GRIPEN NEWS

SPECIAL EDITION: **GRIPEN DEMO**

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GRIPEN DEMO REVEALED

GRIPEN NG:
THE FIRST OF THE NEXT GENERATION

GRIPEN REMAINS THE SUPERIOR CHOICE

Photo: Montage

GRIPEN REMAINS THE **SUPERIOR** CHOICE

THE FUTURE ENHANCEMENT PLAN GIVES GRIPEN C/D CUSTOMERS EVEN MORE OPTIONS

Gripen C/D is in service with, or selected by, the air forces of five nations; the Czech Republic, Hungary, South Africa, Sweden and Thailand. Gripen is the cornerstone of 21st century airpower. Gripen is being evaluated by many more nations who need a supremely effective, affordable, deployable fighter that can go anywhere, handle every mission and work side-by-side with allies – fully networked and interoperable. Gripen remains the epitome of modern air combat systems design – one which solves the cost/performance equation with demonstrated experience of over 100,000 flight hours. Gripen will always be the intelligent choice for tomorrow's air forces, today.

Photo: Jan Gustafsson

Gripen C/D from the Swedish, Czech and Hungarian Air Forces. The latest customer is Thailand, which will take deliveries in 2011. Gripen is also operated by the UK ETPS, Empire Test Pilot's School.

The Gripen Demo and Gripen NG programmes are great news for current and future Gripen customers. SAAB and Sweden's commitment to future technology development means that the growth path for Gripen C/D is assured for decades to come. Air forces now flying Gripen can be assured that they are part of a wider team dedicated to the continuing evolution and enhancement of their aircraft. Air forces now considering their future procurement options can be 100% certain that Gripen will remain just as effective in 25 years time as it is today.

There are few other aircraft on the market that can point to such a level of support for their assured future growth and capability expansion. Gripen C/D is already the product of a carefully considered evolution from the formidable Gripen A/B standard. Quite apart from the many new capabilities to be developed for Gripen Demo and Gripen NG, the Gripen C/D will continue to be upgraded through planned software and systems advances that are already being worked on today. Combined with the 'leap-ahead' innovations now being rolled out by SAAB, Gripen C/D customers have even more options as to how and when they tailor-make their aircraft to their future needs.

The Gripen system has never relied on cumbersome 'mid-life update thinking', which can take an age to be agreed, another age to be implemented and all too often suffers from spiralling cost rises. Gripen follows a path of constant, incremental improvement, rapidly applied through changes to its software-driven design. This will not change. Gripen customers will always be able to draw on a technology base that constantly delivers an ever-improving aircraft. What has changed, thanks to the Gripen Demo programme, is that Gripen customers will have an even wider range of enhancements to choose from, underlining why Gripen will always be the smart choice for the intelligent air force.

South African Air Force Gripen D. *Photo: Frans Dely*

Artist impression/Eskil Nyholm

GRIPEN NG:

THE FIRST OF THE **NEXT GENERATION**

GRIPEN NG IS THE NEXT STEP FOR THE GRIPEN DESIGN, BUT THERE IS MORE TO COME

When discussing the continuing evolution of the Gripen system, it is important to remember that the Gripen Demo programme is just a stepping stone to the fully-fledged Gripen NG (Next Generation) design. The Gripen Demo aircraft will test and develop many of the essential systems and capabilities that will be applied to the Gripen NG, but all of these aspects will be further refined and enhanced in the final production form of the Gripen NG.

As Gripen NG is a platform for the 2015 timeframe, it is clear that many of today's technologies will have moved on by the time the NG is available. For example, active electronically scanned (AESA) radar, communications, electronic warfare and weapons development – all at the heart of Gripen NG's improved capabilities – does not stand still. Therefore, while the Gripen Demo aircraft will be invaluable in sketching out the road map for Gripen's future development, the ultimate NG systems fit will go even further. The AESA radar to be trialled on the Demo aircraft will deliver invaluable integration data and operational experience, but it will not be the final configuration for the Gripen NG. The broadband satellite communications link fitted to the Demo aircraft, uses a commercial Iridium system to prove the capability of such a system, but this will not be the final production fit. Not all of the extra fuel capacity of the Gripen NG design will be utilised in the Demo aircraft, but its feasibility will be fully proven and implemented.

