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DEPARTMENT OF THE NAVY
COMMANDER NAVAL AIR FORCE
UNITED STATES PACIFIC FLEET
BOX 357051
SAN DIEGO CALIFORNIA 92135-7051

5830
Ser N00/293
18 Aug 22

FINAL ENDORSEMENT on CDR (b) (3) (A), (b) (6) ltr of 15 Apr 22

From: Commander, Naval Air Force, U.S. Pacific Fleet
To: File

Subj: COMMAND INVESTIGATION INTO THE FACTS AND CIRCUMSTANCES SURROUNDING THE F-35C CLASS A AVIATION MISHAP OF 24 JAN 22

1. This Command Investigation was convened to inquire into the facts and circumstances surrounding the Class A Aviation Mishap involving the F-35C Lightning II from Strike Fighter Squadron ONE FOUR SEVEN (VFA-147) that occurred on 24 January 2022 onboard USS CARL VINSON (CVN 70).

2. After review of the investigation and endorsements, I concur with and hereby approve the findings, opinions, and recommendations of the investigating officer as endorsed by Commander, Carrier Strike Group ONE and Commander, U.S. SEVENTH Fleet.

3. I have directed my staff to execute the following recommendations:

a. To consult with the manufacturers of the F-35C and Commander, Naval Air Systems Command (NAVAIRSYSCOM) to develop the following:

(1) An internal indication (Helmet Mounted Display and/or audio tone) tc alert a pilot that the aircraft has reached on-speed Angle of Attack (AOA) in the power approach mode without Approach Power Compensation Mode (APC)/Delta Flight Path (DFP) engaged. To avoid this indication during level flight, this symbology or tone should only be triggered above a given rate of descent and below a given altitude.

(2) An external indication that an F-35C is in power approach and APC/DFP is not engaged. This external indication will need to be visible to the Landing Signal Officers (LSO) while the aircraft is on final approach. This would provide the LSOs the opportunity to intervene earlier in a landing attempt, preventing a similar reoccurrence of an airplane approaching the ship without appropriate thrust.

b. To consult with the manufacturers of the F/A-18 E-G and NAVAIRSYSCOM to develop the following:

(1) An internal indication (Heads Up Display and/or audio tone) to alert a pilot that the aircraft has reached on-speed Angle of Attack (AOA) in the power approach mode without

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Precision Landing Mode (PLM) engaged. To avoid this indication during level flight, this symbology or tone should only be triggered above a given rate of descent and below a given altitude.

(2) An external indication that an F/A-18 E-G is in power approach and PLM is not engaged. This external indication will need to be visible to the LSOs while the aircraft is on final approach.

c. To collaborate with NAVAIRSYSCOM on the following:

(1) Update the F-35C Flight Manual to reflect that F-35C pilots **shall fly** APC/DFP when recovering aboard the carrier. The current F-35C Landing Checklist, Step 4 is: APC/DFP – As desired.

(2) Consult with manufacturer of F-35C to incorporate internal HMD and/or audio tone to alert pilot that the aircraft has reached on-speed AOA in the power approach mode without PLM engaged.

(3) To ensure survivability of the upwind Mobile Firefighting Vehicle (MFFV) and its ability to help respond to a crash in the landing area, position upwind MFFV away from the foul line.

4. Separately, I have approved the results of the Field Naval Aviator Evaluation Board (FNAEB) for the mishap pilot and have taken appropriate administrative action where warranted.

5. This investigation and enclosures will be maintained in my Force Judge Advocate office, which may be reached at (b) (3) (A), (b) (6)

K. R. WHITESELL

Copy to:
OPNAV N09G
COMSEVENTHFLT
COMTHIRDFLT
COMCSGONE
COMJOSTRKFITWING
STRKFITRON ONE FOUR SEVEN

DEPARTMENT OF THE NAVY
COMMANDER, U.S. SEVENTH FLEET
UNIT 200225 BOX 1
FPO AP 96602

IN REPLY REFER TO
5830
Ser N01J/044
3 Jun 22

SECOND ENDORSEMENT on CDR (b) (3) (A), (b) (6) ltr of 15 Apr 22

From: Commander, U.S. SEVENTH Fleet
To: Commander, Naval Air Forces Pacific

Subj: COMMAND INVESTIGATION INTO THE FACTS AND CIRCUMSTANCES SURROUNDING THE F-35C CLASS A AVIATION MISHAP OF 24 JAN 22

1. Forwarded. I thoroughly reviewed the subject inquiry and I concur with the findings of fact, opinions, and recommendations.

2. This mishap was the result of pilot error. The mishap pilot (MP) attempted an expedited recovery breaking overhead the carrier, an approved and common maneuver, but the MP had never performed this maneuver before and it reduced the amount of time to configure the aircraft and conduct landing checks. As a result of the compressed timeline and the MP's lack of familiarity with the maneuver, the MP lost situational awareness and failed to complete his landing checklist. Specifically, the MP remained in manual mode when he should have been (and thought he was) in an automated command mode designed to reduce pilot workload during landings.

3. Safety and risk management are foundational to everything we do as a combat-ready fighting force. Operating safely, and guarding against a "must do" attitude where risks are not adequately recognized, enables effective operations. As we answer the Chief of Naval Operation's call to Get Real, Get Better, we must continue to foster a culture of critical self-assessment and continuous improvement, learning and implementing lessons from mishaps like this in order to make our operations ever safer.

4. I echo the comments of Commander, Carrier Strike Group ONE—the sailors of USS CARL VINSON (CVN 70) and Carrier Air Wing TWO are to be commended for their prompt and professional execution of crash and fire response, search and recovery operations, casualty response, and emergency divert procedures.

5. My point of contact in this matter is CDR (b) (3) (A), (b) (6) JAGC, USN, who can be reached by email at: (b) (3) (A), (b) (6) or by DSN at: (b) (3) (A), (b) (6)

K. O. THOMAS

Copy to:
COMTHIRDFLT

DEPARTMENT OF THE NAVY
COMMANDER, CARRIER STRIKE GROUP ONE
UNIT 200217 BOX 1
FPO AP 96602 1700

IN REPLY REFER TO:
5830
Ser N00J/L049
21 Apr 22

FIRST ENDORSEMENT on CDR [redacted] ltr of 15 Apr 22

From: Commander, Carrier Strike Group ONE
To: Commander, Naval Air Forces Pacific
Via: Commander, Seventh Fleet

Subj: COMMAND INVESTIGATION INTO THE FACTS AND CIRCUMSTANCES SURROUNDING THE F-35C CLASS A AVIATION MISHAP OF 24 JAN 22

Ref: (a) JAGINST 5800.7G CH-1

1. Forwarded. I concur with the findings of fact, opinions and recommendations of the Investigating Officers. I commend the Sailors of the USS CARL VINSON (CVN 70) and Carrier Air Wing TWO who responded to the mishap on 24 January 2022 while deployed to the Seventh Fleet area of operations. Their professional execution of crash and fire procedures, casualty response operations, and search and rescue operations was exemplary.

2. The investigation met the requirements of reference (a) and 10 U.S.C. § 2255 pertaining to a Class A aviation mishap. All injuries sustained by personnel as a result of the mishap were in the line of duty and not due to their own misconduct. Corrective measures for the mishap pilot will await the determinations of the Field Naval Aviator Evaluation Board (FNAEB). A culture of safety will continue to be promoted within Carrier Air Wing TWO and supported for all Carrier Strike Group ONE operational units.

3. In accordance with reference (a), this investigation is forwarded to superior commanders who have a direct official interest in the recorded facts. Several recommendations require consideration by the Type Commander. Recommendations regarding developing an internal and/or external indicator for Approach Power Compensation Mode (APC)/Delta Flight Path (DFP) engagement during landings and revisions to Navy policy will require consideration by the Navy and implementation by Naval Air Systems Command. These recommendations should be considered with the results of the Safety investigation.

4. Original evidence pertaining to this investigation is preserved by Carrier Strike Group ONE and the responsible official is LCDR [redacted] JAGC, USN, who may be reached at [redacted] or [redacted].

D. P. MARTIN

Copy to:
Commander, Third Fleet

15 Apr 22

From: (b) (3) (A), (b) (6), 1320, USN, Lead Member
(b) (3) (A), (b) (6), 1310, USN, Subject Matter Expert
To: Commander, Naval Air Forces Pacific
Via: (1) Commander, Carrier Strike Group ONE
(2) Commander, Seventh Fleet

Subj: COMMAND INVESTIGATION INTO THE FACTS AND CIRCUMSTANCES SURROUNDING THE F-35C CLASS A AVIATION MISHAP OF 24 JAN 22

Ref:
(a) JAGINST 5800.7G CH-1, Manual of the Judge Advocate General
(b) NAVAIR 00-80T-104, Landing Signal Officer NATOPS Manual
(c) NAVAIR ARB NO. 33-12M, Single-Weight Settings for Mark 7 Mod 3 Arresting Gear
(d) LOCKHEED MARTIN F35C-FM-001, F-35C 'Lightning II', Flight Manual
(e) NAVAIR 00-80T-105, CV NATOPS Manual
(f) NAVAIR 00-80R-14, NATOPS U.S. Navy Aircraft Firefighting and Rescue Manual
(g) NAVAIR A1-H60SA-NFM-000, MH-60S NATOPS Flight Manual
(h) NAVAIR 00-80T-120, CVN Flight/Hangar Deck NATOPS Manual

