IWC Cal. 52 S.C. from 1940

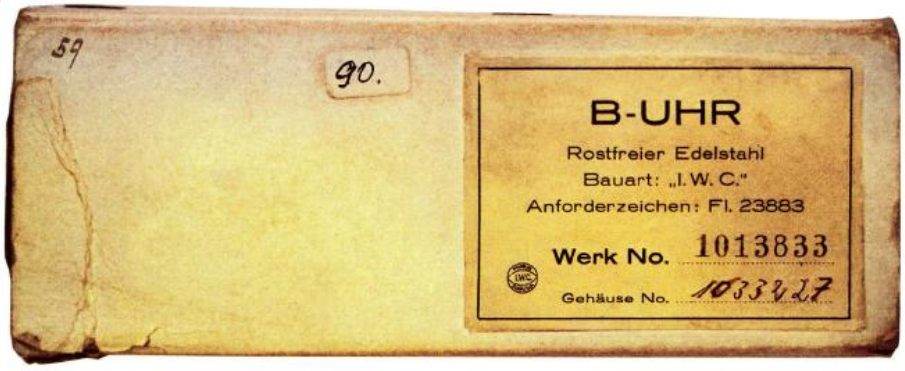
The Big Pilot's Watch

by Konrad Knirim

Later version of IWC's Luftwaffe Deck Wristwatch with conical crown

During the early years of seafaring, solving the so-called "problem of longitude" required shipboard clocks that kept time with the greatest possible accuracy. It was so in the early years of aeronautical navigation as well; aviators needed accurate, robust and readily legible timepieces aboard their aircraft to determine their locations and flight times. The marine chronometers that kept time aboard ships were augmented by deck watches that were used to transfer the precise time kept by one-second pendulum clocks in naval observatories. These deck watches were constructed like pocket watches and ensconced for safekeeping inside sturdy wooden or metal containers.

Pilots were typically in the air for only a relatively brief span of time, so deck watches in pocket-watch format weren't the optimal solution. An aviator needed a watch that he could read quickly and unambiguously; a watch that would show him the correct time with to-the-second accuracy, while allowing him to keep his hands firmly on the steering mechanism of his aircraft. A pilot's deck watch also had to have a long strap so that he could wear it outside the sleeve of his flight suit. But it wasn't until the 1930s that the first watches were developed in Germany to meet the specific needs and requirements of aviators. The defeat of the German air force during World War I and the subsequent Treaty of Versailles prohibited German aeronautics. The severe economic recession of the 1920s further exacerbated the languishing of the development of aeronautical technology, navigational instruments and precise timepieces. It was not until the 1930s – in response to political demands and also because the time was ripe for new modes of transportation – that more attention (and more money for research and development) was invested in this technical endeavor. The Luftwaffe was established as an armed force in its own right in March



The first version of the Deck Watch had a cylindrical crown and the movement number was engraved on the back. Below: Original package labelled with description of contents

1935. Afterwards, the Reich's Aeronautics Ministry (RLM) collaborated with the German Naval Observatory, calling for, and encouraging progress in, the development of precise timepieces.

This was preceded by efforts to improve navigational instruments used by the navy. A document from the German Naval Observatory dated January 5, 1935 invites watchmakers to participate in the "Fifth Competitive Test of Precision Pocket Watches," in which the suitability of timepieces "for scientific purposes and for nautical and aeronautical applications" would be tested. The submitted watches had to be of German provenance. They were first tested and assigned to one of three classes: Special Class, First Class and Second Class. Special requirements with respect to accuracy of rate and degree of perfection of the movement were meticulously defined by the relevant German offices and commanding authorities during the Second World War. Before a watch could be shipped to the military, it had to be tested in accordance with international standards and had to receive a rate certificate from a naval observatory or other official testing institution. These standards stipulated that nothing but the best materials, most impeccably engineered components and the most precise regulating devices were to be used in these watches. They had to be equipped with a high-quality balance (usually made from nickel-steel) and a specially treated balance-spring (with an outer and an inner curve). Further-

