UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION
BOARD REPORT

F-35A, T/N 19-5535

355TH FIGHTER SQUADRON
354TH FIGTHER WING
EIELSON AIR FORCE BASE, ALASKA

LOCATION: EIELSON AIR FORCE BASE, ALASKA

DATE OF ACCIDENT: 28 JANUARY 2025

BOARD PRESIDENT: COLONEL MICHAEL B. LEWIS

Conducted IAW Air Force Instruction 51-307

EXECUTIVE SUMMARY
UNITED STATES AIR FORCE
AIRCRAFT ACCIDENT INVESTIGATION

F-35A, T/N 19-5535
EIELSON AIR FORCE BASE, ALASKA
28 JANUARY 2025

On 28 January 2025, at approximately 12:49:16 local (L), the mishap aircraft (MA), an F-35A aircraft, tail number (T/N) 19-5535, crashed after completing a touch-and-go landing to Runway (RWY) 32 at Eielson Air Force Base (AFB), Alaska (AK). The MA was operated out of Eielson AFB, AK, by the 355th Fighter Squadron (FS) and assigned to the 354th Fighter Wing (FW). There were no fatalities. The mishap pilot (MP), assigned to the 354th FW, ejected safely before impact. He sustained minor, non-life-threatening injuries. The MA was destroyed upon impact, with a total loss valued at $196,500,000. The MA debris was contained within airfield boundaries on Eielson AFB.

The MA was flying as the #3 aircraft in a flight of four F-35A aircraft. After initial takeoff, the MA's nose landing gear (NLG) did not retract properly due to hydraulic fluid contaminated with water that froze, preventing full strut extension and resulting in the NLG being canted to the left. After running initial checklists, the NLG was still turned approximately 17 degrees to the left. The MP initiated a conference call with Lockheed Martin engineers through the on-duty supervisor of flying (SOF). The MA held for approximately 50 minutes while the team developed a plan of action. The MP accomplished two touch-and-go landings attempting to recenter the NLG wheel. While both attempts failed to center the NLG wheel, the right main landing gear (MLG) strut and then left MLG strut did not fully extend after takeoff due to ice forming inside the strut. After the second touch-and-go, all valid Weight on Wheels (WoW) sensors indicated the MA was on the ground, and the MA transitioned to the "on ground" flight control law (i.e., automated ground-operation mode causing the MA to operate as though it was on the ground when flying). However, because it was actually airborne, the MA was uncontrollable. The pilot successfully ejected and emergency responders were at the scene within a minute.

The accident investigation board (AIB) president found, by a preponderance of the evidence, the cause of the mishap was hydraulic fluid contaminated by water that froze in the NLG and MLG struts. The ice prevented the struts from full extension that led the WoW sensors to declare the MA was on the ground when it was airborne. Additionally, the AIB president found, by a preponderance of the evidence, that crew decision making including those on the in-flight conference call, lack of oversight for the Hazardous Materials program, and lack of adherence to maintenance procedures for hydraulic servicing were substantially contributing factors.

Under 10 U.S.C. § 2254(d) the opinion of the accident investigator as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report, if any, may not be considered as evidence in any civil or criminal proceeding arising from the accident, nor may such information be considered an admission of liability by the United States or by any person referred to in those conclusions or statements.

SUMMARY OF FACTS AND STATEMENT OF OPINION
F-35A, T/N 19-5535
EIELSON AIR FORCE BASE, ALASKA
28 JANUARY 2025

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ACRONYMS AND ABBREVIATIONS

354 FW 354th Fighter Wing
355 FS 355 Fighter Squadron
AGE Aerospace Ground Equipment
AFB Air Force Base
AFE Aircrew Flight Equipment
AFI Air Force Instruction
AFRL Air Force Research Laboratory
AIB Accident Investigation Board
AK Alaska
BD Battle Damage
BFM Basic Fighter Maneuver
COA Course of Action
IFE In-Flight Emergency
SRA Senior Airman
Capt Captain
CLAW Flight Control Law
Col Colonel
CTK Consolidated Tool Kit
DoD Department of Defense
EHA Electro-Hydrostatic Actuators
EESOH-MIS Enterprise Environmental, Safety & Occupational Health Management Information System
FAB Function Access Button
FCS Flight Control System
FL Flight Lead
FOD Foreign Object Debris
FT Feet
FW Fighter Wing
G Gravitational Force
HAZMAT Hazardous Materials
HUD Heads-Up Display
IAW In Accordance With
ICAW Integrated Caution and Warning
IFDL Intra-Flight Data Link
IFG In-Flight Guide
IPUG Instructor Pilot Upgrade
HRC Health Reporting Codes
K Thousand
KCAS Knots Calibrated Airspeed
KTAS Knots True Airspeed
KTS Knots
L Local Time
LG Landing Gear
LMLG Left Main Landing Gear
Lt Col Lieutenant Colonel
LWD Left Wing Down
M Mach
MA Mishap Aircraft
MA Mishap Aircraft
MAJ Major
MAJCOM Major Command
MLG Main Landing Gear
MP Mishap Pilot
MS Mishap Sortie
MSL Mean Sea Level
MF Mishap Flight
MRT Maintenance Response Team
MW Mishap Wingman
NCO Non-Commissioned Officer
NLG Nose Landing Gear
NOTAM Notices to Airmen
NWS Nose Wheel Steering
OG On-Ground
OPR Officer Performance Report
ORM Operational Risk Management
PA Powered Approach
PACAF Pacific Air Forces
PCL Pilot Checklist Procedures
PHA Physical Health Assessment
PHM Prognostics and Health Management
PMP Packaged Maintenance Plan
PODS Portable Oil Diagnostics System
QRB Quick release Box
RCR Runway Condition Readings
RMLG Right Main Landing Gear
RTB Return-To-Base
SA Situational Awareness
SAE Society of Automotive Engineers
SAP Satellite Accumulation Point
SAR Search and Rescue
SII Special Interest Item
SME Subject Matter Expert
SOF Supervisor of Flying
TCTO Time Compliance Technical Order
T/N Tail Number
TFLIR Targeting Forward Looking Infrared
TOD Tech Order Data
UA Up-And-Away
UDM Unit Deployment Manager

VFR	Visual Flight Rules
VMC	Vehicle Management Computers
VVI	Vertical Velocity Indication
VCO	Vehicle Control Officer
Z	Zulu Time

SUMMARY OF FACTS

1. AUTHORITY AND PURPOSE

a. Authority

On 13 March 2025, the Pacific Air Forces (PACAF) Deputy Commander appointed Colonel Michael B. Lewis to conduct an accident investigation of the 28 January 2025 crash of an F-35A, tail number (T/N) 19-5535. The aircraft was assigned to the 354th Fighter Wing (354 FW), Eielson Air Force Base (AFB), Alaska (AK) (Tab Y, 3-6). The investigation was conducted by an accident investigation board (AIB) pursuant to Air Force Instruction (AFI) 51-307, *Aerospace and Ground Accident Investigations*, (Tab BB-31) at Eielson AFB from 24 March 2025 to 9 April 2025. A legal advisor (Major), pilot member (Captain), maintenance member (Technical Sergeant), and recorder (Senior Airman) were appointed as board members. A medical subject matter expert (Lieutenant Colonel) was detailed to advise the AIB (Tab Y-7).

b. Purpose

In accordance with AFI 51-307, *Aerospace and Ground Accident Investigations*, this Accident Investigation Board conducted a legal investigation to inquire into all the facts and circumstances surrounding this Air Force aerospace accident, prepare a publicly releasable report, and obtain and preserve all available evidence for use in litigation, claims, disciplinary action, and adverse administrative action.

2. ACCIDENT SUMMARY

The mishap aircraft (MA) was operated by the 355th Fighter Squadron (355 FS), 354 FW (Tab A-4). On 28 January 2025, the MA took off from Eielson AFB at 1122 local (L) for a training sortie and experienced issues with its nose landing gear (NLG) (Tab V-1.2). The mishap wingman (MW) observed the NLG door was ajar and notified the mishap pilot (MP) (Tab V-1.2). The MP extended the landing gear, revealing the NLG wheel was turned about 17 degrees to the left (Tabs J-91, V-1.2). The MP, utilizing the on-duty supervisor of flying (SOF) in the air traffic control (ATC) tower, initiated a conference call with Lockheed Martin (LM) engineers to develop courses of action (Tab V-1.3, 3.3, 5.2). Based on recommendations from the LM engineers, and with the concurrence of the SOF, the MP executed touch-and-go landings at 1218L and 1248L, respectively, to recenter the NLG wheel (Tabs J-91, V-5.3). When the MA lifted off following the second touch-and-go, it did not transition to the appropriate airborne control law (CLAW); instead, the MA remained in the "on-ground" CLAW based on erroneous indications from the weight-on-wheel (WoW) sensors (Tab J-113). At that point, the MA was uncontrollable in the on-ground CLAW and the MP safely ejected, suffering minor injuries (Tab V-1.4). The MA impacted near the west side of the Eielson AFB runway and was destroyed, resulting in a $196,500,000 loss (Tabs P-3, S-1, S-2).

