



SAAB

GRIPEN E/F

Success of a True Collaboration

The Brazilian Fighter



A true collaboration. A long-term partnership.



Gripen and Brazil.

The involvement of the Brazilian Air Force

Preparing to receive the Gripen E/F required a deep involvement by various sectors and Brazilian Air Force personnel.

Timeline

The main milestones of the Gripen programme and the successful partnership with Brazil.

Accessing the Gripen E

The weapons, capabilities and technical details.

Tactical mission systems

Datalink, radar, electronic warfare systems, self-protection in hostile environments and the processing of multiple information in the current combat scenario.

→ **14** → **18** → **20** → **22**



For the next decades. The Transfer of Technology

The intense participation of the Brazilian defence industry in the development of the Gripen E/F programme.

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In 2015, the contract signed between the Brazilian Government and Sweden came into force to equip the Brazilian Air Force (FAB) with the most modern and advanced fighter to maintain the defence of its air space.

In all, 36 Saab Gripen E and Gripen F were purchased for SEK 39.3 billion, including logistical support, weapons and simulators. The process that selected Gripen as the best fighter to join Brazil's defence frontline, while benefiting the national industry with long-term knowledge and technology, was extensive and concluded after many studies.

The selection process was not about buying an on-the-shelf product, already available on the market. Together with Sweden, Brazil became a protagonist in the development of a fighter to meet its needs in the face of present and future threats from the 21st century combat scenario. Gripen is well known for its efficiency, low operating cost, high availability and advanced technological capacity. In several Air Forces in the world, it is the vector responsible for the sovereignty and protection of their nations, 24 hours a day, as well as doing air policing missions in some critical regions. Its entry into service will bring an important qualitative and technological leap, with some of the on-board resources inherited for the FAB, being the pioneer in the operation of the two-seat version, Gripen F, developed jointly by Brazil and Sweden.

Gripen will also impact the national defence industry, involved in the process of developing structures, systems, avionics, production, flight tests and training to support, maintain and modernize this fleet for the next decades. Some of these Brazilian companies have been included in Saab's supply chain, both for Gripen E and Gripen F and for other programmes that may be developed in the future. But the benefits did not end there. The company also invested and expanded its presence in Brazil through Saab Aeronáutica Montagens and Saab Sensores e Serviços do Brasil.

This entire process generated one of the largest transfer of technology programmes ever carried out for FAB, and the largest ever made by Saab to another country.

In the next pages, you will learn, in detail, the timeline of this partnership, the entire transfer of technology process, the involvement of Saab and the Brazilian defence industry in the development of Gripen E and Gripen F, the intense participation and preparation by part of the FAB and the technical and operational characteristics of the fighter and its legacy.

The Smart Fighter

Network communication, objective interface with the pilot and open and modular architecture.

Gripen F - Meeting a demand from Brazil

The joint development of the two-seat version to meet the needs of the Brazilian Air Force.

Gripen, legacy of sovereignty

From a multi-role fighter designed to defend Swedish territory to a combat platform to meet the demanding requirements of Air Forces around the world, an overview of the history of the Gripen programme.

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EXECUTION

Hunter Press Comunicação
Infographics: Gino Marcomini

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For the next decades. Transfer of Technology.

The F-X2 programme considered several attributes to choose the fighter responsible for the defence of Brazilian airspace for the next decades.

The new vector should be modern and capable of receiving updates throughout its operational life. In terms of missions, to fulfil all missions already performed by the current Brazilian Air Force fighters, such as interception, attack and reconnaissance. In terms of logistics, to have support designed for its entire life in operation, capable of maintaining the fleet in a high standard and availability at a competitive cost.

Finally, and one of the most strategic items in the programme, involve the participation of the Brazilian national defence industry.

In the short and medium term, this industrial base would be able to support the logistics chain; to maintain the main systems and sensors; the integration of new capabilities and weapons; and the modernizations of the fighter chosen by the F-X2.

For the future, however, with all the lessons learned through the programme, the goal of the Brazilian government is that the country could have the capacity to develop its own next generation fighter using its industrial base.

To achieve these goals and targets, it would be necessary to insert the defence industry into an extensive and in-depth transfer of technology programme, which would raise it to the desired high level of knowledge and training.

Based on this scenario, Saab was evaluated as the best company to be able to fulfil all the requirements of the F-X2 programme, from technical, operational and cost requirements with the Gripen E/F, to transfer on knowledge in several critical, strategic and interest areas to the Brazilian defence industry.

GREEN, YELLOW AND BLUE

If, geographically, Brazil and Sweden are thousands of kilometres apart, the Gripen E/F acquisition programme brought these two countries closer together, as if they were neighbouring nations. Cultures got closer, as did their traditions.

The F-X2 transfer of technology programme is underway for Embraer, AEL Sistemas, Akaer, Atech, Mectron Communication, Saab Aeronáutica Montagens, Saab Sensores e Serviços do Brasil and the Department of Aerospace Science and Technology, through its subordinate institutes.

The best way to pass knowledge is by daily practice. For this reason, more than 350 Brazilian technicians and engineers will be trained by Saab in a transfer of technology programme that is expected to last 10 years. Many have already gone through this learning process in Sweden and the number grows every month. Most of these professionals were accompanied by their families, and they all carried their life stories mixed in with the enthusiasm to be part of this pioneering team. They all were determined to learn about the fighter,

its characteristics, the development and production process.

The first specialists landed in Linköping, where the main facilities of Saab Aeronautics are located, in October 2015, only weeks before the start of the harsh winter in the Nordic country. In Sweden, these Brazilians participate in theoretical classes and then go on to on-the-job training, participating in the development or production of Gripen.

For each area, there is a specific training and transfer of technology programme, which will reflect the increase in new capabilities of the national Defence industry, some of which have never been seen in Latin America.

In total, there are more than 600 thousand hours of training and 62 projects, including in communication systems (Link BR2), integration of weapons, flight tests, avionics, systems, aerodynamics, production, assembly of the structural components of the Gripen E/F fuselage, among other areas. During the process, some Brazilian companies were integrated to Saab's global supply chain, producing components and systems for orders placed by Sweden itself and future new generation Gripen operators.



Watch the Gripen E hand-over ceremony to the Brazilian Air Force.

Public presentation of the first Brazilian Air Force Gripen E, on 10 September 2019.



EMBRAER

Embraer is Saab's main partner in Brazil for the new generation Gripen programme. With approximately one million hours in transfer of technology activities in development, production, testing and logistical support, important structures are in place for this entire process at its facilities in Gavião Peixoto. It is also where a vital structure for the transfer of technology, support and updates to the Gripen life cycle in service at the Brazilian Air Force (FAB) is located. This is the Gripen Design and Development Network (GDDN), which is considered the point of integration of companies, partners and governmental parties involved in the Gripen pro-

gramme in addition to, of course, Saab itself. Founded in November 2016, the GDDN today relies on the work of Brazilians and Swedes. The objective is that the GDDN can support, in the areas of engineering, flight test, integration and modernizations, in addition to taking part in the development of software for Gripen evolutions in global terms. Most technicians and engineers from the various companies participating in the programme work at the GDDN, after receiving training in Sweden. The structure has engineering centres, simulators - such as the S-Rig, development and engineering tools, among other resources. The environment is virtually integrated between the two countries, with data and infor-

mation security. The Gripen Flight Test Centre (GFTC) will be also located at the Embraer plant. The structure is part of the transfer of technology and which inauguration is scheduled for the end of 2020. Saab has designated a team of 20 employees who will be responsible for the standardization of all flight test procedures, allowing for gains in efficiency and agility in gathering and sharing information between the countries. The GFTC will have a structure to collect, in real time, the telemetry information of the flights, in an encrypted way, which will be later analysed by pilots, technicians and engineers involved in the test campaign, carried out by Brazil and Sweden. In 2020, in the Flight Test department of Saab Aeronautics, the first test conducted by a team of Brazilian engineers from Embraer took place. The duration of that flight was almost two hours and they tested the Head-up Display and the new altimeter radar, benefiting the programme both for Brazil and Sweden. By the end of 2020, teams will be ready to conduct tests of the tactical systems at the GFTC. The final assembly line of Gripen E and F will be also located at Gavião Peixoto. Starting in 2021, 15 fighters will be assembled, tested in flight and delivered to the FAB.

