

**CANADIAN-MADE BINOCULARS, Part 3:  
ELCAN roof-prism, military & civilian versions  
with data on two Fujinon replacements©**

by

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**ABSTRACT**

In 1974, Ernst Leitz Canada received a contract from the Canadian Government to produce 7X50 roof-prism binoculars for the Canadian Inter-Service Military. Production lasted till 1977. In that time, Ernst Leitz Canada produced 8200 ELCAN roof-prism binoculars (about 7800 military versions, and about 400 civilian versions). The eyepiece optics are of an Erfle style (glued doublet with 2 air-spaced singlets), and the objectives are two air-spaced singlets. An 8X50 model was designed for the civilian market, but because of poor civilian sales of the 7X50 version, it was not produced. In 1977, Ernst Leitz received a huge contract to produce 10,000 units of a hand-held laser rangefinder, thus ending the ELCAN binocular production. ELCAN 7X50 roof-prism binoculars are waterproof to 5 m depth, shockproof from 2.44 m onto a hard surface. The military version was issued with yellow filters, rubber ocular and objective lens covers, and a carry case. Later issues were also given a small, zippered case to attach to the neck strap for the filters. The civilian version was issued with rubber ocular and objective lens covers, and a black soft leather carry case with the Leitz® logo.

After more than 25 years as the workhorse binocular for the Canadian military, the ELCAN 7X50 roof-prism binoculars were retired about 1999-2000 in favor of two models of Fujinon binoculars, both with eye-save (anti-laser) green coating: a 7X50 Porro-prism Type 1, with a right eye reticle and 7°30' FoV, and 7X30 roof-prism binoculars with 7° FoV, but no reticle. The ELCAN binoculars are still used in the Canadian Arctic by the Canadian Rangers. The Canadian Rangers are a subcomponent of the Canadian Armed Forces Reserve. Today, most NCOs purchase their own military versions of binoculars.

**INTRODUCTION**

**1974-1977, Roof-Prism Binoculars (ELCAN) Made by Ernst Leitz Canada, Midland, ON**

In Part 1 of Canadian-made binoculars, the Porro-prism Type I REL 6X30, 7X50 of WWII vintage (1939-45) were discussed (Leech 2015a). In Part 2 (Leech 2015b), the REL-BOP retrofits for the Korean War made during the early 1950s were discussed. While searching the history of Canadian-made binoculars, a binocular-related article on Age vs Dilated Eye Pupil

Size was prepared (Leech 2014a). Electronic copies of these are available upon request. The second kind of Canadian-made binoculars are roof-prism binoculars (Fig. 1). The optical design was supervised by Dr Walter Mandler, the mechanical design was supervised by Mr Bechman, and made by Ernst Leitz Canada (hence ELCAN) of Midland, ON. Klaus Kubetz was in charge of ensuring a superior end product. The Canadian Government contract was awarded in 1974 to make 7X50 IF (Individual Focus) roof-prism binoculars for the Canadian Inter-service Military. Production lasted for 3 years. The ELCAN binoculars served as the workhorse binocular for the Canadian Armed Forces (Abrahams 2009), but by about the year 2000, there was a switch to a large black rubber-covered (armored) Fujinon 7X50 Porro-prism Type I binoculars with a  $7^{\circ}30'$  FoV (possibly the same as the USM-22?), and a smaller black rubber-covered Fujinon roof-prism 7X30 binoculars with a  $7^{\circ}$  FoV. Today the ELCANs are still used in the Arctic by the Canadian Rangers (Lemire, pers. comm., 15 August 2014). Military and civilian versions of the ELCAN binoculars were made. Used good ones are rarely for sale.



**Fig. 1. ELCAN 7X50B bins, civilian version, Leitz Canada. One cup rolled.**

## **DISCUSSION**

ELCAN binoculars were designed and made in Canada at an Ernst Leitz GmbH, Wetzlar, Germany, production plant in Midland, ON, starting in 1974 and ending in 1977. These binoculars are no longer made in Canada or elsewhere (Klaus Kubetz, pers. comm., 9 August 2014). Until the 1980s the Midland plant was fully under the control of the German parent company (Ernst Leitz GmbH, Wetzlar) (Klaus Kubetz, pers. comm., 9 Aug. 2014).

## HISTORY

The Leitz Wetzlar Company of Wetzlar, Germany sent an exploratory team (Dr Ernst Leitz III and Karl Seng) to Canada, and it chose Midland, ON, as the new subsidiary factory site in 1952. Since then the ELCAN Company has undergone a number of new owners. The first was started in the mid-70s, when the Swiss microscope and instrument company, Wild Heerbrugg, Switzerland, gradually purchased all of Leica in Germany (more than 50% of the shares by 1990). In November 1990, the Hughes Aircraft Company of California purchased Ernst Leitz (Canada) Ltd, and the name was changed to Hughes Leitz Optical Technologies Ltd, and Hughes announced the closing of its sister plant, Hughes Optical Products Inc. (HOPI), and moved all the equipment, machinery and technology, valued at \$5.5 million, to Midland, ON.