3. BACKGROUND

a. Pacific Air Forces (PACAF)

PACAF is one of nine major commands in the United States Air Force and is headquartered at Joint Base Pearl Harbor-Hickam, Hawaii (Tab BB-26). PACAF's primary missions are to: deliver rapid and precise air, space, and cyberspace capabilities to protect and defend the United States, its territories, and our allies and partners; provide integrated air and missile warning and defense; promote interoperability throughout the Pacific area of responsibility; maintain strategic access and freedom of movement across all domains; and posture to respond across the full spectrum of military contingencies in order to restore regional security (Tab BB-26). PACAF operates about 320 assigned fighter and attack aircraft along with another about 100 deployed aircraft and support personnel (Tab BB-4.8). The Command has nine subordinate wings spread out across USINDOPACOM with about 46,000 military and civilian personnel (Tab BB-26).

b. 354th Fighter Wing (354 FW)

The 354 FW is the host command at Eielson Air Force Base, Alaska, and its mission is to deliver lethal airpower to Combatant Commanders in defense of national military objectives (Tab BB-29). The 354 FW is comprised of about 3,860 military and civilian personnel (Tab BB-28). It operates, among other things, F-35A Lightning II fighter aircraft across two squadrons (Tab BB-3, 4).

c. 355th Fighter Squadron (355 FS)

The 355 FS is located at Eielson Air Force Base, Alaska, and its primary mission is the suppression of enemy air defenses and offensive counter-air missions (Tab BB-3).

d. F-35A Lightning II

The F-35A is the United State Air Force’s latest fifth-generation fighter (Tab BB-5). With its aerodynamic performance and advanced integrated avionics, the F-35A provides next-generation stealth, enhanced situational awareness, and reduced vulnerability for the United States and allied nations (Tab BB-5). The F-35A gives the United States and its allies the power to dominate the skies—anytime, anywhere (Tab BB-5). The F-35A is an agile, versatile, high-performance, 9G capable, multirole fighter that combines stealth, sensor fusion, and unprecedented situational awarenss (Tab BB-5, 8, 9). The F-35A's advanced sensor package is designed to gather, fuse, and distribute more information than any fighter in history, giving operators a decisive advantage over all adversaries (Tab BB-5, 8, 9). Its processing power, open architecture, sophisticated sensors, information fusion, and flexible communication links make the F-35A an indispensable tool in future homeland defense, joint and coalition irregular warfare, and major combat operations (Tab BB-5, 8, 9).

4. SEQUENCE OF EVENTS

a. Mission

On 28 January 2025, a formation of four F-35s (4-ship), callsign YETI, from the 355 FS were scheduled and approved to fly as "red air" (acting as adversary aircraft) (Tab K-3). This 4-ship were in support of formation of two F-35s (2-ship), callsign CHEVY 01 and CHEVY 02, for an Air Combat Maneuvers (ACM) sortie (Tab T-4). The mishap flight (MF) consisted of the flight lead, YETI 01, wingman, YETI 02, MP, YETI 03, and mishap wingman (MW), YETI 04 (Tab T-5).

b. Planning

According to interviews with the MP and MW, the coordination brief with all mission players and the flight brief were all standard for a continuous training (CT) mission (V-1.1).

c. Preflight

The mishap flight received their "step brief" that included, among other things, information on applicable Notices to Airmen (NOTAMS), flight plans, assigned "tails" (i.e., aircraft), applicable maintenance records, a weather briefing, airfield status and restrictions, and confirmation that all aircrew flight equipment (AFE) was serviceable and in working order (Tab K-10-19).

An Operational Risk Management (ORM) worksheet for the MF was filled out and approved with a score of "Low"; the highest threat annotated was potential instrument meteorological conditions (IMC) in the airspace (Tab K-1).

The MP "stepped out" to the MA and conducted a walkaround with the assigned maintenance member, which was uneventful (Tab R-21-3). During engine start, the MA experienced an integrated power package failure (IPP FAIL), which was resolved following appropriate pilot checklist procedures (PCL) (Tabs R-21, V-1.3).

d. Summary of Accident

i. Taxi and Takeoff

The MF taxied out of their respective weather shelters post engine start and joined up in the "Tango/Uniform" area (Tabs V-18.2, BB-206 . The MA taxied from the weather shelter at 19:42 Zulu (Z) and remained outside for the remainder of the sortie (Tab T-18). During this time, there was a slight delay in taxi and takeoff for both the MF and CHEVY flight as they were waiting on other flight members who were troubleshooting minor issues post engine start (Tab N-5-6).

Once all of the jets were ready, the MF taxied to Runway 32 and was cleared for takeoff at 20:21:12Z (Tab N-6). At 20:22:53Z, the MA lifted off the runway and the MP placed the landing gear handle up (Tab B-201-02). At this point, about 40 minutes had elapsed between the MA exiting the climate-controlled weather shelter and being exposed to ambient conditions that hovered around zero degrees Fahrenheit (Tabs J-91, T-18).

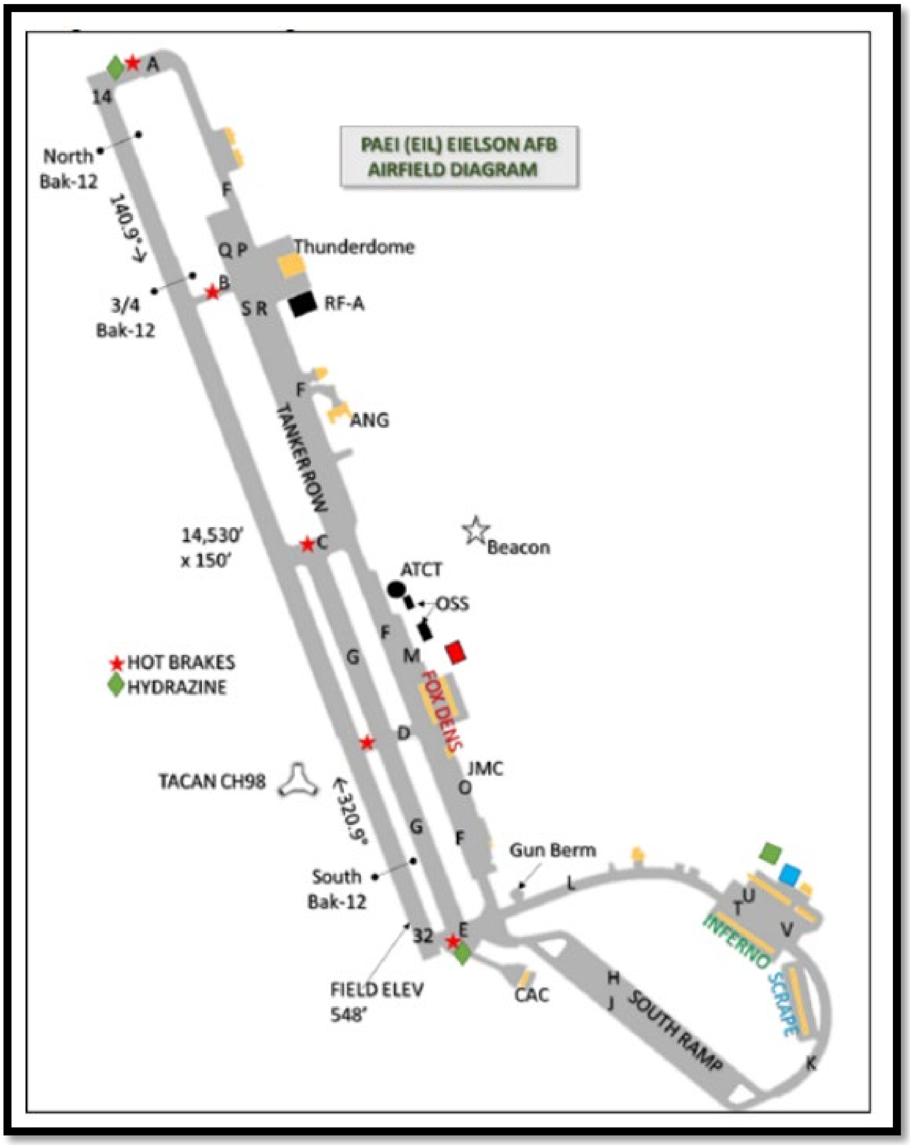

Figure 1: Eielson AFB Airfield Diagram (Tab BB-206)

At 20:23:01Z, the MA was accelerating through 275 knots calibrated airspeed (KCAS) at which point an "OVERSPEED GEAR" caution annunciated inside the cockpit on the integrated caution and warning (ICAW) function access button (FAB) (Tab BB-201-02). In the F-35A Flight Manual, an "OVERSPEED GEAR" caution is annunciated when:

> Aircraft has exceeded or will exceed the LG airspeed limit at the current rate of acceleration. OVERSPEED GEAR provides an approximate 3 seconds predictive warning. OVERSPEED GEAR asserts if the predictive or current aircraft speed rises above 300 KCAS or 0.65 Mach with LG doors not indicating locked, gear handle down, or ALT GEAR EXTENSION commanded. The clean aircraft structural limit is 300 [KCAS]. This alert may not be annunciated in time to allow aircraft speed to be reduced prior to exceeding the overspeed limit." (Tab BB-166)

It is a common occurrence for the predictive OVERSPEED GEAR caution to assert on initial takeoff in the F-35A (Tab BB-201-02). This is especially true in a cold temperature environment such as Eielson AFB on the day of the mishap (Tab BB-201-02). The MP pulled back on the stick to pull the nose up and simultaneously reduced the throttle to not overspeed the in-transit landing gear (Tab BB-201-02). During this time, the gear sequencing appeared to be normal until the NLG indication on the FAB showed yellow and black hash marks, indicating gear in-transit (Tab BB-165, 201-02). The MA then passed through 300 KCAS and traveled at 308 KCAS for a total of seven seconds (Tab BB-201-02). The MA began to slow and at 20:23:23Z and the MP made a radio call to his flight, stating: "3's tied, 275 KCAS with a nose gear remaining open" (Tabs N-9, BB-201-02).

