**9LV NAVAL COMBAT SYSTEM SOLUTIONS**

Saab’s 9LV naval combat system solutions offer complete C4I for every type of naval platform, ranging from combat boats and patrol boats, to frigates and aircraft carriers, as well as submarines and vessels for anti-piracy, security and surveillance.

Our 9LV solutions provide naval forces with outstanding operational capabilities, supporting all mission types, from littorals to the open ocean.

Saab’s 9LV naval combat system solutions consist of three different packages to fit your needs and your platform:

- **9LV COMBAT SYSTEM (9LV CS)**
  As the Lead Systems Integrator (LSI) of the complete combat system, Saab will manage the through-life process and reduce any risk. We can also take the role of Prime Contractor (PC), supplying the platform and a fully integrated combat system. The flexibility of 9LV CS allows customers to select best-of-breed products and components regardless of provider – enabling complete freedom of choice.

- **9LV COMBAT MANAGEMENT SYSTEM (9LV CMS)**
  The 9LV CMS is the command and control centre of many advanced surface vessels and submarines. Saab can take full responsibility for the CMS solution, and due to the open architecture of 9LV, Saab can provide subsets of the CMS solution in partnership configurations. A full 9LV CMS configuration includes the Fire Control System (FCS).

- **9LV FIRE CONTROL SYSTEM (9LV FCS)**
  Saab can act as sub-supplier of the FCS, including kill chain components to other onboard CMS. The Saab Fire Control System configurations range from a single EO director connected to a naval gun, to the full anti-air warfare (AAW) and anti-surface warfare (ASuW) self-defence suite for a frigate or destroyer. This includes a combination of guns, missiles and decoys with full automation support.
Saab’s 9LV CMS system is a perfect example of how you can increase your mission capability by enabling flexible and effective operations. The modular and scalable design of 9LV CMS means hardware and software can be adapted to your specific needs and requirements.

The open architecture enables faster, more affordable upgrades, as well as the easy integration of any third-party module. The system’s flexibility also allows any 9LV module to be integrated with equipment from other providers – giving you complete freedom of choice.

Our thinking edge ensures that we can deliver innovative combat system solutions to support you in meeting your goals and aspirations.

Saab has more than 50 years of experience in naval combat systems. Our 9LV solutions have been provided to leading navies around the world, with deliveries to more than 240 vessels.
The 9LV has recently been engineered to meet the demands of smaller platforms, providing powerful capability with a small footprint. It delivers fully integrated situational awareness, along with weapon control and C2 capabilities normally restricted to larger, more expensive systems. For the benefit of smaller vessels, we have introduced new hardware for operator interaction and a system infrastructure that can be adapted to the available space, without loss of capability. It is low weight, easy to integrate and cost-efficient throughout its lifecycle.

At its core, 9LV CMS contains hardware that provides the functionality needed for maritime security missions, while it is also uniquely scalable due to full compatibility with all 9LV technology. Communication solutions, video surveillance and designation of threats to a remote weapon station are a few examples of mission requirements.

The patrol vessel configuration combines full capability with a small footprint. On vessels such as these, the mix of Multi-Function Consoles (MFCs) and smaller interactive devices is decided based on the ship's size and operational needs. The communication suite links the ship to any manned or unmanned assets and the recording capabilities are extended to handle the data collected by the ship's sensors.

The 9LV’s core functionality has also been extended to include fire control capabilities. A typical set-up, depending on the size of the vessel, is a small or medium-calibre gun integrated with the 9LV. It can be controlled remotely and utilised for both air and surface targets. Typical configurations include MSI Seahawk DS30B, Oto Melara Single 40L70 or BAE Systems Bofors 40 mm MK4. The EOS 500 is the tracking source, providing high accuracy tracking data for ballistic computations and gun-laying for air, surface and littoral land targets. The surveillance radar can also be used as the solo tracking source for surface engagements. An interface for designation to a Remote Weapon Station with a dedicated console (Saab’s Trackfire RWS) can also be provided.
9LV technology is able to interface many subsystems, and its architecture readily scales to corvettes and large frigate or destroyer-type vessels. These solutions will typically support a high number of MFCs. They meet the demanding needs of battle resilience through extensive redundancy and physical separation of critical assets.

