

GRIPEN GETS NEW LIFE

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The Gripen eventually develops more or less in a success story for Swedish aircraft industry. Once only limited orders abroad were earned for previous Saab fighters and even none in case of the Viggen, but today Saab breaks with this past and Gripen is chosen in and outside Europe with several air arms. Gripen has advanced technology, is reliable and needs considerable less maintenance compared with other types. Latest generation values are incorporated in New Generation Gripen (Gripen NG) and the process of designing continuous in avionics and integrated systems which enhance the awareness to a superb level. Gripen operates just like the JSF with companion aircraft as a whole system sharing each others awareness.

COMPOSITE MATERIALS

Where ever did it begin? The Swedish Flygvapnet used the Saab Draken in service, which was later on joined by the Saab Viggen. At the time the Viggen faced end of life and Swedish Air Force was seeking for a replacement several candidates from other manufacturers who could opt for this were in the market. Sweden however was keen to carry on the tradition and developed the Gripen, not only for their own benefit but this time clearly also to create an alternative on the foreign market. The Gripen would be capable to compete with the best types of airplanes. The first test-flight was made by Stig Holmström in 1988 and in 1996 the Gripen Trainings Centre started up at Sätenas. The plane was indicated as 'JAS-39 Gripen' which stands for 'Jakt-Attack-Spaning' or fighter / attack / reconnaissance and a real multi-role airplane was born! The name Gripen means Griffin, and is taken from the Saab-logo.

It is a relatively light plane with only 70% empty weight of the F-16 and half that of Hornet or Rafale. The construction exists considerably of composite material, where about 20 to 30 % on the outside of the fuselage is made of carbon fiber, resulting in a very low radar profile. The wing is known as a cropped delta wing with leading-edge flaps and trailing-edge drooping "elevons". High manoeuvrability is combined with the capability to perform high angles of attack. A special requirement was laid down by the Swedish government; the airplane should be able to operate from emergency airfields (such as highways) with a runway less than 800m. Experiences with the application of the canard to the fuselage on the Viggen provided SAAB already the knowledge of the advantages of this feature in flight characteristics.

On the Gripen they can move ninety degrees, acting this way as air-brake which decreases the landing speed substantially and also at low speeds flight behaviour can be controlled better thanks to more lift. On a highway, the Gripen can be refuelled and rearmed by a five -member ground crew using one truck. Typical Swedish is how they organize their fleet of fighter aircraft to be less vulnerable. The advantage is that the Gripen - in times of trouble - can be spread all over the country. According to the BAS-90 protocol this is executed in groups of six. Build in self test and an additional Auxiliary Power Unit (APU) make the plane less dependent on ground equipment. Entering data remains accessible via a laptop computer.

ADVANCED TECHNOLOGY

The airplane is equipped with fly-by-wire technology which combines the high manoeuvrability with safety, by controlling limits, but still allows forces to 9-G. Next to this the fighter is equipped with analogue back-up controls. For the pilot a centred joy-stick and a left hand throttle control instrument are mounted, using the hands-on-throttle and stick (HOTAS) principle. His awareness is built up by a human-machine interface of three active matrix liquid crystal multifunction displays with a wide angle HUD and a modern canopy which provides even more overview than an F-16. A Ferranti-Ericsson

PS-05 / A pulse Doppler radar based on the Blue Vixen radar GEC Marconi (Sea Harrier) detects, identifies and follows several high-and low-flying targets at a time using long-distance Wide Angle Search in air and High Resolution Mapping of the ground profile. The Gripen is perfect for Beyond Visual Range (BVR) operations through its Celsius AB Tactical Information Data Link System (Tidle). This way a formation Gripens has a constant picture of the radar sensors and other aircraft instruments of each other, secured by a jam-proof digital radio network while radar information can be sent over a distance of 500 kilometres to four fellow-pilots.

In cooperation and linking sensors the awareness strongly increases and better decisions can be made. Information with ground targets may likewise be shared with ground units. Working as a pool the Gripen is even capable of breaking through an enemy radar-jam. Also tasks can be divided, one Gripen can jam a target while another one can track and eliminate this target. All these activities provide the opportunity for orderly instrument management in the cockpit. The Gripen has passive and active electronic warfare capability, while a Saab Avionics AR 830 Radar Warning Receiver (RWR) signals detection by enemy radar. Monitoring the engine is done digitally with Full Authority Digital Engine Control (FADEC). The engine is also an improved version of the General Electric F404J, it's very reliable and also applied in the F-18 Hornet. Sweden builds it under license as the Volvo Aero RM-12 bypass turbo-jet with a larger fan, more powerful and with an afterburner designed in Sweden. The Gripen includes some 30 km wiring, 60.000 parts and 40 computers.

