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IRIS-T



Mockup of the IRIS-T

Type	Short-range air-to-air missile
Place of origin	Italy, Germany, Sweden, Greece, Norway, Spain
Service history	
In service	December 2005
Used by	See operators
Wars	Russo-Ukrainian War
Production history	
Manufacturer	Diehl Defence , Avio spa , Litton Italia, Leonardo S.p.A. ^[1]

Unit cost	€140 million (complete battery, FY 2022) ^[2] €380,000 ^[3] (~US\$430,000) for a missile
Specifications	
Mass	87.4 kg (193 lb)
Length	2.94 m (9.6 ft) ^[4]
Diameter	127 mm (5.0 in)
Wingspan	447 mm (17.6 in)
Warhead	HE/Fragmentation
Detonation mechanism	Impact and active radar <u>proximity fuse</u>
<hr/>	
Engine	Solid-fuel rocket
Operational range	25 km (16 mi) ^[4]
Flight altitude	Sea level to 20,000 m (66,000 ft)
Maximum speed	Mach 3
Guidance system	<u>Infrared homing</u>
Launch platform	<u>Typhoon</u> , <u>Tornado</u> , <u>F-4 AUP</u> , <u>F-5 Super Tigris</u> , <u>F-16V</u> , <u>EF-18</u> , <u>NASAMS</u> , <u>Gripen</u> , <u>M-346</u> .

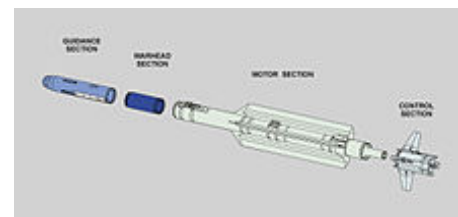
The **IRIS-T (InfraRed Imaging System Tail/Thrust Vector-Controlled)** is a medium range infrared homing air-to-air missile available in both air-to-air and ground defence surface-to-air variants. It also is called **AIM-2000**.^{[5][6]}

The missile was developed in the late 1990s–early 2000s by a German-led program to develop a short to medium range infrared homing air-to-air missile to replace the AIM-9 Sidewinder in use by some NATO member countries at the time. A goal of the program

was for any aircraft capable of firing the Sidewinder to also be capable of launching the IRIS-T.^[7] The air-to-air variant was fielded in 2005.

Surface-to-air defence systems variants came later, with the short-range **IRIS-T SLS** fielded in 2015, and the medium-range **IRIS-T SLM** fielded in 2022. One IRIS-T SLM battery, as supplied by Germany to Ukraine, consists of three truck-mounted launchers, carrying eight missiles each (with a range of 40 kilometres or 25 miles), and a separate command vehicle that can be positioned up to 20 kilometres (12 mi) away. The command vehicle integrates multiple radar sources, and is able to launch and track all 24 missiles simultaneously. The IRIS-T SLM can counter surface-to-air missiles and cruise missiles, including low-flying, stealthy missiles such as the Kalibr.^[8]

History



Subassemblies of the IRIS-T



German Air Force airmen mount an IRIS-T to a Eurofighter

Background

The roots of the ASRAAM date back to 1968 when development began on the Hawker Siddeley SRAAM ("Taildog"). This project ended in 1974 with no production orders. This work was dusted off for the UK–German effort, with the Germans providing a new seeker, and the UK providing most of the remaining components.

After German reunification in 1990, Germany found itself with large stockpiles of the Soviet Vympel R-73 missiles (NATO reporting name: *AA-11 Archer*) carried by the MiG-29 Fulcrum and concluded that the AA-11's capabilities had been noticeably underestimated.^[9] In particular, it was found to be both far more maneuverable and capable in terms of seeker acquisition and tracking than the latest AIM-9 Sidewinder.^[10] In 1990, Germany withdrew from the ASRAAM project, while the UK resolved to find another seeker and develop ASRAAM according to the original range requirement.^[11] This ultimately led to the ASRAAM gaining a significantly more capable 128×128 focal array seeker with IRCCM (infrared *counter countermeasures*) capability, similar performance and notably half the unit cost of the IRIS-T due to the development work that had already been completed on the missile body.

