

CLOSING GAPS

TEXT - PATRICK ROEGIES, PAUL GROSS, JURGEN VAN TOOR
PHOTOS - PATRICK ROEGIES, PAUL GROSS, JURGEN VAN TOOR & RICHARD RIGBY

In November 2017, Vice Admiral Mike Shoemaker stated that nearly one in three Hornets was non-operational awaiting serious overdue maintenance. How do you close this kind of gap?



The ground crew and pilots are in working together to get the airplane started up for the next mission.

Photo by Richard Rigby

Closing gaps

The war against terrorism has put an enormous strain on the United States Naval Aviation Super Hornet operational employability the last few years. This resulted in an actual aviation readiness crisis in the aftermath of the war on terror. A major maintenance backlog presented itself and the Navy has been working intensively to decrease the number of Super Hornets marked as “non-mission capable”.

In November 2017, Vice Admiral Mike Shoemaker stated that nearly one in three Hornets was non-operational awaiting serious overdue maintenance. Later that same year the U.S. Navy secretary stated that only one-third of the more than 546 Super Hornets within the operational inventory of the U.S. Naval fleet was mission capable and considered fit for deployment.

The non-fit for deployment Super Hornets were in the process of maintenance, awaiting maintenance or were assigned to the training squadrons since the condition of the aircraft allowed the aircraft only to be used for training purposes.

During the “low-point” of the crisis unusual measures were deemed necessary. To meet the requirements of the planned deployments for the 2018 carrier strike groups of the USS Carl Vinson, USS Nimitz and USS Theodore Roosevelt, a total of ninety-four Super Hornets had to be submitted to overdue maintenance at the Naval depots. The Navy is struggling to close the readiness requirements gap and is developing a project(s) to prevent similar situations in the future.

With the crisis in progress, the delivery of factory new Super Hornets is still in full swing, with the Hornet production line to remain open until at least 2025. In March 2018 Kuwait ordered twenty-two F/A-18E and six F/A-18F and the U.S. Navy ordered an additional ten Super Hornets, on top of the fourteen already purchased aircraft in fiscal year 2018. The 2019 defence budget will comprise the acquisition of 110 additional Super Hornets to be delivered between fiscal years 2019 and 2023.

Super Hornet developments

Although all operational active Naval fighter squadrons have completed their conversion to the Super Hornet during 2018, and the decommissioning of Carrier Air Wing (CVW) 14 in March 2017, reducing the number of active Carrier Air Wings to nine, a requirement for the delivery of additional Super Hornets is deemed necessary.

With the decommissioning of one Carrier Air Wing, one squadron VFA-15 “Valions”, already operating the Super Hornet was decommissioned on 12 June 2017. The VFA-15 Hornets were reassigned to the remaining squadrons. The decommissioning of CVW-14 however only marginally decreased the strike fighter availability gap.

Another reason of the operational readiness gap is the result of the increase in the Carrier Air Wing (CVW) deployment durations, which have been increasing from 2011 onwards. From an average of 6.4 months between 2008 and 2011 increasing to 8.2 months between 2012–2014. The average duration of a deployment over the three carrier air wings in 2015 was approximately 9 months.

All these reasons combined with the continuing high operational strain have affected in an extended time required for maintenance to deal with the wear on the aircraft. Also the training program for pilots that have not experienced an actual deployment has been delayed as an effect of the increased operational tempo. Additional budget is requested and allocated in order to deal with those challenges.

The requirement received a higher priority due to the delayed Initial Operational Capability (IOC) of the F-35C Lightning II which confronted the United States Navy with an increased number of operational readiness gaps. As a result, several operational Legacy Hornets were submitted to a severe refurbishment program, to extend their operational lifetime. This was the main reason a budget request funding was requested from fiscal year 2017 onwards to bridge the gap between the older Legacy Hornets and the F-35C Lightning II.





Situation appraisal

With the current knowledge that the war against terrorism resulted in a heavily “crippled” Super Hornet availability, the U.S. Navy completed a situation appraisal, to get an as accurate as possible actual root cause analysis for the situation that became apparent. Besides the high up-tempo and the strain on the aircraft and aircrews, economic restrictions, as an effect of budget cutbacks also played a vital role.

Early 2017, the Navy provided Boeing with two carefully selected Super Hornets, possessing the highest amount of flight hours, to facilitate the situation appraisal, and gain an understanding of the “to be expected” scope of works overhauling the Super Hornets. It also provided Boeing with an opportunity to determine if the condition of these aircraft were according to their expectations based upon and developed through modelling, simulation, and physical torture testing of various components.

One of the two Super Hornets the U.S. Navy provided to Boeing for the situation appraisal process was carefully analysed and the findings were better than expected. In October 2017 Boeing completed the situation appraisal and concluded that no severe deviations compared to their simulated expectations were detected and the airframes and components were in a far better state than expected.

Getting on top SLAP and SLEP

The Super Hornet design specifications stated an operational lifetime of 6000 flight hours. Currently the earliest delivered Super Hornets have reached the 35 percent hours limit. If this amount of flight hours is extrapolated to the planned service life of the Hornet to 2035, this will not be sufficient to meet the operational commitment expectations.