The MP then made a request to the flight lead (YETI 01) for the MP (YETI 3) and MW (YETI 4) be cleared off to return to Eielson AFB "High Key" to work the landing gear malfunction checklist (Tab N-9). "High Key" is an area above the airfield designated for emergency aircraft or aircraft performing simulated emergency procedures that would allow the aircraft to be safely recovered to the runway in the event of an engine flameout (Tab BB-201-02, 206). The MP and MW returned to High Key at 9,500ft and contacted the SOF to begin troubleshooting the problem (Tab N-10). The MP informed the SOF the MA had a slow gear retraction on takeoff and its nose wheel door was open (Tab N-10). The MP also reported the MA had a nose wheel degrade, did not show the overspeed ICAW, and the MW would do a battle damage (BD) check of the MA (Tab N-10). The SOF replied, "copy all I'll back you up, I'm on EP-260 Gear Retract Fail" in the PCL (Tab N-10).

At 20:26:48Z, the MW reported, "It does appear that your nose door is open by about 2 inches" (Tab N-10). The MP and SOF then reviewed the PCL and determined the next step was to lower the LG with the LG handle (Tab N-11).

The LG was lowered at 20:28:49Z and the MP reported to the SOF the MA was showing "no light in the handle . . . . three green" and the MP had begun working the nosewheel steering degrade (NWS DEGD) checklist (Tab N-12). In accordance with the PCL, the NWS DEGD was cleared (i.e. the caution went away) after the MP accomplished a flight control system (FCS) engine reset (FSC/ENG RESET)(Tabs J-111, N-11-12). An FCS/ENG RESET resets the FCS and full authority digital electronic controllers (FADEC) faults and is accomplished by pushing the FCS/ENG RESET switch on the FCS control panel (Tab BB-165).

The NWS DEGD caution first annunciated at 20:23:53Z (Tab BB-201-02). At 20:27:23Z, the MP initiated an FCS/ENG RESET which initially cleared the NWS DEGD (Tab BB-201-02). The MP then reported to the SOF the NWS DEGD has cleared and the gameplan was for him to burn down gas and send the MW off to the airspace to rejoin the flight (Tab N-11). However, the MW then reported, "Standby your nose wheel is cocked about 25 degrees to the left" (Tab N-11). The NWS DEGD then reasserted at 20:28:25Z (Tab BB-201-02).

After acknowledging the MW's observation, the MP informed the SOF the NWS DEGD had reasserted and asked if the SOF heard the MW's transmission (Tab N-12). The SOF confirmed he heard the nose wheel was canted 45 degrees off; however, the MP and MW corrected to say it was 25 degrees to the left (Tab N-12). The MP then relayed what was visible inside the cockpit; namely, the landing gear was handle down, there was no light in the handle, three green gear indications were present, as was a NWS DEGD warning, and there was visual confirmation that the nose wheel tire was about 25 degrees off centerline (Tab N-12). Normally, with the LG handle down, no light in the handle, and showing three green gear indications suggests to the pilot the LG are all down and locked and the aircraft is in the proper configuration for landing (Tab BB-169).

The SOF acknowledged and asked how much gas the MA had remaining (Tab N-12). The MP responded "14.5" – which equates to 14,500lbs of fuel, or approximately 80% of fuel capacity for the MA – and then opined a "conference hotel" was appropriate for this situation (Tab N-12).

ii. Conference Hotel

A conference hotel is a call that can be initiated by the SOF to speak directly with Lockheed Martin engineers to discuss an abnormality/malfunction not addressed in the PCL (Tab V-13.1, 14.1, 15.1, 16.1, 17.1). While waiting for the conference hotel to convene, the MP initiated a series of "s-turns" with gravitational forces up to 2.5Gs, as well as a slip maneuver (i.e., left stick input with full right rudder pedal) to see if the nose wheel orientation would change (Tabs N-12, BB-201-02). Upon visual inspection, the MW reported no change to the nose wheel (Tab N-13).

The SOF informed the MP he was on the phone with the conference hotel and Lockheed Martin were getting the LG subject matter experts (SME) on the line (Tab N-13). Five Lockheed Martin engineers participated in the conference hotel, including a senior software engineer, flight safety engineer, and three LG system engineers (Tab V-13.2, 14.2, 15.2, 16.2, 17.2). A senior 354 Operations Group (354 OG) leader also participated in the call, though no transcript is available because the call was made on a personal phone rather than the legal voice recorder in the air traffic control tower (Tab V-2.2, 5.2)

Lockheed Martin SMEs requested information on, among other things, how much fuel the MA had remaining, direction of the NLG wheel, and health reporting codes (HRC) (Tab V-13.2, 14.2, 15.2, 16.2, 17.2). The SMEs did not request or receive information about where the mishap was occurring and ambient air temperature (Tab V-13.3, 14.3, 15.2, 16.3; 17.2).

At 20:48:35Z, the SOF asked the MW for a final assessment on how many degrees off center the nose wheel was, to which MW replied "20 degrees" (Tab N-14).

At 20:50:44Z, the SOF informed the MP that "engineers are looking towards safe answer in this case which would be an approach end arrestment" and recommended burning down as much gas as possible before accomplishing that maneuver (Tab N-15). Burning down gas is a common term used meaning that the pilot is going to continue flying for the purpose of reducing the aircraft gross weight before attempting a landing (Tab BB-201-02). The MP then queried the SOF about the checklist instruction that cable arrestment must be in a "3-point attitude," meaning the NLG would have to be lowered to the ground prior to the cable engagement (Tab N-15, BB-167). The SOF replied that the engineers were looking into that concern and would provide further guidance (Tab N-15).

The checklist for an "ARREST CABLE" procedure directs that for all cable arrestments to lower the nose wheel to the runway, in a 3-point attitude, aligning the aircraft with the runway (Tab BB-167). The checklist includes a warning against "swerving following landing, and/or excessive off-center engagement (especially on narrow runways) [as it] increases likelihood of aircraft rollover (Tab BB-167). As a result, an uncentered nosewheel could make it impossible to safely accomplish a cable arrestment as described above (Tab BB-167).

The SOF relayed an alternate COA, suggested by the conference hotel: a touch-and-go to see if cycling the WoW switches would straighten the nose wheel (Tab N-15). The MP then offered a related COA: a touch-and-go at a higher rate of speed such that the nose wheel can be lowered to touch the runway and then immediately take back off to assess the nose wheel position (Tab N-15).

At 21:12:52Z, the SOF informed the MP, "Alright the engineers uh are not optimistic about this COA but, extremely low PK [probability kill, meaning the probability this would fix the issue], but we're going to try anyway is a touch-and-go on the runway, mains only, do not touch the nose gear, uh lift back off in all cases and have the uh have Yeti 4 reconfirm the nose gear position once your safely airborne." (Tab N-18)

The SOF further explained the engineers believed some sort of mechanical malfunction with the nose wheel was causing these issues; this is because under normal circumstances it is impossible for the nose wheel to be stuck canted off at an angle when the gear is extended (Tab N-19).

Based on previous experience, engineers believed the NLG centering cam was jammed but were uncertain as to the cause (Tab V-13.3, 14.3, 16.3). The COA recommended by LM engineers was a modified gear integrity check executed via touch-and-go (Tab V-13.5, 16.4). LM recommended against an approach-end arrestment due to concerns that a locked uncentered wheel could result in aircraft rollover or runway departure, placing the pilot in extreme danger (Tab V-13.5).

iii. First Touch-And-Go

At 21:18:45Z, the MP accomplished the main gear only touch-and-go and returned to High Key (Tabs J-91, N-20). The MW confirmed via BD check that the nose wheel was still canted 20 degrees left (Tabs N-21, BB-201-02). At 21:20:00Z, the MP informed the SOF the only change to his indications in the aircraft was an FCS FAULT that was now "Latched", meaning it did not clear with an FCS/ENG RESET (Tab N-21). The SOF replied he would relay that information to the engineers (Tab N-21).

At this point, the MP had reported five HRC's to the SOF, including numbers relevant to the left main landing gear (LMLG) and right main landing gear (RMLG) WOW sensors that appeared after the first touch-and-go (Tab N-21).

The SOF communicated "some landing gear HRCs" that included "a main landing gear HRC or two as well." (Tab V-5.5-6). The Lockheed Martin engineers "wanted to know about the nose wheel HRCs" and "did not seem nearly as concerned about the other landing gear HRCs" (Tab V-5.5). The SOF could not recall whether all five HRC numbers were read "verbatim" or just "communicated" (Tab V-5.6).

The Senior OG Leader recalled receiving "all of the codes" from the MP "and then hand[ing] them to the engineers (Tab V-3.4). The engineers then "went line by line . . . with each one" of the HRCs "and then tried to match it to the scenario" with the MA (Tab V-3.7).

All three Lockheed Martin LG SMEs recalled three HRCs reported through the SOF, all relating to the NLG (Tab V-13.6, 15.4, 16.5).

According to the crash survivable memory unit (CSMU), the MA MLG tires touched down at 21:18:45Z (Tab J-111). At 21:19:46Z, an FCS FAULT was annunciated due to failures of RMLG WoW Switch 1 and Switch 2 (Tab J-111).

At this point, the MP did not have any indication as to what was causing the FCS FAULT (Tab BB-201-02). The MA Helmet Mounted Display (HMD) and Panoramic Cockpit Display (PCD) recording showed no HRC for FCS in the Prognostics and Health Management (PHM) page (Tab BB-201-02), and the checklist does not indicate all of the reasons that the FCS FAULT advisory could annunciate (Tab BB-169). The MP then initiated an FCS/ENG RESET at 21:19:50Z; one minute later the FCS FAULT advisory reasserted, showing the WoW switch failures continued to exist (LM REPORT pg. 23).

After the first touch-and-go, neither the MP nor MW were aware that the RMLG did not fully extend (Tab J-118). Absent visual confirmation that the RMLG had not fully extended —and was asymmetric with the LMLG—the only indication of a malfunction in the RMLG were the HRCs indicating two WoW switch faults (Tab BB-201-02).

