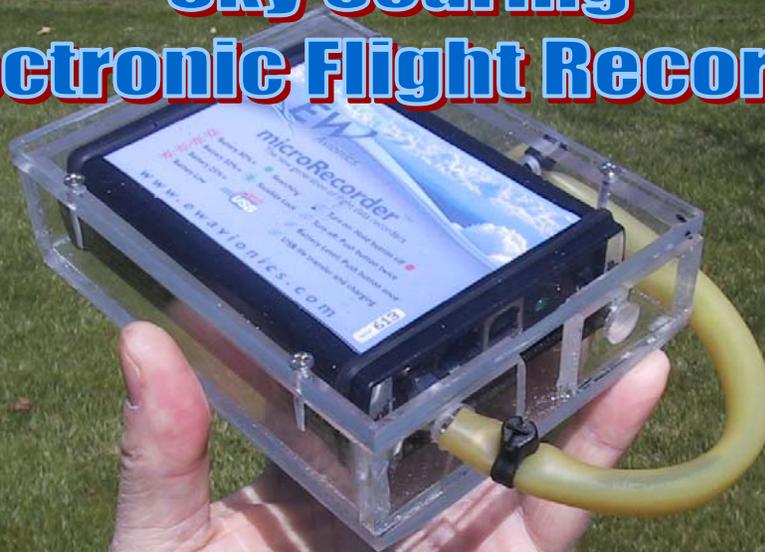Sky Soaring
Electronic Flight Recorder

Manual of Use
EW microRecorder
Version 1.3 – June 2, 2008

Sky Soaring
Electronic Flight Recorder
Manual of Use
EW microRecorder

By John DeRosa (john@derosaweb.com)

Background

A *flight recorder* (sometimes called a data logger) is used in the sport of soaring to verify flights used for badge efforts, record flights and competition in a secure and verifiable way.

History - In the past flight recording had been accomplish using a mechanical device (barograph) which recorded altitude and duration by drawing a line on a strip of paper. In addition, a film camera was used for recording positional information especially during contests. Prior to the use of cameras, assistants were sent to each turnpoint to show large placards of random symbols at selected times. The pilots flying overhead had to see the placard and record the symbol. This was all very tedious indeed.

Electronics - Electronic flight recorders are now being very wildly used for badges, records and competition. An electronic flight recorder uses a Global Positioning System (GPS) satellite signal to record positional information. A pressure transducer is used to record the altitude information. A secure flight log is created which is IGC/FAI certified and can be used for all of the soaring activities mentioned above.

This manual will describe the proper use of the Sky Soaring EW microRecorder Electronic Flight recorder. The electronic flight recorder was purchased by a group of active Sky Soaring members for the benefit of all.
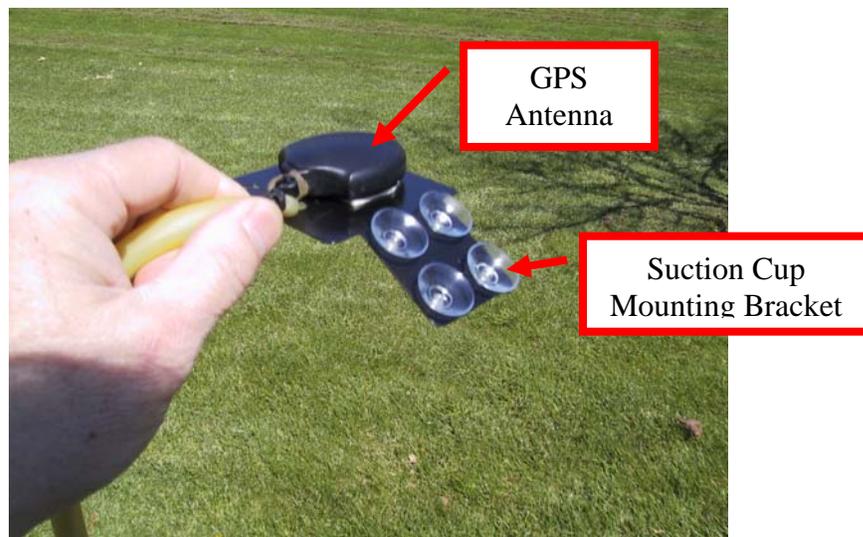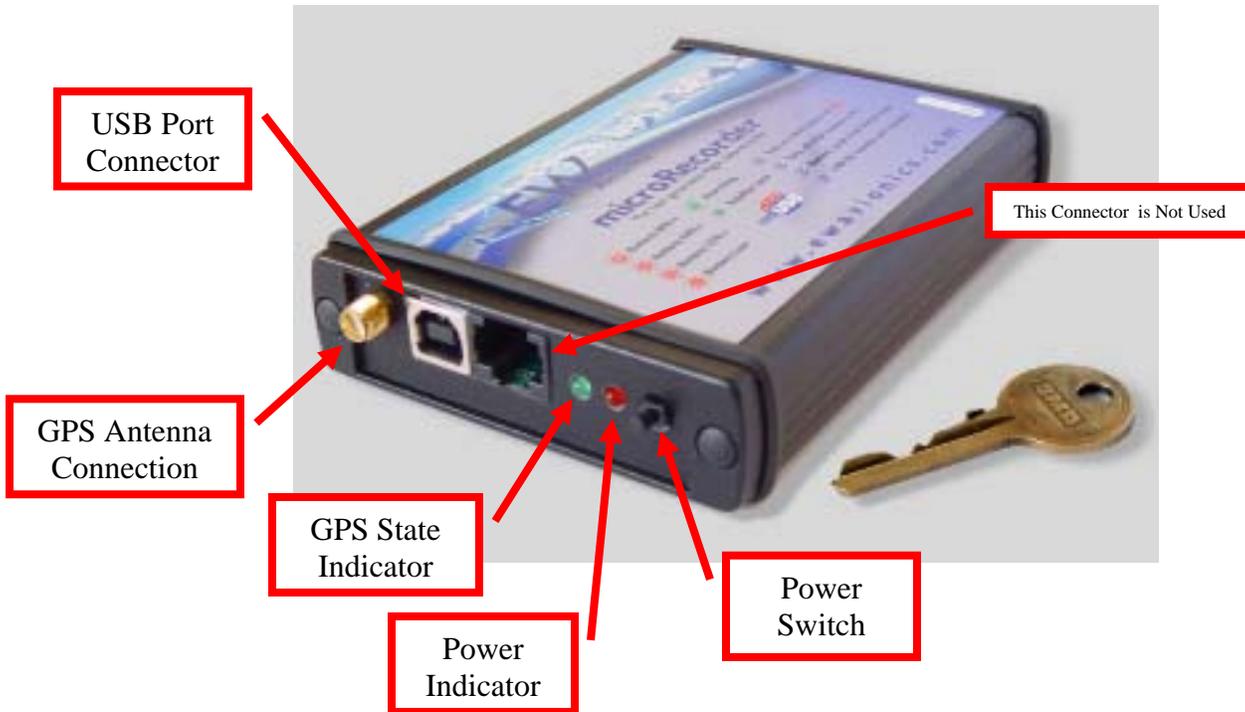
Table of Contents

