BAROGRAPH CALIBRATION PROCEDURES PERFORMED BY

CARL HEROLD, CH ENGINEERING, RENO, NV

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Dear Customer:

Since 5 September1989, CH Engineering (CHE) has provided a Soaring Society of America (SSA) approved Category 2 Barograph Calibration Facility for supporting sailplane Records, Badges, and Soaring Competition. CHE also calibrates Barographs for Balloon, Hang Glider, and Ultra Light accomplishments as well. You can view my accreditation as well as the required calibration accuracy and measuring instrument standards at the SSA WEB Address:
www.ssa.org/calibration.asp <http://www.ssa.org/calibration.asp>

My name is Carl D. Herold, a current member of the SSA since 1957. I completed my US Diamond Badge #40 in 1964, and received my FAI International #60 1000K Diplome in 1985. I am still pursuing and accumulating numerous State and National soaring records, in my Ninmbus 3DM soaring throughout the East side 0f the Great Basin.

This material is provided to answer questions about calibrating barographs and GNSS Flight Recorders (FRs) that customers have been asking me over the years.

1.) INTRODUCTION:

CH Engineering has calibrated most all FAI approved mechanical and electro-mechanical Barographs and FAI approved GNSS Flight Recorders over the past 19 years. I am one of the few U.S. laboratories, which provides Category 2 calibration for the FAI Gliding Division approved barographs and all models of GNSS Flight Recorders in the United States. Other American accredited calibration facilities may support only their specific products(s) and/or their manufactured barographs or GNSS Flight Recorders.

2.) CONTACT ADDRESSES, NUMBERS, SHIPPER, INSURANCE, AND COST

Just ship your flight recorder to: **Carl Herold,** by your preferred means to my Mailing Service address below.

Shipping Addresses for **Mail: UPS, FEDEX, USPS or other Shipping Services,**

1.) E-Mail Address: carlherold@clearwire.net
Summer Mail Address: (16 June 2008 to 1 September 2009)
Cell Phone: 775-230-0527
Carl Herold, 705 Aultman St, Ste # 2, BOX 31, ELY, Nevada 89301

2.) E-Mail Address: carlherold@clearwire.net
Winter Address: (1 September 2008 to 1 June 2009)
Cell Phone : 775-230-0527
Carl Herold, 4790 Caughlin PKWY, Ste 187, Reno, Nevada 89519

At any location or time call me on my Cell phone @ 775-230-0527

Usually the calibration turnaround time will be no longer than two weekdays. Weekends and Holidays are not included. In the summer time, I might be away for a month at a time soaring in ELY NV, so please ship your device early in the season to meet your rapid turn-around needs. For the middle of the summer soaring season, **check my schedule by contacting me for my ELY summer Calibration Schedule by Cell phone or my Email.**

I will return ship your barograph or Flight Recorder by the same carrier and for the same insurance coverage that you ship to me. The calibration charge is:

a.) $35.00 for a mechanical barograph and
b.) $40.00 for GNSS Flight Recorder, also please include my cost for return shipment and insurance.

If you provide more than one barograph and/or Flight Recorder in a single shipment, I provide a $5.00 per barograph discount. Personally delivering and picking up your barograph can also provide a $5.00 discount. You are welcome to witness your calibration process, but please make an appointment in advance. The above discounts are not cumulative. The lab calibration and paper work requires 1 hour for mechanical barographs and approximately an hour and one half for Flight Recorders. Your presence will likely add another 30 minutes to the processing time.

To reduce the calibration chamber run time, I occasionally set your sample time from 4 to 6 seconds. I do not erase your FR GNSS memory of any of your files including the calibration run. You might also want to check your desired sampling interval prior to your next soaring flight. I will check your memory battery for its future soaring for the rest of the season.

Just add the return shipping cost and insurance to the $35.00 or the $40.00 calibration cost and make out the check to: “Carl Herold, Baro”. I do not accept Credit Cards or Debit Cards.

You don’t have to include your software, manuals or cables with your shipment. I have all the necessary equipment.

Include your Email address as well your postal address and phone number to where you want your barograph or FR shipped. I ship with signature required unless you request "NO SIGNATURE REQUIRED."

You will receive a confirming E-Mail or phone call from CHE providing your shipper, shipping date, estimated arrival time, and tracking numbers for your calibrated instrument.

3.) FAI APPROVED GNSS FLIGHT RECORDERS

The FAI approved Glider Flight Recorder list below shows the cables (for 12 volt power and PC communications) and manuals that I currently have in my calibration laboratory.

For new, upgraded, or non-FAI approved instruments not on the list below, you need to include your own cables and manual for operating from a 12 Volt battery within the large 5-gallon windowless altitude chamber. In addition, provide the appropriate connectors for downloading the data files to a laptop PC computer.