The MA was also reporting an NWS DEGD caution and an FCS FAULT advisory (Tab J-111). Additionally, the MW HMD/Targeting Forward-Looking Infared (TFLIR) video indicated the MA NLG was canted about 20 degrees to the left, and the RMLG is not fully extended (Tab BB-201-02).

iv. Second Touch-And-Go

After further discussion on the conference hotel between the SOF, a senior 354 OG leader, and Lockheed Martin engineers, the decision was made to accomplish a second touch-and-go at a higher-than-normal speed (Tab N-24). This time the MP would briefly touch the nose wheel down to the runway, take off again, and the MW would do a BD check to see if the MA NLG centered

(Tab N-24). The MP acknowledged this COA and proceeded to the visual flight rules (VFR) entry point "Sally" to accomplish the second touch-and-go via a straight-in pattern. (N-25).

At 21:48:15Z, the MA MLG touched down, followed by the NLG at 21:48:18Z (Tab J-111). TFLIR video from the MW showed both the MLG and NLG touching down on the runway (Tab BB-202). Once this occurs, TFLIR video and CSMU data showed the nose wheel went from 17 degrees left to 6 degrees left when it touched down (Tab J-183). At 21:48:19Z, the MP momentarily selected Maximum Afterburner (MAX ETR) and the MA lifted back off the runway at 21:48:24Z (Tab J-198). At 21:48:32Z, an FCS/ENG RESET was initiated by the MP and at 21:48:36Z—when the MA is climbing away—the MA began to experience significant oscillations in the yaw axis followed by oscillations in the pitch axis (Tab J-111, 113). The MP attempted to counteract the oscillations with the control stick before selecting MAX ETR at 21:48:41Z (Tab J-113). At 21:48:42Z, the MP attempted to initiate a left bank at which point the MA rolled to the left and aggressively pitched up (Tab J-113). The control stick inputs were neutralized at 21:48:43Z, indicating the MP released his hand from the stick (Tab J-111). And at 21:48:44Z, the MP commanded an ejection (Tab J-111). Testimony from the MP reinforced that the MA experienced uncommanded yaw and pitch oscillations (Tab V-1.4). The MP attempted to counteract those movements before attempting to turn the MA away from the populated area of the airfield and ejecting (Tab V-1.4).

According to the CSMU, the ejection was commanded at 21:48:44Z (Tab J-111). The MA was travelling at 222 KCAS and at approximately 372ft above ground level (AGL) (Tab H-71) with the MA at 30-40 degrees pitch up, -38 degrees (left) roll, and approximately 3g (Tab H-55).

e. Impact

At 21:48:44Z, the MP ejected from the MA approximately 10,000ft down the length of Runway 32 (Tab J-102). The MA continued an upward trajectory reaching an altitude of 3,205ft mean sea level (MSL) (2,665 AGL) before stalling and descending in an uncontrolled state, impacting the ground in a 116-degree right bank at 21:49:16 (Tab J-102). First responders were on scene within one minute (Tab V-1.4).

Figure 2: Eielson AFB Overhead Imagery (Tab J-101)

f. Egress and Aircrew Flight Equipment (AFE)

All AFE equipment was current and worked as intended with no issues (Tab H-74). According to the Martin Baker analysis report, the ejection occurred at approximately 620ft AGL at an airspeed of 222 KCAS (Tab H-55). The MA was pitched up 30-40 degrees pitch up and in a 38-degree left bank (Tab H-55).

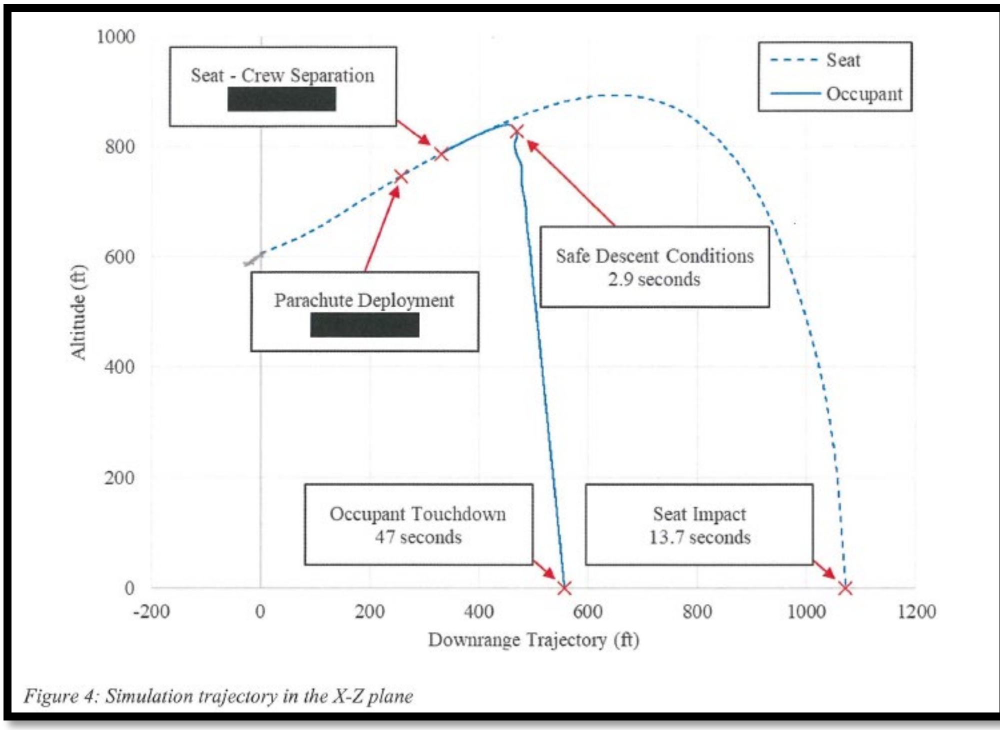

Figure 4: Simulation trajectory in the X-Z plane

Figure 3: Ejection Seat Trajectory (Tab H-56)

g. Search and Rescue (SAR)

The ejection was witnessed by the SOF, controllers in the Air Traffic Control (ATC) Tower, as well as by numerous personnel on the ground around the airfield (Tab V-2.4, 4.2). SOF and ATC personnel immediately initiated established crash response procedures (Tab V-19.2). First responders, who were pre-staged at a nearby taxiway due to the MA in-flight emergency (IFE) also witnessed the ejection (Tab V-1.4). The MP landed on the airfield between Runway 32 and Taxiway Sierra, approximately 50ft west of Taxiway Sierra (Tab J-101). The MP was able to disconnect the parachute and harness via the quick release box (QRB) and was assisted in standing up by first responders (Tab V-1.4). The MP reported that he was able to walk and elected to walk to the ambulance under his own power (Tab V-1.4).

Figure 4: Crash Site Overview (Tab J-102)

5. MAINTENANCE

a. Forms Documentation

The Autonomic Logistics Information System (ALIS) is a program used by F-35 Maintenance personnel to document servicing, inspections, aircraft configuration, status and houses Joint Technical Data (JTD) used to maintain the aircraft to manufacturer specifications (Tab BB-199-200). No major discrepancies were noted regarding documentation of maintenance performed on the MA (Tab BB-199-200).

b. Inspections

The Post Operations Inspection (POS) is completed after the F-35 completes its final flight of the day (Tab BB-199-200). A Before Operations Servicing (BOS) is required before the first flight of the day (Tab BB-199-200). These records are maintained in ALIS and no relevant discrepancies were noted (Tab D-14).

c. Maintenance Procedures

A Landing Gear Fluid Servicing maintenance action was completed on 25 January 2025 to comply with the 200-flight hour inspection required by JTD (Tab D-16). This maintenance action is completed by depleting the pneumatic pressure as well as flushing the hydraulic fluid from the landing gear struts (Tab BB-199). To accomplish this task, the maintainer opens the swivel nut releasing the nitrogen and hydraulic fluid from the strut low pressure port (Tab BB-199). The maintainer will then begin servicing hydraulic fluid in the landing gear strut, followed by pneumatic servicing (Tab BB-199). Hydraulic servicing will be complete when a bubble free stream of hydraulic fluid is seen flowing through the clear tube that is installed on the swivel nut located on the low pressure nitrogen servicing port (Tab BB-199). Following hydraulic servicing, pneumatic servicing will be conducted by connecting a nitrogen servicing cart to the swivel nuts for the applicable high/low pressure pneumatic side of the strut (Tab BB-199). This maintenance action takes more than two gallons to fully service all three landing gear struts (Tab BB-199).

Three days prior to the mishap, the maintenance team used no more than two gallons of hydraulic fluid to service the MA because the team only used one hand cart and they did not refill it during the procedure (Tab V-6.3). It was determined water was already in the struts prior to the servicing on 23 January 2025 because of of the amount of hydraulic fluid correctly serviced. (Tab V-6.3, 7.2).

d. Maintenance Personnel and Supervision

Both maintainers assigned to the 355th FGS who performed the 25 January 2025 hydraulic service on the MA were fully qualified to do the required maintenance action (Tab T-5). The maintainers involved were 5-Level (journeyman) and 7-Level (craftsman) trained maintainers (Tab BB-200).

e. Fuel, Hydraulic, Oil, and Oxygen Inspection Analyses

Following the mishap, the Air Force Research Laboratory (AFRL) tested the hydraulic fluid in the MA's NLG and RMLG (Tab J-19). AFRL found that approximately one-third of the fluid retrieved from the RMLG and NLG was water (Tab J-19).

