

AIRCRAFT ACCIDENT INVESTIGATION REPORT (COMPLETE)

CONTAINING ORIGINALLY EXCLUDED INFORMATION ON:

- (1) THE A-7D's AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS);**
- (2) THE A-7D SN 72-0233's RED X STATUS and APPARENT LONG-TERM INOPERABLE CONDITON;**
- (3) THE MOST RECENT MAJOR MAINTENACE ISSUES ON A-7D SN 72-0233, INCLUDING, *INTER ALIA*:**
 - (a) AN UNREPAIRED RADAR ALTIMETER WITH SIGNIFCANT INACCURATE ALTITUDE READINGS WHEN THE SPEED BRAKE WAS EXTENDED (Pilot was informed the Radar Altimeter/Speed Brake issue was repaired);**
 - (b) UNREPAIRED MALFUNCTIONING FORWARD LOOKING RADAR; AND**
 - (c) AN INOPERABLE, UNREPARED FIRE WARNING LIGHT; OR**
- (4) ANY DISCUSSION in the original investigation report that MAJOR MONAHAN's FLIGHT PLAN REQUIRED:**
 - (a) FLYING USING ONLY INSTRUMENT FLIGHT RULES (IFR);**
 - (b) FLYING AT HIGH SPEED;**
 - (c) DESCENDING from MEDIUM to LOW ALTITUDE WHILE TRANSITIONING from HIGH SPEED to LOW SPEED OVER WATER JUST BEFORE REACHING THE TARGET SHIP; and**
 - (d) DOING ALL of the Above WHERE the OTHER SORTIE PILOTS EACH DISCUSSED THAT MORNING on HOW EVERYTHING BELOW 1000' AGL was "A VISUAL ILLUSION" – The WATER WAS "LIKE A MIRROR" as the SUN ROSE THAT MORNING.**

MAJOR WILLIAM J. MONAHAN

Virginia AIR NATIONAL GUARD, Richmond IAD, 192d TFG, 149 TFS

TIME of IMPACT: February 09, 1982, Between 0929 and 0933

**CONTAINING ORIGINALLY EXCLUDED INFORMATION ON THE A-7D's
AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)**

On the morning of 9 February 9 1982, a flight of three 192d TFG A-7Ds left Byrd International Airport, Richmond, Virginia, and proceeded to the Dare County, North Carolina,

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 2

Navy Bombing Range located on Pamlico Sound, adjacent to the Outer Banks. The flight's mission was to conduct an air-to-ground sortie at RS313. Stumpy Point Gunnery Range.

As relevant background, the prior Summer of 1981, the 192d TFG had just received the A7-Ds from another unit (Previously, the 192d TFG / 149th TFS pilots flew F-105Ds). On or about August 10, 1981, the 192d TFG placed Major William J. Monahan's A-7D (SN 72-0233) in Red-X status, where a significant number of unrelated, significant service repairs were required. *Please see* Exh. 003, Tab H-1 to H-2. On 19 December 1981, SN 72-0233 was released from Red X status upon acceptance of its inspection. On that same day, a Functional Check Flight (FCF) was conducted, which FCF demonstrated that SN 72-0233 was not flight worthy. *Please see* Exh. 003, Tab H-2. The FCF revealed multiple, significant malfunctions and/or failures of the Automatic Flight Control system (AFCS) occurred on the FCF, and SN 72-0233 was grounded until at least 4 February 1982, five days prior to the 9 February 1982 sortie. *Please see* Exh. 003, Tab H-2 to H-3. As a final note: The prior F-105Ds did not have an AFCS, which was new to the 192d TFG/149th TFS, including to the 192d Material Squadron Maintenance Technicians.

Captain Herbert T. Arnold, was the lead in the three-aircraft sortie, and was taking a Tactical Qualification Flight Check. *Please see* Exh. 07, Tab U-2, U-5. Major William C. Jones was Captain Arnold's flight examiner. *Please see* Exh. 07, Tab U-2. As a key part of the flight check, Captain Arnold prepared and briefed the flight plan for the mission, which was an early morning, low altitude employment over water. *Please see* Exh. 07, Tab U-2, U-5; *see also* Exh. 05, Tab K-3 and Tab K-4. Captain Arnold's flight plan set Instrument Flight Rules (IFR) for the mission. *Please see* Exh. 05, Tab K-3 to K-4 and Exh. 07, Tab U-2, U-5, and U-7. In this flight plan, Captain Arnold was Fury 11, and, along with Major Jones (Fury 12), were scheduled to fly the Navy Dare 2 Plan, which was a low altitude flight to the target ship to be bombed on Pamlico Sound, Navy Dare Range, North Carolina. Major Monahan (Fury 13) was to fly at medium altitude, where upon approaching within several miles of the target ship, would descend to low altitude over the water, make a dry run clearing pass to ensure the target ship was devoid of civilians, notify Fury 11 and 12 that the ship was clear, and then "act as an adversary during the ingress of Fury 11", who, at low altitude over the water, would "make the first attack hot." *Please see* Exh. 07, Tab U-2. Low altitude rules of engagement (ROE) were discussed during the briefing due to the inherently dangerous proximity of the aircraft to the water and the level of precision required to avoid potential for surface collision. *Please see* Exh. 07, Tab U-2, U-5, and U-7. As the flight plan was an IFR mission, all pilots were to rely only upon their flight instruments until cancelled to enable visual clearance of the target and adversarial maneuvering. As of this day, Major Monahan had more than 3,700 flight hours, 62 of which were in the A-7D and K models. *Please see* Exh. 02, Tab G-2.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 3

The A-7D flown by these pilots was equipped with an Automatic Flight Control System (AFCS). *Please see* Exh. 08, Chat GPT4 at pgs. 1-2. The cockpit window dashboard for this AFCS was the Head-Up Display (HUD), where altitude, provided by the radar altimeter, was displayed on the right side of the HUD. *Please see* Exh. 08, Chat GPT4 at pgs. 1-2. The purpose of a HUD is like the name says: to provide the pilot with all relevant flight readings, like altitude, so that the pilot may keep their “head up” – instead of looking down at instrument panels. For flying under 5,000 feet altitude, the A-7D Flight Manual advised pilots to use the HUD radar altimeter, noting that the radar altimeter in this altitude range was “highly accurate [] within plus or minus 5 feet or 5 percent of absolute altitude, whichever is greater.” *Please see* Exh. 09, A7-D Flight Manual at pgs. 4 and 5.

The A-7D AFCS was equipped with Forward Looking Radar (FLR), which emits radio waves, similar to the radar altimeter. *Please see* Exh. 08, Chat GPT4 at pg. 5. While the radar altimeter measures altitude, the FLR “scans the terrain ahead of the aircraft for obstacles or features.” *Please see* Exh. 08, Chat GPT4 at pg. 5. Low altitude missions in low to no visibility rely heavily on systems like the FLR to ensure the aircraft doesn’t inadvertently fly into the terrain. Without accurate ranging, the risk of controlled flight into terrain (CFIT) significantly increases. This makes the aircraft unsafe for these types of operations.” *Please see* Exh. 08, Chat GPT4 at pg. 7. A “fully operational FLR is critical for [low altitude] operations”, so much so, that the aircraft should be grounded or restricted from IFR low-altitude missions when the FLR is malfunctioning. *Please see* Exh. 08, Chat GPT4 at pg. 7. A malfunctioning FLR becomes far more dangerous where the radar altimeter is also inaccurate. And this danger is multiplied further where the flight is utilizing IFR where visibility is poor and/or deceptive. This is because the radar altimeter is the flight instrument providing the altitude readings to the FLR, which then displays simulated terrain in front of the aircraft to the pilot via the HUD. *Please see* Exh. 09, A7-D Flight Manual at pg. 4.

“The AFCS and radar altimeter [] played a[n important] role in terrain[/water] avoidance during low-level flights. If [][an accurately operating] radar altimeter detected that the aircraft was descending too close to the terrain[/water], [][an] AFCS [with a properly functioning FLR] would automatically adjust the aircraft’s pitch or thrust to avoid collision, or at least alert the pilot through warning systems.” *Please see* Exh. 08, Chat GPT4 at 2.

Additionally, the A-7D had a single hydraulic system, which controlled the flight controls (e.g., ailerons, elevators, rudder, and other control surfaces) as well as the speed brakes. *Please see* Exh. 08, Chat GPT4 at pg. 10. A “significant vulnerability” of the A-7D’s single hydraulic system was that a single failure of any part of the hydraulic system could lead

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 4

to a catastrophic failure of the entire AFCS for the A-7D. *Please see* Exh. 08, Chat GPT4 at pg. 12.

There is nothing in the Aircraft Accident Report to indicate that prior to the February 9, 1982 departure of Fury 11-13, Captain Arnold, Major Jones, or anyone at the Unit reviewed aircraft maintenance records to ensure that all three aircraft were free from prior issues, recurrent, significant maintenance history, or unresolved maintenance that might warrant grounding an aircraft from participating in the dangerous, high-risk mission of a low altitude mission over water – especially under time of day and conditions where it is not uncommon for the water and horizon to appear as one: a visual illusion day. *Please see generally*, Aircraft Accident Report. Nor is there anything in the Aircraft Accident Report to indicate that AFCS systems and supporting devices, like the radar altimeter, FLR systems, Fire Warning Light, or AMF Light were cleared as operational and safe under conditions that would be applied on a high-speed descent to low altitude over water like Fury 13 would be performing. *Please see generally*, Aircraft Accident Report. This is particularly concerning as Fury 13 would be completely dependent upon the AFCS as IFR rules were in effect via the Flight Plan on a low altitude mission, in visual illusion conditions, where precision navigation was critical as controlled flight into terrain (CFIT) in such situation was a very real safety concern. *Please see* ChatGPT4 at pg. 7.

The departure of 0913 was three minutes later than planned to stay on schedule “for the assigned [time on target] TOT of 0935.” *Please see* Exh. 05, Tab K-5; Exh. 07, Tab U-2 and U-5. To remain on schedule, all three pilots had to exceed the flight plan cruising speed of 440 nautical miles per hour or knots (KTs) by roughly 12%: That is, at an approximate rate of 493 KT. *Please see* Exh. 05, Tab K-3; *see also* Exh. 05, Tab K-5; Exh. 07, Tab U-2 and U-5. Fury 13 flew at a medium altitude per the flight plan. *See* Exh. 07, Tab U-2 and U-5; *see also* Exh. 07, Tab U-3. At 0929, Fury 11 and Fury 12 were “east bound just North of Navy Dare Range and just West of Pamlico Sound” (Exh. 07, Tab U-2) “about two minutes from the turn point” (Exh. 07, Tab U-5), when “Captain Arnold in Fury 11 asked Fury 13 if the target was clear.” Exh. 07, Tab U-2 and U-5. “Fury 13 said he was ‘not there yet’”. *Please see* Exh. 07, Tab U-2 and U-5. From Fury 11’s request to Fury 13, it appears that Fury 13 had not made up the lost three minutes as quickly as Fury 11 and Fury 12, and may have been slightly behind the TOT 0935 at that point.

Between 0929 and 0933, approximately three-plus miles NNE of the target ship, Fury 13 began to descend from a medium altitude to below 1000’ AGL until reaching low altitude immediately over the water to conduct his low-altitude over water clearing pass. *Please see* Exh. 04, Tab J-2 to J-3; Exh. 07, Tab U5. Captain Arnold’s Flight Plan required Fury 13 to be

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 5

at low altitude to engage Fury 11 on Fury 11's low altitude bombing run and by acting "as an adversary during the ingress for Fury 11" and following "low-altitude ROE" *Please see* Exh. 07, Tab U-2. The speed brake is an effective tool for a smooth, controlled deceleration on descent and before "transitioning to a low altitude environment [] where precise control is crucial." *Please see* Exh. 08, Chat GPT4 at 13. "Overall, the speed brake provides the pilot with a means of fine-tuning the descent and ensuring the aircraft's speed, attitude, and trajectory are optimal for a safe, controlled, and effective transition to low-altitude cruise or terrain-following flight." *Please see* Exh. 08, Chat GPT4 at 14. Any effect of the speed brake on the radar altimeter's accuracy, and therefore on the FLR and AFCS, could lead to a failure of situational awareness by the pilot.

At 0933, Fury 11 unsuccessfully attempted contact with Fury 13 and proceeded towards the target. *Please see* Exh. 07, Tab U-5. On approach to the target ship, Fury 11 remarked on the radio that "the water surface [on Pamlico Sound] was perfectly smooth [] 'a visual illusion day'". *Please see* Exh. 07, Tab U-3. Fury 11 noted that "[b[elow 1000' [above ground level] AGL, there was **not a horizon** and depth perception was difficult. [] A great day for **visual illusion**." *Please see* Exh. 07, Tab U-6.

