NOT FOR PUBLICATION UNTIL RELEASED BY
THE HOUSE ARMED SERVICES COMMITTEE
TACTICAL AIR AND LAND FORCES SUBCOMMITTEE

STATEMENT OF

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BEFORE THE

HOUSE ARMED SERVICES COMMITTEE
TACTICAL AIR AND LAND FORCES SUBCOMMITTEE

ON

NAVAL AVIATION STRIKE FIGHTER ISSUES AND CONCERNS

MARCH 28, 2017

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Introduction

Chairman Turner, Ranking Member Tsongas and distinguished members of the subcommittee, we thank you for the opportunity to appear before you today to discuss the Department of the Navy's (DoN) Strike Fighter programs. This statement addresses the DoN Strike Fighter requirement as well as efforts to recapitalize the force. Appendix A includes an overview of related physiological episodes and aircraft mishap data.

Strike Fighter Inventory Management

Through 2009, the Department's Strike Fighter force was relatively healthy. Several events transpired since 2009, however, which drove our current Strike Fighter inventory shortfall. The Budget Control Act of 2011 started multiple years of reduced military funding and F-35B/C fielding plans were delayed. As a result, the DoN decided to extend the life of legacy F/A-18A-Ds using our aviation depots. Sequestration led to furlough and a hiring freeze of a skilled government civilian artisan workforce at aviation depots, significantly impacting depot throughput and fleet readiness along with other factors such as high utilization rates, lack of aircraft procurement and lack of spare parts. Throughout this period, the operational demand for Naval Aviation forces remained high and accelerated the consumption of existing fleet aircraft. In essence, consumption of aircraft exceeded new and re-work production capacity of aircraft causing an increasing shortfall.

The Naval Aviation Enterprise (NAE) aggressively tackled Strike Fighter Inventory Management to ensure that deployed forces are properly manned, trained and equipped. Each budget year, the NAE attempts to harmonize available funding between flying hours and readiness enabler accounts in order to achieve the greatest return on investment towards improved readiness.

Under the current budget and with Secretary Mattis' focus on readiness, aviation spares and readiness enabler accounts are receiving improved funding levels. It is important to note, however, that years of underfunding cannot be corrected in one budget year and will require stable, predictable funding over multiple years to achieve positive results. This shortfall will take time and likely require several years to correct.

The Navy has taken significant risk in Strike Fighter Inventory Management. The Department remains challenged with planning for F/A-18 A-D and AV-8B aircraft that reach the end of their service life before replacement aircraft (F-35B/C) can be delivered into service. PB-17 investments begin to address the gap between the Strike Fighter inventory forecast and Global Force Management (GFM) demand by fully funding depot capacity; however, near-to-mid-term risk remains due to uncertainty in readiness accounts and procurement that fails to match Strike Fighter service life consumption. Mid-to-long-term risk is driven by a shortfall in tactically relevant aircraft to replace those F/A-18 E/F soon to be inducted into commercial depots for service life extension modifications. Long-term risk is driven by Strike Fighter procurement that fails to match Strike Fighter service life consumption and attrition.

Strike Fighter Inventory Management should be viewed in two separate and distinct phases. The near-term challenge is managing a DoN Tactical Aviation (TACAIR) force that has been reduced in capacity through a combination of historically high TACAIR utilization rates, constrained resourcing of sustainment and enabler accounts resulting in inadequate availability of spare parts, F/A-18 depot production falling short of the required output, and reduced Strike Fighter aircraft procurement. TACAIR aviation depots are expected to continue to improve productivity through 2019. In 2019, the focus will shift toward F-35 repair and begin to support F/A-18E/F service life modifications. In a similar effort to increase Harrier aircraft availability,

the Marine Corps conducted a Harrier Independent Readiness Review which identified a need for changes in the Harrier sustainment plan to achieve required flight line and inventory readiness. This year, with sufficient resources, the Department is implementing these changes to return Harrier readiness to the required T 2.0 levels.

In the far-term, the Strike Fighter inventory is predominantly affected by new procurement of F-35 B/C aircraft and F/A-18 E/F as well as the service life modifications of our current F/A-18 E/F fleet to meet future utilization rates by recapitalizing our aging Strike Fighter fleet. Combatant Commander (CCMD)-driven operational demand, Fleet Response Training Plan training and readiness requirements, and Marine Corps operational tasking are driving increased Strike Fighter utilization rates that outpace procurement.

The Navy F-35C requirement is 340 aircraft, which includes 67 Marine Corps F-35C aircraft. The total Marine Corps F-35 requirement is 420 aircraft: 353 F-35Bs and 67 F-35Cs. The Navy and Marine Corps will continue to modify transition plans to take advantage of any possible F-35 accelerated procurement. Due to delays in the F-35 program and a changing threat environment, sustainment and modernization funding will be required to maintain the relevant operational capability of the F/A-18A-F and the AV-8B throughout the extended transition to the F-35.

