DEPARTMENT OF THE NAVY
CHIEF OF NAVAL AIR TRAINING
250 LEXINGTON BLVD SUITE 102
CORPUS CHRISTI TX 78419-5041

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Ser 00/0412
25 Aug 16

FIRST ENDORSEMENT on Colonel(b) (6), (b) (3) (A) , USMC, ltr of 5 Jul 16

From: Chief of Naval Air Training
To: Commander, Naval Air Force, Pacific

Subj: COMMAND INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE NAVY FLIGHT DEMONSTRATION SQUADRON CLASS A AVIATION MISHAP IN SMYRNA, TENNESSEE, ON 2 JUNE 2016

Encl: (126) COMNAVAIRFORINST 4790.2B CH-1 of 15 Jun 13
(127) Certificate of Death of 6 Jul 16
(128) Analytical Report of 8 July 2016
(129) Analytical Report of 18 July 2016
(130) CNATRAINST 5452.23G of 9 Dec 15

1. Executive Summary

a. On the afternoon of 2 June 2016, Captain Jeffery M. Kuss, USMC, was pilot in command of an F/A-18C, Blue Angel Number 6, conducting the Team's first practice show for the Great Tennessee Air Show at Smyrna, Tennessee. Shortly after takeoff, in the middle of the first maneuver, a mishap occurred resulting in the death of Capt Kuss and destruction of the aircraft.

b. All relevant evidence pertaining to the mishap has been assembled and thoroughly considered. The investigation did not uncover evidence the mishap was caused by mechanical, maintenance, or other aircraft-related issues. Although there is evidence that the Number 5 and Number 6 solo pilots communicated at the time of takeoff about a cloud near the maneuver location, weather was also not a causal factor. All personal flight equipment was properly functioning and Capt Kuss was fully certified, qualified, and authorized for flight status.

c. The cause of the mishap was pilot error. Capt Kuss did not properly transition from the initial High Performance Climb (HPC) to the first maneuver, the "Split S." In order to conduct the maneuver within existing Blue Angels standard operating procedures, the aircraft should have had an optimum airspeed between 125 and 135 knots and reached a minimum altitude of 3,500 feet Above Ground Level (AGL) prior to commencing the inverted maneuver at the top of the high performance climb. Capt Kuss had a maximum airspeed of 184 knots with a maximum altitude of 3196 feet AGL. In layman's terms, he transitioned from the high performance climb to the Split S too low and too fast, and by not deselecting his afterburners during the maneuver, he continued to accelerate. The net effect of these deviations was that the aircraft was simply too low and too fast to avoid impacting the ground. Although he might have been able to recover the

aircraft after the initial deviations, Capt Kuss did not attempt any type of dive recovery procedure and he unsuccessfully ejected from the aircraft too late. Although Capt Kuss was a highly trained and respected naval aviator, his deviations from standard operating procedures in executing the Split S maneuver resulted in a fatal loss of situational awareness.

2. Investigative Report

a. On 3 June 2016, I appointed Colonel (b) (6), (b) (3) (A) , USMC as the investigating officer of the comprehensive investigation into the aviation mishap to determine the cause and any attendant circumstances. The investigating officer requested an extension on 21 June 2016 in order to obtain documents essential to the investigative report, and I approved that request. The investigating officer submitted the report of investigation on 5 July 2016. Except as modified below, I hereby approve the investigating officer's findings of fact, opinions, and recommendations. Accordingly, this investigation is readdressed and forwarded.

b. The Engineering Investigations (EIs) on the radar altimeter and the barometric altimeter were not available upon submission of his report but have since been completed, analyzed, and included in the report. Upon receipt of the investigation, I deemed analysis of this data essential for potential mechanical causal factors, therefore delaying completion of my review and forwarding endorsement.

c. A supplemental list of enclosures used in the following modifications to the Findings of Fact and Opinions is attached as additional enclosures (126) through (130).

3. Findings of Fact. Subject to the following additions and modifications, I approve the Findings of Fact of the investigating officer:

a. FoF 15: Modify FoF 15 to read: "The mishap aircraft had a flight hour based Phase 'C' inspection completed on 23 Dec 2015 at 7577.3 flight hours. The Phase 'D' inspection was due at 7792.6 flight hours. Prior to the 2 June 2016 flights, the mishap aircraft logged 7,771.4 hours. [encls (6) and (126)]"

b. FoF 16: Modify FoF 16 to read: "The mishap aircraft had a flight hour based Phase 'B' inspection completed on 05 Jul 2011 at 7392.6 flight hours, prior to being inducted into standard rework. [encls (6) and (126)]"

c. FoF 17: Modify FoF 17 to read: "The mishap aircraft had a flight hour based Phase 'A' inspection completed on 28 Jan 2011 at 7221.2 flight hours, prior to being inducted into standard rework. [encls (6) and (126)]"

d. FoF 18: Modify FoF 18 to read: “The mishap aircraft had a flight hour based Phase ‘D’ inspection completed on 15 Jul 2010 at 7061.9 flight hours, prior to being inducted into standard rework. [encls (6) and (126)]”

e. FoF 180: Modify FoF 180 to read: “Capt Kuss did not survive the mishap. [encls (77), (78), (111), and (127)]”

f. FoF 184: Modify FoF 184 to read: “The cause of death was blunt force injuries. [encls (96), (97), (111), and (127)]”

g. FoF 229: Modify FoF 229 to read: “Utilizing the equation, a Split S started from level flight at 135 knots and 3,500 foot AGL, while accelerating to 250 knots and pulling a maximum of 4Gs in the descent, equates to a 2999 foot radius of turn, and gives the aircraft a 501 foot buffer from the ground. The opposing solo takeoff maneuver initiates the Split-S from a 60-70 degree angle of climb, which will significantly increase apex altitude and the corresponding buffer when the aircraft completes the maneuver. Any angle of climb, airspeed, or altitude can be inputted into the equation to assist in developing a framework for planning and safety, to quantify unacceptable deviations, and refine "No Maneuver" criteria. [encls (13), (14), and (116)]”

h. FoF 230: Modify FoF 230 to read: “Utilizing the same equation, a Split S started in level flight at 135 knots and 3,500 foot AGL, while accelerating to 300 knots and pulling a maximum of 4Gs in the descent, equates to a 3,605 radius of turn, which means the aircraft would impact the ground. However, the opposing solo takeoff maneuver initiates the Split-S from a 60-70 degree angle of climb, which will significantly increase apex altitude and the corresponding buffer when the aircraft completes the maneuver. Any angle of climb, airspeed, or altitude can be inputted into the equation to assist in developing a framework for planning and safety, to quantify unacceptable deviations, and refine "No Maneuver" criteria. [encls (13), (14), and (116)]”

i. FoF 237: Modify FoF 237 to include enclosure (130), which is the instruction for the Mission, Functions, and Tasks (MFT) of the Navy Flight Demonstration Squadron.

j. FoF 250: Add FoF 250 to read: “The height indicator (102163/A P/N 3809413-3) was recovered from the crash site and forwarded to the Materials Engineering Division for examination to identify any witness marks on the face and the internal gearing. [encl (128)]”

k. FoF 251: Add FoF 251 to read: “The AAU-39A Standby Pressure Altimeter (PIN WL 1650AM2, SIN MCM 429) was submitted to the Materials Engineering Division for partial disassembly and microscope analysis for witness marks. [encl (129)]”

Subj: COMMAND INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE NAVY FLIGHT DEMONSTRATION SQUADRON CLASS A AVIATION MISHAP IN SMYRNA, TENNESSEE, ON 2 JUNE 2016

4. Opinions. Subject to the following comments and modifications, the Opinions of the investigating officer are hereby approved:

a. Opinion 1: I concur with and formally approve the investigating officer's finding that Capt Kuss' death occurred "in the line of duty and not due to the member's own misconduct." Accordingly, pursuant to JAGMAN, 0223(c), the Navy Flight Demonstration Squadron will ensure appropriate service entries are made to reflect this determination. Furthermore, pursuant to JAGMAN, 0229, a copy of this investigation is provided to Marine Aviation Training Support Group TWENTY-ONE (MATSG-21) for forwarding to Headquarters, U.S. Marine Corps, Manpower and Reserve Affairs (MMSR-6).

b. Opinion 2: I disapprove the Opinion. Although weather was an element of the investigation, I do not believe it was a causal factor in the mishap.

c. Opinion 4: Modify Opinion 4 to read: "This mishap was not caused by mechanical failure. All maintenance was completed, and there is no evidence of mechanical error. [FF (94), (95), (128), and (129)]"

d. Opinion 19: Modify Opinion 19 to read: "No other NFDS team member or maintenance personnel could have prevented this mishap from occurring. [FF (7) through (15), (20), and (166)]"

e. Opinion 21: Modify Opinion 21 to read: "Capt Kuss did not perform the Split S portion of the maneuver in accordance with the Blue Angels Solo SOP. Capt Kuss would have seen a barometric altitude readout of 3200 feet displayed in his HUD at the apex of the maneuver. Regardless of whether the barometric altitude was accurate, the displayed apex altitude was 300 feet below the SOP minimum Pull-Down (Split-S Initiation) altitude mandated in the Solo SOP and grounds for a "no maneuver." He also exceeded the optimum maneuver entry airspeed by 50 knots. Capt Kuss did not pull the throttles out of MAX at or before 90 degrees nose low, although he made the mandatory radio call, "Vertical, Blowers, RadAlt." Capt Kuss never pulled the throttles out of MAX. [FF (118), (119), (126), (127), and (150)]"

f. Opinion 22: Modify Opinion 22 to read: "During the descent portion of the Split S, there are disparities between the barometric and radar altimeter readouts in the VADR data. The first radar altimeter readout during the descent, at 1568 feet AGL with 33.6° nose down, was five seconds prior to impact with the ground. The height indicator and standby pressure altimeter were submitted to the Materials Engineering Division for analysis. Their examination of the height indicator did not reveal any witness marks that may indicate the position of the LAW index pointer or the altitude pointer at the time of impact. The LAW, BIT, and dial illumination bulbs were examined, and all were found to have most likely been off at the time of impact. However, their examination did reveal a witness mark on the top land of a tooth of the standby pressure altimeter. This witness mark suggested that at some point during ground impact, the

drive gear disengaged the height counter gear, allowing it to rotate freely (skip) and then re-engaged it in the wrong position. The gear disengagement and skipping is likely the cause of the erroneous altitude reading on the altimeter during their examination. However, despite their findings, even if the altimeters malfunctioned and provided delayed or erroneous information, Capt. Kuss had time to react and initiate dive recovery procedures given that the maneuver is visually oriented. Based on his training and experience, he should have recognized his extremely rapid descent rate and that the nose angle does not always equate to aircraft flight path. [FF (129) through (137), (139) through (142), (250), and (251)]"

g. Opinion 27: Add Opinion 27 to read: "The mishap aircraft was not overdue for any calendar or hourly inspections. [FF (7) through (19)]"

5. Recommendations. Subject to the following comments, changes, or modifications, the recommendations of the investigating officer are hereby approved. Having thoughtfully considered the investigating officer's recommendations, I take, direct, or request the actions described below:

a. By copy of this endorsement, my staff will develop administrative procedures for implementation of recommendations (1) through (6) that will be established as annual inspection items. The Blue Angels will be inspected on these items as part of their annual certification beginning with the 2017 Air Show Season.

b. By copy of this endorsement, the Commanding Officer of the Blue Angels shall provide a report no later than 1 December 2016 on recommendations (7) and (9). I will take action on the report and implementation prior to training for the 2017 Air Show Season. The Split S portion of the Solo Low Transition/High Performance Climb/Split S Maneuver shall not be practiced or performed until this action is complete.

c. By copy of this endorsement, I concur with recommendation (8) and will forward it to the appropriate chain of command for analysis and recommendations for incorporation. Realizing advancements in Naval Aviation safety is often preceded by an event demonstrating the unforgiving nature of a brief loss of situational awareness, in turn producing catastrophic results. We have a responsibility and duty to be vigilant and flexible and constantly evaluate our training, operations, and technological advancements.

d. By copy of this endorsement, recommendations (10) and (12) are forwarded to the appropriate chain of command for implementation if practicable.

e. By copy of this endorsement, my staff will prepare a commendation for the citizens, airport personnel, and first responders in Smyrna, TN. Although they had just witnessed a very traumatic aviation accident, they were able to compose themselves and render immediate, valuable, and courageous assistance to first responders and the Navy's on-scene investigation

units. Moreover, the first responders provided superior, invaluable assistance to the Navy's response and investigation of the mishap. The Navy's response and investigation efforts would have been diminished without the superior professionalism, teamwork, and communication of the citizens of Smyrna, TN.