In 1987, after years of silence on the program, the US proposed a requirement that the weapon must use Sidewinder rails rather than the universal aircraft rail adaptor named the Missile Support Unit that had been developed. This delayed the project by one year as the British, German and Norwegian proposals were redesigned. Fearing erosion of its industrial base, the US proposed it would choose the latest version of its existing Sidewinder design with increased maneuverability and IRCCM unless the European partners increased the US industrial workshare,^[12] designated AIM-9X.^[13] However, the Sidewinder upgrade proposal failed to interest NATO buyers and, in 1992, the missile development programme ultimately separated with the UK the ASRAAM, France the MBDA MICA, US the AIM-9X and Germany electing to restart development on what became the IRIS-T.

Development

In 1995, Germany announced the start of the IRIS-T development, in collaboration with Greece, Italy, Norway, Sweden and Canada. Canada later dropped out, while Spain joined as a procurement partner in 2003.^[14] The German Air Force took first delivery of the missile in December 2005.^[15]

The respective share of the development of the IRIS-T are:^[1]

- Germany 46%
- Italy 19%
- Sweden 18%
- Greece 13%
- 4% split between Canada and Norway.

Missile characteristics

In comparison to the AIM-9M Sidewinder, the IRIS-T has higher ECM resistance and flare suppression.^[16] Improvements in target discrimination allow for five to eight times longer head-on firing range than the AIM-9M. It can engage targets behind the launching aircraft, made possible by extreme close-in agility, allowing turns of 60 g at a rate of 60°/s via thrust vectoring and LOAL capability.^{[17][4]}

The IRIS-T is able to intercept fast-moving and miniature targets, such as air-to-air/surface-to-air missiles and air-to-surface/surface-to-surface missiles and rockets, UAV/drones, and cruise missiles. To improve the probability of a direct hit, the missile is equipped with an active radar proximity fuze.^[18]

The IRIS-T has the unique ability, in comparison to other similar missiles such as the AIM-9X, to target and shoot down other air-to-air and surface-to-air missiles, thus offering a 360° defence capability.^{[19][4]} Surface launched variants of the IRIS-T, the IRIS-T SLS and IRIS-T SLM, have enhanced capabilities to destroy aircraft, helicopters, cruise missiles, air-to-surface missiles, anti-ship

missiles, anti-radar rockets and large-calibre rockets. They have a high probability of a killing shot against UAVs and other small manoeuvring threats at very-short and medium-range distances.^[20]

The Royal Norwegian Air Force (RNoAF) has tested a new air-to-surface capability developed by Diehl BGT Defence for the IRIS-T. A proof of concept test firing to acquire, track, and engage a target representing a small fast attack boat was conducted in Norway in September 2016, where the IRIS-T missile was launched from an RNoAF F-16AM multirole aircraft. For the air-to-surface role, the missile retains the same standard IRIS-T AAM hardware configuration, including the HE warhead and IIR guidance package, with only an updated software insertion required to deliver the additional ground attack capability.^[21] This basic air-to-ground capability provides the ability to acquire, track and engage individual ground targets like boats, ships, small buildings and vehicles.^[22]

Variants

IDAS

Main article: IDAS (missile)

The IDAS variant is a navalized version of the missile, and is also being developed for the new Type 212A submarine of the German Navy. IDAS is supposed to engage air threats, small or medium surface vessels or near land targets.

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A model of the IDAS



An IDAS and a Barracuda torpedo at the TechDemo'08 Exhibition, 2008

Surface-to-air



Wikimedia Commons has media related to IRIS-T SAM.