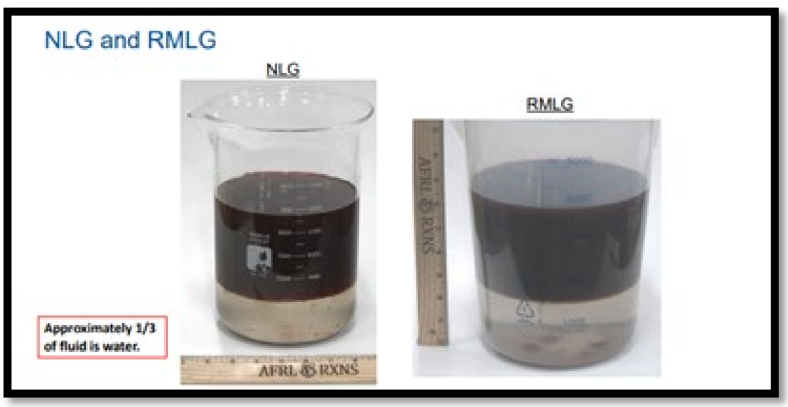

Figure 5: NLG and RMLG Hydraulic Fluid Contamination (Tab J-190)

Figure 6: 1L of Water Found in 2.8L of NLG Hydraulic Fluid (Tab J-190)

Figure 7: 1.5L of Water Found in 4L of MLG Hydraulic Fluid (Tab J-28)

The hydraulic fluid was sourced from a barrel in the 355th FGS support section and serviced into MA with a hydraulic servicing handcart (Tab V-6.4). The barrel and servicing cart were both tested for contamination following the mishap using a Portable Oil Diagnostics System (PODS) (Tab BB-133, 241). The PODS uses Society of Automotive Engineers (SAE) standards for hydraulic fluid, and the test results showed that both the barrel and hydraulic servicing cart failed to meet minimum standards for hydraulic fluid (Tab BB-133, 241). To that end, the barrel tested with more than 1024 parts per million (ppm) particulates, which is more than double the allowable limit for particulates in hydraulic fluid (Tab BB-133, 241). The hydraulic servicing cart also contained more than double the allowable limit for particulates in the tested fluid (Tab BB-133). It is important to note that the test does not accurately measure contaminates above 1024ppm, so the contamination was potentially far greater than 1024ppm (Tab BB-133).

SAE AS4059

SAE AS4059 Rev. E Table 2 (Cleanliness Classes for Cumulative Counts)(Particles per 100 ml)

(1)	>1µm	>5µm	>15µm	>25µm	>50µm	>100µm
(2)	>4µm(c)	>6µm(c)	>14µm(c)	>21µm(c)	>38µm(c)	>70µm(c)
Size code	A	B	C	D	E	F
Classes						
000	195	76	14	3	1	0
00	390	152	27	5	1	0
0	780	304	54	10	2	0
1	1560	609	109	20	4	1
2	3120	1217	217	39	7	1
3	6250	2432	432	76	13	2
4	12500	4864	864	152	26	4
5	25000	9731	1731	306	53	8
6	50000	19462	3462	612	106	16
7	100000	38924	6924	1224	212	32
8	200000	77849	13849	2449	424	64
9	400000	155698	27698	4898	848	128
10	800000	311396	55396	9796	1696	256
11	1600000	622792	110792	19592	3392	512
12	3200000	1245584	221584	39184	6784	1024

(1) Size range, Optical microscope, based on longest dimension as measured per ARP598 or APC Calibrated per ISO 4402:1991

(2) Size range, APC Calibrated per ISO 11171 or Electron Microscope, based on projected area equivalent diameter.

Complete standard available from www.sae.org.

Figure 8: Hydraulic Fluid Contamination Table (Tab BB-138)

f. 355th Hazardous Communication Support Program

The 355th FGS hazardous materials program (HAZMAT) program suffered from insufficient manning and frequent supervision changes at times relevant to the mishap (Tab V-9.5). Airmen and non-commissioned officers were frequently swapped into the program and, at the time of the mishap, there was not a primary HAZMAT program manager assigned (Tab V-9.5).

Additionally, HACOM program managers did not lock the barrels, observe servicing of hydraulic cart to ensure maintainers were properly servicing hydraulic or oil hand carts, nor log what hydraulic or oil servicing carts were filled from the barrels (Tab V-10.3, 10.4). Moreover, the hydraulic pump that sits on top of the barrel had no Teflon thread sealer, which could permit water to contaminate the hydraulic fluid if the barrel was not stored properly (Tab Z-3, 4, 12).

Figure 9: Contaminated Hydraulic Barrel and Pump Threads (Tab Z-3, 4, 12)

Additionally, there was insufficient tracking of what hydraulic barrel(s) went on movements and whether said barrel(s) returned to Eielson AFB (Tab V-9.11). Information pertaining to barrel movement is not required to be tracked in depth, but HAZMAT records were incomplete and did not permit accurate tracing (Tabs V-9.11, BB-199-200). For example, information about at 354 FGS hydraulic fluid barrel that was transported to Kadena Air Base, Japan, in support of a Theater Security Package (TSP) was overwritten by a subsequent deployment to that Air Base (Tab BB-199-200). This error made it impossible to track where the barrel had traveled upon completion of the exercise (Tab BB-199-200).

Because of incomplete records, there was insufficient information to confirm whether the barrel used to service hydraulic fluid the MA on 23 January 2025 was the same hydraulic barrel that was left outside in inclement weather at Kadena Air Base for at least six weeks (Tab BB-199-200). This was in direct violation of Air Force regulations, which require that hydraulic fluid be stored in a "container tightly closed in a dry and well-ventilated place." in accordance with AFI 91-203 and OSHA Safety Data Sheets (Tab BB-14, 22). Additionally, the hydraulic barrel that was used to service the MA had been marked "empty/consumed" in April 2024, but had not been disposed of (Tabs D-15, BB-199-200). Even so, it was in-use at the 355 FGS and, when tested, contained about 33 percent water (Tab J-13).

g. 6 February 2025 Incident

A similar incident to the MA occurred nine days later, on 6 Feb 25, when another F-35A from Eielson AFB experienced a landing gear malfunction on takeoff (Tab J-194). That aircraft experienced a nose wheel gear unsafe indication after takeoff and, after following the gear fail to retract checklist, the pilot lowered the landing gear and flew for approximately 40 minutes before landing uneventfully (Tab J-194). Post flight analysis indicated the unsafe nose gear indication was due to the uplock missing the roller and rotating the nose wheel 10 degrees to the left in a similar manner to the MA (Tab J-195-96). While landing, maintenance data showed the nose wheel went from the 10 degrees to the left to 5 degrees at touchdown (Tab J-194). Neither the pilot nor the wingman noticed that the nose wheel was canted prior to the uneventful landing (Tab V-12.2).

A post flight test was done on this aircraft by first towing it into a climate-controlled shelter (approximately 70 degrees F) and recording the nitrogen pressures on the landing gear shock struts (Tab J-195). The aircraft was then towed outside where temperatures remained below 15 degrees Fahrenheit (F) (Tab J-195). After 12 hours outside, the aircraft was jacked up until all landing gear cleared the ground (Tab J-195). Measurements were then taken of the landing gear struts (Tab J-195). The aircrafts Landing Gear failed to reach full extension (Tab J-195). When the MLG struts fail to fully extend, the WoW switches cannot physically extend and do not function properly (Tab J-118). Temperature was taken of all three struts which measured 14F for the NLG, and 7F for the LMLG and RMLG. The aircraft was then lowered and towed back into a 70F climate-controlled hanger and sat for 12 hours (Tab J-195). All three landing gear struts were then drained of all fluid into mason jars (Tab J-195). The NLG and LMLG had a significant amount of water present while the RMLG appeared to be all hydraulic fluid (Tab J-194-95).

Figure 9: Contaminated NLG and LMLG Hydraulic Fluid (Tab J-195)

This subsequent incident and test replicate the same conditions that the MA was experiencing (Tab Tab J-194). The presence of water in the LG struts during below freezing weather conditions did not allow the gear to fully extend in either aircraft (Tab J-195-96).

Flight records show these two aircraft had previously flown in the days prior to both incidents without experiencing this malfunction (Tab T-6-21). During those sorties, the ambient temperature was not as cold as the day of the mishap (Tab W). Additionally, the time spent during ground operations (i.e., the time between leaving the heated weather shelter and takeoff) was less than both the MA sortie on 28 January 2025 and incident on 6 February 2025 (Tab T-7-21). With that, it is likely that both aircraft flew sorties with water in the landing gear struts without malfunction since the water did not have time to freeze before takeoff and gear retraction. (Tabs T-7-21, W-3-5)

h. Unscheduled Maintenance

There was no unscheduled maintenance relevant to this mishap.

6. AIRFRAME, MISSILE, OR SPACE VEHICLE SYSTEMS

a. Structures and Systems

Prior to the mishap, the MA was designated as partially mission capable due to issues affecting systems that were not relevant to the mishap (Tab D-14). The MA showed no major issues and worked as described, aside from the landing gear and related systems that will be discussed below (Tab J-223).

b. Landing Gear System

The landing gear system is a tricycle design consisting of the MLG and NLG, extension and retraction, wheels and brakes, nose wheel steering, position and warning, and arresting gear (Tab BB-199-200). The NLG Uplock Hook is used to ensure the NLG assembly is up and locked appropriately. The uplock is mechanically "slaved" to the NLG door (Tab J-176). The NLG is in the uplock so NLG door actuator will start to close the door, raising the uplock hook into the "LOCKED" position (Tab J-176). When the uplock hook is in "LOCKED" position, the doors are closed and aircraft is ready for full flight envelope (Tab BB-199-200).