Strike-Fighter Force Structure

The 1,174 aircraft Strike Fighter force provides the projected DoN inventory needed to support the anticipated operational demand of nine Carrier Air Wings through the 2025 timeframe. The Navy inventory requirement of 779 aircraft supports 36 active duty DoN Strike

Fighter squadrons, including Marine Corps Strike Fighter squadrons, composed of 396 aircraft (mix of 10-12 aircraft per squadron) and two reserve squadrons with 22 total aircraft assigned. In order to maintain the operational aircraft, support aircraft are required for aviator training, flight-test, attrition reserve and the depot pipeline. This inventory entitlement is estimated based on historical averages and supports the validated requirement of four Strike Fighter squadrons per carrier air wing. Through detailed analysis, inspections and structural repairs, the DoN has been successful in extending F/A-18 A-D aircraft to 8,000 flight hours - 2,000 flight hours beyond the original designed service life. Future inventory projections are based on a service life extension for F/A-18E/F aircraft to 9,000 flight hours from the current design life of 6,000 flight hours.

The Navy's F-35C Strike Fighter program requires 18 active squadrons (14 Navy and 4 USMC) and 2 training squadrons. The F/A-18E/F capabilities complement the F-35C and enhance the overall carrier-based warfighting capabilities. This force structure supports the operational demand per the Global Force Management Allocation Plan and projected aircraft carrier deployments. The Marine Corps' F-35B/C Strike Fighter program requires 14 active, 2 reserve, and 2 training squadrons. Integral to our current force structure reductions, our tactical aviation squadrons were restructured to optimize the support they provide to the Marine Air Ground Task Force (MAGTF) and the joint force.

F/A-18 A-D Hornet:

The F/A-18 A-D was designed for, and has achieved, a service life of 6,000 flight hours, performing as expected through its design life. Ongoing service life management efforts have extended its designed 6,000 flight hour service life to 8,000 flight hours; with select aircraft being extended possibly up to 10,000 flight hours. Continued investment in the Service Life

Extension Program (SLEP), High Flight Hour (HFH) inspection program and Air Systems Support (i.e. Program Related Engineering and Program Related Logistics) will remain crucial to the flight hour extension strategy. In order to maintain warfighting relevancy in a changing threat environment, we will continue to procure and install advanced systems on selected F/A-18 A-D aircraft such as Digital Communication System Radios, Joint Helmet-Mounted Cueing Systems (JHMCS) with Night Vision Cueing and Display, High Order Language Mission Computers, ALR-67v3 radar warning receivers, ALQ-214v5 self-defense suite, Multi-Function Information Distribution System-Joint Tactical Radio System (MIDS-JTRS), APG-73 radar enhancements, Advanced Targeting Forward Looking Infrared (ATFLIR) upgrades, and LITENING targeting pods. While investing in warfighting upgrades, the Services are unable to improve the reliability of this rapidly aging airframe. While we may upgrade them and return the correct number to our flight lines, we are concerned that we will not be able to effectively train or fight these aircraft due to low reliability.

Based on inventory modeling, a portion of the existing inventory of 557 Navy and Marine Corps F/A-18 A-D aircraft will be available through the 2030s. The DoN will continue to meet Navy operational commitments with F/A-18 A-D until 2027 for active squadrons, 2030 for Marine Corps active and reserve squadrons and through 2034 for Navy reserve squadrons. Using the Structural Life Management Program, fleet managers monitor and maintain the health of the legacy F/A-18 A-D fleet through analyses of TACAIR inventories and the management of usage rates at the squadron level. 92 percent of the F/A-18 A-D fleet has over 6,000 flight hours and 24 percent (142 aircraft) have flown more than 8,000 flight hours. As of February 2017, the highest flight hour airframe has attained over 9,799 hours.

The F/A-18 A-D Service Life Assessment Program (SLAP) demonstrated the airframe can be flown beyond 8,000 hours and up to 10,000 hours with a combination of further inspections and airframe modifications via Engineering Change Proposals (ECPs) to maintain airworthiness certification. The inspection results to date have matched the SLAP data. Depot throughput of these jets is complicated by on-going discovery of corrosion which significantly increases unplanned work on the inducted airframes. Depot leadership has an aggressive plan to design and develop inspections and standard repair packages for corrosion-induced work to better manage depot workload and increase throughput.

The F/A-18 A-D SLEP effort has featured a phased approach since inception. HFH inspections are required to assess the material condition and airworthiness of aging F/A-18 A-D aircraft and meet resourcing requirements as aircraft reach 8,000 hours. The HFH suite continues to be revised as a result of on-going HFH inspections and SLEP analysis. As a result, F/A-18 A-D airframe inspections and ECPs have been developed and fielded for those components and airframe areas at high risk of fatigue and corrosion. These efforts have reduced risk in airworthiness and reduced service life extension turn-around time providing program trade space to mitigate Strike Fighter procurement delays. To date, 194 HFH inspections have been successfully completed with 113 HFH inspections currently in-work.