Encl:
(1) Command Investigation Convening Letter dated 25 January 2022
(2) Command Investigation Extension Letter dated 23 March 2022
(3) Copy of VFA-147 Smooth Schedule
(4) USS CARL VINSON (CVN 70) Integrated Launch and Recovery Television Surveillance (ILARTS) System Footage
(5) Eyewitness Phone Footage of JASON 406 attempted recovery
(6) Eyewitness GoPro Footage of JASON 406 attempted recovery
(7) Summary of Interview Statements of CDR (b) (3) (A) (b) (6), Executive Officer, VFA-147
(8) Summary of Interview Statements of CDR (b) (3) (A), (b) (6), Air Boss, CVN 70
(9) Summary of Interview Statements of LT (b) (3) (A) (b) (6), CVW-2 LSO
(10) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VFA-192 LSO
(11) Summary of Interview Statements of LCDR (b) (3) (A), (b) (6), VFA-147 Training Officer
(12) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VFA-147 LSO
(13) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VAQ-136 LSO
(14) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VAW-113 LSO
(15) Summary of Interview Statements of LCDR (b) (3) (A), (b) (6) CVW-2 LSO
(16) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VFA-113 LSO
(17) Summary of Second Interview Statements of LT (b) (3) (A) (b) (6), CVW-2 LSO
(18) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VFA-2 LSO

(19) Summary of Interview Statements of CAPT (b) (3) (A), (b) (6), Commander, CVW-2 (CAG)
(20) Summary of Interview Statements of CDR (b) (3) (A), (b) (6), Commanding Officer (CO) VFA-147
(21) Summary of Interview Statements of CDR (b) (3) (A), (b) (6), CO, VFA-113
(22) Summary of Second Interview Statements of LCDR (b) (3) (A), (b) (6) VFA-147 Training Officer
(23) Summary of Interview Statements of LCDR (b) (3) (A), (b) (6) CVN 70 Aircraft Handler
(24) Summary of Interview Statements of LT (b) (3) (A), (b) (6), Mishap Pilot, VFA-147
(25) Copy of Maintenance Logs and Records for VFA-147 BUNO 169304
(26) Copy of Form F, Tactical Weight and Balance Clearance Form for VFA-147 BUNO 169304
(27) Copy of VFA-147 Published Schedule
(28) Copy of LT (b) (3) (A), (b) (6) 3710 Logbook for October 2021 – January 2022
(29) Copy of VFA-147 Pilot Currency from SHARP
(30) Copy of LT (b) (3) (A), (b) (6) Fleet Replenishment Squadron (FRS) Completion Letter
(31) Copy of LT (b) (3) (A), (b) (6) FRS Carrier Qualification (CQ) Completion Letter
(32) Copy of LT (b) (3) (A), (b) (6) NATOPS Instrument Rating
(33) Copy of LT (b) (3) (A), (b) (6) NATOPS Exams
(34) Copy of LT (b) (3) (A), (b) (6) NATOPS Evaluation dated 1 June 2021
(35) Copy of LT (b) (3) (A), (b) (6) Operational Physiology and Survival Training
(36) Copy of VFA-147 Pilot Designations and Qualifications
(37) Copy of LT (b) (3) (A), (b) (6) Naval Aviator Designation Letter
(38) Copy of LT (b) (3) (A), (b) (6) CNATRA Naval Aviator Aviation Training Jacket Summary Card
(39) Copy of LT (b) (3) (A), (b) (6) Crew Resource Management (CRM) Training & Evaluation Record
(40) Copy of LT (b) (3) (A), (b) (6) Medical Up-chit
(41) Copy of LT (b) (3) (A), (b) (6) Aircrew Personal Gear Record
(42) Copy of LT (b) (3) (A) (b) (6) LSO Qualification Letter
(43) Copy of LT (b) (3) (A), (b) (6) LSO Qualification Letter
(44) Copy of LCDR (b) (3) (A), (b) (6) CVW-2 LSO Qualification Letter
(45) Copy of LT (b) (3) (A) (b) (6) CVW-2 LSO Qualification Letter
(46) Written Statement of LT (b) (3) (A), (b) (6), CVW-2 Flight Surgeon ICO Landing Signals Officers Fit-For-Full-Duty
(47) Copy of CDR (b) (3) (A), (b) (6) Air Officer Designation Letter
(48) Copy of CDR (b) (3) (A), (b) (6) Air Officer Designation Letter
(49) Copy of CDR (b) (3) (A), (b) (6) Assistant Air Officer Designation Letter
(50) Copy of CDR (b) (3) (A), (b) (6) Helicopter Control Officer Designation Letter

(51) Summary of Interview Statements of LCDR (b) (3) (A), (b) (6), CSG-1 METOC ICO Weather Data for 24 January 2022
(52) Copy of CVN 70 Deck Log for 1502-1958 24 January 2022
(53) (Rel to US DoD Only) LM AERO FLIGHT SAFETY TECHNICAL REPORT 169304 CF-30 CLASS A MISHAP 20220124 FINAL (JAGMAN)
(54) (Rel to US DoD Only) CF-30_750138_LOA_CSMU_Engine_Analysis (Released to JAGMAN)
(55) Copy of VFA-147 Master Training Plan
(56) Copy of LT (b) (3) (A), (b) (6) VFA-147 LSO CV Landing Trend Analysis
(57) Copy of VFA-147 Landing Performance
(58) Summary of Interview Statements of ABHAN (b) (3) (A), (b) (6) and (b) (3) (A), (b) (6), CVN 70 MFFV Crew
(59) Summary of Interview Statements of ABHAN (b) (3) (A), (b) (6), CVN 70 MFFV Crew
(60) Summary of Interview Statements of CWO3 (b) (3) (A), (b) (6), CVN 70 Crash and Salvage Officer
(61) Written Statement of ABHC (b) (3) (A), (b) (6), CVN 70 Crash & Salvage
(62) Written Statement of LT (b) (3) (A), (b) (6), CVN 70 Officer of the Deck (OOD)
(63) Written Statement of CDR (b) (3) (A), (b) (6), CVN 70 Command Duty Officer (CDO)
(64) Written Statement of ENS (b) (3) (A), (b) (6), CVN 70 Officer of the Deck Under Instruction (OOD U/I)
(65) Written Statement of LT (b) (3) (A), (b) (6), CVN 70 Arresting Gear Officer (AGO)
(66) Written Statement of LCDR (b) (3) (A), (b) (6), HSC-4 Pilot
(67) Written Statement of CDR (b) (3) (A), (b) (6), CVN 70 Mini Boss
(68) Written Statement of AWS2 (b) (3) (A), (b) (6), HSC-4 Rescue Swimmer
(69) Summary of Interview Statements of LT (b) (3) (A), (b) (6), VAQ-136 MMCO
(70) Summary of Interview Statements of CDR (b) (3) (A), (b) (6), CVN 70 AIMD
(71) Summary of Second Interview Statements of LCDR (b) (3) (A), (b) (6), CVW-2 LSO
(72) Summary of Interview Statements of Mr. (b) (3) (A), (b) (6), COMNAVAIRPAC Maintenance Program Manager
(73) Written Statement of LT (b) (3) (A), (b) (6), CVW-2 Flight Surgeon ICO LT (b) (3) (A), (b) (6) Injuries
(74) Written Statement of LT (b) (3) (A), (b) (6), CVW-2 Flight Surgeon ICO Toxicology Labs
(75) Copy of LT (b) (3) (A), (b) (6) Medical Scan Results
(76) Written Statement of LT (b) (3) (A), (b) (6), CVW-2 Flight Surgeon ICO LCDR (b) (3) (A), (b) (6) Injuries
(77) Copy of LCDR (b) (3) (A), (b) (6) Medical Scan Results
(78) Written Statement of LT (b) (3) (A), (b) (6), CVW-2 Flight Surgeon ICO ADAN (b) (3) (A), (b) (6) Injuries

(79) Copy of ADAN (b) (3) (A), (b) (6) Medical Scan Results
(80) NAVAIR PMA-213 Analysis of CVN 70 JPALS data from 24 January 2022
(81) Summary of Interview Statements of LCDR (b) (3) (A), (b) (6), VFA-147
(82) Copy of CDR (b) (3) (A), (b) (6) OOD Qualification Letter
(83) Copy of LT (b) (3) (A), (b) (6) CDO Qualification Letter
(84) Aircraft Strike Authorization 2022-07, DTG 071129Z APR 22
(85) Summary of Personnel Injuries for Line of Duty Investigation
(86) Summary of Interview Statements of LTJG (b) (3) (A), (b) (6), VFA-147 MMCO
(87) Command Investigation Report Acronym List

Preliminary Statement

1. Pursuant to enclosure (1) and in accordance with reference (a), a command investigation was conducted to inquire into the facts and circumstances surrounding the Class A Aviation Mishap of F-35C aircraft Bureau Number (BUNO) 169304 from Strike Fighter Squadron ONE FOUR SEVEN (VFA-147) on 24 January 2022 aboard USS CARL VINSON (CVN 70) in the South China Sea. All times in this report are local Greenwich Mean Time (GMT) +08H unless otherwise annotated.

2. Per reference (a), an extension for submission of this report was requested and granted by the Convening Authority to expire on 15 April 2022, enclosure (2). The extension was necessary to ensure receipt and analysis of critical data recovered during the aircraft salvage efforts.

3. LCDR (b) (3) (A), (b) (6), JAGC, USN, Staff Judge Advocate (SJA), Carrier Strike Group ONE assisted the Investigating Officers (IOs) with legal advice during the course of this investigation. Administrative assistance was provided to the IOs by: LCDR (b) (3) (A), (b) (6), 1310, USN; LT (b) (3) (A), (b) (6), 1310, USN; YNC (b) (3) (A), (b) (6), USN; LN1 (b) (3) (A), (b) (6), USN; Technical assistance was provided to the IOs by: Mr. (b) (3) (A), (b) (6), F-35 Lightning Support Team Lead Engineer; CDR (b) (3) (A), (b) (6), 1310, USN, Chief Operational Test Director for the U.S. Operational Test Team; and LCDR (b) (3) (A), (b) (6), 1310, USN, VFA-125.

