



Sky Soaring Electronic Flight Recorder Manual of Use

Version 1.1



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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 the past this has been accomplished using a mechanical device (barograph) which recorded (draws) altitude and duration on a strip of paper. In addition, a film camera was used for recording positional information.

More recently electronic flight recorders are being used for badges, records and competition. An electronic flight recorder uses a Global Positioning System (GPS) satellite signal and a pressure transducer to record (log) the altitude, duration and positional information of your flight. The secure flight log 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 Cambridge 302A Electronic Flight recorder. The electronic flight recorder was purchased by a group of active and concerned members for the benefit of Sky Soaring.

Table of Contents

Background.....	2	Transferring Log Files	11
Quick Start Guide	3	Other Devices.....	11
Overview of the Flight Recorder	4	Applying for Badges or Records.....	11
Rental Cost.....	5	Contest Use	11
Handling.....	5	Appendix A – IGC File Naming.....	12
Maintenance	5	Appendix B – Mounting Details.....	13
Calibration.....	5	Blanik L-13	13
Weight and Balance	5	Blanik L-23	13
Mounting.....	6	Schweizer 1-26.....	14
Power	6	Schweizer 1-34.....	15
Flight Considerations	7	Schweizer 2-33.....	15
Flight Logs	7	Appendix C – Internet Resources	16
Downloading Flight Logs	8	Appendix D – Battery Testing	17
Reviewing the Flight.....	10		

Quick Start Guide

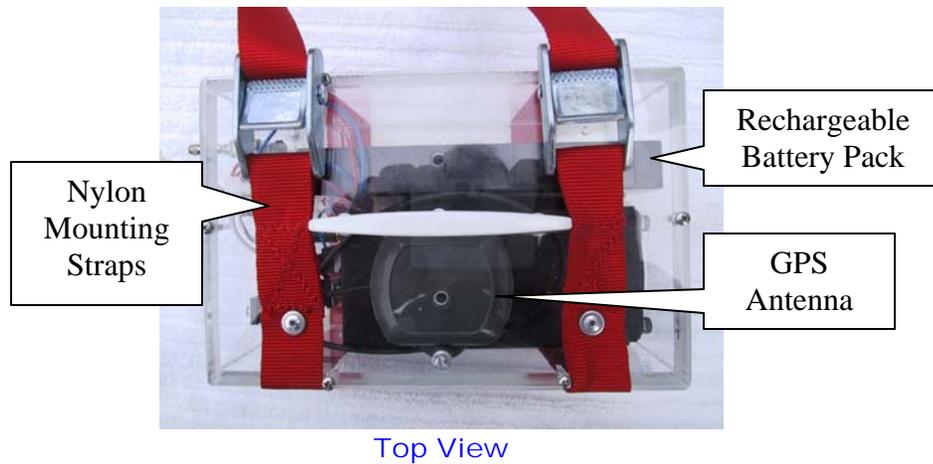
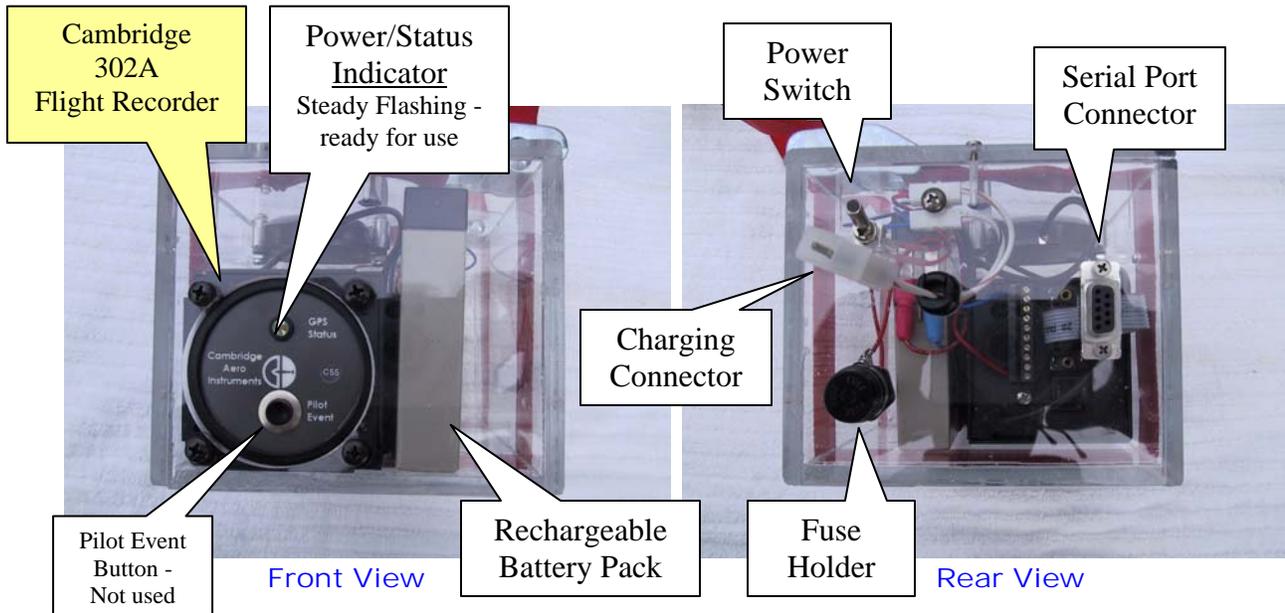
- Read this entire manual in its entirety at least once before the use of the flight recorder.
- Remove the recorder from the charger in the radio room. If the recorder was not found on a charger, the internal battery may not have enough power to record an entire flight. See the [Power](#) section of this manual for more details.
- Turn power on by pulling the locking power switch out and then up. See the [Power](#) section of this manual for more details.
- Wait for the power/status indicator on the front of the recorder to begin to blink in a steady and repeating pattern. 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.
- Consult the weight and balance chart of the glider to verify that the addition of the weight of the recorder maintains the center of gravity of the glider. See the [Weight and Balance](#) section of this manual for more details.
- After a flight, download the log file from the recorder by connecting it to the gray serial port 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.
- Turn the power off on the recorder. Place the recorder on a charger in the radio room. See the [Power](#) section of this manual for more details.

