

Integrated Self-Protection System Plug-on-Device

The flexible Helicopter Self-Protection Solution



1. Integrated Self-Protection System Plug-on-Device: ISSYS POD

The Integrated Self-Protection System (ISSYS) alerts helicopter crews to imminent threats, and deploys effective countermeasures for both ground and air-based attacks. ISSYS accomplishes this by detecting a broad spectrum of radar and laser threat emissions, as well as UV emissions from approaching missiles. Between 2 and 16 modern chaff and-flares are then deployed to decoy and neutralise approaching threats. ISSYS also supports custom user-programmed threat libraries.

Due to the larger scope of missions, the proliferation of missiles and the danger of becoming a target during a mission, equipping helicopters with self-protection solutions has become increasingly important over the past few years. Previously, the adoption of a self-protection solution was equivalent to the introduction of a fully-integrated solution. Besides the extensive lead time and the comprehensive recertification process involved in the integration, a part of the fleet would not be available for missions during this period. Furthermore, once integrated, the system cannot be used on another platform.

For these reasons, Electronic Warfare (EW) solutions were rarely used in older (protection of investment) or smaller helicopters, or in cases where self-protection was needed for just a few missions. Scenarios in which different platforms occasionally required self-protection are also not covered by fixed integrations. This is where ISSYS POD comes in.

It is inherently versatile: using specially designed Plug-on-Devices (POD) mounted on aircraft hard points, ISSYS can be installed within 30 minutes by just two people. This enables easy sharing across different platforms, including those no longer compatible with fixed installations, and enables equipping platforms with ISSYS on a per-mission basis. EASA certification is available for the use of ISSYS POD on civil and special mission helicopters, e.g. for protecting air ambulances, while military helicopters are certified by the responsible authorities.

ISSYS POD is a solution provided by RUAG Aviation and Saab, and can be custom-equipped with radar-warning function (RWS-300), laser-warning function (LWS-310), missile-approach warning function (MAW-300) and countermeasure-dispensing function (BOP-L Series). The system consists of two POD devices for mounting onto the helicopter hard points or a weapon carrier. The modifications of the helicopter itself are minimal. Most of the weight of the EW solution is concentrated in the ISSYS POD, which can be easily removed and reattached.



ISSYS POD mounting options

The ISSYS POD is a member of RUAG Aviation's ISSYS product family, and addresses the markets where a fixed integration of the self-protection suite is not an option. The POD requires a limited partial integration into the helicopter, thereby retaining the same outstanding performance as ISSYS, the fully integrated version of the self-protection solution. The POD can be easily exchanged between different helicopters and platforms on a per mission basis.

ISSYS POD can be flexibly configured according to customer requirements:

- The basic POD comes with 4 or 5 missile approach warning sensors and requires only a Control Display Panel (CDP) to control the POD operation. The CDP can be temporarily or permanently mounted into the cockpit (for example in the centre console).
- Flare dispensation can be performed fully autonomously by the POD. Due to the ease of use, this version is particularly suitable for the civilian and paramilitary market; the effort for the system introduction, staff training and daily operation is limited to the absolute minimum. As only a very limited integration into the platform and a relatively simple recertification are required, this solution offers utmost flexibility and a very fast introduction in case of urgent demand.
- The enhanced POD can be equipped with sensors for radar and laser threats, and is equipped with a threat display to provide pilots with full control and in-depth information about threats. The enhanced POD offers the same functions as a fixed integration while requiring only partial integration.

In case the mission type or the threat environment changes, ISSYS POD can be easily upgraded to the required sensor configuration.



ISSYS POD left and right side units

All POD variants are equipped with one countermeasure dispenser per side. The dispensers can be flexibly implemented for chaffs or flares, or a combination of both. The dispenser orientation can be defined before production to meet customer's requirements.

The elevation angle of the sensors can be changed using a modified sensor field during the production of the POD.