Medium-sized configurations often focus on one type of mission, such as anti-submarine warfare (ASW) or surface warfare (SuW) using surface-to-surface missiles (SSM). Larger configurations provide a wide range of capabilities and typically include multiple tactical data links and highly automated tactical responses to a range of simultaneous threats, above and below the surface. They also integrate with command support systems to provide the ship with complete C4I capability.

Through our work with 9LV technology and our acquisition of naval platforms specialist Kockums, Saab has vast experience in submarine solutions. Several generations of 9LV technology have been used for submarine CMS and weapon control configurations. 9LV technology has also been used as the platform for advanced integrated sonar systems with multiple operators and sensors.
9LV CMS is designed to meet the needs of every customer.
9LV CMS technology comprises a range of software and hardware components that are designed to fit together in different configurations to meet the needs of all of our customers. All 9LV equipped ships contain a core of components for the I/O interconnections to external equipment, the network and computer infrastructure, and the operator interactive devices and HMI.

In any 9LV CMS, a core feature is to provide a common situational picture. Operators are presented with a single, clear image of the naval domain, graphically presented with chart or map information and tactical overlays. By establishing and maintaining a coherent maritime picture, the 9LV CMS provides a basis for the operator to make informed situation assessments and tactical judgements, based on readiness and priority. The system achieves this through an integrated data fusion process. It generates the picture automatically from received data inputs and allows the operator to interact through a selection of modes, as well as to directly intervene with and override commands. The operator is supported by a situation and anomaly detection function. This automates tasks to allow the operator to focus on tactical decisions.

The architecture includes advanced IT security solutions, and provides support for streaming large amounts of video and recording large and complex amounts of data. It also handles weapon system safety requirements, and supports the real-time requirements of a critical fire control chain. Saab scales each solution to match your vessel’s size and capabilities. For example, the 9LV’s architecture and hardware infrastructure mean it can handle the demands of a complex frigate or destroyer. Alternatively it can be scaled down for much smaller ships that require special consideration due to size, weight and crew limitations.

Saab’s experience in combining functional modularity with modern computer technology has led to the creation of flexible, scalable solutions, with built-in capacity for upgrades and extensions during the entire lifecycle of the ship.
Saab is a leading provider of AAW and ASuW solutions. These solutions range from small electro-optical systems controlling a light or medium-calibre naval gun, to large configurations with multiple guns and surface-to-air missiles (SAM). Enabling rapid reaction times, automated responses, and high precision engagements, Saab provides naval ships with their entire critical self-defence chain.

The 9LV CMS comprises the 9LV FCS capabilities and can reduce the operator’s workload in critical conditions by automating threat evaluation, engagement planning and weapon control during engagements.

Features:
- Coordinates all sensors and weapons (hardkill and softkill)
- Probability-based evaluation
- Cyclic re-evaluation and feedback loop
- Quick response to scenario changes
- Manual/semi-automatic/fully automatic options

Further information regarding the Saab 9LV Fire Control System can be found in our 9LV FCS brochure.
SSM missiles like the Saab RBS 15 are a normal addition to a 9LV system onboard naval ships such as fast attack craft or destroyers. The 9LV system provides the Combat Information Centre (CIC) crew with information from all available sources to prepare and execute the mission. The 9LV situational picture visualises the terrain in littoral environments to assist the operators in finding tactical advantages.

With this addition, a 9LV equipped surface vessel is provided with the capabilities to participate in or lead anti-submarine operations. For a small vessel, a subset of sensor or weapon capabilities can be selected, including links for information exchange with other units. Larger ships benefit from the full 9LV suite of solutions for ASW, through a collaborating force of surface and air units.

Saab provides a wide range of solutions and products for mine warfare, and the 9LV system encompasses the entire portfolio for mission planning, control and evaluation. Saab provides ROV-based mine hunting solutions, as well as solutions for unmanned mine sweeping. Integrated solutions are built by combining mine warfare capabilities with other parts from the CMS portfolio, such as self defence.
With this, a ship can receive total video coverage, where operators have a panoramic presentation, and the opportunity to zoom in and focus in any direction. This is enabled by merging all video from TV and IR cameras, both fixed and moveable. Synthetic information, such as tactical data and track symbols, enhances the presentation. The video presentation can be stabilised to compensate for ship movements, and the presentation parts can handle data recorded by off-board assets such as ROVs or UAVs to further enhance the crew’s situational awareness.