Flight Recorder Weight _____ Lbs _____ Oz

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) even without power. The acrylic box contains the recorder and battery system. It is self contained and should not be opened.

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



Rental Cost

There is a rental charge of \$5 per flight for the recorder. 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. Keep out of reach of small children. Void where prohibited.

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 side 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 21st, 2008

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 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.

Flight Recorder
Weight
_____ Lbs _____ Oz

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 with nylon mounting straps and industrial Velcro® patches for that purpose. See [Appendix B](#) for details on suggested mounting in various Sky Soaring club owned gliders.

It is also critical that the internal GPS antenna has a clear view of the sky to allow reception of the signal from the GPS satellites in orbit around the earth. Mounting under a canopy or cloth fuselage covering is acceptable to adequately receive GPS signals. A small amount of metal (i.e. tubular frame members) between the flight recorder and the sky will most likely not affect reception of GPS signals but a test flight is strongly recommended. Mounting the recorder beneath the solid metal (aluminum) skin of a glider will probably block adequate GPS signals and is strongly discouraged. Fiberglass composition gliders will not interfere with GPS signal reception. Other materials such as carbon fiber will probably adversely affect GPS signals and is not recommended. Again a test flight is highly recommended.

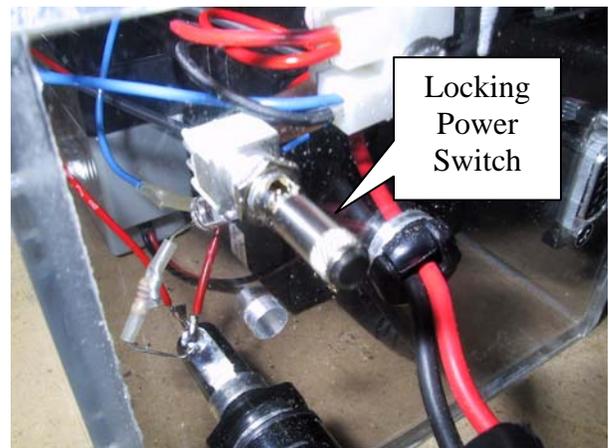
Power

Battery – The recorder’s case contains a rechargeable 12Vdc 2.0Ah sealed electrolyte lead-acid battery. The battery is completely sealed and will not leak in any position. The flight recorder has been bench tested to run on internal battery power for greater than ten (10) hours between charging. See [Appendix D](#) for details.