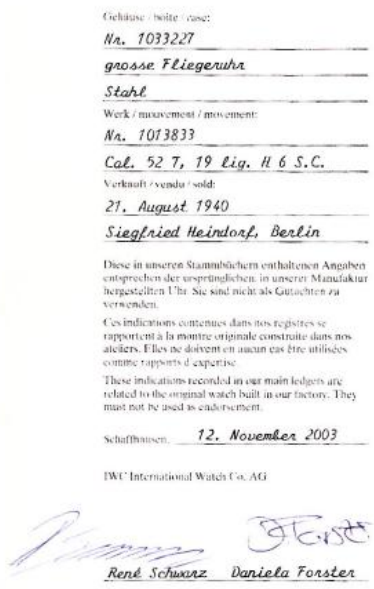
The dragonfly octant and the deck watch were used to determine an aircraft's momentary position during a long-haul flight

more, each watch had to undergo fine adjustment in six positions and at three temperatures. As a rule, only watches that had been subjected to the aforementioned treatment were able to satisfy the test conditions for the Special Class or First Class categories for precise pocket watches.

"In External Form, All Deck Watches Must Be Crafted as Wristwatches"

Few documents about the RLM's collaboration with the German Naval Observatory and the watch industry survive from this era. Many records were no doubt destroyed during the nighttime aerial bombardments that occurred between 1942 and 1945. The specifications to be fulfilled by a special pilot's watch were listed, perhaps for the first time, on a document from the RLM. Dating from 1935, this document was recently discovered at the Military Archive in Freiburg. Bearing neither a title nor signature, it appears to be the notes of a meeting. The text begins with a terse line: "Re: watches, chronometers, dials." The document probably refers to the plans for a new Nautical Yearbook of Aeronautics and a suggestion contained therein about the kind of watches that would be needed for the purposes of celestial navigation. These recommendations can be regarded as heralding the birth of specially developed watches for the German air force.

1. The watches should include degree strokes in their minute-circle. Ultimately, however, the decision was made to dispense with degree strokes.
2. The dial of a deck watch or ground-based chronometer should be clearly numbered, unambiguously and easily legible. A design like the one used on the face of Longines' Lindbergh was tested (Fl. 22604), but it was rejected because of the double set of numbers for hours and degrees, and because it could be inadvertently reset.
3. Deck watches should be equipped with mechanisms to halt their hands, so that these could be precisely set to show Greenwich Mean Time (GMT). This hand-stopping mechanism was not included in naval deck watches.
4. In accordance with their purpose, only chronometers with lever escapements and hand-stopping mechanisms were used as ground-based chronometers. These specifications defined the Luftwaffe's ground-based chronometer.
5. Further requirements for deck watches included resistance to vibration, reliability at low temperatures (–20°C) and regularity of rate. In external form, all deck watches had to be crafted as wristwatches.



Gehäuse / boîte / case:
Nr. 1033227
grosse Fliegeruhr
Stahl
Werk / mouvement / movement:
Nr. 1013833
Cal. 52 T, 19 Lig. H 6 S.C.
Verkauft / vendu / sold:
21. August 1940
Siegfried Heindorf, Berlin

Diese in unseren Stammbüchern enthaltenen Angaben entsprechen der ursprünglichen, in unserer Manufaktur hergestellten Uhr. Sie sind nicht als Gutachten zu verwenden.

Ces indications contenues dans nos registres se rapportent à la montre originale construite dans nos ateliers. Elles ne doivent en aucun cas être utilisées comme rapports d'expertise.

These indications recorded in our main ledgers are related to the original watch built in our factory. They must not be used as endorsement.

Schaffhausen, 12. November 2003

IWC International Watch Co. AG

René Schwarz Daniela Forster

Excerpt from an album recording the first shipment of Luftwaffe Deck Watches to the German air force