Operations focusing on the subsurface environment can be particularly challenging and require additional support from a CMS. 9LV CMS features advanced data fusion and situation presentation functionality for subsurface operations. Tools are provided to support operators in analysing and presenting the subsurface environment in reality, as well as in planning and training modes.

The 9LV Squadron IP link connects the participating units to provide local tactical information exchange, as well as video and audio communication within line of sight. All units, manned or unmanned, participate in the creation of a synchronised, continually updated situational picture. A larger ship can merge the collected information and relay it to other squadrons or operational headquarters. The system also allows for real-time information exchange with small craft positioned beyond line of sight, through the use of low bandwidth radios, as well as through relaying high bandwidth information from one unit to another, thus extending the coverage of the squadron.
The 9LV CMS features a built-in simulation function which supports command team training. It provides flexible game functions which support a wide variety of training exercises to be prepared and executed in a simulated environment. Sensors and weapons are simulated to provide realistic training for the whole chain, from detection to engagement.

The simulation provides an experience which is almost identical to live operations, except in cases where this would put safety at risk.

A range of system configurations have been delivered to support training, testing, experimentation and development at shore-based facilities. Examples range from full CMS equipment installations that support immersive command team training, to part-task trainers and configurable emulators for an office environment.

The Integrated Training Environment of 9LV supports integration of system-of-system configurations using a wide variety of standards for distributed simulation.

A modern submarine fitted with 9LV is provided with advanced sensor and weapon integration to ensure optimal performance.

This capability package provides unique solutions that are key to providing subsurface situational awareness to modern submarines and their weapon systems.

The 9LV CMS has hardware and software tailored specifically for submarine environments and operational requirements.
LONG-TERM SUPPORT

DEFINING A COMBAT MANAGEMENT SYSTEM SUPPORT AGREEMENT

A long-term support agreement is defined by your specific operational requirements, system availability and existing maintenance organisation. The support agreement outlines the parameters for long-term support. As part of our long-term support commitment for 9LV CMS, Saab can take full responsibility for all the delivered systems after the system delivery warranty has expired. The undertaking will be governed by a long-term support agreement covering the systems in the delivery. Due to the variances in the scope of 9LV CMS, the long-term support agreement will be tailored according to customer-specific requirements.

The agreement typically spans five years for the first operational vessel and gives you a main point of contact at Saab for the entire combat management system, including subsystems. The agreement normally includes the following:

- **HELP DESK SUPPORT**
  The Saab help desk function provides technical or operational support, and is coordinated by an assigned support engineer.

- **REPAIRS AND SPARE PARTS**
  Saab repairs faulty parts at our premises, or we can organise a subcontractor under the supervision of our quality assurance organisation.

- **SYSTEM PLANS**
  In order to keep the 9LV CMS up-to-date over time, Saab will periodically notify the customer about any available hardware or software upgrades.

- **CUSTOMER CONFERENCES**
  Depending on the number of systems or vessels in operation, meetings between assigned Saab personnel and the customer will take place at least once a year.

- **TECHNICAL SUPPORT ON SITE**
  A support agreement will include several predefined visits by skilled support engineers.

- **FAILURE ANALYSES AND STATISTICS**
  Saab will establish and maintain a fault history archive in order to capture usage, failure and corrective action data.

- **OBsolescence MANAGEMENT**
  In the event of a component approaching obsolescence, Saab will notify the customer with a suggestion for component stockpiling and/or replacement.

- **SECONDARY TRAINING**
  Saab provides secondary training at the customer’s premises, securing transfer of vital knowledge to new technicians and operators. System documentation is configured to provide each user with the information they need to operate and maintain the system.
Modern naval vessels have a life expectancy exceeding 25 years. To ensure continuous development during this time, Saab provides long-term technical support. This includes the provision of spare parts and a variety of services in order to improve reliability, availability, maintainability and testability throughout the system’s operational lifecycle.