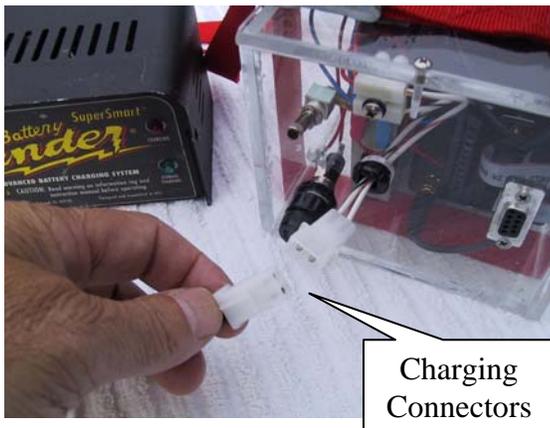
The flight recorder is capable of maintaining a log file even if it encounters short term losses of power. That is, if power is lost (for up to five minutes), and then restored, a single log file will be maintained albeit with a missing piece of the flight. This assumes power is restored within the five 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 – The fuse holder on the rear of the recorder contains a one amp (1A) fast blow fuse. Replace the fuse with the same type and amp rating only. Replacement fuses are stored in the supply cabinet in the radio room and are available from the electrical maintenance chairperson.

Turning On the flight Recorder –The power switch is located on the rear of the recorder as shown at right. This switch is a locking power switch and must be pulled out and then up to turn ON the device.



Status Light – The front panel status light will turn on, flash off, then turn on again, glowing steadily. This means that the flight recorder has successfully powered up but is not yet ready for use. After 1-3 minutes the flight recorder’s status light will begin to steadily blink. This blinking indicates that the recorder’s GPS receiver has acquired enough satellite signals for a 3-D fix and is ready for flight use.



Turning Off the Flight Recorder – The power switch is located on the rear of the recorder. This switch is a locking power switch and must be pulled out and then down to turn OFF the device. The flight recorder may be turned off at any time following a flight. There are no special precautions necessary to insure the integrity of the flight log.

Recharging the Flight Recorder – Move the power switch to the off position. The recorder contains a unique power connector unlike that used with all other Sky Soaring devices. This should be connected to the flight recorder’s specific “smart” charger located in the radio room as shown at left. The connector is polarized and can only be connected in the correct orientation.

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 with at least a bronze badge may be an observer of your flight. They will need to sign the badge or record form to certify your flight.
- Declare your Flight – It is important to declare 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.
 - 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.
 - 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, or in addition, 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 Cambridge 302A. 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.

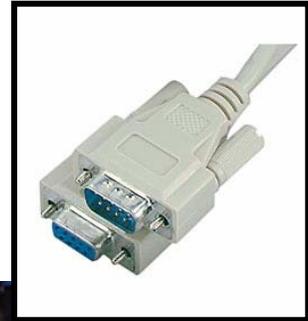
Shown below are the first few lines of a typical log file.

```
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
HFPRSPRESSALTSSENSOR:INTERSEMA, MS5534-AP, 20000
I033638FXA3941ENL4247REX
LCAMSEVER:5FWVER:F17200
B1713244209244N08831004WA0025000272000028000000
B1713264209244N08831004WA0025000272000024000000
B1713284209244N08831004WA0025000272000020000000
B1713304209244N08831004WA0024900272000024000000
B1713324209243N08831004WA0025000273000040000000
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B1713364209243N08831004WA0025000274000088000000
```