The Gripen Design and Development Network (GDDN) in Gavião Peixoto (SP) brings together professionals from Embraer, Saab, AEL Sistemas and Atech.





Embraer is responsible for part of the development of Gripen, its final integration, assembly and flight tests.

SAAB AERONÁUTICA MONTAGENS

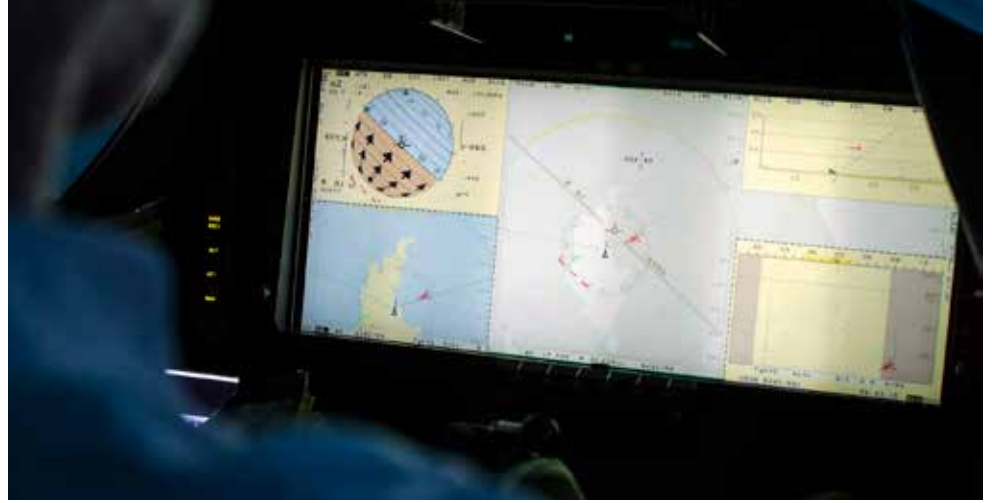
On May 9, 2018, Saab's aerospace factory in Brazil began by opening its facilities in São Bernardo do Campo, in the metropolitan region of São Paulo. With an area of 5,000 m² and having started industrial operations in June 2020, the site produces Gripen E and F aircraft structures, such as the tail cone, aerodynamic brakes, wing box, rear fuselage and front fuselage. The team is made up of approximately 60 employees, most of whom are Brazilians who have undergone training in Sweden for periods ranging from 12 to 24 months long. For the next two years, Saab will maintain a team of Swedes on site to assist with transfer of technology. Saab Aeronáutica Montagens is already part of Saab's global supply chain for Gripen E and F. The aerostructures produced in Sao Bernardo do Campo will be part of the Brazilian Gripen as well as the aircraft for other nations' air forces. In the future, the plant may also receive projects



and orders for other highly complex aeronautical programmes, including larger structures, such as commercial aviation. The Brazilian subsidiary works with the same tools, software, concepts and technologies used in the production of Gripen in Linköping. Likewise, in all aircraft structures manufacturing stations, technicians and engineers will work with the support of computer systems, which eliminates the use of any type of paper documentation in the production area.

In January 2020, a group of engineers and assemblers from Saab Aeronáutica Montagens delivered the first serial production rear fuselage of the Swedish Gripen E as part of the on-the-job training programme, in Linköping. The Brazilians who are learning and working on the production of the fighter's rear fuselage will be the same ones who will start the production of aircraft structures in Brazil, at the plant in São Bernardo, with the support of the Swedish specialists.

The Wide Area Display (WAD), manufactured by AEL Sistemas.



AEL SISTEMAS

The company has almost 40 years of experience in the aeronautical sector, developing and producing electronic and avionics components for the civil and military sectors. Headquartered in Porto Alegre, Rio Grande do Sul, AEL Sistemas was selected in 2015 to provide the interface between Gripen and the fighter pilot (Human Machine Interface, HMI), through three displays that will provide situational awareness and access to tactical mission and weapon systems in a battle scenario. The main one is the Wide Area Display (WAD), an intelligent system, resistant to failure, and with redundant backups to increase its reliability even in extreme situations. The 48x20cm (19x8 inch) panoramic high resolution screen displays a continuous image over its entire length. AEL Sistemas developed models A, B and C of the prototype from WAD units to the Brazilian Gripen, respectively in 2015, 2016 and 2018.

In May 2016, it delivered the preliminary version software that demonstrates the HMI concepts to Saab for the future WAD. The wide-angle Head-up Display (HUD) that provides the essential flight and mission information, is installed above the instrument panel, at the pilot's eye level. AEL Sistemas was also responsible for the development of the Helmet Mounted Display (HMD). Designated Targo, the mission and flight information, also displayed at the HUD, is projected on the visor and is also integrated into the aiming and firing system of the armament. The development of these systems was planned to be conducted over five years. New technologies are being added in HMI development for the advanced fighters, along with the

ability to perform maintenance of avionics. In November 2018, the company became Saab's global supplier for next generation Gripen displays. Sweden, which initially would use an arrangement of three smaller screens in the cockpit of its Gripen E fleet, opted for AEL avionics, including the WAD. Within the scope of Brazilian Air Force communication systems, the AEL Sistemas Group has been developing the LBR2 project using the Mission Airborne Radio and Computer (MARC). The new equipment is being integrated with Gripen E/F and, through the network LBR2, will allow sharing mission data, operational information, audio, video, text, etc. between Gripen E/F fighters and other aerial, land and naval platforms equipped with the compatible systems to increase the operational performance.

AKAER

Headquartered in the city of Sao Jose dos Campos, the partnership between Akaer and Saab started in 2009, when the selection of the F-X2 fighter programme was still in progress and far from having announced its winner. Saab currently owns 40 percent of Akaer's shares.

The company's mission in the programme began with preliminary studies of the rear fuselage, its dimensioning and complete development. The company also did the detailing and engineering documentation of the central fuselage, wings, the main landing gear doors and the place where the fighter cannon is installed. Akaer also advised Saab in manufacturing and electrical

projects area. In Brazil, Akaer uses the same development tools used by Saab in Sweden, as well as follows the same procedures in a controlled and secure virtual environment. After more than 10 years of partnership, the company has already surpassed the mark of 750 thousand hours worked in the programme.



Akaer's staff involved in development of Gripen E/F.

ATECH

With global operations and present in all the main strategic programmes of the Brazilian Armed Forces, Atech, an Embraer Group company, has extensive experience in the development of airspace surveillance and control systems. For Gripen, it provides simulators, both to validate fighter systems and avionics throughout its development, as well as those used for training pilots in Gripen squadrons.