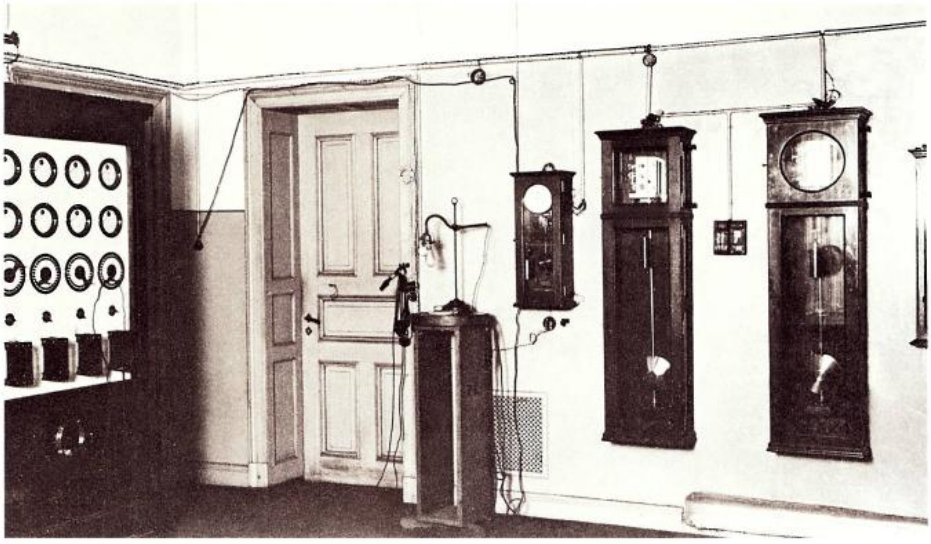
Only 1,200 Movements Were Constructed

The aforementioned document essentially defines all of the specifications that would later characterize IWC's watches for the Luftwaffe. Not all details are specified (e.g., the scale for measuring radial degrees and the not-yet-completed testing of sidereal-time watches). The now rare and, consequently, avidly coveted degree-measuring chronometers and deck watches were undoubtedly created in the response to these military specifications. In their final form, all movements were uniformly housed in gray brass or steel cases measuring 55 millimeters in diameter and fitted with snap-on back covers. The following information was marked inside of the back cover: type of construction, device number, movement number, order mark, and the name of the manufacturer. The dials were black. Large Arabic numerals coated with radium-based luminous material indicated the hours. Strokes marked the minutes and seconds. The hour-hand, minute-hand and seconds-hand were coated with radium-based luminous material. The seconds-hand had a counterweight. Furthermore, all watches had a centrally axial seconds-hand powered from outside the flow of force, as well as a mechanism to momentarily halt the balance. Extracting the crown stopped the watch so that its hands could be exactly set. The watch would begin to run again when the crown was reinserted. This mechanism also enabled such timepieces to be used for measuring brief intervals.

IWC's movement ledger records the number of specimens of the Caliber 52 S.C. manufactured in the company's factory halls in Schaffhausen. According to the *manufacture*'s meticulously kept list, the first such caliber, made in 1940, bore the serial number 1013801. The last serial number, likewise assigned in 1940, was 1015000. Subtracting the latter from the former shows that IWC manufactured 1,200 specimens of Caliber 52 S.C.

Pilots synchronizing their watches prior to a mission: the crew's watches were synchronized with the deck watch worn by the so-called "observer"

The complete designation of the movement is "52 T 19"' H6 S.C." The "T" stands for the type of movement construction with tirette (hand-setting by extracting the crown). The number 19"' specifies the movement's diameter of 19 lignes (42.25 millimeters). IWC's albums list the diameter as 19/22"' because, after it was fitted with a movement ring, the caliber's diameter increased to 22 lignes. "H6" is the abbreviation for the height of the movement (6 millimeters). And "S.C." means that this movement supports a centrally axial seconds-hand (*seconde centrale*). This indirect propulsion, with a braking spring on the fourth-wheel pinion, was added to the original Caliber 52. Other basic data about the movement that ticked inside the Luftwaffe's watch include 16 jewels, swan's neck fine adjustment, slit metallic balance with weight screws and regulating screws, and a Breguet balance-spring. The balance was borne in olived and domed jewels with endstones. The steel lever of the Swiss lever escapement was polished glossy. The escape-wheel was matte. The plate was sandblasted and gold plated. The bridges and the movement ring were also gold plated. The visible wheels and the click were polished and embellished with a sunburst pattern. The pinions were polished. The third wheel had an elongated pivot to accept the transfer wheel leading to the pinion for the central seconds-hand beneath the additional seconds-pinion bridge. Each movement was signed "IWC" and marked with the movement number. One thousand of the 1,200 specimens of the Caliber



