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1. Introduction

The second generation Rotax 912iS Engine Management Unit (EMU 912iS evo) interfaces to the dual redundant Engine Control Unit (ECU) CANaerospace display networks of the Rotax 912iS / 915iS engine. The main functions of the EMU 912iS evo are:

- Dual optically isolated CANaerospace data bus interfaces (ECU display bus compatible)
- Integrates seamlessly into the Rotax 912iS / 915iS engine wire harness
- Minimum installation effort (3 connectors and 9 wires for full functionality)
- Indication of all engine parameters including external fuel pressure sensor information
- Indication of the engine status and error conditions in clear text
- Continuous monitoring and health checking of both ECU CANaerospace display buses
- Power Margin Indicator (PMI) provides engine performance and subsystem data information
- GPS receiver for flight state and time data acquisition
- Engine data recording over up to 2000 flight hours for both ECU CANaerospace buses
- Sophisticated data visualization and processing tool for recorded data (Windows, Linux, MacOS)
- Google Earth file export for recorded data including GPS and engine data
- User-configurable for display units, fixed/constant speed propellers and multi-engine aircraft
- Full Authority Digital Engine Controller (FADEC) with Mühlbauer constant speed propeller governor
- Electric power supply range: 9 – 32 VDC, tolerant to power outages

The EMU 912iS evo uses advanced TFT technology, providing a display with 640 x 480 pixels and 600 cd/m2 luminosity and wide viewing angle. Additionally, the EMU 912iS evo offers growth potential for future upgrades through several additional discrete inputs/outputs, an RS-232 link and two analog inputs.

The EMU 912iS evo is an integral part of the Rotax 912iS / 915 iS engine concept and provides two optically isolated CANaerospace networks for the Lane A and B display buses of the ECU. This is the only correct method to interface to the 912iS / 915iS ECU (if the Lane A and B networks are interconnected, a single failure may corrupt both Lane A and B, resulting in an immediate loss of engine indication). The EMU 912iS evo complements the 912iS / 915iS system redundancy concept to the full extent.
2. Mechanical Drawings

Figure 2-1 shows the two-side view of the EMU 912iS evo with its outer dimensions. The enclosure is machined from ALMg3 (EN AW-5754) aluminum, with all surfaces anodized according to aerospace standard. Panel installation is accomplished through a rectangular cutout and four M4 screws as shown in Figure 2-2. A 3D CAD model of the EMU 912iS evo is available on request.

Figure 2-1: EMU 912iS evo Mechanical Dimensions

Figure 2-2: Panel Cutout
### Technical Specification

The EMU 912iS evo is suitable for installation in instrument panels of aircraft flying below 25,000 ft. The electronics is protected against dust and humidity.

<table>
<thead>
<tr>
<th>EMU 912iS evo</th>
<th>Specification Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Dimensions (width x height x depth)</td>
<td>146 mm x 120 mm x 82 mm</td>
</tr>
<tr>
<td>Total Mass</td>
<td>0.8 kg</td>
</tr>
<tr>
<td>Electrical Power Supply</td>
<td>9 – 36 VDC, Power consumption: 0.3 A @ 24 VDC, 0.6 A @ 14 VDC</td>
</tr>
<tr>
<td>CANaerospace Interfaces</td>
<td>According to ISO 11898-2, optically isolated</td>
</tr>
<tr>
<td>Display</td>
<td>Active Color Matrix TFT, resolution 640 x 480 pixels, 2 % - 100 % dimmable LED backlight, maximum brightness 600 cd/m²</td>
</tr>
<tr>
<td>Electronics</td>
<td>Xilinx Spartan-3 FPGA with dual Microblaze processors, PicoMod1 Display Controller</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-20 °C to +70 °C</td>
</tr>
<tr>
<td>Operating Altitude</td>
<td>Less than 25,000 ft (7,620 m)</td>
</tr>
<tr>
<td>Humidity</td>
<td>Less than 95 %, non-condensing</td>
</tr>
</tbody>
</table>

*Table 3-1: Technical Specification*
4. Panel Connectors

The EMU 912iS evo rear view is shown in Figure 4-1, the Sub-D connector pin numbering in Figure 4-2.
The Lane A and Lane B connectors are male 9-pin Sub-D (DB9P) while the RS-232 connector is a female 9-pin Sub-D (DB9S). The Auxiliary connector is a female 15-pin Sub-D (DB15S). Tables Table 4-1, Table 4-2 and Table 4-3 describe the signal assignment of the EMU 912iS evo connectors. The ECU interface is realized through the Lane A/B connectors which are configured with a CAN baud rate of 125 kbit/s. The general CANaerospace network and fuel pressure sensor wiring of the EMU 912iS evo is shown in Figure 4-3. The NL-603 GPS receiver directly plugs into the Mini-DIN (PS/2 style) receptacle and is secured through a fixing clamp.