Pursuant to FAA rules and consistent with the IFR Flight Plan, the FAA advises pilots to "have confidence in your instruments and ignore all conflicting signals" when these pilots encounter visual illusion conditions like those approaching the impact site and observed and remarked upon by Fury 11. *Please see* Exh. 10, FAA Guidance on Visual Illusion at p.4. Technical Order (TO) 1A-7D-1, the USAF A-7D Flight Manual (A-7D Flight Manual), directed pilots as follows: "Maximum use of the AFCS is recommended during instrument flight." *Please see* Exh. 09, A-7D Flight Manual at pg. 7.

After Fury 13 did not respond to repeated calls from Fury 11, Fury 11 and 12 continued a dry run of the attack with negative clearance from Fury 13 on the target. *Please see* Exh. 07, Tab U-6. Two and one-half to three miles from the target at a 37-degree heading, Fury 11 noticed what appeared to be a sandbar looking area. *Please see* Exh. 07, Tab U-6. After conducting three observations passes over the impact area, Fury 11 felt that Fury 13 had hit the water. Fury 11 initiated a safety and rescue (SAR) effort, but there was no survivor from the crash into the waters of Pamlico Sound. *Please see* Exh. 01, Tab A-1. The crash response team found no evidence of an ejection. *Please see* Exh. 01, Tab A-1.

The widely spread impact site area establishes that Fury 13 did not impact the water in a nosedown position and/or hit the water at an apparent angle. *Please see* Exh. 06, Tab R. This is evidenced by the wreckage debris area being spread approximately 1,500 feet apart – the distance of five football fields. *Please see* Exh. 06, Tab R. It is significant to this

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 6

observation that the bottom-nose of the A-7D is not much more than a very large air-dam.

Please see A-7D at pgs. 2-3.

After first bumping off the water's surface and leaving "assorted scraps" of wreckage, it was another 750 feet before any other aircraft parts were found: the Project Map Display System (PMDS) Tape. *Please see Exh. 06, Tab R.* The PMDS Tape stored flight data, such as altitude and airspeed, and was located in the avionics bay, on the bottom of the aircraft behind the front landing gear on the A-7D. *Please see Exh. 08, Chat GPT4 at pg. 17; see also Exh. 09, A-7D Flight Manual at 3.* Based on the wreckage locations to the initial impact area and the target, after the initial bump on the water, the A-7D entered an adverse yaw left, which general direction continued until final impact as demonstrated by the location of the remaining wreckage. *Please see Exh. 06, Tab R.* About 75' further, it appears the adverse yaw left resulted in a full, uncontrolled roll of the aircraft, which left behind the Upper Horizontal Tail (UHT) and Tail section of the aircraft. *Please see Exh. 06, Tab R.* Approximately 900'+ after initial minimal impact with the water, the engine, located in the rear fuselage of the A-7D, was found. *Please see Exh. 06, Tab R; see also Exh. 09, A-7D Flight Manual at pg. 3 (diagram displaying the engine location).* Only after travelling above the water's surface for approximately 1,000' after initial minimal impact, the nose, cockpit, and bulk of the aircraft impacted, leaving a 10' x 8' depression. *Please see Tab R.* The main landing gear were adjacent to this primary impact site and engine accessories and the tailpipe were strewn up to 500 feet further from the primary point of impact. *Please see Tab 4R.*

Operating pursuant to an IFR flight plan, Fury 13 failed to safely descend from medium altitude, through 1000' AGL where the horizon was indistinguishable from the mirror-like water. Fury 13, however, *almost* did so, leveling out of the descent and travelling for up to 1000' to 1500' along the water's surface before fully impacting. And Major Barry's report finding that the pitch actuator(s) was/were in a "neutral position", indicates that Major Monahan believed that he was finishing a controlled, normal level-off from a high-speed descent – there was no panic attempt to pull up. *Please see Exh. 06, Tab A-002.* This is *prima facie* evidence that faulty instrument readings that Major Monahan had to rely upon in the prevailing visual conditions were responsible for the crash.

Air Force Technical Order (AFTO) 781s document the maintenance, repairs and inspections performed on a particular aircraft. The AFTO 781 for SN 72-0233, compiled from the Aircraft Historical Record File and the MMICS Computer Products (as the 781 forms binder was reported as destroyed with the aircraft in the crash) shows the following major maintenance issues with Fury 13's A-7D in the 180+ days prior to its last mission on February 9, 1982:

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 7

- From August 10 through December 17, 1981, the aircraft was in Red X status after being received by the 192d TFG in non-flight-worthy condition.
 - During the Red X period a significant number of major maintenance actions were taken on the aircraft, including for example:
 - 16 Nov 81, Trailing Edge Flaps Inoperable. Corrective action: Replaced Circuit Card;
 - 18 Nov 81, rudder servo leaking. Corrective Action: “removed and replaced rudder servo”.

Please see Exh. 03, Tab H-1 to H-2.

Note1: The rudder servo was a critical part of the rudder control system on the A-7D, to help the pilot control yaw. *Please see Exh. 08, Chat GPT4 at pg. 18.*

- 17 Dec 81, the maintenance inspector performed an Aircraft Acceptance Inspection, and found SN 72-0233 to be ready for flight and free of from major maintenance issues. The Unit removed SN 72-0233 from Red X status. *Please see Exh. 03, Tab H-2.*
- 19 Dec 81, a single Functional Check Flight (FCF) was performed to verify the functionality of all systems. The aircraft was released from the FCF the same day. The following major maintenance issues were identified during that flight, including:
 - AFCS “ACCEL” YAW actuator does not move to left as it should. Corrective Action: 24 Dec 81, performed balance and ops check IAW 1A-7D-2-9.
 - AFCS to Center ball in flight, need one unit right rudder. Corrective Action: 6 Jan 82, performed balance and ops ck IAW 1A-7D-2-9.
 - When the speed brake is estended (sic), radar altimeter lock on to approximately 30 degrees. Corrective Action: 6 Jan 82, removed and replaced **RT-1046** ops check good IAW 1A-7D-2-12.
 - The angle of the radar altimeter should not have been affected by the speed brake, but the accuracy of the radar altimeter could be adversely affected by a power surge and/or electromagnetic interference (EMI) arising from application of the speed brake and/or damage to internal circuits. *Please see Exh. 08, Chat GPT4, at pg. 21.* In any event, there is

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 8

nothing in the AIRCRAFT ACCIDENT REPORT to indicate that the speed brake and/or radar altimeter correlation was ever flight checked.

- Radar altimeter read approximately 250 degrees low-RA 4160 (RT-1046%) BARO 4476. Corrective Action: 6 Jan 82, removed and replaced RT-1046, ops check good IAW 1A-7D-2-12.
 - The angle of the radar altimeter should not have been affected by the speed brake, but the accuracy of the radar altimeter could be adversely affected by a power surge and/or electromagnetic interference (EMI) arising from application of the speed brake and/or damage to internal circuits. *Please see* Exh. 08, Chat GPT4, at pg. 21. In any event, there is nothing in the AIRCRAFT ACCIDENT REPORT to indicate that the speed brake and/or radar altimeter correlation was ever flight checked.
- FLR in priority, no FLR ranging at release (VIS Attack or CCIP). Corrective Action: Write up left open due to Unit's lack of test equipment. *Please see* Exh. 03, Tab H-2 to H-3; *see also* Exh. 08, Chat GPT4 at pgs. 6, 8-9.
 - No ranging by the FLR in *any* mode could have serious effect on instrument readings for orientation during level-off over water.
- 21 Dec 81, the rudder servo was leaking again. Corrective Action: "removed and replaced rudder servo." *Please see* Exh. 03, Tab H-2.
- 22 Dec 81, rudder servo valve leaking beyond limits. Corrective Action: "removed and replaced rudder servo." *Please see* Exh. 03, Tab H-2.
- 4 Feb 82, first flight.
 - Fire Warning Light INOPERable. No record and recollection that the Fire Warning Light INOP was ever repaired or addressed. The last record available – five days before the aircraft's final flight - indicates that the Fire Warning Light was inoperable. *Please see* Exh. 03, Tab H-3.
- 5 Feb 82 and 6 Feb 82. First flight, no discrepancies. *Please see* Exh. 03, Tab H-3.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 9

As demonstrated above and below, there were serious, unresolved issues regarding the maintenance performed on critical aircraft systems by the Unit. The Unit's failure to ground SN 72-0233 and place it back into Red X status is clear. On 9 February 1982, the Unit cleared this aircraft for an IFR medium to low altitude engagement. *Please see* Exh. 003, Tab H-2. SN 72-0233 had never flown a single mission at the 192d TFG. *Please see* Exh. 003, Tab H. On 19 December 1981, the day the 192d Material Squadron (Maintenance) inspected SN 72-0233, it cleared it from Red-X Status. *Please see* Exh. 003, Tab H-2. That same day, SN 72-0233 failed its FCF, because the FCF revealed significant repairs that were required regarding multiple flight systems on the reliability of which the AFCS was dependent for safe, operational flight. *Please see* Exh. 003, Tab H-2. SN 72-0233 was only cleared for its first post-FCF test flight five days prior to being approved by the 192d Material Squadron (Maintenance) to fly an IFR mission on a visual illusion day with a high-speed flight plan, requiring a high-speed descent from medium altitude to low altitude. *See generally*, Exh. 003, Tab H-3. Unsurprisingly, the above performance and related decisions resulted in Major Monahan's death. In particular, there are several key issues that are illustrative:

1. Instead of addressing why the radar altimeter readings read as if the AN 72-0233 was locked onto 30 degrees off center when the speed brake was extended – and read as if it was also 250 degrees off otherwise – the Maintenance Officer simply replaced part RT-1046.

Observation: Unfortunately for Fury 13, *inter alia*, RT-1046 was an Ultra-High Frequency (UHF) Radio Transceiver; ***NOT the Radar Altimeter.*** *See* ChatGPT pgs. 1-4. Accordingly, Fury 13 was sent on a dangerous high-speed, medium altitude to low-level altitude engagement in circumstances where the use of the speed brake was expected - with a malfunctioning radar altimeter that, upon engaging the speed brake, displayed false altitude to the pilot on the cockpit HUD (Nor were any diagnostics run to try to identify why the speed brake was adversely interfering with a completely unrelated AFCS system, the readings of the Radar Altimeter). The IFR flight plan, A-7D Flight Manual, and the FAA IFR rules for visual illusion days directed use of the radar altimeter as displayed on the right of the cockpit HUD. *Please see* Exh. 05, Tab K-3; Exh. 09, A-7D Flight Manual at page 7 (directing maximum use of the AFCS system, where, in this instance, the radar altimeter and FLR were the primary AFCS systems); and Exh. 10, FAA Visual Illusion Directive at page 4;

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 10

2. When it was identified that the FLR in priority was not functioning properly, the Maintenance Officer simply decided to leave the FLR in a malfunctioning state and clear the aircraft for flight: *because the Unit did not have the proper test equipment.*

Observation: The FLR system is crucial for safe flight in low-altitude environments, particularly in low visibility conditions, and its malfunction under such circumstances significantly increases the risk of CFIT – which is precisely what happened to Fury 13 on February 9, 1982 at or about 0933. *Please see Exh. 08, Chat GPT4 at pgs. 5-7; and*

3. When the Fire Warning Light was identified four days prior to flight as INOPERABLE, no known action was ever taken and the aircraft was sent on its February 9, 1982 low altitude engagement mission with no way of detecting an electrical fire (*e.g.*, when the speed brake was extended and an electrical situation occurred that was significant enough to cause the radar altimeter to malfunction).