In December 1997, Hughes Aircraft Company and Texas Instruments sold their defence businesses to the Raytheon Company of Lexington, Massachusetts, which included the Hughes Leitz Optical Technologies Ltd. The organization took on the ELCAN brand name and became known as Raytheon ELCAN Optical Technologies. ELCAN's success led to the strategic integration in the year 2000 with a US optical manufacturing facility that Raytheon acquired with Texas Instruments. Raytheon incorporated a number of the Texas Instrument legacy optics groups in Richardson, Texas. These unified operations made ELCAN the largest and most fully integrated North American company with complete opto-electro-mechanical capabilities. In 2003, a Spanish printed circuit board maker was also brought in, enabling ELCAN to further increase its capabilities.

The rifle optical sight business was and is the biggest program at ELCAN. Rifle Optical Sights in Midland have been built since the 1980s. Over 80,000 units, solely for military applications, have been sold all over the western world. The early ones were 4X32, but the newer ones are, with a flick of a lever, either 1X32 or 4X32. There are laser dot models as a variant to the reticle. The biggest user is the US military, followed by many European countries and Canada (NATO).

Definitely no ELCAN binoculars were made after 1977, as ELCAN landed a big, multi-year contract with RCA of Massachusetts to build over 10,000 units of a hand-held laser range finder, a monocular with basically the same optical design as the ELCAN binoculars, but with a different optical coating and mechanical design. This shift in production was a major reason that the making of the superior ELCAN binoculars stopped (Kubetz, pers. comm., 9 Aug. 2014). In the ELCAN plant in Midland, ON, about 8200 of the ELCAN binoculars were produced, 7800 military version and 400 civilian version (Kubetz, 9 August 2014). Poor marketing is blamed for the lack of sales for the civilian units. Because the civilian sales were so poor, an 8X50 binocular that had been designed for the commercial market never saw production.

The ELCAN binoculars are roof-prism binoculars. The Schmidt-Pechan roof-prism system was aligned in the prism housing, and the position was secured with the injection of a permanently flexible epoxy. This made the core assembly shock proof, and far superior to other existing prism-mounting technologies. The glass for the prisms and lenses for the ELCAN binoculars

came, without exception, from Schott AG in Mainz, Germany (Kubetz, 13 October 2914). The FoV (Field of View) for all the ELCAN military and civilian versions is 7.65° (Kubetz, pers. comm., 24 August 2014). There was not an earlier ELCAN version issued with a narrower FoV), and a later version with a wider FoV, as is stated in numerous publications. The 7.65° FoV is equivalent to 402 ft/1000 yds or 134 m/1 km. This FoV permits the observer to focus and concentrate on the issues at hand, and not be distracted by peripheral issues.

All ELCANs have the same heavy weight, mainly because of the special Schott AG glass used in the prisms and optics (Kubetz, pers. comm., 24 August 2014). From the start in 1974, the optical and prism-coating systems, including the Pechan reflective side (a silver-based coating) used in the 7X50 ELCAN binoculars, had a 99% reflectivity (Kubetz, pers. comm., 24 October 2014). This was the best in the world at that time (Kubetz, pers. comm., 24 October 2014).

A point of interest, the ELCAN 7X50 binoculars have been memorialized by a picture on the backside of the older Canadian \$10 paper bill (not the new plastic bill), showing a soldier using a pair of these binoculars (Fig. 2). Tom Gibson McBain Cameras Ltd, Edmonton (pers. comm. August 2014) told me that he sold many of the civilian version of the ELCAN binoculars to the Alberta Hutterite Colonies. These were preferred binoculars by the Hutterites as they could take the tremendous abuse given on farms by multiple users, and during hunting seasons where they would be tossed without caution into a vehicle or boat yet retain collimation.



**Fig. 2. The older, paper Canadian \$10 bill showing a soldier using the ELCAN 7X50 binocs.**

The bodies of the ELCAN binoculars are tough, even though they are made of cast aluminum. They are designed to take the kind of beatings and thrashings that accompany a soldier in action. (I have not tested mine to see just how much abuse they can take!) Klaus Kubetz (27 September 2014) reported that the ELCANs are water-proof to 5 m depth, that they could be dropped 2.44 m (8 ft) onto a hard floor, and that they are anti-magnetic (can be put next to a ship's compass without affecting the compass reading accuracy). All the ELCAN 7X50s were leak tested by a government inspector, filled with nitrogen, 10 at a time, to +5 psi. Readings on the pressure station gauges could not drop more than a quarter of 1 psi during a 30 minute testing sequence.