Since this was partially anticipated the development of a Service Life Assessment Program (SLAP) commenced in 2008 and comprised a three-phased program. The development of this program was completed in early 2018.

Depot Readiness Initiative

The main purposes of SLAP is to assess the feasibility of extending the current Super Hornet operational service life from 6000 flight hours to 9000 flight hours. It is based on actual data, used to analyse the effect of the current use and resulting state of the aircraft. The analysed data will be compared with structural test data. Subsequently a Service Life Extension Program (SLEP) should effectively result in the actual prolongation of operational service lifetime of the aircraft until 2035.

Three stages have been defined to assess each individual airframe. During the first stage the airframe is assessed, including the flight controls including and all integrated subsystems and is already completed. The second stage is analysing the data derived from the assessment. The results from this stage will be the basis for the SLEP specifying the modifications and necessary inspections to maintain and ensure airworthiness. The third stage is carrying out the defined work as assessed in the analysis.

The first Super Hornet that was SLEP overhauled to extend the aircrafts operational lifetime commenced in 2015. Work was carried out by Boeing. An increasing number of aircraft are currently in the process of entering stage 2 and stage 3. On an annual basis forty to fifty Super Hornets are submitted to their specific SLEP in the Boeing facilities at St. Louis and San Antonio. Hornets that have been earmarked as “worst condition aircraft” will be submitted to this program with priority.

In May 2018 the Defence Logistics Agency awarded a five-year contract to Boeing, budgeted at 427 Million USD annually and comprised the delivery of required spare parts. This meant the starting point to work through a reasonable backlog of Hornets due for maintenance. The program was referred to as the “Depot Readiness Initiative” and the main purpose of the program was to drastically decrease the number of non-mission capable Hornets. As a result of this program, during 2018 the operational employability situation slightly improved to 50 percent. By early August 2018 it was reported that 241 aircraft were fully mission capable and by the end of August the number of mission capable aircraft improved to 270 aircraft.



A line up of F/A-18F from VFA-122
Photo by Richard Rigby

The Blue Angels

In 2018 U.S. Naval Air Systems Command (NAVAIR) also awarded a 17 million USD contract to Boeing for the conversion of 11 existing Super Hornets for the Blue angels. The contract comprised the retrofit documentation and kits for nine F/A-18E and two F/A-18F aircraft in accordance with engineering change proposal 6480.

The retrofit will be carried out in the St. Louis facility and is planned to be completed in 2021. The Blue Angels received their first Hornets in 1986 and operated all variants of the Legacy Hornet.

Legacy Hornets last leap

The U.S. Navy retired most of the Legacy Hornets from operational deployment, as the F-35C nears operational status. The last Legacy Hornet cruise took place on the USS Carl Vinson and was completed on 12 March 2018. The last squadron operating the F/A-18C was VFA-34 "Blue Blasters" and started their conversion to the F/A-18E Hornet upon their return.

On 01 February 2018 the last Legacy Hornet operations took place at NAS Oceana where VFA-34 was the last squadron to exchange their Legacy Hornets for Super Hornets. The role of the Legacy Hornet within the U.S. Navy however is not yet completed as it will continue service with the Naval Aviation Warfighting Development Center (NWADC) at NAS Fallon and in reserve squadrons. The First F/A-18C models entered service in 1987 and cost 29 million USD each.

It was concluded that 136 mainly F/A-18D aircraft that reside within the U.S. Navy and U.S. Marine Corps could be authorized to be struck off charge. This decision has been taken because their effective technical lifetime has exceeded, and it would require significant funding to extend their service life as a result from refurbishment and refit programs.

The decision to withdraw these aircraft from use was mainly based upon the readiness risk, long term operational costs to keep the aircraft combat capable, versus the gain in capability compared to the Super Hornet.





Withdrawal of the Delta

By withdrawing the F/A-18D from use and putting them in long term storage the aircraft can also be used to keep the Legacy Hornets in use within the U.S. Marine Corps. This by using parts and sending the best of breed aircraft to the U.S. Marine Corps operational squadrons. In March 2018 the U.S. Navy revealed that the 136 selected F/A-18D aircraft will be sent to the AMARG at Davis Monthan to serve as parts donors for the remaining Legacy Hornets within the U.S. Navy and U.S. Marine Corps.

On 17 January 2019 however Raytheon received a purchase order to supply a total of 84 U.S. Marine Corps Legacy Hornets with new APG-79 version 4 Active Electronically Scanned Array (AESA) radar. This radar system is similar to the application implemented in the Super Hornets and is according to the U.S. Marine Corps 2018 Aviation Plan. The delivery of the first modernized Legacy Hornets is planned for delivery in 2020 and will continue until 2022, as a temporary measure to keep the Legacy Hornets combat capable until they will be replaced by the F-35B aircraft.

The U.S. Navy also stated their plan to use the parts to keep the remaining Legacy Hornets within the inventory of the U.S. Navy operational until they are replaced with the Super Hornet. It is planned that four squadrons will make their conversion to the F/A-18 Super Hornet by the end of 2019.