Observation: “According to FAA regulations (14 CFR Part 91) and military airworthiness standards, all safety-critical systems, including fire warning systems, must be fully operational for an aircraft to be considered airworthy. If a fire warning light is inoperable, it could be considered a deficiency that compromises the aircraft's airworthiness.” *Please see Exh. 08, Chat GPT4 at pg. 19.* “Without a functioning fire warning system, an A-7D Corsair II would not be considered airworthy due to the significant safety risks involved. The fire warning system is essential for the pilot’s safety, and any inoperable critical warning system would require repair before the aircraft is cleared for flight.” *Please see Exh. 08, Chat GPT4 at pg. 19.*

Based on all of the facts contained in the record, SN 72-0233 should have been grounded in Red X status pending major maintenance diagnostics and accurate repairs and adjustments that ensured that critical systems like the radar altimeter, the FLR, the Fire Warning Light, and repeated, uncorrected hydraulics issues were properly diagnosed, identified, and corrected.¹ Under no circumstances was this aircraft remotely fit for a low-

¹ A strong argument could be made that the 192d TFG Material Squadron Maintenance Technician working on SN 72-0233, in replacing the rudder servo – three (3) times – because the “rudder servo was leaking” [even after the rudder servo’s multiple, new part replacements], and never running through a troubleshooting checklist (*e.g.*, are the hydraulic lines dry damaged; is there too much

AIRCRAFT ACCIDENT INVESTIGATION REPORT

Re: 9 February 1982 Flight of A7-D, SN 72-0233 (Fatal)

Virginia Air National Guard, 192d TFG, 149 TFS

Pilot: Major William Jay Monahan

Page 11

altitude, IFR engagement in visual illusion conditions. The fact that the AFCS did not autocorrect to avoid the impact with the water – as the AFCS is supposed to do when fed accurate radar altimeter readings - only reinforces this conclusion.

Bottom Line: This crash was not pilot error.

Very respectfully,

Will Monahan

William J. Monahan
GA Bar No. 801028

pressure in the hydraulic line system; etc.) – **at best** – demonstrated a lack of methodical action in practice as it relates to his/her maintenance of SN 72-0233. *Please see* Exh. 003, Tab H-2 to H-3. If flight and/or maintenance records for SN 72-0233 revealed that prior to August 1981, SN 72-0233 had not been flown for a significant period of time, the inside of the hydraulic lines and/or seals in hydraulic line related equipment may well have been dry rotted, weakened, or worse.

AIRCRAFT ACCIDENT REPORT

AF FORM 711 - USAF MISHAP REPORT

Exhibit 01
TAB A
AIRCRAFT ACCIDENT REPORT

NR

AIRCRAFT ACCIDENT REPORT
ACCIDENT INVESTIGATION REPORT

SUMMARY OF FACTS:

On 9 February 1982 at 0913 a flight of three Virginia Air National Guard A-7Ds left Byrd International Airport and proceeded to the Dare County bombing area in North Carolina. The flight's mission was to conduct an air-to-ground sortie at R5313, Stumpy Point Gunnery Range. Specifically, Captain Arnold (Fury 11) and Major Jones (Fury 12) were to conduct a low level flight and tactical evaluation. Major Monahan (Fury 13) was to accomplish a target clearing pass on the scuttled target ship in the restricted area.

The start and launch of the aircraft was routine and uneventful. Fury 13 departed Richmond with the flight, then proceeded single ship to the range as planned. Radio contact between the three aircraft was made during the last portion of the low level approach. Fury 13 was to arrive at the target early and clear the flight into the target area for a bomb pass. During the final phase of the target run, several attempts to establish contact with Fury 13 for final clearance was made, but no response was received from Fury 13. Without clearance, a dry pass was made over the ship by Fury 11 and 12. As they left the target area, they noticed a disturbed area in the water approximately three miles northeast of the target.

The final leg of the flight was made directly over Pamlico Sound. Both pilots reported good visibility, but that a low level haze obscured the horizon over the water. The surface winds were calm and the water surface was smooth and looked like a mirror. Below 1000' AGL, there was no visible horizon and depth perception was difficult.

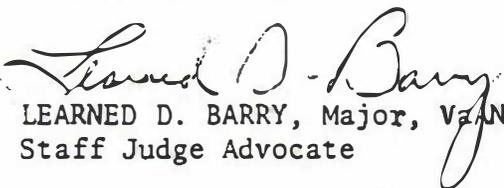
Immediately after the pass over the target by Fury 11 and 12, radar agencies and emergency airfields were contacted to determine the location of Fury 13. When no contact was made with Fury 13 on any frequency, Fury 11 initiated a SAR effort which determined that Fury 13 had impacted in the water with no survivor. Fury 12 remained in the area until the Coast Guard responded and confirmed the crash site to be in the disturbed area northeast of the target. The aircraft suffered massive impact damage. The crash response team could not find any evidence of an ejection.

The aircraft in question, SN 72-0233, had been received from the Air Force and had undergone an extensive transfer acceptance inspection from 10 August 1981 to 17 December 1981. All engine required maintenance had been performed to date. Flights immediately prior to the incident noted no discrepancies for the aircraft. The remains of the aircraft and its engine were forwarded to Tinker AFB on 25 February 1982 for examination by the depot level system managers. Their investigation of the engine and engine accessories did not disclose any type of materiel and/or primary failure except for impact damage. The position of the regulator piston indicated that the engine was operating in a high power mode at time of impact. It was determined by the investigators that the engine did not contribute to the aircraft mishap.

The hydraulic systems and flight control components were also analyzed. There was no evidence found that would indicate that any of the systems were not serviceable at time of impact. Analysis of the pitch and yaw control actuators show no significant deflection from a neutral position. No spoiler or aileron actuators were recovered. Weight and balance documents verify that the aircraft was properly loaded. Diagrams and photographs contained herein indicate the relative position and appearance of the wreckage.

The pilot of Fury 13, Major William J. Monahan, was fatally injured. Major Monahan had accomplished 3776.5 hours of flying time and was in excellent physical and psychological condition. He had received 62 hours of training in the A-7D and K models. Flight training records indicated that Major Monahan was qualified to fly this mission. Mission preparation was properly conducted and all preflight information filed as required.

The authority for this investigation is AFR 110-14, ANGR 110-14 and ANG Special Order M-2-Va.


LEARNED D. BARRY, Major, VAANG
Staff Judge Advocate

AIRCRAFT ACCIDENT REPORT

FLIGHT AND PERSONNEL RECORDS

TAB G

Index	G-1
Aircraft Flying Hour Summary	G-2
Individual Flight Record Transfer	G-3
Individual Data Summary	G-4

PERSONAL DATA - PRIVACY ACT OF 1974

FH-AH,

SSAN

AIRCRAFT FLYING HOURS (PA)

CREW POS

M D S

CREW POS AND MDS MAY BE
MASKED WITH AN ASTERISK

P

*

NAME MONAHAN WILLIAM J

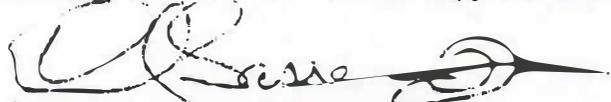
GRADE

04 UNIT

0149

MDS	C	SEQ	TOTAL	PRIMARY	SECOND	INSTR	EVAL	OTHER	CMBT	CMBT-SUI
A007D	P	01	00041.9	00041.9	0000.0	0000.0	0000.0	0000.0	0000.0	0000.0
A007K	P	02	00020.1	00020.1	0000.0	0000.0	0000.0	0000.0	0000.0	0000.0
F084	P	00	00200.8	00200.8	0000.0	0000.0	0000.0	0000.0	0000.0	0000.0
F105	P	00	01128.7	01011.9	0031.8	0085.0	0000.0	0000.0	0000.0	0000.0
T033	P	00	00032.3	00029.0	0003.3	0000.0	0000.0	0000.0	0000.0	0000.0
T037	P	00	02350.9	00267.3	0012.7	2070.9	0000.0	0000.0	0000.0	0000.0
T038	P	00	00001.8	00000.0	0001.8	0000.0	0000.0	0000.0	0000.0	0000.0
TOTAL			03776.5	01571.0	0049.6	2155.9	0000.0	0000.0	0000.0	0000.0

I certify this to be a true copy of the original.



EMIL LASSEN, III, 1LT, USAF
Recorder

[REDACTED]

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED 82 FCU 18

INDIVIDUAL FLIGHT RECORD (PA) AS OF 82 FEB 17

PCN SA002-G08

TRANSFER

NAME: MONTANAN WILLIAM J
UNIT: 0149 TFS

WING: 0192 TFG

SSAN: [REDACTED]
COMMAND: OT

RANK: MAJ
RJFT: 2

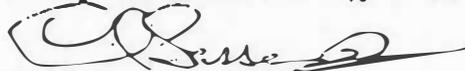
PRIMARY CREW POSITION: P
SYSTEM CONTROL: 1

PRIMARY AIRCRAFT: A007

MDS	DATE	DUTY POSN	PRIM	SEC	INSTR	EVAL	OTHER	TOTAL	SORTIES	NITE	INST	SIM- INST	RES	SPC IND	FRDS CONVERSION	
															DUTY POSITION	HOURS
A007D	820209	FP	0.4	0.0	0.0	0.0	0.0	0.4	1	0.0	0.0	0.0	1		FP	0.4
SUMMARY			0.4	0.0	0.0	0.0	0.0	0.4	1	0.0	0.0	0.0				0.4

Exhibit 02
Tab G-003

I certify this to be a true copy of the original.



EMIL LASSEN, III, 1LT, USAF
Recorder

HAGG80: 01338

END PAGE 2

END PAGE 1

G-3

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED 82 FEB 18

INDIVIDUAL FLIGHT RECORD

AS OF 82 FEB 17

PCN SA002-G08

TRANSFER

NAME: MCNAHAN WILLIAM J
UNIT: 0149 TFS

WING: 0192 TFG

SSAN: [REDACTED]
COMMAND: 0T

RANK: MAJ
RJET: 2

POSITION: P
CONTROL: 1

PRIMARY AIRCRAFT: A007D

MDS	DATE	DUTY POSN	PRIM	SEC	INSTH	EVAL	OTHER	TOTAL	SOFTIES	DUTY	SIM-INST	RES	SPC IND	FRDS CONVERSION	
														DUTY POSITION	HOURS
A007D	820209	FP	0.4	0.0	0.0	0.0	0.0	0.4	1		0.0	1		FP	0.4
SUMMARY			0.4	0.0	0.0	0.0	0.0	0.4	1		0.0				0.4



G-3

I certify this to be a true copy of the original.

EMIL LASSEN, III, 1LT, USAF
Recorder

NAOGR0: 81338

END PAGE 2

END PAGE 1

PERSONAL DATA-PRIVACY ACT OF 1974

Exhibit 02
Tab G-004

PERSONAL DATA-PRIVACY ACT OF 1974

PREPARED: 82 FEB 06

AFORMS INDIVIDUAL DATA SUMMARY (PA)

AS OF: 82 FEB 06

PCN 5A002-G01

NAME: MONAHAN WILLIAM J

GRADE: MAJ

SSAN: [REDACTED]

DOB: 400508

WING: 0192 TFG

UNIT: 0149 TFS

PERSONAL DATA

HOME PHONE NO: [REDACTED]
 STREET: [REDACTED]
 CITY/STATE: [REDACTED]
 ZIP CODE: [REDACTED]
 DUTY PHONE NO: 411
 OFFICE SYMBOL: OPS
 MBR SVC CAT: N
 ORIG AERO RATING: C = PLT
 EFFECTIVE DATE: 640903
 CURR AERO RATING: A = CMD PLT
 EFFECTIVE DATE: 790903
 ADDN AERO RATING: = NONE
 EFFECTIVE DATE:
 DUTY AFSC: 014912
 EFFECTIVE DATE: 820116
 PAS CODE: M40TFMQX
 SHORT TOUR INDICATOR:
 DEROS:
 DOR:
 DOS/OBLIGATION: 888888
 DATE DEP LAST DUTY STA:
 OATE ARR THIS STATION:
 PERSONNEL RECORD STATUS:
 PROJECTED DAFSC:
 PROJECTED PAS CODE:
 PROJ DUTY LOCATION:
 PROJ DEPARTURE DATE:
 PROJ REPORTING DATE:
 LAST PHYS DATE/CODE: 810207/8
 DUE DATE: 820531
 PHYS AVAIL DATE/CODE: 811112/A
 PHYSIOLOGICAL TNG DATE: 810523
 DUE DATE: 840531
 LEAVE BALANCE: 00-0

SECURITY CLEARANCE: Top SECRET
 SECURITY CLEARANCE OATE: 700801
 RESTRICTED AREA BADGE TYPE:
 RESTRICTED AREA BADGE #:
 POI INOEX/DATE: 032/B20101

JUMP STATUS
 PARACHUTE RATING/DATE: /
 JUMPMASTER QUAL/DATE: /
 JUMP STATUS:
 JUMP DUTY ACCUM MONTHS:

SYSTEMS MANAGEMENT
 HOST DSM CODE: CVVM
 DEPLOYED OSM CODE:
 DEPLOYED DATE:
 REDEPLOYED DATE:
 BJETS CODE: 2
 SYSTEM CONTROL CODE: 1
 SPECIAL CAT ID:
 RECORDS REVIEW ACC DATE: 811205
 RECORDS REVIEW DUE DATE: 820531
 RECORDS REVIEW STATUS CODE: N

AIRCRAFT ASSN DATA
 ACFT OP LOC: CVVM BAC: C
 CMO OF ACFT: OT ACFT SVC CAT: N
 PRIMARY ACFT: A0070
 FLT DUTY CERT CODE: FP
 CATEGORICAL FLYING WAIVER:

ACIA DATA
 AERO ORDER TERM DATE: 880711
 OFFICER SERVICE DATE: 630712
 AVIATION SERVICE DATE: 631022
 AVIATION SERVICE CODE: 3A
 EFFECTIVE OATE: 811022
 PRIOR ASC: 2A
 EFFECTIVE DATE: 751022
 PRIOR ASC:
 EFFECTIVE DATE:
 RPP CODE: 6
 EFFECTIVE DATE:
 FAC:
 PRE-ACIA-OFOA: 126
 OFEDA GATE 12: 143
 OFEDA GATE 18: 215
 OFEDA TO DATE: 215
 OFEDA CONTROL DAY: 21
 OFEDA CONTROL MONTH: 016

TRAINING/QUAL STATUS
 USAF MAJCOM
 CODE DATE CODE DATE

INCENTIVE PAY DATA
 LAST MPO DATE:
 LAST MPO RSN:
 MPO AOSN:
 DROT NUMBER:
 PAY STOP DATE:

DATE-LAST-OFDA-FLT: 820128
 DATE-PREV-OFDA-FLT: 820108

I certify this to be a true copy of the original.