![Diagram of EMU 912iS evo General Wiring]

**Figure 4-3: EMU 912iS evo General Wiring**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Signal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PWR</td>
<td>DC Power Supply (9-36 VDC)</td>
</tr>
<tr>
<td>2</td>
<td>CAN-L</td>
<td>CAN Low</td>
</tr>
<tr>
<td>3</td>
<td>Reserved</td>
<td>Do not connect</td>
</tr>
<tr>
<td>4</td>
<td>Reserved</td>
<td>Do not connect</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>DC Power Ground</td>
</tr>
<tr>
<td>6</td>
<td>Reserved</td>
<td>Do not connect</td>
</tr>
<tr>
<td>7</td>
<td>CAN-H</td>
<td>CAN High</td>
</tr>
<tr>
<td>8</td>
<td>Reserved</td>
<td>Do not connect</td>
</tr>
<tr>
<td>9</td>
<td>Reserved</td>
<td>Do not connect</td>
</tr>
</tbody>
</table>

Table 4-1: CANaerospace Connector Pinout (Lane A, Lane B)
Important notes:

- Aircraft power shall be supplied to the EMU 912iS evo via the Lane A connector (pins 1 and 5).
- To ensure electromagnetic compatibility with other aircraft systems, the CANaerospace display bus wiring should be done using aircraft grade AWG24 shielded twisted pair (STP) cable with 120Ω impedance as shown in Figure 4-4. Also for electromagnetic compatibility reasons, the CAN_GND signals of the ECU shall not be connected. These cables are available as a harness set with part number 21008-713 (incl. power supply wires).
- Installation of the Rotax 664365 external fuel pressure sensor is highly recommended. Other sensors might lead to incorrect readings on the indicated fuel pressure.
- Omitting the GPS receiver has no adverse effect on the operation of the EMU 912iS evo. Without the GPS receiver aircraft position, height, ground speed and UTC data is not available in the recorded data files and cannot be displayed later.

![Recommended Wiring between ECU and EMU 912iS evo (part number 21008-713)](image)

Figure 4-4: Recommended Wiring between ECU and EMU 912iS evo (part number 21008-713)
The EMU 912iS evo RS-232 interface is used for test and future enhancements. No connections shall be made to this connector. In table 4.2 the pinout of the RS-232 connector is given. The RS-232 interface outputs status information during system start and is configured as follows:

- 115.200 Baud
- 8 Data Bits per Character
- 1 Stop Bit
- No parity

### Table 4-2: RS-232 Connector Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Signal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12V</td>
<td>12 VDC Power Supply</td>
</tr>
<tr>
<td>2</td>
<td>TXD</td>
<td>RS-232 Transmit Data</td>
</tr>
<tr>
<td>3</td>
<td>RXD</td>
<td>RS-232 Receive Data</td>
</tr>
<tr>
<td>4</td>
<td>3V3</td>
<td>3.3 VDC Power Supply</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Reference Ground</td>
</tr>
<tr>
<td>6</td>
<td>5V</td>
<td>5 VDC Power Supply</td>
</tr>
<tr>
<td>7</td>
<td>GPS_RX</td>
<td>GPS Receive Data</td>
</tr>
<tr>
<td>8</td>
<td>GPS_TX</td>
<td>GPS Transmit Data</td>
</tr>
<tr>
<td>9</td>
<td>GND</td>
<td>Reference Ground</td>
</tr>
</tbody>
</table>

In Table 4-3 the pinout of the AUX connector is given. Figure 4-5 gives an overview of the connections available on the Auxiliary connector. The analog reference ground (pins 5 and 12 of the Auxiliary connector) relates to the analog inputs (pins 1 – 3) and the 12 V / 5 V reference voltages (pins 11 and 13). These signals and the reference voltages are isolated from the aircraft supply (ACSUP, ACGND). The maximum power which may be drawn from the reference power outputs is 0.1 A.