4. Line of duty determinations for all injured Sailors were made in accordance with reference (a), and included within this report.

5. All reasonably available and relevant evidence was collected. Interviews by the IOs and their team were conducted while embarked USS CARL VINSON (CVN 70) in person or via telephone. No difficulties were encountered while interviewing witnesses. All original evidence was collected and maintained by the IOs.

6. The IOs have met each of the Convening Authority's directives. They have investigated the cause of the accident and provided opinions as to any fault, neglect or responsibility. The

IOs have also provided recommendations to mitigate the possibility of this type of mishap happening in the future.

Executive Summary

7. On 24 January 2022, at 1631L (GMT+08H), an F-35C Lightning II aircraft assigned to VFA-147 suffered a Class A Aviation Mishap as it attempted to land aboard the USS CARL VINSON (CVN 70). The aircraft impacted the CVN 70 ramp forward of the main landing gear, forcing the pilot to eject. The aircraft slid off the forward section of the CVN 70 Landing Area (LA) and into the sea. The aircraft was later recovered on 2 March 2022 from a depth of over 12,000 feet utilizing a remotely operated vehicle embarked on the Diving Support Construction Vessel (DSCV) PICASSO.

8. The investigation determined the cause of the mishap to be pilot error. The pilot entered the carrier break, bringing the throttle to Flight IDLE, allowing the aircraft to slow to approach speed. Once approach speed was achieved, the F-35C landing checklist was not fully completed by selecting Approach Power Compensation Mode (APC)/Delta Flight Path (DFP), leaving the aircraft operating in Manual Powered Approach (PA) Control Laws (CLAW).

9. During the start, middle, and in-close portions of the landing approach, the pilot applied corrections via stick inputs under the assumption that the aircraft was in either APC or DFP PA CLAW. These corrections did not engage the engine to provide additional thrust as the aircraft was still operating in Manual PA CLAW with the throttle still at Flight IDLE. The aircraft developed a rapid sink rate during the in-close portion of the landing approach and a manual engine power demand was not added until 2.6 seconds prior to impact. This late power addition was insufficient to prevent the aircraft from striking the ramp.

Findings of Fact – Aviation Mishap

1. F-35C aircraft BUNO 169304, (JASON 406) and USS CARL VINSON (CVN 70) were involved in a Class A Aviation Mishap on 24 January 2022. JASON 406 will be further referenced as the Mishap Aircraft (MA). [Encl 3-20]

2. The mishap occurred on 24 January 2022 at 1631:31L (0831:31Z) as the aircraft attempted to recover aboard CVN 70 in the South China Sea. [Encl 4-20, 52, 53]

3. LT (b) (3) (A), (b) (6), USN was the pilot of the MA when the mishap occurred. The mishap pilot (MP) was active-duty Navy, assigned to VFA-147, and deployed with the VINSON Carrier Strike Group (CSG) and embarked CVN 70. [Encl 3, 7, 20, 24]

4. According to the Autonomic Logistics Information System (ALIS), the MA was in compliance with all periodic maintenance inspections and applicable technical directives. The aircraft had 1446.18 total flight hours. 130.16 flight hours had occurred since the last

intermediate phase inspection. The aircraft's last 196 day special inspection was completed on 4 October 2021. [Encl 25]

5. Post-Operation Servicing (POS) and Before-Operation Servicing (BOS) inspections were conducted on the MA on 23 January 2022 and were valid for the mishap flight. The Inter-Operations Servicing (IOS) inspection was conducted on the MA on 24 January 2022 and was valid for the mishap flight. No discrepancies were noted. [Encl 25]

6. According to ALIS, the MA was combat capable for the assigned mission. The MA was not fully mission capable due to an Electronic Warfare (EW) sensor degradation; this EW degrade did not affect the MA's airworthiness. [Encl 25]

7. MA was within all weight and balance limitations. [Encl 26]

8. The mishap flight was properly scheduled per applicable directives. The flight was authorized by VFA-147 Commanding Officer (CO), CDR Mark Cochran. [Encl 3, 20, 27]

9. MP's last flight was 23 January 2022. [Encl 28]

10. MP was current for day landings aboard the aircraft carrier in accordance with reference (b). The mishap flight was the MP's fifth daytime flight in the preceding 11 days. [Encl 28, 29]

11. MP was an F-35C qualified combat wingman. He had 650.3 total flight hours with 370.7 flight hours in the F-35C. [Encl 28, 30, 36]

12. MP had current and appropriate qualifications and designations including Naval Air Training and Operating Procedures (NATOPS), Instrument, Egress Training, Naval Aviation Survival Training, Medical up-chit, and no evidence of illegal drug, medication or alcohol use was noted. [Encl 30-40, 74]

13. MP's Aviation Life Support Systems were in compliance with all periodic maintenance inspections. [Encl 41]

14. (b) (6) [redacted] Encl 7, 24, 27]

15. MP's flight briefs included an overall air wing LFE mass brief followed by a DCA element brief. [Encl 7, 24, 27]

16. The element brief was conducted by the element division lead, LCDR (b) (6), (b) (3) (A) of VFA-147. The element brief covered all aspects of flight to include Administration, Tactical Administration, Mission, and Operational Risk Management (ORM). [Encl 7, 24]

17. MP received 8 hours of sleep the night prior to the mishap and was not experiencing any personal stress factors. MP reported eating breakfast and working out prior to the brief. [Encl 24]

18. All members of the Landing Signals Officer (LSO) wave team to include CAG Paddles, Primary and Backup, were designated and qualified for their positions on that day per applicable directives. [Encl 9, 15, 19, 42-46]

19. At the time of the mishap, the CVN 70 Air Boss and Mini Boss were appropriately qualified to perform their duties per applicable directives. [Encl 47-50]

20. At the time of the mishap, the CVN 70 Officer of the Deck (OOD) and Command Duty Officer (CDO) were appropriately qualified to perform their duties per applicable directives. [Encl 82, 83]

21. Forecasted weather by the VINSON Strike Group Oceanography Team for the day of the mishap called for wind from north at 10-15 knots; few to scattered clouds at 5,000 feet; combined seas of 2-4 feet. [Encl 51]

22. Observed weather for the mishap area was reported by special observation as 25.8 degrees Celsius; wind from 030 at 16 knots; scattered clouds at 3,000 feet; combined seas of 4 feet; altimeter setting of 29.85 ins; visibility of 10 nautical miles (nm); density altitude (DA) of +1758. [Encl 51]

23. At the time of mishap, CVN 70 was driving steady on course of 030 degrees true at approximately 12 knots in international waters. [Encl 52]

24. At the time of mishap, winds over the flight deck of CVN 70 were reported as 27 knots with 1-2 knots axial. [Encl 9, 17, 51]

25. According to reference (c), the Recovery Headwind required for a normal landing configuration of the F-35C (at a DA of 2000 feet with a 3.5 degree glideslope) is 26 knots. The DA at the time of the mishap was 1800 feet.

26. The Joint Precision Approach and Landing System (JPALS) remained in a certified operational status with zero data gaps or loss of uplinks observed within the ten minute window centered on the mishap (1625-1635L). [Encl 80]

MA Sequence of Events

27. MA flight data shows that the MA took off from CVN 70 at 1255L. [Encl 3, 81]

28. The following sequence of events occurred during MA flight operations:

29. At 1255L, the MA launches in support of air wing LFE and executes air wing LFE mission portion of flight to include two aerial refuelings (AR). [Encl 81]

30. From 1522-1606L, the MA executes VINSON CSG DCA portion of flight with an AR post mission. Once AR is complete, the MA is led back to the Case I overhead stack by his section lead, JASON 407. [Encl 81]

31. At 1628L, the MA takes administrative lead of the section to gain section lead experience in the carrier environment. [Encl 81]

1630:37L: MP initiates the carrier break at the stern of CVN 70. [Encl 4, 6]

1631:04L: MP lowers the landing gear. [Encl 4, 6, 53]

1631:20L: MA enters the groove. [Encl 4, 6]

1631:25L: Backup LSO gives a "Right for lineup" call. [Encl 4, 10]

1631:26L: Primary LSO gives a "Little power" call. [Encl 4, 12]

1631:27L: CAG Paddles gives a "Powe.. Waveoff, Waveoff, Burner, Burner, Burner.. Burner" call. The word "power" is not completed by CAG Paddles before starting the "Waveoff…" sequence of calls. [Encl 4, 9, 17]

1631:31.4L: MA impacts the ramp of CVN 70 just forward of the MA main landing gear, shearing the main landing gear, bouncing the tail of the MA into the air with a left-wing-down, nose-down component. [Encl 4, 6]

32. The MA's station 1 (farthest left, sitting in the cockpit) Launcher (LAU)-151 catches the first arresting wire (1631:32.3L), initiating a slight counter-clockwise rotation of the MA. The MA's nose gear are perpendicular to the MA direction of movement and reestablish contact with the flight deck just prior to the second arresting wire and begin to collapse. [Encl 6]

33. The MA nose gear fully collapses on top of the second arresting wire (1631:32.5L). Remnants of MA nose gear assembly catch the second arresting wire and it begins to payout. [Encl 6]

34. The second arresting wire releases from the MA nose gear remnants after approximately 20 feet of payout (1631:32.65L). [Encl 6]

35. MA's station 1 LAU-151 then catches the second arresting wire (1631:32.85L). [Encl 6]

36. MA's station 1 LAU-151 detaches from the left wing of the MA. First and second arresting wires release from MA. Counter-clockwise rotation rate of the MA increases (1631:32.95L). [Encl 6]