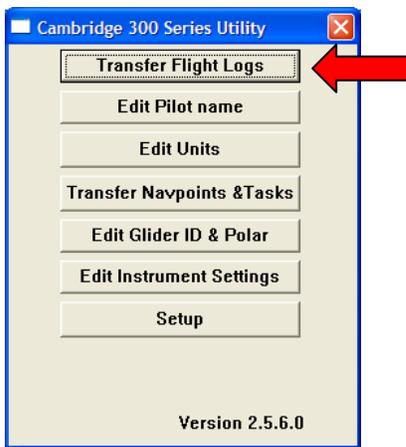
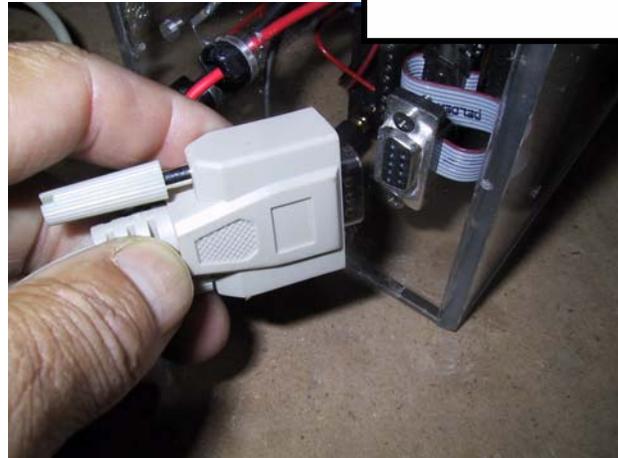
Downloading Flight Logs

The rear of the flight recorder has a serial port connector used for communications with a computer. This connection has nine (9) pins and is roughly “D” shaped and is known as a “DB-9” connector.

A DB-9 serial cable connects the flight recorder to a computer’s serial port. The Sky Soaring computer has a gray DB-9 serial port cable already connected to its serial port. A typical cable is shown at the right.



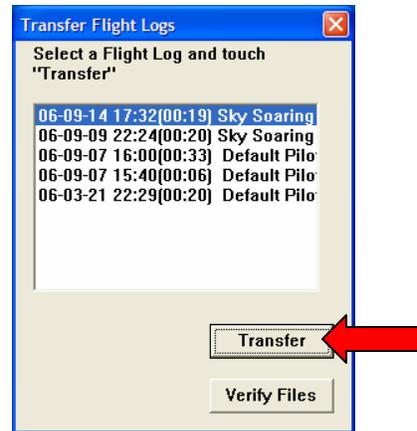
- 1) Connect the Cambridge flight controller to the Sky Soaring desktop computer with the DB-9 serial port cable as shown at the right.
- 2) Start the “Cambridge 302A Download” program¹ which is located within the “Cambridge Flight Recorder” folder located on the desktop of the Sky Soaring desktop computer. Click on the “Transfer Flight Logs” button.



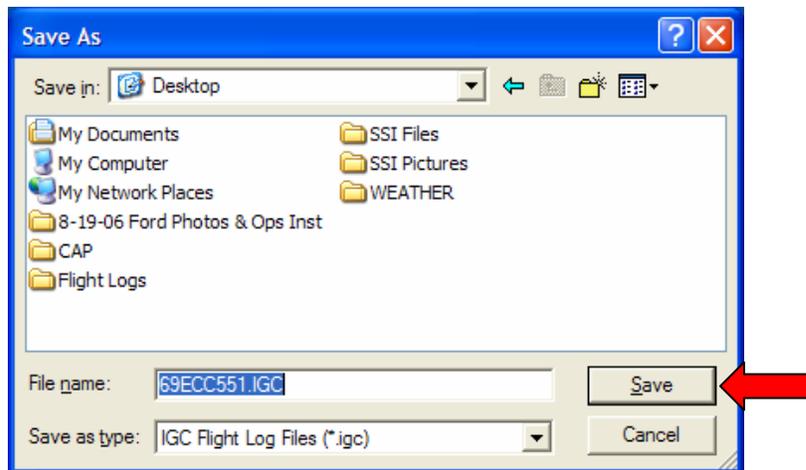
NOTE: Do not use any of the other buttons within this software to change any of the parameters of the flight recorder. Doing so may invalidate your flight. Generic Pilot information has been saved to the flight recorder. The SSA has approved this approach for the common use of a single flight recorder.

¹ This program is actually called “3UTPC256.exe” but has been renamed for readability. The software and manual is available for free download from <http://www.cambridge-aero.com>. A copy of the manual is available in the Sky Soaring office and on the Sky Soaring computer.