### Table 4-3: Auxiliary Connector Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Signal Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AIN0</td>
<td>Analog Input #0 (Fuel Pressure)</td>
</tr>
<tr>
<td>2</td>
<td>AIN1</td>
<td>Analog Input #1 (Header Tank Fuel Level)</td>
</tr>
<tr>
<td>3</td>
<td>AIN2</td>
<td>Analog Input #2 (Aircraft Voltage)</td>
</tr>
<tr>
<td>4</td>
<td>AIN3</td>
<td>Analog Input #3 (Governor Limit)</td>
</tr>
<tr>
<td>5</td>
<td>AGND</td>
<td>Analog Input Reference Ground</td>
</tr>
<tr>
<td>6</td>
<td>START_PWR</td>
<td>Start Power Relay Output</td>
</tr>
<tr>
<td>7</td>
<td>MOTOR+</td>
<td>Propeller Governor H Bridge Driver Output (High Side)</td>
</tr>
<tr>
<td>8</td>
<td>MOTOR-</td>
<td>Propeller Governor H Bridge Driver Output (Low Side)</td>
</tr>
<tr>
<td>9</td>
<td>DOUT+</td>
<td>Discrete Output, High Side (derived from MOTOR+)</td>
</tr>
<tr>
<td>10</td>
<td>DOUT-</td>
<td>Discrete Output, Low Side (derived from MOTOR-)</td>
</tr>
<tr>
<td>11</td>
<td>5V</td>
<td>5V Analog Reference Voltage</td>
</tr>
<tr>
<td>12</td>
<td>AGND</td>
<td>Analog Input Reference Ground</td>
</tr>
<tr>
<td>13</td>
<td>12V</td>
<td>12 VDC Reference Voltage</td>
</tr>
<tr>
<td>14</td>
<td>ACSUP</td>
<td>Aircraft Power Supply (9-32 VDC)</td>
</tr>
<tr>
<td>15</td>
<td>ACGND</td>
<td>Aircraft Power Supply Ground</td>
</tr>
</tbody>
</table>
The input voltage for the analog inputs is limited to +/- 10 VDC. Note that higher voltages on these pins may destroy the EMU 912iS evo electronics, as no overvoltage protection is implemented for these signals. The EMU 912iS evo Software supports an analog fuel pressure sensor on input AIN0 with the following specification:

- Pressure range 0 – 10 bar
- Supply voltage 12 VDC, maximum supply current 25 mA
- Output voltage 0.5 VDC to 4.5 VDC, equalling 0 bar to 10 bar
- Accuracy: Equal to or better than +/- 1% of full scale over a -10 to +80°C temperature range

The recommended fuel pressure sensor for the EMU 912iS evo is the Keller Piezoresistive Pressure Transmitter type PA-23C (Rotax Part Number 664365).

The MOTOR+/MOTOR- and the DOUT+/DOUT- outputs are driven by the same signals but have different driver characteristics. The EMU 912iS evo standard software uses MOTOR+ and MOTOR- to drive a Mühlbauer P-853-xx constant speed propeller governor. The connection harness is available with part number 21008-716.

The START_PWR relay output drives up to 500 mA of inductive and may be used with the aircraft power ground available on pin 15. The EMU 912iS evo uses this output to drive an external start power relay to simplify the engine start procedure. Figure 4-5 shows the wiring of the start power relay for the Rotax 912iS system.

![Figure 4-5: EMU 912iS evo Auxiliary Connector Interface Overview](image-url)
### 4.1 Connectors and Harnesses

The connectors and harnesses for the EMU 912iS evo are available with the listed part numbers:

<table>
<thead>
<tr>
<th>Part-No.</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>21008-713</td>
<td>Connection Harness</td>
<td>Shielded cables for the connection of the EMU 912iS evo Lane A and B to BRP Rotax 912/915 iS engines. Including power supply wires. Open wire ends at the side of the ECU. Length 6.5 ft.</td>
</tr>
<tr>
<td>21008-716</td>
<td>SLPC Connection Harness</td>
<td>Shielded cable for the connection of MT Governors to the EMU 912iS evo. Open wire ends on the EMU side. Length 10 ft.</td>
</tr>
<tr>
<td>10-085</td>
<td>Auxiliary Connector</td>
<td>Auxiliary Connector for the EMU 912iS evo. Including connector shell, contact insert and 15 milled crimp contacts.</td>
</tr>
<tr>
<td>10-111</td>
<td>Harness EMU, preassembled</td>
<td>Consists of the above listed parts. The harness is prefabricated and assembled.</td>
</tr>
</tbody>
</table>