The S-Rig, a simulator installed at Gripen

Design and Development Network (GDDN) in Gavião Peixoto, is an example. It is the first Gripen simulator to be installed outside of Sweden and is part of the transfer of technology package. The S-Rig is used to verify and validate systems, subsystems, software, avionics and weapons before these are tested in flight on the aircraft.

In this way, it is possible to mitigate any error, reduce delays and increase the security of the programme. Recently, the Targo helmet was integrated into the S-Rig, and virtual flights can now be made with this functionality.

The next step includes the development of a tactical flight simulator. With Saab's support and consultancy, this system will help in the training of the new Gripen fighter pilots, which will rely on this important tool.

The company will also be able to provide all logistical support, necessary updates and provide technical support for the simulators. The choice of Atech by Saab took place in April 2016, when the first technicians and engineers of the Brazilian company were selected and sent to Sweden to receive the entire training and transfer of technology.

On the S-Rig, installed at the GDDN in Gavião Peixoto, are tested and validated the systems, subsystems, software, avionics and weapons of Gripen E/F.



The Active Electronic Scanned Array Raven ES-05, Infrared Search and Track (IRST) Skyward-G and the IFF SIT426 E Scan antennas.



SAAB SENSORES E SERVIÇOS DO BRASIL

As Gripen is equipped with the latest technology in radar and electronic warfare sensors, Brazil has prepared itself to have a complete structure in the country to provide adequate support for these systems. Transfer of technology also took place in this segment, with Brazil sending a team of professionals to Sweden to learn about sensors and maintenance testing requirements. Brazilian technicians jointly developed with Saab the test bench (hardware and software), as well as the adapters for more than a dozen different mod-

ules, which will allow testing to be carried out automatically, quickly and reliably. These Brazilian technicians today work intensively at Saab Sensores e Serviços do Brasil (Saab Sensors and Services) to prepare the workshops that will allow the maintenance of high technology equipment. The development of this capacity in Brazil is in line with Saab's

long-term objective of growing in Brazil, which may expand into the civilian and other defence sectors.

With the company's work, it will not be necessary to send the sensors and radars to be repaired or overhauled abroad, providing agility in maintenance and expanding availability at the Gripen's fleet.



Major Aviator Cristiano de Oliveira Peres, Brazilian Air Force test pilot after his first flight on Gripen E, on 20 August 2020.





The Gripen FLight Test Centre, responsible for the flight tests in Brazil will be located in Gaviao Peixoto.

WORK PACKAGES

After all the theoretical and, mainly, practical learning done in Sweden with on-the-job training, the technicians and engineers, back to Brazil, get involved in the realization of the work packages, that is, in the execution of the development services and industrial production in Brazil, already outside a training and education environment.

There are more than 50 packages that involve the areas of systems, structure, software, avi-

onics and many others.

Among the examples of work packages is the S-Rig, jointly built by Saab, Embraer and Atech. The preliminary design review of Gripen F directly involved Embraer and Saab. Embraer and AEL Sistemas worked on generating the software for the software for the Human-Machine Interface (HMI), and the module was sent to Sweden to be integrated into the aircraft.

Atech participated in the development of the mission support system, a ground station where

pilots carry out the planning, flight preparation and loading operational missions into Gripen, including all analysis of the mission after landing. The production of Gripen also includes work packages, such as the production of the 15 fighters at Gavião Peixoto; the manufacture of aircraft structures by Saab Aeronáutica Montagens; and the production of the displays by AEL Sistemas.

In the maintenance segment, following Saab's guidelines, the work packages are both in support of AEL Sistemas' displays and in Saab Sensores e Serviços do Brasil's radar and electronic warfare systems.

Akaer developed a series of work packages in the design phase, but without the need to receive transfer of technology, since it already had the necessary knowledge for this task absorbed in the first years of partnership established with Saab from 2009.

On the other hand, there are transfer of technology without work packages associated with Gripen. One example of this was the absorption of specific knowledge in composite material, in which, in this case, Brazil should take advantage of this training in other areas, but not in Gripen.



In Sweden, Brazilian flight test engineers of Embraer Defesa e Segurança are participating in the Transfer of Technology programme.

Gripen E

Transfer of Technology

Participation of the Brazilian defence industry in the Gripen E/F development programme

AKAER: Design of the rear fuselage, central fuselage, wing box, doors of the main landing gear, the placement of the cannon installation, advice in manufacture and electrical projects.

EMBRAER: Joint development in engineering, final integration, production, flight tests and logistical support.

SAAB AERONÁUTICA MONTAGENS: Production of aircraft structures of the tail cone, aerodynamic brakes, wing box, rear fuselage and front fuselage.

SAAB SENSORES E SERVIÇOS DO BRASIL: Logistical and technical support for radar,IRST and Electronic Warfare systems.



Integration of some Brazilian national defence industry companies at

Saab's global supply chain.



600.000 hours

in training.



More than
60 projects

in Transfer of Technology.