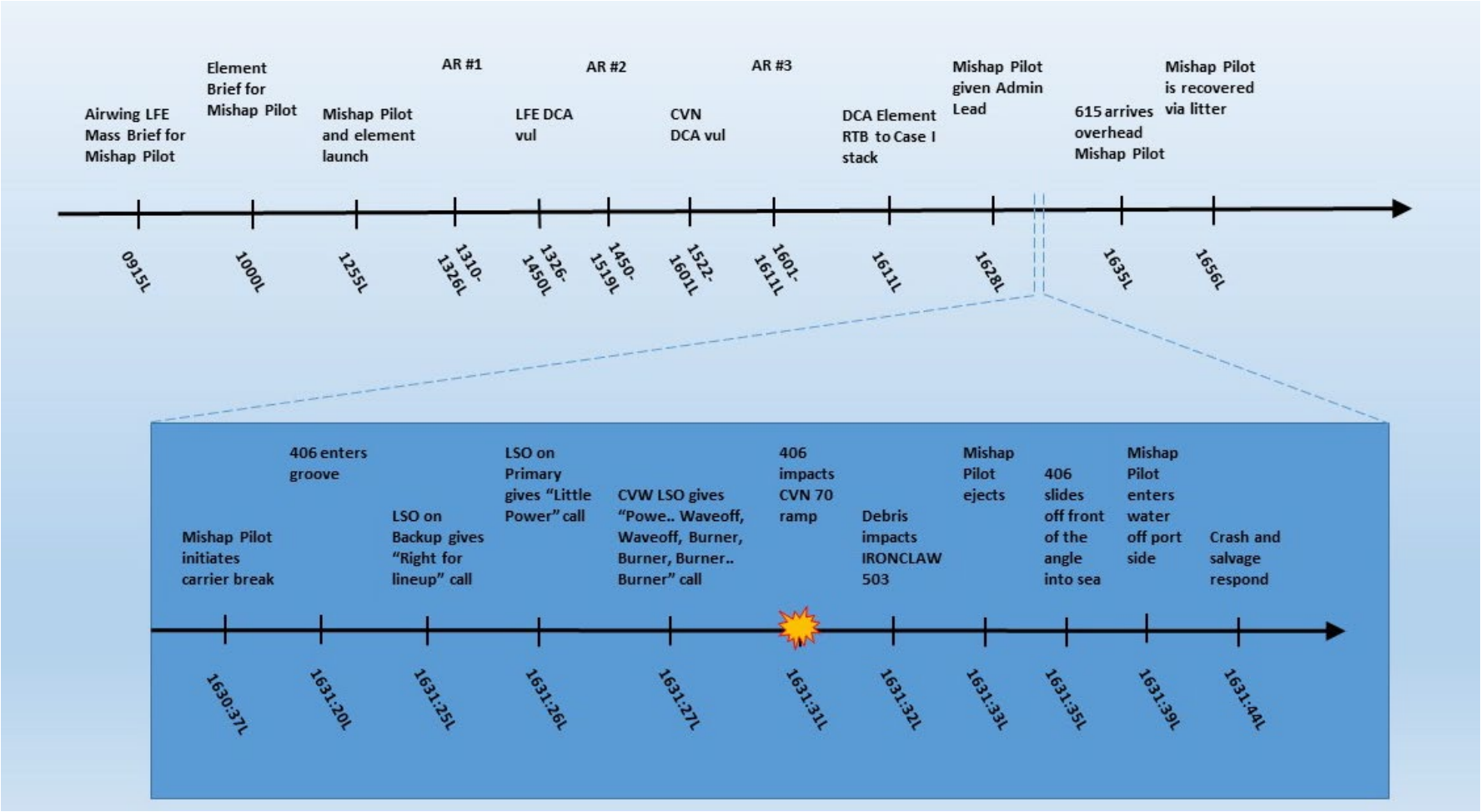
37. The MP ejects from the MA. MA is forward of the fourth arresting wire, left-wing-down, nose pointing approximately 80-90 degrees to port of the LA heading as it continues counter-clockwise rotation (1631:33.3L). [Encl 4, 8]

38. MA continues counter-clockwise rotation through the LA as it slides off the front of the CVN 70 LA. MA completed 360 degrees of counter-clockwise rotation through the LA and an additional approximate 140 degrees as it falls to the sea surface (1631:35.8L). [Encl 4, 6]

39. The MP enters the water along the port side of CVN 70 (1631:39L). [Encl 4]

40. CVN 70 crash and salvage's P-25 Mobile Firefighting Vehicle (MFFV) begins spraying Aqueous Film Forming Foam (AFFF) on wreckage still in the LA (1631:44L). [Encl 4]

[Intentionally Blank]



Mishap Aircraft Sequence of Events

Markings Removed

Normal Execution and Procedures According to the F-35C Flight Manual

41. The normal execution and procedures according to the F-35C Flight Manual, reference (d), are explained in Findings of Fact (FF) 39-64.

42. The F-35C Landing Checklist is:

1. Landing Gear – Down
2. Hook – Down (as required)
3. Land/Taxi Lights – As required
4. APC/DFP – As desired

43. The F-35C landing gear extension airspeed limit is 300 KCAS. The use of speedbrake within 10 seconds of touchdown during a Carrier, Fixed Wing Aircraft (CV) recovery is a prohibited maneuver.

44. The F-35C flight control system enters PA CLAW when airspeed is less than 300 KCAS and either the gear handle is lowered or alternate gear extend is activated.

45. The PA CLAW provides precise control of glideslope, lineup and speed/Angle of Attack (AOA).

46. There are three modes of flight within PA CLAW; Manual; APC; and DFP.

47. Manual mode requires the use of both the stick and throttle for coordinated flight by the pilot. The stick will control aircraft pitch and roll while the throttle will add and subtract thrust demand from the engine.

48. The aircraft will be in Manual PA CLAW if no other inputs are provided to the aircraft. The most notable Helmet Mounted Display (HMD) display indications that the aircraft is in Manual mode are the presence of the AOA bracket (E-bracket in Fig. 1) while on-speed, and the lack of CMD APC (Fig. 2) or CMD DFP (Fig. 5) above the speed group (airspeed dial).

(b) (3) (A)

Figure 1 depicts Manual Mode Flight Reference Symbology in the HMD

49. When DFP or APC modes are available, using Manual mode is considered a degraded mode. This is due to the increased workload associated with controlling approach airspeed, glideslope and lineup. Fast and high conditions are most challenging in Manual mode in clean wing configuration due to the prolonged time with throttle at or near flight IDLE.

50. APC is designed to reduce workload and to improve energy management and glideslope control during approach. With APC engaged, the aircraft automatically controls engine thrust to maintain desired AOA, allowing the pilot to fly the desired glideslope using pitch stick only to command Vertical Speed Indication (VSI). In APC mode, the aircraft will automatically add or subtract power, and/or rapidly maneuver the flight controls to maintain the VSI set by the pilot's stick inputs.

51. The pilot enters APC by selecting the APC (T6) switch (Fig. 3) with the landing gear down. At APC engagement, the aircraft seeks on-speed AOA. If the AOA is below but near on-speed, the aircraft gradually slows to on-speed. If the AOA is significantly below on-speed, APC engagement causes the nose to pitch up to seek on-speed AOA, which could cause a significant deviation from intended glide path unless the pilot overrides the pitch up with forward stick. CMD APC and an APC ship referenced velocity vector (SRVV) are displayed (Fig. 2) in the HMD when APC is entered.

(b) (3) (A)

[redacted]

Figure 2 depicts the APC Indications Displayed in the HMD

52. APC mode is deselected by any of the following methods: toggling the APC (T6) switch, raising the landing gear, or applying greater than 10 pounds of force in either direction on the throttle.

(b) (3) (A)

Figure 3 depicts the F-35C Throttle

53. A one-time "THROTTLE, THROTTLE" audio alert is issued for any APC disconnect except when due to ground contact, raising the gear, or for commanded waveoffs.

54. DFP mode reduces carrier landing workload in the pitch axis to minimal levels. The CLAW computes a target flight path based on ship information. Flight path changes are then commanded by the pilot via pitch stick using anticipation releases near a centered meatball. The pilot enters DFP by selecting the pinkie switch (S10) on the stick (Fig 4). At engagement, the F-35C will gradually dip over to the reference flight path. CMD DFP and the DFP SRVV will be displayed in the HMD (Fig 5).

(b) (3) (A)

Figure 4 depicts the F-35C Stick

(b) (3) (A)

[redacted]

Figure 5 depicts the DFP Indications Displayed in the HMD

55. The paddle (S9) switch (Fig. 4) smoothly disables DFP while allowing the approach to be continued in APC mode.

56. The DFP reference flight path is computed using ship speed, lens angle, and aircraft parameters via the landing reference point (LRP). LRP entry may be entered manually or automatically (AUTO), with AUTO being the preferred LRP data setting when landing at a ship equipped with a JPALS system, because the aircraft is receiving real-time ship information.

57. The primary recovery mode for shipboard operations is DFP. The mode should be engaged once the ball is centered and stable approaching the wings level transition. Pursuant to reference (d), the glideslope correction technique in DFP is to push/pull pitch stick until the desired apparent flight path rate is achieved. This will correct for glideslope deviations by increasing or decreasing VSI. The pilot must hold the stick correction until a centered meatball

is observed, and then allow the stick to neutralize in order for DFP to recapture the LRP glideslope setting (normally 3.5 degrees).

58. DFP automatically downgrades to APC if the system detects a flight path error due to a sensor failure.

59. APC is considered a downgraded mode of DFP with comparable system performance in glideslope control, but requires more frequent pitch stick inputs due to the fact that it commands a flight path rate (VSI) vice a glideslope.