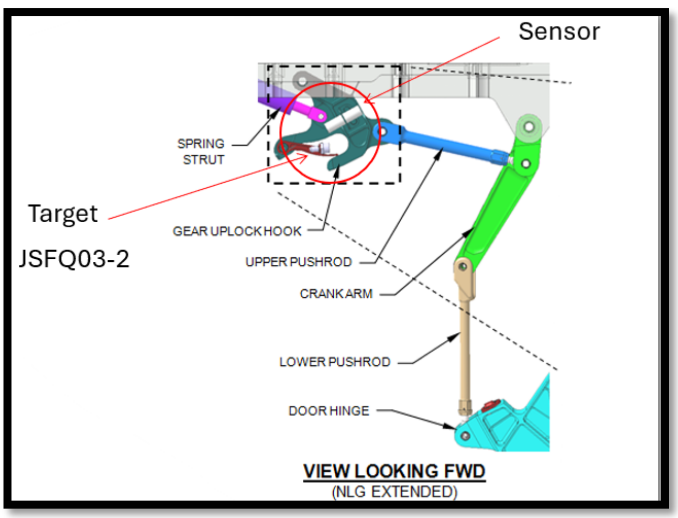

Figure 10: NLG Uplock (Tab J-177)

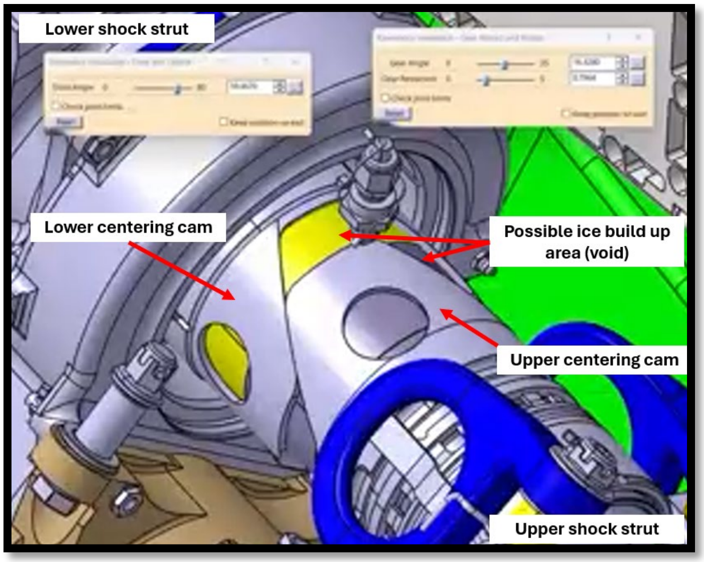

Figure 11: Nose Landing Gear Lower Shock Strut (Tab J-192)

The NLG centering cams are used to ensure proper centering of the NLG (Tab J-191). One of the cams is mounted at the top of the landing gear strut and the other one is mounted at the bottom of the landing gear (Tab J-185).

At the beginning of the mishap flight, the NLG didn't fully extend due to ice build-up within the NLG strut (Tab J-189). This ice buildup was the combination of significant water contamination in hydraulic fluid used to service the struts and ambient freezing temperatures around Eielson AFB (Tab J-189). The lack of full extension caused a misalignment that prevented the NLG uplock hook from catching the NLG uplock roller, causing damage to the metal adjacent to the roller (Tab J-185).

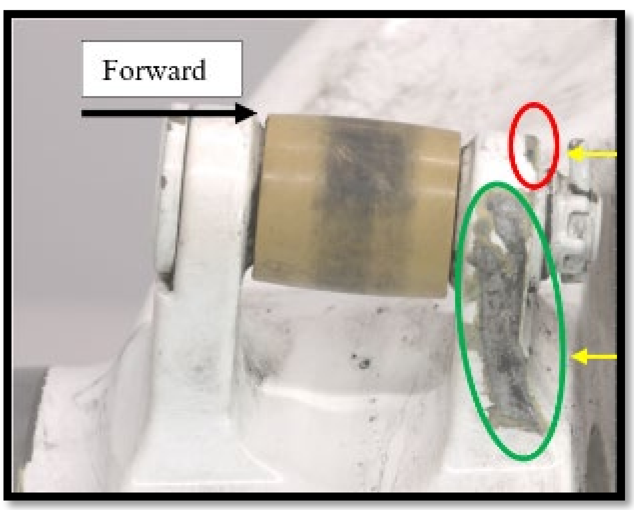

Figure 12: Damaged NLG Uplock Hook (Tab J-185)

Additionally, significant pitting was identified within the LG piston that, while caused by contamination to the hydraulic fluid, did not affect the LG function (Tab BB-255).

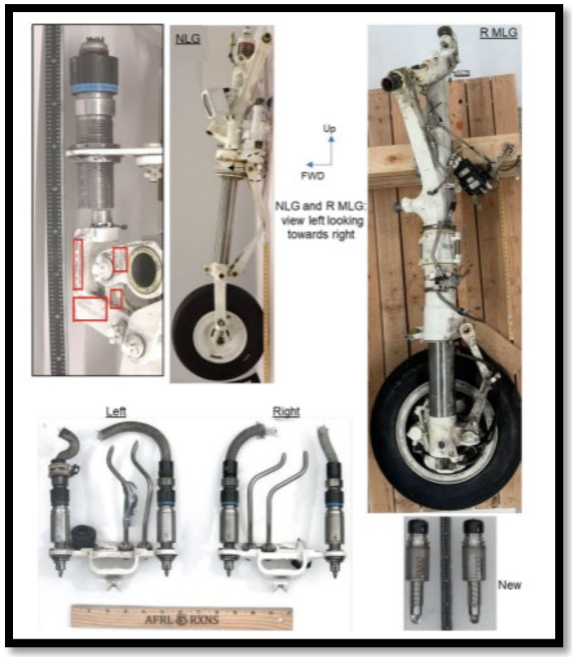

Figure 13: NLG, MLG, and WoW Sensors (Tab J-22)

After the NLG uplock hook missed the roller, the NLG was forced left 17.5 degrees (Tab J-191). Leading to the IFE and multiple touch-and-go attempts (Tab J-91). After the first touch-and-go, the RMLG and NLG WoW sensors showed weight on wheels despite the MA being airborne (Tab J-91). This was because aforementioned ice buildup prevented the NLG and RMLG struts from fully extending or retracting (Tab J-185). On the last touch-and-go, the NLG wheel went from 17.5 degrees to 6 degrees after it was allowed to briefly touch the runway (Tab J-186).

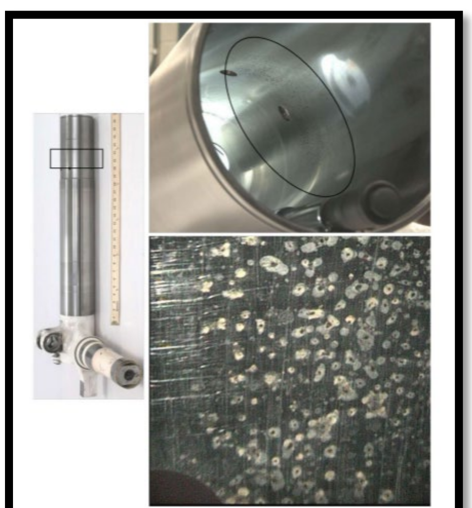

Figure 14: Pitting Identified in MLG Piston (Tab J-29)

As discussed below, the inability of the strut to fully extend and retract impacted the proper function of the WoW sensors and flight control law (CLAW) on the MA (Tab J-168). According to Lockheed Martin, if a MLG strut fails to fully extend to a pre-determined length then the WoW sensors cannot extend and will report weight ON wheels (Tab J-179).

c. Weight on Wheels (WoW) sensors

The WoW sensors are one component of the F-35A's flight control system (Tab J-127). Each MLG has two WoW sensors that are mounted on the shock strut (Tab J-129). These sensors, along with a single WoW in the NLG, are part of a redundant system that is intended to function even when multiple WoW sensors fail (Tab J-129). When the shock struts are fully extended and then compressed by the weight of an aircraft, the WoW sensors are designed to reflect that the aircraft is on the ground (Tab BB-199-200). Both main gear WoW sensors are plunger-type sensors actuated by keeping physical contact with the landing gear torque arms integral cam (Tab J-129).

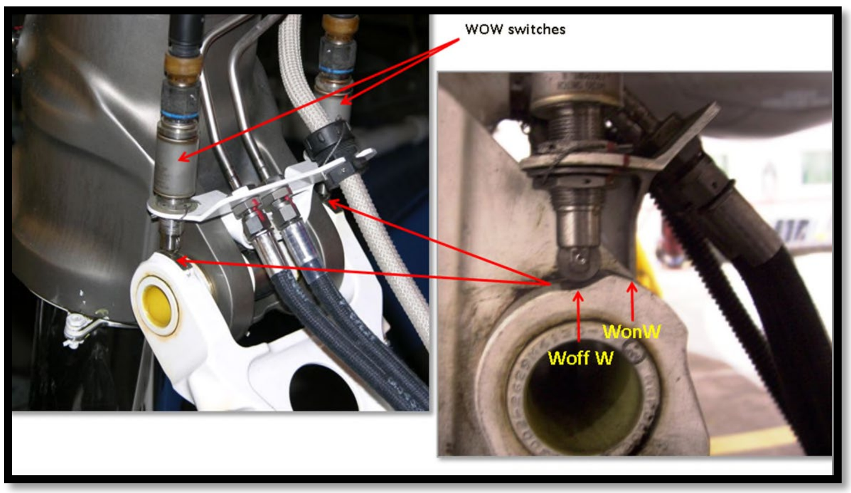

Figure 15: WoW MLG Sensors (Tab J-180)

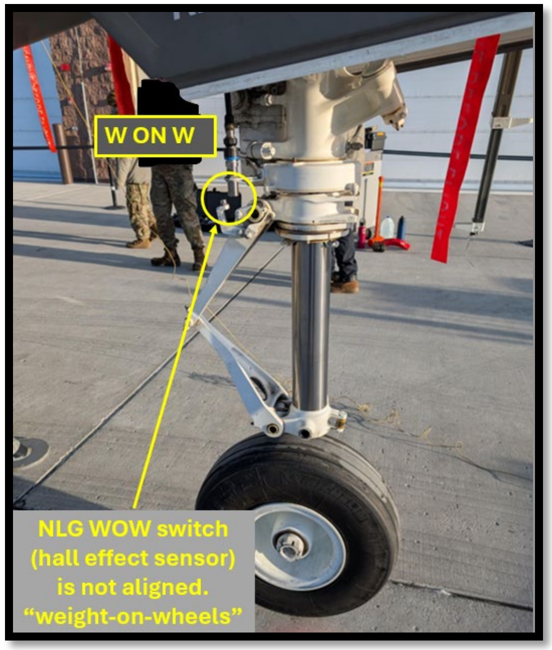

Figure 16: NLG WoW Sensors (Tab J-180)

The NLG WoW switch is a hall-effect sensor actuated by the upper torque arm (Tab J-179). The magnet side of the sensor must be within a pre-determined distance from the sensor for the aircraft to recognize weight OFF wheels (Tab J-179).