One-second pendulum clocks at the German Naval Observatory in Hamburg kept reference time for all nautical and aeronautical events

52 S.C. were delivered to the German Luftwaffe in the late summer and autumn of 1940. The remaining 200 specimens of the Caliber 52 S.C. were used as deck watches by the British Royal Navy. The watch existed in two variants: one lot, shipped on August 21, 1940, consisted of watches with cylindrical crowns; a second lot, which left Schaffhausen on September 30, 1940, had conical crowns. IWC's album records that these watches were marked with serial numbers 1033201 to 1034200. IWC didn't deliver these watches directly to the RLM. Their recipient is listed as Siegfried Heindorf in Berlin. Heindorf remained an IWC concessionary in Berlin for many years until he retired in the 1960s. Prior to shipment, each watch underwent obligatory testing in six positions and at various temperatures.

It is self-explanatory that the basic dimensions of the caliber necessitated a correspondingly large watch. The steel case was 55 millimeters in diameter. Measured from horn to horn, the diameter was a full 67 millimeters. The height was equally impressive: 17.5 millimeters. The hands were set by rotating the crown, which likewise was of titanic dimensions. When its user read the time remaining until a mission was set to begin or when he used celestial navigation to determine his position, he scrutinized the face of a 0.9-millimeter-thick metal dial with a visible diameter of 49 millimeters. His gaze also fell upon a minute-circle, printed at five-minute intervals and glowing brightly in the dark, thanks to its radium coating. The dial's design was rounded out by Arabic numerals to mark the hours and a triangle flanked by luminous dots at the "12." The hands that tracked the passing seconds, minutes and hours were made of blued steel and coated with radium. Neither the dial nor any other immediately visible component of the watch bore any markings to show that this highly precise timepiece had been made in Schaffhausen. The rust-free steel of its case, however, revealed its origins because the inside surface of the back was engraved with the phrase "B-Uhr Bauart I.W.C.," as well as with the movement number and the order mark Fl. 23883. This last-mentioned alphanumeric was a sort of order number that the Luftwaffe's procurement offices could use when ordering watches of this type. "Fl." stood for "Fliegnummer" ("flying number"). The next two digits specified the number

of the group (e.g., the digits 22 and 23 designated flight-monitoring devices and the digits 25 stood for navigational devices). The three final digits were serially assigned by the German Testing Office for Aeronautics (DVL). The inner surface of the back was also stamped with the phrase *Rostfreier Stahl* ("rust-free steel"), the case number, and IWC's "Probus Scafusia" stamp. The case number appeared on the outer surface of the back. Some of these watches were also stamped with the alphanumeric "BA 2690" inside an octagon, but only a few of them received this stamp upon receipt. Stamping was a governmental act; agents authorized to perform it were designated with the abbreviation "L. Dv. 61/1 gab." These regulations stipulated that tests and hallmarks could only be given by the Airborne Construction Monitoring Facility (BAL) or the Operative Monitoring Authority (BA). The BAL, a branch office of the RLM, had its headquarters on the manufacturer's premises. At sites where no BAL was physically present, the monitoring was performed by the manufacturer's own testers, who had taken an oath to confirm their reliability. This was the case at IWC, because this manufactory is located on Swiss soil. These testers identified themselves with the "BA" abbreviation. An extra-long leather strap was affixed to the watch so that the timepiece could also be worn over the bulky sleeve of a flight suit. The strap had twin loops and a pronged buckle. Two rivets firmly affixed the strap to its lugs.

