New Product Development at Zeiss & How SF Binoculars were Born

By Lee Thickett & Gerold Dobler
With Important Suggestions from Sebastian Döntgen



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When new binos or scopes are launched, have you ever wondered how these were developed? What was the process that took a shiny new binocular from the glimmering of an idea in someone's mind to the carton on the dealer's shelf? I certainly have, so I asked one of the people I had interviewed previously for Birdforum, Gerold Dobler of Zeiss Sports Optics, if he could give Birdforum an insight into these behind-the-scenes processes, and some months later I was able to assemble the results of several conversations and drafts into the article below.
It is vital for me to emphasise that the sequence outlined below might be different from model to model, for example an upgrade of an existing model will follow a simplified series of processes compared with a totally brand new, 'blue-sky', product.
In addition, the article is really a list of processes which very much gives the impression that one process is completed, and then another one begun, in an orderly sequence of separate events, and this is very misleading. In real life many of the processes proceed in parallel with each other and some take far longer than others.
To give extra insight and interest I also obtained from Herr Dobler some personal input about how he came to develop his concept for SF and how it was tested before launch, as well as obtaining the names of a few of the other key personnel involved
During my own working life I was involved in many development projects and although the products concerned were very different from binoculars, many of the processes were very similar so when discussing these with Herr Dobler I often found myself on very familiar ground.

Initial Proposal

Typically, a new product proposal will define its performance features, how it fits with existing own and competitors' products, estimated cost/retail price, and sales potential.

SF Actuality

Herr Dobler is a birder and has a huge network of birder friends with whom he mixes on a day by day and week by week basis, on field trips, weekends and birding events around the world, and his conversations with these birders as well as his own birding experiences, led to a concept of what a new kind of birding binocular might be like. When Richard Schmidt of Zeiss Sports Optics asked him if he could create a market-leading binocular designed from the beginning with birders in mind he jumped at the chance. Knowing that his concept would challenge existing binocular optical paradigms he asked for optical engineer Konrad (Konnie) Seil to be recruited to the project. Dobler had worked with Seil in a previous job and Seil was now working as a freelance engineer and was available to join the project. A project leader for the development of any kind of product, including binoculars, must know enough about the technological principals involved to be able to set challenging but realistic and achievable technical targets for the team. For SF, Dobler's own experiences and discussions with birders around the world led him to draw up a working specification based on a new kind of balance, improved ergonomics, and a class-leading field of view and optical performance. Here is how he described it:

The Genesis of SF, by Gerold Dobler
Where did the concept for SF come from? What was my thinking behind it and what was I aiming to achieve? I know we have spoken about this before but this is my personal story of how it came about.

I am a birder, and I spend as much time as possible birding and have several thousand species on my life list. This is because I am lucky enough that my job gives me many birding opportunities all around the world. I have been to such different places as Israel, the Norfolk coast of England, Lake Neusiedel, and the Americas in just a few months. But this travelling did not only bring me new species, it allowed me to meet birders with every kind of idea of what they wanted from their

birding and from their binoculars. You cannot believe how many different kinds of birders there are. Many of them bird in mountains, on sea coasts or plains or deserts, in big landscapes, but others bird in forests and jungles and on heaths or in small valleys. Today, many of them use a scope alongside their binos, but many do not. Increasingly, birders take an interest in the rest of nature too with dragonflies and butterflies and animals being favourites. Being invited to come up with a concept for the definitive birding binocular to satisfy the needs of all of these different kinds of birders that I have met and talked with, was a dream come true.

I wanted to create a binocular that would be a good companion to a spotting scope (so I decided on a super-wide field of view) but also be capable of fulfilling the needs of a birder who has no scope at all. Immediately, this decision reminded me that while birders with scopes on tripods take a rest from holding up their binoculars, other birders, without a scope, rely on their arms to hold up their binos for as long as they can. Holding off fatigue for as long as possible became a target for me. Naturally I wanted state of the art optical performance, but I wanted to create a 'complete package' with handling comfort and the reduction of fatigue being important too.

The more birders I met in my travels around the world, the more convinced I was that this 'complete package' was what Zeiss needed to create if we were to really take the birding binocular to the next level.

Bearing all this in mind focused my thoughts on the critical aspects of performance needed to create this package, and I began to visualise the needs of the many birders I had spoken to, using some of my own birding experiences. I wanted to provide birders with the optical performance that, given the right opportunities, would allow them to separate adult female from juvenile Hen Harriers, to separate sub-species of Peregrine Falcons, to quickly spot a new species among flocks of familiar birds and, stepping away from the counting and ticking of species, to just enjoy the plumage details of their favourite birds which for me means the European Bittern (see my photograph).

Combined with this optical performance I wanted birders to be able to hold their binoculars up for as long as possible in order to watch those Hen Harriers coming in to their roost, to watch those circling or diving Peregrines, or indeed to watch for Skuas passing by over the sea, without having to lower their binoculars so often. This is what led to my concept of re-balancing SF compared with other binoculars. Also, using the SFs for long periods of time I wanted to deliver as much of the world to their eyes as possible so this was another reason for the super-wide field of view. Another target to avoid a different kind of fatigue was my idea to also avoid having to move the hand or bend the first finger in order to reach the focus wheel, which is necessary on some bins and it was this target that decided the position of the focus wheel.

And talking of the focus wheel, if you ask birders about focus speed, I find you always get a diversity of opinions about how fast or slow it should be but one thing seemed clear from conversations around the world, and that is that birders wanted a focus somewhat faster than generally available, but not so fast that they were always 'overshooting' the point of focus. So I chose a focus speed that I felt achieved this and field tested it with the help of many birders and it has been successful.