The Department is conducting SLEP/HFH inspections/repairs at seven locations: Naval Air Station (NAS) North Island, California; NAS Jacksonville, Florida; Cecil Field, Jacksonville, Florida; Marine Corps Air Station (MCAS) Miramar, California; MCAS Beaufort, South Carolina; NAS Oceana, Virginia; and in Montreal, Canada. While less complex SLEP modifications can be incorporated at all sites, major SLEP modifications are done concurrently with major depot events.

F/A-18E/F Super Hornet:

The F/A-18 E/F Super Hornet will be numerically the predominant aircraft in the Navy's carrier air wing Strike Fighter force through 2035. The F/A-18 E/F began full rate production in 2000. To date, 98 percent of the total procurement objective has been delivered (570 of 584 aircraft). Continued investment in capability upgrades significantly improves the lethality of the carrier air wing. The Super Hornet modernization plan features an incremental approach to incorporate new technologies and capabilities, to include Digital Communication System Radios, MIDS-JTRS, JHMCS, ATFLIR with shared real-time video, Accurate Navigation Distributed Targeting System, Infrared Search and Track (IRST) and continued advancement of the APG-79 Active Electronically Scanned Array Radar.

Due to high utilization rates, the F/A-18E/F fleet has flown approximately 47 percent of the total flight hours available within the 6,000 hour limit design life. The remaining fleet flight hour capacity will be inadequate to meet operational commitments out to the 2040's. As a result, The Department initiated an F/A-18E/F SLAP to determine what would be required to extend the airframe service life beyond 6,000 flight hours. The F/A-18E/F SLAP effort incorporates lessons learned from the F/A-18 A-D SLAP and SLEP analysis and was initiated sooner in the F/A-18 E/F life cycle. Similar to the F/A-18 A-D Hornet, the Super Hornet program is executing a phased SLAP which commenced in 2008 with completion expected in 2018. The SLAP goal is to analyze actual Fleet usage versus structural test data to support the design of Service Life Modifications (SLM) that will ultimately extend F/A-18E/F service life from 6,000 to 9,000 flight hours. The initial phases of the F/A-18E/F SLM effort began in 2014 with the development and fielding of ECP kits to upgrade life-limited locations revealed by the SLAP analysis.

EA-18G Growler:

The EA-18G Growler is a critical enabler for the joint force, bringing fully netted warfare capabilities to the fight that provides unmatched agility in the Electromagnetic Maneuver Warfare environment. To date, 136 aircraft have been delivered, representing 85 percent of the funded inventory objective. Initial Operational Capability occurred in September 2009 and Full Rate Production was approved in November 2009. Since their initial deployment, Growlers have flown more than 2,300 combat missions, expended approximately 16 percent of the 7,500 flight hour life per aircraft and are meeting all operational commitments. Electronic attack capabilities, both carrier-based and expeditionary, continue to mature with development of the Next Generation Jammer, which is scheduled to replace the legacy ALQ-99 Tactical Jamming System. We continue to invest in the EA-18G passive detection and identification capabilities while improving network connectivity to provide battlespace awareness and targeting for the carrier strike group.

The recent addition of seven aircraft will extend deliveries to FY 2018, which is expected to fulfill Navy requirements for carrier-based Airborne Electronic Attack (AEA) and expeditionary EA-18G squadrons. A number of additional EA-18Gs, above the funded procurement objective of 160, is still under consideration as the Navy is currently exploring solutions that optimize the Growler procurement plan to support an AEA force structure to meet the joint requirement. To meet the joint force and fleet AEA requirement beyond 2040, we are beginning the EA-18G SLAP to assess what is required to extend the service life beyond 7,500 hours.

AV-8B Harrier:

The current Marine Corps inventory consists of 126 AV-8B aircraft. This includes 34 Night Attack, 76 Radar aircraft and 16 TAV-8B trainers. These aircraft support 5 operational squadrons of 16 aircraft each (Primary Mission Aircraft Authorization of 80). To date, the AV-8B fleet is averaging 11 aircraft out-of-reporting for Planned Maintenance Interval and special re-work, with a five-year average of 18.1 percent per year. Most importantly, the Harrier has historically suffered from inadequate supply support, driving down the number of aircraft that can train, deploy, and support our Marines.

To address degraders to readiness, the AV-8B conducted the Harrier Independent Readiness Review (HIRR) in December of 2014. The focus of this study was to address out of reporting aircraft, manpower deficiencies, and material degraders. Since the conclusion of the HIRR there has been a positively trending readiness recovery in the AV-8B fleet due in large part to executive-level engagement with OEMs, vendors, and all DoD commands that have a supporting relationship with the AV-8B program.