Quick Start Guide

- Rental cost is $5 per flight no matter what length.
- Read this entire manual in its entirety at least once before the use of the flight recorder.
- Remove the recorder from the USB charger cable attached to the office computer. If the recorder was not found on charge, the internal battery may not have enough power to record an entire flight. See the Power section of this manual for more details.
- Turn power on by using a pencil or other similar item to press and hold the power button for 3 seconds or until the red light comes on. See the Power section of this manual for more details.
- Wait for the green GPS indicator light on the front of the recorder to glow steady. This may take several minutes depending on the state of the GPS receiver.
- Mount the recorder in the glider in an approved location and means. See the Mounting section and Appendix B of this manual for more details.
- After a flight, download the log file from the recorder by connecting it to the USB cable attached to the Sky Soaring computer. See the Downloading section of this manual for more details.
- Transfer the flight log for your personal, badge and record use. See the Transferring section of this manual for more details. Do not delete flight logs from the recorder.
- Turn the power off on the recorder by pressing the power button twice in rapid succession. Place the recorder connected to the USB cable on the computer in the office. See the Power section of this manual for more details.

Overview of the Flight Recorder

The Cambridge 302A flight recorder can determine and store the position of a glider into a secure format log file. The flight recorder will securely store the previous 20 or more flights (depending on the length of the flights). The internal battery is specified to last for 100 hours between charges (but should be fully charged before each flight. The acrylic case should never be opened.

See the images below for descriptions of the various parts of the Sky Soaring electronic flight recorder.

USB Port Connector

This Connector is Not Used

GPS Antenna Connection

GPS State Indicator

Power Indicator

Power Switch

GPS Antenna

Suction Cup Mounting Bracket

Rental Cost

There is a rental charge of $5 for the recorder per flight no matter what the length of the flight is. This should be paid using the standard Sky Soaring pay envelope system.

Handling

Please handle the flight recorder with care and avoid bumps and sudden drops. While the case and contents were built for use during flight in turbulent air, they should be treated as you would any other piece of avionics equipment. Do not insert metal objects into any of the case holes.

The recorder should be returned to the office each day and connected to the computer via the gray USB computer cable (which charges the internal battery).

Maintenance

No routine daily maintenance is necessary except for the recharging of the battery (see Power section below). Please contact the Sky Soaring electrical maintenance chairperson for any necessary repair or issues.

Calibration

The governing bodies which controls soaring badges, records and contests require that electronic flight recorders must be re-calibrated every 24 months. The next re-calibration date is labeled on the bottom of the flight recorder and is also shown at the right.   Make note of this date before your flight in order to avoid having the flight invalidated. Please contact the Sky Soaring electrical maintenance chairperson when re-calibration is necessary.

> Flight Recorder
> Next Calibration Date
> *March 5, 2009*

NOTE: The flight recorder may also be recalibrated within one (1) month after the flight (for badges). Thus if the recorder was mistakenly not recalibrated within the last 24 months, you still have (a short amount of) time to correct the error. However, due to the time lag in processing badge claims, if this error is discovered by the SSA badge officials (rather than the pilot), there will most likely not be enough time to obtain a recalibration within the one month time period.