60. Burble turbulence is disturbed air behind the ship due to its superstructure (tower). DFP mode performance through burble turbulence for light through medium headwind (16-40 knots) conditions is a predictable trend of going ½ to 1 ball low at the ramp, which may be easily corrected by a small ¼ aft stick input to re-center the ball. Burble response in APC mode results in a slight settle at the ramp, requiring small aft pitch stick correction followed by a single forward pitch stick correction to arrest the rising ball once it is centered.

61. Lineup corrections in DFP and APC modes are comparable, resulting in minimal glideslope deviations, trending on a slight settle. Flight test has shown that both APC and DFP provide compensation to automatically reduce the impact of the ship's burble, but significant compensation is necessary to minimize sink in close, if landing in Manual mode.

62. In PA mode, Integrated Direct Lift Control (IDLC) provides an immediate flight response to pilot commands by briefly commanding the flaps and ailerons up or down to generate a short-term rise or sink. This additional deflection blends back to zero as thrust responds to the commanded engine thrust (ETR). IDLC is an intrinsic feature of the PA CLAW and cannot be deselected.

63. In Manual mode, IDLC is coupled to the throttle and responds to throttle inputs with glideslope response attributed to pilot anticipation and control of both throttle and stick. In APC and DFP modes, IDLC drives the direct lift surfaces with pitch stick inputs.

64. The F-35C uses an Integrated Caution, Advisory and Warning (ICAW) system to notify pilots of system faults. A Warning alerts the pilot of a condition requiring immediate response or attention to prevent personal injury, loss of life, loss of aircraft, or failure of mission. Visual Warning alerts are displayed in red in the HMD/HUD and Panoramic Cockpit Display (PCD) with an accompanied audio alert tone and voice.

65. The following engine emergencies will include a visual alert, audio tone and accompanied "Engine" voice warning: Eng Oil; Eng Stall.

66. The following engine emergencies will include a visual alert, audio tone and accompanied "Engine, Engine" voice warning: Eng Comm Fail; Eng Ctrl Fail.

67. A Flameout engine emergency will include a visual alert, audio tone and accompanied "Flameout, Flameout" voice warning.

68. No visual alerts, audio tones or voice warnings were noted by the MP to indicate abnormal flight characteristics. [Encl 24]

69. No visual or audio indications of abnormal engine operations were noted by the MP or eyewitnesses to the mishap. [Encl 9, 10, 12, 24]

70. MA flight data show that no ICAW indications were present during the MA flight that would indicate engine malfunctions prior to impact with the CVN 70 ramp. [Encl 53]

71. Pursuant to reference (d), the F-35C lands at an optimum approach AOA of 12.3 degrees. This "on-speed AOA" of 12.3 degrees keeps the arresting hook at the appropriate angle for an arrested landing. APC is available in PA mode and maintains optimum approach AOA when selected. When an airplane is heavier, 12.3 degrees AOA will correspond to a faster approach speed. As the weight of the airplane gets lighter, the actual approach speed of the aircraft is reduced. Although the weight of an aircraft is variable, 12.3 degrees will always put the aircraft at the same approach attitude.

72. MA flight data reported a fuel load of approximately 7,300 lbs at impact. Based on the configuration and weight of the MA, this would correspond to an optimum approach speed of approximately 140 KCAS. [Encl 53]

73. Pursuant to reference (b), near the port side of the LA, the Improved Fresnel Lens Optical Landing System (IFLOLS) uses fiber optic "source" light to provide pilots with a vertical indication of where their airplane is located relative to optimum glideslope. The source light is also known as a meatball or ball. For example, an airplane on glideslope will see a centered ball on the IFLOLS.

74. According to the CV NATOPS, entry into the break shall be made at 800 feet. All breaks shall be level. A descent to 600 feet to intercept the downwind leg of the landing pattern shall commence when established downwind. Descent to 600 feet shall be completed before reaching the 180 position. [Ref (e)]

75. The landing pattern downwind leg is flown at 600 feet, 1 to 1-1/2nm abeam the ship's stern. Aircraft should maintain a minimum of 150 knots in the landing pattern until approaching the ship's bow. Aircraft in the Visual Flight Rules (VFR) Day Landing Pattern should be established in the intended landing configuration, wings level at 600 feet with landing checklist complete by the 180. At the 180, the aircraft should begin the approach turn and gradual descent to pass the 90-degree position at 450 to 500 feet. The pilot should continue the approach turn until intercepting the extended centerline of the ship's angled deck and acquire the optical landing system meatball image. The approach turn from the 180 to the start should take 45 seconds. [Ref (e)]

76. The aircraft should roll wings level on centerline with a centered ball to allow a 15 to 18 second groove before aircraft touchdown on deck. At touchdown, the pilot shall add power as appropriate, and prepare to bolter. Following arrestment, the pilot shall follow the instructions of the aircraft directors and comply with the procedures in NAVAIR00-80T-120 (CV Flight/Hangar Deck NATOPS manual). [Ref (e)]

Aviation Mishap

77. The MP led his flight from two thousand feet to the initial when the flight deck was ready for the fixed wing recovery. Approaching the ship, the MP initiated an expedited recovery to the downwind. An expedited recovery maneuver is when an aircraft initiates a turn to downwind from either behind the ship or over the top of the ship. Based on airspeed, break location, and G-forces applied to an aircraft, there are various types of expedited recoveries (also referred to as a Sierra Hotel Break (SHB)). [Encl 7, 24]

78. The expedited recovery maneuver is commonplace in naval aviation and it can reduce the amount of open deck time as a ready deck is waiting for a recovering aircraft. During an expedited recovery, an aircraft uses G-forces to decelerate over the course of a 360-degree turn, dropping the landing gear when the aircraft is below landing gear transition speed. When breaking aft of the ship or overhead the ship, a pilot has a reduced amount of time to configure the aircraft and conduct landing checks. An expedited recovery reduces the amount of open deck time and can increase flight deck efficiencies. When breaking upwind of the ship, a pilot has more time to configure the aircraft for landing, trim the airplane, conduct landing checks, and prepare for the approach turn to landing. [Encl 10]

79. Before the Mishap Flight (MF), the MP had never initiated an expedited recovery from overhead the ship. On 24 January, it was his first attempt. The MP was a previous Top-5 Nugget and a Top-10 ball-flyer within CVW-2, indicating that his landing performance at the ship had been exceptional for a first-tour junior officer (JO). [Encl 7, 24]

80. The MP discussed the proper execution of an expedited recovery with other members of his squadron. The MP wanted to try a "benign first attempt" at breaking overhead the ship. The MP explained that other JOs had performed the maneuver overhead the ship and he wanted to attempt it before the end of deployment. The MP described hearing from CVW-2 LSOs that an expedited recovery can reduce open deck times, but he did not feel pressure to perform an expedited recovery on 24 January from the CVW-2 LSOs or anyone else. [Encl 24]

81. In the previous 30 days, the MP flew 22.3 hours. In the previous 60 days, he flew 33.8 hours. In the previous 90 days, he flew a total of 48.4 hours. The MF was the MP's fifth daytime flight in the preceding 11 days. The MP described feeling comfortable and proficient in the airplane on the day of the MF. Because the deck was open, the MP was training for where a division lead would have to initiate the carrier break and keep the division within 4nm of the carrier. [Encl 24, 28]

82. The MP explained that he felt no pressure from his flight lead to execute a break overhead the ship on 24 January. He wanted the opportunity to lead the 2-ship (a section) of F-35Cs into the break and he knew that the deck was ready for the recovery. He did not want to be too fast during the break and he remembered his airspeed being 370-390 knots as he initiated a break over the LSO platform. He called "Burner" on the auxiliary radio, informing his wingman that he was selecting afterburner, and then initiated his break, deselecting afterburner after a few seconds. [Encl 24]

83. MA flight data shows a 400 KCAS, 7 G break while in maximum afterburner. MP will hold 7 G for five seconds, ease to a 2 G pull for five seconds, pull to 7 G again for four seconds, and then maintain a 2-3 G pull for the next 10 seconds. [Encl 53]

84. MA flight data shows the throttle placed to flight IDLE at 1630:40.6L and remained there until maximum afterburner was selected approximately 48 seconds later (2.6 seconds prior to impact). [Encl 53]

85. The MP explained that he tried avoiding a wide approach pattern by maintaining his pull (keeping G on the airplane) in an attempt to get below 300 KCAS (landing gear extension speed limit). He described pulling the ship to the nose at the 90 and then dropping the landing gear as he targeted an appropriate groove-distance. After dropping the landing gear, MP put down the arresting hook, but he could not recall selecting APC. [Encl 24]

86. MA flight data show that MP actuated speedbrakes at 1630:53L until final retraction at 1631:27L, approximately 4.1 seconds prior to impact. [Encl 53]

87. MA flight data analysis states that with the release of the speedbrake switch the trailing edge flaps will retract from the speedbrake position to their nominal PA symmetric position. This movement will result in a loss of lift. [Encl 53]

88. MA flight data shows that MP lowered the landing gear at 1631:04L at 228 KCAS. [Encl 53]

89. The MP did not remember selecting or confirming that he had selected APC for landing. The MP stated that he did not select DFP because he was working hard to get the airplane slowed to optimum approach AOA, on glideslope, and on centerline. [Encl 24]

90. MA flight data does not indicate the selection of APC or DFP during the MF. [Encl 53]

91. The MP recalled being uncomfortable at the 45 because the airplane was taking a long time to decelerate to optimum approach speed (12.3 degrees AOA) and the ship was getting closer. In large part due to being at a faster-than-normal airspeed, the MP also explained that he was seeing a different sight-picture in the approach turn from what was typical. [Encl 24]