CHE is intimately familiar with the list of Flight Recorders below, have all the current manuals, 12-volt power cables, PC download cables, and factory supplied to the FAI approved “Public Short Programs” (freeware) for:

Cambridge FR Models: 10, 20, 25, 301, and 302.
Colibri FRs
All Filser LX Series FRs, LX-20, LX-21, LX5000, LX-7000 and the DX50 FAI FRs.
EW AVIONICS (& special printer) for Model A, B, C, and D barographs.
PrintTek GR 1000 FR.
Volkslogger FR for both connector versions: Hardware 3.3 and 3.4.
Zander 940

Please Include your 12 volt power cable, PC download cable, and the operations manual for the:
Westerboer and Peschges Flight Recorders

if you include all the necessary paraphernalia and handholding. The only additional cost to you for my learning period of mastering your product is the time it takes me to clear up for my lapses or the lapse of the manufacturer.

If I haven't mentioned your Specific Flight Recorder, please include the Operations Manual, Flight Recorder, and the 12-volt cables (for running your barograph in an altitude chamber without 110 volt 60 cycle power) and downloading your Flight Recorder to a PC. Bare in mind that not all Barographs and or GNSS Flight Recorders are on the FAI approval list: <http://www.fai.org/gliding/gnss/index.asp>. I will calibrate unapproved Barographs and flight Recorders as well.

4.) CHE CALIBRATION PRACTICES AND PROCEDURES

All barographs are calibrated from sea level up to a maximum altitude of from sea level at 29.92 inches to 36,000 feet or the limit altitude of the barograph to the ICAO Atmospheric Standard. My secondary standard altimeter is serviced and calibrated to Part 43 Standards every 24 months and set to 29.92 in Hg. We generally hold to reading accuracies within 5 to 10 feet for all calibrations. I use an unbalanced muffin fan taped to the reference altimeter and the rate of climb (less than 4,000 FPM) instrument mount for gentle vibration. For mechanical barographs, I provide a laboratory signature on the barograph calibration trace (which I make a copy for my files) and for electronic digital barographs and for FRs a printed calibration table and with an accompanying correction curve. A sample set of calibrated FR tabulated and plotted altitude correction data are attached to this document.

For mechanical barographs, CHE calibrates in 2,000-foot increments up to 8,000 feet and in 4,000-foot increments to a maximum of 36,000 feet (or to the limit altitude of the barograph) and retrace the same altitudes down to sea level (to show the hysteresis, scribe or pen pressure effects). The reason for the full up and down calibration of mechanical barographs is to note the hysteresis, friction, and poor scribing (dulled scribe, insufficient or excessive scribe pressure on the drum on the trace) for acceptable readability and accuracy. For those who still use inked barographs, I use burning camphor soot on a heavy aluminum foil for the calibration trace. As the electronic barographs don't exhibit hysteresis, we are required to run from sea level to the maximum altitude. For mechanical barographs, each altitude step is **allowed two minutes to stabilize the trace**.

I suggest you remove the aluminum foil from the mechanical barograph drum that you seal the mechanical camphor soot traces with clear Krylon spray.

The barograph and drum start and finish time are recorded on the trace in order for you or your Official Observer (OO) to determine rotation rate for speed tasks. The calibration trace will also include: the technician signature, the barograph name, serial number, model, and the calibration date, and rotation rate are provided. As a service to those who still use a mechanical barograph for speed records, the barograph trace is marked for start and finish times to determine drum rotation rates. This provides the drum rotation rate with your OO communicating "Start Gate Pullup" and "Finish Gate for a time mark on the barograph trace to determine Finish Altitude.

For GNSS FRs, CHE calibrates from sea level (at 29.92 in Hg) in 2,000-foot increments to 36,000 feet preserving altitude resolution for remote start/finish gates. Each altitude step is usually stable in pressure and temperature of the electronic barographs do not display hysteresis, I run the trace from sea level up to 36,000 feet in 2,000 foot positive steps. The +/- error in the trace is limited by the small least memory digit plus the reference altimeter reader.

The FAI Flight Recorder approval process provides WEB pages for the FAI approved freeware "Public Short Programs", for downloading IGC files, for all FAI approved FRs. There are some Approved Flight Recorders (e.g. EW Model D) where the manufacturer software supplied to FAI, doesn't allow a barograph-sampling rate to be edited to a high sampling rate (of at least 4 to 10 seconds per sample) so the calibration process in the chamber will only take up to 30 to 40 minutes, Instead of days. CHE usually leaves the calibration file on the FR. For those FRs with a full memory, CHE will erase sufficient memory space for the calibration data.

The calibration logs for all correspondence, chamber altitude steps and time of the chamber cycle at each altitude and time, the local RENO ATIS Pressure, start time and finish time, date, the barographs and their serial numbers in the chamber run. I have an office computer record of over 1000 barograph and FR serial numbers I have calibrated. If I am notified of a lost or stolen barograph, I can recognize it.

For your information, all Flight Recorders and a few other electronic barographs (e.g. GNSS FRs, EW Model A, B, & C, XYLON, and AEROGRAF) require calibration every 24 months. All other barographs must be calibrated within 12 months prior to your flight or within 30 days after the flight to be valid for all FAI world and national altitude record categories. For FAI and SSA Badge Rules and procedures, State, National, or World Record Rules refer to URLs:

www.ssa.org for badges, state and national records and
www.fai.org for national and world records on approved GNSS Flight Recorders, Manuals, approval documents and etc.