(b) (6)

DELL D. BULL

Copy to:
COMNAVSAFECEN
OJAG (Code 15)
MATSG-21

5 Jul 16

From: (b) (6), (b) (3) (A) , USMC
To: Chief of Naval Air Training

Subj: COMMAND INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE NAVY FLIGHT DEMONSTRATION SQUADRON CLASS A MISHAP IN SMYRNA, TENNESSEE ON 2 JUNE 2016

Ref: (a) 10 U.S.C. § 2255
(b) JAGMAN, 0241c(2)
(c) OPNAVINST 3750.6S

PRELIMINARY STATEMENT

1. Enclosure (1) directed that I lead a comprehensive investigation into the facts and circumstances surrounding the Blue Angels' Class A aviation mishap of F/A-18 aircraft Bureau Number (BUNO) 163455 in Smyrna, TN on 2 June 2016. Enclosure (2) supplemented enclosure (1) by providing additional time to acquire the autopsy report, deemed essential to my report, analyze the enclosures, and complete the investigative report. This letter is the required report and a comprehensive list of enclosures is included at the end of this report as an attachment.

2. I am senior in rank to the Commanding Officer of the Navy Flight Demonstration Squadron (hereinafter "Blue Angels"). Additionally, as required by references (a) and (b), I possess the knowledge and expertise required for aviation mishap investigations, and I am qualified to conduct the inquiry. I am a graduate of the Aviation Safety Command Course, legal officer course, and Military Justice Senior Officer course. I have experience as a former Aviation Safety Officer, legal officer, and Director of Safety and Standardization for a Marine Aircraft Group. I also have specific knowledge and expertise relevant to the Naval Air Training Command (NATRACOM) and the Blue Angels' flight operations.

3. I am not involved with the concurrent Aviation Mishap Board (AMB) investigation required by reference (c) nor am I a member of the mishap unit. Although I properly obtained non-privileged technical data from the AMB in accordance with reference (c), I did not have access to the proprietary safety information developed by the AMB during the course of their separate and distinct investigation. Therefore, this report is submitted with no existing prejudices, pre-conceived opinions, or inclination in judgment based upon any other findings or expressed opinions concerning causation of the mishap.

4. The engineering investigation (EI) on the radar altimeter and the barometric altimeter found in the wreckage has not been completed as of the date of this report. Additionally, I have not obtained

confirmation of the expiration date for the torso harness worn by Capt Kuss. A formal death certificate is not yet available to use.

5. Although I have not obtained the information in the preceding paragraph, I determined such information is not so essential to warrant further delay to the completion of my report. All other reasonably available and relevant evidence was collected and all factual data was obtained from the listed enclosures in the attachment.

6. No evidence, findings of fact, opinions, recommendations, or other parts of this investigation contain classified material. The report may be appropriately handled as unclassified material, but it is not intended for casual distribution. Any external publication of this investigation outside of the Department of the Navy (DON) or Department of Defense (DOD) must be reviewed and disseminated by the proper release authority in accordance with the Freedom of Information Act, 5 U.S.C. Sec. 552 (as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175, 121 Stat. 2524).

7. I encountered minor logistical difficulties during this investigation with the compiling, scanning, and formatting of documentation due to technical restrictions and limitations on the Next Generation Enterprise Network (NGEN). Specifically, due to computer security safeguards, flash media (i.e. SD cards and thumb drives) are not authorized on government computers and graphics editors, such as Adobe Photoshop, are not available on all computers.

8. I encountered difficulty obtaining Subject Matter Expert (SME) assistance during the initial stages of this investigation, primarily with the identification and consultation of technical experts. Of the SMEs who I contacted, most were hesitant to assist with the investigation because of their concerns of violating “privilege” that is associated with the AMB investigation, or they were concerned their input could result in legal consequences. Ultimately, I located and received input from credentialed SMEs that provided essential analysis for the investigation.

9. Legal Counsel during the course of this investigation was provided by LCDR (b) (6), JAGC, USN, who is assigned to NATRACOM located in Corpus Christi, TX.

10. On 3 June 2016, LCDR (b) (6) accompanied me to the impact site for an assessment of property damage, potential claims and claimants, and identification of any displaced persons for immediate assistance. Reports of damage in and around the vicinity of the mishap site were provided to the Office of the Judge Advocate General’s (OJAG) Claims

and Tort Litigation Division (Code 15). Potential claimants have been provided contact information for OJAG Code 15.

11. Salvage operations on aircraft BUNO 163455 have been completed. Remediation of the impact site is being assessed, coordinated, and completed by Commander, Navy Region Southeast.

12. I certify that all documentary evidence contained in this report are either the original or a copy that is a true and accurate representation of the original.

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FINDINGS OF FACT

Aircraft BUNO 163455 Information

1. The mishap aircraft was a Naval Flight Demonstration Squadron (NFDS) F/A-18C BUNO 163455. [encls (3), (4), (6)]

2. The mishap aircraft was properly preflighted. [encl (6)]

3. The mishap aircraft had a proper daily inspection completed at 1714 on 1 Jun 16. [encl (6)]

4. There were no downing discrepancies noted in the mishap aircraft Aircraft Discrepancy Book (ADB). [encl (6)]

5. The mishap aircraft ADB contained only minor “up” gripes. [encl (6)]

6. The mishap aircraft ADB contained an Aircraft acceptance "A" sheet (CNAF 4790/141) that was not signed by Capt Kuss for the mishap flight. [encl (6)]

7. The mishap aircraft had a 14 day inspection completed on 30 May 2016. [encl (6)]

8. The mishap aircraft had a 30 hour inspection completed on 17 May 2016. [encl (6)]

9. The mishap aircraft had an 84 day inspection completed on 9 May 2016. [encl (6)]

10. The mishap aircraft had a 100 flight hour inspection completed on 31 May 2016. [encl (6)]

11. The mishap aircraft had a 200 flight hour inspection completed on 23 Dec 2015. [encl (6)]

12. The mishap aircraft had a 112 day inspection completed on 4 Apr 2016. [encl (6)]

13. The mishap aircraft had a 182 day inspection completed on 3 Mar 2016. [encl (6)]

14. The mishap aircraft had a 364 day inspection completed on 20 Aug 2015. [encl (6)]

15. The mishap aircraft had a Phase “C” inspection completed on 23 Dec 2015. [encl (6)]

16. The mishap aircraft had a Phase “B” inspection completed on 05 Jul 2011. [encl (6)]

17. The mishap aircraft had a Phase “A” inspection completed on 28 Jan 2011. [encl (6)]

18. The mishap aircraft had a Phase “D” inspection completed on 15 Jul 2010. [encl (6)]

19. The mishap aircraft had an acceptance inspection from Depot completed on 3 Sep 2015. [encl (6)]

Mishap Pilot Qualifications

20. The sole aircrew member on board and pilot in command was Capt Jeffery M. Kuss, USMC, on active duty and assigned to the Blue Angels. [encls (3), (4) and (5)]

21. Night vision goggles were not employed as this was a day flight. [encl (26)]

22. Capt Kuss was designated a Naval Aviator on 20 Nov 2009 from Training Air Wing TWO. [encl (9)]

23. Capt Kuss possessed a current F/A-18 Naval Air Training and Operating Procedures Standardization (NATOPS) qualification. His NATOPS qualification was set to expire on 28 Feb 2017. [encls (7), (9)]

24. Capt Kuss possessed a current special instrument rating set to expire on 20 Nov 2016. [encls (7), (9)]

25. Capt Kuss possessed a current aeromedical flight clearance (up-chit), dated 30 Sep 2015 and set to expire on 30 Sep 2016. [encls (9) and (97)]

26. Capt Kuss possessed a current annual ejection seat brief and egress training given on 11 Nov 2015. [encl (9)]

27. Capt Kuss possessed current Aviation Physiology and Water Survival Training (Class 1). This is a four-year qualification, and it was last completed at NAS Pensacola, FL on 12 Aug 2014 and set to expire on 31 Aug 2018. [encl (9)]

28. Capt Kuss had no previous military mishaps or flight violations. [encl (9)]

29. Capt Kuss had been to the Wyle Science, Technology and Engineering Group, Brooks City, Base, TX centrifuge training on 27 Oct 2014. [encl (9)]

30. Capt Kuss' flight qualifications included NATOPS instructor on 27 Jan 2016, Instrument Instructor on 22 Jan 2016, Post-Maintenance Check Flight (PMCF) on 27 Jan 2016, Crew Resource Management Instructor (CRMI) on 22 Jan 2016, Strike Fighter Tactics Instructor on 29 Jul 2014, and TopGun Level 1 Adversary on 14 Sep 2012. [encl (9)]

31. Capt Kuss had two flight logbooks, but only the second logbook was provided to the command investigator. This limited the ability to accurately break out Capt Kuss' flight time by aircraft type. [encls (7) and (8)]

32. Capt Kuss' second logbook was incomplete. The last flight logged was 8 May 2016. Optimized Organizational Maintenance Activity (OOMA) data was used to fill in the missing flight time for the purposes of this investigation. [encls (7) and (8)]

33. Capt Kuss flew three times on 2 June 2016, the day of the mishap, but the flight time had not been logged into OOMA at the time of the mishap. [encl (8)]

34. Capt Kuss had accumulated 1,686.5 total military flight hours, but these totals do not include the flights on 2 June 2016 (the day of the mishap). [encls (7) and (8)]

35. Capt Kuss had accumulated 498.7 flight hours with the NFDS, but these totals do not include the flights on 2 June 2016 (the day of the mishap). [encls (7) and (8)]

36. Capt Kuss' second logbook shows he had accumulated 877.8 flight hours in the F/A-18, but his first logbook was not available in order to accurately calculate his total F/A-18 flight time, and these totals do not include the flights on 2 June 2016 (the day of the mishap). [encls (7) and (8)]