The AV-8B was originally designed as a 6,000-hour airframe with expected service life through 2012. In 2010, the Department transitioned to a Fatigue Life Expended (FLE) model that more accurately measures actual stress history on individual airframe components, enabling the airframe to fly beyond 6,000 hours. Fleet average for all three single-seat variants of the AV-8B Harrier is 34.6 percent FLE; there is sufficient airframe life left in these aircraft to reach their eventual end of service. Sub-contractors and vendors divested manufacturing lines of AV-8B material in anticipation of the 2012 sundown and the United Kingdom Royal Air Force divestiture of the AV-8B (GR-9) airframe. Delays in F-35 procurement, coupled with F/A-18 A-D out-of-reporting challenges led to changes in the Marine Corps' TACAIR transition order

planning to shut down three FA-18 squadrons early and extending the service of the AV-8B to mitigate a growing Marine Corps TACAIR inventory shortfall.

Due to component obsolescence concerns and supply shortfalls, the Department purchased 72 GR-9 aircraft, 38 MK-107 engines, parts supply, and support equipment from the United Kingdom in 2011. The GR-9 buy was meant to fill a supply gap allowing the Naval Supply Systems Command immediate access to supply inventory, to develop long term sustainment strategies and give industry time to re-develop parts production lines to support the AV-8B until transition to the F-35 is complete. To date, over 75,000 parts exceeding $71 million have been used from the GR-9 purchase. This decision had an immediate impact in reducing supply backorders. However, a reduction in demand signal from the GR-9 and other lifetime-type buys may cause additional reduction in sub vendors and supply contractors unless carefully managed.

The AV-8B continues to be in high demand deploying in support of Combatant Commander (CCMD) requirements and operational contingencies. Each Marine Expeditionary Unit (MEU) deploys with embarked AV-8Bs. AV-8B and F/A-18 A-D squadrons alternate in support of Special Purpose Marine Air-Ground Task Force (SPMAGTF) deployments. Harriers deploy with 10-aircraft squadron sized units, with their remaining 6 aircraft at sea with a MEU. They are flying and leading joint and coalition strikes in Iraq and Syria today. The AV-8B, equipped with LITENING targeting pods and a video downlink to ROVER ground stations, up to six precision strike weapons, Advanced Precision Kill Weapon System, and beyond visual range air-to-air radar missiles, has continued to be a proven, invaluable asset for the MAGTF and joint commanders across the full spectrum of operations. During the first half of FY 2015, the AV-8B received the H6.1 Operational Flight Program (OFP) enabling full integration of the

Generation 4 LITENING targeting pod. During 2016, the program continued work on the H6.2 Operational Flight Program, which will integrate the initial Link 16 message sets; AV-8B successfully flew Link 16 in developmental test in October of 2016 and is expected to start fielding the capability in early 2018. Additionally, this OFP will integrate Federal Aviation Administration compliant required navigation performance/area navigation (RNP/RNAV) capability and correct additional software deficiencies identified through combat operations. Work continues on H7.0 OFP, which will complete the integration of Link 16 as well as address weapon obsolescence improvements. The Airborne Variable Message Format (VMF) terminals are being installed in AV-8Bs to replace the current digital-aided close air support (CAS) technology and additional efforts include tactical datalink and sensor improvements in support of operational contingencies until transition to the F-35. As an out-of-production aircraft, the AV-8B program will continue its focus on sustainment efforts to mitigate significant inventory challenges, maintain airframe integrity, achieve full FLE, and address reliability and obsolescence issues of avionics and subsystems.

F-35 Lightning II:

The future of DoN TACAIR relies on a combination of F-35B and F-35C 5th generation aircraft that are part of the larger Joint F-35 program. More than just the next fighter, the F-35 brings unprecedented low observable technology, modern weaponry, and electronic warfare capability to the Navy and Marine Corps. Marine Fighter Attack Squadron 121 achieved the world's first F-35 operational capability in 2015 and the squadron is now forward deployed in Japan defending the Nation's interests abroad. In 2018, the Navy and Marine Corps team will deploy two Marine Expeditionary Units with a detachment of F-35Bs aboard ship marking the first extended at sea deployments for F-35. The Navy's first F-35C squadron begins transition in

2018, Initial Operational Capability (IOC), although event-driven, is expected in late 2018 to early 2019 and the first deployment on an aircraft carrier is planned for 2021. The Marines will begin their first F-35C squadron transition in 2019 and, while also even-driven, expect IOC in 2020. Together, the Navy and Marine Corps will be operational in 2020 and replace our aging aircraft inventory with the greatest practical speed. These aircraft will help recapitalize some of our oldest aircraft – our legacy F/A-18s – which are rapidly approaching the end of their service lives.