The ELCANs shown here are in essentially mint condition, especially the optics. The military version of the ELCAN 7X50 binoculars, including filters, neck strap, spare ocular caps, ocular and objective covers and case weigh 1.61 kg. The civilian version of the ELCAN 7X50 binoculars, including neck strap, ocular and objective covers and case weighs 1.40 kg. The binoculars alone each weighs 1.12 kg.

The military bodies are painted, as issued by the factory, with a nearly smooth, flat black paint that is non-reflective, and were camouflage-painted by the Canadian soldier who had one (Fig. 3). The flat black paint also permits a non-slip grip on the body barrels, even when it is cold outside, or if hands are wet. Issued with the military binocular units were these: a pair of yellow filters (Wratten #13) that fits onto the oculars, spare eye cups, black rubber ocular and objective covers, a dark green neck strap, and a stiffened canvas case (Figs 4, 5). The canvas case has a pair of pockets on the hinge-side that are used for storing the yellow filters (Fig. 5). Issued later was a small, flat, zippered, greenish leather filter holder. The filter holder can be attached onto the neck strap. There is a Mil and Range scale reticle in the right ocular barrel of the binoculars set up for users with an inter-pupillary (I-P) distance of 63 mm. It is an inconvenient setting for one of us (Leech), as my I-P distance is 71 mm. At that I-P distance, the Range Scale reticle is almost sideways, not vertical and lateral.



**Fig. 3. Two ELCAN 7X50 binos. The black one (left) is as factory issued (obvious red Nitrogen purge screws). The camo-colored version was painted by the user, and the red purging screws were painted over.**

The ELCAN eye pieces are an Erfle type with a doublet of two cemented lenses and two singlets with air spaces (giving a wider FoV). The objectives lenses are two air-spaced singlets (Woodward & Waldstein 1977: 194, 196; via Kubetz, email, 12 Dec 2014).



**Fig. 4. ELCAN 7X50 binos with all the issued gear: yellow filters, eyepiece caps, objective caps, extra pair of eye cups, and a small, green neck strap case for the yellow filters. The green neck strap is missing.**



**Fig. 5. As issued ELCAN 7X50 military canvas case. Note the 2 pockets for holding the yellow filters and/or eye cups.**

The ELCAN binoculars are moisture and leak-proof. There are 2 nitrogen-purging screws and gaskets for each half of the binocular (i.e., 4 screws and gaskets in all, Fig. 6). These screws are

found on both the military and civilian models.



**Fig. 6. ELCAN 7X50 binos showing the 4 red nitrogen purge screws and gaskets. The serial # (07328) indicates that this pair was near the end of 7800 units produced.**

The Canadian Army still maintains optical repair depots where the binoculars are serviced and maintained, along with other more modern ELCAN optics (e.g., rifle scope on the Canadian Army rifles).

The civilian model, in contrast to the military model with flat black paint, is covered with a gun-metal grey, smoothly textured enamel. The enamel paint came from Germany, but it was applied at the ELCAN facility in Midland, ON. There is no reticle in the right eye of the civilian model. In cold weather, or if the hands are wet, the civilian model can be a bit slippery. The civilian units were issued with a soft, black leather case with the Leica® logo on the lower right front, a black neck strap, ocular and objective lens covers (Fig. 7), and there is a “MADE IN CANADA” disc (Fig. 8) with the Leitz optical computing number, and the serial number on it. For more discussion on comparisons between Porro-prism Type I and roof-prism binoculars, see Leech (2014b), and the discussion below.

### **Advantages of older Porro-Prism Binoculars over older Roof-Prism Type Binoculars**

Smaller roof-prism binoculars (e.g., 8X20) can be folded to fit into a pocket, and they may handle more easily than do Porro prism Type binoculars. But, Porro-prism Types I & II binoculars offer one distinct advantage over roof-prism binoculars: Porro-prism Type binoculars have the objective lenses farther apart than are the oculars, which are set at your inter-pupillary (I-P) distance. This gives the Porro-prism binoculars a distinct edge for stereo or 3-D interpretation of objects out to the critical distance of about 100 m distance or slightly more. In

comparison, the roof-prism type binoculars have essentially the same I-P distance for both the ocular and objective lenses. Reasonably priced, high quality Porro-prism Type I binoculars can usually have a considerably wider FoVs than can roof-prism binoculars, whether pre-2005 or post-2005.