92. The MP stated that he used speedbrakes to help get the airplane slowed to approach speed, observing at the 45 position that he was 3-4 balls high on IFLOLS. In an effort to correct for being high, MP made a nose-down correction. [Encl 24]

93. Instead of arriving to the start of the landing attempt with the airplane at optimum approach AOA, the MP believes he was somewhere around 180 knots, with one ball high on the IFLOLS, and on centerline. [Encl 24]

94. The MP explained that he thought the LSOs were going to waveoff his attempt to land because he was fast at the start to in the middle of the landing attempt. [Encl 24]

95. Optimum approach AOA of 12.3 degrees for an F-35C based on the MA's configuration and fuel on board would yield an optimum approach speed of 140 knots. [Encl 53]

96. As the jet approached the optimum approach AOA (and 140 knots), the MP attempted to add power by increasing aft-stick input. [Encl 24, 53]

97. The MP realized that the jet was extremely underpowered as the jet became slow and continued to descend (settle). At this moment, MP manually pushed the throttle to military power and then went to maximum afterburner once he realized that the airplane was in a perilous state, failing to climb. [Encl 24, 53]

98. MA flight data shows that maximum afterburner was selected approximately 2.6 seconds prior to impact. There was a 3-4 knot increase in KCAS before impacting the ramp. [Encl 53]

99. During the MA's landing attempt, the MA continued decelerating to a speed of approximately 120 KCAS and increased AOA to 16 degrees before striking the ramp at 123.5 KCAS and 21 degrees AOA. [Encl 53]

100. The MP explained that he did not complete his landing checklist because he was overwhelmed by an abundance of tasks (a condition known as task saturation). The MP described lowering his Landing Gear (step 1), dropping the Arresting Hook (step 2), having his Land/Taxi lights as required (step 3), but he failed to confirm that he had engaged APC/DFP (step 4). [Encl 24]

101. From the initiation of the overhead maneuver until the ramp-strike, 54 seconds time elapsed. [Encl 6, 53]

Landing Signals Officers and MP Qualifications

102. LT (b) (3) (A), (b) (6) [redacted], CVW-2 LSO, was on the LSO platform performing duties as CAG Paddles at the time of the mishap. LT (b) (3) (A), (b) [redacted] arrived to CVN 70 on 20 January 2022. He earned his CAG Paddles Staff Qualification on 23 January 2022 and 24 January 2022 was his first autonomous day on the LSO platform. LCDR (b) (3) (A), (b) (6) [redacted], CVW-2 LSO, was also on the LSO platform at the time of the mishap, standing next to LT (b) (3) (A), (b) (6) [redacted] [Encl 9, 15, 19]

103. The mishap occurred at 1631:31L as the MA was the first aircraft attempting to land in the 1630L recovery. The 1630L recovery was the final recovery of the day. LT [redacted] described seeing "lots of color on the platform" throughout the day. By using that term, he explained that there were several wave-offs earlier in the day and that a previous F-35C landing had made the LSOs uncomfortable when it landed approximately 50-feet aft of the 1-wire. Earlier the same afternoon, the LSO team talked about "waving defensively" and making sure that they were not complacent on the LSO platform. The idea of waving defensively was explained as communicating with pilots earlier in the landing pattern, not accepting significant deviations from pilots, and waving off an airplane if it looked unsafe. [Encl 9, 10]

104. In an effort to limit arrested landings on the CVN-70 3-wire, the LSOs were targeting on top of the 2-wire at the time of the mishap, which is 210 feet forward of ramp of the ship. Pursuant to reference (b), if an aircraft is on glideslope when targeting 210 feet, the aircraft's hook will pass over the ramp with 12.9 feet of vertical clearance, also known as hook-to-ramp clearance. Typically, the commanded hook touchdown point is 230 feet forward of the ramp, which is halfway between the 2-wire (210 feet) and the 3-wire (250 feet). When targeting 230 feet, an aircraft on glideslope will have 14.1 feet of hook-to-ramp clearance. [Encl 9]

105. LT (b) (3) (A), (b) (6), VFA-147 LSO, was the primary controlling LSO on 24 January. An F-35C pilot and the senior LSO for VFA-147, he was Wing qualified with over 9 months of underway LSO experience. A Wing LSO qualification is the highest qualification a first-tour LSO can attain. The backup LSO also had 9 months of underway LSO experience. [Encl 12, 43]

106. LCDR (b) (3) (A), (b) (6), CVW-2 LSO, was not on the LSO platform at the time of the mishap. LCDR [redacted] has served nearly two years as CVW-2 LSO and after watching the videos of the F-35C crash, he described the LSO's response to the F-35C landing attempt as "appropriate and on-time." It was his opinion that the LSOs (including LT [redacted] performed their duties as expected. [Encl 15]

107. The COs within CVW-2 set different restrictions on expedited recoveries. CAPT Tommy Locke, Commander, Carrier Air Wing TWO (CAG), did not restrict or limit expedited recoveries. CAG's guidance to his COs/XOs was for air wing pilots to operate "safely and professionally" around the boat. [Encl 19-22]

108. Regarding expedited recoveries, the VFA-147 CO indicated he wanted his pilots to make their appropriate intervals, but he did not encourage expedited recoveries or want his pilots delaying their commencement from overhead the ship in order to set up an expedited recovery. There had been no significant safety issues with VFA-147 expedited recoveries in the previous 6+ months of deployment. He trusted his pilots to use good headwork. [Encl 19-20, 24]

109. LCDR (b) (3) (A), (b) (6), CVW-2 LSO, explained that most of CVW-2 had been underway for 8 of the previous 12 months and that the Air Wing had gained significant experience operating around the boat. He explained that the LSOs had a policy of making sure an aircraft in an expedited recovery was on glideslope, on centerline, and on-speed by the middle

of the landing attempt or they would wave off the aircraft. He also stated that the normal range of time from execution of the break to touchdown should be 65-70 seconds. [Encl 15, 71]

110. (b) (6) [redacted]

[Encl 30, 38]

111. (b) (6) [redacted] [Encl 20, 22, 55]

Fire and Execution of Casualty Response

Figure 6 depicts the Location of Injured Personnel and Damages

112. The primary P-25 MFVV is stationed and manned just aft of the last fighter parked on the 4-row, starboard of the starboard foul line, with a clear view of the LA for the 1630L aircraft recovery. [Encl 8, 58-60]

113. The secondary P-25 MFFV is parked and manned on the forward bow in the FLY 1 (forward third of the CVN flight deck) position for the 1630L aircraft recovery. [Encl 8, 58-60]

114. Pursuant to reference (f), the MFFV is manned by three personnel, the Driver, Turret Operator, and Handline Operator.

115. Pursuant to reference (f), during aircraft recovery, ships with two operational MFFVs shall position one so that a downwind approach can be made to the LA. One shall be positioned in the FLY 1 area. The units will be manned and running from commencement of recovery until recovery is completed.

116. Rotary wing aircraft BLACK KNIGHT 615 was on plane guard during the 1630L fixed wing aircraft recovery aboard CVN 70. [Encl 8, 66]

117. BLACK KNIGHT 615 was approximately 7.5nm from CVN 70 monitoring the tower frequency at the time of mishap. [Encl 8, 66]

118. Reference (g) states that the designated plane guard helicopter is "on-station" when operating within 20nm (day) or 10nm (night) of the carrier. The helicopter shall remain within ultra high frequency (UHF) range and monitor the assigned air control frequency at all times.

119. Upon hearing the LSO calls over the tower frequency to the MA, BLACK KNIGHT 615 helicopter aircraft commander (HAC), LCDR [redacted], took the controls and began returning to CVN 70. [Encl 66]

120. In the turn to the ship, smoke was seen by the BLACK KNIGHT 615 Crew Chief (CC), AWSC [redacted], in the vicinity of CVN 70. [Encl 68]

121. Six seconds post MA impact with CVN 70 (1631:36L), BLACK KNIGHT 615 is called over tower frequency by the CVN 70 Mini Boss, CDR [redacted], to "Bring it in, we've got an emergency aircraft. Pilot in the water." [Encl 8, 66, 67]

122. Twelve seconds post MA impact with CVN 70 (1631:43L), primary P-25 MFFV Driver observes the MA wreckage slide off the LA. He sees smoldering debris remaining in the LA and initiates spraying AFFF. Initial AFFF is dispensed upward as the Turret Operator had sheltered from incoming aircraft debris, but then begins spraying at the smoldering debris in the LA. AFFF is only dispensed for seven seconds as the P-25 Driver assesses that the debris is no longer burning and no further fires are on deck. [Encl 4, 58, 59]

123. Thirteen seconds post MA impact with CVN 70 (1631:44L), medical assistance is requested from the LSO platform to Tower, over the Tower frequency. "Hey…Tower, we need emergency personnel to the paddles platform." LSOs continue to perform first aid on a casualty impacted by debris. CVN 70 Mini Boss calls medical emergency over the 5MC and reports it to the CVN 70 OOD. [Encl 4, 9, 10, 67]

124. BLACK KNIGHT 615 HAC initiated search and rescue (SAR) procedures for the BLACK KNIGHT 615 crew as they proceeded to the ship. [Encl 66]

125. At 1631:51L, CVN 70 Mini Boss told remaining airborne aircraft "99, max conserve" over Tower frequency. [Encl 8, 67]

126. At 1631:55L, BLACK KNIGHT 615 HAC advised "615 is on the way" over Tower frequency. [Encl 66]

127. At 1631:57L, another "99 max conserve" call was made over Tower frequency by CVN 70 Air Boss. [Encl 8]

128. BLACK KNIGHT 615 arrived on-scene at approximately 1635L. [Encl 8, 66, 67]

129. CVN 70 Mini Boss directed aircraft overhead to take high holding and report in with fuel states. With no immediate fuel concerns, overhead aircraft are switched to departure frequency and the Carrier Air Traffic Control Center (CATCC) monitors fuel states. [Encl 8, 67]