Four WoW sensors from the MA were tested by the Air Force Research Laboratory (AFRL), who found they were functioning within specification (Tab J-48). However, this testing did not account for whether the WoW sensors would be able to function if the shock struts were not properly extended as a result of ice buildup within the shock piston (Tab J-42-62).

d. Flight Control Law (CLAW)

The F-35A is controlled by execution of a defined set of algorithms, known as CLAWs (Tab J-144). The F-35A CLAWs include power approach (PA) for takeoff and landing, up-and-away (UA), and on-ground (OG) (Tab J-144). The PA CLAW is selected when airspeed is less than the programmed air speed or when precise control of the aircraft is required (Tab J-144) The OG CLAW is selected when three of five WoW sensors suggest there is, in fact, weight on the wheels because the aircraft's weight has compressed the extended strut while on the ground (Tab J-144). If an aircraft is airborne but still in the "on-ground" CLAW, it will experience significant degradation in flying qualities and loss of control can be expected (Tab J-165). This is because CLAW software is designed to provide the desired aircraft response rather than direct control by the pilot (Tab J-165). When the MA went airborne following the second touch-and-go attempt, it remained in the OG CLAW and control of the aircraft was not possible (Tab J-168).

e. Flight Control System (FCS)

The FCS brings together systems to provide pilot control of various parts of the aircraft through Vehicle Management Computers (VMC) and Electro-Hydrostatic Actuators (EHA) in each flight control system (Tab J-128).

f. Crash Survivable Memory Unit (CSMU)

The CSMU is designed to survive a catastrophic crash and acts as a flight data recorder (Tab J-106). The CSMU from the MA was retrieved successfully (Tab J-91). The CSMU begins recording data when the Integrated Power Package is started (or when external power is applied to aircraft) and records continuously through the mission (Tab J-106).

g. Health Reporting Code (HRC) Issue

Lockheed Martin released a maintenance newsletter in April 20204 that discussed MLG WoW switch faults (Tab BB-196). It said, in relevant part:

> The WOW switches on the MLG are a mechanical plunger switch that are known to have a history of failure due to internal damage . . . . These failures assert as actionable HRCs and become more frequent during extreme cold weather operations where aircraft are prepared for flight in a climate controlled hangar and takeoff 20-40 minutes after being exposed to outside ambient conditions. Faults should be taken as an early indication of failure. If an actionable HRC is asserted noting a fault to a MLG WOW switch, the AFRS tied to that HRC must be followed . . . . Not acting on a WOW switch fault HRC could result in . . . WOW switches faulting . . . on a future flight which can cause erratic flying qualities making it difficult for the pilot to maintain control of the aircraft.

The newsletter identified HRCs relating to the MLG WoW sensors, several of which were present during the 28 January 2025 mishap and reported by the MP during the conference hotel with the SOF and Lockheed Martin engineers (Tab BB-196).

7. WEATHER

a. Forecast Weather

The forecasted weather at Eielson AFB during the MF was winds 260 at 4 kts (kts), temperature -1F, dew point -5F, visibility 15 statute miles (SM), ceiling 4,500ft AGL, no significant weather, with the freezing level at the surface (Tab F-3). The temperature at FL100 (approx. 10,000ft MSL) was forecasted to be -29C (Tab F-3).

b. Observed Weather

The observed weather at Eielson AFB at 2155Z was reported to be winds 260 at 3 kts, 10 SM visibility, a scattered cloud layer at 2,500ft AGL, a broken cloud layer at 5,000ft AGL, temperature -17C (1.4F), dewpoint -21C (-5.8F) (Tab H-51).

8. CREW QUALIFICATIONS

a. Mishap Pilot

At the time of the mishap, the MP was a current and qualified F-35A evaluator pilot (Tab G-124). The MP had a total of 554.6 hours in the F-35A, 51.9 of which were evaluator hours, and 403.7 of which were instructor hours (Tab G-124). The MP received his evaluator qualification on 19 September 2022, instructor qualification on 10 November 2021, mission qualification on 27 October 2020, and initial instrument qualification on 29 June 2020 (Tab G-21). Prior to qualifying in the F-35A, the MP was previously qualified as an instructor in the A-10 with 1697.6 hours, and instrument qualified in the F-16 with 146.4 hours (Tab G-124). The MP had a total of 2702.5 career flying hours (Tab G-124).

The MP most recent evaluation was on 6 August 2024 where he was qualified with no discrepancies (Tab G-5). During this evaluation, the MP received a commendable in the area of Flight Leadership and Instructor Performance (Tab G-6). A "Commendable" rating is awarded "if, in the examiner's determination, the aircrew member has demonstrated exceptional skill and knowledge."(Tab BB-204)

The MPs recent flight time in the F-35A is as follows (Tab G-3):

	Hours	Sorties
30 days	8.7	5
60 days	19.9	11
90 days	29.0	16

9. MEDICAL

a. Qualifications

The MP was medically qualified for flight duties, with no duty limiting conditions notated (Tab T-3). The medical review revealed no other factors relevant to the mishap (Tab T-3).

b. Health

The MP was in good health at the time of the mishap (Tab T-3). A review of the MP's medical records did not reveal any illnesses or duty limiting conditions (Tab T-3). There is no evidence to indicate that the MP's health was a factor in this mishap (Tab T-3). He sustained a compression fracture of the thoracic spine and superficial abrasions to the neck and face as a result of the mishap (Tab T-3).

c. Pathology

Toxicology samples were obtained and submitted to the Armed Forces Medical Examiner System for analysis (Tab T-3). For all relevant parties, urine and blood specimen analysis showed negative results for drugs of abuse panel, ethanol, methanol, isopropanol, and acetone (Tab T-3).

d. Lifestyle

The 72-hour and 7-day prior histories were obtained under safety privilege/confidentiality and not available to review for the purposes of this board (Tab T-3). Based on the MP statement, initial medical response, and medical record, and lifestyle information provided to flight surgeons as part of the initial medical response, there is no evidence to suggest lifestyle factors were a factor in the mishap (Tab T-3).

e. Crew Rest and Crew Duty Time

There is nothing to suggest that the MP did not comply with published crew rest guidelines at the time of the mishap (Tab T-3).

10. OPERATIONS AND SUPERVISION

a. Operations

The only applicable special interest item (SII) in regards to the mishap sortie was Cold Weather Operations (Tab BB-208). This SII must be briefed during every flight briefing and consisted of briefing topics such as cold weather AFE gear, hangar bay operations, ice foreign object debris (FOD), altitude corrections, taxi speeds, runway condition readings (RCR), braking effectiveness, rapidly changing weather conditions, snow removal, etc. (Tab BB-208).

b. Supervision

Review of flight training records for the MP and the other flight members showed that all were current and qualified to participate in the sortie (Tab K-4).

11. HUMAN FACTORS ANALYSIS

a. Introduction

The accident investigation board (AIB) considered all human factors relevant to this mishap, as prescribed in the Department of Defense (DoD) Human Factors Analysis and Classification System (HFACS) 8.0 (DoD HFACS 8.0) (Tab BB-209). The DoD HFACS 8.0 is a framework that identifies potential areas of assessment during an accident investigation and lists potential human factors that can play a role in an aircraft mishap (Tab BB-210-11). A human factor is any environmental, technological, physiological, psychological, psychosocial, or psychobehavioral factor a human being experiences that contributes to, or influences, performance during a task (Tab BB-211 to BB-240).

The framework is divided into four main categories: Acts, Preconditions, Supervision, and Organizational Influences (Tab BB-240). Each category is subdivided further into related human factor subcategories (Tab BB-240). The main categories allow for a complete analysis of all levels of human error and demonstrate how such errors may interact together to contribute to a mishap (Tab BB-211). The human factors relevant to this mishap are defined below (Tabs BB-224, 228, 229).

b. Applicable Human Factors

PP101 Ineffective Team Resource Management: is when crew/team members failed to actively maintain an accurate and shared understanding of the evolving task, or manage their distribution of tasks, which resulted in a hazardous condition or unsafe act. This includes communication breakdowns (e.g. standardized terms, phrases, hand signals or language/lexicon barriers), critical information not shared, rank/position intimidation, lack of assertiveness or other teamwork functions.

SI001 Ineffective Supervisory or Command Oversight: is when the availability, competency, quality or timeliness of supervisor/leader oversight did not meet task or mission demands, which resulted in hazardous conditions or unsafe acts. (Examples include: failure to verify accuracy and completeness of work, conduct pre-combat checks/pre-mission inspections, mismanagement of emerging risks during mission execution, etc.)

SI007 Failed to Identify or Correct Hazardous Practices, Conditions or Guidance: is when any supervisor/leader in the unit failed to identify or correct known hazardous conditions of equipment, facilities, or written procedures/guidance, or correct unsafe work practices of personnel within his/her scope, which resulted in hazardous conditions or unsafe acts.