The interface between the POD and platform is very simple: the basic POD is powered by the platform via a breaker panel. The Control Display Panel (CDP) can be mounted into the cockpit without being integrated into the avionics system of the platform. A platform-specific interface adapter is used to attach the POD units to the platform hard points or to a station on the weapon carrier. The integration

with the audio system and the indication lighting control (dimming bus) can be performed. A threat display in 3ATI form factor mounted in the cockpit provides the same threat visualisation known from fixed integration solutions.

Depending on customer requirements the POD relies either on its integrated auxiliary systems, or on a tighter integration that is also possible.

The POD provides information on platform orientation and movements, date and time as well as airspeed (for meaningful recordings) – enabling it to be operated independently from the platform. Each POD unit is equipped with a Safety Disarm Unit: the safety features are equivalent to those known from fixed integrations. The POD on the left side of the helicopter comes with a System and Interface Panel offering basic control at the flight line.

The ISSYS POD is designed to meet the same standards as the helicopters it is intended to be used with. This includes that the POD can be operated in a wide range of environmental conditions. Military certification is carried out according to the local requirements.

The complete ISSYS POD kit can be stored in two carrier boxes, allowing air transport as well as storage in harsh environments. The kit also includes a ruggedized notebook computer used for the management of the ISSYS POD system.

The installation can be performed at the flight line by 2 persons in less than 30 minutes, requiring just simple standard tools and mounting material. “Full sensor covers” can be attached to the POD units to protect the sensors during handling. The full sensor covers have two handles each, enabling safe lifting and mounting of the POD units. After the POD units are mounted onto the helicopter, and when the helicopter is prepared for a mission, the sensor covers can be removed without tools.

Depending on local requirements, a mounting aid available from RUAG can be used.



Storage and Handling – carrier box and full sensor cover

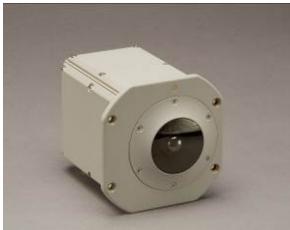
The operation principles are very similar to the ones known from fixed integrations, thus minimising training effort. Tasks at the flight line include starting-up and self-testing the system, downloading the Operational Computer Program and User Data File as well as uploading recordings and system health information.

System tests with “missim”, RUAG’s 4-in-1 test solution for all self-protection sensors, “CAST-easy”, an electronic flare simulator for easy and eco-friendly dispenser testing, Zero Volt tests and subsequent loading of the chaff-and-flare dispensers are conducted in the same way as with a fixed integration self-protection system. The safety measures are equal. During the course of a mission, no relevant distinction can be made to the operation of an integrated system.

2. POD System Characteristics

- Modular architecture, low number of least replaceable units
- One compact Electronic Control Unit (ECU) interfacing directly to all sensors and the dispensers
- Missile approach warning: UV-C based. Spatial coverage of 360° azimuth with 4 sensors. Full downward looking coverage with 5 sensors
- Optional Laser warning: 0.85 – 1.7 μm, threats covered are GaAs, NdYag, Raman Shifted NdYag and Erbium Glass Lasers
- Optional Radar warning: 0.7 – 40 GHz (pulsed), 0.7 – 18 GHz (CW)
- Countermeasure dispensing: BOP-L 39 for chaff and flares
- Auxiliary Systems – allowing self-contained operation
- Control Display Panel and (optional) 3ATI Threat Display

3. Missile Approach Warning



The missile warning function is based on the MAW-300 sensor. It offers a unique optical design with filters, purpose-built image intensifier tubes and photon-counting focal-plane array processors, and ensures high sensitivity equating to long detection range. Each sensor uses a dedicated digital signal processor to ensure optimal utilisation of information in real-time. Digitising and pre-processing functions are performed at the detector using an advanced focal-plane processor.

The sensor’s data is transferred to a dedicated digital signal processor (MAW Controller) resident in the Electronic Control Unit (ECU), which performs equalisation, segmentation and feature extraction. The sensor processors can detect and process multiple potential targets. It passes the spatial and temporal feature data to the processor card in the ECU, where spatial data is integrated with real-time Inertial Navigation System (INS) information to compensate for platform movement, attitude and altitude. The MAW Controller then executes neural net pattern recognition algorithms to ensure accurate operation with very low false alarm rates.