**Fig. 7. LEITZ CANADA ELCAN 7X50B, civilian version, as issued with the soft leather case bearing the Leica® logo.**

### **Best of Roof-Prism Binoculars Now Match Porro-Prism Type Binoculars**

With the exception of the ELCAN binoculars, until the year 2005, Porro-prism Type binoculars held an edge over the roof-prism type binoculars in relation to brightness, contrast and resolution. In 2005, the optical quality of the best roof-prism binoculars, using the latest up-to-date lens coatings (especially a well-designed dielectric coating and phase coating) in Schmidt-Pechan prism versions and the Abbé-König prism systems, made both of these binocular prism systems comparable with the best Porro-prism binoculars. The coatings are these: *phase-coated* (aka *P-coating*), *aluminum-coated*, *silver-coated*, and *dielectric-coated* (Binoculars 2014: 8). With these latest coating systems, a reflectivity of 99% or more across the visible light spectrum is achieved (Schmidt-Pechan Prism 2014). Porro-prism binoculars, and roof-prism binoculars using the Abbé-König roof-prisms, do not use or need dielectric coatings because these prisms

have a very high reflectivity using reflection within the prism rather than requiring a mirror coating on the outside of the prism (Binoculars 2014: 8). The Porro prism system is the most bulky, the Abbé-König type prism system is slightly less bulky, and the Schmidt-Pechan is the least bulky (Abbé-König Prism 2014). Schmidt-Pechan prism systems can be constructed more compactly than can either the Porro prism system or the Abbé-König prism system (Schmidt-Pechan Prism 2014), and this may have been an important issue for the ELCAN binoculars for military use.



**Fig. 8. ELCAN 7X50B, civilian version, with the “MADE IN CANADA” disc. Serial # 0176 indicates that this was # 176 of about 400 issued, and # C 317 is ELCAN’s optical computing number.**

## **TWO FUJINON BINOCULARS REPLACE ELCAN BINOCULARS**

Somewhere in 1999-2000, the ELCAN binoculars were phased out, and two different Fujinon binoculars were gradually phased in to replace them. These Fujinon binoculars are still in use today with the Canadian Military (Geoff Closs, pers. comm., phone calls, emails, 4-11 December 2014). The larger Fujinon is a 7X50 Porro-prism Type 1, 7°30' FoV, in a black rubber protective cover. The smaller binoculars are also Fujinon, 7X30 roof-prism binoculars, 7°FoV, also with a black rubber protective cover. Both of these Fujinon binoculars have anti-laser (green color coating) on the front objective lenses (Geoff Closs, pers. comm., phone calls, 4-11 December 2014).

At present, with better, cheaper and commercially available military roof-prism binos in the market, troops are purchasing their own binos. Some even purchase a monocular because of less weight and size. Remember, to someone walking long distances, a few grams weigh like kilos. The timing of these changes is interesting. In the recent past, only officers had binoculars, now any and all troops can purchase their own binos. This means that there are more eyes spotting potential problems when the armies are on the move.



**Fig. 9. Fujinon 7X50 Porro-prism Type 1, black rubber armored bino, the first of two kinds Fujinon bins serving the Canadian Forces since about 1999-2000. (Photo by W. O. Geoff Closs, 1PPCLI, Edmonton.)**



**Fig. 10. Fujinon 7X30 roof-prism, black rubber armored bino, the second of two kinds of Fujinon bins serving the Canadian Forces since about 1999-2000. (Photo by W.O. Geoff Closs, 1PPCLI, Edmonton.)**

## **Conclusions**

Though ELCAN 7X50s are slightly on the heavy side, they have specially coated optics, and are

fantastic. They are superior roof-prism binoculars, either as the military or the civilian model. They have the Schmidt-Pechan roof-prism system with a silver-based reflective surface on the Pechan reflective side of the system. The Pechan prism in the ELCANs gave them an edge optically. The eyepiece oculars are an Erfle style (1 glued doublet plus 2 airspaced singlets), and the objectives are two airspaced singlets. Few binoculars of any make will have the durability and shock-absorbing qualities that the ELCANs have. I do recommend that if one obtains a pair of the military model, that the old case be replaced with new, soft leather case that is lighter and easier to use (or have one made). Porro-prism Type I binoculars do give a better stereo or 3-D perception than do roof-prism binoculars to about 100 m. The complete unit of the ELCAN 7X50 binoculars weighs in at 1.61 kg. All pictures were taken by the author and are of binoculars in his collection unless otherwise noted. Since 2005, the best roof-prism binoculars are comparable with the best Porro-prism binoculars. Good Porro-prism type binoculars usually have considerably wider FoV than do most roof-prism binoculars, mainly because of price, size/weight of prisms and no market demand for the extra FoV.

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