As a part of the NATO MEADS program, the German Air Force and others are now using a surface-launched (SL) radar-guided version of the missile, called **IRIS-T SL**. It has a pointed nose, unlike the regular IRIS-T, with a jettisonable drag-reducing nose cone. The missile uses a GPS-aided inertial navigation system, with radar data link for command guidance during the initial approach. The interference-resistant IR seeker head is activated at the terminal stage.^{[23][24]}

Compared to the IRIS-T, the diameter of the rocket motor was increased by 25 mm, to 152 mm. Test launches from a battery consisting of a CEA CEAFAR radar, a Diehl IRIS-T SL launcher and an Oerlikon Skymaster battle management system were performed in 2014.^[25] The IRIS-T SL qualification tests were completed in January 2015 at the Denel Overberg Test Range in South Africa.^[26]

By 2022, two variants were available: IRIS-T SLS (short-range) with 12 km range and altitude and IRIS-T SLM (medium range) with 40 km range and 20 km maximum altitude. A third variant, IRIS-T SLX (long range) variant with a dual-mode (IR and RF) seeker, a range of 80 km and a maximum altitude of 30 km, is in development as of April 2022.^{[27][28]} Operational testing of the IRIS-T SLM was completed in January 2022.^[29]

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An IRIS-T SL missile

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A Bv 410 with Giraffe 1X radar and Diehl ML-98 IRIS-T SLS launcher

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A MAN SX44 6x6 7-ton IRIS-T SL launcher

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A MAN SX45 8x8 10-ton IRIS-T SLM launcher

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A MAN SX45 8x8 10-ton IRIS-T SLM launcher rear

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A Hensoldt TRML-4D radar

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A CEA CEAFAR (GBMMR) radar

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The Thales Ground Master 200 MM/C radar

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A Hensoldt TwInvis passive radar

In 2019, the Swedish Army fielded a ground launched version of the IRIS-T SLS, designated *Luftvärnsrobotsystem 98* (lvrbs 98), to replace the RBS 70 missile system. Four missiles are carried on Eldenhet 98 (elde 98) launcher, a special version of a Bv 410 tracked, armored vehicle, with Saab Giraffe 1X electronically scanned radar integrated in the front car.^{[30][31]}

The Norwegian Army ordered the "Mobile Ground Based Air Defence System", based on NASAMS command and control solutions, in a direct acquisition with Kongsberg Defence & Aerospace.^[32] The system will integrate tracked IRIS-T SLS launchers from Diehl Defence GmbH with High Mobility Launchers for AIM-120 and AIM-9X missiles and radars from Weibel Scientific; initial delivery is planned for 2023 and will include six modified M113 vehicles carrying IRIS-T SLS missiles, while additional launchers will be based on the ACSV.^[33]

IRIS-T SLM can be integrated with a variety of electro-optical/infrared (EO/IR) guidance systems and AESA radars, such as Hensoldt TRML-4D, Thales Ground Master 200 MM/C, CEA CEAFAR, and Saab Giraffe 4A.^[18] A version with a Lockheed-Martin Skykeeper command and control station,^[34] Giraffe 4A radar and Diehl IRIS-T SLM launcher was shown at IDEX 2019 under the name Falcon Ground Based Air Defence.^{[35][36][37]}

Egypt ordered Diehl IRIS-T SLM launchers, Hensoldt TRML-4D radars, and fire and control stations equipped with Airbus Defence Fortion IBMS^[38] integrated battle management software, all mounted on MAN 8×8 military trucks; the deal was approved by the German government in December 2021.^[39] Further orders includes Hensoldt TwInvis passive radars,^{[40][41]} IRIS-T SLS launchers and IRIS-T SLX long-range missiles.^{[42][43][27]} Passive radars can detect enemy aircraft by analysing reflections from external radio and television signals, making them effective in urban areas where active radars struggle.^[44]

The German Air Force will receive its First IRIS-T SLM system in 2024 and five more by 2027. Also mixed SLS/SLM systems are being planned.^[45]

Air-to-surface

For the air-to-surface role, the only difference from air-to-air version is an updated software insertion required to deliver the additional ground attack capability. Tested by Royal Norwegian Air Force.^[46]

Operational usage

On 19 October 2022, Ukrainian sources stated that an IRIS-T air defense system had shot down a Russian missile in Chernihiv Oblast, thirty kilometers from Kyiv. Photos of the wreckage of a IRIS-T missile were shared on social media, and



