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SA-7/GRAIL--THE 'ARROW': THE SOVIET IR-GUIDED MAN-PORTABLE ANTI--ETC(U)
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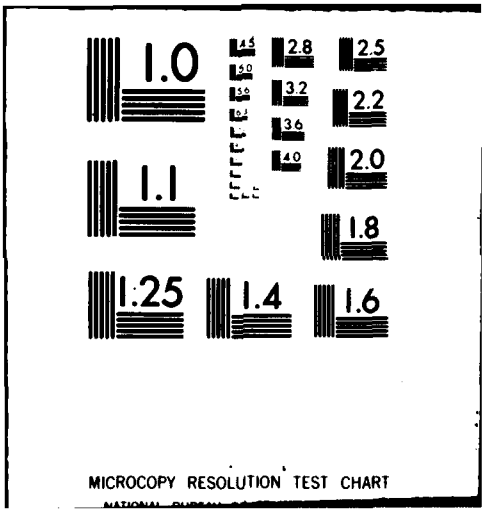
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TITLE: SA-7/GRAIL--The "Arrow": The Soviet IR-Guided Man-Portable ~~Antiaircraft~~ Missile for Everyone

SA-7/GRAIL--der "Pfeil": Die Sowjetische Fliegerfaust fuer jedermann

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SA-7/GRAIL--THE "ARROW":
The Soviet IR-Guided Man-Portable Antiaircraft Missile for Everyone

[Lippert, Guenter, LTCOL; SA-7/GRAIL--der "Pfeil": Die Sowjetische Fliegerfaust fuer jedermann; Soldat und Technik, No. 9, 1981; pp. 518-519; German]

In the past ten years Soldat und Technik has reported frequently on the SA-7/GRAIL. The following article summarizes the information available to this date on that weapon, which is the product of the Soviet armaments industry exported in largest numbers after the Kalishnikov, and tells how it is part of the armament of terrorists and resistance fighters of all shades. /518*

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The SA-7/GRAIL, known under the Russian designation "Strela" /Arrow/ in the armed forces of the Warsaw Pact, is a one-man antiaircraft weapon against low-flying aircraft moving at a maximum speed of 860 km/hr (0.7 Mach) which is launched from the shoulder. This antiaircraft guided missile weapon system which resembles the American REDEYE was developed in the second half of the sixties. Before it was delivered in larger numbers to the Soviet Army and to non-Soviet Warsaw Pact armies, it had already been tested in combat: in 1968/69 in the war of attrition in the Suez Canal which followed the Six-Day War of 1967, and at about the same time in Vietnam, where the US Air Force employed flares as IR decoys for the first time to deceive the missile.

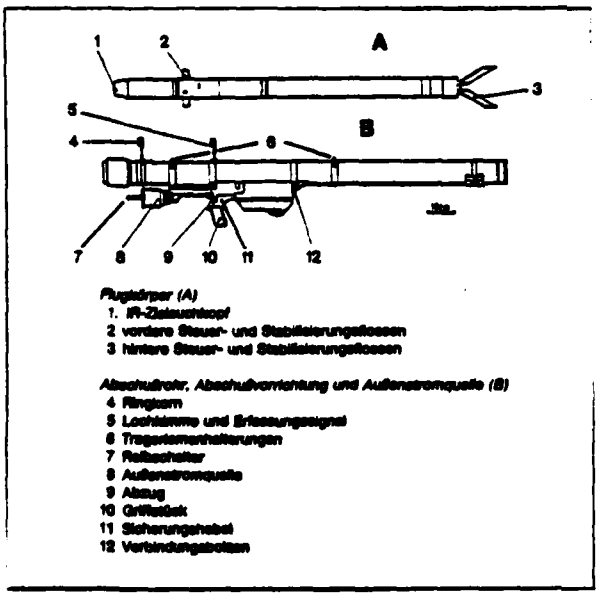

Fig. 1. Missile (A)

1. IR homing device 2. Forward control and stabilizing fins 3. After control and stabilizing fins

Launch tube, launch mechanism, and external power source (B)

4. Ring front sight 5. Rear sight and acquisition signal 6. Sling mount 7. Friction switch 8. External power source 9. Trigger 10. Grip 11. Safety 12. Connecting bolts

Since then the SA-7/GRAIL has spread throughout the world; not only is it part of the standard equipment of the Warsaw Pact forces, but it has also been supplied to the armed forces of a number of other states of the most varied political orientation. They include the Peoples Republic of North Korea, Vietnam, and South Yemen, the Arab states ruled by socialist regimes of the Magreb and the Near East, like Algeria, Libya, and Syria, and finally, Finland and Kuwait. But

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*Numbers in the right hand margin indicate pagination in the original text.

it was not only the profit motive which attracted the Soviet exporters; the anti-Rhodesian resistance movements employed the SA-7 in the bush warfare against white supremacy in present-day Zimbabwe. The Polisario Liberation Movement supported by Algeria and Libya brought down Moroccan aircraft with it over the Western Sahara, and West European security forces feared that they would be able to be fired by terrorists from areas surrounding international airports against civil aircraft--as was done by the Palestinians in Rome. Finally, the "Arrow" acted like a boomerang for the Soviets; probably supplied by Egypt, SA-7/GRAILS from the remaining stock of Soviet weapons assistance or copies of them came into the hands of Afghan freedom fighters, who are using them to combat Soviet helicopter gunships!