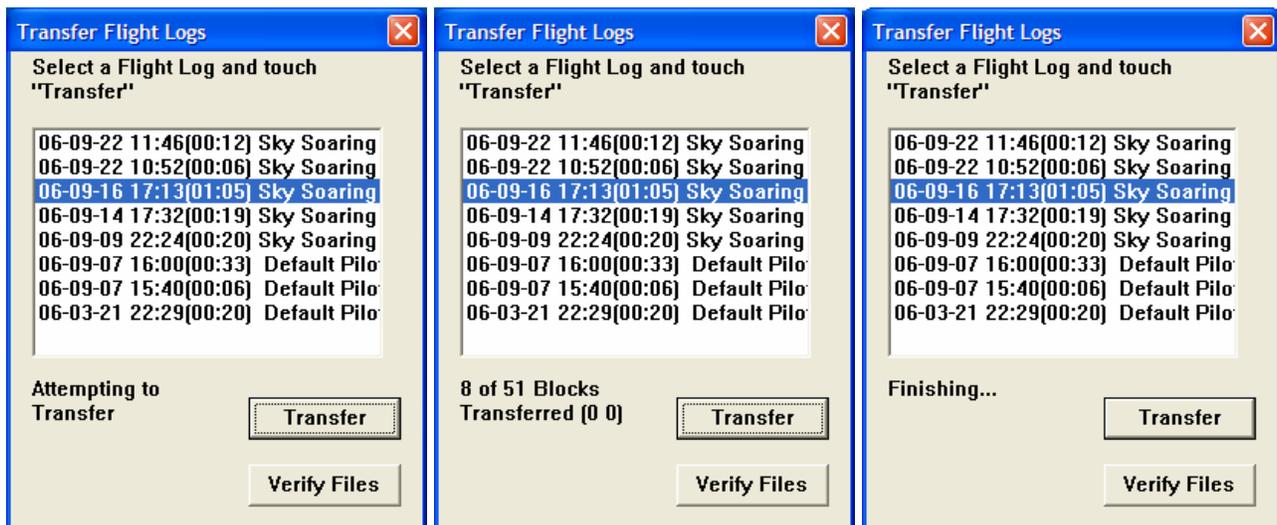
- The software will communicate with the flight recorder and list all of the flights currently stored within the recorder. Select the flight which you would like to download to the computer and click on "Transfer".



- Select the location where the file should be saved on the destination computer. **The default name of the file should never be changed.** See [Appendix A](#) for details on decoding the file name.



- The file will begin being transferred and during the transfer process you will see screens similar to those shown below.



- 6) Once the file has been successfully downloaded, you should see the following dialog box which means that the file has been validated and may be used for badges and records. Any error could mean that the file is not valid and may not be able to be usable for badge or record efforts. If you encounter an error, attempt to download the file again. Click OK when finished.