The Marine Corps also operates the STOVL variant of the F-35, the F-35B. The fielding of the F-35B continues to make excellent progress due to the combined efforts of the Department, industry, and Congress. Critical Military Construction (MILCON) at our bases and stations is underway both at home and overseas to support this fifth generation capability. Due to the level of effort, funding, and timely MILCON, the Marine Corps' transition plan remains on-track. VMFA-211 stood up in July, 2016 on Marine Corps Air Station, Yuma, AZ and the Marine Corps' will transition its third operational squadron to F-35B in 2018.

The F-35B has performed remarkably this last year, successfully achieving a number operational and training milestones. The Marine Corps permanently deployed a squadron to Japan, conducted trans-oceanic flights across both the Atlantic and Pacific, and exercised the expeditionary capability of the aircraft both aboard ship and in austere environments. On the training side, we graduated our second class of F-35B students from our most advanced weapons schools and conducted sustained training operations across the range of military operations to include participation in large scale joint exercises such as Red Flag.

F-35 employs a block upgrade program to usher in new and advanced war-fighting capabilities. Whether the mission requires the execution of strike, close air support, counter air,

escort, and electronic warfare – this machine is the key to our future – empowering our maritime forces to fight from sea bases and expeditionary bases ashore in any clime and place, against any foe. The F-35 is the war-winning, any clime, any place, any threat 5th generation strike fighter we need. However, all Services must get the spare parts posture right, along with the rest of the supporting logistics and MILCON to take full advantage of the aircraft's advanced capability and keep the transition from legacy platforms on-track.

The Navy and Marine Corps aviation fleet is an agile maritime strike and amphibious power projection force in readiness. Such agility requires that the aviation arm of our naval strike and expeditionary forces remain fully manned, trained and equipped. Mr. Chairman, and distinguished committee members, we appreciate your continued support of our Naval Aviation programs and we look forward to working with you to build the force of the future.

Appendix A: Aviation Mishap Data

F/A-18 AND EA-18G PHYSIOLOGICAL EPISODES

Physiological Episodes (PEs) occur when aircrew experience a decrement in performance, related to disturbances in tissue oxygenation, depressurization or other factors present in the flight environment. PEs are categorized into two general groups, those related to Onboard Oxygen Generation Systems (OBOGS) or pilot breathing gas, and those caused by problems in the Environmental Control System s (ECS), i.e. – unscheduled pressure changes in the flight station. These phenomena jeopardize safe flight.

As a result of physiological episodes, the F/A-18 Program Office (PMA-265) established a Physiological Episode Team (PET) to investigate the root causes associated with F/A-18A-F and EA-18G aircraft. The core F/A-18 PET is comprised of 17 members of PMA-265, 23 members from the Fleet Support Team (FST) at NAS North Island, 14 members of the FST at MCAS Cherry Point, three members from the Aircrew Oxygen Systems In-Service Support Center, 10 engineers affiliated with NAVAIR 4.3's Environmental Control Systems (ECS) team and 21 members associated with NAVAIR 4.6's Human Systems team. The F/A-18 PET works closely with other program offices, cross-service affiliates and industry partners in evaluating each episode.

The NAVAIR PET is currently addressing hypoxia and decompression events as the two most likely causes of recent physiological episodes in aviators. As symptoms related to depressurization, tissue hypoxia and contaminant intoxication overlap, discerning a root cause is a complex process. Episodes of decompression sickness typically accompany a noticeable loss of cabin pressure by the aircrew, while the cause of hypoxic related events may not readily

apparent during flight. Reconstruction of the flight event is difficult with potential causal factors not always readily apparent during post-flight debrief and examination.

Historical data of F/A-18 physiological events prior to May 2010 is based on safety reports. The rate per 100,000 flight hours during FY 2006-FY 2010 based on safety reports follows:

Date Range	F/A-18A-D	F/A-18E-F	EA-18G
FY06	3.66	2.18	0.00
FY07	1.63	3.73	0.00
FY08	3.72	4.28	0.00
FY09	6.19	8.33	0.00
FY10	4.95	11.96	0.00

In May 2010 PMA-265 established the PET to investigate root causes of physiological episodes while Commander, Naval Air Forces directed specific reporting procedures to collect more data on the occurrence of an event. The rate per 100,000 flight hours beginning in May 2010 with the implementation of new reporting protocol follows:

Date Range	F/A-18A-D	F/A-18E-F	EA-18G
05/1/2010 - 10/31/2010	12.20	8.98	0.00
11/1/2010 - 10/31/2011	10.90	8.65	5.52
11/1/2011 - 10/31/2012	16.39	23.35	5.42
11/1/2012 - 10/31/2013	21.01	26.23	9.80
11/1/2013 - 10/31/2014	29.54	26.39	15.05
11/1/2014 - 10/31/2015	30.20	28.02	42.89
11/1/2015 - 10/31/2016	57.24	31.05	90.83

The process for investigating a physiological episode begins with the submission of data describing the event. Engineers from the ECS FST and the Aircrew Oxygen Systems In-Service Support Center work with the squadron maintenance department to identify which components of the aircraft should be removed and submitted for engineering investigation. The squadron flight surgeon also submits data on the medical condition of the pilot and in-flight symptoms that were experienced.