Weight and Balance

It is the responsibility of the pilot in command of the aircraft to determine the proper weight and balance. It is absolutely critical that the weight and balance of the glider is considered when using this flight recorder. The flight recorder is considered "baggage". You should reference the glider operations manual to determine the proper CG for the glider after adding the flight recorder.

Mounting

It is critical that the recorder case is mounted in an approved, secure and safe location so that the devices does not come loose during turbulent flight. The recorder is fitted industrial Velcro© patches for that purpose. See Appendix B for details on suggested mounting in various Sky Soaring club owned gliders.

It is critical that the external GPS antenna (shown at right) has a clear view of the sky to allow reception of the signal from the GPS satellites in orbit around the earth.

Best GPS antenna Location

- The best location for the GPS antenna is on the interior of the canopy, using the suction cup mount shown above.
- Located the antenna behind the pilot's head so as not to distract the pilot.

Good GPS Antenna Locations

- Mounting the GPS antenna under a canopy or cloth fuselage covering is acceptable.
- A small amount of metal (i.e. tubular frame members) above the antenna will typically not interfere with GPS signal reception.
- Fiberglass composition gliders will typically not interfere with GPS signal reception.

Bad GPS antenna locations

- Mounting the recorder beneath the solid metal (aluminum) skin of a glider.
- Other materials such as carbon fiber.

A test flight is highly recommended prior to an important or official flight.

GPS Status Indicator

There is a green LED status light on the front edge of the flight recorder as shown in the picture at the right.

When the recorder is first powered up, the status light will be a steady green. The GPS receiver in the recorder will then attempt to "acquire" a signal from several GPS satellites in Earth orbit overhead.

Once enough satellites have been acquired, the status light will begin to flash. If the status light does not begin to flash, no flight logging will occur. Try to reposition the GPS antenna for a clearer view of the sky.

GPS State Indicator
Steady Green – Acquiring GPS Satellites
Flashing Green – OK to fly

Power

Battery – The recorder's case contains an internal rechargeable battery. The battery is completely sealed and will not leak in any position. The manufacturer of the flight recorder advertises the battery as lasting for approximately 100 hours. However the recorder should be fully charged before each flight.

The flight recorder is capable of maintaining a log file even if it encounters short term losses of power. That is, if power is lost (for up to five minutes), and then restored, a single log file will be maintained albeit with a missing piece of the flight. This assumes power is restored within the five minute time requirement. Power loss greater than five minutes will create two separate flight logs. Generally multiple sequential log files for a single flight are allowed for badges if it is obvious to the reviewer that the flight is continuous.

Fuse – There is no fuse on the recorder.

Turning On the flight Recorder –The power button is located on the right side of the recorder. Using a long thin device (such as a pencil) to press the power button for 3 seconds until the power light comes on.

Power Light – The power light will turn on and begin to blink. The number of blinks indicates the charge level (see the table below). The power light will cease blinking after a short time. To determine the charge level at a later time, press the power button once.

Blinks	Charge State
4	80%
3	50%
2	25%
1	Low battery

Turning Off the Flight Recorder – Press the power button twice in quick succession.

Recharging the Flight Recorder – The recorder should be returned to the office each day and connected to the gray USB computer cable (which charges the internal battery). See the image at right.

Flight Considerations

There are several things to consider when you are making a recording of a flight for badge or records;

➢ Designate an Observer – Anyone may be an observer if they have attained at least a bronze badge. They will need to sign the badge or record form to certify your flight.
➢ Declare your Flight – It is important to declare in writing to the observer prior to your flight what your intentions are.
➢ Power – Make sure that the flight recorder's battery is fully charged.
➢ Beginning of Soaring Flight – Your flight begins after release from tow. It is critical to mark the beginning of your soaring flight within the flight log in some way, especially for durations flights.
   a. When using a mechanical barograph, this is done by rapidly descending 100-200 feet and then climbing again. This marks the altitude trace with a clear V-shape up/down altitude change (called "notching" for obvious reasons). Because this type of maneuver cannot be performed while on tow, this clearly marks the beginning of your soaring flight on a barograph trace. This may also be used with an electronic flight recorder.
   b. The counterpart of a notch for an electronic flight recorder is by performing a sharp thermalling turn. Because this type of turn cannot be performed while on tow, this clearly marks the beginning of your soaring flight in your flight recorder's log file. Alternately , a notching maneuver may be performed.
➢ See also Applying for Badges section below for more details.

Flight Logs

The recorder keeps a record of your flight using an internal Global Positioning System (GPS) receiver within the flight recorder. This is done by storing the altitude and positional information in a secure log file. The log file must then be transferred from the recorder to a computer to allow it to be used for badge or record attempts.

Flight log files are stored in a unique secure format which typically ends in the extension .IGC (less often in .CAI and other extensions). While the files can be opened and read by any text reader like Notepad or Microsoft Word (an interesting exercise in itself), the contents of the file should never be changed. If you change even the smallest part of the log file, the file will become unusable. This is done on purpose to prevent tampering with the log file.

The previous 20 or more flight logs, depending on the length of the flights, will be securely held in the recorder without continuous power. When the flight recorder's memory is full, the recorder automatically overwrites the oldest log file. Existing flight logs cannot be manually erased from the recorder.