Ukrainian President Volodymyr Zelenskyy has said that IRIS-T "is a really effective system" and "has shown itself very well", but there was no evidence that the German IRIS-T SLM shot down that particular missile, and some Ukrainian sources stated that it had been shot down with a different system.^[47]

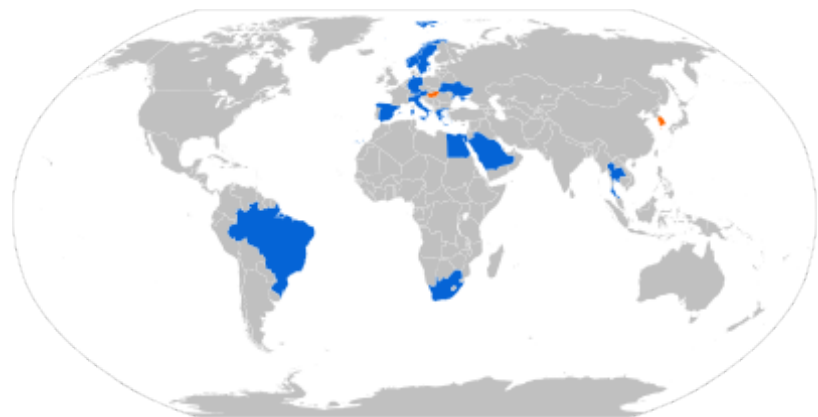
IRIS-T system deployed in Ukraine

Following another Russian missile attack against Ukraine on 31 October 2022, the Ukrainian Air Force stated that IRIS-T missiles had a 100% success rate countering the attack.^[48]

On 15 November, footage appearing to show the IRIS-T system shooting down two cruise missiles circulated. One missile appeared to be a Kalibr cruise missile.^{[49][50]}

On 7 June 2023, a Ukrainian TRML-4D multi-functional radar from an IRIS-T SLM air defense system was taken out of action by a Russian ZALA Lancet loitering munition.^[51]

Operators



Current operators
Future operators

The following operators are listed and defined as of October 2022.

 **Austria**
25^[52]

 **Brazil**
IRIS-T missiles for the new Saab JAS 39 Gripen E/F variants.^{[53][54]}

 **Egypt**

 **Germany**

1,250 missiles^[52] 8 SLM Systems and additional SLS systems planned.

 **Greece**

350 IRIS-T missiles^[52]

 **Italy**

 **Norway**

150 IRIS-T missiles^[58]

 **Saudi Arabia**

1,400 IRIS-T missiles^[59]

 **South Africa**

25 IRIS-T missiles delivered as interim armament for Saab JAS 39 Gripen aircraft until the completion of the A-Darter SRAAM project.

 **Spain**

770 IRIS-T missiles. Original budget €247m, final cost €291m.^[3]

 **Sweden**

450 IRIS-T missiles, designated *Jaktrobotssystem 98* (jrbs 98).^[52]
IRIS-T SLS variant used in ground-based air defense systems.

 **Thailand**

220 IRIS-T missiles ordered.^[58] to be integrated with F-5T, Gripen C/D, and F-16 eMLU.^[62]

 **Ukraine**

4 IRIS-T SLM Systems delivered from Germany, 2 delivered since October 2022. On 13 May 2023 the Germany Defence Ministry announced four more systems would be sent to Ukraine.^{[63][64]}

Future operators

 **Hungary**

IRIS-T integration for Hungarian Saab JAS 39 Gripen MS20 Block II modernization program was ordered in December 2021.^[65]

 **South Korea**

IRIS-T integration for the KF-X fighter program was ordered in 2018.^[66] With the first test firing taking place in April 2023.^[67]

 Latvia  Estonia^[68]

In May 2023, the Latvian and Estonian governments announced their decision to jointly procure the IRIS-T SLM systems, with deliveries expected in 2025.^[69]

See also

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Further reading

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External links



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