I archive the calibration IGC file and the calibration log, correspondence, and the tabulated and plotted data for my records. I keep a soft copy of the barograph calibration as well as a physical copy of the barograph trace for my records, and a soft copy of the Flight Recorder calibration log record for as well.

When I calibrate your instrument, I usually leave the calibration file in your flight recorder. In addition, I change the sampling rate of your flight Recorder to 4 seconds to speed up the calibration period. I usually do not erase any of your files unless necessary. Upon receipt check you instrument to make sure it is set to your desired sampling rates for your soaring flights.

5.) FAI SPORTING CODE SC3 (Provided by the Badge Lady)

Sporting Code SC3 effective 10/1/2007 through 9/30/2008)

(No changes proposed or adopted for SC3 effective 10/1/2008 through 9/30/2009

4.4.7 Barograph calibration period
Barograph calibrations are required to ensure that the measurement of barometric pressure and time are checked against, and corrected as necessary, to official standards.
For altitude and gain of height records, both (a) AND (b) calibrations below are required, and the least favourable calibration of the two shall be used making the calculations for the record. For badges, start height verification, and altitude difference calculation, either (a) OR (b) are required.

a. PRIOR TO THE FLIGHT

The calibration (All Mechanical Barograph) used must have been performed within 12 months prior to the flight or, for IGC-approved electronic barographs and FRs, 24 months.

b. AFTER THE FLIGHT

The calibration (All Mechanical Barograph) used must have been performed within one month after the flight or, for IGC-approved electronic barographs and FRs, two months.)

6.) SOURCES OF REFERENCE DATA, REQUIREMENTS, AND PROCEDURES

The URL for approval documents on the FAI web page below contain information on unique GNSS calibration procedures, and equipage:
http://www.fai.org/gliding/gnss

The list of approved FAI Gliding Division Flight Recorders is in URL:
http://www.fai.org/gliding/gnss/approved_gnss_flight_recorders.asp

Tim Newport-Peace, has provided a URL with cable wiring diagrams for various flight recorders.
If you have FR cable problems, contact Cumulous-Soaring, Paul Remde **(paul@remde.us,**
Office Phone: 952-445-9033) or, **http://www.cumulous-soaring.com/). Paul** can have cables built and ship them much faster than most FR manufacturers will, especially overseas FRs.

The URL below provides cable wiring, downloading of **"FAI Short Programs"**, and other information.
http://www.spsys.demon.co.uk/

Downloading for each of the approved unique manufactured Flight Recorders,
"**Public Short Program**", Freeware for:

1.) Downloading Recorded Files (Data-)
2.) Conversion to IGC files (Conv-), and
3.) Security Validation Checking (Vali-)

I have provided you the URL for the **"Short Programs"** provided by the FAI the only proven DOS Downloading, Conversion, and Security Validation (to IGC Text Files) Applications.

The "FAI Short Programs" URL are available for downloading at:
http://www.fai.org/gliding/gnss/freeware.asp

Be aware, Manufacturers early software, SeeYou, and Strepla for downloading to PDAs, iPAQs, and the FRs **occasionally** fail and are known to have glitches in their security downloading, **denying a valid IGC file for your record or Badge Flight**.

For my Flight Recorder calibration, I have had no problems in downloading my soaring Record flight files. I always use the "Short Programs". The "Badge Lady", Judy Ruprecht has noted the occasional **invalidation** in downloading applications produced by manufacturers software, especially by downloading software in PDA and iPAQs in the SOARING Magazine on several occasions.

Another common failure is the pilot selects an inexperienced Official Observer at the last minute before takeoff for his record or badge attempt. Many times this Official Observer doesn't really know the required procedures. Many new OO's do not realize that their job is to have the knowledge to protect the observed flight by insuring the pilot follows the rules from start to finish. Protect yourself by selecting the most knowledgeable OO you can meet the required procedures well ahead of your flight. Prior to take-off, the OO must observe the operating Flight Recorder and write down the Flight Recorder UTC time display, and write down from the flight recorder, the start /finish points, turn-point names or their coordinates prior to launch. In addition, the OO (or an approved stand-in Observer) must also oversee the downloading of the IGC file to a floppy as well as ship it to the "Badge Lady". The pilot does not handle or mail the floppy out of sight of the OO..

A last comment, even with the DOS **"FAI Short Program",** your IGC security will be lost when you download with the short program with a "T" command which more quickly downloads the file eliminating the security required. To protect your IGC security you have to hit **"Return" instead of "T"** and wait longer for the download with the Secure IGC file proving it was not tampered with. Not all FR Files require a Conversion to the required IGC Secure format. For example the Cambridge Models 10, 20, 25 produce a secure CAI file which has to be **converted to an IGC text file without losing security.**

Thank you for your service.
If you have any further questions, don't hesitate to ask me.

This brochure should answer most of your FR Calibration questions.

Regards, Carl Herold

CHE BARO_18