*Table 4-4: Connectors and Harnesses*
5. **Startup Power Relay Functionality**

For the Rotax 912iS / 915iS engine, the spring-loaded “Start Power Switch” (SPS), as specified in the BRP-Powertrain installation manual, has to be activated prior to engine start. As soon as START has been commanded and the engine runs, the SPS has to be released. The function of the SPS is to temporarily feed aircraft battery power to the Engine Control Unit (ECU), so that engine start is possible. Remove this connection after the engine is running, so that the ECU is exclusively supplied through its assigned alternator during normal operation.

![Figure 5-1: Battery Backup Switch](image)

In order to improve aircraft handling during the engine start process, the EMU 912iS evo provides an automatic start power switch function which is accomplished using an external relay wired in parallel to the SPS. This relay is activated as soon as the EMU 912iS evo is powered up and remains activated until the engine reaches 1500 rpm for the first time. As soon as this happens, the relay is deactivated and is never activated again, until the EMU 912iS evo is turned off. Using this function, engine start can be commanded through an OFF/ON/START key switch (where the START position is spring-loaded). The aircraft installation of the relay with reference to the BRP-Powertrain documentation is shown in Figure 5-2.
Figure 5-2: Aircraft Wiring with EMU 912iS evo and Start Power Relay
6. Technology

The EMU 912iS evo CAN interfaces are implemented with licensed Bosch C_CAN controller IP cores to ensure compatibility with the Bosch CAN standard and to allow precise hardware timing and control over the transmission and reception of CANaerospace messages. The Xilinx FPGA and the EMU 912iS evo software provide local buffering and 60 ns time stamp resolution for all messages and implement CANaerospace specific protocol functions. An integrated SDHC interface is used for data acquisition storage, system configuration information and firmware upgrades.

The EMU 912iS evo is integrated into a rugged aluminum box which is powered from 9-24 VDC allowing it to run from standard 12 VDC aircraft power buses according to the EN2282 specification. The power input lines are protected against transient overvoltage and electromagnetic interference. The maximum power consumption of the EMU 912iS evo unit is 8.5 W (TFT at full brightness). The CANaerospace interfaces and the TFT are serviced by different processors to ensure graphics performance and prevent loss of data.
7. Operation

The EMU 912iS evo front panel LED is illuminated in red during the 10 second boot process. After that the LED is switched off and the startup screen (see Figure 7-1) is displayed for 5 seconds. During this time, the EMU 912iS evo performs internal self-tests.

The display then reverts to the main screen, showing the most important engine parameters from the parameter list of Table 7-1. Additionally, it displays the active ECU lane controlling the engine and the associated system status including power/economy mode and generator switch state.