Shown below are the first few lines of a typical log file.

```
ACAMC55
HFDTE160906
HFFXA050
HFPLTPILOT:Sky Soaring INC 55LL
HFGTYGLIDERTYPE:Fleet Ships
HFGIDGLIDERID:55LL
HFDTM100GPSDATUM:
HFRFWFIRMWAREVERSION:F1.7
HFRHWHARDWAREVERSION:300 Series Version 2
HFFTYFRTYPE:CAMBRIDGE AERO INSTRUMENTS, CFR
HFGPS:GARMIN,LVS-25,12,18000
HFPRSPRESSALTSENSOR:INTERSEMA, MS5534-AP, 20000
I033638FXA3941ENL4247REX
LCAMSBVER:5FWVER:F17200
B1713244209244N08831004WA0025000272000028000000
B1713264209244N08831004WA0025000272000024000000
B1713284209244N08831004WA0025000272000020000000
B1713304209244N08831004WA0024900272000024000000
B1713324209243N08831004WA0025000273000040000000
B1713344209243N08831004WA0025000273000068000000
B1713364209243N08831004WA0025000274000088000000
```

Downloading Flight Logs

The flight recorder has a USB serial port connector used for communications with a computer. See the image below.


To the Computer
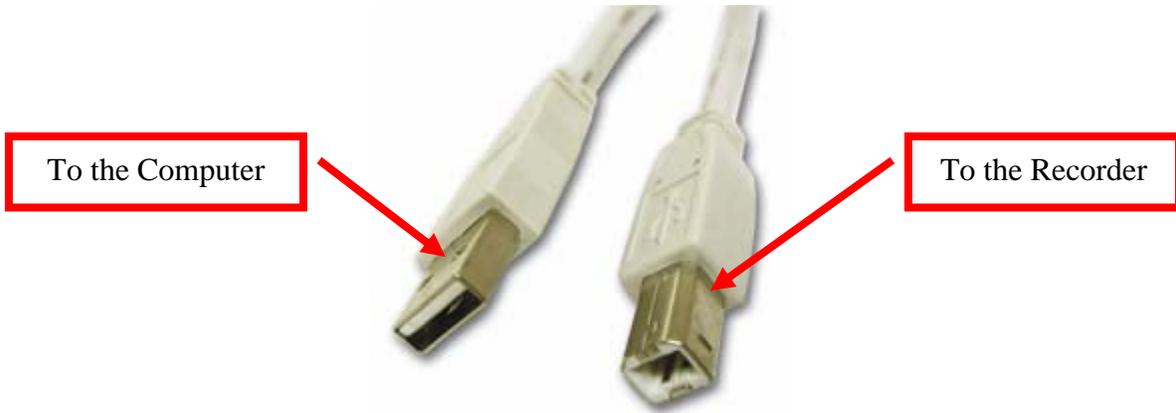
To the Recorder

A USB serial cable connects the flight recorder to a computer's USB port. The Sky Soaring computer has a gray USB serial port cable already connected to it's serial port.

1) Connect the flight recorder to the Sky Soaring desktop computer with the USB serial port cable as shown at the right.

2) Windows Computers
   a. Go to My Computer.
   b. Look for the device "EW IGC Logs". See the image to the right. This view may be different on your computer.
   c. Double-click on "EW IGC Logs".
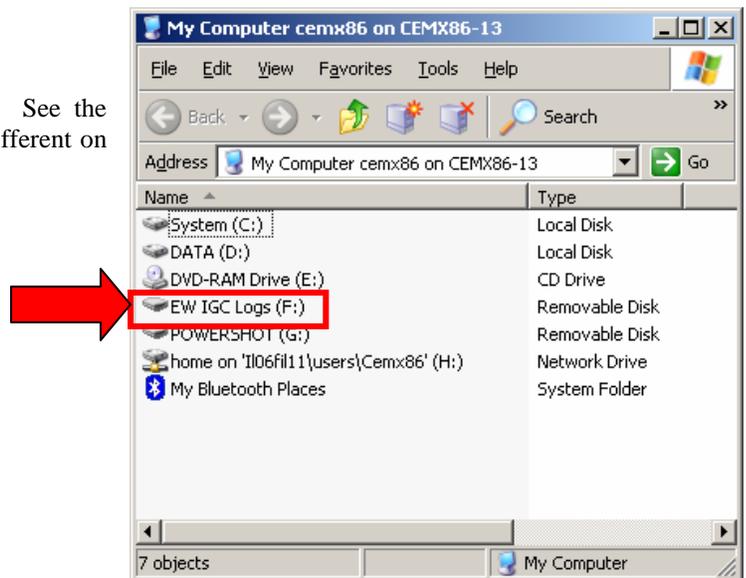
3) Within the "EW IGC Logs" you should find the log file for your flight as shown below. There may be other log files. To locate your log file it is best to sort by date to find the file that was created on the date of your flight. The date of the flight is also encoded in the file name. See Appendix A to learn how to decode the IGC file name.