The new missile approach warning system (MAWS) fitted to the Demo aircraft is an impressive new capability, but an even more advanced system is under consideration for the Gripen NG. The Gripen Demo aircraft will undertake weapons carriage trials, but the Gripen NG will be fully prepared to adopt cutting-edge weapons that are still under development.

Many other changes and improvements will be implemented in Gripen NG. The Gripen Demo and the associated avionics systems development rig will play a key part in that story. However, that story is only beginning with the roll-out of the Gripen Demo and even now, the development team is looking further into the future to see what else can be achieved. Gripen NG is not simply the next generation Gripen, it is the first of generations to come.

STANDING ON THE EDGE OF **A NEW ERA**

THE GRIPEN DEMO PROGRAMME IS THE START OF THE GRIPEN STORY FOR THE NEXT 40 YEARS.

Johan Lehander is the Managing Director of Gripen International. A SAAB veteran of nearly 25 years, he joined the company as a Systems Engineer on the Viggen programme. During the 1990s, he worked on Gripen's avionics systems and was later appointed Programme Manager for the entry into service of Sweden's first aircraft. Few people have as much insight into where Gripen has been and where it is going. 'Gripen News' asked Johan about the requirements driving the Gripen Demo and Gripen NG programmes and what these initiatives mean for the future of the Gripen system.

"In the fighter market, no matter how good your current product is, each potential customer wants to know what's next. Will you invest in the aircraft for the future? Will your own Air Force, and your own government, support the programme too? The Gripen Demo programme and our plans for the Gripen NG prove that the answer to those questions is a very clear – yes."

"We are committed to the Gripen system. It already has many years of investment behind it and the world can see now that it has many more years to come. The roll-out of the Gripen Demo proves our dedication to the aircraft and its customers in the most concrete way possible."

"The Gripen Demo is not just the first step towards a new Gripen, it is driving the development of new technology for existing Gripen customers and for other applications entirely. The Demo aircraft is a platform for technology insertion for the whole Gripen family. It reassures any customer buying Gripen today that they will be able to upgrade and enhance their aircraft when they need to."

"You can see already that the story of the Gripen is one of development, evolution and constant enhancement. The Gripen Demo and NG programmes fit into that story but they are also driven by a very clear and detailed assessment of what the future market actually needs – and by what our competitors might be doing 30 years from now."

"We have concentrated on the key strategic performance and capability areas. That includes the aircraft sensors, communications fit, weapons load, self-protection systems, range and engine performance. But we also need to build and deliver a system that remains affordable. In the coming years Gripen will find itself in a league of its own when it comes to costs, particularly long-term life cycle costs. We are already delivering systems and capabilities that our competitors still can only offer as promises. In the years to come Gripen will get even more advanced, even more sophisticated while staying every bit as affordable as it is now. We understand cost control. Not everyone can say that."

"The Demo aircraft is a platform for technology insertion for the whole Gripen family"

Johan Lehander,
Managing Director, Gripen International

Photo: Jan Gustafsson

"The Gripen Demo and NG programmes change all of our market predictions because of what they add to the life of the system. Today's Gripen C/D is one of the most advanced combat aircraft, by far, on the market and we can continue to sell that aircraft for another 10 years. The Gripen NG takes us into the market 10 or 15 years beyond that, so already you are looking at a 25-year high-tech programme."

"I can tell you that over those 25 years there will be another step forward, maybe more than one, because we will continue to respond to what our customers need for the future. That's not just an assurance from Saab, you also have the commitment of our industrial partners who have already made a huge investment in the Gripen Demo. The cash value of the Demo programme has effectively been doubled by the contributions of our partners. They have all embarked on their own Gripen-related development work, to say nothing of the essential new equipment they have delivered for the Demo aircraft."