Saab’s solutions do not require expensive modifications part way through their lifespan, as any upgrades can be made over time when necessary, without the need for additional testing and verification of the system. Many of our systems are hardware independent, meaning parts can be easily interchanged, thus minimising end-of-life problems. Saab’s long-term support is not limited to the acquisition phase, and lasts throughout the system’s lifetime.
The Halifax-class upgrade is an example of teamwork through global partnership using open architecture technology and modularity. Saab provided CMS modules and an advanced FCS based on CEROS 200 directors, ESSM missiles and a 57 mm gun.

- Supplied the 9LV Mk4 FCS in control of the main gun, ESSM and CWI equipment
- Provided modules in CANACCS 9LV for data fusion, sensor interfaces and training
- Provided CEROS 200

Saab has a long history of providing 9LV CMS and integrated platforms to satisfied customers around the world. Below are just some examples of our most notable projects.

**ANZAC-CLASS FRIGATES AUSTRALIA**

Saab is the CMS design and integration authority of the Anzac-class frigate. Continuous subsystem and CMS capability upgrades are performed to extend and evolve the CMS solution according to increasing operational demands.

- Combat system based on 9LV CMS and FCS
- Post-build capability enhancements include full integration of ESSM, Harpoon and Nulka active missile decoy
- Anti-ship missile defence
- Combat system capability modelling and analysis and validation in the virtual maritime systems architecture
- Integration of an active phased array radar and multi-channel phased array Continuous Wave Illuminator (CWI)
- Integration and conformance to standard certification of Multi-Link L11, L16, VMF TADIL solution
- Automatic performance-based engagement control of ESSM against supersonic missile targets

**HALIFAX-CLASS FRIGATES CANADA**

The Halifax-class upgrade is an example of teamwork through global partnership using open architecture technology and modularity. Saab provided CMS modules and an advanced FCS based on CEROS 200 directors, ESSM missiles and a 57 mm gun.

- Supplied the 9LV Mk4 FCS in control of the main gun, ESSM and CWI equipment
- Provided modules in CANACCS 9LV for data fusion, sensor interfaces and training
- Provided CEROS 200
VISBY-CLASS CORVETTES SWEDEN

Saab is CMS integrator for the new build corvette and continuing upgrades.

- Combat system based on 9LV CMS and FCS
- Support to FMV for combat system integration
- Supplier of sensor and effector subsystems
- Tactical data links
- Post-build integration of subsurface warfare and sonar subsystems

GOTLAND-CLASS SUBMARINES SWEDEN

Saab is CMS integrator for the new build submarine and continuing upgrades.

- Combat system based on 9LV CMS
- Integration of all sensor and weapon systems
- Post-build modernisation includes new generation of 9LV CMS
- Post-build integration of new WECDIS navigation system, new ESM system and of new active sonars
- Integration testing, harbour and sea acceptance testing
- Data fusion sonar tracking

WORKING WITH SAAB

THE TRUE NEEDS OF THE NAVY
Saab's broad experience in the naval domain has made us a trusted partner for many navies around the world. Our customers benefit from a long-term relationship with support at every stage, from the early phases where ideas are captured, to the shaping of tailored solutions, through to maintenance and upgrade planning. As a solutions provider, Saab recognises that the key to long-term success is understanding the true needs of the end user.

A FLEXIBLE GLOBAL PARTNER
In order to provide the best possible solutions for our customers, Saab works with leading companies in the naval domain, often forming long-term relationships based on the supply of outstanding products.

Saab can take a leading role, or work as a sub-supplier, depending on the situation. Our products and business models are designed for partnership and lead to flexible teamwork options where both Saab and our partners become part of a winning team.

LOCAL PRESENCE, LOCAL PARTNER
Saab recognises local presence as an increasingly crucial factor for success. This makes it important to be established locally, build local competence and understand local conditions. Today, Saab has a local presence in more than 30 countries and sales in over 100.

Saab cooperates with local industry and forms partnerships to better meet and understand local conditions. Our local partnership approach is tailored, based on a balance of all contributing factors to form an optimal and sustainable solution that is successful during and after the initial project. Existing skills are incorporated and enhanced throughout projects where Saab addresses the needs of product adaptation and in-country support.