EMIL LASSEN, III, 1LT, USAF
Recorder

NAOG00: 82015

PAGE 7

ANG PAGE 7

AIRCRAFT ACCIDENT REPORT

AFTO FORM 781 SERIES

TAB H.

The following maintenance data was extracted from the Aircraft Historical Record File and the MMICS Computer Products. The 781 forms binder was destroyed in the mishap. The aircraft had undergone an extensive transfer acceptance inspection from 10 Aug 81 to 17 Dec 81.

OPEN DISCREPANCIES IN AFTO 781-A

1. NONE

OPEN DISCREPANCIES IN AFTO 781-K

1. NONE

INSPECTIONS NOT COMPLIED WITH

1. NONE

TIME CHANGE ITEMS OVERDUE

1. NONE

TCTOs NOT COMPLIED WITH-AIRCRAFT

1. TCTO 1A-7D 879 Rework of A-7D main landing gear trunion pin assemblies.
2. Aircraft has not received Special Project 81-02 Aural Radar Altimeter Warning System.

TCTOs NOT COMPLIED WITH-ENGINES

1. NONE

SIGNIFICANT AFTO 781A ENTRIES

1. Aircraft 72-0233 was placed on Red X status for Virginia Air National Guard transfer acceptance inspection 10 Aug 81. Acceptance was completed 17 Dec 81. The following major maintenance actions took place during the inspection.
2. 6 Aug 81, TCTO 1A-7D-882 inspection of A-7D canopy latch assembly due. Corrective Action: 6 Aug 81, TCTO complied with.

3. 6 Aug 81, STCTO 1A-7D-852 replacement of APS ECA modules.
Corrective Action: 6 Oct 81, TCTO complied with.
4. 14 Aug 81, Survival kit and parachute removed for inspection.
Corrective Action: 18 Aug 81, inspection complied with I.A.W.
1A-7D-2-2c1-2.
5. 25 Aug 81, TCTO 1A-7D-870 inspection and replacement of engine throttle control panel and level assembly.
Corrective Action: Complied with 25 Aug 81.
6. 6 Nov 81, STCTO 1A-7D-872 inspection of fuel tube.
Corrective Action: Complied with 6 Nov 81.
7. 16 Nov 81, **Trailing edge flaps INOP.**
Corrective Action: 5 Dec 81, installed circuit card, system ops checked good.
8. 17 Nov 81, Right UHT actuator leaking.
Corrective Action: 23 Nov 81, removed and replaced actuator, ops check, pressure check, and rig check all good.
9. 18 Nov 81, **rudder servo leaking.**
Corrective Action: 8 Dec 81, removed and **replaced rudder servo**, ops check and pressure check good.
10. 18 Nov 81, right hand outer panel leading edge flap inboard actuator swivel leaking.
Corrective Action: 20 Nov 81, removed, repaired and reinstalled, ops check good.
11. 19 Nov 81, left hand UHT cylinder leaking.
Corrective Action: 30 Nov 81, removed and replaced cylinder, ops check, pressure check and rig check all good.
12. 17 Dec 81, **aircraft acceptance** inspection completed.
13. 21 Dec 81, **rudder servo leaking.**
Corrective Action: 21 Dec 81, removed and **replaced servo**, leaks on ops check.
14. 22 Dec 81, **rudder servo valve leaking beyond limits.**
Corrective Action: 3 Feb 82, removed and **replaced rudder servo**, ops check and pressure check good.
15. 30 Dec 81, URGENT ACTION TCTO 1A-7D-889 inspection of A-7D trailing edge flap and rib assembly.
Corrective Action: 24 Dec 81, complied with by message, no defects noted.
16. 30 Dec 81, URGENT ACTION TCTO 1A-7D-890 and 890c inspection of A-7D leading edge flap actuator and end assembly.
Corrective Action: 31 Dec 81, complied with, no defects noted.

SIGNIFICANT AFTO 781 ENTRIES-30 DAYS

1. 19 Dec 81, functional check flight (FCF).
 - a. AMF override switch INOP
Corrective Action: 24 Dec 81, repaired broken wire at A301, systems ops checked good IAW 1A-7D-2-9.

- b. AMF light goes out intermittently in flaps up position.
Corrective Action: 24 Dec 81, could not duplicate malfunction, systems ops checked ok IAW 1A-7D-2-9.
- c. Air conditioning, in auto, pressure and noise oscilation, manual, ok.
Corrective Action: 28 Dec 81, trouble-shot system, found leak at donut seals, reposition donut seals, check good IAW 1A-7D-2-3.
- d. AFCS "ACCEL" YAW actuator does not move to left as should.
Corrective Action: 24 Dec 81, performed balance and ops check IAW 1A-7D-2-9.
- e. AFCS to center ball in flight, need one unit right rudder.
Corrective Action: 6 Jan 82, performed balance and ops ck IAW 1A-7D-2-9.
- f. When speed brake is estended, radar altimeter lock on to approximately 30 degrees.
Corrective Action: 6 Jan 82, removed and replaced RT-1046 ops check good IAW T.O. 1A-7D-2-12.
- g. Radar altimeter read approximately 250 degrees low-RA 4160 (RT-1046%) BARO 4476.
Corrective Action: 6 Jan 82, removed and replaced RT 1046, ops check good IAW 1A-7D-2-12.
- h. FLR in priority, no FLR ranging at release (VIS Attack or CCIP).
Corrective Action: Write up left open due to unit's lack of test equipment.
- i. Left wing fold actuator swivel fitting leaking.
Corrective Action: 22 Dec 81, symbol entered in error. Write-up transferred to 781A page 4, block 3. 3 Jan 82, removed and replaced left wingfold swivel, ops check and pressure check good.
- j. Aircraft released from FCF 19 Dec 81.
2. 4 Feb 82, first flight.
- a. Fire warning light INOP.
Corrective Action: This information destroyed in AFTO 781s in crash.
3. 5 Feb 82, first flight.
- a. No discrepancies.
4. 6 Feb 82, first flight.
- a. No discrepancies.


GINA R. SMITH, LT, USAF
Maintenance Officer

AIRCRAFT ACCIDENT REPORT

TECHNICAL AND ENGINEERING EVALUATIONS OF MATERIEL (DOD)

TAB J

Index	J-1
Engine TDR Prelim/Final Report	J-2
Pneudraulics and Flight Control	J-8
Fuel Control TDR	J-10
Fuel Governor TDR	J-12
Fuel Pump TDR	J-13
Air Flow Regulator TDR	J-14

DIR MAT MGT TINKER AFB OK//MMP//
1TFW LANGLEY AFB VA//SEF//
INFO HQ AFLC WPAFB OH//LOA//
HQ AFISC NORTON AFB CA//SER//
ACCT AF-ACXJRF

UNCLAS E F T O

~~REDACTED~~ THIS IS A LIMITED USE REPORT. SEE AFR 127-4
FOR RESTRICTIONS.

FOR COL. F. FITZSIMMONS

SUBJ: ACFT CLASS A MISHAP A7D 72-0233, TF41-A-1B ENGINE, S/N 141110,
A7D ACFT 72-0233

ENGINE TDR PRELIMINARY AND FINAL REPORT: ENGINE RECORDS REVIEWED
REVEALED THIS ENGINE UNDERWENT A MAJOR OVERHAUL OCT 80. ALL TCTO'S
RELEASED WERE COMPLIED WITH AT TIME OF OVERHAUL. TOTAL TIME WAS 90.8
HOURS TSO (WHICH DOES NOT INCLUDE THE LAST FLIGHT).

1. PRELIMINARY REPORT RECEIVED INDICATED THAT A7D ACFT 72-0233
INVOLVING TF41-A-1B ENGINE, S/N 141110, WAS INVOLVED IN A CLASS A
MISHAP RESULTING IN LOSS OF ACFT. PRIOR TO THIS ACCIDENT, IT WAS
REPORTED THAT THE ACFT WAS IN DESCENDING FLIGHT ANGLE PROCEEDING
TOWARD A TARGET AREA, ATTEMPTS TO ESTABLISH CONTACT WERE NOT SUCCESS-

MMMSDC MMPM MMPRT MAE MAT MAQ CC-ALC/RF

Darrell L. Lane
DARRELL L. LANE/AERO ENGR
MMPRE/3551/nf/26 FEB 82

D. E. Lane 26 Feb 82

HENRY M HOLLAND, Deputy Chief
Propulsion Management Division
Directorate Materiel Management

M. J. ...
Jack Smith
MMPRTA
David ...
UNCLASSIFIED
John H. ...
MMPR
...
MMPRE
2/26/82

FUL, AND IMPACT AREA REVEALED ONLY A DARK BROWN AREA WITH DEBRIS SCATTERED THROUGHOUT. THE IMPACT AREA WAS APPROXIMATELY THREE MILES NNE OF TARGET.

2. REMAINS OF THIS ENGINE WERE FORWARDED TO TAFB/OC-ALC, RECEIVED ON 25 FEB 82 AND A TDR INVESTIGATION WAS INITIATED. THIS TDR INVESTIGATION WAS COMPLETED ON 26 FEB 82. THE ENGINE RECORDS DID NOT REVEAL ANY PROBLEMS. AVAILABLE SOAP {OIL ANALYSIS} DATA REVIEWED DID NOT REVEAL ANY ADVERSE OR INCREASING WEAR METAL TRENDS. AS RECEIVED INVESTIGATION OF ENGINE, MISCELLANEOUS DAMAGED PARTS AND ACCESSORIES REVEALED THIS ENGINE TO HAVE EXTENSIVE IMPACT AND CORROSION DAMAGE.

3. ENGINE ACCESSORIES AND DAMAGED PARTS RECEIVED WITH THE ENGINE WERE EXAMINED. EXAMINATION DID NOT DISCLOSE ANY TYPE OF MATERIAL FAILURE AND/OR PRIMARY FAILURE INDICATIONS EXCEPT FOR IMPACT DAMAGE. TDR OF LP GOVERNOR, MAIN FUEL CONTROL, HP FUEL PUMP, AND AIRFLOW CONTROL REGULATOR REVEALED ALL INTERNAL PARTS TO BE IN GOOD CONDITION. ALL DAMAGE WAS DUE TO IMPACT. THE REGULATOR PISTON IN THE AIRFLOW CONTROL REGULATOR WAS FOUND TO BE APPROXIMATELY ONE HALF TO THREE QUARTERS INCH FROM THE RETRACT POSITION. THIS WOULD INDICATE THAT THE ENGINE WAS OPERATING IN A HIGH POWER MODE AT TIME OF IMPACT.

4. TDR INVESTIGATION PERFORMED ON THIS ENGINE AND RESULTS OBTAINED

UNCLASSIFIED

ARE AS FOLLOWS:

{A} THE LP/IP COMPRESSOR ASSEMBLY, INTERMEDIATE SUPPORT ASSEMBLY, FORWARD AND REAR EXTERNAL MOUNTING, HIGH SPEED GEARBOX ASSEMBLY, ALL FUEL/OIL AND AIR TUBING, ELECTRICAL ACCESSORIES AND WIRING, FUEL MANIFOLD AND FUEL NOZZLE FITTINGS WERE NOT AVAILABLE FOR INVESTIGATION.