37. In the last 7/30/60/90 days before the mishap, Capt Kuss had accumulated 7.4/38.3/67.6/92.7 flight hours respectively, but these totals do not include the flights on 2 June 2016 (the day of the mishap). [encls (7) and (8)]

38. Capt Kuss was fully qualified to fly this aircraft. [encls (7) through (9)]

Readiness, Modifications, and Authorization for Flight

39. Capt Kuss' oxygen mask was current and due for inspection on 2 August 2016. [encl (10)]

40. The Naval Aviation Logistics Command Management Information System (NALCOMIS) Aircrew Equipment Report shows that the torso harness worn by Capt Kuss during the mishap flight expired on 30 Sep 2015, but internal Blue Angel tracking sheets show it expiring on 30 Sep 2017. [encl (10)]

41. The NFDS possesses an up to date pre-mishap plan. [encl (17)]

42. The NFDS possesses a current NAVAIR interim flight clearance for Blue Angel flight maneuvers and aircraft modifications set to expire on 15 December 2017. [encl (18)]

43. The NFDS aircraft are significantly modified from fleet aircraft. [encl (18)]

44. The NFDS flies with its own special software load (OFP). [encls (6) and (19)]

45. The ejection seat used in NFDS aircraft is the SJU-5/A and is capable of a 0 altitude/0 airspeed ejection. [encls (20) through (22)]

46. The NFDS ejection seat has a modified lap belt and modified PCU-16 harness with additional straps that help keep the pilot secure while flying inverted. [encls (20) through (22)]

47. The NFDS possesses a current Commander, Naval Air Forces (CNAF) Aviation Life Support System (ALSS) waiver set to expire on 31 Dec 2016. [encl (20)]

48. The ALSS waiver exempts the Blue Angels from the requirement to wear the Anti-G suit and the requirement to use oxygen during air shows and practice air shows where a cockpit altitude of less than 10,000 feet shall be maintained. [encl (20)]

49. The Blue Angels possess a current FAA Waiver for their Airshow Maneuvers Package dated 15 March 2016. [encl (25)]

50. The NFDS was certified as air show ready by Chief of Naval Air Training (CNATRA), their Immediate Supervisor in Command, on 4 Mar 2016. [encl (24)]

51. The flight that resulted in the mishap was authorized in accordance with OPNAV 3710.7U by CDR (b)(6), (b)(3)(A) , Commanding Officer of the Naval Flight Demonstration Squadron. [encls (26) and (27)]

52. The flight that resulted in the mishap was the third flight of the day for Blue Angels 1 through 6. [encls (26), (60), (61) and (65)]

53. The flight that resulted in the mishap was scheduled in compliance with OPNAV 3710.7U. [encl (27)]

The Airshow Site

54. At approximately 0915, Blue Angels 1 through 6 departed NAS Pensacola, FL as a formation, overflew downtown Nashville and the Nashville International Airport and then arrived at the Smyrna, TN Airport at approximately 1000 local, 2 June, 2016. [encls (26) and (60) through (65)]

55. Approximately one hour after arriving in Smyrna, Blue Angels 1 - 4 (the Diamond formation) and then Blue Angels 5 and 6 (the Solos) flew separate “circle” flights. [encls (26), (60) through (68), (71) through (73) and (76)]

56. Circle flights allow the Blue Angel pilots to become familiar with the airshow airspace, obstacles, terrain, and specific checkpoints prior to executing a practice show at the show site. [encls (26), (29), (30), (32), (33) and (60) through (65)]

57. The Blue Angels use Google Earth images to identify checkpoints, run-in lines, show lines, the aerobatic box, and obstacles out to five miles. [encl (32)]

58. The Blue Angels identify obstructions in the pre-flight brief. [encls (60), (61) and (65)]

59. After completing the circle requirements, Blue Angels 5 and 6 conducted a pre-coordinated photo shoot with (b)(6) of Oracle. [encls (60), (61) and (65)]

60. The photo shoot is not annotated on the Blue Angels flight schedule for Thursday, 2 June 2016. [encl (26)]

61. Once the two separate “circle” flights were complete, the Blue Angels reconvened and briefed the scheduled afternoon practice show. [encls (26), (60) through (65), (68), (71) and (72)]

62. The Blue Angels briefed their “high show” which requires 9000 feet AGL or greater weather ceilings. [encls (15), (16), (60) and (61)]

63. The Great Tennessee Air Show complied with all the requirements listed in the Blue Angels’ Support Manual. [encls (51), (52), and (60) through (73)]

64. The observed weather for Smyrna Airport at 1456 local, four minutes before scheduled takeoff, was scattered clouds at 3000 feet and no ceiling. [encl (34)]

65. At 1500 Central Daylight Time, 2 June 2016, the sun altitude and azimuth was 57.6° altitude and 254.5° azimuth. [encl (35)]

66. The Avian Hazard Advisory System (AHAS) forecasted a moderate bird risk for Nashville International Airport (the closest airfield with an AHAS forecast) for 1500 local time, 2 June 2016. [encl (36)]

67. Smyrna Airport and the Great Tennessee Airshow possessed a current FAA Certificate of Waiver for the Air Show. [encls (28) through (30)]

68. There was an active Notice To Airmen (NOTAM) for the airshow that included the Thursday, 2 June 2016 Blue Angels’ practice show. [encl (37)]

69. There was an active Temporary Flight Restriction (TFR) in place for the Blue Angels’ Thursday, 2 June 2016 practice show. [encl (38)]

The Mishap Flight

70. During the brief, there were no concerns voiced about the show site, terrain, obstacles or weather. [encls (60) through (65)]

71. After the brief, Blue Angels 1 through 6 arrived at the “Water Wagon”. The Water Wagon is a vehicle that provides drinking water to the pilots and delivers the individual Aircraft Discrepancy Books (ADB) for individual pilot review and signature of their assigned Aircraft Acceptance “A” sheet. [encls (60) through (66), (74) and (75)]

72. At 1445, Blue Angels 1 through 6, commenced the practice at Smyrna, TN. [encls (26), (54), (55), (60) through (66), (71) and (72)]

73. Blue Angel 4 flew one of the Blue Angels' two-seat aircraft because the team had a guest rider. [encls (60) and (64)]

74. The Diamond taxied for departure on Runway 32. [encls (42) and (60) through (64)]

75. The Solos taxied for departure on Runway 14. [encls (42), (60) and (65)]

76. The 1456 local weather observation for Smyrna, TN was winds 020/7; 10 statute miles visibility; scattered clouds at 3000 feet; temperature 29°C; dew point 21°C; and altimeter 30.01. [encl (34)]

77. The field elevation for the Smyrna, TN airport is 543 feet Mean Sea Level (MSL), and the density altitude for the 1456 local observed weather conditions was 2,340 feet. [encls (33), (34) and (100)]

78. During the Takeoff Checks, Blue Angel 1 (flight lead), calls for the altimeters (barometric and radar) to be set to 0 so that all six Blue Angel aircraft have field elevation set at 0 for reference during flight. [encls (13), (15) and (16)]

79. The radar altimeter is the altitude used in the Heads-Up Display (HUD) during Blue Angel 6's Low Transition and is selected by the pilot via the ALT switch on the HUD control panel. [encls (13) and (101)]

80. Due to a cloud located off the departure end of Runway 32 and the possibility that it would impact the maneuver, the Diamond elected to perform a "Diamond Burner Go" and not execute their High Show takeoff maneuver. [encls (42), (60) through (64), (71) and (72)]

81. As the Diamond prepared to depart Runway 32, Blue Angel 6 queried Blue Angel 5 via their designated and separate Solo radio channel about the clouds at the departure end of their departure runway, Runway 14. [encls (42), (60), and (65)]

82. On the Solo channel, Blue Angel 6 asked Blue Angel 5 about doing the High Performance Climb (HPC) and whether it was possible with the clouds near the projected flight path. [encls (42), (60), and (65)]

83. On the Solo channel, Blue Angel 5 told Blue Angel 6 that he thought Blue Angel 6 could successfully make the maneuver. [encls (42), (60), and (65)]

84. Blue Angel 6's mishap occurred during the Split S portion of his takeoff maneuver, the Low Transition/High Performance Climb/Split S. [encls (42), (43), (46) through (49) and (84)]

85. In 2004, the Blue Angels experienced a mishap while training the new Blue Angel 6 in the Split S maneuver. [encls (113) and (123)]

86. The pilot survived the 2004 mishap, but the aircraft was a total loss. [encls (113) and (123)]

87. At approximately 1501 local, after the Diamond departed Runway 32, Blue Angels 5 and 6 commenced their High Show takeoff maneuvers: the Dirty Roll on Takeoff for Blue Angel 5 and the Low Transition/HPC/Split S for Blue Angel 6. [encls (42), (81) and (82)]

88. Blue Angels 1, 5 and 6 were given preassigned radar squawk codes. [encls (39) through (41), (60) and (65)]

89. Smyrna Airport does not have its own Air Traffic Control (ATC) radar so the Nashville ATC radar provides coverage of the area. [encls (39) through (41, (54) and (55)]

90. According to Nashville ATC personnel, the radar usually picks up aircraft departing Smyrna Airport at approximately 1000 feet if they are actively squawking. [encls (39) through (41)]

91. Review of the Nashville ATC radar tapes for 1500 local time, 2 June 2016 shows Blue Angels 1 and 5 squawking, but no squawk for Blue Angel 6. [encls (39) through (41)]

92. All subsequent information concerning Blue Angel 6's flight parameters such as times, airspeeds, barometric altitude, radar altitude, nose pitch, Angle of Attack (AOA), Gs, vertical velocity, throttle position, engine performance, stick movement, and Flight Control System status were taken from the mishap aircraft's Voice and Data Recorder (VADR). [encls (81), (82) and (85) through (87)]

93. VADR is an older 8-bit system that is data limited, which causes "gaps" between the data points captured. [encls (81) through (83) and (85)]

94. The VADR data shows that the engines in the mishap aircraft were operating normally and no issues with the Flight Control Systems prior to the mishap. [encls (81), (82), (88) and (112)]

95. Although the mishap aircraft was also equipped with a Memory Unit, no data was captured by the Memory Unit during the mishap flight. [encls (81), (82), (85) through (87) and (101)]

96. For the Opposing Solo's (Blue Angel 6) takeoff maneuver, the Blue Angel Solo SOP stipulates an acceleration to 295 – 305 KCAS during the Low Transition before a maximum stick deflection pull to 60 – 70° nose up during the HPC (See enclosure 14 for a diagram of Blue Angel 6's maneuver). [encls (13) and (14)]

97. At 1501, 23 seconds local time, at the departure end of Runway 14, the Solos made their timing call of "Ready, Hit It" and at 312 Knots Calibrated Airspeed (KCAS), Blue Angel 6 briefly pulled 4.9 inches backstick for 5.72 Gs and momentarily attained a maximum of 60.2° nose up while entering the HPC. [encls (42), (81) and (82)]

98. The Low Transition and initial portion of the HPC were performed in compliance with the Blue Angel Solo SOP, the FAA approved Blue Angels Maneuvers Package and the Interim Flight Clearance. [encls (13), (14), (18) and (25)]