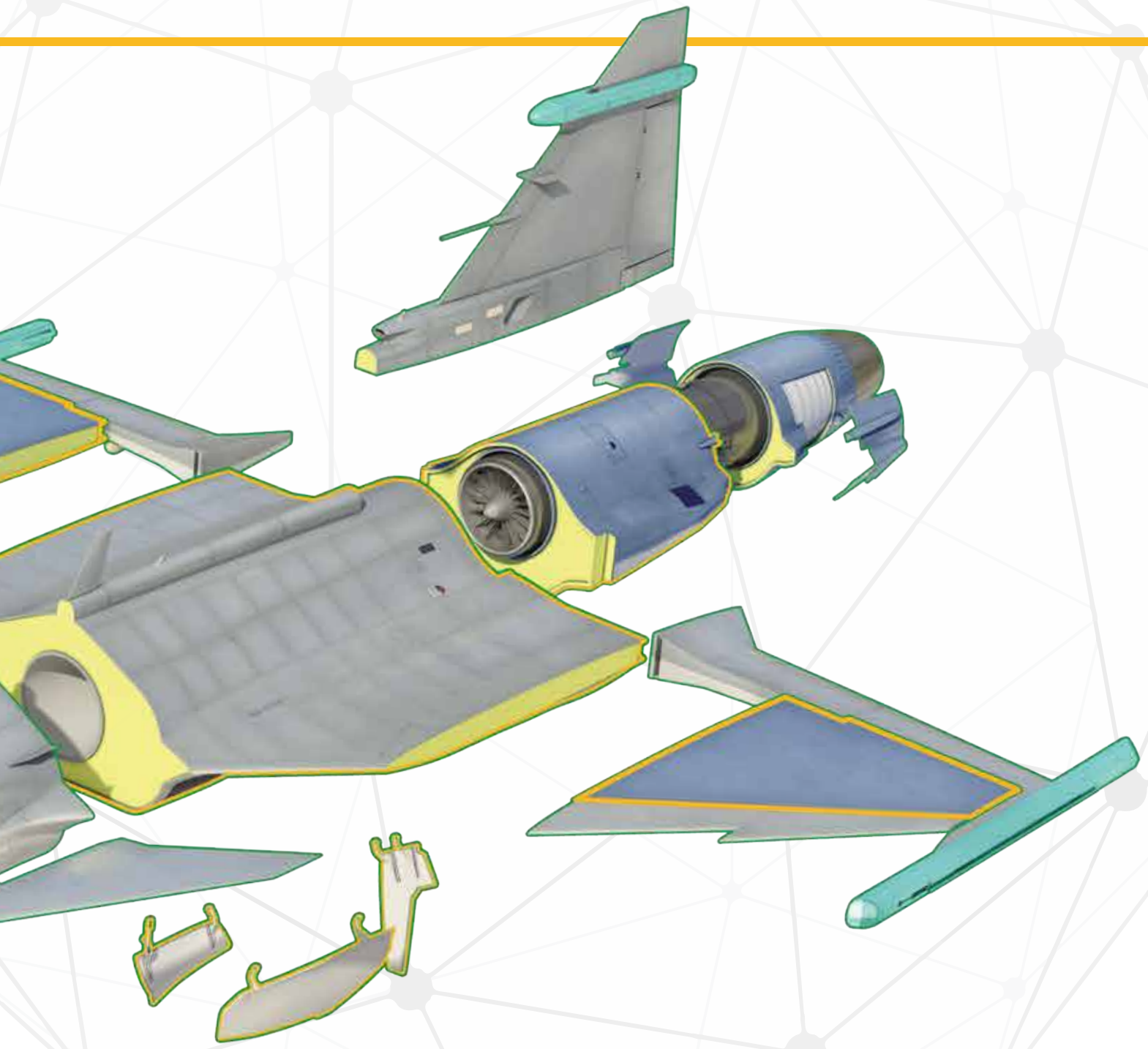


More than

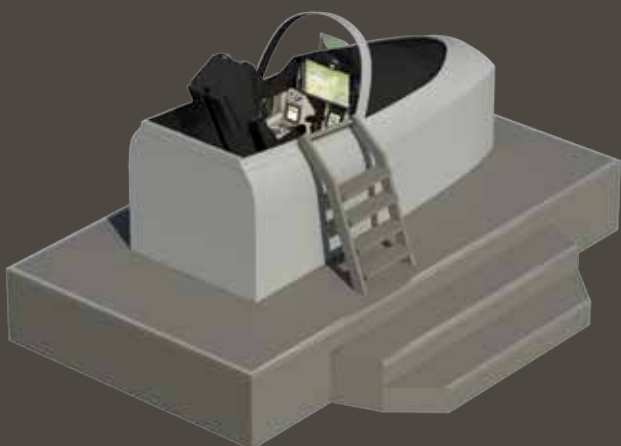
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engineers and technicians

trained in Sweden, in periods ranging from 12 to 24 months.



ATECH: Systems Rig (S-Rig) and tactical flight simulator for pilot training.



AEL SISTEMAS: Wide Area Display, Head-up Display and Helmet-Mounted Display.



The Brazilian Air Force involvement

The deployment in service of Gripen E/F, a state-of-the-art new generation fighter, involves a series of actions, in addition to production, transfer of technology and the training of pilots and mechanics.

At Wing 2, in Anápolis, State of Goiás, just 130km from the federal capital Brasília, is the headquarters of the 1st Air Defence Group (1^o Grupo de Defesa Aérea - 1^o GDA), the squadron that will be the future operator of Gripen in Brazil.

Chosen for its strategic location, in the central region of the country, isolated from large urban areas, with combat capability, rapid response, and favorable weather conditions for most of the year, the air base structure for Wing 2 was created in the 1970s, and will be modernized for the Gripen E/F.

Saab, in coordination with the Brazilian Air Force, has already made several technical visits and inspections at the base, in order to assist with the technical specifications of the improvements and adaptations that must be made.

Among them, a new hangar, new electrical system, new administrative and operational buildings, reinforcement in the security of the installations, new infrastructure preparation for receiving the flight simulator, expansion the aircraft parking area, new flight line hangars, modern maintenance shops, armory and weapons testing area.

Great attention was given to the infrastructure dedicated to the preparation and maintenance of the physical condition of the pilots, so that they can achieve the best possible performance in flight. Due to the great performance and manoeuvrability of Gripen, the pilot can remain for long periods under high gravitational load (G-force). For the pilot to withstand these effects on the body and extract the full potential of the aircraft in combat, adequate physical preparation is crucial.

Hence, the Brazilian Air Force has revised its fitness requirements, seeking alignment with the requirements of the Swedish Air Force pilots. As a result, a 16-week training programme was designed for the first pilots who will fly the aircraft.



Gripen's importance
to Brazilian Air Force.

Military personnel of the Monitoring and Control Group of the Brazilian Air Force (GAC-Saab) at Saab facilities in Linköping, in August 2020.

The Gripen implementation process is above all multidisciplinary, involving many professionals: commands, commissions, departments, boards and institutions, not only from the Brazilian Air Force but also from the Ministry of Defence, the industrial base of national defence, as well as research and development institutions.

The Department of Aerospace Science and Technology (Departamento de Ciência e Tecnologia Aeroespacial - DCTA), in São José dos Campos, is one such example.

The modernizations, purchases or the development of new equipment are all managed by the Coordinating Committee of the Combat Aircraft Project (Comissão Coordenadora do Projeto Aeronave de Combate - COPAC). Headquartered in Brasília and subordinated to the DCTA, COPAC manages the selection process, participates in the choice and negotiation of the contract, and monitors the execution of contractual items as well as the industrial compensations of the transfer of technology. Part of COPAC's structure is also the Monitoring and Control Group - GAC, which is based at the at Saab facilities in Linköping, Sweden. Their mission is to advice on the contracts and agreements signed between the Air Force Command and the Swedish manufacturer. Its routine includes technical, administrative and financial monitoring and the inspection of the contracted activities, at all stages of the project.

GAC also aims to ensure that development conducted by Saab fully meets the established requirements by the Air Force, actively participating the different phases of the Systems Engineering and definitions related to the Human-Machine Interface (HMI). The presence of this team allows decisions to be taken with agility, preventing the programme from suffering any kind of delay.

Another important part of this scenario is the Institute of Promotion and Industrial Coordination (Instituto de Fomento e Coordenação Industrial - IFI), located in São José dos Campos and which will be responsible for issuing the military certification of Gripen in Brazil. In compliance with Government Quality Assurance standards, the Institute conducts technical and quality inspections and audits



Saab facilities in Sweden and in Brazil. Brazilian companies involved in the programme are also audited, to ensure compliance with industrial and product quality requirements and industrial processes. IFI is also responsible for assessing compliance with commercial, industrial and technological compensation, in support of COPAC's contract areas. There is also the participation of the Institute of Research and Flight Test (Instituto de Pesquisas e Ensaios em Voo - IPEV), which will participate in the testing campaign in Brazil alongside Embraer, with the support of Saab, at the Gripen Flight Test Centre (GFTC) to be inaugurated at the end of 2020, at Embraer's facilities in Gavião Peixoto. Part of the GFTC will be installed within the Gripen Design and Development Network (GDDN). IPEV will participate in the flight test campaign,

enhancing the development of the aircraft, Swedish and Brazilian test pilots and engineers, the Brazilian Air Force, Embraer as well as Saab. In Brazil, around 900 sorties on Gripen E/F, starting in 2021. The data collected from the test flights will compose a joint information base used by Brazil and Sweden. And, to meet standardization in procedures between countries in this segment, a team of approximately 20 Saab employees is working to obtain maximum efficiency and synergy in sharing this information.

The preparation for receiving Gripen in Brazil includes an important task performed by the Fox Working Group (Grupo de Trabalho Fox), of the Training Command (Comando de Preparo - COMPREP) located in Brasília.