130. On the approach to hover, BLACK KNIGHT 615 HAC observed the MP in his single person raft, 2 ring smoke markers, a ballooning parachute (due to trapped air at entry into the water), fuel/oil slick, MA and scattered debris floating in the water. [Encl 66]

131. As BLACK KNIGHT 615 entered the hover, the MP gave a thumbs up indication. BLACK KNIGHT 615 HAC ordered the deployment of the rescue swimmer (RS), AWS2 (b) (3) (A), (b) (6). [Encl 66, 68]

132. Additional hose teams were manned and ready, Air Department personnel were assisting medical with stretchers, and a massive effort by all on the flight deck to begin clearing debris to make a ready deck. [Encl 8, 60, 61, 67]

133. CAG arrived on the flight deck, assessed the damage, and headed back to the Tactical Flag Command Center (TFCC) for situational awareness of the location of USS ABRAHAM LINCOLN (CVN 72). CAG began coordination with CVN 72 for AR aircraft to refuel aircraft holding overhead, and for holding aircraft to temporarily recover aboard CVN 72. [Encl 19]

134. CVN 70 Mini Boss coordinated with ALRE to get catapult (CAT) 4 up in case launch of the Turning Tanker Last Recovery (TTLR) was needed. CAT 3 would remain down due to Foreign Object Debris (FOD) in the CAT track. [Encl 67]

135. CAG arrived in CATCC to check holding aircraft fuel states, track AR tanker arrival, and coordinate with squadron representatives for divert fuel required to CVN 72 plus a few approaches. [Encl 19]

136. BLACK KNIGHT 615 RS performed disentanglement procedures with the MP and performed an initial assessment of the MP. The MP indicated some neck and back pain, so a

rescue litter was called for at approximately 1640L to minimize any further injury. BLACK KNIGHT 615 RS begins swimming MP away from parachute while rescue litter is prepared. [Encl 68]

137. CVN 70 Tower is informed that CVN 72 is sending a tanker configured aircraft to refuel aircraft holding overhead. [Encl 8]

138. At 1645L, BLACK KNIGHT 615 CC finished assembly of the rescue litter and lowered it to the BLACK KNIGHT 615 RS. [Encl 66, 68]

139. BLACK KNIGHT 615 RS removes MP from the raft by popping the raft and begins securing MP to the rescue litter. After completion of safety checks, BLACK KNIGHT 615 RS signals that the MP is ready to be hoisted at 1656L. [Encl 68]

140. At approximately 1700L, after coordination between CAG and the CVN 70 CO on the status of the flight deck, the aircraft holding overhead CVN 70 were diverted to recover aboard CVN 72. [Encl 8, 19]

141. BLACK KNIGHT 615 CC hoisted MP into the aircraft and secured him in the cabin. At 1701L, BLACK KNIGHT 615 RS was recovered from the water. [Encl 66, 68]

142. BLACK KNIGHT 615 is directed to recover aboard CVN 70 on aircraft elevator 1 due to FOD still on the rest of the flight deck. [Encl 66, 67]

143. BLACK KNIGHT 615 recovers aboard CVN 70 at 1705L and transfers MP to CVN 70 medical personnel. [Encl 8, 67, 68]

144. Multiple combat FOD walkdowns were conducted back and forth across the flight deck. The Handler and Flight Deck Officer were ensuring that personnel were using proper personal protective equipment (PPE) while picking up debris. [Encl 8, 60, 61, 67]

145. Three patients required medevac ashore. The FOD walkdowns were concentrated on the waist and LA to clear an area for the medevac helicopters. [Encl 8, 61, 67]

146. All arresting wires are changed out to prepare for aircraft recoveries. After the three patients were stabilized for transport aboard CVN 70, they were transferred ashore via two helicopters at approximately 1930L. [Encl 8, 67]

147. The aircraft previously diverted to CVN 72 refueled, launched, and began recovery aboard CVN 70 after the medevac helicopters were airborne, approximately three hours after the mishap. [Encl 8, 19, 67]

Property Damage to Aircraft/Flight Deck

148. The mishap resulted in the destruction of BUNO 169304, significant damage to EA-18G BUNO 169211 (IRONCLAW 503), and minor damage to the CVN 70 flight deck and ground support equipment. [Encl 4-6, 69, 70-72, 84]

149. The MA will be struck from the inventory. The purchase price of the MA, BUNO 169304 was $115,395,938.00. [Encl 85, 86]

150. Aircraft BUNO 169211 (IRONCLAW 503) was parked on aircraft elevator 3 of CVN 70 and struck by debris from MA impacting the flight deck. The following monetary costs are for replacement of IRONCLAW 503's respective component, which is the expected course of action at the organizational level. [Encl 4-6, 69]

a. Radome - $411,699.00 [Encl 69]
b. Port Aileron - $415,314.00 [Encl 69]
c. Port Stabilator - $1,502,764.00 [Encl 69]

151. The damage to the fuselage skin and internal components of IRONCLAW 503 cannot be evaluated at the organizational level, but are expected to be significant. The aircraft will be inducted by Fleet Readiness Center Southwest (FRCSW) where an exact assessment will be made. The timeline for that assessment, however, will extend well beyond the current deadline for this investigation. [Encl 69]

152. Aircraft debris struck the Primary P-25 MFVV while positioned along the forward and starboard edge of the LA. [Encl 58-60]

153. The following monetary costs are for repairs done to the Primary P-25 MFFV while aboard CVN 70:

a. Light fixture assembly - $795.00 [Encl 70]
b. Replacement of a light fixture - $88.00 [Encl 70]

154. The front frame of the P-25 was also bent and will be assessed by a civilian artisan for an estimate to include metalwork and paint/powdercoat. [Encl 70]

155. Aircraft debris struck a shipboard tow tractor (STT) while positioned along the forward and starboard edge of the LA. [Encl 71]

156. The MA struck the CVN 70 ramp leaving several gouges in the metal and removed a portion of the leading gutter. [Encl 4-6, 72]

157. The approximate monetary costs for repairs done to the CVN 70 flight deck:

a. Metal work - $120,000.00 [Encl 72]

Personnel Injuries and Line of Duty Determinations

158. Six Navy personnel sustained injuries as a result of the mishap requiring line of duty determinations. Appropriate medical record entries were made for other members who suffered minor injuries in accordance with reference (a). [Encl 85]

159. LT (b) (3) (A), (b) (6), USN, the MP, was injured during the mishap. He was injured during the performance of his duties while piloting the F-35C aircraft. [Encl 73-75, 85]

160. LCDR (b) (3) (A), (b) (6), CVW-2 LSO, USN, assigned to CVW-2, deployed with VINSON Carrier Strike Group, and embarked CVN 70 was injured during the mishap. He was injured on the LSO platform in the performance of his duties. [Encl 76, 77, 85]

161. ADAN (b) (3) (A), (b) (6), USN, assigned to VAQ-136, deployed with VINSON Carrier Strike Group, and embarked CVN 70 was injured during the mishap. ADAN (b) (3) (A), (b) (6) was injured on the flight deck in the performance of her duties. [Encl 78, 79, 85]

162. ATC (b) (3) (A), (b) (6), USN, assigned to VAQ-136, deployed with VINSON Carrier Strike Group, and embarked CVN 70 was injured during the mishap. ATC (b) (3) (A), (b) was injured on the flight deck in the performance of his duties. [Encl 85]

163. AMAN (b) (3) (A), (b) (6), USN, assigned to VFA-147, deployed with VINSON Carrier Strike Group, and embarked CVN 70 was injured during the mishap. AMAN (b) (3) (A), (b) (6) was injured on the flight deck in the performance of his duties. [Encl 85]

164. AZ1 (b) (3) (A), (b) (6), USN, assigned to VAW-113, deployed with VINSON Carrier Strike Group, and embarked on CVN 70 was injured during the mishap. AZ1 (b) (3) (A), (b) (6) was injured on the flight deck in the performance of his duties. [Encl 85]

Opinions – Aviation Mishap

1. The MP was fully qualified, in accordance with all known and current instructions, to perform the duties he was assigned on the VFA-147 flight schedule on 24 January 2022. [FF 10-15]

2. The LSOs on duty during the mishap recovery aboard CVN 70 were fully qualified. The audio calls and visual waveoff commands given by the LSOs during the MA's attempted recovery were timely and executed within the norms expected. [FF 18, 102-106, 109]

3. Targeting on top of the 2-wire was not causal to the mishap because the extra foot of hook-to-ramp clearance would not have prevented the MA from striking the ramp. [FF 33, 104]

4. CVN 70's flight deck and deckhouse crew were fully qualified, per all known and current instructions, to perform the duties assigned on 24 January 2022. [FF 19-20]

5. The MP was in compliance with all crew rest and currency requirements. [FF 10, 11, 17]

6. While no medical tests were completed for the MP, there is no evidence that illegal drugs, medication or alcohol use were involved. [FF 12]

7. Aircraft BUNO 169304 and aircrew flight gear had no material failure that contributed to the mishap. [FF 4-8, 13]

8. The MP was qualified, per experience level and current instructions, to conduct administrative section lead practice. [FF 11-12, 31, 51, 108]

