

Operating the Science Data Recorder in 29J

Introduction

Just in time for the 2004 wave season, 29J is ready to start collecting science data. The system is completely automatic, but it does require the pilot to turn the system on when data is to be collected. Any flight in 29J will be a science data collection flight by following these guidelines.

Background

29J is equipped with two sets of sensors that produce useful data for atmospheric research.

The Cambridge 302 provides airdata (airspeed, pressure altitude, ambient temperature), 2 axis accelerometer data, and GPS position, rates, and time.

The MicroStrain 3DM-G combines three angular rate gyros with three orthogonal DC accelerometers, three orthogonal magnetometers, multiplexer, 12 bit A/D converter, and embedded microcontroller, to output its orientation in dynamic and static environments. Operating over the full 360 degrees of angular motion on all three axes, 3DM-G provides orientation in either matrix or quaternion formats, which are easily converted to Euler angles. The digital serial output can also be programmed to provide scaled sensor data from all nine sensors.

Data from these two instruments can be recorded on a Flight Data Recorder (“FDR”) neatly stowed in the nose of the 2-32. This recorder has been implemented using a very low power (6W) industrial PC platform with a Pebble LINUX operating system and application software developed by Pedja. The PC is equipped with a wireless Ethernet connection and FTP server so that recorded data can be easily downloaded using standard software and a laptop anywhere within 500 feet of the aircraft.

Procedure for recording a flight

To record data from all sensors, follow these steps.

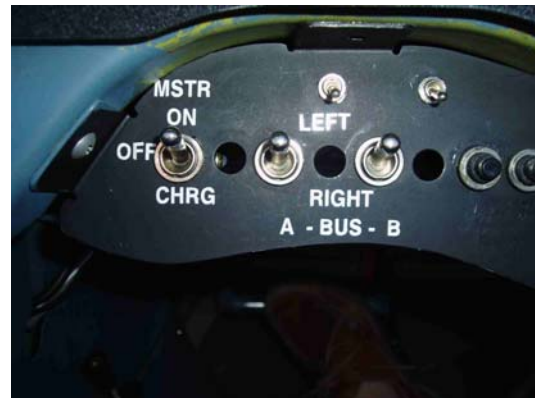
1. Set the *Red Handled toggle switch* to the right of the 302 to the *up position*. In this position, data from the 302 is routed to the FDR where it is recorded and repeated on a second serial port connected to the IPAQ for real-time display. Note that when the switch is up, the IPAQ will only receive 302 data if the FDR is powered on (see step 3). In the down position, data is sent directly to the IPAQ. Use this position when the FDR is not powered on.



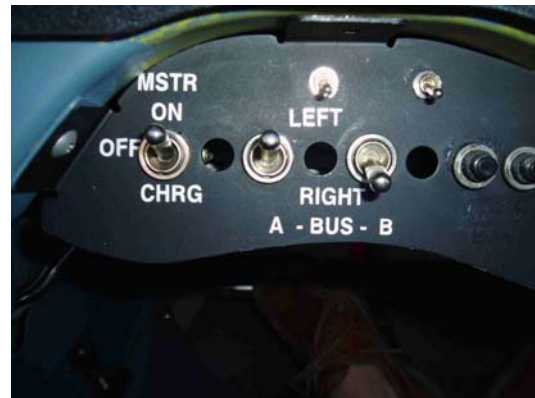
2. Check the circuit breaker (“CB”) panel to insure that the CBs for the FDR and 3DM-G are pushed in (ON). The CB labeled FC is the FDR and the 3DM-G is (temporarily) connected to the lights circuit.



3. To start recording on the FDR, turn on the “B bus” power switch either up (to power this bus from the left side battery) or down (to power this bus from the right side battery). The center position is OFF.



If both batteries are topped off, it is a good idea to run the flight instruments (A bus) from one battery and the FDR (B bus) from the other battery. This balances the load and keeps the current drain on each battery modest. However, if one battery is low, and the other is topped off, both buses can be operated from the same battery. This should still provide >5 hours of flight time at low temperature.



4. Once on the ground, be sure to switch the 302 data flow switch back to the 302->IPAQ position, and turn off the FDR power by returning the B Bus toggle switch to the middle position. Place the batteries on charge if capacity is <80% indicated in the ILEC vario.

5. When a flight has been completed with data collection enabled, call or send an email to Mike Exner (303-817-2097 or <mailto:mlexner@earthlink.net>) to report the flight; he will download the data for processing.