The mission of this operational management group is to study the aircraft, its systems, characteristics, capabilities and develop the training programme and operational doctrine of the Brazilian Air Force.

This task is executed while the fighter is still in final development and production, allowing it to be immediately integrated into the air defence structure when the fighters arrive in 2021. The Fox Working Group also acts as an advisory tool for the high commands of the Brazilian Air Force, considering that Gripen will positively impact the Force, promoting doctrinal elevation in its various sectors, since it adds unprecedented capabilities for the country.



Institute of Promotion and Industrial Coordination (IFI) team following inspection of the engine receipt F414-GE-39E at Saab in Linköping, Sweden.

GRIPEN

THE SMART FIGHTER

Power, efficiency, flexibility:
only one modern fighter holds them
all in perfect balance. Fuelled by
Saab's *thinking edge* at every stage
of its development, Gripen is more
than a fighter. It's a national asset
that protects sovereign independence
and empowers a nation towards



Gripen E

Main milestones of Gripen programme and

Timeline



9 December 1988

The first development aircraft Gripen flies under the command of the test pilot Stig Holmström. The fighter already had digital instrument panel, wide-angle Head-up Display, datalink compatible with the country's national systems and high manoeuvrability. The wings, stabilizer landing gear, canards and landing gear doors were made of carbon fibre.

8 June 1993

The first production Gripen A is received by the Swedish Defence Material Administration (Försvarets materielverk, FMV), and later delivered to the Swedish Air Force.

29 April 1996

The two-seater Gripen B fly for the first time, under the command of the pilots Clas Jensen and Ola Rignell. The variant was intended, primarily, for fighter pilot's conversion to the future Gripen A.

9 June 1996

Gripen A is officially introduced to the Swedish Air Force.

16 June 1997

Saab announces the development of Gripen C, for export, to meet the standards of the North Atlantic Treaty Organization (NATO). The fighter received a probe for in-flight refuelling, datalink and other avionics systems compatible with NATO military aircraft.

March 2001

The 100th Gripen is delivered to the Swedish customer.

14 August 2002

The first production model of Gripen C flies for the first time.

19 June 2007

In partnership with some of the most important international suppliers, Saab launches the Gripen Demonstrator (Demo) programme to develop a fighter that would meet the new challenges of the 21st century.

27 May 2008

The Gripen Demo (registered 39-7) makes its maiden flight, initiating a series of tests that served as the basis for the Gripen E/F programme.

2009

Akaer, an engineering company specialized in the development of aviation structures, headquartered in São José dos Campos (SP), was contracted by Saab to develop the projects for the central and rear fuselages, landing gear doors and wings of the new Gripen.

18 December 2013

Brazil chooses Gripen for the F-X2 programme. In all, 28 Gripen E and eight Gripen F are initially purchased.

27 October 2014

Saab and the Brazilian Government sign the contract for the development and purchase of 36 Gripen E/F, for a value of SEK 39.3 billion.

18 December 2014

For SEK 548 million, Brazilian Government signs the logistical support contract for Gripen E/F, for a period of five years after the arrival of the aircraft in 2021.

25 February 2015

The Brazilian company AEL Sistemas, based in Porto Alegre (RS), becomes a Saab supplier for the three cabin displays of the Brazilian Gripen E/F: the Wide Area Display (WAD), the Helmet-Mounted Display (HMD) and the Head-up Display (HUD).

23 April 2015

The weapon acquisition contract with Brazil is signed for USD 245 million.

10 September 2015

The contract for the development and supply of the 36 Gripen E/F to Brazil enters into force, as well as the offset contract.

October 2015

The Brazilian Air Force Monitoring and Control Group (GAC-Saab) starts operating within Saab in Linköping, Sweden, to closely monitor the development of the programme. In the same month, first group of Brazilians arrived in Sweden to start training and the transfer of technology programme. In all, more than 350 professionals will undergo training at Saab.

26 April 2016

Atech becomes a partner in the Brazilian Gripen E/F programme, providing simulators, training systems and ground support systems. In May, the company's first professionals are sent to Sweden, starting training as part of the transfer of technology.

22 November 2016

Saab and Embraer inaugurate the Gripen Design and Development Network (GDDN), in Gavião Peixoto (SP), a hub that brings together, in a secure environment, the joint development actions required for the programme.

the successful partnership with Brazil



15 June 2017

The first Gripen E (registered 39-8) flies for the first time under the command of Saab test pilot Marcus Wandt.

18 October 2017

Over the Baltic Sea, Gripen E (registered 39-8), flies at supersonic speed for the first time.

9 May 2018

Saab Aeronáutica Montagens, Saab's aerostructures factory in Brazil and responsible to produce the tail cone, aerodynamic brakes, wing box, rear and the front fuselage of the Gripen E/F, is inaugurated in a 5,000 m² installation in São Bernardo do Campo (SP).

26 October 2018

The Gripen E (39-8) successfully completed the first tests of releasing external loads in the test field in Vidsel, Sweden, with the jettisoning of an external fuel tank and the firing of an air-to-air IRIS-T missile. As part of the weapons integration activities, this same month, the Gripen E (39-8) also concludes the test flight with the air-to-air Meteor missile.

25 November 2018

AEL Sistemas is integrated to Saab's global supply chain, with the request of Swedish Defence Materiel Administration (FMV) to provide the WAD, HMD and HUD cabin displays also for the Swedish Air Force Gripen E.

26 November 2018

During a 33 minutes long flight commanded by the test pilot Robin Nordlander, Saab takes to the sky for the first time with the second Gripen E (registered 39-9).

10 June 2019

The third Gripen E (39-10) flies for the first time, on a 57-minute mission. At the command was Saab test pilot Jakob Högberg.

26 August 2019

The fourth Gripen E flies for the first time. With the Saab's registration number 39-6001, this fighter will be the first to be delivered to the Brazilian Air Force with registration number 4100. The flight was made by Saab test pilot Richard Ljungberg and lasted 65 minutes.

10 September 2019

The first Brazilian Gripen E is presented publicly at a ceremony in Linköping, Sweden, with the presence of Brazilian and Swedish authorities. The fighter completed around 50 flight hours in Linköping, before being sent to Brazil for the continuation of the flight test campaign.

4 November 2019

Saab flies for the first time the Electronic Attack Jammer Pod of the Arexis family. The system will be offered to equip Gripen E/F on missions to block enemy radars.

25 November 2019

Saab opens the first Gripen development simulator outside of Sweden (S-Rig), at the GDDN in Gavião Peixoto (SP).

3 December 2019

The inaugural flight of the first production Gripen E, registered 6002, to be delivered to Swedish Air Force is carried out.

22 January 2020

The first rear fuselage of a production example of Gripen, which had the participation of Saab Aeronáutica Montagens' employees, was delivered in Linköping.

Second quarter of 2020

Saab Aeronáutica Montagens starts the aircraft structures production at São Bernardo do Campo (SP).

20 August 2020

Brazilian Air Force test pilot Major Aviator Cristiano de Oliveira Peres becomes the first Brazilian to fly Gripen E.

Fourth quarter of 2020

First Brazilian Gripen E (39-6001), with registration 4100, arrives in Gavião Peixoto, at the GDDN, for the continuation of the flight test campaign.

Fourth quarter of 2020

The Gripen Flight Test Centre (GFTC) in Gavião Peixoto (SP) starts operating.