The German Naval Observatory Also Disseminated and Administrated the Exact Time for Aeronautics

The German Naval Observatory in Hamburg wasn't only responsible for testing watches for the Luftwaffe. This observatory also administrated, monitored and disseminated the precise time for civil aviation. The prime reference time for all events at sea and in the air was kept by precise one-second pendulum clocks. The following main clocks were kept either in the time-service room at the observatory or atop granite foundations in the building's cellar: Knoblich No. 2090, Strasser & Rohde No. 219, Riefler No. 223, Max Richter No. 101 and 102. All precise timepieces were tested here (e.g., chronometers and deck watches for the navy and air force). The time service's most important task was to trigger and monitor the radio-telegraphic Nauen Time Signal, which was used to set the timepieces in the radio rooms and mission rooms of military airfields, as well as the ground-based chronometers at flight-preparation rooms. Prior to a mission, these were the venues where a time observer read the precise official time and transferred it to his large wristwatch. Extraordinarily precise time-setting was essential for accurate celestial navigation. Aircraft commander Hellmut Nagel, a pilot who served in an oceanic reconnaissance group, recorded exactly how astronomic positioning was accomplished using an IWC pilot's watch and an octant during a long-haul mission over the Atlantic. The deck watch used for airborne navigation by his team was an IWC Cal. 52 S.C. with case number 1033227 and movement number 1013833.

Several reference clocks kept time in the time-service room and atop granite foundations in the cellar of the German Naval Observatory. One such timepiece was this precise clock: No. 223, made by Clemens Riefler in Munich

Right: an illustration of the "dissemination" of the precise time for the Luftwaffe from the German Naval Observatory to the observer's deck watch and the airborne crewmembers' wristwatches. This right-hand side of this illustration also shows the hierarchy of precision

Nagel wrote, "The participants in this event aboard a JU 290 of the FAG 5 were the commander, who wore the deck watch, and the observer, who operated the dragonfly octant. On the upper surface of the fuselage of the JU 290, between the two pivoting protective stands and approximately at the midpoint of the aircraft, was a transparent cover that was free from all optical distortions. Beneath it, on the floor of the fuselage, was a circular rotating platform approximately one meter in diameter. This platform could be raised and lowered. The observer stood atop this platform with his octant in hand. The wearer of the deck watch stood nearby. The two men communicated via their own voice-communications system. When the observer had the dragonfly, the square of the crosshairs and a star (which could also be the sun during daytime navigation) in view, he would say, 'Attention: zero' and then switch on his octant for the corresponding observation interval of 40, 60, or 90 seconds. The moment the wearer of the deck watch heard the word 'zero,' he would read from his watch the hour, minute and second when the observation had begun. Incidentally, prior to every mission, deck watches were synchronized with a ground-based chronometer kept in the command post. The measured values to be read from the octant were: ten-degree setting, degree drum, degree disk in the integrator and minute drum, height of the star observed, half of the octant's running time added to this, and the current time. This data was entered into a calculating form that had been previously prepared by an astronomer. The result was a location line, which intersected with the course that was being flown if the observed star was situated ahead of the aircraft, and which ran parallel to the course if the star was situated to the right or left of the current course."

Luftwaffe pilots set their deck watches prior to a mission according to the reference time shown on a ground-based chronometer

The location of the chronometer had to be taken into account when the deck watch was synchronized prior to the mission. The following example clarifies how this task was accomplished. Suppose the deck watch for an upcoming flight was to be synchronized with the chronometer at 5:30 a.m. on the morning of January 9, 1942. According to the chronometer diary, this timepiece had had a status of −14s at 2:00 p.m. on the afternoon of January 8, 1942. According to the data, the rate was calculated at +1.5s. This resulted in a status of −13s for January 9, so the deck watch would be set at 05h30m00s. The deck watch was set running the instant the chronometer showed 05h30m13s, so the status of the deck watch would be 0. The observer's watch would then be used to orient the watches worn by all other crewmembers. IWC's pilot's watch was thus the most precise timepiece aboard the moving object.

Seconds Pendulum Clock,
German Naval Observatory

Headquarters in Germany

Time Signal,
Nauen Radio Signal

Operative Clock
Radio Room/Mission Room

Ground Chronometer,
Flight-Preparation Room

Onsite at the
Military Airfield

Time-Transfer Clock
at Military Airfield

Portable Timepieces in the Aircraft
and/or Strapped to the Pilot

Deck-Watch
Observers

Blind-Flight Watch,
Instrument Panel

Eight-Day Built-in Watch,
Radio Operations Center

Flight Commander's
Chronograph

Flight Personnel's
Service Wristwatch