4. Laser Warning



The laser warning function bases on LWS-310 sensors and a processor card in the ECU.

It features high sensitivity, excellent threat coverage and exceptional Probability of Intercept (POI) for single as well as multi-pulse emissions. A unique feature of this system is that it not only classifies laser emissions but also can also identify laser emissions based on a user-programmable threat library.

5. Radar Warning



The radar warning function is performed by compact radar warning sensors, front end receivers generating video signals for further analysis and dedicated processing cards in the ECU.

It offers wide band operation, high sensitivity and a high probability of intercept. Radar threats can be defined in the threat library.

6. Countermeasures Dispenser



The two BOP-L 39 dispensers are controlled by the chaff-and-flare dispenser controller residing in the ECU. The main operation mode is automatic dispensing upon threat identification. Semi-automatic and manual firing as well as jettison of all payloads is also possible. User-defined dispensing sequences are executed per identified threat. These sequences are defined in the threat library and can be uploaded to the system on the flight line.

The dispensers can be loaded with 1" x 1" or 2" x 1" pyrotechnical payloads – the mixture of chaff and flare can be defined by the customer. Besides the usual NATO standard flares the new 2-in-1 1" x 1" cartridges containing two flare payloads within one case are supported.

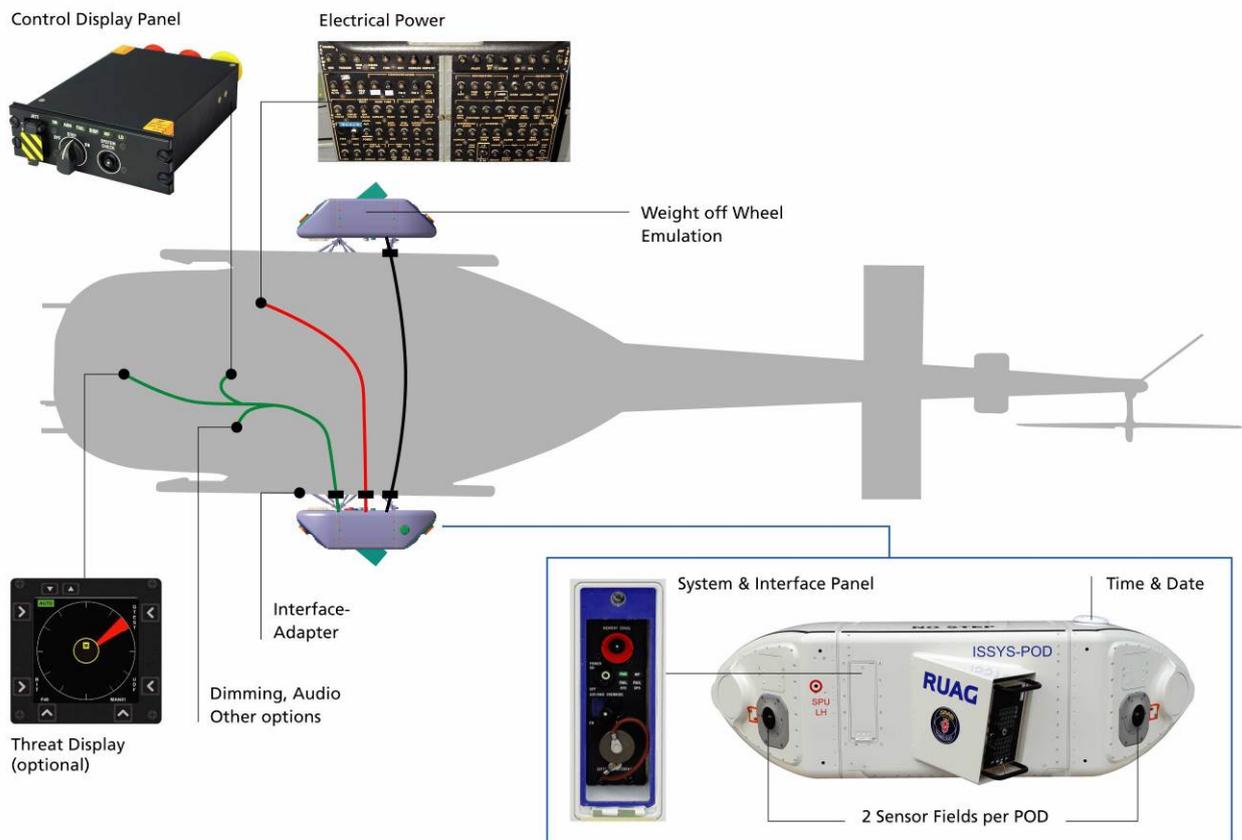
7. POD Solution

The POD solution comprises all functions that together provide self-protection and offer all necessary services around the EW system and the minimal integration into the platform.

The following building blocks are required:

- 2 POD units, with the EW system and auxiliary units providing user interfaces like the System & Interface Panel. In case of civil applications, this also includes a "safe altitude" function.
- The typically very simple and cost-efficient platform pre-integration provides electricity for the POD system, space for the CDP and additional optional interfaces to, for example, the dimming bus or the audio panel. All POD solution Line Replaceable Units (LRUs), including the ones in the cockpit, receive power from the ISSYS POD harnesses; there is no need to provide power separately.
- The dimming bus integration is performed only once and can be used for the CDP and the Threat Display. All signals needed for the different integration options are provided at a harness connector. Overall, effort is minimal and weight added by the pre-integration is a mere (approximately) 11 kg.