Caution - Do <u>not</u> modify the EW-User.txt file shown below. This may damage your log file.
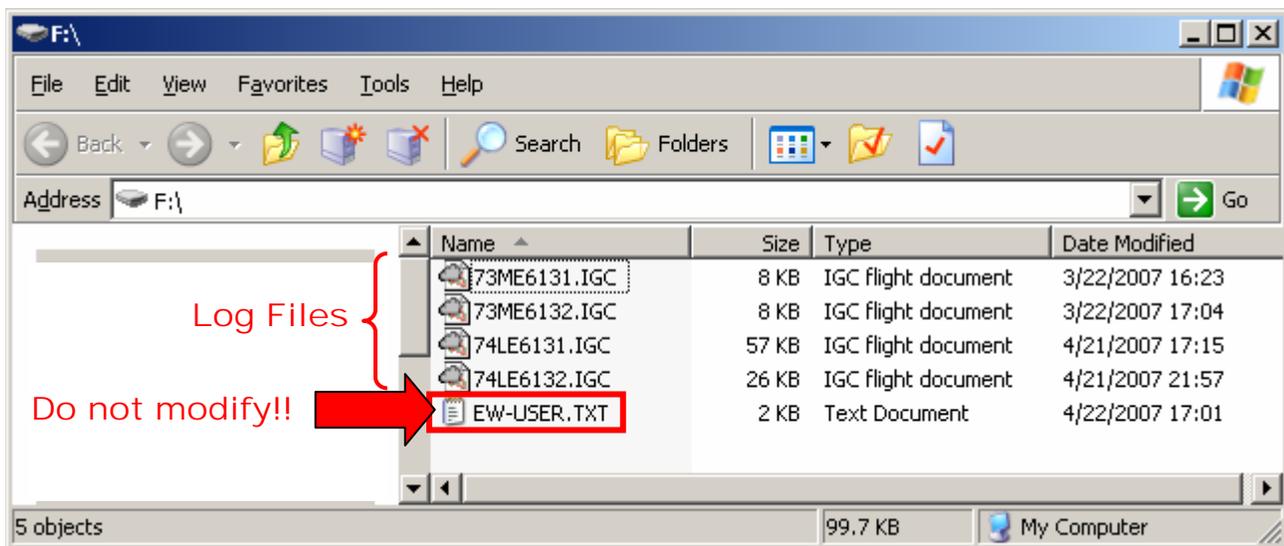
4) **Do not delete any flight logs from the recorder.** You might need to download a second copy if the first copy does not verify properly.

5) The recorder can hold up to 100 hours of flights. Flight log files are retained in the recorder until the recorder is "full". The oldest file is then overwritten by newer files.

Transferring Log Files

Immediately after your flight, you should make a copy of your flight log file and keep it in a secure place. This is especially important if you plan on using the log file for badge, contest or record work.

DO NOT CHANGE THE NAME OF THE FILE – this can render the file unusable.
DO NOT DELETE FILES FROM THE RECORDER - You might need to download a second copy if the first copy does not verify properly.

There are several ways to transfer the log files from the Sky Soaring computer to another person or computer;

1) **Email** – The Sky Soaring computer is connected to the Internet. You may log into your email account from this computer and send the log file to yourself. When you return home you can log into your email account and download the log file. This can also be used to send the log files to the SSA badge and record officials (see Applying for Badges and Records, below, for more details).
2) **Removable Media** –
   a. Flash Drives – These are small portable memory devices which are commonly known as "thumb" drives. They can store and transport files between computers. The devices are plugged into the USB port of Sky Soaring's computer (front panel).
   b. Removable Memory Cards – A card reader is attached to the top of the Sky Soaring computer which can be used to read/write log files to/from most types of memory cards.
3) **CD-ROM** – The Sky Soaring computer contains a disk drive that can "burn" CD-ROM disks. You must provide your own blank media. Instructions for use are not included in this manual.
4) **Floppy Disk** – Cannot be used as the Sky Soaring computer does <u>not</u> contain a floppy disk drive.
5) **Direct Connection** – The flight recorder may be connected to the USB port of a portable computer which has been brought to the field for that purpose. The recorder must <u>not</u> be removed from the field except as authorized by the Board.

Verifying a Log File

Before sending your file to be judged for a badge, contest or record, you should verify your file. This is accomplished via a specialized program available at http://www.soaringpilotsoftware.com/GPS_LOGpage.htm.

What should you do if your file does not verify? You should go back to the flight recorder and obtain a "fresh" copy of your flight log.

Reviewing the Flight

Following a flight it is important to review the log file and analyze if the goal for the flight (duration, distance, altitude, etc) has been achieved. The sky soaring computer has a program called "Cambridge Aero Explorer"[1].

Double-click on any flight log file (ending in .IGC) and this program should automatically be started.