After completion of the component investigations, the incident is examined holistically by members of the engineering teams and Aeromedical specialists to identify the most likely cause of the incident. Of 382 cases adjudicated by the PET so far, 130 have involved some form of contamination, 114 involved an ECS component failure, 91 involved human factors, 50 involved an OBOGS component failure, 13 involved a breathing gas delivery component failure, and 76 were inconclusive or involved another aircraft system failure. Of note, some of the events resulted in assignment to more than one category.

T-45 Physiological Episodes

Data recorded since introduction of the T-45 Physiological Event Reporting Protocol form in November 2011 is presented below by calendar year. Prior years' data for T-45 aircraft is incomplete and is not included.

Calendar Year	Calendar year rate per 100K flight hours	Cumulative rate per 100K flight hours
2012	11.86	11.86
2013	16.22	13.94
2014	18.43	15.36
2015	44.99	22.70
2016	46.97	28.01

The process for investigating a physiological episode mimics that being used by the F/A-18 and is also managed by the Physiological Episode Team (PET). After completion of the component investigations, the incident is examined holistically by members of the PET's engineering teams and aviation medical specialists to identify the most likely cause of the incident. More than one causal factor can be attributed to a single physiological episode event. Of the 79 physiological episode reports adjudicated to date, 24 were assessed to be most likely caused by contamination, 12 involved human factors (these may also include incidents of airsickness and vertigo), 12 involved OBOGS component failure, 11 involved a breathing gas delivery failure, three involved cabin integrity, and the remaining 23 were inconclusive or involved another system failure.

Navy's Efforts to Mitigate Physiological Episodes

A variety of actions have been undertaken to address the occurrence of physiological episodes in the F/A-18 / E/A-18G:

1) New maintenance rules for handling the occurrence of specific ECS built-in test faults have been implemented throughout the fleet requiring that the cause of the fault be identified and corrected prior to next flight.

2) Transportable Recompression Systems have been put on forward deployed aircraft carriers to immediately treat aircrew in the event they experience decompression sickness symptoms.

3) Mandatory cabin pressurization testing is now performed on all F/A-18A-F and EA-18G aircraft every 400 flight hours and ECS pressure port testing is performed on all F/A-18A-D aircraft every 400 flight hours. Overhaul procedures for ECS components and aircraft servicing procedures have been improved.

4) Emergency procedures have been revised, all pilots now receive annual hypoxia awareness training, and biennial dynamic training using a Reduced Oxygen Breathing Device to experience and recognize hypoxia symptoms while operating an aircraft simulation.

5) Aircrew are provided portable hypobaric recording watches to alert them when cabin altitude reaches a preset threshold.

6) Internal components of the F/A-18 OBOGS have been redesigned to incorporate a catalyst to prevent carbon monoxide from reaching the pilot and provide an improved capability sieve material (filter). These new OBOGS components have been installing in 80 percent of the in service F/A-18 fleet so far.

7) Improvements to existing maintenance troubleshooting procedures and acceptance and test procedures for reworked components have been incorporated and additional improvements are under evaluation.

8) Hardware and software changes are in work for Super Hornets and Growlers to mitigate cabin pressurization issues due to moisture freezing in the ECS lines.

9) Component redesign, improved performance testing, and newly established life limits will improve component reliability across all F/A-18 configurations.

10) An increased capacity for the emergency oxygen bottles is under contract.

11) Trial sampling efforts for contamination have been conducted at EA-18G squadrons located at NAS Whidbey Island to improve real-time data collection for OBOGS related systems. “Sorbent tubes” which help collect and identify unknown contaminants have been added to oxygen masks for aircrew to collect samples of breathing gas for post-flight analysis of potentially harmful compounds.

12) An ECS laboratory is under construction to improve root cause and correct actions of ECS engineering investigations of fleet events. The projected operational date of the ECS lab is September of 2017.

13) Aircraft are flown with “slam sticks” to track and collect cabin pressure changes over time for rigorous data analysis and to compare data to what the aircrew experienced.

14) Future projects include systematic evaluations of technologies to monitor and detect physiological symptoms.

The Department of the Navy remains focused on solving this issue. Fleet awareness is high, protocols are in place and we are focused on mitigating risk, correcting known deficiencies and attacking this issue. Moving forward we will continue to fly while applying every resource to solve this challenging problem.