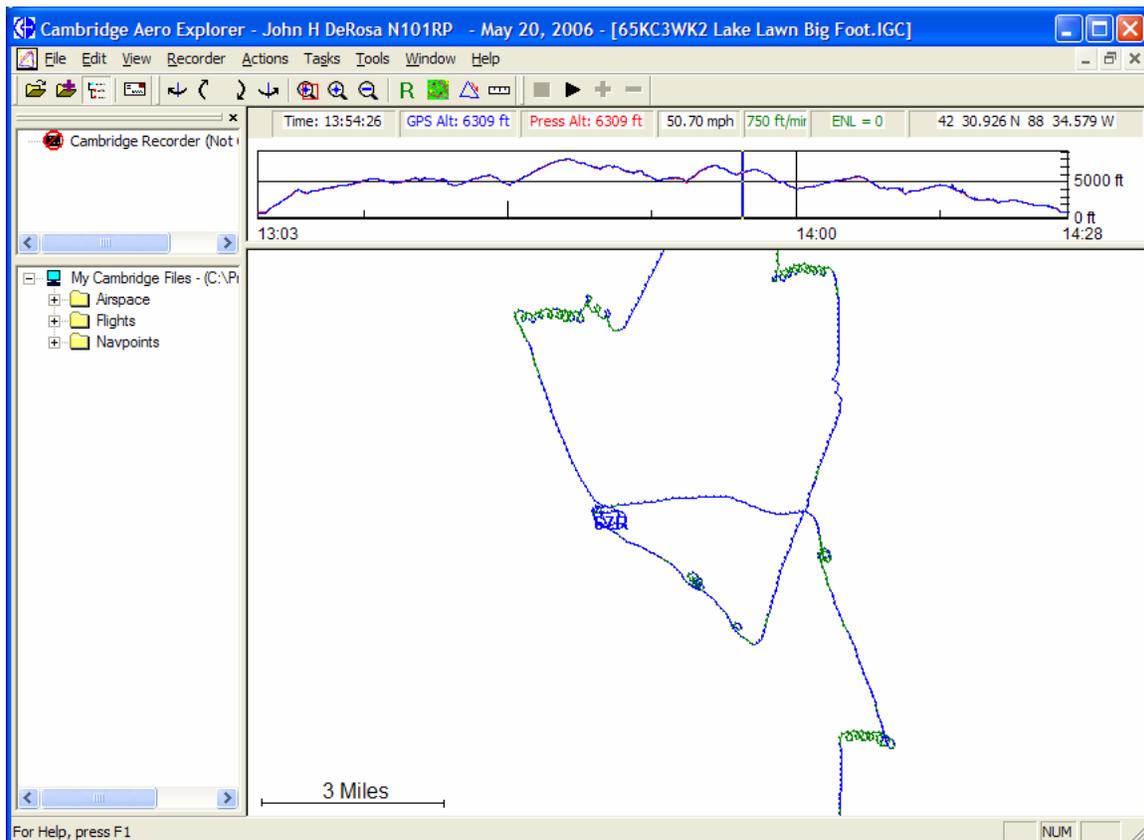


Reviewing the Flight

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 Cambridge flight recorder comes with a simplified two-dimensional viewer called the "Cambridge Aero Explorer"².

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.



² 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.

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>

Transferring Log Files

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 not contain a floppy disk drive.
- 5) **Direct Connection** – The flight recorder may be connected to the serial port of a portable computer which has been brought to the field for that purpose. The recorder must not be removed from the field except as authorized by the Board.

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

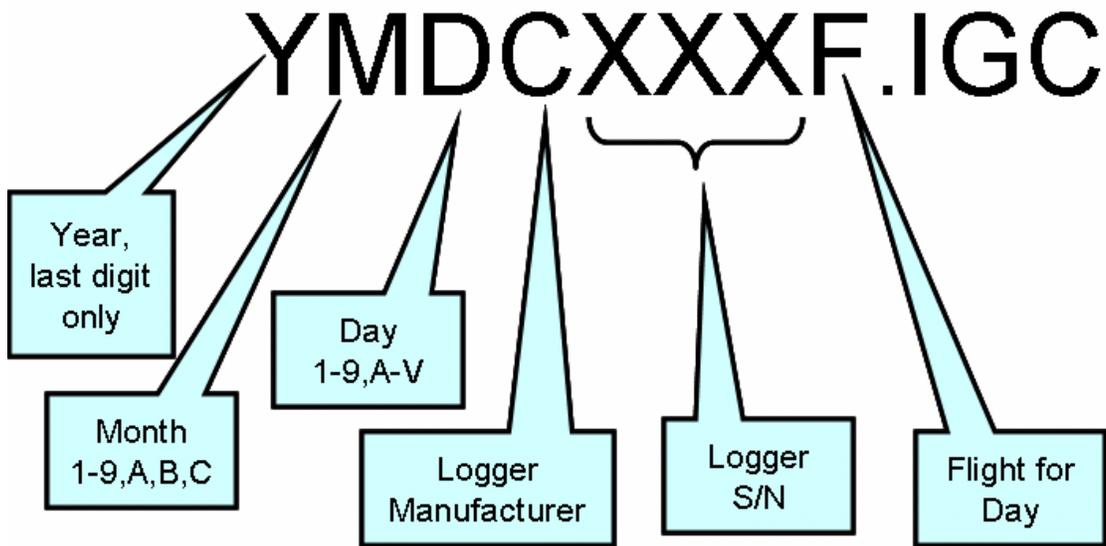
The Sky Soaring flight recorder is not intended for extended non-local use such as at a contest. Contests are generally held at distant locations and for extended periods of time which may adversely impact the other members of the club.

