CHAPTER 13.1

FLIGHT RECORDERS

development

Flight Recorders (FR's)

Affordable, small and efficient aircraft global positioning systems (GPS, more correctly termed Global Navigation Satellite Systems or GNSS) have facilitated the manufacture of the present-day Flight Recorder. The use of electronic FR's has eliminated carrying on board bulky barographs and cameras and avoids all the fuss traditionally connected with these pieces of equipment. FR's provide real-time, accurate digital flight records. In addition to making a record of the flight, the stored (logged) digital flight data can be utilised later and presented in all manner of graphic ways – eg: as a flight track over terrain, as a barograph, as a speed graph or as statistical data. Studying this data can assist pilots to improve their techniques and develop better flying strategies.

Flight data from the FR is downloaded to a PC using off-the-shelf gliding software such as StrePla or SeeYou. Coupled to all this, Flight Declarations, still a requirement for badge and record claims, can now be made either directly into the FR, or uploaded to it via a PC. Multiple flight tracks from different pilots' FR's and viewed together for comparative assessments and even animated re-plays of entire flights can be studied this way. Continuous software makes terrain and glider features more realistic all the time.

When Flight Recorders first made their appearance, the International Gliding Commission (IGC) of the Federation Aeronautique International (FAI) recognised the need to form a special Flight Recorder Approval Committee (GFAC) to test, evaluate and certify different manufacturers' Flight Recorders to ensure compliance with FAI standards. The result is three groups of flight recorders – those *without* FAI approval (such as an off-the-shelf GPS which has a recording facility – such as a hiking Garmin), and Flight Recorders with FAI approval in so-called classes A and B. Three groups; only two officially FAI/IGC approved for gliding claims.

In both class A and B FR's the hardware components have to be encased in a sturdy, sealed, tamper-proof case. Both types incorporate internal electronic barographs, recording pressure altitude as well as GPS altitude. In addition, both classes of Flight Recorders comprise a logging device and data storage facility.

The fundamental difference between class A and class B FR's is as follows: class B FR's read their positional data

(x and y co-ordinates) from an *external* GPS receiver. These FR's can be used for badge claims up to Diamond but may not be used for records or the 1000km diploma.

The class A FR, on the other hand, while containing all the above components, *also* has an integral GPS receiver. These self-contained units may also be linked to an on-board flight computer, and some may form an integrated element of a complete variometer and glide-computer system. This has no bearing on the actual data they log from the satellite sources. The class A units can be used for all types of gliding claims including records.

Apart from their recording (logging) facilities, most FR's can be uploaded via a PC with hundreds of different waypoints as well as dozens of pre-determined routes or tasks, and it's a simple matter to activate the particular task that is going to be flown. The flight declaration is also uploaded via a PC, though it can also be entered directly into the logger.

Turn points no longer have to be scaled from maps, as via the Internet there are resource sites such as the *Worldwide Turnpoint Exchange*. From here gliding turnpoints for most gliding regions of the world (including all over South Africa) can be downloaded free of charge in various electronic formats to suit almost all makes of logger.

The standard IGC files produced by FR's are *tamper-proof* – which is the most important concept of the FR concept. These files are all based upon a standard WGS84 (World Geodetic System of 1984) worldwide latitude and longitude datum. This *datum* is a standardised theoretical "whole world" model from which the co-ordinate values for any point can be referenced. Previously, different regions around the globe utilised different datums for their own particular map bases, but WGS84 is universal and can be used with GPS wherever you are on the surface of the Earth. This is something to bear in mind when scaling your own co-ordinates from maps, which in South Africa have in the past been based on the Cape Datum, which in turn is referenced to the so-called Modified Clarke 1880 ellipsoid, first introduced in 1866 and modified in 1880. The WGS84 datum varies with about 300 metres in latitude and 70 metres in longitude from the "Clarke", though this is not much for navigational purposes. Just a point - if the small print on your map refers to the Haartebeeshoek94 Datum, then it is based on WGS84.

IGC files from a FR contain an algorithmically calculated "key" as part of the flight file, which can confirm whether the data is authentic or has been subsequently tampered with. The important point of an IGC file is that it is a *true* record that can't be altered in any way without being noticeably corrupted.

To sum up briefly, if you refer to a "secure" Flight Recorder, it should be one that is mechanically tamper-proof, produces electronic flight record files in .IGC format and has been certified by the IGC.

Many glider instrument manufacturers have products in growing FR market (such as Filser and Cambridge), including others who specialise only in Flight Recorders (eg. Volkslogger).

Some of the present generation class A Flight Recorders are smaller than the old instamatic cameras, but can still be pre-programmed with a database of hundreds of turnpoints, dozens of routes (tasks), and can log up to 80 hours of flight time, depending on the rate of gathering satellite "fixes". This logging rate is usually 12 seconds in straight flight and 1 or 2 seconds when in the turnpoint observation zone. The shape of the observation zone can also be pre-set (either standard photo-sector, cylinder or a line feature), and an audio signal can be generated once sufficient "fixes" have been recorded within the turnpoint zone, so the pilot hardly has to be aware of terrain features below. With satellite navigation there is no longer a need for any turnpoint to have recognizable terrain features at all, so they can now even be positioned over a water body if needed.

Apart from logging, most class A FR's display a comprehensive range of GPS navigational data – such as altitude, speed, distance to next turn point, bearing to the next turn point, and the actual track which the glider is making over the ground. Directional data with FR's is usually referenced to true north, not magnetic. For self-launching gliders, FR's can sense and record exactly when the engine is deployed, by means of an engine noise level (ENL) sensor.

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Practice

Airmanship

at all times