99. The Blue Angel Solo SOP stipulates selecting barometric altimeter (via the ALT switch on the HUD control panel) during the HPC, attaining an optimum airspeed of 125 – 135 knots and reaching a minimum altitude of 3,500 feet AGL on the barometric altimeter before commencing the 180° roll to inverted at the top of the HPC. [encls (13), (101) and (105)]

100. Barometric altimeter is selected during the HPC because the radar altimeter is ineffective during extremely high and low nose angles. [encls (13), (101) and (105)]

101. The Blue Angel Solo SOP states that after setting the wings (level while inverted), execute a smooth pull to 20 – 25 alpha and hold until absolutely certain a safe bottom can be made on the Split S maneuver. [encls (13) and (14)]

102. The Solo SOP further states that an accurate assessment concerning a safe bottom can usually be made at 90° nose low. [encls (13) and (14)]

103. The Solo SOP goes on to say that approaching 90° nose low, continue to monitor the pull to achieve the G required to intercept

the level off altitude for the Split S maneuver. [encls (13) and (14)]

104. The Solo SOP also directs that at or before 90° nose low, deselect afterburner, reselect radar altimeter (RadAlt) and transmit "Vertical, Blowers, RadAlt" on the radio and then transition to an outside/inside scan, acquire the flight line, monitor altitude/airspeed control and acquire the Diamond to ensure de-confliction. [encls (13), (14) and (42)]

105. The Solo SOP notes that airspeed on the backside (descent in the Split S) should be 250 – 300 KCAS through 90° nose low and once the bottom is made, accelerate to 400 KCAS for the clear. [encls (13) and (14)]

106. The Solo SOP also states that 4 Gs should not have to be exceeded in order to make the bottom of the Split S, with 150 feet AGL being the minimum altitude. [encl (13)]

107. The Solo SOP notes that afterburner can be used, when necessary, for airspeed corrections. [encl (13)]

108. Dive recovery rules are provided in the Solo SOP for the Split S; "60° for 2000', 45° for 1500', 20° for 1000'" and 3000 feet AGL is the minimum altitude for 90° nose low. [encls (13) and (14)]

109. The Solo SOP also dictates that 3000 feet AGL is the minimum altitude for airspeeds between 300 – 350 KCAS and that airspeeds above 350 KCAS will require a higher minimum altitude (to start the split S). [encls (13) and (14)]

110. In bold font, the Solo SOP attempts to emphasize that a "maximum performance dive recovery maneuver is required any time one of the above conditions is met to ensure terrain avoidance." [encl (13)]

111. The Solo SOP states that airspeed deviation, high density altitude, terrain and pilot proficiency may require "these numbers to be significantly increased". [encl (13)]

112. The Solo SOP provides for guidance concerning three parameters for a "no maneuver" during the Low Transition/HPC/Split S maneuver: (1) in the climb; (2) from the inverted position in the Split S and; (3) when approaching the show line. [encl (13)]

113. The Solo SOP also provides additional notes/techniques for Blue Angel 6's Low Transition/HPC/Split S maneuver, including the fact that the dive recovery rules must be committed to memory and to ensure that

a safe recovery can be made during the maneuver, first and foremost. [encl (13)]

114. The Solo SOP additional maneuver notes also dictate to not begin the Split S at too low of an altitude, and that 3500 feet AGL is the minimum roll altitude and should be raised if terrain, high density altitude, and pilot proficiency are a concern. [encl (13)]

115. The Solo SOP additional notes also state that the pull on the Split S can range from 10 – 20 alpha, depending on the distance to the show center point and density altitudes. [encl (13)]

116. The Solo SOP additional notes also state that in order to arrive at level off altitude prior to show center point, place the velocity vector just below the show center point marker (usually a trailer if the show will be over land as was the case in Smyrna, TN or a boat if over water). [encl (13)]

Blue Angel 6 SOP Deviations

117. After Blue Angel 6 commenced the HPC portion of the Low Transition/HPC/Split S takeoff maneuver, there are several deviations from the Blue Angel Solo SOP standards for the maneuver. [encls (13), (42), (81), (82) and (84)]

118. VADR data shows that Blue Angel 6's slowest speed was 184 KCAS just prior to reaching a maximum altitude of 3196 feet AGL on the barometric altimeter. [encls (81) and (82)]

119. The SOP optimum airspeed is 125 – 135 knots and the SOP minimum altitude to execute the maneuver is 3500 feet AGL. [encls (13) and (14)]

120. Instead of the 180° roll from the HPC to begin the Split S maneuver that is described in the SOP, Blue Angel 6 executed a 540° roll to the inverted to begin the Split S. [encls (13), (14), (42), (43), (81), (82) and (84)]

121. As the maneuver is written in the Blue Angel Solo SOP, the 540° roll is not part of the Blue Angel 6 Low Transition/HPC/Split S takeoff maneuver. [encl (13)]

122. The 540° roll is not part of the FAA approved Blue Angel Maneuvers Package; approved on 15 March, 2016. [encl (25)]

123. The 540° roll does not comply with the NAVAIRSYSCOM Interim Flight Clearance for Blue Angels' Aircraft. [encl (18)]

124. Although the 540° roll is not an approved maneuver, there were no subsequent Flight Control System failures and the VADR data does not show any abnormal aircraft performance indications after the 540° roll. [encls (81) through (84) and (86)]

125. Between the barometric altitudes of 3196 feet AGL (the peak altitude attained by Blue Angel 6) and 2856 feet AGL, the aircraft reached its steepest nose down attitude of 86.8°, 26.6 AOA, and approximately 238 KCAS (VADR has one second data capture gaps for airspeed). [encls (81) and (82)]

126. Blue Angel 6 makes the SOP directed “Vertical, Blowers, RadAlt” call, indicating that he is 90° nose down, has retarded the throttles from MAX, and has switched the ALT switch on the HUD Control Panel to radar altimeter (RDR). [encls (13), (14), (42) and (84)]

127. While Blue Angel 6 is nearly 90° nose down (vertical) at this point, and makes the “blowers” call, he does not retard the throttles and the throttles remain at the MAX position until the aircraft impacts the ground. [encls (13), (14), (42), (81), (82) and (84)]

128. Post mishap inspection of the ALT switch on the HUD Control Panel indicates that the radar altimeter (RDR) was selected. [encls (103) through (105)]

129. In the subsequent Findings of Fact (130 - 136), the Blue Angel Solo SOP dive recovery procedures for the mishap maneuver are used as a baseline to understand the sequence of events, but with awareness that there are gaps in the mishap flight’s VADR data. [encls (81), (82) and (84)]

130. At 1501 and 45.9 seconds local time, Blue Angel 6 was 33.6° nose down at 1960 barometric/1568 radar altimeter feet AGL, 26.6 alpha, 3.73 Gs, and 268 KCAS, which is compliant with the SOP “60°(nose down) for 2000’.” [encls (13), (14), (81), (82) and (84)]

131. Due to the aircraft’s nose low angle, 1568 feet AGL was the first radar altimeter reading in the descent. [encl (82),(103) and (104)]

132. Since the barometric altimeter was set at 0 prior to takeoff (as per the Blue Angel SOPs) and the terrain to the southeast of the airfield is not significantly higher than the airfield, it is notable that there is a 392 foot difference between the barometric and radar altimeters at this point. [encls (82), (103) and (104)]

133. At this same point in time, Blue Angel 6 was in excess of a 21,000 foot per minute rate of descent. [encls (81) and (82)]

134. One second later, at 1501 and 46.9 seconds local, Blue Angel 6 was 23.8° nose down at 1456 barometric/1472 radar altimeter feet AGL, 23.8 alpha, 3.48 Gs, and 268 KCAS, which is compliant with the SOP "45°(nose down) for 1500'." [encls (13), (14), (81), (82), (103), and (104)]

135. At this same point in time, Blue Angel 6 still had a 17,280 foot per minute rate of descent. [encls (81) and (82)]

136. One more second later, at 1501 and 47.9 seconds local time, Blue Angel 6 was 12.6°(nose down) at 1168 barometric/480 radar altimeter feet AGL, 23.8 alpha, 3.48 Gs and 272 KCAS. This is technically compliant with the SOP, "20° (nose down) for 1000'," but does not take into account the massive rate of descent at just 480 feet AGL on the radar altimeter (readout provided to the HUD). [encls (13), (14), (81), (82), (103) and (104)]

137. There is a 688 foot disparity between the barometric and radar altimeters at this point. [encls (81), (82), (103) and (104)]

138. For the F/A-18, if the radar altitude becomes invalid, barometric altitude is displayed and a "B" next to the altitude flashes to indicate barometric altitude is being displayed. [encl (101), (103) and (104)]

139. Blue Angel 6 is still in a 15,360 foot per minute rate of descent at this point. [encl (82)]

140. Two seconds later, at 1501 and 49.9 seconds local time, Blue Angel 6 was 2.8°(nose up), 456 barometric/96 radar altimeter feet AGL, 19.6 alpha, 3.11 Gs, and 264 KCAS. [encl (82)]

141. Again, there is a 360 foot disparity between the barometric and radar altimeters, with the radar altimeter the lower of the two. [encls (82), (103), and (104)]

142. At 96 feet AGL on the radar altimeter, Blue Angel 6 is still in a 5,760 foot per minute rate of descent. [encl (82)]

143. At this point, the stick goes from 1.7 inches backstick to 2 inches forward stick, indicating that Blue Angel 6 removed his hand from the stick and reached for the ejection handle. [encl (82)]

144. The Blue Angels fly with an "artificial feel spring" that pulls forward on the stick with a weight of forty pounds. [encls (18) and (60) through (65)]

145. Without resistance applied to the stick by the pilot, the stick will move forward and the aircraft will nose down. [encls (18) and (60) through (65)]

146. The artificial feel spring is designed to allow the Blue Angels to precisely maneuver the aircraft in close proximity to other aircraft. [encls (18) and (60) through (65)]

147. In the Interim Flight Clearance, there is a WARNING that states, "Ejection with artificial feel spring connected increases the probability of serious injury due to the aircraft pitch down when the stick is released. [encl (18)]

148. At 1501 and 50.9 seconds local time, just one second after Blue Angel 6 initiates the ejection sequence, VADR recorded its last data, showing the aircraft 7°(nose down), an erroneous barometric altimeter with a radar altimeter reading of 0 feet AGL, 12.6 alpha, 1.86 Gs and 48 KCAS. [encls (81) and (82)]

149. Both the current Blue Angel 5 and a former Blue Angel Solo, Col (b) (6), stated that the Split S portion of the maneuver is visually oriented and visual cues are primarily used to sense the aircraft's rate of descent. [encls (60), (65) and (99)]

150. Capt Kuss did not attempt any type of dive recovery procedure during the mishap. [encls (42), (81), (82), (84), (96) and (98)]

Mishap Aircraft Ground Impact

151. The aircraft initially impacted trees at a height of approximately 30 to 40 feet above the ground on a general heading of 320° and was .9 nautical miles away from the approach end of Runway 32 at Smyrna Airport. [encls (45), (46), (80), (81), (90) through (92), (95) and (124)]

152. The deciduous trees in the impact area are approximately 60 – 80 feet tall. [encls (80), (90) and (91)]

153. The aircraft's initial ground impact occurred approximately 80 feet after the initial tree impact. [encls (80), (90), (93) through (95), (124) and (125)]