EXPORT

Many elements from the Viggen era came back such as operating from highways and the use of data-link applications in which Sweden is a pioneer, but one thing did give Sweden little pain. They have never been able to export the Viggen because too many requirements were typically tailored to the Swedish requirements. They looked for a joint venture for the export sale, which was found with BAe Systems and the Saab-BAe Gripen was called AB. This way Saab could take the profits of the marketing experience of BAe. The one-and two-seat versions in the Swedish Air Force with respectively 176 and 28 examples are JAS-39A and B versions, while the standard NATO version is indicated as JAS-39C and D, they include a provision for refuelling in the air. Both Czech Republic and Hungary use these versions (both with 12 single-seaters and 2 two-seaters). They choose for a lease-contract with Saab, and they experienced how a handful of Gripens could easily replace a complete army of Mig-21's. They expect a lifetime of 30 years for the Gripen and agreed upon a contractual right to buy the planes after the 10-year lease-contract. The C and D versions were standard indicated as EBS (Export Baseline Version) or also called 'batch 3'. Sweden itself responded this way and had the A and B versions (from 2004) converted to batch 3 versions. Initially South Africa and Thailand were two customers found outside Europe.

Thailand first ordered in 2008 a batch of six Gripens consisting of two single-seat C-models and four two-seat D-models, which were delivered in 2011 and a second order of six single seat C-models was announced in 2010 and delivered in 2013 with a possible chance of a third order. South Africa ordered 26 Gripens C/D (17 single-seat and 9 two-seat models) which deliveries commenced in 2008. Then Saab had to conquer for new orders which in order to survive is nowadays a necessity. Saab was always a contender but several potential customers were attracted to concurrent aircraft for different reasons. Poland linked itself to the F-16, Finland to the F-18 Hornet and Norway committed itself to the JSF as did the Dutch. Some countries such as Romania and Bulgaria focuses more on second handed F-16's. In 2008 an offer was made to Croatia for eight Gripens but due to short budget, orders are still postponed and the Mig-21 soldiers on. Other European countries were involved in the production of their own fighter aircraft such as Rafale and Typhoon and even become a tough concurrent for export. Some orders were missed such as an offer to Oman which requirement eventually was won by the Typhoon. Also India showed much interest, but after a serious test program they decided not to choose for the Gripen because they considered the many U.S. manufactured equipment installed would make them to much dependable on the USA. Specific USA and Israeli technology was protected and could block deliveries in the last phase. Also they found in their opinion shortfalls in performances. The order for 126 Multi role combat aircraft (MRCA) would ensure Saab as a producer of Fighter aircraft in near future, but Saab has learned from the India-issue. Interest stayed in navalised variant capable of operating from an aircraft carrier which put Saab in other point of view of designing. Developing continued and Saab presented the Gripen NG (New Generation).

GRIPEN NG

During production Gripen is constantly improved. The last batch 3 versions have a new inertial

navigation system with GPS and improved Data Link 39 (CDL 39), a more powerful main-computer with five MILSTD 1553B data busses instead of three, a more powerful RM-12UP engine and improved EWS-30 Electronic Warfare system. On May 27th of 2008 a new Gripen was airborne, with more modern technology. This model stands for NG or 'New Generation'. It includes a 25% more powerful engine, the General Electric F414G, also applied in the F18E/F Super Hornet enabling the plane to a possibility of super cruise (mach 1.1 without afterburner) with armament. The tank-capacity has increased with 40% resulting in an increased range up to 4000 km, while the maximum take-off weight increased from 14.000 to 16.000 kg. Under the wings some 6000 kg can be mounted. On November 5th 2009 a flight was made with a new type of antenna 'active electronically-scanned array' (AESA) radar from Selex Galileo named Vixen 500E.

An array of programmable transmit-receive (TR) modules can operate parallel and work together which make it possible to jam and scan at the same time. This radar scans 200 degrees, which means also backwards! This demonstrator has to lead to a JAS-39E/F production version. The latest technology is used and to make the Gripen even more attractive it is qualified to carry the most smart weapon-systems like the American AMRAAM, the British ASRAAM and the Israeli Rafael Python 4 rocket systems and capable to carry other systems like the Litening targetpod and Thales Vicon 70 recce-pod. It is obvious that Saab will continue walking first line. Already there have been simulated tests for a sea-version for landing on a carrier.