- The interface adapters can easily be attached and removed from the platform. The adapters use existing hard points of the platform and can either be used for the POD only, or, for example, also to mount a machine gun. If the outer stations of weapon carriers can be made available, the POD units can be mounted to these weapon stations using a very simple interface.

Short platform external harnesses connect the POD units to the bulkhead connectors on the platform. Depending on the platform and the customer's preferences, the POD harness can be kept external or be integrated into the platform using the short external harnesses mentioned above.



ISSYS POD Solution Diagram – platform pre-installation and functional overview

The auxiliary units provide the following functionality:

- Provision of inertial navigation data: the Electronic Control Unit (ECU) uses the attitude information for the threat discrimination process.
- A built-in GPS system provides date and time for use in meaningful recordings (threat data and other parameters).
- In civil applications a built-in RADALT (radar altimeter) provides a “safe altitude” safety interlock. For military applications the POD system is prepared to interface to the platform’s ‘weight off wheel signal’.
- Safety Disarm Units with safety pins at both POD units.

The System and Interface Panel (SIP) implements the flight line user interface and provides essential control and status indicators as well as an interface to a computer. This interface is used for downloading the Operational Computer Program and the User Data File (threat data and dispensing programs) to the ECU and to retrieve recorded data, such as threat and system health data, from the ECU for further processing.

8. Control Display Panel

The Control Display Panel (CDP) is available in several off-the-shelf variants catering for the different requirements of civil and military customers. All variants contain ISSYS POD mode control (OFF / STANDBY / AUTO) and provide a guarded jettison push button. Indicators for FAIL, ON, ARM and DISPENSE are also standard. Optional control elements include a dispensing mode selector (BOTH SIDES, LEFT or RIGHT) and buttons for manual dispensing. The ASN is available for a QAR installation or STC design for a specific aircraft type. Over the years RUAG has regularly extended the activities and network. Customers from all over the world appreciate our broad expertise and excellent reputation in the aviation industry.



Control Display Panel variants

9. 3ATI Threat Display

The 3ATI threat display provides detailed threat information such as type, direction as well as the relative lethal range (radar threats) for the aircrew. The crew can control the functions of the POD. Its small size also enables integration into smaller cockpits.

An integration with a Multifunction Display or a Head-up Display can be conducted upon request.

