-
12/15/18	00:25 pm	0:26	0:34	8.0	+15
12/11/18	04:47 pm	1:01	1:06	8.9	+5
12/11/18	09:58 am	1:36	1:46	9.2	+9

Config.

Exit

Figure 1: Pictures of the last 36 flights recorded in the flight log of the EPM

Appendix 2:

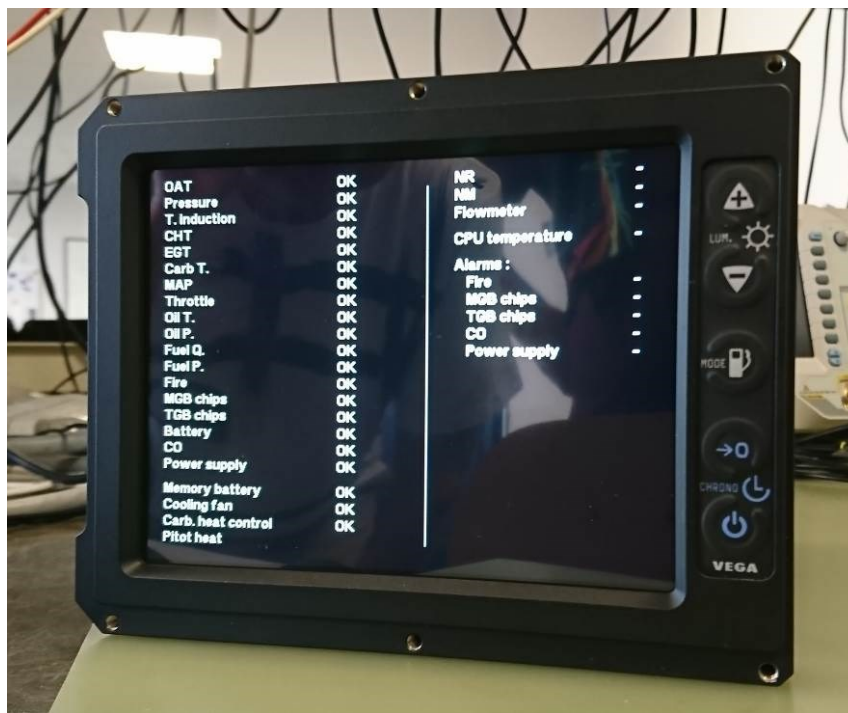


Figure 2: Picture of the alarms and sensors page of the EPM