SUMMARY OF CLASS A, B AND C AVIATION-RELATED SAFETY ISSUES

A summary of all Naval Aviation Class A, B and C aviation-related safety issues, including recent mishaps, trends, and analysis from October 2015 through February 28, 2017 follows. The rates presented are based on mishaps per 100,000 flight hours.

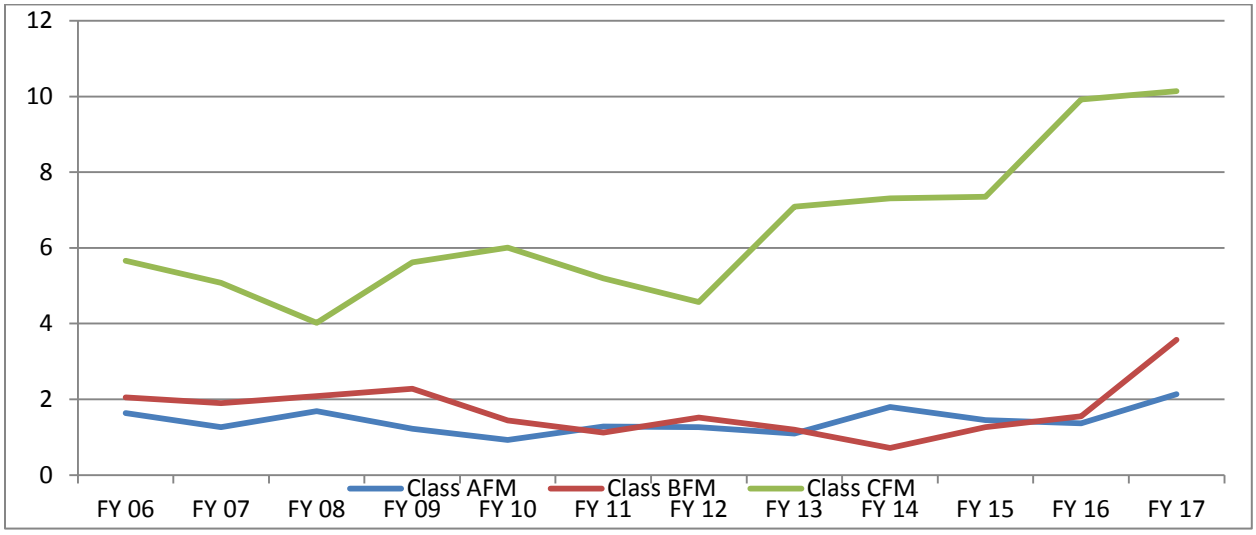
Year	Flight Hours	Class A	Class A Rate	Class B	Class B Rate	Class C	Class C Rate
FY16	1,098,519	18	1.64	29	2.64	229	20.85
FY17	420,191	12	2.86	21	5.00	97	23.08

The most recent FY17 DoN flight Class A mishaps include:

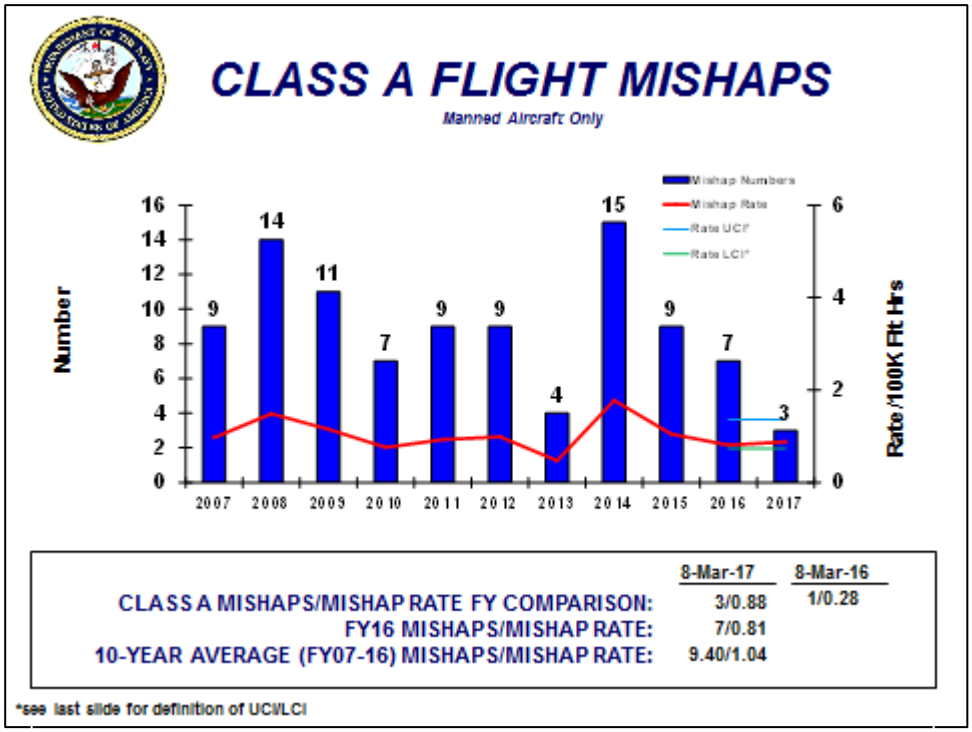
- 17 Jan 2017: (NAS Meridian, MS) T-45 crashed following a Bird/Animal Aircraft Strike Hazard (BASH) incident on takeoff. Both crewmembers ejected. No fatalities.
- 13 Dec 2016: (Off the Coast of Okinawa, Japan) MV-22B attempted a precautionary emergency landing (PEL) to dry land but crash landed in shallow water. Crew of 5 evacuated with injuries.
- 07 Dec 2016: (Off the Coast of Iwakuni MCAS, Japan) F/A-18C crashed into the water while conducting a night mission. 1 fatality.
- 21 Nov 2016: (Upper Mojave Desert Region) F/A-18F struck a tree while instructor pilot was conducting a currency low-level flight event. Returned to base safely. No injuries.