See below for examples of a flight shown within the Cambridge Aero Explorer software.
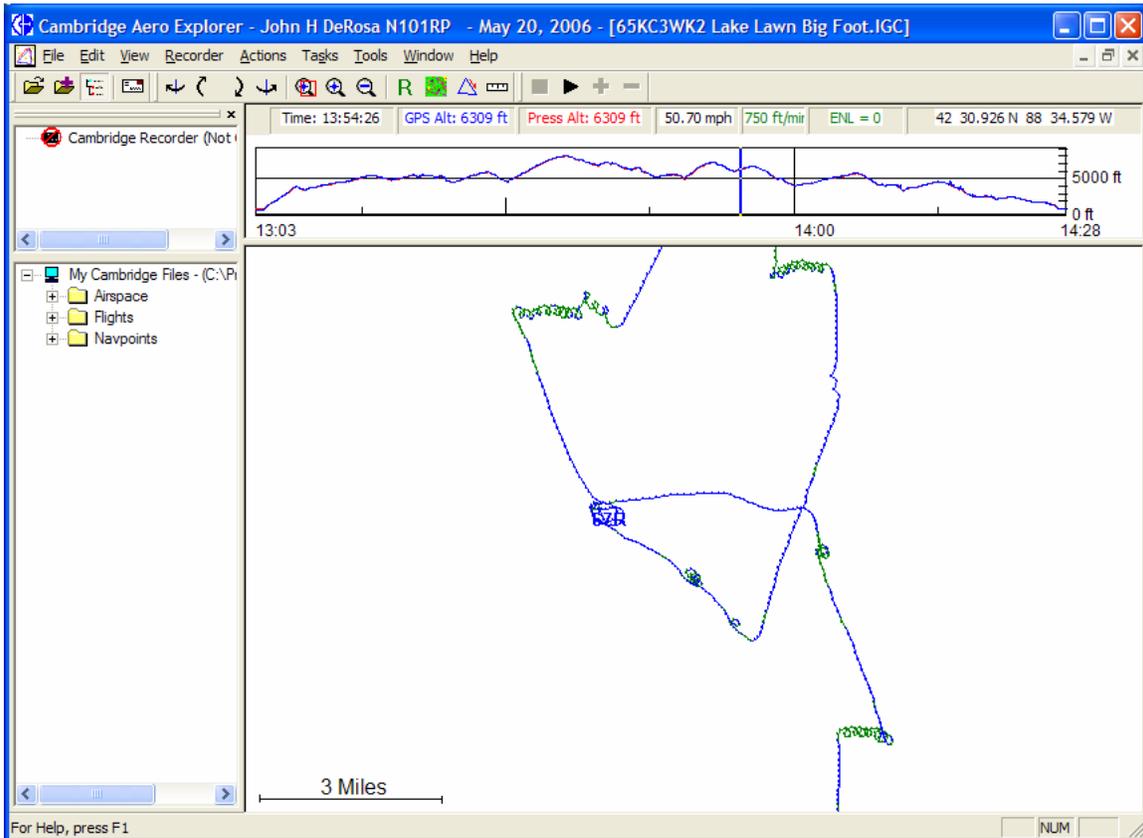
Alternative Flight Review Software – There are other products that allow two and three dimensional views of flights along with further flight analysis capability. Demonstration versions of the software are available from;

- SeeYou – http://www.seeyou.ws
- StrePla – http://www.strepla.de/StrePla4/english

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[1] The Cambridge Aero Explorer software and manual is available for free download from http://cambridge-aero.com/CA_explorer.htm.   A copy of the manual is also available in the Sky Soaring office and on the Sky Soaring computer.

Other Devices

Do not connect the flight recorder's serial port to any other device except as noted in this manual. For example it is not recommended attaching a personal digital assistants (PDA) to the recorder as this may drain the internal battery and prevent complete recording of the flight.

Applying for Badges or Records

Please see http://ssa.org/members/badgesandrecords/questions.asp for details on applying for soaring badges.

Please see http://ssa.org/members/badgesandrecords/usrecords.asp for details on reviewing and applying for soaring records.

Contest Use

The Sky Soaring flight recorder is not intended for extended non-local use such as at a remote contest. Contests are generally held at distant locations and for extended periods of time which may adversely impact the other members of the club. Check with the club's board for details.

Appendix A – IGC File Naming

A flight log file from an FAI approved flight recorder is named in a very specific way to convey various details of the flight such as:

> ➢ Date of flight
> ➢ Manufacturer of the flight recorder
> ➢ Serial number of the flight recorder
> ➢ Flight number for that day