First quarter of 2021

The flight test campaign in Brazil begins.

Fourth quarter of 2021

The first Brazilian Air Force's Gripen E are delivered.

Gripen E

Technical Specification



Armaments



Gripen can receive a wide range of short and long-range air-to-air missiles; bombs and missiles guided by laser, radar or electro-optical system against targets in the air, land and sea.

Each aircraft can carry a combination of these armaments and external sensors to fulfil a wide range of tasks in the same mission, from air defence, interdiction to reconnaissance without having to go back to base and change its configuration.



Minimum take-off distance: **500m**
Landing distance: **600m**




Combat turnaround air-to-air:
10 minutes with five military personnel
for an air defence mission

Availability

The time to refuel, rearm and do a technical inspection on Gripen for an air defence mission is 10 minutes. The required team of five military personnel may be conscripts who are doing military service and have received 10 weeks of training.

The availability of Gripen is one of its key features, being designed to have inspection intervals of 2.5 hours for every 7.6 hours flown.



Maximum speed: **Mach 2**
Maximum altitude: **More than 16 thousand meters**

External hardpoints: **10**

In-flight refuelling probe: **Retractable**

Width overall: **8,6m**

G-limits:
-3G/+9G

Length overall: **15,2m**

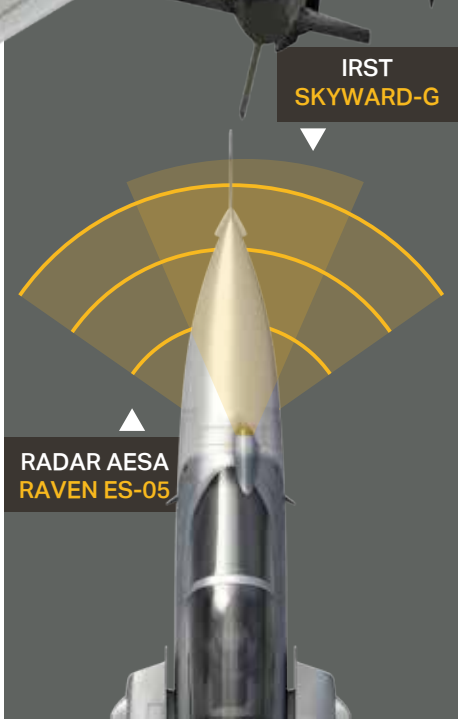
Engine: General Electric
F414-GE-39E of 9,979kgf (98kN) thrust

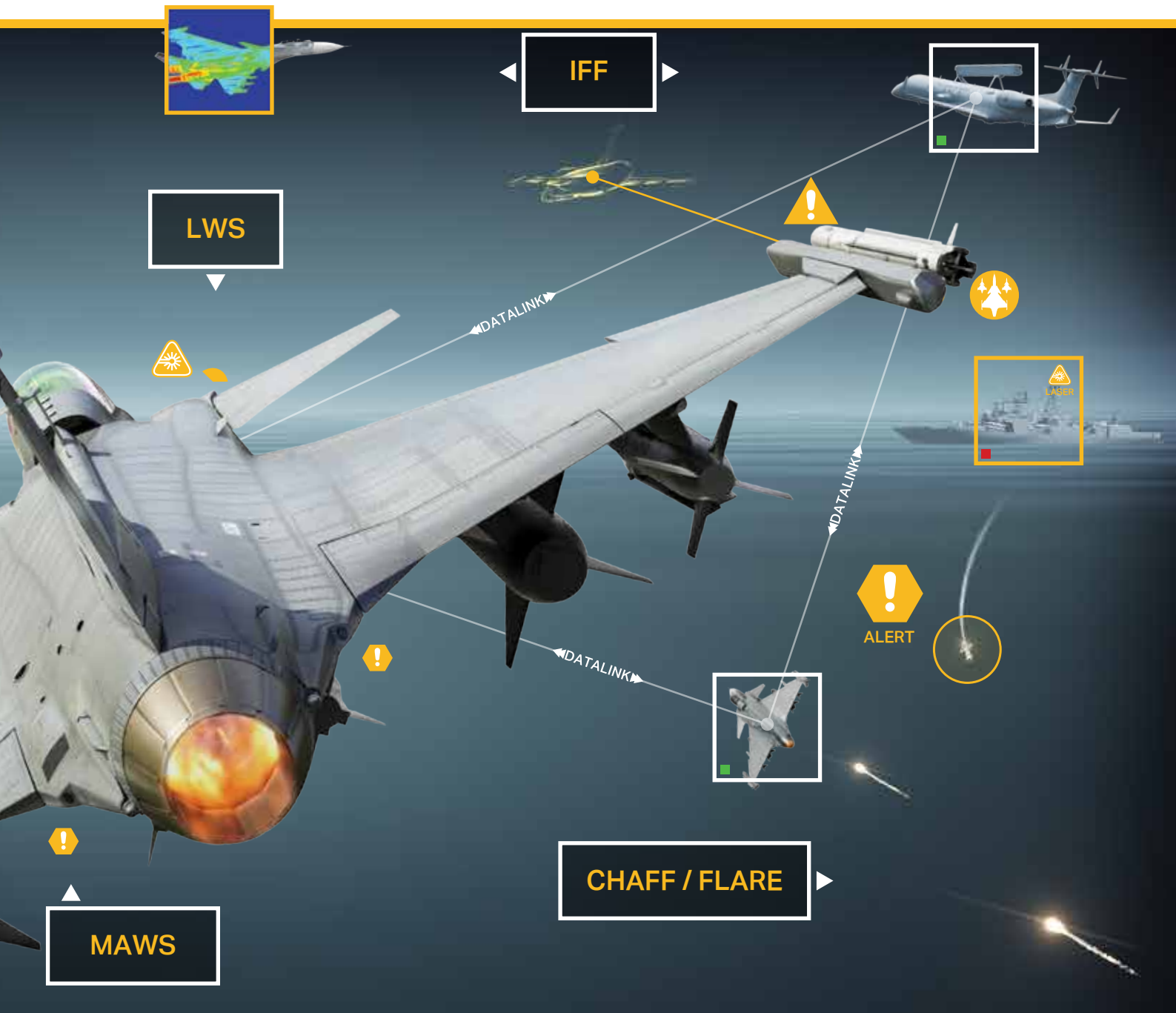
Gripen E

Tactical Mission Systems



Gripen Attack Force





RADAR / IRST

The Raven ES-05, an Active Electronic Scanned Array (AESA) category radar, has small electronic modules that tracks targets in different directions, in the air or on the ground/sea, simultaneously, and at different frequencies, without needing to move the position of the antenna.

The Raven ES-05 radar is resistant to electronic interference, has a high service availability and the field of the view is more than 100°.

Gripen E/F is also equipped with the Infrared Search and Track (IRST) Skyward-G sensor. Unlike radar, which is active and emits waves to search for the enemy's location, IRST is passive, as it uses the target's heat emissions to track it. The Skyward-G can act in conjunction with Raven ES-05 or be used independently, reducing the possibility of Gripen being detected.

IFF - Identification Friend or Foe

Tells whether the radar emission is from a friendly or an enemy force.

ECM - Electronic Countermeasures

Antennas that interfere with enemy radars, either confusing, saturating or preventing Gripen from being targeted.

LWS - Laser Warning System

Alerts the location of any laser emission against Gripen.

MAWS - Missile Approach Warning System

Alerts about the approach and direction of missiles fired at Gripen.