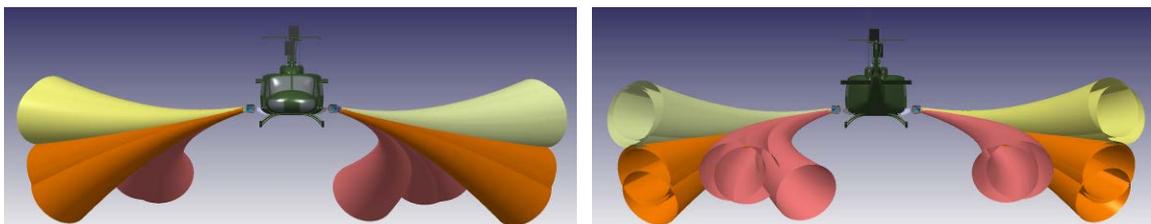


3ATI Threat Display

10. Aircraft Integration

ISSYS POD can be flexibly used on essentially any helicopter type. Prerequisites are that the helicopter must possess hard points and a suitable amount of free space in the cockpit.

Each helicopter expected to require temporary or permanent self-protection has to be prepared for use with ISSYS POD.



Flare trajectories

The following very limited preparations are required:

- Installation of bulkhead connectors (e.g. at prefabricated entry points) and fuselage harness into the cockpit. The harness must at least be connected to the platform breaker panel to obtain power supply (28 VDC) for the POD. The harness must also be routed to the CDP mounting position. The CDP is installed in a standard slot using DZUS mounts. The harness already provides the CDP power supply; a separate power connection at the CDP is not required.
- Fixed bulkhead connectors (e.g. at prefabricated entry points) and fuselage harness between both sides of the helicopter. This harness is used to connect the right and left side POD units to each other.
- The helicopter has to provide suitable hard points or stations at the weapon carrier. RUAG Aviation is prepared to design, produce and certify standardised or customer-specific interface adapters for any helicopter platforms.

The following preparations are optional:

- The POD system is prepared for the integration with the aircraft dimming bus and audio system. As the POD - cockpit harness is already prepared, the integration is straightforward.
- A 3ATI threat display can be mounted at a suitable location in the cockpit; the POD – cockpit harness already provides all required signals, including power supply.
- If a platform is to be equipped with a dispense button on the cyclic stick, the integration is easily performed as all CDPs support external dispense buttons.

A deeper integration is always possible – the system is specifically developed to provide as easy and cost efficient an integration as possible.

11. Test Support Equipment

RUAG Aviation offers the complete test and support equipment needed to operate and test the POD.

11.1 missim – the only 4-in-1 test solution for all self-protection sensors

The POD’s internal testing is performed using its comprehensive built-in self-test. Using missim, our 4-in-1 test solution for all self-protection sensors, the threat recognition capability of ISSYS POD can be tested immediately prior to the start of the mission. missim can be programmed with generic or customer-specific threats. If the POD is not equipped with a threat warning display, the tests can be performed using a test magazine. A Zero Volt test is usually conducted before loading chaffs and flares into the dispenser. With the EW Data Management System software, the threat definitions and the countermeasure actions for the POD system can be defined. Additionally, a post-flight analysis of the recorded data is provided.



missim – the 4-in-1 test solution for all self-protection sensors

11.2 CAST-easy – the electronic flare simulator for easy dispenser testing

A universal replacement of standard chaff-and-flare cartridges for training purposes in the air, on the ground and in labs. CAST-easy simplifies self-protection training of dispenser units: it can be reset at the push of a button, with the dispensing method clearly visible. Reusable with an unlimited shelf life, CAST-easy is cost-effective and easy to use, with no maintenance required.

CAST-easy is RTCA/DO-160G and partly MIL-Std-810G airworthiness certified. It contains no pyrotechnics, which enables deployment on many different systems and without geographical or safety restrictions, as well as independence of ITAR restrictions.



CAST-easy – the electronic flare simulator for easy and eco-friendly dispenser testing

12. EW System Installed Base

Customers worldwide rely on products from the ISSYS product family. Due to its excellent performance and highly flexible design, the Saab EW system has been installed by both RUAG Aviation and Saab on many aircraft types ranging from helicopters to transport aircraft and fighters. The installed base includes the helicopters Eurocopter Puma / Super Puma / Cougar family, Westland Lynx, Agusta A109, Boeing CH47, NH90, Hindustan Aeronautics ALH, the Transport A/C C-130 B and the fighters Hawk 100 and SU-30.