This file name should never be changed or the log file may become unusable. You may "decode" the file name using the following information.
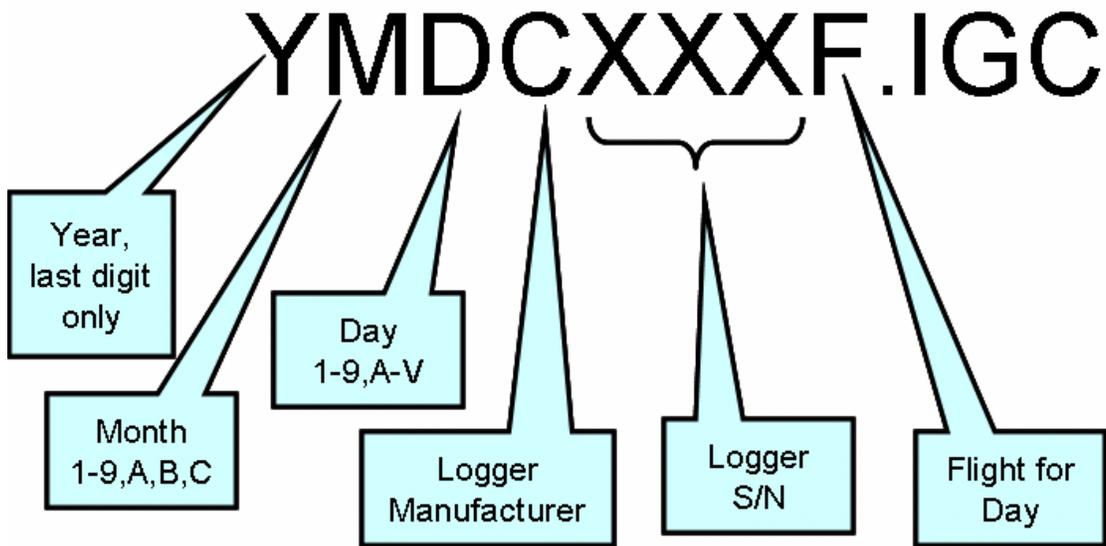
| Month of Year	Manufacturer of Flight Recorder	Day of Month	
===============	===============	==========	
1 = January	A = Garrecht	1 = 1	G = 16
2 = February	C = Cambridge	2 = 2	H = 17
3 = March	E = EW Avionics	3 = 3	I = 18
4 = April	F = Filser	4 = 4	J = 19
5 = May	L = LX Navigation	5 = 5	K = 20
6 = June	S = Streamline Data	6 = 6	L = 21
7 = July	W = Westerboer	7 = 7	M = 22
8 = August	X = All other	8 = 8	N = 23
9 = September		9 = 9	O = 24
A = October		A = 10	P = 25
B = November		B = 11	Q = 26
C = December		C = 12	R = 27
		D = 13	S = 28
		E = 14	T = 29
		F = 15	U = 30
			V = 31

Appendix B – Mounting Details

It is absolutely critical that the recorder is mounted in an approved, secure and safe location so that the recorder does not come loose during turbulent flight. The recorder is fitted with nylon mounting straps and industrial Velcro© patches for those purposes.

It is the responsibility of the pilot in command of the aircraft to determine the proper weight and balance of the glider (see the Weight and Balance section for details).

Blanik L-23

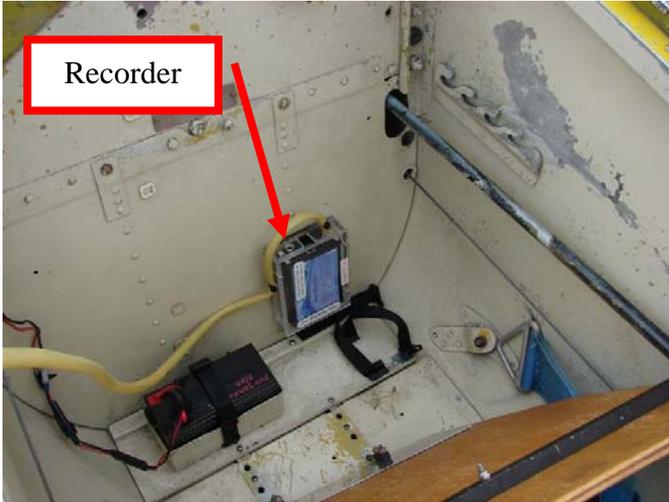The suggested location for mounting the flight recorder is shown below.

1) **Recorder** - Should be mounted within the "baggage" area behind the rear seat . Velcro mounting tape is located on the recorder and on the glider for mounting purposes.
2) **Antenna** – The antenna is mounted on the inside of the rear canopy via the suction cups towards the rear of the canopy. Mount the antenna in such a way as to not interfere with the vision of the rear pilot.
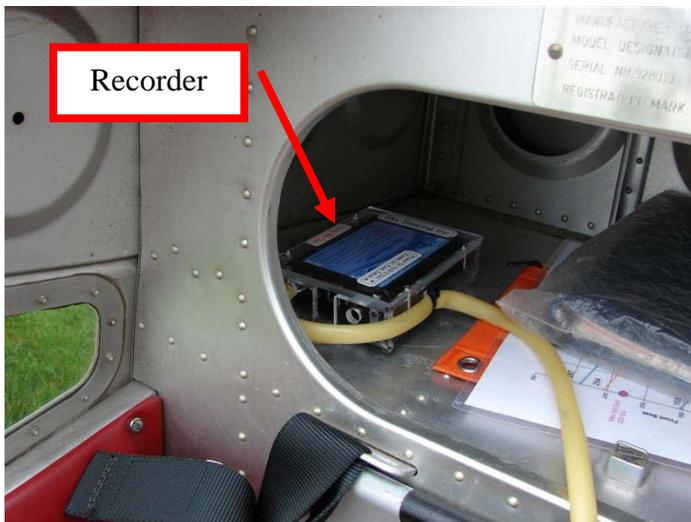
Schweizer 1-26