<table>
<thead>
<tr>
<th>No.</th>
<th>Parameter Name</th>
<th>Range</th>
<th>Display Limits</th>
<th>Display Colors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engine RPM</td>
<td>Range: 0 to 7000 1/min</td>
<td>0 to 1500 1/min&lt;br&gt;1500 to 1800 1/min&lt;br&gt;1800 to 5500 1/min&lt;br&gt;5500 to 5800 1/min&lt;br&gt;5800 to 5800 1/min&lt;br&gt; &gt; 5800 1/min</td>
<td>Red&lt;br&gt;Amar&lt;br&gt;Green&lt;br&gt;Amar&lt;br&gt;Red</td>
</tr>
<tr>
<td>2</td>
<td>Throttle Position</td>
<td>Range: 0 to 105 %</td>
<td>0 to 12 %&lt;br&gt;12 to 100 %&lt;br&gt; &gt; 100 %</td>
<td>Amber&lt;br&gt;Green&lt;br&gt;Red</td>
</tr>
<tr>
<td>3</td>
<td>Manifold Air Pressure</td>
<td>Range: 0 to 1400 hPa</td>
<td>0 to 200 hPa&lt;br&gt;200 to 1100 hPa&lt;br&gt;1100 to 1150 hPa&lt;br&gt; &gt; 1150 hPa</td>
<td>Amber&lt;br&gt;Green&lt;br&gt;Amber&lt;br&gt;Red</td>
</tr>
<tr>
<td></td>
<td>Parameter</td>
<td>Range</td>
<td>Display Colors</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------</td>
<td>------------------------------</td>
<td>----------------------</td>
<td></td>
</tr>
</tbody>
</table>
| 4 | Oil Pressure            | Range: 0.0 to 10.0 bar       | 0 to 1.5 bar  
1.5 to 3.0 bar  
3.0 bar to 5.0 bar  
5.0 bar to 7.0 bar  
> 7.0 bar   | Red  
Amber  
Green  
Amber  
Red       |
| 5 | Oil Temperature         | Range: -65 °C to 150 °C     | -65 to 50 °C  
50 to 110 °C  
110 to 130 °C  
> 130 °C   | Amber  
Green  
Amber  
Red       |
| 6 | Fuel Pressure           | Range: 0.0 to 5.0 bar        | 0.0 to 2.6 bar  
2.6 to 2.7 bar  
2.7 bar to 3.5 bar  
3.5 bar to 3.8 bar  
> 3.8 bar   | Red  
Amber  
Green  
Amber  
Red       |
| 7 | Fuel Flow               | Range: 0 to 50 l/h           | 0 to 20 l/h  
20 to 25 l/h  
> 30 l/h    | Green  
Amber  
Red       |
| 8 | Manifold Temperature    | Range: -65 °C to 150 °C     | < -25 °C  
-25 to 40 °C  
40 to 65 °C  
> 65 °C    | Amber  
Green  
Amber  
Red       |
| 9 | Coolant Temperature (CHT) | Range: -65 °C to 150 °C     | < 50 °C  
50 to 110 °C  
110 to 120 °C  
> 120 °C   | Amber  
Green  
Amber  
Red       |
| 10| Exhaust Gas Temperature| Range: -65 °C to 1100 °C (for each cylinder) | -65 to 900 °C  
900 to 950 °C  
> 950 °C    | Green  
Amber  
Red       |
| 11| Ambient Air Pressure    | Range: 0 to 1400 hPa        | < 400 hPa  
> 400 hPa    | Amber  
Green       |
| 12| Ambient Air Temperature | Range: -65 °C to 150 °C     | < -25 °C  
-25 to 40 °C  
> 40 °C     | Amber  
Green  
Amber       |
| 13| ECU Supply Bus Voltage  | Range: 0.0 to 32.0 VDC      | < 10 VDC and > 15 VDC  
10 VDC to 12 VDC   | Red  
Amber  
Green       |
| 14| Engine Hours            | -                            | -                    | White       |
| 15| Engine Status           | -                            | -                    | White       |
| 16| Engine Faults           | -                            | -                    | White/  
Amber/  
Red       |

Table 7-1: Engine Parameter List
7.1 Main Page
The main page displaying all parameters relevant for the engine operation is shown in Figure 7-2. Other pages may be selected through the three bottom soft keys. Rotating the brightness potentiometer (BRT) adjusts the TFT brightness between 2% and 100%. The initial brightness after power-on is 100%.

![Figure 7-2: MAIN Display Page](image)

The color of the main page text information changes automatically according to the limit definitions as set forth in Table 7-1. The squares labeled "A" and "B" indicate the status of the ECU lanes. The color of the squares changes with the error status of the corresponding ECU lane (green/red). This is also indicated through the corresponding text (i.e. "A:SBY" or "B:ACT"). All data displayed on the main page is that of the active lane (the lane in control of the engine). In case of sensor failure, the display of the associated signal will revert to dashes ("---") to immediately indicate the failure situation.

The central warning area displays informational messages when engine parameters are out of range. Messages displayed in the central warning area will disappear when confirmed by pressing the "MCR" (Master Caution Reset) button. The display units may be switched between metric and US representation through the configuration page.

7.2 Engine Data Information (INFO) Page
The Engine Data Information page (INFO) displays selected engine data in parameter groups using colored bars indicating the current values and the associated operational warnings and limits. The desired parameter group may be selected using the up/down soft keys. The selected parameter group is depicted on a green background.
An example for the layout of the INFO page is shown in Figure 7-3. The various engine parameter groups may be selected using the up/down buttons. Each parameter has its own drag indicator (white horizontal lines on top). The drag indicators for each parameter group may be reset at any time through the ZERO button. Pressing the RET button brings up the MAIN page regardless of the currently selected parameter group.