"We want everyone, the customers and the industrial team, to be proud to belong to this programme. We are a reliable supplier and we are an independent supplier. We always deliver what we promise – both in terms of the aircraft system and the entire spread of industrial co-operation and offset provision. You can be confident in Gripen for the next 40 years and be very secure in your relationship with SAAB and with Sweden."

GRIPEN DEMO
REVEALED

Basic data	Gripen C	Gripen NG
Length excl. pitot tube	14.1 m	14.1 m
Wing span incl. launchers	8.4 m	8.4 m
Number of Stations	8	10
Empty weight	6 800 kg	~7 000 kg
Internal Fuel	100 %	~140 %
Engine Thrust	18 000 Lbs	> 22 000 Lbs
Max Take-off weight	14 000 kg	16 000 kg
Payload	5 000 kg	6 000 kg

SAAB
TERMA
THALES
MEGGITT
Martin-Baker
Rockwell Collins
Honeywell
VOLVO AERO
apph

GRIPEN DEMO IS THE PATHFINDER FOR A WHOLE NEW GENERATION

At a casual glance you might not notice all the new features in the Gripen Demo aircraft. Look again and you will see the new landing gear configuration and the extra pylons underneath the aircraft. You might also notice the larger fuel tanks it can carry – but many of the most important changes to the Demo aircraft lie hidden under its skin.

The Gripen Demo has more internal fuel and a brand new engine. It will be fitted with an advanced AESA [Active Electronically Scanned Array] radar plus an array of new avionics and mission systems. It is a leap ahead, not just for the Gripen system, but for fighter technology in general.

The cockpit design of the current Gripen C/D is already the most advanced of any in-service combat aircraft anywhere in the world. In the Gripen Demo that has not changed, but the new technology of the Demo aircraft means that Saab's avionics team is already thinking two generations ahead when it comes to the design of future systems.

The Gripen Demo aircraft is the testbed for the coming Gripen NG. It will prove the design changes and new capabilities that will be transferred to Gripen NG in the future. The Gripen Demo is not a finished product, it is a work-in-progress – a responsive adaptive testbed that opens the door to tomorrow. There is more to come.

The Gripen Demo Aircraft

The two-seat Gripen Demo aircraft is a former Swedish Air Force JAS 39B, upgraded to the latest Gripen D standard and then modified once more for its Demo role. The work was undertaken using the CATIA VFM digital design system and computer-controlled manufacturing. There are 3,500 new parts in the Gripen Demo aircraft.

General Electric F414G Turbofan

The Gripen Demo's new GE F414G powerplant replaces the current standard Volvo Aero RM12 engine (derived from GE's F404). Some changes were made to the aircraft's internal engine bay walls to accommodate the F414G and the engine is mounted slightly higher than the previous RM12. The air channel feeding the engine has been redesigned to deliver the higher airflow needed by the more powerful engine and the external air intakes have also been modified and widened.

Extra Load-Carrying Capacity

The changes to Gripen Demo's landing gear arrangement allow the addition of two new hardpoints (Stations No. 5L and No. 5R) underneath the aircraft, complementing the earlier (single) station No. 5. The Gripen Demo aircraft will conduct carriage trials with new weapons including Small Diameter Bomb (SDB).

AESA Radar

Gripen Demo will conduct trials with a new active electronically-scanned array (AESA) radar developed by Saab and Thales. No changes are required to the radome or the exterior of the aircraft to house the new radar. Internally the Demo aircraft has been fitted with new radar electronics in its forward equipment bay and a new liquid cooling system.