The suggested location for mounting the flight recorder is shown below.
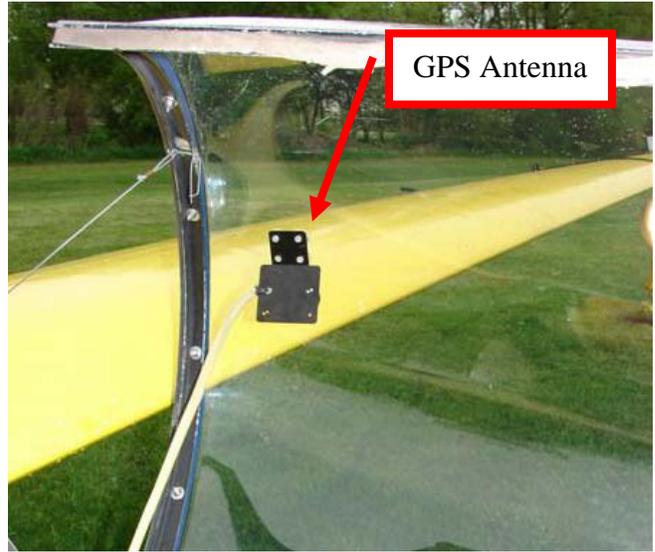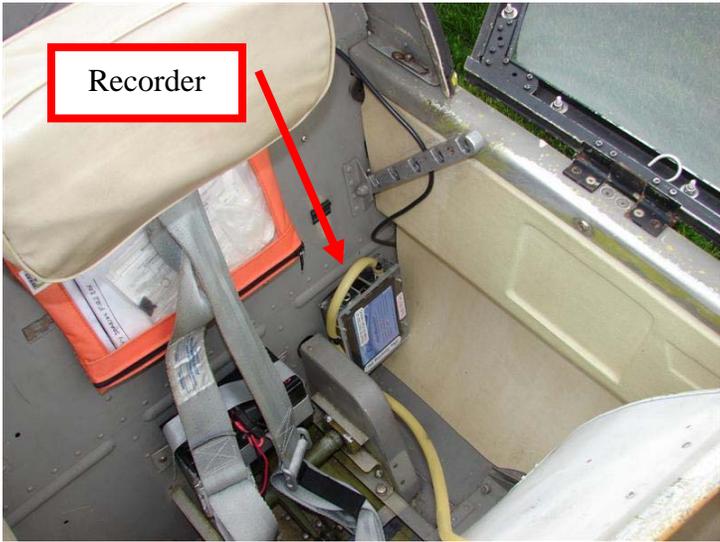
1) **Recorder** - Should be mounted behind the seat back. Velcro mounting tape is located on the recorder and on the glider for mounting purposes.
2) **Antenna** – The antenna is mounted on the inside of the canopy via the suction cups towards the rear of the canopy. Mount the antenna in such a way as to not interfere with the vision of the pilot.

Recorder

GPS Antenna

Schweizer 1-34

The suggested location for mounting the flight recorder is shown below.

1) **Recorder** - Should be mounted behind the seat back. Velcro mounting tape is located on the recorder and on the glider for mounting purposes.
2) **Antenna** – The antenna is mounted on the inside of the canopy via the suction cups towards the rear of the canopy. Mount the antenna in such a way as to not interfere with the vision of the pilot.

Recorder

GPS Antenna

Schweizer 2-33

The suggested location for mounting the flight recorder is shown below.

1) **Recorder** - Should be mounted on the back of the front seat just above the rear pilot's left knee. Velcro mounting tape is located on the recorder and on the glider for mounting purposes.
2) **Antenna** – The antenna is mounted on the inside of the rear fixed canopy via the suction cups. Mount the antenna in such a way as to not interfere with the vision of the rear pilot.

Recorder

GPS Antenna
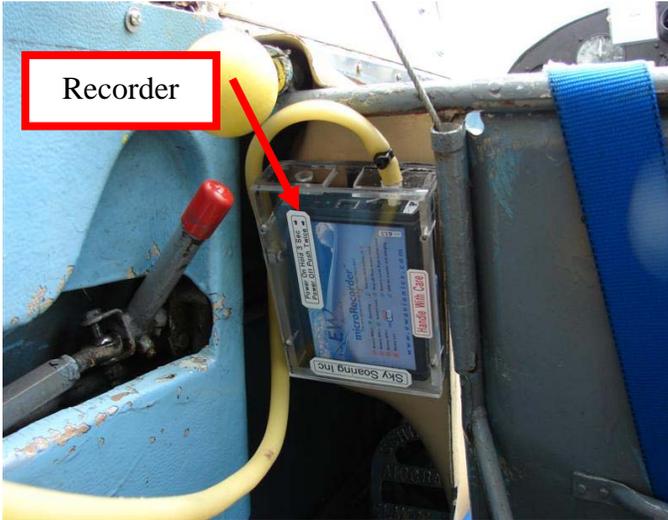
Appendix C – Internet Resources

Name	Description	Link
Soaring Society of America	Badge and Records information	http://ssa.org/members/badgesandrecords/questions.asp
Soaring Society of America	Flight Recorder information	http://ssa.org/members/badgesandrecords/BadgeFr.asp
EW Avionics	Manufacturer of the EW Microrecorder	http://www.ewavionics.com
GPS	Global Positioning System Information	http://en.wikipedia.org/wiki/GPS
Soaring Network News	rec.aviation.soaring	http://groups.google.com/group/rec.aviation.soaring
GPS_LOG Software	IGC file verification software.	http://www.soaringpilotsoftware.com/GPS_LOGpage.htm
Cambridge Software	2D Soaring Flight Analysis Software	http://cambridge-aero.com/CA_explorer.htm
StrePla Software	3D Soaring Flight Analysis Software	http://www.strepla.de/StrePla4/english
SeeYou Software	3D Soaring Flight Analysis Software	http://www.seeyou.ws