{B} REMAINS OF THE HP COMPRESSOR CASE SEGMENTS AND VANES EXHIBITED HIGH SPEED ROTATIONAL/INTERFERENCE AND RUB INDICATIONS IN CONJUNCTION WITH ROTOR BLADE FORWARD (AXIAL) DISPLACEMENT OF APPROXIMATELY TWO INCHES.

{C} HP COMPRESSOR ROTOR ASSEMBLY DISKS, SPACERS AND REMAINING BLADES EXHIBITED HIGH SPEED RPM INTERFERENCE/RUB INDICATIONS AND FORWARD AXIAL DISPLACEMENT. THE HP COMPRESSOR REAR SHAFT WAS FOUND TO HAVE FAILED IN TORSIONAL SHEAR AND HAD SEPARATED AT THE NO. 7 AND NO. 8 ROTOR DISK I.D. ASSEMBLY CONNECTION POINTS. THE LP/IP DRIVE SHAFT WAS TWISTED/BENT AND PROTRUDING OUT THE FORWARD REMAINS OF THE HP COMPRESSOR REAR DRIVE SHAFT.

{D} THE OUTER COMBUSTION CASE, COMBUSTION LINERS, AND HP TURBINE INLET GUIDE VANES WERE ALL FOUND TO EXHIBIT ONLY IMPACT DAMAGE. THE COMBUSTION CASE HAD BEEN GOUGED OPEN ON THE LEFT SIDE VIEWING THE ENGINE FROM THE REAR. SOME BROKEN SEGMENTS AND DEBRIS FROM THE

UNCLASSIFIED

UNCLASSIFIED

X 04

PP PP EEEE

MMPRT 261207 X

INTERMEDIATE SUPPORT ASSEMBLY WERE FOUND IN THE INTERIOR AREA OF THE COMBUSTION CASE.

{E} THE HP AND LP TURBINE BLADES, ALL ROTATING AND STATIONARY AIR SEALS, AND OUTER TURBINE BLADE SHROUD SEGMENTS WERE FOUND TO EXHIBIT HIGH SPEED ROTATIONAL INTERFERENCE, RUB, AND AXIAL (BOTH FORWARD AND REARWARD) DISPLACEMENT INDICATIONS. ROTATIONAL DAMAGE FOUND TENDS TO INDICATE HIGH ROTATIONAL SPEED AND ORBITING. THE HP TURBINE DRIVE SHAFT WAS FOUND TO BE TWISTED AND THE LP TURBINE DRIVE SHAFT HAD FAILED/SEPARATED IN TORSIONAL SHEAR AT THE HUB OF THE LP-1 TURBINE WHEEL JUST FORWARD OF THE SHAFTS ROTATING AIR SEAL POSITION. HP AND LP TURBINE BLADES AND VANES DID NOT EXHIBIT ANY MATERIAL FAILURES AND/OR THERMAL DAMAGE DISTRESS INDICATIONS.

{F} REMAINS OF THE EXHAUST CASE MIXER ASSEMBLY EXHIBITED ONLY IMPACT TYPE DAMAGE. THE ENGINE REAR MOUNT SUPPORT WAS BENT AND THE SUPPORT FAILED DUE TO IMPACT SHEAR FORCES. ONE FAIRING LOCATED AT APPROXIMATELY THE 10 O'CLOCK POSITION (VIEWING THE ENGINE FROM THE AFT) WAS FOUND TO HAVE IMPACT DAMAGE ON THE TRAILING EDGE. NO OTHER FAIRINGS EXHIBITED THIS TYPE OF DAMAGE.

{G} THE CENTER BEARING OIL FEED TUBE WAS FOUND TO BE TWISTED IN TORSION AND SEPARATED IN THE SAME LOCATION AS THE LP TURBINE DRIVE

UNCLASSIFIED

Exhibit 04
TAB J-005

SHAFT.

{H} ALL AVAILABLE ENGINE MAIN BEARINGS, I.E., NO. 2, NO. 3, NO. 4, NO. 5, NO. 6 AND NO. 7, WERE REVIEWED AND FOUND TO EXHIBIT ONLY ROTATIONAL AND IMPACT TYPE DAMAGE. THE NO. 7 BEARING AND BEARING CAVITY WAS FOUND WITH AN OIL RESIDUE ON THE INTERNAL SURFACES.

5. RESULTS OF THIS TDR INVESTIGATION DID NOT REVEAL ANY EVIDENCE OF MATERIAL FAILURES WHICH COULD BE CONSIDERED PRIMARY TYPE FAILURES. BASED UPON THE FINDINGS AND RESULTS OF THIS INVESTIGATION, IT HAS BEEN CONCLUDED THAT THIS ENGINE WAS OPERATING AT OR ABOVE 90 PERCENT RPM ENGINE SPEED AT THE TIME OF IMPACT. THEREFORE, IT HAS BEEN CONCLUDED THAT THIS ENGINE DID NOT CAUSE AND/OR CONTRIBUTE TO THE SUBJECT ACFT MISHAP.

6. THIS INVESTIGATION WAS PERFORMED AND COMPLETED WITH LT. G. SMITH, ACCIDENT BOARD MEMBER MAINT. OFFICER, IN ATTENDANCE. COPIES OF THIS ACCIDENT REPORT, ACCESSORY TDR REPORTS, ACCIDENT ENGINE PHOTOGRAPHS AND NEGATIVES WERE PROVIDED TO LT. G. SMITH PRIOR TO DEPARTURE FROM TAFB. FORMAL/FINAL COPY OF TDR REPORT WILL BE FORWARDED BY MAIL.

7. ACCIDENT ENGINE TDR INVESTIGATION HAS BEEN COMPLETED. THIS IS CLOSING ACTION ON ~~XXXXXXXXXXXXXXXXXXXX~~ SUBJECT ACFT CLASS A MISHAP A7D 72-0233. ENGINE PARTS WILL BE RETAINED BY OC-ALC PENDING DISPO-

UNCLASSIFIED

Exhibit 04
TAB J-006

UNCLASSIFIED

X 06 06

PP PP EEEE

MMPRT 261207 X

SITION INSTRUCTIONS FROM THE ACCIDENT BOARD. GIDEP/DPCCP ALERT
CONSIDERED AND DETERMINED NOT REQUIRED.

UNCLASSIFIED

Pneudraulics and Flight Controls Analysis concerning Class A mishap investigation of A-7D Aircraft, S/N 72-0233, which occurred on 9 February 1982 near Stumpy Point, North Carolina.

Items which were recovered were brought to Tinker AFB for teardown and analysis to determine flight control positions and operational status at time of impact. The results of our findings are listed by major systems.

1. Pneudraulics System:

Portions of all three system reservoirs were recovered.

a. PC-1 reservoir - Several pieces of this reservoir were received and they had sustained severe impact damage. Impact marks of the main piston on the housing place the piston approximately in the mid-stroke position. This indicates that system 1 still had a fluid supply.

b. PC-2 reservoir - Several pieces of this reservoir were received and they had sustained severe impact damage. Impact marks of the small piston (pressurization piston) in the bore of the large piston place the large piston in the mid-stroke position. This indicates that system 2 still had a fluid supply.

c. PC-3 reservoir - Several pieces of this reservoir were received and they had sustained severe impact damage. Impact marks of the main piston on the housing place the piston in the mid-stroke position. This indicates that system 3 still had a fluid supply.

d. Conclusions: All available evidence indicates that all three hydraulic systems were serviceable at the time of impact.

2. Pitch and Yaw Control Systems:

a. Left hand unit horizontal tail (UHT) actuator - This actuator had received moderate impact damage. The rod end was broken off, but it was recovered. The input levers had been bent over. Teardown revealed a piston impact mark on the inside of the cylinder wall which related to 8 degrees UHT trailing edge up. No evidence was found that would indicate that the actuator assembly was not operating at the time of impact.

b. Right Hand UHT Actuator - Only the broken off rod end and a portion of the attached piston rod were received. Based on the similarity of the breaks between the left hand and the right hand rod ends, it is determined that the right hand UHT was between 5 and 8 degrees UHT trailing edge up.

c. Rudder Actuator - This actuator had received only minor impact damage. Teardown revealed two sets of piston impact marks on the inside of the cylinder wall. One set of impact marks was in the "as received" position and corresponds to 11 degrees right rudder. The other set of impact marks (deeper than the "as received" set) corresponds to 2.5 degrees left rudder.

d. Pitch and Yaw Automatic Flight Control System (AFCS) Actuators - No determination could be made as to which actuator was installed in which position. The only way to determine this is to also receive the structural cages around these actuators.

(1) Actuator 1. This actuator had received severe impact damage. One of the two servovalves was missing and the cover on the other had been torn off. One of the two transducers was missing and the other was bent up. There was a gouge in the wall of one of the two lock piston bores. This gouge had broken all the way through the wall exposing an O-ring seal groove. This seal had then been blown out of its groove by hydraulic pressure. This indicates that hydraulic pressure was still available to this actuator during breakup. The lock pistons were also captured in the engaged position.

(2) Actuator 2. This actuator had received severe impact damage. One of the two servovalves was missing and the cover on the other had been torn off. Both of the transducers were bent down. Teardown was accomplished. We were unable to determine if this AFSC actuator was engaged or disengaged at the time of the impact. No evidence was found which would indicate that this actuator was not serviceable at the time of impact.

e. Conclusions: All available evidence indicates that the above pitch and Yaw system components were serviceable at the time of impact.

3. Roll Control System:

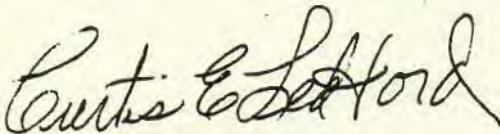
No spoiler or aileron actuators were received. The only roll system component received was the roll AFSC actuator. This actuator had received severe impact damage. Both servovalves were missing and one of the two transducers was missing. There was severe damage to the locking pistons which were in the disengaged (UP) position when received. The unit was disassembled. We were unable to determine if this AFCS actuator was engaged or disengaged at the time of impact. No evidence was found which would indicate that this actuator was not serviceable at time of impact.

4. Speed Brake:

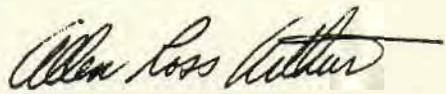
The speed brake actuator had received only moderate damage. The rod end was broken off and was not received. The actuator was received in the fully or nearly fully retracted position. This indicates that the speed brake was not extended.

5. Conclusion Summary:..

There was no evidence found during our investigation that would indicate PC-1, PC-2, or PC-3 hydraulic systems were not serviceable at time of impact. No evidence was found which would indicate that any of the flight control components were not serviceable at time of impact.