![Engine Data Display](image)

Figure 7-3: INFO Display Page

7.3 System Information (SYST) Page

The system information page (SYST) provides six subpages for Warnings, ECU faults, the status of the ECU lanes, the ECU configuration, the status of the EMU 912iS evo flight data recording function and a CANaerospace bus monitor. The desired status information subpage may be selected using the up/down soft keys. The selected information group is depicted on an amber background (Warnings and ECU Faults) or a green background (all others). Pressing the RET button brings up the MAIN page regardless of other selections. The layout of the SYST subpages is shown in Figures Figure 7-4 to Figure 7-8.
The integrated CAN bus monitoring function of the EMU 912iS evo may be used to troubleshoot installation and wiring problems. "Rx/Tx Messages" indicate how many CANaerospace messages are received and transmitted on the two ECU communication buses within a 100ms time period.

The EMU 912iS evo continuously interrogates the ECU to prevent dormant failure situations. Clean wire harness installations should ALWAYS show zero CAN Errors for transmission and reception. If this is not the case it is highly recommended to check the wiring, connectors and CAN termination resistors.

CAN is very robust and will continue to work in case of bus errors. Nevertheless, the CAN bus monitor should be activated as part of regular maintenance actions to detect any cable/wire problems at an early stage.
Figure 7-5: SYST Display Page (ECU Faults Subpage)

Figure 7-6: SYST Display Page (ECU Status Subpage)
7.4 The System Configuration (CONF) Page

The system configuration page (CONF) allows to display and modify the EMU 912iS evo configuration settings. The desired configuration may be selected using the up/down soft keys. The selected configuration is depicted on a green background. The layout of the CONF page is shown in Figure 7-9.

Selected configuration settings become effective immediately and may be stored permanently on the SD card through the "SAVE" soft key at any time. The file on the SD card containing the settings has
the name "EMU912iS.CFG". This file is in readable ASCII format and may also be edited on a desktop or laptop computer.

At this time, the EMU 912iS evo supports the following selections:

- Metric vs. US units for all display pages
- RPM indication in crankshaft vs. Propeller RPM
- Manifold pressure in hPa vs. InHg
- Fuel pressure offset adjustment

![System Configuration](image)

**Figure 7-9: CONF Display Page**

The layout of the fuel pressure offset adjustment sub-page is shown in Figure 7-10. The offset should be changed in order to reflect the fuel system layout and the location of the pressure sensor. This is accomplished by comparing the main page fuel pressure indication of the EMU 912iS evo with the reading of a calibrated pressure gauge.
Figure 7-10: FuelP Corr Display Sub-page
8. Flight Data Recording

The EMU 912iS evo provides data recording of all CANaerospace data transmitted by the ECU over the CAN interfaces. The data is stored on the SDHC card. For each restart of the EMU or after 6 minutes (1/10 hour of flight), a new file of arbitrary length is created and the previous one is closed. The file naming convention is:

DAT_wxyz.CAN

where "wxyz" is the decimal file number, which is incremented by one for each new file and allows 9999 different files to be created, named and stored. The number of the last file which has been closed and written to the SDHC card is stored as a 4-character ASCII string in the file "TOPDAT.CFG" which is also written to the card. The EMU 912iS evo records all data of both ECU data bus lanes (12 kbytes/s). Most of the data is transmitted 10 times per second. Using a 32GB SDHC memory card, this results in a maximum recording time of 760 hours.

A powerful Engine Management Debriefing Station (EMDS) software for the MS Windows, SuSE Linux and MacOS X operating systems is delivered with the EMU 912iS evo. This tool (see Figures Figure 8-1 to Figure 8-3) allows visualization and post processing of the recorded data.

![Figure 8-1: Engine Management Debriefing Station (EMDS) Software](image-url)
Figure 8-2: EMDS Instrument View

Figure 8-3: EMDS generated Google Earth View
9. **Software Upgrades**

The EMU 912iS evo allows software upgrades to be made through the SDHC card interface. The software is delivered in zipfiles with the following structure:

**EMU_SW_1.6.zip -> EMU_SW_1.6 -> mb0.srd, mb1.srd**

The binary software upgrade files (mb0.srd, mb1.srd) have to be stored on a SD or SDHC card which is then inserted in the SDHC card slot. The files are recognized by the EMU 912iS evo software which checks for these files each time power is applied. When these files are detected, the content is automatically programmed into FLASH memory and the new software is started.

On success, the EMU 912iS evo software deletes the upgrade files from the SDHC card and writes a log file (“INSTALL.LOG”) to the card which provides information about the upgrade. The current software version is indicated on the EMU 912iS evo startup screen (see Figure 7-1).