154. The debris field was approximately 1500 feet long and oriented on a general heading of 320°. [encls (80), (90), (91), (93) through (95), (124) and (125)]

155. Blue Angel aircraft 6, BUNO 163455, was completely destroyed resulting from impact with terrain and the subsequent explosion. [encls (80), (90), and (91)]

156. The HUD control panel was found after the mishap with the ALT switch selected to radar (RDR). [encl (105)]

157. After the pilot pulls the ejection seat handle in a SJU-5/A ejection seat, there is a .3 second delay initiator that allows the canopy to be jettisoned before the catapult fires. [encl (23)]

158. Within .2 seconds of the catapult firing, which is .5 seconds total time after the pilot initiates ejection, the seat clears the aircraft. [encl (23)]

159. At .8 seconds total elapsed time from pilot ejection initiation, the drogue shoot, designed to stabilize and decelerate the seat, fires. [encl (23)]

160. At 1.8 seconds total elapsed time, seat/man separation begins and at 2.0 seconds total elapsed time, the ejection sequence is complete. [encl (23)]

161. The Mishap Investigation Support Team (MIST) in-field findings indicate that after Blue Angel 6 initiated ejection, catapult operation was normal. [encl (92)]

162. During the post catapult phase, the seat/man separation and recovery phases were interrupted, which prevented successful completion of the ejection sequence. [encl (92)]

163. The MIST in-field findings also indicate that the drogue parachute system deployed, along with the main parachute system, while traveling through fire. [encl (92)]

164. A fire ball began when the aircraft impacted the terrain. [encls (42), (44), (46) and (90) through (92)]

165. Both the drogue shoot and the main parachute were quickly destroyed in the fire and provided little to no deceleration for the pilot. [encl (92)]

Mishap Aircraft Response

166. Just prior to Blue Angel 6 impacting the ground, the Blue Angel Flight Surgeon, acting as a safety observer and evaluator at the

Communications Cart, radios, “Kooch check alt,” to prompt Blue Angel 6 to check his altitude. [encls (42) and (72)]

167. The Communications Cart sees an explosion and four seconds later transmits “Knock it off” over the radio. [encls (42), (71) and (72)]

168. “Knock it off,” a term used to direct all aircraft to cease maneuvering, is acknowledged immediately by Blue Angels 1 through 5. [encl (42)]

169. Smyrna Airport Fire Rescue departs for the mishap site less than a minute after the explosion. [encls (53), (54) and (79)]

170. The Smyrna (City) Fire Department arrived at the mishap site less than four minutes after the explosion. [encls (53), (57) through (59) and (78)]

171. Multiple agencies respond to the mishap, including the Smyrna Airport Fire Rescue and the Smyrna City Fire Department as well as state and local law enforcement agencies. [encls (53), (57) through (59), (78) and (79)]

172. Initially, Blue Angel 5 circles the mishap site at 2000 feet AGL. [encls (42), (60) and (65)]

173. Blue Angels 3 and 4 detach from the Diamond and land Runway 14 at Smyrna Airport at approximately 1505 Central Daylight Time. [encls (42), (60), (63) and (64)]

174. Blue Angel 1, flight lead and the Blue Angels’ Commanding Officer, circles the mishap at 2500 feet AGL and Blue Angel 2 circles the mishap at 3000 feet AGL with Blue Angel 5 still at 2000 feet AGL. [encls (42), (60) and (61)]

175. Blue Angel 2 detaches and lands Runway 14 at Smyrna Airport at approximately 1508 Central Daylight Time. [encls (42), (60) and (62)]

176. Blue Angel 5 then lands Runway 14 at Smyrna Airport at 1510 Central Daylight Time. [encls (42), (60) and (65)]

177. Rescue helicopters (Medic 8 and Medic 22) depart Smyrna Airport at approximately 1510 for the mishap site and are on scene by 1514 Central Daylight Time. [encls (42), (78) and (79)]

178. Blue Angel 1 lands on Runway 14 at the Smyrna Airport at 1511 Central Daylight Time. [encls (42), (60) and (61)]

179. A Special weather observation at 1514 local time for the Smyrna Airport reported scattered clouds at 3000, winds variable at 3 knots, visibility 10 statute miles, temperature 31°C, Dew point 21°C, and altimeter 3001. [encl (34)]

180. Capt Kuss did not survive the mishap. [encls (77), (78) and (111)]

181. Capt Kuss' body was found by first responders near (b) (6) and ((b) (6) within minutes of arrival at the mishap site. [encls (56), (77), (78), (80) and (91)]

182. Capt Kuss' body was removed from the mishap site at 1850 Central Daylight Time, 2 June 2016 by medical personnel. [encls (77) and (78)]

183. This is a Class A mishap because of the fatality and total loss of an aircraft. [encls (1), (3) (4) and (111)]

184. The cause of death was blunt force injuries. [encls (96), (97) and (111)]

Line of Duty Considerations

185. The toxicology report shows nothing abnormal in the blood of Capt Kuss. [encls (96), (97) and (110)]

186. Capt Kuss was not under the influence of alcohol or drugs at the time of the mishap. [encls (96), (97) (110) and (111)]

187. There is no evidence of any pre-existing diseases or conditions that may have contributed to this mishap. [encls (72), (96), (97) and (111)]

188. The Blue Angels returned to Pensacola on Sunday, 29 May after a ten-day trip that included three airshow sites in Lynchburg, VA; Annapolis, MD; and Jones Beach, NY. [encls (60) through (75)]

189. Monday, May 30 and Tuesday, May 31 were days off for the Blue Angels, providing Capt Kuss with time to rest, recuperate, and spend time with his family. [encls (60) through (73)]

190. Capt Kuss showed no signs of fatigue or stress on Wednesday, 1 June or Thursday, 2 June 2016. [encls (60) through (73) and (75)]

191. Review of Capt Kuss' medical record, dental record, and NATOPS jacket by a NAMI Flight Surgeon did not reveal any medical conditions

or physiologic issues that would have contributed to the mishap. [encls (96) and (97)]

192. Review of the mishap flight profile and atmospheric conditions at the time of the mishap by a NAMI Flight Surgeon showed no physiologic issues, such as gray out, or atmospheric conditions, such as sun angle or visual illusion, that would have contributed to the mishap. [encls (13), (34), (42), (84), (96) and (97)]

193. No other aircraft were involved in this mishap, and the mishap was not the result of a mid-air collision nor a near mid-air collision. [encl (42)]

Eye-witness Accounts

194. Four civilians witnessed the mishap and were interviewed during this investigation. [encls (44) and (46) through (50)]

195. The first witness, Mr. (b) (6), was only a few hundred feet from the initial aircraft impact site and debris field. He lives at the Sam Davis Historic Site where the mishap occurred and confirmed that there was an explosion and subsequent fire ball that traveled from his right to left, in a northwesterly direction. [encls (31), (44) and (46)]

196. A second witness, Ms. (b) (6), lives in the apartment complex just north of the Sam Davis Historic Site and was approximately 400 feet from the northwest portion of the debris field. [encls (44) and (47)]

197. Ms. (b) (6) confirmed that initial responders had difficulty accessing the mishap site due to a wooden fence, and rescue vehicles were forced to find an alternate path to the mishap site. [encls (44), (47) and (91)]

198. The third witness, Mr. (b) (6), and a fourth witness, Mr. (b) (6), were standing together, several hundred yards north of the initial impact. They stated that it looked as though Blue Angel 6 had leveled out or was slightly nose high before disappearing behind the trees. [encls (44) and (48) through (50)]

199. At approximately 1625 Central Daylight Time, Col (b) (6), (b) (3) (A), USAF, (b) (6), (b) (3) (A) of the 118th Wing arrived and established himself as the Mishap Site On-Scene Commander. [encls (56) and (77)]

Response and Recovery

200. An Emergency Operations Center was established at the mishap site at 2015 Central Daylight Time, 2 June 2016. [encls (31) and (78)]

201. Col Albritten remained as the Mishap On-Scene Commander until relieved by Capt (b) (6), USMC, of the Naval Safety Center at 1210 Central Daylight Time, Friday 3 June 2016. [encl (77)]

Administration of the Blue Angel SOPs

202. During the Spring 2016 CNATRA Oversight Inspection, the NFDS received a grade of "excellent" in the Standardization Category, which includes SOP evaluation. [encls (11) and (12)]

203. The Blue Angels rely heavily on SOPs to ensure safety of flight, standardization, compliance, and training for new team members while providing a professional flight demonstration to millions of spectators each year. [encls (13), (14), (60) through (68), (71), (72) and (119)]

204. Blue Angel SOPs are constantly updated throughout Winter training in El Centro and during the show season, building upon years of practical and demonstration experience. [encls (60) through (68), (71), (72) and (119)]

205. The Diamond, Blue Angels 1 through 4, each have positional SOPs. [encls (13), (15) and (119)]

206. The Solos, Blue Angels 5 and 6, have a single Solo SOP. [encl (13)]

207. The Blue Angel SOPs generally have the same formatting, structure, and layout, but they are adapted to the individual positions. [encls (13), (15) and (119)]

208. The process for SOP updates/changes and the subsequent review/approval process is not universally understood by the Blue Angel team members. [encls (60) through(73) and (119)]

209. The FAA's role in the maneuver review and approval process is not universally understood by the Blue Angel Team members. [encls (25) and (60) through (73)]

210. The maneuver limitations articulated in the Interim Flight Clearance are not universally understood by the Blue Angel Team member. [encls (18) and (60) through (73)]

211. The responsibility for SOP version control and tracking SOP updates is not universally understood by the Blue Angel Team members. [encls (60) through (73), (118) and (119)]

212. There are disparities between the SOPs when referring to the same information; for instance, the Communications Cart SOP states different High Show requirements than the Flight Demonstration and Communications Manual stipulates. [encls (16) and (120)]

213. The Blue Angels SOP archives are in accordance with Navy standards, but NFDS does not have a robust archival system. [encls (118) and (119)]

214. Without longer term archives, it is difficult to discern the origin of maneuver parameters such as the Solo's Low Transition/HPC/Split S maneuver Dive Recovery rules. [encl (13)]

215. The current Lead Solo did not know the origin of Dive Recovery rules. [encls (13), (60) and (65)]

216. According to NAVAIR Subject Matter Experts (SMEs), the Solo SOP Dive Recovery parameters listed for the mishap maneuver don't come from the F/A-18 NATOPS Performance Manual Dive Recovery charts. [encls (89), (102) and (106) through (109)]

217. The NAVAIR SMEs stated that the Dive Recovery charts are not applicable to the mishap maneuver because the charts are designed for recovery after weapons delivery. [encls (89), (102) and (107)]

218. The Solo SOP Dive Recovery rules provide a maximum dive angle allowed for a given altitude, but they do not provide an airspeed, which is required for use of the Performance charts. [encls (13), (89), (102) and (107)]

219. The NATOPS Flight Manual's description of OCF Recovery states that during a dive recovery, minimum altitude loss is achieved by advancing the throttles to MAX and maintaining 25 to 35° AOA until a positive rate of climb is established. [encl (101)]

