Report of the use of a new type of logger in HAB competition. Dec 2008

In June this year I directed a competition in Brazil where they used a type of logger unknown to me. The logger used was a Royaltek RBT-2100 and was rented from a company that uses them in car racing. The downloading was done by local officials and I had limited time to check this logger in depth, however it became clear to me that this logger produced reliable tracks with no spikes.

Two month later while in the US I had the opportunity to buy the latest model of the logger the Royaltek RBT-2300. With the dollar at its lowest and a ' bulk' rebate I was able to buy 30 of them for under 60U$ each which is very reasonable.

According the specification the logger is using the latest GPS-chipset, the 'SiRF Star III'. This chipset is developed for use in car navigation systems specifically to be used in areas of lesser reception quality. It scans 20 satellites, has a very short TIFF (Time to First Fix) and supports WAAS/EGNOS.

The logger was shipped with an AC charger and a car adapter for use in the cigarette lighter plug. The logger has a standard Nokia telephone Li-ion battery (3,7V 680mAh). The logger has no display, no USB connection and only one On/Off switch. Three LED lights indicate the operational status of the logger. The logger has a BT (Blue Tooth) receiver/transmitter.

The logger is delivered with minimal software. The software allows setting a few things like track point time interval and/or mode and enables downloading of the tracks. Besides of logging track points in memory, the logger also transmits its position every second according the NMEA 183 protocol. The BT position transmitting mode can be switched to Off by software commands. Because there is no cable connection to the logger, downloading tracks and setting operation modes is done via the BT connection and a PC. Each logger is delivered with a unique hexadecimal 6 character number assigned to it.

Since we had no experience we started using two loggers for each pilot the RBT-2300 being the 'primary' and a Geko 210 as secondary logger. This proved to be a good idea then the first two flights we had several RBT's stopping halfway the flight. After some time we found out that they had stopped after 4093 TP's. So for some reason or another they did not log more than 4 Kilo(4x1024) TP's. This was rather disappointing then they are advertised as having 100 000+ track points capability. After reducing the track point time interval from one seconds to five seconds we achieved a logging time of over five hours (4000x5/3600).

My first experiments with loggers were in 2001 (Roehn Cup Wildflecken). We then used the Garmin 'eTrex Venture' that could log 2000TPs. The logger was contained in a plastic household butter box and ran on two AA batteries. The logger turned out to be rather heat sensitive and in sunny weather the temperature in the logger sometimes exceeded the allowed values and thus shutting down the logger. Another problem was that the logger was subject to interference, producing what we called 'spikes'.

The next type of logger used was the Garmin Geko 201. This model was available at about half the price of the Venture and ran on two AAA batteries. This model was a lot better than the Venture and

not heat sensitive. It logged 10 000 TPs allowing to reduce the time interval from 10 to 5 seconds or even less. However the logger was still quite sensitive to disturbances and produced spikes occasionally.

My third experiment now is done with the RBT-2300. Compared to the Garmins is has the advantage of being half the price of a Geko, using no batteries but a Li-ion accumulator, having a memory capable of up to 100 000 TPs, transmitting the position via BT and having no input capabilities there is less changes to screw up the handling.

The RBT-2300 is still not what we are aiming for namely the logger that logs and provides pilots inputs marked in relation to the logged track. However this logger (or a logger based on this principle) may well be part of a system that does precisely that. I can imagine that splitting the logging device from the GPS receiver is a valuable goal. Such a logger will have a small numerical keypad much like the numerical keypad of computer keyboards, in the same housing there will be a storage card (e.g. SD card) and a BT receiver receiving and logging the TPs transmitted by the RBT-2300. This setup provides a relative simple and cheap logging part whereas the GPS can be any BT GPS thus providing the possibility of using more advanced models at a later stateas they may become available.

Experience when using the RBT-2300 in October 2008 in Debrecen Hungary.

The competition had 15 pilots. Gabriela Slavec did the downloading of the RBT and Brigit Fouache downloaded the Geko's the 'old fashioned' way. Both were downloaded with Toshiba laptops. It took quite some time to have the right BT programs running. I can only recommend anybody intending to use the RBT to experiment well in advance with this setup. Once set up, downloading is easy and a lot faster than with the Geko. Strangely deleting the track after downloading takes quite some time and I have the impression that the program overwrites every memory point with NULL instead of deleting an index to the track. We sat the RBT-2300 initially at one second TP interval. As mentioned this didn't work and we had to change that to 5 seconds. The downloaded track is in the NMEA format. There are some logging options and depending on the set mode, a Track Point consists of 1 up to 5 sentences. My program needed the Ozi-explorer text file format so the track had to converted to .plt and then to .txt which was quite time consuming. However software can be relatively easily made to produce tracks in a desirable format from the given output. After some experimenting we scored the last two flights entirely on the RBT tracks and without any problem.