RWR - Radar Warning Receiver

Alerts the direction of signals coming from any radar on the ground, at sea or in the air that is detecting Gripen.

CHAFF / FLARE - Pyrotechnic device used to interfere at radars and at missiles guided by radar and by heat (infrared) going towards Gripen.

The Smart Fighter

The way it can communicate with other friendly units, arranged in the sky, land and sea, at the same time; to identify and defend itself from opponents through its highly advanced on-board Electronic Warfare sensors; the ability to process immense amounts of information in seconds and to display it in a simplified and objective way for the pilot; and the use of state-of-the-art technology and its modular and open architecture make Gripen the smart fighter - from the fulfilment of its mission and survival on the battlefield, to the simple modernizations keeping it updated for future challenges and threats.

NETWORK - THE CENTRAL ELEMENT

Information is received from several sources: radio, radar and Electronic Warfare sensors, for example. In current combat scenarios, this data also comes through stations located on the ground, troops, a naval task force and other surveillance airplanes.

The ability to receive the data, process it and transmit it to the pilot in a clear and objective way, providing situational awareness, is one of the several advantages of Gripen. In this way, datalink is one of its key features.

A Gripen attack force could have their radars turned off, but would still receive the enemy's position data and have their weapons guided by a friendly ship through the datalink.

If before the aircraft flew close to each other to provide mutual protection, and even due to the difficulty of data transmission and communication, with Gripen it is possible to maintain a separation of tens of kilometres from each other, making it difficult for the enemy to detect them. In addition, it is a deterrent factor, as it confuses the opponent about the number of aircraft in the air and the tactic to be adopted to combat them.

In these formations, while one uses radar to scan targets on the ground, another uses Infrared Search and Track (IRST) to seek for threats in the air. And the third fighter can make electronic interference in the enemy's defences. Via datalink, information is shared, making it possible for a fighter to direct the missiles of other aircraft to destroy any threats, as well as it is

possible to detect in advance any hostility that may be directed at any aircraft in the formation.

MODULAR ARCHITECTURE

In today's world, threats and technologies are constantly evolving, but combat aircraft undergo only one or two modernization processes (mid-life upgrade) throughout their service in an air force, which can, in some cases, exceed 40 years of operation.

Traditionally speaking, any upgrade or integration of new significant capabilities in a fighter implies high expenses and prolonged execution time, which can take months or years to complete. And when these processes are over, the battle scenario has evolved, and the fighters are again out of date.

With Gripen, however, this is not the reality. Using open architecture, modular system and products that are already available on the market, Saab has provided the facility in modernizing Gripen, both in terms of costs and deadlines. These qualities are further strengthened by the fact that the software and hardware are independent of each other and updating one or exchanging the other does not cause problems or the need for adjustments in the other systems.

In practical terms, it means that the integration of a new weapon or sensor, for instance, in most cases, is a matter of software update, while the improvement in the speed of data processing represents the replacement of a hardware component.



Developed by AEL Sistemas,
the helmet-mounted display
of the Gripen E/F.

Gripen's Network-
Centered Capabilities



Thus, the operator can update his fleet within weeks, instead of it taking months or years. This process can be done in shorter intervals of time, adapting, whenever necessary, the fighters to overcome threats that are included in the geopolitical context of the region in which the country is located. Furthermore for a much lower cost and compatible with the budget.

This is one of the reasons why Gripen is called a smart fighter.

The open architecture also allows Saab to establish several industrial partners around the world, which provide transfer of technology in commercial agreements with future Gripen operators and extends its industrial cooperation.

COCKPIT

The entire architecture and interface of Gripen was developed to consider the pilot as a central part of its operation. This aspect was so important for Saab that the figure of a fighter pilot was present from the first day of development of the programme, which would result in the conception of the next generation fighter. From the operational point of view, Gripen is objective and intuitive. The ergonomics, the



Brazilian Gripen E first flight

symbology of the information and the way in which it is passed on to the pilot means that he can make assertive decisions in fractions of a second.

There are three displays available in the cockpit. The largest and main one is the Wide Area Display (WAD). It displays the information selected by the pilot at each stage of the flight, such as operational data for navigation and combat, of the tactical scenario of the aircraft, and its weapon systems. Changing the informa-

tion presented is done by touching the screen, using the multifunctional keys on the panel, or by pressing the joystick and throttle controls (HOTAS system).

On the WAD is located the wide-angle Head-up Display (HUD), on the eye level of the pilot and where flight, performance, sight and weapons information are displayed.

There is also the Targo helmet, which has a display attached and where is presented the HUD's information, in addition to being able to aim and fire at targets that the pilot is looking at, without the need to direct the aircraft to the threat in order to use the armament.

ELECTRONIC WARFARE

Detecting and analysing potential threats against Gripen E/F in a combat scenario, as well as providing evasion measures or countermeasures are the main objectives of the Electronic Warfare system of the aircraft.

Through the high processing rate and the fusion of thousands of information by the Multi Functional System-Electronic Warfare (MFS-EW), the pilot can have a complete view of the environment around him, determining where and how the surveillance radars, air defence systems, ships, air defence fighters, early warning planes and friendly forces are arranged. These scenarios are complex, and the domain of knowledge and information is the key to the success of any mission.





Gripen F

Meeting a Brazilian demand

The development programme of new generation Gripen included the two-seat version of the fighter.

Designated Gripen F, Brazil is its launch customer, having acquired eight fighters that will be used, mainly, for the training and operational conversion of pilots to fly the single-seat variant.

With Gripen F it is possible to conduct training missions, where the instructor will be in one cabin and the student in the other.

The platform can be further developed depending on the customer needs. Gripen F can also be used in operational missions with two crew members, who can divide the tasks by selecting, in the Wide Area Display, the information and features with which they will work. This version can also be piloted independently of the front or rear cabin and its technical characteristics are practically identical to those of Gripen E.

The first aircraft is expected to be delivered in 2023.



First metal cut for Gripen F

Hardpoints: 10

Maximum speed:
Mach 2

Combat turnaround
air-to-air:
10 minutes

Minimum take-off distance: 500m
Landing distance: 600m

JOINT DEVELOPMENT

Brazil and its defence industry have a large participation in the development of Gripen F. The flight test campaign will be carried out in Sweden and Brazil, starting in 2023, when the first aircraft should leave the production line.

In all, 400 engineers are working on the development of this variant, most of which are concentrated at the Gripen Design and Development Network (GDDN) in Gavião Peixoto (SP).

Like Gripen E, this variant will be produced in Brazil and in Linköping, Sweden. The tail cone, aerodynamic brakes, wing box, front fuselage and rear fuselage will be built at Saab Aeronáutica Montagens, in São Bernardo do Campo, while the final assembly will be done at Gavião Peixoto, at Embraer.

In terms of design, the Brazilian engineers are involved with the modifications to add the seat, flight controls and Wide Area Display at the rear cabin; in addition to oxygen system; adapting of the electric power and air conditioning system; studies and analysis of structures, aerodynamics, aero elasticity and loads; redesign of the forward fuselage and the air duct section;

and rearrangement of avionics and electrical installations.

In March 2018, preliminary design work on the fighter's front fuselage and on the engine air duct was completed, including its structural design, in a work carried out in partnership with Embraer and Saab teams at the GDDN and Linköping.

This step was essential to evaluate structural and systems installation issues in relation to the maturity of the project and its future production. In December 2018, the team completed preliminary design work on the rest of the aircraft.