220. The Blue Angel Solo SOP directs the use of the maximum performance dive recovery maneuver anytime the aircraft is not in compliance with the SOP Dive Recovery rules, but the Solo SOP does not define the maximum performance dive recovery procedures. [encls (13) and (101)]

221. The Solo SOP procedures for the mishap maneuver mandate to hold 20 – 25 alpha until absolutely certain that the bottom (of the Split

S) can be made, but airspeed references throughout the maneuver are nebulous. [encl (13)]

222. Velocity vector (aircraft flight path) is not factored into the Blue Angel Split S maneuver and is only mentioned as a tool to aid in arrival at level off altitude prior to center point. [encl (13)]

223. Other variables such as terrain, high density altitude, pilot proficiency, and distance from CenterPoint are referenced, but no specificity is given for how or when to factor them in. [encl (13)]

224. True Airspeed Speed (aircraft speed over the ground in a no wind situation) versus Calibrated Airspeed (what is seen in the HUD) is never mentioned directly and these two airspeeds can be significantly different under certain conditions such as a high density altitude. [encls (13), (100), (102) and (115) through (117)]

Performance Analysis

225. While there are NATOPS Performance Manual Charts to determine radius of turn and rate of turn for level flight, there are no charts provided for radius of turn/rate of turn in the vertical. [encl (102)]

226. The Split S portion of the maneuver is actually a radius of turn/rate of turn in the vertical plane instead of level flight. [encls (14), (102) and (114) through (117)]

227. There is a generic equation to determine the radius of turn in the vertical plane (Split S). [encls (115) and (116)]

228. With basic programming tools (provided on disk as an enclosure), the radius of turn for a Split S can be calculated in seconds, ensuring safe parameters for execution of the maneuver. [encls (115) through (117)]

229. Utilizing the equation, a Split S started at 135 knots and 3,500 foot AGL, while pulling 4 Gs and accelerating to 250 knots in the descent, equates to a 2999 foot radius of turn, and gives the aircraft a 501 foot buffer from the ground. [encl (116)]

230. Utilizing the same equation, a Split S started at 135 knots and 3,500 foot AGL, while pulling 4 Gs and accelerating to 300 knots in the descent, equates to a 3,605 radius of turn, which means the aircraft would impact the ground. [encl (116)]

231. Blue Angel 6 was 184 knots and 3,196 feet AGL at the start of the Split S, pulled to 3.73 Gs and accelerated up to 272 knots during the descent, meaning that his higher starting airspeed and lower G significantly increased his radius of turn while starting from a lower altitude. [encls (82) and (115)]

232. The number of Class A flight mishaps for the Department of the Navy over the life of the F/A-18 for all models is 190 events, with 7,143,222 flight hours flown, for a USN mishap rate of 2.66. [encl (123)]

233. The number of Class A flight mishaps for the Department of the Navy over the life of the F/A-18 A – D models is 167 events, with 5,584,718 flight hours flown, for a mishap rate of 2.99. [encl (123)]

234. While flying the F/A-18, the number of Class A flight mishaps for the Blue Angels prior to this mishap is 5 events, with 63,115 flight hours flown, for a mishap rate of 7.92. [encl (123)]

235. The last three Blue Angel Class A mishaps (2016, 2007 and 2004) have involved Blue Angel 6, the Opposing Solo, that resulted in two deaths. [encls (113) and (123)]

236. Both the 2004 mishap and this mishap occurred during the Split S maneuver. [encls (42), (43), (84) and (113)]

Blue Angel Officer Billets

237. In 2014, an O-5 level Executive Officer (XO) billet was added to the Blue Angels to align the team with the rest of the Navy and assist the Commanding Officer with his ground duties. [encl (118)]

238. The selection process used to pick the XO was similar to the Boss selection process and included senior leadership interviews with final selection done by CNATRA. [encl (118)]

239. This year, the second year for the XO billet, the functional tasks associated with the billet have grown from what is defined in the official billet description. [encls (60), (68) and (118)]

240. While the XO is still responsible for all tasks listed in the official billet description, he has also taken on duties at the Communications Cart (Comm Cart) during show practices and flight demonstrations. [encls (60), (68), (71), (72), (118) and (120)]

241. The XO now acts as a substitute for the Maintenance Officer (MO) at the Communications Cart for tasks historically assigned exclusively to the MO. [encls (60), (68), (71), (72) and (120)]

242. The Communications Cart MO duties focus on ground and airspace control. [encls (60), (71) and (120)]

243. For the Thursday, 2 June practice show, the Maintenance Officer was acting in his traditional duties as the MO at the Communications Cart. The XO was also at the Communications Cart, acting as radio relay between the Communications Cart and the Blue Angel team member stationed in the Smyrna Airport tower. [encls (42) and (60) through (73)]

244. The Blue Angels Administrative Officer billet is gapped this year due to a lack of applicants for the job. [encl (118)]

245. Without an Administrative Officer, the XO has also assumed some of the Administrative Officer responsibilities. [encls (60), (68) and (118)]

246. While the volume of applicants to the Blue Angels varies from year to year and from job to job, some billets have been more difficult to fill than others. [encl (118)]

247. Factors such as Detailer influence and problems aligning detailing windows with the Blue Angels Application/Selection process are common. [encl (118)]

Post Mishap Flights

248. Post mishap, the Blue Angels first flight was 16 June 2016. [encl (121)]

249. Post mishap, the Blue Angels' first Airshow occurred from 2 – 4 July 2016 in Traverse City, MI. [encl (122)]

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OPINIONS

1. The death of Capt Kuss occurred in the line of duty and not due to his own misconduct or willful negligence. [FF (1), (20 through 30), (38), (51) through (53), (180), and (183) through (187)]

2. Weather was a factor in this mishap. The weather observation was 3,000 scattered, but there were multiple billowing clouds near the departure end of the takeoff runway, Runway 14. Just prior to takeoff, Capt Kuss had a discussion with the Lead Solo about the viability of being able to “make” (successfully execute) the HPC. The clouds may have influenced Capt Kuss’ decision to begin the Split S before reaching the mandatory minimum altitude of 3,500 feet AGL. [FF (62), (64), (74), (76), (77), (80) through (84), and (118)]

3. Sun angle was not a factor in this mishap. [FF (65) and (192)]

4. This mishap was not caused by mechanical failure. [FF (94), (95), and (127)]

5. This mishap was not caused by a bird-strike. [FF (66)]

6. This mishap was not caused by G-LOC or A-LOC. [FF (191) and (192)]

7. This mishap was not caused by visual illusion. [FF (191) and (192)]

8. Capt Kuss was viewed as one of the most meticulous and professional Blue Angel pilots by his teammates, but leading up to the mishap flight, he committed errors that appear out of his norm, including not signing the aircraft acceptance (A) sheet for the aircraft prior to the mishap flight and not turning on his Mode 3 squawk during the mishap flight, although a preassigned squawk was provided to him. [FF (6) and (88) through (91)]

9. The 540° roll executed by Capt Kuss during the High Performance Climb (HPC) portion of the mishap maneuver was not in accordance with the Blue Angel Solo SOP, the FAA approved Blue Angels’ maneuvers package or the Interim Flight Clearance for Blue Angels’ aircraft, but is not a primary causal factor for the mishap. [FF (96 through 100), (112), (114), and (119) through (124)]

10. The series of events that allowed inclusion of the 540° roll in the demonstration, in violation of and without review and authorization of governing entities and directives, is not a causal

factor of the mishap, but it is of significance. [FF (202) through (214)]

11. The series of events that led to incorporation of an unauthorized maneuver into the demonstration reflect a lack of awareness and understanding by the team as to how to correctly add/modify/change maneuvers, both within internal NFDS processes (SOPs), as well as those of higher authorities. Understanding and abiding by the process ensures the maneuver is safe for the team and spectators, is an authorized maneuver, and is within the performance parameters of the aircraft. [FF (202) through (211)]

12. The Blue Angel SOPs are some of the most important documents that exist within the NFDS. They are essential for turnover, training, standardization, safety, and the effective execution of Blue Angel flight demonstrations. They contain years of experience and knowledge that is passed down to team members assuming new positions as well as new Squadron members assuming the positions for the first time. Portions of the SOPs have been “written in blood,” but even with this level of importance, the Blue Angel SOPs and the SOP support processes need improvement. Currently, the NFDS adheres to standard Navy archival protocol, meaning that SOPs are kept up to five years, or until superseded. It is standard practice for the Blue Angels to update (supersede) their SOPs every year. Because there is no archival system in place, the “who, what, where, when, and why” that initiated a change/modification/addition is lost. Case in point, the NFDS has no idea when, who, or why the Split S Solo Dive Recovery procedures were incorporated into the Solo SOP. They do not comply with the F/A-18 Performance Manual Dive Recovery charts. [FF (203) through (215)]

13. The content of the NFDS Solo SOP Low Transition/High Performance Climb/Split S requires revision. The maneuver description is vague and poorly written. The maneuver description does not provide detailed standards for execution under varying conditions. Quantifiable limitations and additional safety factors must be added. “No maneuver” conditions must be amplified and articulated with additional granularity. [FF (99) through (116)]

14. NFDS SOP version control requires attention and improvement. Following a request for the most current version of the SOPs, the NFDS provided the Command Investigator with different versions of the same documents and ultimately never provided the version listed on the NAVFLIGHTDEMRONNOTE 5215, List of Effective Instructions and Notices, dated 29 June 2016. The Flight Leader SOP provided by the team shows an Instruction Number of 3710.2X and an effective date of 31 Jan 2009, but has an unofficial header with the date of October 2015. The 5215

shows the current SOP as 3710.2T with an effective date of 11 November 2014. Every Blue Angel Officer interviewed for this investigation stated that the SOPs are updated at least annually. Other positional SOPs provided by the NFDS either have no Instruction Number or an invalid one. Version control is supremely important because the Blue Angel SOPs are the primary source documents for how to execute the demonstration maneuvers. It is a safety of flight issue. [FF (202) through (208), and (211) through (214)]

15. Ultimately, a Commanding Officer is responsible for everything his/her command does or does not do, but it is also important to appreciate the Blue Angels' unique situation, the overwhelming responsibility given to the NFDS Commanding Officer, and the extremely high operational tempo. These factors are the primary reasons that an Executive Officer billet, at the O-5 rank, was integrated into the NFDS two years ago. Since that time, some of the XO billet's roles and responsibilities have changed, leading to a diluted focus on the primary tasks such as: Exercising control over the preparation, issuance and revision of the regulatory, procedural, and other directives governing the administration and operation of the command; exercising general supervision over Squadron correspondence, files, records, and reports; and interpreting and implementing orders, regulation and directives from higher authority as they pertain to the administration of the Squadron. [FF (237) through (245)]

16. While all Blue Angel members should be familiar with SOPs, as well as pertinent orders and directives covering the demonstration, the Blue Angels Operations Officer/Solo Training Officer must be acutely knowledgeable of the governing documentation and capable of shepherding requests and modifications through the review/approval process. [FF (208) through (210)]

17. Every team member is essential to the success of the Blue Angel mission. No team member is more important than any other, yet the NFDS is without an Administrative Officer for the 2016 show season. The Team is going without the Administrative Officer for reasons that are primarily out of their control. While many may see gapping the Administrative Officer billet as unimportant, the Administrative Officer is a Support Officer for practices and demonstrations. Taking one person out of an already lean Support Officer rotation results in one less person to help cover Communications Cart and Tower requirements during practices and shows. It also creates a knowledge gap when dealing with administrative issues such as SOPs and compliance with directives. Some of the Administrative Officer's tasks are being covered by the XO, diverting more of his attention away from primary XO tasks. Gapping the billet also sends a subtle message that some Blue Angel jobs are "more essential" than others.