12. GOVERNING DIRECTIVES AND PUBLICATIONS

a. Publicly Available Guidance Relevant to the Mishap

1) AFI 51-307, *Aerospace and Ground Accident Investigations*, dated 18 Mar 19
2) AFMAN 11-202V2_PACAFSUP, *Aircrew Standardization and Evaluation Program, PACAF*, dated 30 Dec 22
3) DAFG, *DoD Human Factors Analysis and Classification System (HFACS) Version 7.0*, dated 25 May 22
4) DAFMAN 91-203, *Air Force Occupational Safety, Fire, and Health Standards*, dated 25 Mar 22

NOTICE: All Air Force directives and publications listed above are available digitally on the Air Force Departmental Publishing Office website at: http://www.e-publishing.af.mil.

b. Other Guidance Relevant to the Mishap

1) SAE AS4059 Hydraulic Fluid Cleanliness Standards
2) Lockheed Martin F-35 Maintenance Newsletter, dated Apr 24
3) F-35A-FM-001, F35A 'LIGHTNING II', FLIGHT MANUAL
4) 354 FW In-Flight Guide, dated 8 Mar 24

c. Known Deviation from Directives or Publications

1) AFI 91-203, *Air Force Occupational Safety, Fire, and Health Standards*, para 1.4.1 and related Safety Data Sheet (SDS) standards for hydraulic fluid storage which was part of a substantially contributing factor for the mishap.

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8 July 2025

MICHAEL B. LEWIS, Colonel, USAF
President, Accident Investigation Board

STATEMENT OF OPINION
F-35A T/N 19-5535
Eielson Air Force Base, Alaska
28 January 2025

Under 10 U.S.C. § 2254(d) the opinion of the accident investigator as to the cause of, or the factors contributing to, the accident set forth in the accident investigation report, if any, may not be considered as evidence in any civil or criminal proceeding arising from the accident, nor may such information be considered an admission of liability of the United States or by any person referred to in those conclusions or statements.

On 28 January 2025, at approximately 12:49:16 local (L), the mishap aircraft (MA), an F-35A aircraft, tail number (T/N) 19-5535, crashed after completing a touch-and-go landing to Runway (RWY) 32 at Eielson Air Force Base (AFB), Alaska (AK). The MA was operated out of Eielson AFB, AK, by the 355th Fighter Squadron (FS) and assigned to the 354th Fighter Wing (FW). There were no fatalities. The mishap pilot (MP), assigned to the 354th FW, ejected safely before impact. He sustained minor, non-life-threatening injuries. The MA was destroyed upon impact, with a total loss valued at $196,500,000. The MA debris was contained within airfield boundaries on Eielson AFB.

The MA was flying as the #3 aircraft in a flight of four F-35A aircraft. After initial takeoff, the MA's nose landing gear (NLG) did not retract properly due to hydraulic fluid contaminated by water that froze, preventing full strut extension and resulting in the NLG being canted to the left. After running initial checklists, the NLG was still turned approximately 17 degrees to the left. The MP initiated a conference call with Lockheed Martin engineers. The MA held for approximately 50 minutes while the team developed a plan of action. The MP accomplished two touch-and-go landings attempting to recenter the NLG wheel. While both attempts failed to center the NLG wheel, the right main landing gear (MLG) strut and then left MLG strut did not fully extend after takeoff due to ice forming inside the strut. After the second touch-and-go, all valid Weight on Wheels (WoW) sensors indicated that the MA was on the ground, and the MA transitioned to the "on ground" flight control law (i.e., automated ground-operation mode causing the MA to operate as though it was on the ground). However, because the MA was actually airborne, it was uncontrollable. The pilot successfully ejected and emergency responders were at the scene within a minute.

In forming my opinion, I relied on the Autonomic Logistics Information System (ALIS), Crash Survivable Memory Unit (CSMU), the MP's & mishap wingman's (MW) Helmet Mounted Display (HMD) and Panoramic Cockpit Display (PCD) recordings, Targeting Forward-Looking Infrared (TFLIR) video, analysis and reports from the Air Force Research Laboratory (AFRL), the Lockheed Martin technical report on the accident, and interviews to reach an evidence-based causal conclusion.

1. CAUSE

I find by a preponderance of the evidence that hydraulic fluid contaminated by water in the MA's landing gear struts, combined with slightly extended ground operations at extreme cold temperatures, caused ice to form inside the struts. Initially, the water in the NLG strut froze, which started the cascading events. When the NLG strut would not fully extend due to the ice in the strut, then the uplock hook was not able to engage the forward uplock roller. This caused both the initial unsafe gear indication and the NLG to be canted approximately 17 degrees to the left. Because the PCL directed the MP to put the gear down after the first touch-and-go, enough ice had formed in the *right* MLG strut to prevent it from fully extending, causing the *right* MLG WoW sensors to declare it was on the ground. After the second touch-and-go, enough ice had formed in the *left* MLG strut to prevent it from fully extending, causing the *left* MLG WoW sensors to declare it was on the ground. Once all WoW sensors agreed that the MA was on the ground, the flight control laws declared the aircraft to be on the ground. According to Lockheed Martin, the aircraft is not controllable while airborne if the control law is "on ground," ultimately leading to the MP ejecting.

Much of this series of events was repeated on a F-35A flight on 6 February 2025 with tail number 05-5479 as illustrated by subsequent testing on that aircraft. With a significant amount of water in the NLG and left MLG struts at below freezing ambient temperatures, the struts were not able to reach full extension. According to Lockheed Martin, if the MLG struts are not within a certain degree of full extension, then the WoW sensors will report the aircraft is on the ground.

Due to a lack of accurate documentation, I cannot determine when the water was introduced into the MA's landing gear struts. Through interviews, I determined that the hydraulic barrel the 355th FGS used when deployed to Kadena AB, Japan, in 2023 was likely contaminated with water.

2. SUBSTANTIALLY CONTRIBUTING FACTORS

I find by preponderance of the evidence that crew decision making, a lack of oversight of the 355th FGS hazardous materials program (HAZMAT), and lack of adherence to maintenance procedures in the 355th FGS for hydraulic servicing equipment were substantially contributing factors.

a. Crew decision making

The entire team involved in this mishap—the MP, MW, supervisor of lying (SOF), 354th operations group (OG) leadership, air traffic controllers (ATC), and Lockheed Martin engineers who participated in the Conference Hotel—admirably dealt with a challenging situation that had not been seen in the F-35 fleet previously. The MP used a variety of resources available to troubleshoot and attempt to safely recover the MA. The MW showed initiative and superior problem-solving abilities by his excellent and timely inputs and observations, as evidenced by using the HMD to accurately estimate how far off center the NLG was canted. The SOF, Lockheed Martin engineers, and 354th OG leadership all assisted and provided their best advice and considered a variety of potential options to fix the NLG. However, in this situation, the decision to advise the MP to accomplish touch-and-goes led to the MP's uncontrolled ejection.

As demonstrated by the F-35A flight on 6 February 2025 from Eielson AFB that had a similar situation, the MA could have safely recovered. On 6 February, that pilot landed his aircraft with the NLG initially 10 degrees left of center that corrected to 5 degrees left of center on touchdown. The pilot landed safely without even realizing his NLG was not centered.

On the second touch-and-go with the MA on 28 January 2025, the NLG straightened out to 6 degrees left of center, which based on the evidence from the 6 February flight, would have given the MP enough control authority to safely land.

When the MP relayed the HRCs after the first touch-and-go, the Conference Hotel participants potentially could have referenced the Lockheed Martin maintenance circular from April 2024 that said these WoW sensor issues could lead to aircraft controllability issues. Had the Conference Hotel participants considered this potential outcome, they likely would have advised a planned full stop landing or a controlled ejection instead of a second touch-and-go.

b. Lack of adherence to maintenance procedures in the 355th FGS for hydraulic servicing equipment

The Airmen in the 355th FGS HAZMAT program did not follow established procedures and technical orders for storing and handling hazardous materials. Specifically, they stored hydraulic barrels outside while deployed to Kadena AB, Japan, and on at least one other temporary duty away from Eielson AFB. At both locations the barrels were exposed to humid conditions and inclement weather. Further, at home station 355 FGS personnel did not observe personnel while they were filling hydraulic carts for use, lock the hydraulic barrel when not servicing carts, document when and how much hydraulic fluid was used, nor appropriately dispose of a barrel certified as empty. Because of poor record keeping, it is unclear whether the barrel certified for disposal was the same barrel that was stored outside and exposed to inclement weather. But the barrel used to service the mishap aircraft was contaminated with significant amounts of water.

These are significant lapses in following procedures that indicate an overall lack of discipline. This lack of discipline, specifically a lack of documentation for the hydraulic barrel, was the key reason I could not identify when the water was introduced into the landing gear struts prior to the servicing on 25 January 2025.

c. Lack of oversight of the 355th FGS hazardous materials program

The 355th FGS flight and squadron leadership allowed the culture of the HAZMAT program to decline by frequently swapping Airmen in the program leading to a general inexperience and a lack of knowledge of the program requirements such as proper storage and use. At the time of the accident, there was not a primary HAZMAT manager assigned, which led to one of the Airmen assigned as an alternate manager to assume the duties of the primary manager by his own initiative. While this Airman's actions are commendable because he recognized the need, flight leadership failed in their duty to assign a primary program manager.

4. CONCLUSION

I find by a preponderance of the evidence the cause of the mishap was water that froze in the NLG and MLG struts. The ice prevented the struts from full extension that led the WoW sensors to declare the aircraft was on the ground when it was airborne. I could not establish when the water was introduced into the landing gear struts.

Additionally, I find by a preponderance of the evidence that crew decision making, a lack of adherence to maintenance procedures for hydraulic servicing equipment, and a lack of oversight for the Hazardous Materials program were substantially contributing factors.

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8 July 2025

MICHAEL B. LEWIS, Colonel, USAF
President, Accident Investigation Board

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