Construction and Performance Data

There are now two known versions of the Soviet IR-guided man-portable antiaircraft missile:

--the first SA-7a/GRAIL version, and
--the improved SA-7b/GRAIL MOD 1 version.

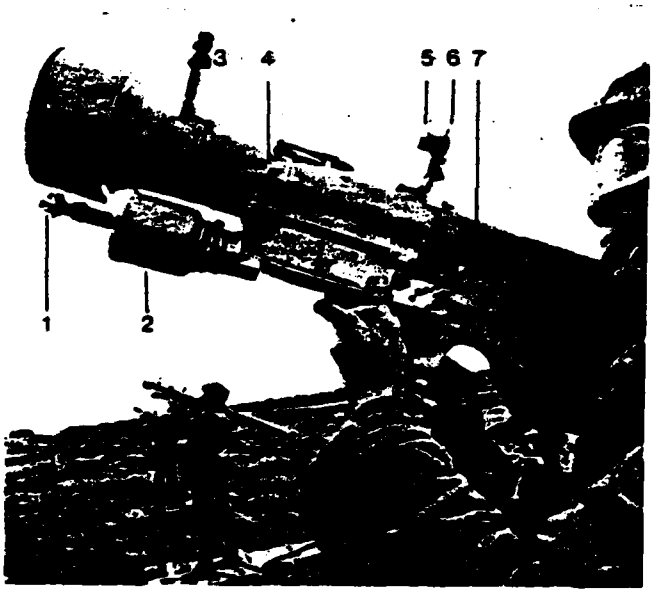

Fig. 2. Men of the Polish assault landing division during training with the SA-7/GRAIL

1. Friction switch 2. External power source 3. Ring front sight 4. Lead indicator 5. Acquisition signal 6. Rear sight 7. Safety lever

The main difference between the two versions is the improved propulsion of the MOD 1 of the SA7b, by which its speed and effective range have been considerably increased.

In addition to the combat version of the weapon, which is painted green, the Warsaw Pact forces use two training versions: a silver-gray dummy version and a yellow practice version. While the dummy version of the actual weapon is the same only in its external appearance, the practice version is just like the combat model except for the missing combat propulsion and the explosive. Therefore, every function can be practiced except for the launch.

The main parts of the SA-7/GRAIL which weighs about 15 kg, are as follows:

--the guided missile with IR homing device /519
--the launch tube with sighting device and target acquisition indicator

--the reusable launch device, and
--the external power source.

The guided missile has a length of 1.40 m, a diameter of 70 mm, and a weight of 9.2 kg, 2.5 kg of which is for the warhead including the IR homing device. The passive IR homing device operates in the medium IR range (about 10^{14} Hertz), that is, especially for heat radiation from aircraft and helicopter power plants. Consequently, airplanes as a rule can be combatted only at close range, therefore, after the pass. The control signas of the homing device are transmitted to two pairs of control and stabilizer fins located behind the homing device and the end of the missile. Propulsion for launch and cruise is supplied by solid-fuel engines. The cruise engine imparts a speed of 1610 km/hr to the GRAIL guided missile and an effective slant range of 3220 m, a cruising speed of 2090 km/hr (1.55 Mach) to the GRAIL MOD 1 and an effective slant range of 4830 m. To protect the AA missilemen, the fuze of the warhead is activated 45 m into the trajectory. After a flying time of about 12 sec after propulsion is cut off, the missile is exploded by a self-destruct mechanism.

The guided missile is rigidly connected with the 1.45-m long launch tube until launch; the tube is made of glass fiber reinforced plastic and is provided with two breech covers. The lead indicator, the ring front sight, and the rear sight fold down and are mounted on the launch tube; a target acquisition signal, a green lamp, is located on the mounting of the rear sight. A projection in the front lower part of the launch tube accommodates the external power source and also serves as a support for the launch mechanism. There are also two supports for the carrying strap on the tube.

The reusable launch mechanism is connected with the tube by 24 plug contacts in the SA-7a, and by 28 within the SA-7b, and the connection is secured by a bolt. It contains the safety device and the trigger.

The external power source consists of a thermal battery, which is activated by turning the externally mounted friction switch. It provides the IR homing device with current until its detectors have acquired the thermal radiation of the aircraft. From that point on, the internal power source of the missile takes over the supplying of power. Since the external power source functions about one minute... /text ends here/...

Fig. 3. NVA personnel with dummy model of the SA-7/GRAIL during combat training.

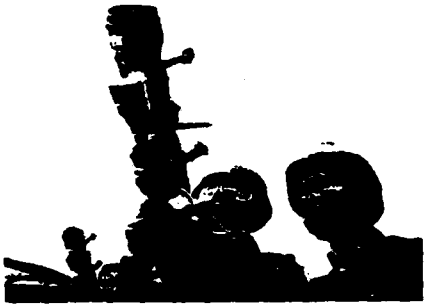

Fig. 4. Soviet artillerymen with the practice model of the SA-7/GRAIL during target training

Fig. 5. Employing the SA-7/GRAIL from a BMP armored personnel carrier of the Soviet armored infantry troops

Fig. 6. CVA personnel with dummy model of the SA-7/GRAIL during parade in Prague

Fig. 7. SA-7 training compartment of the NVA

Fig. 8. Polish SA-7 gunner with IFF (?) device on helmet


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