It is counter to the Blue Angels' messaging campaign concerning team concept. The Blue Angels represent the entire Department of the Navy and not just the aviation community. [FF (208), (237), and (244) through (247)]

18. Support Officer training needs improvement. During the investigation interviews, some questions pertaining to safe demonstration execution could not be answered by the Support Officers. Good "eyeball" calibration is not enough and must be complemented with factual knowledge. [FF (134) through (136), (139), 166), and (167)]

19. No other NFDS team member could have prevented this mishap from occurring. [FF (20) and (166)]

20. This mishap was caused by pilot error. [FF (6), (20), (88), (91), (117) through (119), (124) through (127), (132) through (142), and (150)]

21. Capt Kuss did not perform the Split S portion of the maneuver in accordance with the Blue Angels Solo SOP. Capt Kuss would have seen a barometric altitude readout of 3200 feet displayed in his HUD at the top of the HPC as he transitioned to the Split S. Regardless of whether the barometric altimeter was accurate, the displayed altitude was 300 feet below the minimum altitude mandated in the Solo SOP and grounds for a "no maneuver." He also exceeded the optimum maneuver entry airspeed by 50 knots. Capt Kuss did not pull the throttles out of MAX at or before 90° nose low, although he made the mandatory radio call, "Vertical, Blowers, RadAlt." Capt Kuss never pulled the throttles out of MAX. [FF (118), (119), (126), (127), and (150)]

22. During the descent portion of the Split S, there are disparities between the barometric and radar altimeter readouts in the VADR data. Engineering Investigations have been requested for both. The first radar altimeter readout during the descent, at 1568 feet AGL with 33.6° nose down, was five seconds prior to impact with the ground. Even if the altimeters malfunctioned and provided delayed or erroneous information, there was still time for Capt Kuss to react, and given that the maneuver is visually oriented, he should have recognized his extremely rapid descent rate and that nose angle does not always equate to aircraft flight path. [FF (129) through (137), and (139) through (142)]

23. Capt Kuss was compliant with portions of the Solo Dive Recovery limits for this maneuver, but the Dive Recovery limits do not factor in aircraft flight path or rate of descent. The Solo Dive Recovery limits may have given Capt Kuss a false sense of security descending

through 2000 feet AGL and 1500 feet AGL. [FF (129), (130), and (133) through 136)]

24. It is mathematically impossible to successfully execute a Split S (radius of turn in the vertical) maneuver under the parameters that Capt Kuss flew. The circumstances required pilot recognition of the situation in a rapidly dwindling window for recovery. [FF (226) through (231)]

25. Capt Kuss did not realize the seriousness of his situation and never attempted to perform a dive recovery or a maximum dive recovery. [FF (130), (133) through (136), (139), (140), (142), and (150)]

26. Capt Kuss unsuccessfully attempted to eject from the aircraft at the very last moment. The ejection seat propelled him out of the aircraft, but the ejection sequence was interrupted, most likely by trees or aircraft debris caused by the aircraft's contact with trees. The aircraft's impact with trees and terrain sparked an explosion that instantaneously burned the drogue shoot and parachute and prevented Capt Kuss' deceleration. Capt Kuss died of blunt force trauma injuries. [FF (140), (142) through (148), and (158) through (165)]

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RECOMMENDATIONS

1. Recommend instituting an acknowledgement letter to be annually signed by all NFDS officers concerning Blue Angel SOPs, FAA equities in relation to the NFDS, and the context of the Interim Flight Clearance. The letter should explain the SOP review process, SOP update procedures, and SOP approval processes within the NFDS; the FAA review and approval process for Blue Angel maneuvers during flight demonstrations; and the requirement to adhere to the aircraft flight limitations articulated in the Interim Flight Clearance.

2. Recommend instituting a Blue Angel SOP archival process that notes all SOP changes/updates/modifications, the person who originated the change, the reason for the change, and the date the change was approved. The archived SOP would be kept in perpetuity. The SOPs are based on years of corporate knowledge, and it would be beneficial to be able to go back and see when and why changes were instituted.

3. Recommend institution of tighter version control for Blue Angel SOPs. The SOPS are arguably the most important set of documents owned by the Squadron and are essential to the safe execution of flight practices and demonstrations. The Blue Angels' Administrative Department should be the keepers of the SOPs. A tracking log should be instituted for SOP copies, delineating the recipient and the copy number provided. The copy provided should reflect the copy number on all pages.

4. Recommend a detailed review of all Blue Angel SOPs and instructions associated with the execution of the flight demonstration. Outdated material is dispersed throughout the various documents as well as inconsistencies and disparities between the documents when describing the same information.

5. Recommend incorporating maneuver diagrams into the SOPs. Most aviators are visually-oriented learners. Maneuver diagrams, supplemented by text descriptions, will provide greater clarity. (An example of a maneuver diagram for the Split S is provided as enclosure 14).

6. Recommend three NFDS SOP reviews annually; two internal reviews and one review with CNATRA. The first review would be an internal review and would occur as soon as the new team stands up in November. The second review would be at the end of Winter training with CNATRA and in conjunction with his "air show ready" certification visit to El Centro, CA. The second review would also confirm all maneuvers are reflected in the FAA approved maneuvers package and confirm that all maneuvers comply with the flight limitations imposed by the Interim

Flight Clearance. The third review would be an internal review and would occur near mid-season, after the team has completed a few months' worth of airshows. Any proposed mid-season SOP changes/modifications/updates involving maneuvers would require a brief to CNATRA and would require a change transmittal to the basic instruction as well as require the identification of any deviations from the approved FAA maneuvers package. The brief would serve to confirm that the maneuver is also in compliance with the Interim Flight Clearance.

7. The Opposing Solo Low Transition/High Performance Climb/Split S requires a thorough, detailed revision. The NFDS 2004 Class A mishap also involved the Split S maneuver. Some changes were made to the Split S maneuver after the 2004 mishap, such as revising the pull to 20 – 25 alpha and instituting dive recovery rules, but the revision was not comprehensive enough. A "proposed changes" diagram is provided as enclosure 114 that could serve as a starting point for revision. The proposed changes modify the current radio calls from the Opposing Solo aircraft to the Communications (Comm) Cart and add two additional radio calls. The proposed radio calls help ensure the maneuver is safe at the top, at the 90° nose down, at the 45° nose down and at the bottom of the maneuver. The calls add a level of safety and ensure the aircraft is within parameters without significantly burdening the pilot. The proposed changes also set a maximum speed of 250 KCAS in the descent and implement the requirement for a 4G pull. Airspeed and G are two key variables in defining a radius of turn in the vertical plane and the Split S is a radius of turn in the vertical plane. Implementing a specified airspeed and G for the descent adds a level of precision and safety to the maneuver. The proposed changes also call for the velocity vector to be visible in the HUD by a specified altitude (altitude to be determined by SMEs at Pax River). The velocity vector depicts the aircraft's flight path, not nose position. If the velocity vector is not visible as the pilot pulls the nose towards level flight, near the bottom of the maneuver, the aircraft is not going where the pilot intends for it to go. The proposed changes also clarify the (maximum) dive recovery procedure requirement, as described in the NATOPS flight manual.

8. Recommend integrating tools that will help the Blue Angels fly a safer, more precise demonstration. Although the Performance Manual only addresses level flight radius of turn, it is possible to calculate vertical radius of turn for a Split S. There are too many show sites, too many variables, and too little time for the Team to perform computations by hand for every show. With the assistance of a UVA computer and mechanical engineering student, a computer program is included (enclosure 117) in this investigation as an example of what can be provided. The program will quickly calculate a vertical radius of turn. All that is needed is readily available information such as

the starting airfield elevation, desired altitude (AGL) to start the maneuver (top of the Split S), starting airfield temperature, desired airspeeds, and desired G. The program incorporates Density Altitude and True Airspeed into the radius of turn calculation. The computer program allows user input for speeds and Gs so it is flexible enough to use to calculate the backside of any looping maneuver. The computer program could easily be turned into a smart phone app as well. Recommend that CNATRA consider submitting the computer program to NAVAIR for review and to serve as a template for NAVAIR to design their own program or use the one provided.

9. Recommend designing and implementing a dedicated, structured training plan for the Blue Angel Support Officers. Support Officers play a critical role when manning the Comm Cart and the Tower during show practices and demonstrations. The training must ensure that Support Officers understand all maneuver safety parameters such as minimum altitudes for the start of maneuvers and minimum allowable altitudes for the bottom of maneuvers. It should also include the parameters for “no maneuvers.” The training plan should include a tracking sheet to detail time spent in the Tower and the Communications Cart. It should also track time spent in the desert during winter training practices.

10. Recommend that senior Navy leaders emphasize the importance of the NFDS Officer manning to all communities within the Department of the Navy. The Blue Angels are without an Administrative Officer for the 2016 show season and currently have one applicant for this billet for the 2017 show season. The lack of applicants is not an anomaly; it is the norm for the Administrative Officer billet as well as other Support Officer billets. Some communities do not see a Blue Angels’ tour as career enhancing and actively discourage potential applicants from applying. Only top down emphasis from senior Navy leaders can force a positive, lasting change to resolve the issue and ensure a pool of high quality applicants for all Blue Angel billets.

11. Recommend that as soon as the NFDS has their entire complement of Support Officers, the XO refocus on the roles and responsibilities listed in the official billet description, the reason why the billet was created in the first place.

12. Recommend a reassessment of how the Department of the Navy conducts mishap investigations and consider creating a “post mishap facilitator” billet. From an outsider’s perspective, the Navy’s mishap process is confusing and disjointed. The average citizen sees two separate investigations (a Command Investigation and a Safety Investigation) underway, but no dedicated military lead that serves as the one “military face” for the mishap and has the ability to reach

across boundaries to synchronize efforts. The Command Investigator and the Aircraft Mishap Board each have their responsibilities and must remain within their lanes of responsibility. A professional, trained, dedicated facilitator could also assist the separate investigations in getting started and "up to speed" much faster without compromising the concept of "privilege" that is so important to the AMB process. The post mishap facilitator would have the training, experience and points of contact needed to overcome the inertia of getting both investigations started. Whether accurate or not, a few of Smyrna's civilian leaders expressed their disappointment in the Department of the Navy's response to the mishap.

13. Recommend public recognition for the City of Smyrna and the agencies that provided support to the post mishap effort. They did a noteworthy job, especially considering the scope of the investigations and the overwhelming media interest in this high visibility mishap.