CURTIS E. LEDFORD
Equipment Specialist, GS-11
OC-ALC/MMIRAH/Tinker AFB OK
Autovon 735-3769 or 7015



ALLEN ROSS ARTHUR
Mechanical Engineer, GS-12
OC-ACL/MMIRAH/Tinker AFB OK
Autovon 735-5681 or 2928

pg 1 of 2 pgs

TEARDOWN DEFICIENCY REPORT		MIP NUMBER	INSPECTION DATE	FORM APPROVED
1. ACTIVITY PERFORMING INSPECTION OCHLC		OCPTC 82-0110		OMB NO. 21-RO 101
2. INSPECTOR James B. Farley		3. PRIORITY	4. DEFICIENCY OT	
3. STATION SERIAL NUMBER		6. SUBMITTED BY MAEPT THE WATER	7. EQUIPMENT SERIAL NUMBER 141110	
8. INSTALLED POSITION Engine	9. TMS OR MDS TF41-A1 MAIN FC	10. SECTION OR PROPERTY CLASS 2915	11. SUB SYS OR MODEL Fuel	
12. MAJOR ASSEMBLY, TYPE OR MODEL, NSN 2915-00-531-4615 CH		13. PRODUCT SERIAL NO. B 2636	14. MINOR ASSEMBLY, NSN NA	
15. NOMENCLATURE OR PART, NSN 6886089		16. REFERENCE NO. NA	17. TYPE DEFICIENCY NA	
18. CONDITION N/A	19. PRIMARY CAUSE OF FAILURE 212K			
20. DISPOSITION COND.	21. MANUFACTURER, HOURS OR MILES SINCE NEW LUCAS 212K			
22. FORMS RECEIVED WITH EQUIPMENT AFSC 945		23. LAST USING ACTIVITY - NAME, ADDRESS, COMMAND		
24. LAST OVERHAUL ACTIVITY, DATE, HOURS OR MILES SINCE OVERHAUL OCHLC 5-11-76, Ajob; 3-2-77, Ijob; 2-10-80, Ijob				25. DT RMVO FROM SVC HRS.
26. NO. OF PRIOR OVHLS UNK	27. REASON FOR REMOVAL AIC Accident			

28. TEARDOWN DEFICIENCIES ANALYSES		
PART NOMENCLATURE	PART SERIAL NUMBER	LOCATION, DESCRIPTION AND CONDITION
<p>I Primary Discrepancy: see block 27.</p> <p>II Investigation:</p> <p>a. Shakedown: The control was hand carried to the TDR area on 25 Feb. 82. The control had suffered classic impact damage. Sheared away & missing were the Non Return Valve, TO 613-4-82-4 fig. 9, ind. 9, TS Limiter, figs. 6 & 14, PJ Limiter, fig 4 & pipes, fig. 3, ind Nos. 182. Also sheared away & missing from the Lever Housing fig 5 was the lever, ind. 8, Min-Max stop screws, ind. 44 & related parts, ind. Nos. 45, 46 & 47, all of which had broken away from the stop plate, ind. 13. The cam shaft, ind. 12 was bent 90° to the dir. of rotation locking it to a fixed position. The bush dr. lever ind. 9 & riggering pin hole of the stop plate were in alignment with each other. The cam lever assy, ind. 28 had both bearings, one that rests on the idle stop screw when at idle & one that rests on the cam shaft when above idle busted out. Idle adj. screw is ind 38 & bearings 28 C. Peen marks could be seen on the adj. screw. The latter could be the result of the lever bearing that rests on the cam crushing out allowing the idle bearing to contact the adj. screw crushing it. Also the described damage to the Lever Housing assy may be typical as the position of the cam shaft, dir. of bending etc. is almost identical to that of control SIN B 4529, ENR. SIN 141180. The Gov Body with the ACU Body, see fig 1-1 of the-3, had to be taken to machine shop to get one</p>		

AFSC/AFSC FORM 49 JAN 80 REPLACES AFSC FORM 389, DEC 72, WHICH IS OBSOLETE.



pg 2 of 2 pgs.

bolt cut off to remove the PCU Body to retrieve the Gov.

The capsule sleeve, fig 10, ind 32 of the -4 had to be forced from the Gear Body because of impact & when the capsule, ind 1, was removed from the sleeve, the packing end (ind nos 58 & 59) between the first & second convolutions separated. The separation may be the result of impact since the Rocker Lever Assy, ind nos. 29A - 45 was bent. The capsule has been taken to the Lab for an analysis of the separation. The capsule SN, RB 168-62/178 was not listed in TO. see pg 2-84A of the

-3 No discrepancies not attributed to impact were found. Locking tabs cup washers etc. were all secure. Only normal wear ^{normal} patterns of wear were detected.

III Additional Information:

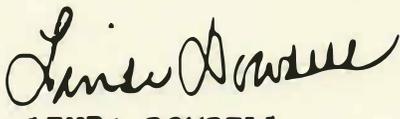
Hrs recorded in block 24 were hrs. reported at the time of Minor Repair processing when the control was tagged to Eng Line on 10 Oct. 80.

James B. Farley

MATPER 6824

TEARDOWN DEFICIENCY REPORT		MIP NUMBER	INSPECTION DATE	FORM APPROVED
		OC PAC 82-0110	25 Feb 82	OMB NO. 21-90101
1. ACTIVITY PERFORMING INSPECTION	2. INSPECTOR	3. PRIORITY	4. DEFICIENCY DT	
Oklahoma City ALC	James Ledford			
5. STATION SERIAL NUMBER	6. SUBMITTED BY	7. EQUIPMENT SERIAL NUMBER		
		141110		
8. INSTALLED POSITION	9. TMS OR MDS	10. SECTION OR PROPERTY CLASS	11. SUB SYS OR MODEL	
Engine			LP Fuel	
12. MAJOR ASSEMBLY, TYPE OR MODEL, NSN	13. PRODUCT SERIAL NO.	14. MINOR ASSEMBLY, NSN		
TF41-A1	B4806			
15. NOMENCLATURE OR PART, NSN	16. REFERENCE NO.	17. TYPE DEFICIENCY		
Governor Assy L.P	2915-00-092-82 25CH			
18. CONDITION	19. PRIMARY CAUSE OF FAILURE			
	A/C Crash			
20. DISPOSITION	21. MANUFACTURER, HOURS OR MILES SINCE NEW			
TDR	Allison			
22. FORMS RECEIVED WITH EQUIPMENT	23. LAST USING ACTIVITY - NAME, ADDRESS, COMMAND			
A5LC 945	UNK			
24. LAST OVERHAUL ACTIVITY, DATE, HOURS OR MILES SINCE OVERHAUL	25. DT RMVD FROM SVC			
UNK				
26. NO. OF PRIOR OVHLS	27. REASON FOR REMOVAL			
	A/C Crash investigation			
28. TEARDOWN DEFICIENCIES ANALYSES				
PART NOMENCLATURE	PART SERIAL NUMBER	LOCATION, DESCRIPTION AND CONDITION		
I Primary Discrepancy A/C crash				
II Investigation		<p>A. Governor Assy was received in the shop accompanied by A5LC 945 Requesting TDR. All external housings and fittings were broken or missing due to impact.</p> <p>B. Test. No test could be given.</p> <p>C. Teardown Analysis Governor Assy was disassembled ZAW TO 257-11-3 No discrepancies were found that could account for failure Governor showed no signs of extreme wear or sudden stoppage</p>		
III Conclusions		<p>A. Inspection of governor Assy indicates no cause for failure of governor to operate properly at impact. All damage to Assy due to impact of crash.</p> <p>B. Governor Assy was returned to TDR unit</p>		
		<p>James Ledford Inspector MTRPCD</p>		

AFSC/AFSC 49

TEARDOWN DEFICIENCY REPORT		MIP NUMBER	INSPECTION DATE	FORM APPROVED
		OCPAC 82-0110	FEB 25-82	OMB NO. 31-80101
1. ACTIVITY PERFORMING INSPECTION	2. INSPECTOR	3. PRIORITY	4. DEFICIENCY DT	
OKLA CITY ALC	ROBINSON JACK 3796	ASAP		
5. STATION SERIAL NUMBER	6. SUBMITTED BY	7. EQUIPMENT SERIAL NUMBER		
	MC WATERS MAEPI 6188			
8. INSTALLED POSITION	9. TMS OR MOS	10. SECTION OR PROPERTY CLASS	11. SUB SYS OR MODEL	
Single	A-7		fuel	
12. MAJOR ASSEMBLY, TYPE OR MODEL, NSN		13. PRODUCT SERIAL NO.	14. MINOR ASSEMBLY, NSN	
TF-11 High Pressure Pump		L 909		
15. NOMENCLATURE OR PART, NSN		16. REFERENCE NO.	17. TYPE DEFICIENCY	
NONE				
18. CONDITION	19. PRIMARY CAUSE OF FAILURE			
	NONE			
20. DISPOSITION		21. MANUFACTURER, HOURS OR MILES SINCE NEW		
		Lucas		
22. TOPNS RECEIVED WITH EQUIPMENT		23. LAST USING ACTIVITY - NAME, ADDRESS, COMMAND		
AFLC 915				
24. LAST OVERHAUL ACTIVITY, DATE, HOURS OR MILES SINCE OVERHAUL			25. OT RMVD FROM SVC	
26. NO. OF PRIOR OVNLS	27. REASON FOR REMOVAL			
	AIRCRAFT CRASHED			
3. TEARDOWN DEFICIENCIES ANALYSES				
PART NOMENCLATURE	PART SERIAL NUMBER	LOCATION, DESCRIPTION AND CONDITION		
1. <u>PRIMARY DISCREPANCY:</u>				
	NO DISCREPANCIES NOTICED OTHER THAN	IMPACT DAMAGE		
11. <u>INVESTIGATION:</u>				
a. <u>Shakedown:</u>	The Pump was hand carried by George Stringer to this location, the item was in poor condition due to heavy impact damage all safety wire /bolts/nuts were tight.			
b. <u>TEST:</u>	As Received: The Pump could not be tested due to heavy damage.			
c. <u>TEARDOWN ANALYSIS:</u>	See Tech Order 6J10-71-1. Figure six item 30 HMG Diaphragm P/N 7561212 The diaphragm did not leak durin pressure test , the whole HMG assembly was in exceptional good condition using visual inspection. The Port Inserts/Link assemblies all shafts were in good condition condition, the pump appeared to have low operating time. The only damage was crash damage.			
 JACK ROBINSON MATPEB 3796		 LINDA DOWDELL MATPEB 7064		

AFLC/AFSC FORM 79 7971 ACRA AFLC FORM 79, DEC 72, WHICH IS OBSOLETE

TEARDOWN DEFICIENCY REPORT		WIP NUMBER	INSPECTION DATE	FORM APPROVED
		OCPAC 02-0110	Feb 21 82	OAS NO. 21-PO101
1. ACTIVITY PERFORMING INSPECTION	2. INSPECTOR	3. PRIORITY		4. DEFICIENCY OT
Okla City ALC	ROBINSON JACK 3796	ASAP		
5. STATION SERIAL NUMBER	6. SUBMITTED BY		7. EQUIPMENT SERIAL NUMBER	
	Mc Waters MAEPI 6188			
8. INSTALLED POSITION	9. THRS OR MOS	10. SECTION OR PROPERTY CLASS	11. SUB SYS OR MODEL	
Single		TF-11	Fuel	
12. MAJOR ASSEMBLY, TYPE OR MODEL, NSN		13. PRODUCT SERIAL NO.	14. MINOR ASSEMBLY, NSN	
TF-11 Air Flow Regulator		KK8665		
15. NOMENCLATURE OR PART, NSN			16. REFERENCE NO.	17. TYPE DEFICIENCY
18. CONDITION	19. PRIMARY CAUSE OF FAILURE			
	Unknown			
20. DISPOSITION		21. MANUFACTURER, HOURS OR MILES SINCE NEW		
		Lucas		
22. FORMS RECEIVED WITH EQUIPMENT		23. LAST USING ACTIVITY - NAME, ADDRESS, COMMAND		
AFLC 945				
24. LAST OVERHAUL ACTIVITY, DATE, HOURS OR MILES SINCE OVERHAUL				25. OT FROM SVC
				1 1
26. NO. OF PRIOR OVHLS	27. REASON FOR REMOVAL			
	CRASH			
28. TEARDOWN DEFICIENCIES ANALYSES				
PART NOMENCLATURE		PART SERIAL NUMBER		LOCATION, DESCRIPTION AND CONDITION
1. <u>PRIMARY DISCREPANCY:</u>				/NO DISCREPANCIES NOTED
No apparent		reason for failure		
11. <u>INVESTIGATION:</u>				
a. <u>SHAKEDOWN:</u>				
Item was hand carried to this location via hand. The Regulator suffered heavy crash damage, all safety wires, etc was normal.				
b. <u>TEST:</u>				
The Air Regulator could not be tested due to damage.				
c. <u>TEARDOWN ANALYSIS:</u>				
See Tech Order 9PIO-1-22-1. Page 2-11 item 31 P/N 6862875				
Piston regulator figure two was approximately one half inch from retract position indicating engine was under power.				
The I.G.V. Diaphragm was in good condition P/N 6860726 Figure three item 27..				
The internal parts that were not damaged durin impact were in good condition.				
<i>Jack Robinson</i> JACK ROBINSON MATPEB/ 3796				<i>Linda Dowdell</i> LINDA DOWDELL MATPEB / 7061

AFLC/AFSC FORM 49 JAN 80 REPLACES AFLC FORM 389, DEC 73, WHICH IS OBSOLETE.