On 6 March 2018 the plan to strike the F/A-18D from the operational inventory between fiscal years 2017 and 2020 was approved by the U.S. Navy.



Transferring the Legacy Hornets

According to the U.S. Marine Corps 2018 Aviation Plan the service operates 180 Legacy Hornets divided over active, reserve and training squadrons. Additionally, there are another 100 Legacy Hornets besides the 2018 Aviation Plan that are all submitted to heavy maintenance.

From 2017 onward however more than 50% of all Legacy Hornets within the operational inventory of the U.S. Marine Corps were not in operational capable status and therefore not mission ready. Supplementing the shortage in available Hornet resources the U.S. Marine Corps received 30 legacy Hornets from the U.S. Navy that already had been stored in at AMARG in Davis Monthan. These were returned to active service within the operational squadrons. The struggle to keep an increasing number of aircraft in operational status however continues.

The F/A-18D aircraft will subsequently be replaced by the F-35B Lightning II. Since the U.S. Marine Corps did not select the Super Hornet as an interim solution to close the gap between the full swing delivery of the F-35 and keeping the Legacy Hornet fleet operational is creating severe problems. Unfortunately, the development challenges and delays in deliveries of the F-35C Lightning II have slowed the process of replacing the Legacy Hornets for the new fifth generation fighter into the operational squadrons. According to current expectations the U.S. Marine Corps plans to operate the Legacy Hornets until 2030 until the aircraft will be retired.

The hand me down aircraft could be a major boost to the U.S. Marine Corps. Depending on whether the U.S. Navy has completely stripped the retired aircraft of useful components, those donor airframes could continue the support Marine Corps Hornets as well. The deciding factor will be how fast the U.S. Navy can transition its own units and transfer the Legacy Hornets to the U.S. Marine Corps Squadrons.

On 1 March 2018, Boeing stated that the initial service life extension program contract (SLEP), worth up to \$73 million, to begin the overhaul of four Navy Super Hornets was received. The company says it will open a production line at its San Antonio, Texas plant specifically for this program in 2019.

Remaining on top of things

Boeing will combine this traditional service life extension work with the Block III upgrades, as well, to try and streamline the integral process. The new separate configuration will include infrared search and track capability, conformal fuel tanks, updated electronic warfare systems, a larger widescreen cockpit display, an improved mission computer, and data links with greater capacity to send and receive information.

Starting up the program Boeing estimates the combined upgrade process will take approximately 18 months per aircraft. However, by gaining experience and efficiency Boeing expects to decrease the required modification time to 12 months as the facilities at San Antonio come on line and they work through any residual issues. The first four airframes will serve as an important trial run and both Boeing and the Navy have been working together since 2017 to get a better understanding of exactly what the process will entail.

The two parties are eager not to repeat the issues they experienced with an earlier service life extension effort for older F/A-18C/D Hornets that started in 2012. That project suffered extensive delays. This was caused by attempting to do the work as an extension of normal less intensive depot-level maintenance. The program hit a number of unexpected issues, including discovering more extensive structural wear and tear and corrosion than expected, as contractors actually began pulling the planes apart.

Besides the inventory of the crippled Super Hornet Fleet and the immediate demand for maintenance the U.S. Navy also purchased an additional 110 Super Hornets in fiscal year 2019 and has awarded Boeing with a contract to start with the overhaul and the service life extension program of the existing “early” Super Hornets to the latest Block III configuration.

The two-seat Block III Super Hornet, with integrated conformal fuel tanks, an enhanced electronic suite featuring improved electronic defences, data links and other mission systems will result in enhanced capabilities of the Super Hornet.

Block III modifications

The infrared search and track system will further improve the Hornets already powerful AN/APG-79 active electronically scanned array radar. This will enable the crew to spot adversaries at extended ranges. The conformal fuel tanks will increase the overall range without the need for drop tanks, allowing the Hornet to carry additional weapons or other mission specific equipment.

Further improvements currently in development include some limited stealth features, such as a fully enclosed weapons pod, and a more powerful, fuel efficient engine. However, these updates are unlikely to be part of the final Block III configuration.

Integrally combining the refurbishment and modification program will most probably result in a multiple phase overhaul for a yet non-defined number of Super Hornets. This might result in an extended overall overhaul time to get fully modernized jets back in for deployment service. The full-service life extension program modification kits including software will not be ready until the earliest 2022 or 2023. This means that the selected jets in severe need of new parts and maintenance before that period will only get a partial update and will have to return to the factory for the additional modifications when available.

The path to success

It remains unclear how many of the over 546 Super Hornets currently in the operational inventory of the U.S. Navy will ultimately be put through the upgrade program. With deliveries of the newly built Block III Super Hornets The U.S. Navy intends to reduce the most imminent demands and close the gap to the desired level of operational readiness capable Super Hornets.

Independent of the final result of the program within a reasonable time the U.S. Navy will be significantly reducing its Legacy Hornet inventory. This in favour of the advanced Super Hornet operating alongside the F-35C Lightning II now slowly being integrated into the operational Navy squadrons. As a secondary result the program will also boost the Marine Corps Hornet squadrons remain mission capable until it can acquire sufficient numbers of F-35B Lightning II aircraft.

