Shaun Lapworth visits the Winter factory in Germany, where the Rolls-Royce of gliding instruments have been individually crafted since 1931

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ON A recent trip to Germany, I was lucky enough to visit Winter Instruments to satisfy my curiosity of what lies behind the glass. The renowned German manufacturer, the home of the mechanical gliding instrument started by three brothers in 1931, is now run by the third and fourth generation of Winters.

The Winter Instruments factory in Jungingen, Germany

WHEN ALL THE ELECTRONIC GADGETRY FAILS, WE KNOW WE CAN RELY ON THEM TIME AND TIME AGAIN

The instruments have barely changed in over 80 years. Yet, today, they are in just about every glider built and, when all the electronic gadgetry fails, we know we can rely on them time and time again. This reliability is no accident and within each one is many hours of delicate precision engineering.

Each instrument is exquisitely made and assembled by one person. There are no high-tech production lines here. Each man at his bench builds and assembles the vario, altimeter or air speed indicator and then calibrates it before signing the register next to the serial number. The history and service records can be traced for every single instrument in a set of hand-written ledgers dating back to the 1930s!

Achim Winter, the current managing director and third generation of Winters to run the company, showed me around the building and explained the philosophy and history of the business. Everything is made in house or sourced within 100km: a preference to engineer the components and control supply internally helps with scheduling of new instrument builds, repairs and service. The core components of spindles, screw threads, actuators, face plates and needles are all manufactured on site, with only the external casing and some of the finest springs used in the varios being sourced from local suppliers.

The atmosphere in the workshop is how you might imagine a cuckoo clock factory; quiet and efficient with a whiff of Lederhosen. On the ground floor, a traditional machine shop turns, cuts and mills the delicate metal components in batches for each type of instrument. From here, the larger core components are made from the individual pieces, including the copper bellows. The bellows are the primary moving component and expand and contract with air pressure moving an actuator arm or screw thread that then in turn moves the indicator needle in each instrument. The copper sheet used to produce the various different styles and types of bellows is critical. Not only is this of the highest purity and quality, when assembled the unit is annealed at a critical temperature to produce a uniform expansion and contraction rate. This annealing temperature differs by one or two degrees between batches and each batch of copper sheet is tested thoroughly before it can be used in production.

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Pictured above, from left to right: The machine room on the ground floor; gearwheel segments for altimeters; engraving of airspeed indicator dial; assembly of airspeed indicator

Alongside the assembly of the bellows you will find the build of the mounting components that contain the jewelled bearings in which the spindles sit. It is these specialist bearings that deliver the smooth action for the indicator needles in each of the instruments. Different versions of the instruments are now available for motorgliders and turbos, which suffer more vibration than a pure glider. In these versions the bearings are harder and the mountings suspended on energy-absorbing material to help maintain the instrument's calibration.

Adjacent to the machine shop is the store room, where each batch of components is stored and catalogued after manufacture. Literally thousands of components are kept in stock both for new instrument builds and also for the repair and service of older models.

From the stores, each instrument's set of components are collected and taken to the main production floor where the build of each individual instrument is completed by one man. Each employee spends six months learning how to build, calibrate and test each type of instrument before they can go "solo" on a particular model. At every stage of production, a simple set of tests is run to make sure that the production is of the highest standard. Once fully assembled, the instrument is connected to the appropriate calibration tool and each indicator segment individually marked in pencil before being hand-painted or marked. (If you look closely at your Air Speed Indicator the next time you are sat in your glider, you will see the scale is not quite linear!)

On completion, the instrument is given a serial number, EASA Form 1 if appropriate, and the ledger is signed by the maker. If and when the instrument comes back for repair or service, it would not be uncommon for the same man who made the instrument to inspect, repair and service it before release back to the customer. This kind of very personal attention to detail is seen only today in companies such as Rolls-Royce or perhaps Rolex.

Talking of which, would you keep your Rolex in a damp, dark box and then rattle it around with the vibration of towing out or running a turbo? When you consider how we use and often abuse these delicate instruments it is a miracle that they survive. Winter mechanical instruments are expected to be serviced every five years or, more realistically, when your inspector finds a fault or calibration error and refuses your annual until serviced.

Achim Winter has a few top tips to keep your instruments in good shape. The two key things that cause problems with these instruments are damp and vibration. Take care when

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Diaphragms for airspeed indicator

Managing Director Achim (left) and cousin Gerd Winter, production and quality manager

towing out your glider to the launch point; we have all seen the wings bouncing up and down in the rear view mirror, just think what it is doing inside your cockpit. Take it easy; a few more minutes on your tow-out could save you hundreds of pounds in service!

Our Northern European climate is damp, particularly in the non-gliding season. If it is possible, try to store your glider in the dry and, if not, perhaps think about taking out the instrument panel or the individual instruments and keeping them somewhere dry and at a stable temperature. All of this will extend the service life of the instrument.

Winter do provide a very good maintenance service, which you can imagine is particularly busy in the early part of the year before the season starts. If you have a sticky altimeter, or you notice your mechanical vario is slightly out of trim, think about sending it off at the end of the season rather than at the beginning!

Having seen the huge amount of work that goes into the instruments behind the glass, I now think of my panel as full of Rolexes and drive just that bit slower to the launch point. I will also tuck my glider up in the cold, wet winters of the UK.

(Winter Instruments also provide specialist altimeters and varios for balloonists and paragliders, airspeed indicators/altimeters for microlights, and a comprehensive range of imperial and metric instruments for gliders. ***www.winter-intruments.de***)

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Shaun Lapworth has been a club and nationals pilot for 10 years. Based at Lasham, he has all three Diamonds and is still searching for the elusive UK 750km and a 1,000km in South Africa. Shaun recently set up NAVboys with Dave Draper *www.navboys.com*

Left: production of spare part for diaphragms, and (above) calibration of airspeed indicators (All photographs courtesy of Winter Instruments)