The next steps were the preliminary review of the project and then the detailing phase of the front fuselage by Embraer and the rear fuselage by Akaer. This work was made possible after a team of approximately 50 Embraer employees underwent training in Sweden, including the on-the-job training stage.

The first piece of the fighter started to be produced in Linköping in December 2019.

Subsequently, Saab cut this piece, reaching an important milestone in the development of the programme. The expectation is that the assembly of Gripen F will start in the second half of 2020.



← Width overall: 8,6m →



← Length overall: 15,9m →

Gripen, legacy of sovereignty

In the 1980s it would have taken only 15 minutes for any of the approximately 4,300 combat aircraft, from the countries that constituted the former Warsaw Pact military alliance, to reach Sweden. They were fighters, bombers, supersonic fighters, intelligence and Electronic-warfare aircraft positioned in dozens of air bases and ready to attack the small country located on the Scandinavian peninsula.

In quantity, this force was greater than the sum of the order of battle of the Air Forces of Sweden and Finland, and the air component of the North Atlantic Treaty Organization (NATO) based in Denmark and Norway.

As a country that had adopted a policy of non-alignment and neutrality in 1814, which was the last time it was involved in a conflict, Sweden's geographical position was strategic for both Western and Eastern bloc of countries during the Cold War, since it would be possible to establish bases and launch attacks to either side. To preserve its neutrality status and, at the same time, to guarantee the sovereignty of its territory, Sweden invested in defence research to remain at the technological forefront and not depend on other countries.

In this complex scenario Saab AB was one of the main partners of the Swedish Air Force, designing an aircraft that met and exceeded the established military requirements. Gripen as an example.

FOR THE SWEDISH DEFENCE

With Gripen, Sweden wanted a fighter that fulfilled the tasks of interception, attack and reconnaissance, with the pilot being able to switch from one mission to another in mid-flight pressing a single button. That's how Gripen, a multi-mission fighter, inaugurated a new generation of fighters of the time. Saab developed this new combat vector in a way that was easy to manufacture, in addition to low acquisition and operational cost. Small and single-engine, it is agile, with high warfare capacity and simplified maintenance. Internally, it would have an advanced on-board radar, self-protection systems, electronic warfare and datalink to communicate with other planes, vessels and stations on the ground.

Gripen also received computer-aided flight commands (Fly-By-Wire); Head-Up Display, a digital display with the main flight information, tactics and weapons on the eye level; and a fully digital instrument panel with three monochrome multi-functional displays. Upon returning to the base, the fighter could be armed and refuelled in a matter of minutes, at which point the ground crews would carry out the necessary repairs, including the engine replacement, in a short time. For this reason, its on-board equipment was modular to allow this agility in the substitution of defective com-

ponents.

In addition to the multi-mission capability, this mobility has made Gripen a force multiplier, given that with few of these aircraft it is possible to challenge a numerically superior enemy. Finally, Gripen should be able to operate from remote bases or, in more extreme cases, from the country's highways. Thus, in addition to the need to land and take off runways measuring 16m wide and 800m long, the fighter would dispense with complex infrastructures for its operation.

In 1996 Gripen A entered service with the Swedish Air Force, and the country, having developed it to defend its own sovereignty and territory, was not concerned with its exportation.

THE NEW GENERATION - A FIGHTER FOR THE WORLD

In 1997 Saab announced the development of the export version of its newest fighter. Gripen C, as it became known, was designed to be able to operate in other countries and to be compatible with NATO systems, such as datalink and communication. In addition, the in-flight refuelling probe was added to extend its range and the cockpit received new, larger and colourful, digital displays. The wings were also reinforced to support a greater weapons.



Gripen has a wide operating capacity from remote bases.

Gripen E, the smart fighter for the next decades.



Saab developed the two-seat variant, called Gripen D, which had the same technological resources as Gripen C. In a short time, more than 65 aircraft started their operation with the air forces of South Africa, Hungary, Czech Republic and Thailand.

IN ACTION

In the last decade, in some parts of the globe, Gripen operators have deployed their aircraft for flights for beyond national and international training missions or exercises. In fact, the presence of the delta-shaped fighter has been increasingly frequent in actual situations. This is the case of Baltic Air Policing, a mission established by NATO on 30 March 2004, aimed at protecting the airspace of Estonia, Latvia and Lithuania against irregular flights without a flight plan, or from aircraft that are facing any type of problem. Through a rotation system, maintained by NATO member countries, armed fighters with a crew ready to take off and intercept any aircraft that have not been identified, are kept on alert 24 hours a day, all year round. The first time that the Czech Republic Air Force participated in this mission was in 2009 with



Inaugural flight of first development Gripen aircraft.



Gripen, always combat ready.



four Gripen in Lithuania, repeating the mission again in 2012 and 2019.

Hungary debuted in 2015 with four Gripen, returning to the region in 2019, in one of the years with the highest number of scramble carried out by NATO. More than 400 flight hours and 370 take-offs made by the Hungarian crews, who mostly intercepted transport aircraft.

Another operation in which Gripens participated, this time by the Swedish Air Force itself, was in the Unified Protector, in which the aircraft executed a tactical reconnaissance missions over Libyan territory. The first aircraft arrived on 2 April 2011, just 23 hours after the Swedish Parliament authorized the aircraft to go to the African continent and take part in the NATO-led operation. The fleet had eight Gripen and at the end of the mission, completed on 24 October 2011, 650 combat missions and two thousand flight hours had been conducted with the production of 150 thousand photos.

FOR THE NEXT DECADES

The constant technological transformation of threats in the 21st century scenario led Saab to conduct studies, in the mid 2000's, for the

smart fighter for generations to come.

Designated as Gripen E (single seater) and Gripen F (two seater), Saab has integrated a unique, horizontal display in the cockpit, which can be easily configured with the information the pilot wants to see at any given time. For example, at the take-off and landing phase, with flight, fuel, engine, speed and altitude data. Or on the battlefield; tactical data, weapons, radar and the enemy's position on the ground and in the air.

An Infrared Search and Track (RST) sensor was also integrated and placed externally in front of the windshield. It is capable of capturing, over great distances, the heat emissions from other aircraft, as well as vessels and vehicles on the ground, allowing the pilot to launch a surprise attack. The system is passive and works silently without reporting its presence to the enemy, unlike the radar whose wave emission can be detected.

The ability to communicate between fighters automatically in Gripen E/F is also a key feature. It is possible, with an aircraft formation, that one interferes in a certain system of the enemy while another makes the surveillance in the air. They all act as if they were one. Pilots determine what needs to be done and the systems

act to obtain the best efficiency.

The fighter has gained a new electronic warfare suite, expanding its possibility of survival in a hostile environment permeated by modern threats based on the ground and in the air. Likewise, it received new sensors that actively block enemy radars.

Finally, the new generation of the Saab fighter has now 10 external hard points for weapons, instead of eight as in the previous generation. On Gripen, improvements and modernizations are made by updating the hardware and software, independent from each other, thus reducing time, costs and facilitating the process for the operator. In the case of the radar, for example, which already searches for targets electronically, instead of having to direct the antenna to the target, it is possible to improve its performance by changing only the processing capacity.

Adding all these features and capabilities with its small dimensions, Gripen is in fact an aircraft difficult to be detected by radars, and it's considered to be the most modern and advanced vector in its category, with the advantage of having low operational and acquisition cost, which represents a fraction of other fighters.



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