AIRCRAFT ACCIDENT REPORT

DD FORM 175 OR AUTHORIZED SUBSTITUTE FLIGHT PLAN FORMS

TAB K

Index	K-1
Local Flight Clearance	K-2
Standard Flight Plan (DD-175)	K-3
Flight Plan Filed for Fury 13 (DD-175)	K-4
Runway Supervisory Log	K-5


K-1

Exhibit 05
TAB K-001

LOCAL FLIGHT CLEARANCE / DAILY FLIGHT ORDER

CREWMEMBERS LISTED BELOW WILL PROCEED IN AIRCRAFT INDICATED AND UPON COMPLETION OF FLIGHT WILL RETURN TO PROPER STATIONS						DEPART O/A 9 FEB 82	RETURN O/A 9 FEB 82	PAGE 1 OF 1 PAGES			
CALL SIGN FURY		BASE OF DEPARTURE BYRD IAP, SANDSTON VA		UNIT ISSUING ORDER 149 TFS		ORDER NUMBER 17	DATE OF ORDER 9 FEB 82			TYPE AIRCRAFT F-105	
POSITION		LAST NAME, INITIALS	GRADE	SSAN	MISSION SYMBOL	ROUTE OF FLIGHT (VARIATIONS IN ITINERARY AUTH.)	ETD	ETE	FSS FILED	T.O. DATA WEATHER NOTAMS	SIGNATURE
FLIGHT	CREW										
# 11	FP	ARNOLD, HT	CPT	[REDACTED]	T-30	DARE #3	0935	1130	R/SV 0740	✓	H.T. Arnold
# 2	IP	JONES, W.C.	MAJ	[REDACTED]					✓		W.C. Jones
3	FP	MONAHAN, W.J.	MAJ	[REDACTED]		DARE #1			R/SV 0740		W. Monahan
21	FP	MAXFIELD, E.D.	CPT	[REDACTED]	T-30		1250	1.5			E.D. Maxfield
22	IP	MARIN, C.W.	CPT	[REDACTED]							C.W. Marin
23	FP	DRUMMOND, E.G.	1/CS	[REDACTED]							E.G. Drummond
# 41	FP	CRAWFORD, W.H.	MAJ	[REDACTED]	T-30	DD 175	1300	1+20		✓	W.H. Crawford
42	IP	LEGG, R. H.	MAJ	[REDACTED]	24						R. Legg

CW
MAJ
MAJ

PERSONNEL ARE SUBJECT TO THE PROVISIONS OF THE UNIFORM CODE OF MILITARY JUSTICE WHILE PERFORMING THIS DUTY.

AUTHENTICATING OFFICIAL

Robert O. Seyfert

K-2

DARE # 1

MILITARY FLIGHT PLAN		AIRCRAFT UNIT OF ASSIGNMENT/MOBILE STATION		AIRCRAFT SERIAL NO.		
TYPE OF FLIGHT PLAN <input checked="" type="checkbox"/> IFR <input type="checkbox"/> DVFR <input type="checkbox"/> VFR		RADIO CALL		AIRCRAFT DESIGNATION/TO CODE		
ESTIMATED TRUE AIRSPEED		192 TFG/RIC		DEPARTURE TIME (Z)		
440		/A-7/P		PROPOSED	ACTUAL	
INITIAL CRUISING ALTITUDE		POINT OF DEPARTURE		STANDARD INSTRUMENT DEPARTURE		
150		RIC		NAME AND NUMBER TO		
				HPW		
FR	VFR	ROUTE OF FLIGHT			TO	ETE
X		CVI R-5314				0+16
		Ⓡ D _____ R-5314 RIC				
X		P _____ R-5314 445 160				
		CVI RIC 185040			RIC	0+13
REMARKS						
REQUEST RADAR DEPARTURE						
NAME/NUMBER CODE		PSNR/CARGO CODE				
HOURS FUEL ON BOARD	DIST TO DESTN	ALTERNATE AIR FIELD	ETE TO ALTN	NOTAMS	DD FORM 365F (W2 and Bal)	WEATHER
		IF REQ				REQUEST CLEARANCE AFTER
DIST BAKING	SIGNATURE OF PILOT IN COMMAND		SIGNATURE OF APPROVING AUTHORITY			DATE
CREW/PASSENGER LIST— <input type="checkbox"/> Attached <input type="checkbox"/> See Passenger Manifest						
DUTY	NAME AND INITIALS	GRADE	SSAN	ORGANIZATION AND LOCATION		
PILOT IN COMMAND						

DD FORM 175
1 AUG 72

MILITARY FLIGHT PLAN		AIRCRAFT UNIT OF ASSIGNMENT/REGISTRY STATION		AIRCRAFT SERIAL NO.	
TYPE OF FLIGHT PLAN <input type="checkbox"/> IFR <input type="checkbox"/> VFR <input type="checkbox"/> VR		AIRCRAFT DESIGNATION/ TO CODE F13 T.A. 7/12		ESTABLISHED TRUE AIRSPEED 1400	
POINT OF DEPARTURE F13		STANDARD INSTRUMENT DEPARTURE NAME AND NUMBER TO			
OR	VFR	ROUTE OF FLIGHT		TO	ETE
		CANNED FLIGHT PLAN NAME DARE #1			
		VR	PT	TO PT	
		R D 0420	R- 5314	RIC	
		P 1450	(IFR PICKUP TIME)		
AIRSPEED ON LOW LEVEL _____ LOW LEVEL ENTRY TIME _____ EXIT TIME F-55					
MARSA WITH _____ F-55 FILED 0740					
CLASS OF FLIGHT	CLASS OF SERVICE	ALTERNATE AIR FIELD	REQ TO ADV	NOTAMS	DO NOTAM (IFR and VFR)
CLASS OF SERVICE	MANUAL OF FLIGHT BY COMMAND	SIGNATURE OF APPROVING AUTHORITY			DATE
<input type="checkbox"/> Approved <input type="checkbox"/> Not Approved					
ENTRY	TIME AND GROUND	CLASS	SEAM	COMPLETION AND LOCATION	

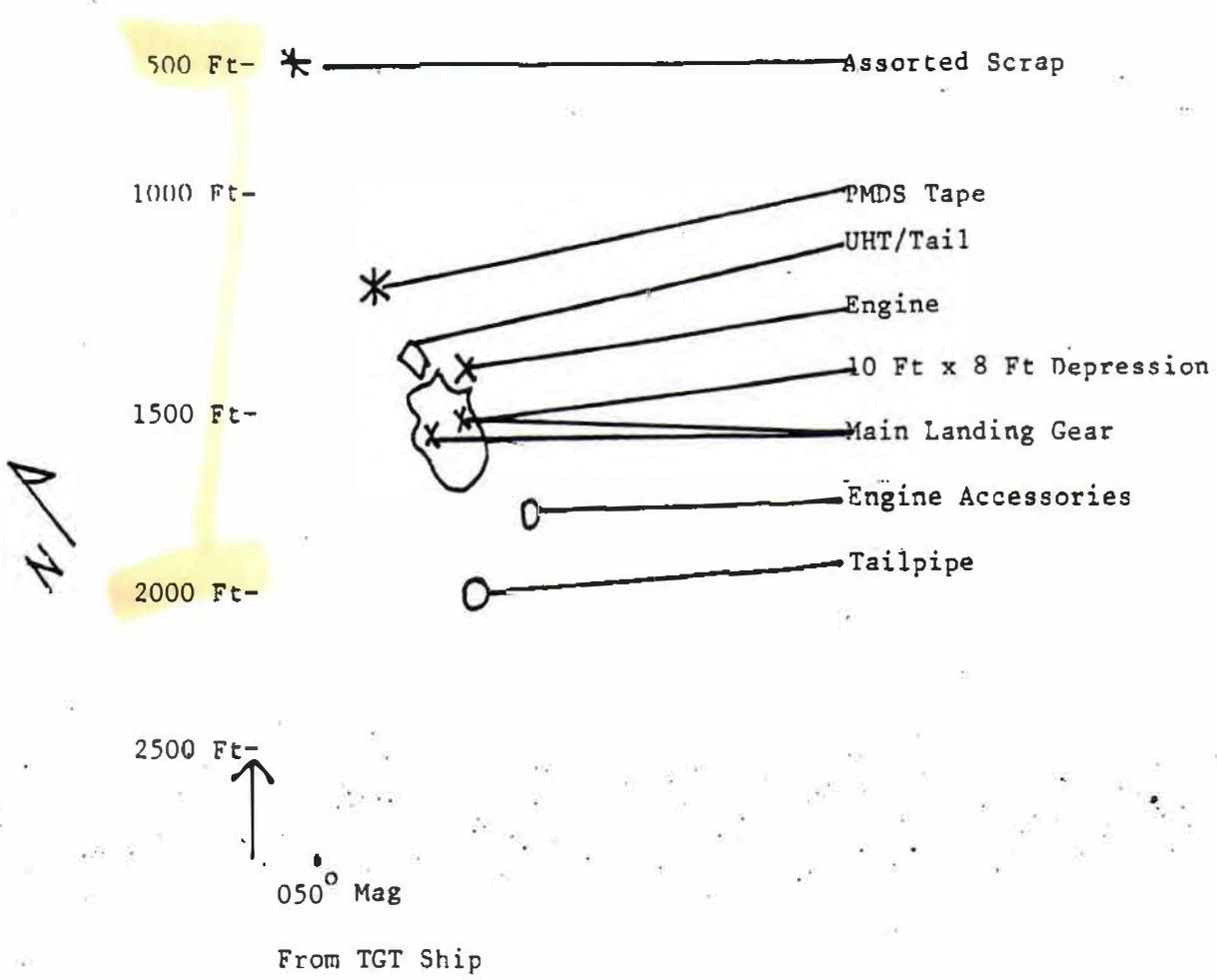
175
1 APR 72

AIRCRAFT ACCIDENT REPORT

DIAGRAMS (FALLOUT-IMPACT AREA, ETC)

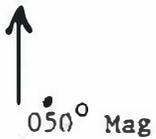
TAB R

* Coast Guard Buoy
• ILS Box



× CG Buoy

• Crash Site



Target Ship

AIRCRAFT ACCIDENT REPORT

TESTIMONY/STATEMENTS OF WITNESSES

TAB U

Index	U-1
Testimony of Major William C. Jones	U-2
Testimony of Captain Herbert T. Arnold	U-5
Testimony of Thomas J. Wallace	U-7
Testimony of Robert O. Seifert	U-8
Testimony of Major Wilbur E. Rose	U-9

TESTIMONY OF MAJOR WILLIAM C. JONES

5 March 1982

I was number two in a flight of three scheduled for Stumpy Point ship target on 9 Feb 82. I was the flight examiner for Captain Arnold who, as lead, was taking a Tactical Qualification flight check. The flight call sign was Fury 11. Major Monahan was Fury 13.

Captain Arnold was given the unit tasking order the day before so that he could begin planning the mission. He also came to work early on 9 Feb to complete his preparation for the flight. It may be noted that his preparation for this mission was noteworthy.

The flight briefing started at about 0730. All pertinent areas were covered and the low altitude employment phase was particularly emphasized (Special Interest Item on Low Altitude Employment was in the briefing guide). Two separate flight plans were filed, one for Fury 11 and 12 to fly VR-1753 low level and the other for Fury 13 to fly medium altitude to the Restricted Area. Fury 13 was to clear the target area (so Fury 11 could make the first attack hot) then act as an adversary during the ingress for Fury 11. All three aircraft took the runway together. Captain Arnold had coordinated the departure so that Fury 13 would takeoff 15 seconds behind the lead element on his separate flight plan. The departure was a few minutes later than planned to make good the assigned TOT of 0935.

Radio contact was made with Fury 13 on Navy Dare primary frequency (358.8) during the last portion of the low level. Fury 13 acted as a radio relay with Navy Dare Range to clear the flight onto Stumpy Point target. The flight was cleared to operate on frequency 320.2. All aircraft checked in on 320.2. Position of Fury 11 at the time was just short of the Alligator River. Captain Arnold asked Fury 13 if the target was clear. Fury 13 replied that he wasn't

there yet. Captain Arnold then called for a channel change back to Navy Dare primary frequency to check the altimeter setting. Fury 13 never checked in on that frequency, but that fact did not seem unusual because it was understood that the flight would operate in the target area on 320.2. Fury 11 and 12 were on 358.8 for about one minute before switching back. The position of Fury 11 at that time was east bound, just north of Navy Dare Range and just west of the Pamlico Sound.

Fury 13 never responded to calls from Fury 11 during the final portion of the target run. The final leg of the low level is south bound over the Pamlico Sound. The visibility was good, but a low altitude haze (possibly the early morning sun angle) obscured the horizon somewhat over the water. Surface winds were calm and the water surface was perfectly smooth and looked like a mirror. Captain Arnold made the remark on the radio that it was "a visual illusion day".