9. The tactical portion of the MP's flight, while stressful at times, was not causal to the mishap. [FF 29-30, 80-82]

10. MP initiated a 400 KCAS 7 G break, aft of the CVN 70 rounddown, while momentarily in maximum afterburner. The MP entered the carrier break at a slightly faster-than-normal airspeed based on his previous carrier breaks of 350 KCAS. To compensate for the faster airspeed, the MP moved the throttle to flight IDLE approximately 3 seconds after initiation of the carrier break, and used a 7 G pull to begin slowing the aircraft. The slightly faster airspeed increased the speed at which the MP travelled through the landing pattern while the 7 G pull shrunk his landing pattern. The faster airspeed and higher G pull resulted in an increased distance travelled through the carrier landing pattern before the MA was below landing gear speed limits, contributing to the MA arriving at the approach speed later in the landing pattern (based on the MA's weight and configuration). [FF 44, 83-87, 89, 92]

11. MA entered the carrier break at 400 KCAS and used a 7 G pull at initiation of and through the next 5 seconds of the break. The MP maintained a heavier G pull than required for his airspeed during several portions of the overhead maneuver, causing the MA to fly a tighter pattern and compressing the time the MP had to configure the MA for landing. It is the opinion of the board that this initial 7 G pull was excessive, decreasing the turn circle through the air while compressing the amount of time and distance that the jet would have had at a higher airspeed or lower G pull. This resulted in a 12-second groove length vice the normal 15-18 second groove length. From initiation of the break to impact of the ramp took 54 seconds where as a normal time is approximately 65-70 seconds. [FF 83-101]

12. The increased time and distance required for the MA to slow below landing gear airspeed toward on-speed compressed the MP's timeline for executing his landing checklist. These factors, coupled with unfamiliar sight-pictures throughout the landing pattern, ultimately prevented the MP from completing his landing checklist. Specifically, the MP did not select APC or DFP during the carrier landing pattern. This resulted in the MA remaining in the Manual mode of PA CLAW, vice the DFP mode in which the MP typically utilized. [FF 83-93]

13. The MP was unaware that the MA was still in a Manual mode of PA CLAW with the throttle still at Flight IDLE. During the final portion of the attempted carrier landing, the MP was making flight control inputs to the MA as if the MA was in DFP mode of PA CLAW which resulted in the following events: the MA quickly decelerated through the approach airspeed, the MA developed a rapid sink rate while approaching the in-close position, the AOA continued to increase, and the MA received Flight IDLE thrust from the engine until max afterburner was manually selected by the MP 2.6 seconds prior to impact. [FF 90, 91, 96-101]

14. It is the opinion of the IOs that the mishap could have been prevented by an actuation of the APC switch (T6) on the throttle or an actuation of DFP via the pinkie switch (S10) on the stick. This would have moved the MA from a Manual mode of PA CLAW to either APC or DFP modes, activating the engine to respond to pilot-stick inputs and to capture optimum on-speed AOA. [FF 51, 52, 55]

15. The MP brought the throttle to Flight IDLE after the carrier break and did not add a power demand until 48 seconds later. In an attempt to decelerate, the MP actuated the speedbrake near the 90 of the carrier pattern. The speedbrake remained extended until 4.1 seconds prior to impact. The F-35C Flight Manual lists use of speedbrake within 10 seconds of a CV landing as a prohibited maneuver. The MP's use of speedbrake within 10 seconds of touchdown increased the rate of deceleration, causing the MA to rapidly drop below optimum approach airspeed and contributed to the mishap. [FF 44, 85-88]

16. The MA impact with the CVN 70 flight deck sheared the main landing gear, caused significant damage to the MA engine, and slowed the aircraft to preclude any possibility of flyaway airspeed being achieved. The MP ejection was warranted and timely. [FF 31, 37]

17. It is the opinion of this board that pilot error was the cause of the mishap. However, the error was not conducted in a reckless manner nor with malicious intent. [FF 100]

Fire and Execution of Casualty Response

18. All CVN 70 and CVW-2 personnel executed crash and fire procedures appropriately. Their responses to the mishap were timely and effective. [FF 112-147]

19. CVN 70 Mini Boss was exemplary in the execution of crash procedures and the coordination with the remaining airborne aircraft. [FF 122-126, 129, 144]

20. Casualty response operations and procedures were appropriately executed. This effort included medical and flight deck personnel conducting first responder duties. [FF 112-147]

21. Search and rescue operations and procedures were appropriately executed. The response of BLACK KNIGHT 615 and crew successfully and safely recovered the MP. [FF 117-122, 124, 126, 128, 130-131, 136-143]

22. The upwind MFFV was impacted by a portion of the F-35C wreckage due to its position near the LA foul line. Although the MFFV requires a straight path to the LA, it could be located further from the foul line to reduce the potential for personal injury. [FF 112-115, 155-156]

Property Damage to Aircraft/Flight Deck

23. Aircraft BUNO 169304 was recovered from the sea floor via salvage operations on 2 March 2022. The aircraft was stricken from the fleet. Multiple weeks of saltwater intrusion at depth will likely result in the lack of salvage potential for any aircraft components. [FF 148-149]

24. Aircraft BUNO 169211 (IRONCLAW 503) was struck by debris from the MA striking the ramp. The resulting damage will likely cross the $2.5 million threshold of a class A aviation mishap after I-level assessments made at FRCSW. [FF 150-151]

25. The MA left several large gouges in the flight deck ramp and multiple areas of flight deck non-skid that were scuffed, scraped or removed. The resulting cost was estimated at $120,000 and will likely not exceed the $600,000 class C aviation mishap threshold. [FF 156-157]

26. The MA's station 1 LAU-151 caught the first and second arresting wires after impact with the ramp. This resulted in the MA slowing and starting a counter-clockwise rotation through the CVN 70 LA. This likely kept the MA fuselage wreckage from impacting other personnel, ground equipment and aircraft parked on the four row of CVN 70's bow. [FF 32-38]

Personnel Injuries and Line of Duty Determinations

27. In accordance with reference (a), the injuries incurred by LT (b) (3) (A), (b) (6) during the JASON 406 mishap were incurred in the line of duty and not due to his own misconduct. [FF 159]

28. In accordance with reference (a), the injuries incurred by LCDR (b) (3) (A), (b) (6) during the JASON 406 mishap were incurred in the line of duty and not due to his own misconduct. [FF 160]

29. In accordance with reference (a), the injuries incurred by CPO (b) (3) (A), (b) (6), AZ1 (b) (3) (A), (b) (6), ADAN (b) (3) (A), (b) (6), and AMAN (b) (3) (A), (b) (6) during the JASON 406 mishap were incurred in the line of duty and not due to their own misconduct. [FF 162-164]

Recommendations

1. The IOs recommend the following for consideration by the Navy in consultation with the manufacturer of the F-35C, which could aid pilots and LSOs during future landing attempts:

a. Develop an internal indication (HMD symbology or audio tone) to alert an F-35C pilot that the aircraft has reached on-speed AOA in the Power Approach mode without APC/DFP engaged. To avoid this indication during level flight, this symbology or tone should only be triggered above a given rate of descent and below a given altitude.

b. Develop an external indication of an F-35C that is in Power Approach and APC/DFP is not engaged. This external indication will need to be visible to the LSOs while the F-35C is on final approach. This would provide the LSOs the opportunity to intervene earlier in a landing attempt, preventing a similar reoccurrence of an airplane approaching the ship without appropriate thrust.

2. The following recommendations could be considered by Naval Air Systems Command (NAVAIRSYSCOM) as changes to current policy and/or practice:

a. Update the F-35C Flight Manual to reflect that F-35C pilots shall fly APC/DFP when recovering aboard the carrier. The current F-35C Landing Checklist, Step 4 is: APC/DFP – As desired.

b. Upgrade Nimitz-class aircraft carriers to Digital Integrated Launch and Recovery Television Surveillance (ILARTS) system. This upgrade would not have prevented this mishap on CVN-70, but this would certainly improve the LSO oversight of future landings, crash and salvage efforts, and overall situational awareness.

c. Consider incorporating the above manufacturer recommendations for the F/A-18E-G, as required, since there is potential for the F/A-18E-G to experience a similar mishap.

d. To ensure survivability of the upwind MFFV and its ability to help respond to a crash in the LA, position upwind MFFV away from the LA foul line.

3. The IOs suggest that the recommendations of the Field Naval Aviator Evaluation Board (FNAEB) be followed in regards to any actions prescribed to the MP. Based on FNAEB findings, and consistent with the opinions in this report, the IOs recommend referring any corrective measures to CSG-1, CVW-2 and CO, VFA-147 for appropriate action.

4. The IOs do not recommend modifying CV NATOPS in the following areas for the reasons described below:

a. Modifying CV NATOPS procedures to ban expedited recoveries or SHBs. Although the expedited recovery was a factor in time compression for the MP, the execution of a

400 KCAS expedited recovery over the LSO platform was not directly the cause of the mishap. This mishap occurred because the MP failed to select APC/DFP at any point during the 27 seconds between the lowering of the landing gear and subsequent impact with the flight deck.

b. Requiring overhead maneuvers to occur forward of the ship or extending aircraft further upwind than 4nm from the ship. When leading a division, the flight lead needs to break no later than overhead the ship or dash-4 will be greater than 4nm upwind of the ship. Case-1 weather requires at least 3000 feet and 5 miles visibility with the Mini Boss responsible for maintaining sight up aircraft upwind of the ship (for safety considerations).

c. Utilizing the Extended Landing Pattern (ELP) for daytime operations. With an extended pattern, there would be more time for a pilot to complete landing checklists and prepare the aircraft for landing. The ELP is undesirable, however, for several reasons. Due to visibility in the tower, it limits the ability of the Air Boss to monitor aircraft during their approach turn. Aircraft like the E-2 face challenges locating their interval for determining when to initiate their break downwind.

(b) (3) (A), (b) (6) [redacted]

(b) (3) (A), (b) (6) [redacted]