Advanced Communications Systems

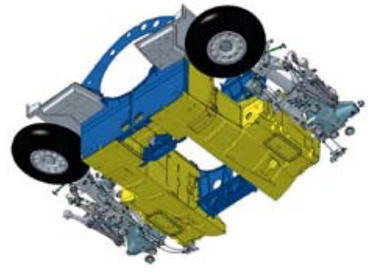
A satellite communications (Satcom)system is installed on the Gripen Demo aircraft, ushering in a new era in high-speed data transmission. Gripen is already the most networked aircraft in service, with a comprehensive array of fully-integrated datalink systems. The Satcom, developed by SAAB and Thales Norway, will take Gripen's netcentric capability to a new level. Gripen Demo is also fitted with a broadband UHF video datalink, for use with ground forces, allowing the aircraft to communicate most effectively with forward air controllers in the Close Air Support role.

Advanced Defensive Systems

The Gripen Demo aircraft is fitted with a missile approach warning system (MAWS) developed by SAAB Avitronics from its MAW-300 system. Four new ultra-violet warning receivers for the MAWS have been added to the Demo airframe.

Improved Main Landing Gear

In a major change to the Gripen Demo aircraft, the main landing gear has been attached to the wing root and moved outboard to new housings under the wing. This frees up substantial space inside the aircraft for extra fuel. Some structural changes have been made to the wing, but its fundamental design remains unchanged. The landing gear is supplied by the UK's APPH.



Expanded Fuel Capacity

Through the redesign of the main landing gear, the Gripen Demo aircraft has gained significantly enlarged internal fuel carriage space. Once full advantage is taken of all the available volume the extra fuel will boost Gripen's range. The Gripen Demo aircraft is also capable of carrying new 450 US gallon underwing drop tanks. The drop tanks and extra internal capacity increase Gripen's total fuel load by 1,400 kg.

New Avionics Systems:

EVEN FASTER, EVEN BETTER

AN ENTIRELY NEW AVIONICS ARCHITECTURE WILL EMPOWER GRIPEN NG

Away from the Gripen Demo aircraft there is a second strand in future Gripen technology work now underway. An avionics design and development team will deliver an entirely new avionics architecture for Gripen NG. With a combination of advanced hardware and a wide-ranging re-appraisal of how an avionics system functions, the improvements to Gripen NG will be revolutionary.

Driving the new core computer system avionics is the need to give customers a step-change in affordability, availability, flexibility and growth capacity over the previous generation of avionics. At the same time, weapon system performance and safety must be guaranteed.

Design for Affordability

By adopting commercial-off-the-shelf (COTS) hardware, Gripen NG brings an enormous reduction in cost for the complete avionics system. Out goes the 'design handcuffs' of dedicated hardware and bespoke solutions found in so many previous systems. In comes a more modern, more flexible and more affordable COTS approach. COTS hardware provides real economies of scale in development and procurement costs. COTS systems also benefit from the faster technology update cycle of the commercial world.

Gripen NG's avionics team is making extensive use of model-based systems development, with automatic software code generation and automated testing. A dedicated avionics development rig allows all new software to be fully tested and verified before it is inserted into the production hardware. The ability to automatically generate code for verification and validation work significantly reduces development costs and schedules. Hand-in-hand with this, a model-based approach for concept evaluation and production software development allows for quicker and cheaper development of essential symbology and cockpit functionality.

Design for Flexibility and Security

Gripen NG takes advantage of the latest ARINC 653 integrated modular avionics standard that provides for the separation of critical functions onboard the aircraft. ARINC 653 sets out new design rules for safety, security and the integration of both common and user-specific capabilities.

Modular object-orientated software architecture allows system changes to be made, verified and certified in an efficient manner. Each ARINC 653 partition can isolate an individual customer's specific data. This makes it possible to host several software criticality levels in the same computer. Most significantly it allows critical and non-flight critical application software to be kept completely apart.

With many current avionics systems almost every avionics change forces the user to reverify the entire aircraft each time, to ensure that flight safety functions have not been affected. With Gripen NG, those critical functions are never touched when a user adds new operational capabilities to the aircraft. This makes the upgrade and modification schedule speedy, and much less expensive.