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
=====
1 = January
2 = February
3 = March
4 = April
5 = May
6 = June
7 = July
8 = August
9 = September
A = October
B = November
C = December

Manufacturer of Flight Recorder
=====
A = Garrecht
C = Cambridge
E = EW Avionics
F = Filser
L = LX Navigation
S = Streamline Data
W = Westerboer
X = All other

Day of Month
=====
1 = 1
2 = 2
3 = 3
4 = 4
5 = 5
6 = 6
7 = 7
8 = 8
9 = 9
A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

G = 16
H = 17
I = 18
J = 19
K = 20
L = 21
M = 22
N = 23
O = 24
P = 25
Q = 26
R = 27
S = 28
T = 29
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. At the same time the proper weight and balance of the glider must be maintained (see [Weight and Balance](#) section for details).

Blanik L-13

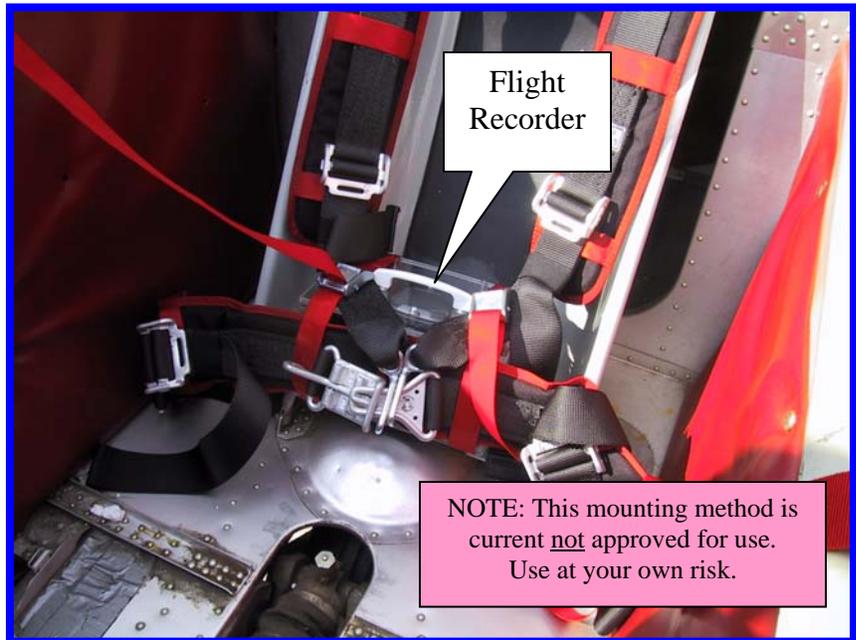
To be determined at a later date.

Blanik L-23

The suggested location for mounting the flight recorder is in the rear seat pan and secured by the flight recorder's red nylon straps to the glider's seat belts.

Steps

- 1) Remove the rear seat cushions from the glider.
- 2) Connect the seat belts to one another as normal. Be sure to securely latch the catch.
- 3) Cinch up all seat belt straps to their minimum lengths.
- 4) Securely wrap the flight recorder's red nylon straps around the glider's seat belts.
- 5) Cinch the red nylon straps as tightly as possible.



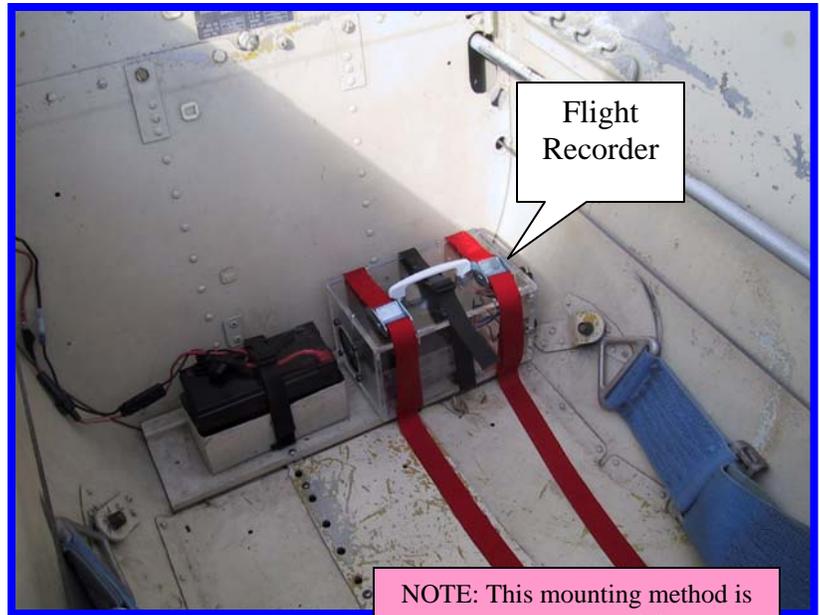
NOTE: Glider operation with two pilots-in-command (PIC) may not be valid for recording of badge and records flights.