Were the RBT stands out is its reliability. We had several tracks in which the Geko produced horizontal or vertical spikes, the same track from the RBT showed no interference at all. Also the tracks seamed more stable in altitude and position. Whether the RBT is actually more precise or not than the Geko is difficult to say and needs further experimenting and comparison with high quality GPS devices.

Pilots were required to operate and use the loggers the same way as the Geko. That means the logger must be attached 2 meters above the mouth on the right hand side and switched On before the flight and Off thereafter. Since the logger has no display and is relatively small and light, we did not put them in boxes but hang strait to the envelope. However in order to protect them from moisture and dirt

we slipped a simple freezing bag over the logger before hanging them to the envelope. This proves to be practicable and simple.

One mayor advantage of this logger is that the pilot can make use of the position the logger is transmitting via BT. This really is a great step forward because the pilot now can see on his PDA or laptop precisely the position and altitude the logger is logging and the data he will be finally be scored with after the flight!

I will further experiment with the logger. Especially practical things like handling, charging batteries, setting up downloading and track deleting procedures need further study. Also I need to look for better software to interact with the logger and produce file converting code for the use with my other programs. Also I need to investigate how to use the whole memory in order to log files with 1 second time interval for longer flights.

The good performance of the logger may tend to abandon the procedure of hanging the logger to the envelope. However I strongly advise to stick to the agreed procedure then allowing it to be carried in the basket will considerably reduce the reliability of the position by shielding of the logger from the satellites by the moving body of the pilot and other negative influences on the reception.

Résumé:

Pros:

- The Royaltek RBT-2300 is a reliable logger.
- Produces stable tracks without interferences.
- The BT function works fine (pairing may be cumbersome as with other BT connections).
- The price is very competitive.
- The build in accumulator lasts for at least two flights.
- No batteries needed and therefore more ecological and less expensive.
- The logger seems robust and is build in a clean plastic housing with one On/Off switch, charging plug covered by a small rubber lid and has three simple LEDs. The size is between that of a matchbox and pack of cigarettes.
- BT enables pilots to see precisely what is logged and hence what they will be scored to.

Cons:

- Manufacture provided software is minimal.
- Without better software tracks are limited to 4093 TPs at the moment.

Internet forums:
If you search Google you will find several forums of people (hikers & bicyclers) experimenting and using the RBT-2300. Their information is interesting. One reports that with the latest firmware the logger will start a new track-log every time the logger is switched on, while retaining the other tracks.

Below is a short downloading report by Gabriela Slavec:

Analyses on Tracks from BlueTooth RoyalTek devices during the competition in Debrecen 2008

FLIGHT 1

- o track from pilot 9 was not complete
  - - it ended before landing
  - - pilot said he used the Bluetooth logger to see his track at his own laptop during the flight
  - - pilot said he switched off his laptop before landing and thought the devide was disconnected
  - - pilot said the device was turned oo after the landing
  - - the device has registered 4093 track points
- o track from pilot 15 has also registered 4093 track points and stopped registering
- o to make some more testing on all the devices we decided not to erase the data before Flight 2

FLIGHT 2

- o tracks from all pilots were not complete
  - - many track points were checked and the sum of points of the tracks from Flight 1 and tracks from Flight 2 is 4091
- o track from pilot 9 was not complete for Flight 2 but it has registered information from the flight
  - - the device is then able to keep more than 4093 track points
- o track from pilot 15 was almost complete for this flight but still not complete - total 3694 points
  - - the track logs from the BT (3694 points) and GEKO (2009 points) devices are very different during the whole flight
- o track from pilot 2 was complete - total 5358 points
  - - track logs from both loggers are matching although the BT device has no spikes (look at PID 1859 - Geko device)
- o track from pilot 7 was complete - matches with GEKO track log

FLIGHT 3

- o we had no problems with the tracks from Flight 3. They had no spikes either and they were all used!