The use of open standards across all aspects of the avionics core computer system (i.e. ARINC 653, MIL-STD-1553 and Ethernet), provides easier and cheaper development of functions to customers and partners, with none of the expense and complication of propriety solutions.

Design for Availability

Reliable avionics system operation is supported by independently-powered computers and networks/databuses. This 'distributed system' provides for much greater redundancy and security in the air. The incorporation of COTS equipment, with a proven high mean time between failure (MTBF) reliability rate, further ensures that the system stays up and running – and significantly reduces maintenance demands. The latest generation of COTS hardware has significantly better MTBF than today's bespoke hardware.

All application software is divided into ARINC 653 partitions. If one partition fails then the others will generally not, as they are supported by independent systems This ensures a robust and fault-tolerant system, that is better able to cope with the real-world demands of service life.

Design for Obsolescence and Growth

Gripen NG introduces a significant increase in processing, memory and data communications capacity over any current generation avionics systems. This will support all current needs and – critically – any future growth in sensors, weapons and networked-enabled capability.

The bespoke hardware of current generation avionics computer systems becomes obsolete and expensive to replace. Gripen NG avionics use COTS hardware from vendors with a published development road map for their equipment. This ensures that the hardware supplier will be able to continually upgrade the equipment. Equally, open standards design makes it easy to replace hardware with an alternative system should that ever be required. This is another benefit of the ARINC 653 compatible operating system, which isolates application software from the hardware.

Design for Performance

From the very beginning, Gripen NG's avionics core computer system is designed with performance and growth in mind. COTS hardware will always deliver the best levels of performance available on the market. Switched Ethernet, with a bit rate of up to 1 Gbit/sec, drives the high-speed main core network. Commercial development of Ethernet will ensure that band width in the main network will increase in the future.

GRIPEN DEMO TEST PILOTS

SAAB'S HIGHLY EXPERIENCED FLIGHT TEST TEAM IS READY FOR GRIPEN DEMO'S MAIDEN FLIGHT

Mikael Siedl is the Chief Test Pilot for the Gripen Demo programme. Together with his colleague Magnus Ljungdahl, he will take the Gripen Demo aircraft into the skies.

The two have substantial experience in test flying, with both pilots working in the testing role for about 15 years. Mikael graduated from the US Navy Test Pilot School, while Magnus is a graduate of the UK's Empire Test Pilot's School.

Mikael talked to Gripen News about the Demo test programme. "The first phase will be characterized by basic aircraft testing and standard envelope expansion. The redesign of the landing gear and the new engine means we are treating the Gripen Demo as a brand new aircraft type."

Phase Two of the flight programme will contain more systems testing, including the new AESA radar. Mikael has been a member of the project management team since the early days of the Gripen Demo programme. He contributing a pilot's point-of-view on the key elements of the development process.

"Being part of the management team meant, among other things, that I've had full insight on all the technical decisions during the development. Extensive simulation and rig testing have been performed over the last year and now we are moving into the final flight safety verification phase of the software. The test pilots are also involved with all the new aspects of the aircraft, such as the run-up of the new engine, and all the traditional stuff that goes before a first flight," he says.

Mikael feels well prepared for the flight tests. He has been very impressed by the SAAB team which has been dedicated to the Gripen Demo programme so far, especially by the technical team actually building the aircraft. "It is quite remarkable how much has been done in such a short time," he notes.

A whole host of administrative work is demanded by all flight testing. For example, within the SAAB Flight Test Department there is a small, but highly experienced team that writes the all-essential flight manual. "It's a huge and very important function that has to be done with extreme care before we pilots go out and evaluate the whole thing," says Mikael.

The test pilots are now getting ready for the big day when they will take the controls of the finished Demo aircraft and begin the final ground tests, such as engine runs and taxi trials. This paves the way for the Gripen Demo to make its maiden flight in the very near future.

Photo: Per Kustvik

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