There are no recent FY17 DoN Class A flight related mishaps. There are three recent FY 2017 DoN Class A aviation ground operations mishaps (AGM):

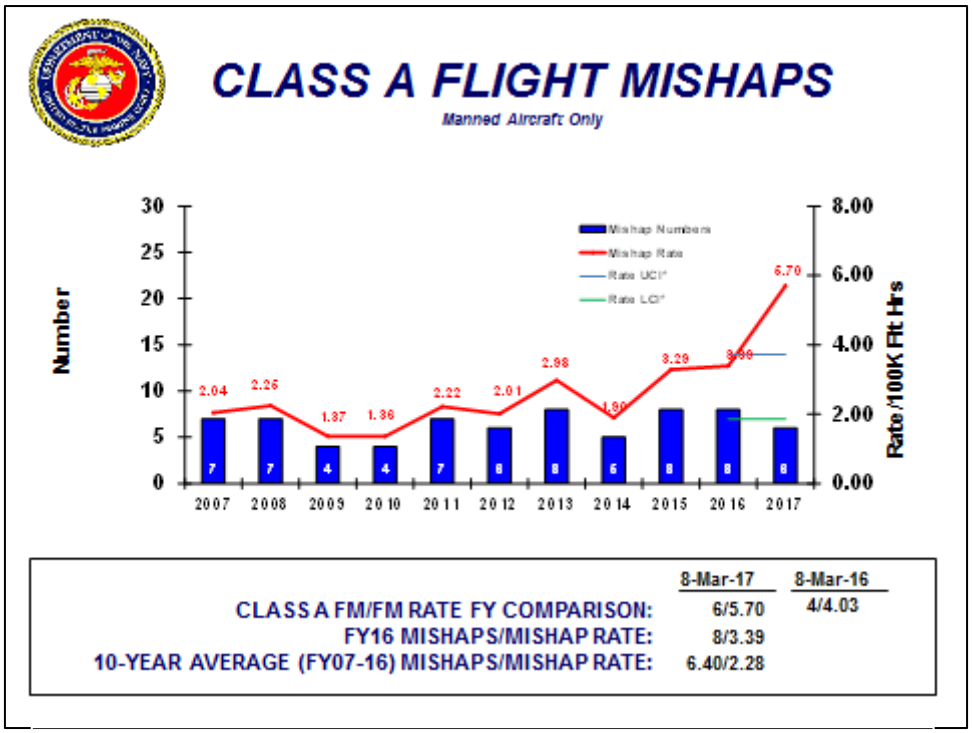
- 19 January 2017: (NAS Norfolk, VA) Three E-2C aircraft damaged in an engine oil related event. (AGM)
- 18 December 0216: (Kadena Air Force Base, Japan) Tow bar separation resulted in aircraft/tow collision with damage to nose gear and lower fuselage of P-8A. (AGM)
- 16 December 2016: (NAS Whidbey Island, WA) Canopy on EA-18G exploded/jettisoned resulting in severe injuries to two personnel. (AGM)



DoN Historical Mishap Rate Trend per 100K Flight Hours per Mishap Class
(As of 28 February, 2017)



Class A Manned Flight MISHAP Historical Data for U.S. Navy



Class A Manned Flight MISHAP Historical Data for U.S. Marine Corps

UCI = Upper Confidence Interval LCI = Lower Confidence Interval

Rate values above the UCI or below the LCI infer a statistically significant change is probable. This is only an indicator. Significance cannot be determined until end-of-year. Values between the UCI and LCI infer that nothing significant has occurred to increase or decrease mishap rate.