I hope this explains how meeting birders around the world and comparing their needs with my own gave me the inspiration for SF, and I hope it explains why I am proud of it.

Feasibility Study and Decision to Proceed
Key personnel consider the proposal from technical, production and sales viewpoints and opinions sought from key subsidiaries and dealers. One of the many key decisions is whether the product can be produced consistently to the right quality, and whether it can be produced in the right quantities and at the right cost. A pre-development study involves the Purchasing Department (for raw materials, and the cost of components and accessories not made in-house), the Development Department and the Accountant Controllers who together consider the internal cost implications, and the specification is provided to the Sales Department for them to consider sales forecasts and retail pricing. If it is decided to proceed a development team is appointed and a Project Plan is defined with dates for key milestones to be achieved.

SF Actuality
The project was launched and Dobler confirmed as Project Leader, Konnie Seil as Principal Optical Engineer and Werner Maier-Wendt was appointed as Principal Mechanical Engineer. I should say at this point that Dobler was keen to emphasise that many other personnel made important contributions to the success of the project, and among these was Armin Schlierbach who worked on the focus mechanism.

Optical Development
Computer simulations of lenses, prisms and glass-types are conducted until the desired results are shown to be achievable.
SF Actuality
Dobler and Seil had actually already successfully concluded optical-train simulations during a marathon session in Seil's office over a period of several days and nights, sleeping in the office, until they got the results they wanted, before the project was even given the go-ahead. Dobler wanted to control the weight but he also wanted a wide field of view, with good eye relief, both factors increasing the weight of the eyepiece. But by removing one lens from the objective group, he could keep the overall weight within targets, and also re-balance the binocular in the way he wanted. To his credit, Konnie Seil didn't dismiss this concept as unworkable by leading to excessive chromatic aberration. Instead he and Dobler set about simulations that included using the focusing lens in the objective lens group and incorporated a mild field-flattener in the eyepiece. Step by step, by changing lens designs and glass-types, including specifying very special fluoride-doped glass for the two objective lenses and the focusing lens, the simulations gradually resolved towards the successful final design.

External Design
Initial optical tube design is made and the dimensions sent to an Industrial Design specialist company employed to propose an external design. This means principally the armour, but includes the entire visible appearance. At this stage it must be decided whether the appearance will follow the principals of previous products or if a new design direction is to be sought. The external design must work in conjunction with the optical tube shape and dimensions that are defined by the size and position of the optical components inside, and must also facilitate the use of controls such as the focus wheel and dioptre adjustment in all weathers, including while wearing gloves, as well as accessory parts like the eyecups, so this process contains a certain inherent tension between the optical engineers, mechanical engineers and the stylists, but a winning design is eventually chosen.
External Design by Gerold Dobler

Not only does the external appearance and finish have to be rugged enough to withstand heavy use, with bumps and scrapes along the way, in all climates and habitats, it also needs to look good too. Nobody falls in love with an ugly binocular, and both amateurs and professionals need a robust instrument.

Sourcing of Bought-in Items

The several items that are bought-in from specialist producers are researched. These include the carrying case and shoulder strap, neck strap, moulded products such as the rubber armour, eyecups and objective and ocular (rainguard) covers, focus wheel cover/dioptre adjuster cover, as well as machined components for the focusing mechanism. These are sourced not only for production quantities but also the limited quantities for prototype production.

Prototypes

Initial prototypes are produced using components made both in-house and sourced from specialist suppliers, using 'soft' moulds/tools and low-quantity prototyping techniques. Performance is evaluated and especially the optical components are rigorously checked for compliance with the design specification. All aspects of product performance are finalised and documented whether to internal targets or to comply with ISO Standards.

Pre-Production Units

Pre-production units are produced to full production standards but using prototyping methods and are both laboratory and field-tested.

Testing, by Gerold Dobler

What happened when I at last had prototypes in my hands? How did we confirm that we had created the binoculars that we had visualised? The first thing was to use laboratory instruments to measure all aspects of the optical performance. Once I had assured myself that our optical targets had been met, not only by hand-made prototypes but by prototypes made to full production standards, it was time to test in the field. This is the most important part for me and I want to say that I do not regard it as just 'product-testing'. It is hard for me to express in English quite what it felt like to take an SF out for real birding for the first time. It was a mix-up of excitement and a bit of nerves too, but in the many, many hours of field testing that I did I was satisfied that my baby was everything I hoped for. This field testing was done not only by myself but also by many trusted birders and tour guides and others, in several countries, including in the UK at the Potteric Carr Reserve, on the very day before it was launched at Bird Fair. The result was a terrific response from everyone and I was a very happy birder indeed.

Full Production Methods

A full parts list is drawn up, including accessories and costs and prices finalised. Orders are placed for bought-in parts based on production-standard moulds, tooling, and lathe programming, and packaging is ordered. Date for launch set. Units are produced to full production standard using full production methods and some are selected as 'reference units'. Production confirm all OK, Quality confirm all OK, external suppliers all confirm prices, quantities and delivery dates. All necessary preparation for production including training of production and quality personnel is undertaken and a date for production commencement set,

Production begins at reduced levels and all procedures and protocols are assessed as production personnel gain experience

Production is accelerated to the desired levels and world-wide deliveries to dealers and reviewers commence.

Summing up

I hope this glimpse inside the workings of a new product development programme, with examples from the SF programme, has been interesting and illuminating.

Lee