(b) (6)

(b) (6), (b) (3) (A)

Attachments:
As stated

Subj: COMMAND INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE NAVY FLIGHT DEMONSTRATION SQUADRON CLASS A MISHAP IN SMYRNA, TENNESSEE ON 2 JUNE 2016

Encl: (1) Your ltr 5820 Ser N00J/0291 of 3 Jun 16
(2) Your ltr 5041 Ser N00J/0315 of 21 Jun 16
(3) Copy of NFDS CASREP DTG 0315335Z JUN 16
(4) Copy of NFDS OPREP-3 SIR DTG 030005Z JUN 16
(5) Copy of Capt. Kuss' orders
(6) Copy of Aircraft Discrepancy Book (ADB) for BUNO 163455
(7) Excerpts from Capt. Kuss' Logbook
(8) Copy of Optimized Organizational Maintenance Activity (OOMA) Excel Spreadsheets for Missing Flight Records
(9) Excerpts from Capt. Kuss' Naval Air Training and Operating Procedures Standardization (NATOPS) Jacket
(10) Excerpts from Capt. Kuss' Personal Equipment Records
(11) CNATRA's Report of spring 2016 Oversight Inspection of the NFDS, dtd 20 Apr 16
(12) Navy Flight Demonstration Squadron (NFDS) Commanding Officer response to CNATRA's spring 2016 Oversight Inspection of NFDS, dtd 18 May 16
(13) Excerpts from the Blue Angels' Solo Pilot SOP
(14) Diagram of Blue Angel Opposing Solo Low Transition/HPC/ Split S Maneuver
(15) Excerpts from the Blue Angels Flight Leader SOP
(16) Excerpts from the Blue Angels Flight Demonstration Communication and Maneuver Profiles
(17) Blue Angels Pre-Mishap Plan and Incident Reporting Procedures
(18) Interim flight clearance for Blue Angels aircraft, dtd 032003Z Nov 15
(19) Interim flight clearance to use Operational Flight Program 20X in Blue Angels aircraft, dtd 241753Z Mar 16
(20) NFDS Aviation Life Support System (ALSS) waiver, dtd 1 Feb 16
(21) NavAir diagram and description of authorized SJU-5/A ejection seat modifications for the Blue Angels
(22) MIST Team Leader, Mr. (b) (6) email clarifying the modifications done to ejection seats in Blue Angel Aircraft
(23) Description and Diagram of the SJU-5/A Ejection Seat Ejection Sequence
(24) CNATRA letter certifying NFDS 2016 season, dtd 4 Mar 16
(25) NFDS FAA Waiver for Flight Demonstration and excerpt from the FAA approved Maneuvers Package
(26) NFDS Flight Schedule for 1 – 5 Jun 16
(27) Excerpts from OPNAVINST 3710.7U
(28) FAA Waiver for The Great Tennessee Air Show, Smyrna, TN, for 2 through 5 Jun 16
(29) The Great Tennessee Air Show layout map

(30) The Great Tennessee Air Show overhead imagery of control points, show line and crowd line
(31) The Great Tennessee Air Show Safety, Security and Emergency Response Plan
(32) Copy of Blue Angel Solo's Google Earth Imagery for the Smyrna Airshow with obstacles and run-in lines
(33) Blue Angel Waypoint Sheet for Smyrna, TN
(34) Weather Observation for Smyrna Airport at time of Incident and special observation immediately after the mishap
(35) U.S. Naval Observatory Sun Altitude/Azimuth Table for Smyrna, TN on 2 Jun 16
(36) Avian Hazard Advisory System (AHAS) report for Nashville, TN at 1500 local (2000Z), 2 Jun 16
(37) Published NOTAM for the Great Tennessee Air Show in Smyrna, TN on 2 Jun 16
(38) Temporary Flight Restriction (TFR) and Waiver Times for the 2016 Great Tennessee Air Show in Smyrna, TN
(39) Meeting notes for review of Nashville Air Traffic Control radar video from 1500 local (2000Z), 2 Jun 16 with the Pensacola TRACON Air Traffic Manager
(40) DVD of Nashville radar coverage during mishap flight on 2 Jun 16
(41) IO Interview with Ms. (b) (6) , Nashville Air Traffic Control
(42) DVD of Blue Angel's Air Show Practice on 2 Jun 16 filmed by Blue Angels video personnel
(43) DVD of YouTube video showing the 2 Jun 16 mishap
(44) Google map of eye witness locations during the mishap
(45) Foreflight overhead imagery with distance from mishap to Smyrna Airfield
(46) Summary IO interview of Mr. (b) (6) , mishap eye witness number one
(47) Summary IO interview of Ms. (b) (6) , mishap eye witness number two
(48) Summary IO interview via phone of Mr. (b) (6) , mishap eye witness number three
(49) CD and Printed Photo of Mishap Taken by Mr. (b) (6)
(50) Summary IO interview via phone of Mr. (b) (6) , mishap eye witness number four
(51) Summary IO interview of Mr. (b) (6) , Smyrna Airshow Coordinator
(52) Summary IO interview of Mr. (b) (6) , Smyrna Airshow Air Boss
(53) Summary IO interview of Mr. (b) (6) , Public Safety Chief
(54) Summary IO interview of Mr. (b) (6) , Air Traffic Manager at Smyrna Airport

Subj: COMMAND INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE NAVY FLIGHT DEMONSTRATION SQUADRON CLASS A MISHAP IN SMYRNA, TENNESSEE ON 2 JUNE 2016

(55) Summary IO interview of Mr. (b) (6), Air Traffic Controller at Smyrna Airport
(56) Summary IO interview of Col. (b) (6), (b) (3) (A), (b) (6), (b) (3), 118th Wing, Tennessee Air National Guard
(57) Summary IO interview of Mr. (b) (6), Chief of Smyrna Fire Department
(58) Summary IO interview of Mr. (b) (6), Assistant Chief of Smyrna Fire Department
(59) Summary IO interview of Mr. (b) (6), Assistant Chief of Smyrna Fire Department
(60) Investigating Officer list of questions for Blue Angel Team Members
(61) Summary IO interview of Blue Angel #(, CDR (b) (6), (b) (3)
(62) Summary IO interview of Blue Angel #(, LT (b) (6), (b) (3)
(63) Summary IO interview of Blue Angel #(, LT (b) (6),
(64) Summary IO interview of Blue Angel #(, LCDR (b) (6), (b)
(65) Summary IO interview of Blue Angel #(, LT (b) (6), (b) (3) (A)
(66) Summary IO interview of Blue Angel #(, LT (b) (6),
(67) Summary IO interview of Blue Angel (b), Capt. (b) (6),
(68) Summary IO interview of Blue Angel Executive Officer, CDR (b) (6),
(69) Summary IO interview of Blue Angel (b), Maj. (b) (6), (b)
(70) Summary IO interview of Blue Angel (b), Maj. (b) (6), (b) (3)
(71) Summary IO interview of Blue Angel (b) (6), (b) (3) (A), LT (b)
(72) Summary IO interview of Blue Angel (b) (6), , LCDR (b) (6), (b)
(73) Summary IO interview of Blue Angel Public Affairs Officer, LT (b) (6), (b) (3) (A)
(74) Summary IO interview of Blue Angel Maintenance Chief, ATCS (b) (6), (b)
(75) Summary IO interview of Blue Angel #(Crew Chief, AE1 (b) (6), (b)
(76) Summary IO interview of Blue Angel Videographer, AT2(AW) (b) (6),
(77) Mishap On-Scene Commander Logbook
(78) Rutherford County Emergency Management Agency logbook for the Smyrna Airshow
(79) Smyrna Airport Fire-Rescue Incident report, dtd 6 Jun 16
(80) Investigating Officer Initial Walk through of the site
(81) Legend for Visual And Data Recorder (VADR) Raw Data categories
(82) VADR Raw Data for aircraft BUNO 163445 on 2 Jun 16
(83) Animation VADR Data with engineering tools used to fill in data gaps
(84) NavAir Animation video of the 2 Jun 16 mishap

(85) Summary of IO phone conversation with Mr. (b) (6), NavAir Flight Control and Mishap Specialist concerning VADR data
(86) Email between the IO and Mr. (b) (6) confirming that there were no FCS faults seen on the mishap aircraft, dtd 15 Jun 16
(87) Email between the IO and Mr. (b) (6) describing specific VADR data categories, dtd 17 Jun 16
(88) Email from Mr. (b) (6) concerning the engine nozzles and operation in afterburner, dtd 17 Jun 16
(89) Performance Manual Dive Recovery information and Graphs
(90) CD of post-mishap photos taken by the mishap site On-Scene Commander
(91) DVD of post-mishap photos taken by the Command Investigator, photos 1 – 24
(92) Mishap Investigation Support Team (MIST) Infield preliminary report
(93) Mishap Site Debris Field Map with Contour Intervals, 8.5 X 11, Scale 1:12,200
(94) Mishap Site Debris Field Map with Contour Intervals, 8.5 X 11, Scale 1:3,050
(95) Mishap Site Debris Field Overhead Imagery with Contour Intervals, 8.5 x 11, Scale 1: 3,050
(96) Subject Matter Expert List and Qualifications
(97) CDR (b) (6), USN, Subject Matter Expert (SME), NAMI Flight Surgeon, Evaluation and Input
(98) Col. (b) (6), USMC (ret), SME, F/A18 Pilot, Evaluation and Input
(99) Col. (b) (6), USMCR, SME, F/A18 Pilot and Former Blue Angel Solo, Evaluation and Input
(100) AOPA Definition of Density Altitude and how to Calculate
(101) Excerpts from the NATOPS Flight Manual Navy Model F/A-18A/B/C/D Aircraft
(102) Excerpts from the NATOPS Flight Manual Performance Charts
(103) Summary IO interview of Mr. (b) (6), BOEING – AWL, China Lake, CA
(104) Email from Mr. (b) (6) about the Radar Altimeter and Barometric Altimeter
(105) Post Mishap Picture of Altimeter Switch on HUD Control Panel
(106) Summary IO interview of Mr. (b) (6), Flight Dynamics, NAVAIR, NOCAD
(107) Summary IO interview of Mr. (b) (6), Air Vehicle Performance, NAVAIR
(108) Summary IO interview of Mr. (b) (6), Flying Qualities Group, NAVAIR

(109) Email from Mr. (b) (6), NAVAIR Flight Dynamics
(110) Toxicology Report
(111) Autopsy Report
(112) Email with Preliminary Engine Report from Mr. (b) (6)
(113) Excerpts from the Command Investigation of the 2004 Blue Angel Class A Mishap
(114) Diagram of Proposed Changes to the Blue Angel Opposing Solo Low Transition/HPC/Split S Maneuver
(115) Excerpts from Clarkson University Aircraft Performance and Flight Mechanics Presentation
(116) Vertical Radius of Turn Examples
(117) Vertical Radius of Turn Calculator and Instructions
(118) Email from Blue Angel Executive Officer with XO Billet Description and why the Administrative Officer Billet is Gapped
(119) NAVFLIGHTDEMRONNOTE 5215, dtd 29 Jun 16
(120) Excerpts from the Blue Angels Communications Cart SOP (DRAFT)
(121) Blues Angels Flight Schedule for 13 – 18 June (Notes the First Post Mishap Flight)
(122) The Blue Angels Itinerary for Traverse City, MI, 2 – 4 July (The First Post Mishap Airshow)
(123) Naval Safety Center Mishap Data
(124) Mishap Site Debris Field Overhead Imagery with Contour Intervals, 21 x 27, Scale 1:1,200
(125) Mishap Site Debris Field Map with Contour Intervals, 21 x 27, Scale 1:4,800