SWISS DECISION

Then Switzerland chose the Gripen and this was vital for the Saab concern. Interest was shown from 2008 but finally on 30 November 2011 the Swiss government announced the decision to buy 22 Gripen NG. The JAS-39C/D was tested and again reports from insiders, leaked to the press, mentioned opinions of not fully satisfactory performances. In this reports Rafale and Typhoon showed better combat performances. Critics on this reports however claimed comparison was based on the JAS-30C/D versus concurrent aircraft and not on the Gripen NG which would bring improvement on this. Nevertheless the Swiss government almost ensured the tax-payer a sufficient price-quality product. In the process to acquisition of the 22 JAS-39E in 2018-2021 the Saab factory will lease eight JAS-39C and 3 JAS 39D between 2016-2020 to train Swiss pilots. A small detail in the process is a national referendum on this matter in 2014 could change all plans but seems at this moment to have minor chance.

F-X2

Recently another success for Saab came unexpectedly. Brazil laid down a competition called F-X involving a replacement of current types with a 4+ generation aircraft with a requirement of 36 aircraft. Participants in this competition next to the Gripen were the Super Hornet, the Typhoon, the Rafale and even the Sukhoi Su-35. The competition did not lead to a winner ad a follow-on process on this requirement was called F-X2 with even an eye open for the Lockheed Martin F-35 JSF but recently the Brazilians picked up the Gripen as the winner. This was caused by a good offer from Saab. They offered strong partnership, not only in production but also in designing. This can lead to an effort focused on the marine variant again. The Saab costs only half the price of the Rafale in acquisition and maintenance costs and cost-effectiveness is of high importance. Brazil was a customer of French aircraft for years and so this choice also surprised analysts.

With the plans to have in future 24 Navy fighters on a new Sao Paulo aircraft carrier in 2025 the Brazilians are in the role of co-designing and co-developing the Sea-Gripen which work was already started in 2011. Once this project will be running with Saab and Brazilian partners Indian again will be in focus with their wish to replace their carrier-based aircraft. The Sea-Gripen will be fitted with a few navalised enhancements on the Base-line Gripen-E such as strengthened undercarriage, bigger brakes and a beefed-up tail hook. Some features as high precision landing capability and enhanced anti-corrosion protection are already actualised. The concept suggested by SAAB is called 'short take-off, but arrested recovery (STOBAR)' implicating both catapult as Ski-jump starts are possible with classical landing helped by arrester hook. The new sales and trust in Gripen NG could open minds of new customers to vote on the latest version of the Saab product.



GRIPEN CHARACTERISTICS (BATCH 3)

Length	14,1m
Height	4,5m
Wingspan	8,4m
Wingsurface	25,5 square meter
Empty weight	6620 kg
take off weight	8720 kg
Max.take off weight	14.000 kg
Tank content	3300 L extra 2x droptanks a 1100 L is optional
Engine	1 x RM-12 Volvo Aero turbofan without afterburner 54 kN and with afterburner 81,9 kN or 8350 kg. thrust.
Speed	Mach 2 + (2470 km/u)
Accelleration	Mach 0,5 tot Mach 1.1 in 30 seconds
Range	1200 km
Fighting range	800 km
Max.wingload	336 kg/square meter
Thrust/weight ratio	0.97
'Ferry' reach	3200 km (with 2 droptanks)
Minimal runway	600m (landing 500m , start in interceptor mode 400 m)
Radar	Saab PS-05/A pulse doppler X-band radar
ECM	1 x ALQ-TLS ECM pod
Self-protection	BOP/B en BOP/C dispensers with 160 chaff or flares and BO2D RF decoy in supersonic flight EWS-30 EW system
Eject-seat	Martin Baker S10L zero zero (zero altitude, zero speed)
Hardpoints	8
Armament	1 x Mauser Bk-27 canon (120 rounds) 8 x Mk 82 bombs or 2 x Bk 90 cluster munition 6 x Rb 74 or Rb 98 air-air missiles or 4 x Rb 71 or Rb 99 of MICA or METEOR air-air missiles or 4 x Rb 75 air-ground missiles or 2 x KEPD 350 cruise missiles or 4 pods with 13,5 cm unguided missiles or 4 GBU-12 Paveway II Laser guided bombs (LGB) or 2 x Rbs.15F anti ship missiles

Swedish missile indications

Rb 71	license Skyflash
Rb 74	license AIM-9 Sidewinder
Rb 75	license AGM-65 Maverick
Rb 98	license IRIS-T (Infra-red Imaging System Tail/Thrust Vector controlled) In combination with Cobra helmet mounted sight
Rb 99	license AIM-120 AMRAAM