13. Partial Integration, Maintenance, Repair and Overhaul

RUAG Aviation is a reputable and highly-experienced market partner in the field of EW platform integration, maintenance, repair and overhaul for a wide range of platforms and equipment types.

RUAG Aviation is your partner for partial integration of the ISSYS POD as well as for MRO.

14. Performance and Specification Data

Missile approach warning:

- UV-C based
- 110° conical FOV for a single sensor
- Typical detection range of 5 km
- Identification, tracking and prioritisation of minimum 10 threats simultaneously

Radar warning:

- 0.7 – 40 GHz (pulsed)
- 0.7 – 18 GHz (CW)

Laser warning:

- 0.85 – 1.7 μm
- Threats covered are GaAs, NdYag, Raman Shifted NdYag and Erbium Glass Lasers
- Tracking and displaying of minimum 8 threats

Countermeasure Dispensers:

- One dispenser per side with each 39 1" x 1" or 19 2" x 1" NATO standard ammunition
- Mixtures of chaff and flare are supported
- 2-in-1 1" x 1" cartridges (two flare payloads fitted) are supported

Power supply (from helicopter):

- +28 V DC power (Range 24.0 V to 29.0 V)
- Power Consumption 350 W (MAW only) to 500 W (all 3 sensor types), additional 380 W while dispensing on both sides

Weight:

- 96 – 130 kg: complete system without chaff & flares (depending on POD configuration)
- Pre-integration material that remains in platform: approx. 11 kg

Dimensions:	1280 x 380 x 490 mm (L x H x W)
Colour:	depending on customer requirements
Environmental:	certified according to DO-160E

Certification:

- Military certification depending on customer requirements
- Civil aviation certification according to EASA on customer request

The self-protection related performance of ISSYS POD is identical to the one of the fix ISSYS integration. The weight of the POD is comparable to the weight of a complete fixed integration including harnesses and structural reinforcements.

15. Scope of Supply

ISSYS POD system:

- Right side POD unit (with chosen sensor configuration, radar altimeter and dispenser)
- Left side POD unit (with chosen sensor configuration, controller ECU, System and Interface Panel and dispenser)
- Ruggedized laptop computer with POD Maintenance Software
- Mounting tools and consumption material
- Documentation

Platform specific material:

- Interface Adapters "right side" & "left side" for selected helicopter platform
- POD – POD harness – platform external parts
- POD – cockpit harness – platform external part

Platform upgrade material:

- Control Display Panel CDP (several variants are available, customer specific versions can be provided on request)
- POD – POD harness – platform internal part
- POD – cockpit harness – platform internal part
- 3ATI Threat Display

The POD cockpit harness provides interfaces to the platform power supply (breaker panel), the CDP and 3ATI threat display as well as the platform dimming bus and audio system. The harness is prepared for a deeper integration of the POD system into the platform.

Optional items:

- EW Data Management System (software)
- missim 4-in-1 flight line tester for sensor testing
- CAST-easy – electronic flare simulator for dispenser testing
- Zero Volt Tester
- Dispenser Tester
- ISSYS POD mounting aid
- Carrier boxes for storage (allowing air transport as well as storage in harsh environment)

ISSYS POD can be equipped with additional sensors should your mission requirements or the threat environment change. ISSYS POD is delivered in a basic version with, for example, 4 missile warners, and can be upgraded to 5 missile warners, 4 laser and 4 radar warners or a subset of these sensors at a later stage.

Design and Integration Services

RUAG Aviation has considerable experience in helicopter upgrades and offers a complete one-stop-shop service package:

- EW System effectiveness & safety analysis
- Design and supply of customer specific interface adapters, harnesses and CDPs
- Platform integration (load analysis, breakers, cables & connector, mechanical integration, threat page integration into multi-function display etc.)
- Civil and military certification
- POD maintenance, repair and overhaul
- EW System maintenance, repair and overhaul
- ISSYS POD upgrades

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