Schweizer 1-26

The suggested location for mounting the flight recorder is directly behind the pilot's seat back along the aluminum mounting rail. There is a black nylon strap attached to the glider which can be used for mounting.

Steps

- 1) Remove the seat back.
- 2) Place the recorder along the left side of the glider as shown at right.
- 3) Securely connect the buckles of the black nylon strap to one another.
- 4) The flight recorder's red nylon straps may also be used for additional security.
- 5) Return the seat back to its correct position.



NOTE: This mounting method is current not approved for use.
Use at your own risk.

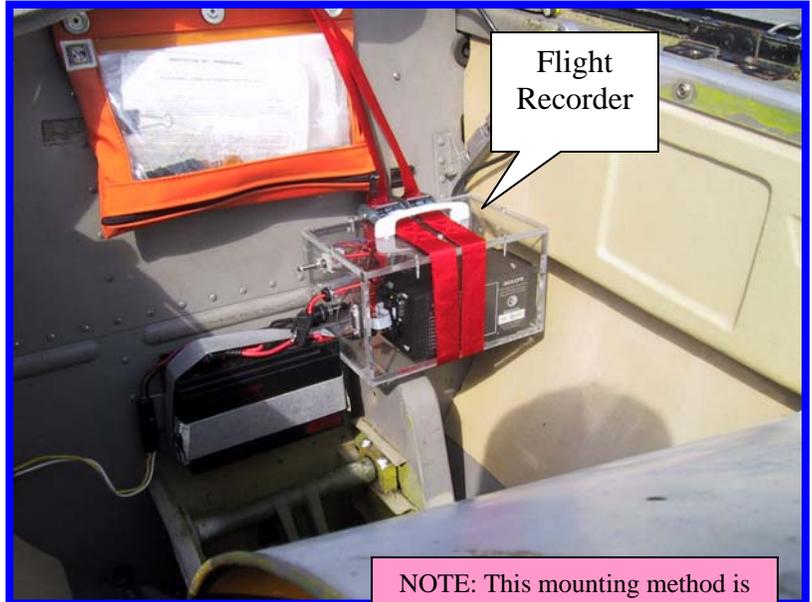
Schweizer 1-34

The suggested location for mounting the flight recorder is directly behind the pilot's seat back on top of the retractable gear mounting bracket. There are several pads of industrial Velcro® which secure the recorder. The flight recorder's red nylon straps may also be used for additional security.

Steps

- 1) Remove the seat back.
- 2) Place the recorder along the left side of the glider as shown at right.
- 3) Verify that the Velcro® attach points are securely engaged.
- 4) The flight recorder's red nylon straps may also be used for additional security.
- 5) Return the seat back to its correct position.

It is suggested that a thin cushion be placed over the flight recorder as shown at right. This will protect the recorder from impact from the pilot's seat back.



NOTE: This mounting method is current not approved for use. Use at your own risk.



Schweizer 2-33

To be determined at a later date.

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
Cambridge Aero Instruments	Manufacturer of the 302A flight recorder and software	http://cambridge-aero.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
StrePla Software	Soaring Flight Analysis Software	http://www.strepla.de/StrePla4/english
SeeYou Software	Soaring Flight Analysis Software	http://www.seeyou.ws

Appendix D – Battery Testing

The battery used for the electronic flight recorder is a;

Brand: Enersys
Model: Genesis
Voltage: 12Vdc
Current: 2.0Ah
Type: Sealed rechargeable lead-acid

Below is a graph showing the discharge rate of the above battery using the flight recorder as a load.