The attack on the ship target was flown as briefed, but dry since no clearance was received from Fury 13. Timing was about 15 seconds later than planned. The planned egress was toward the northeast and during the egress and subsequent orbit in the target area, both Fury 11 and 12 observed what appeared to be a sandbar several miles northeast from the target ship. (later confirmed to be the accident site)

Radar agencies and emergency airfields in the vicinity were contacted to determine if Fury 13 was in contact with anyone. Fury 11 then began RTB to see if Operations had any information regarding Fury 13. I remained in the target area until Captain Arnold confirmed that Operations had not heard from Fury 13, then I initiated the SAR with Elizabeth City Coast Guard Station. The time was about 1000 when the SAR was initiated. Navy Dare (Mr. Harry Mann) assisted in the SAR coordination and a Navy A-6 from Oceana assisted by acting as a high CAP while the helicopter was enroute. I remained on station until the helicopter arrived.

and pointed out the crash site to them. (By that time I observed something orange in the water - probably an LPU). The crash response by the Coast Guard was excellent. They confirmed the scene as the aircraft crash site.

William C Jones

WILLIAM C. JONES, Major, VaANG

TESTIMONY OF CAPTAIN HERBERT T. ARNOLD

5 March 1982

Our briefing began at 0700 in intelligence with a briefing to the flight lead only. The other flight members would get their intel briefing from lead. The flight brief began at 0715-0725. In the briefing we outlined the flight as follows:

The three ship would takeoff together with Fury 11 and Fury 12 on a "Dare # II" clearance, i.e. Low Level VR-1753 Pt "C" to "J" to attack the target in R-5313. Fury 13 was on a "Dare I" clearance, i.e. medium altitude to R-5314 and would separate from the flight after airborne, proceeding to R-5313 as filed. Fury 13 was to clear the target in accordance with range procedures after which he was to attack Fury 11 and 12 on the elements ingress. The low altitude ROE was briefed and the attack was briefed. The briefing ended at 0815 for an 0830 start.

The start taxi takeoff was standard and uneventful. Fury 13, as briefed, departed the flight airborne on a separate clearance. Fury 11 and 12 flew VR-1753 and although the flight took off three minutes late, we were on time at Pt "G" on the low level. We contacted Fury 13 at 0929L on UHF Preset Ch 15 for target clearance and Fury 13 said he was "not there yet". Fury 11 told him we were two minutes from the turn point. The last contact was on 320.2 Navy Dare secondary. About 30 seconds after the 320.2 channel checkin, Fury 11 and 12 changed channels to Navy Dare Primary in order to get an updated altimeter. The intent was not for 13 to change with us, but if he did, he did not checkin on the change to Primary, or the change back to Secondary. At 0933L, Fury 11 attempted to reestablish contact with Fury 13 to inform him that we were at the turn point, and wanted to know if the target was clear. With negative contact,

we pressed into visual range on the target and continued our attempt to establish radio contact with Fury 13.

The target area weather was very workable. There was a slight overcast at about 25,000' and we had visual contact on the target at a range of 8 NM. There was a thin haze layer from the surface to 1500' AGL. The water was very smooth and glass-like. Below 1000' AGL, there was not a horizon and depth perception was difficult. Fury 11 commented to Fury 12 that it was a "great day for visual illusion". My intention was to say heads up, be careful.

Fury 11 and 12 continued the attack with negative clearance of the target. The flight made a dry attack and egressed on a heading of 037°. During the egress portion of the flight, Fury 11 noticed a sandbar looking area 2 1/2 to 3 miles from the target on the 037° heading. Fury 11 and 12 called "knock-it-off" and safed up the armament switches. At that time we orbited the area and unsuccessfully attempted to contact Fury 13. Fury 11 then made three observation passes over the impact area and felt at that time that Fury 13 had hit the water.

Fury 11 departed the target area in an attempt to contact Fury Operations and insure that 13 was not at home plate. Fury 12 initiated the SAR effort from Elizabeth City after Fury 11 relayed the message that 13 was not in Richmond. Fury 11 returned to base and Fury 12 returned to base 25 minutes later.


HERBERT T. ARNOLD, Captain, VaANG

TESTIMONY OF MAJOR WILBUR E. ROSE

5 March 1982

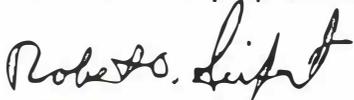
I arrived at work at approximately 0700 and proceeded to Base Ops to check the area weather. The forecast for Byrd Field and target areas was good for the flight. Fury 11 was briefing for a TAC Check. The flight was to go low for Fury 11 and 12 and high for Fury 13, who was to clear the target area as required. All factors concerning the flight were good and the SEFE stated that special items of interest for the flight were covered, i.e. Low Level, Over Water Flight etc.


WILBUR E. ROSE, Major, VaANG.

TESTIMONY OF ROBERT O. SEIFERT

9 March 1982

I was the supervisor of flying on the morning of 9 February 1982. I was present when all flight members appeared to brief the flight. Because the flight was a Tactical Evaluation for Captain Arnold, much of the flight preparation had been accomplished the day prior to the mission. I checked the weather for the target and it was forecast to be good. There were three aircraft for this mission; they were called in on time with no discrepancies. There were no irregularities with the briefing and the flight left the operations area on time to make their takeoff. Takeoff occurred near on time. The next time I heard from the flight was when Captain Arnold checked in with us on his return from the target. He indicated one of our aircraft had crashed. I ensured a rescue had been initiated, this was confirmed by Navy Dare. Duties associated with an aircraft mishap were then accomplished.



ROBERT O. SEIFERT, Major, VaANG

TESTIMONY OF THOMAS J. WALLACE

9 March 1982

February 9th, pilot arrived at aircraft and put helmet bag on ladder and started to check aircraft forms. I took the helmet bag up to cockpit and started to set things up and stow the bag. Pilot walked under ladder and reached up and tapped me on my foot and we spoke to each other (normal greeting). He seemed O.K., just in a hurry. I came down ladder and went around behind him to make sure he didn't forget anything. Everything looked good. I went up ladder and helped the pilot strap in. I said, "Well it looks like your're in there." He said, "I hope so." He said something about a check ride and he would be number three. He said he would be back in about 1.5 hours. I went down ladder and got on head set. Start and launch was normal.


THOMAS J. WALLACE, TSgt, VaANG

AFCS in A-7D and the radar altimeter HUD display

ChatGPT said:

The **Automatic Flight Control System (AFCS)** in the **A-7D Corsair II** and its integration with the **radar altimeter** and **HUD (Head-Up Display)** were key components for enhancing the pilot's situational awareness, particularly during **low-level flight** and **precision bombing** missions. Here's how these systems worked together:

AFCS and Radar Altimeter Integration:

1. Radar Altimeter (RADALT):

- The **radar altimeter** in the **A-7D** was designed to measure the aircraft's **altitude relative to the terrain** beneath it, providing accurate altitude data when flying at low levels, which is crucial during **terrain-following**, **low-level bombing runs**, or **evading enemy radar**.
- Unlike barometric altimeters, which measure altitude relative to sea level, the **radar altimeter** provides a "**height above ground level**" (**AGL**) reading. This is especially important during **low-altitude tactical missions**, where maintaining an exact altitude is vital for mission success and avoiding terrain or obstacles.

2. AFCS and Radar Altimeter:

- The **AFCS** in the A-7D used the radar altimeter's readings to help maintain **stable, low-altitude flight**. For example, during **low-level cruise** or **attack profiles**, the AFCS could work in conjunction with the radar altimeter to ensure the aircraft stayed at a consistent altitude above the terrain.
- The **autopilot** mode of the AFCS could use radar altimeter data to maintain a **set altitude**. This allowed the pilot to focus more on navigation and targeting, especially during precise bombing runs or when flying in **contested environments**.

3. Radar Altimeter in the HUD:

- The **radar altimeter's reading** was typically displayed on the **Head-Up Display (HUD)** to give the pilot immediate feedback on the aircraft's altitude relative to the ground. This is critical in **low-level, high-speed flight** where sudden terrain changes can occur.
- The radar altimeter would show up on the HUD as a **numeric readout** or sometimes as a **bar scale**, allowing the pilot to quickly verify if the aircraft was flying at the desired altitude.
- The **HUD** also included other critical flight data, like **airspeed**, **heading**, and **attitude**, which all contributed to the pilot's ability to navigate, maintain the proper altitude, and execute mission objectives while minimizing the risk of hitting terrain or obstacles.

AFCS and Radar Altimeter HUD Display Interaction:

1. Altitude Hold:

Exhibit 08 at pg. 001

- If the pilot had set the AFCS to a "**height hold**" mode or was flying a **terrain-following** profile, the **radar altimeter reading** displayed on the HUD would allow the **AFCS** to maintain the desired altitude above the terrain.
- In such a mode, the radar altimeter's altitude data would directly feed into the AFCS, enabling it to make fine adjustments to the aircraft's pitch or throttle to maintain consistent altitude, even over changing terrain. The pilot could monitor the system's performance via the HUD and make manual adjustments as necessary.

2. **Terrain Avoidance:**

- The **AFCS** and radar altimeter also played a role in **terrain avoidance** during low-level flights. If the radar altimeter detected that the aircraft was descending too close to the terrain, the AFCS could automatically adjust the aircraft's **pitch** or **thrust** to avoid a collision, or at least alert the pilot through warning systems.
- The radar altimeter was vital in such scenarios, providing continuous, real-time altitude readings to ensure the aircraft maintained a safe height above the ground, especially when flying in mountainous or rough terrain.

3. **Automatic Control During Bombing Runs:**

- During **precision bombing runs**, the **AFCS** would use radar altimeter data to ensure the aircraft maintained a specific altitude above the target area. The **HUD** would display the radar altimeter's altitude, allowing the pilot to maintain the correct altitude for optimal weapon delivery.
- The HUD would provide visual cues like **altitude hold markers** or **flight path vectors**, while the radar altimeter data kept the aircraft at a constant, precise altitude for effective bombing.

Practical Example of HUD Display and AFCS Interaction:

- If the A-7D was flying at low altitude for a **tactical bombing run**, the radar altimeter would continuously measure the altitude above the ground. The **AFCS** could then adjust the aircraft's flight path, if needed, to ensure that it remained at the correct altitude for weapons release or to avoid obstacles.
- The **HUD** would show the radar altimeter's output, ensuring the pilot could quickly assess whether the aircraft was maintaining the correct altitude or needed correction.

Summary:

The integration of the **AFCS**, **radar altimeter**, and **HUD** in the **A-7D** allowed for a more **automated and stabilized flight profile** during **low-level flight** and **precision bombing missions**. The **radar altimeter** provided crucial real-time data about the aircraft's altitude relative to the ground, which was displayed on the **HUD** for the pilot's awareness. The **AFCS** could then use that data to help maintain altitude, adjust the aircraft's flight path, and reduce pilot workload during complex or dangerous missions. This interaction between the **AFCS** and radar altimeter ensured that the aircraft could safely and accurately carry out its tactical missions, even at high speeds and low altitudes.

A-7D RT-1046 and the radar altimeter

ChatGPT said:

The **RT-1046** is a **UHF radio transceiver** used in the **A-7D Corsair II** for communication purposes, typically operating in the UHF frequency range **for both voice and data transmissions**. It is **not directly connected to the radar altimeter system**, but both components are essential for the aircraft's overall operational capabilities.

On the other hand, the **radar altimeter** is a crucial system that measures the aircraft's **altitude** above the ground, typically through the use of **radio waves** to determine the distance to the terrain beneath the aircraft. While the **RT-1046** and the **radar altimeter** do not directly interact, the radar altimeter and communications systems (like the RT-1046) often serve complementary roles during flight operations.

Radar Altimeter and Its Role:

The **radar altimeter** on the A-7D Corsair II is a critical flight instrument that provides highly accurate measurements of the aircraft's **altitude** above the terrain, usually in the range of 0 to around 5,000 feet (or more, depending on the specific model). Unlike the barometric altimeter, which measures altitude based on atmospheric pressure, the radar altimeter uses **radio waves** to measure the aircraft's **distance to the ground**.

- The radar altimeter is especially useful in **low-level flying** operations (common in tactical aircraft like the A-7D), **terrain-following radar**, and during **precision bombing or target identification** where knowledge of the aircraft's exact height relative to the ground is critical.
- **Primary Use:** It provides real-time altitude information to the pilot, helping in scenarios like **low-level navigation, terrain-following flight**, and during **approaches** where precise altitude control is required.

RT-1046 Communication and Radar Altimeter Integration:

While **the RT-1046 does not directly interface with the radar altimeter**, both systems are important for different aspects of the aircraft's operational capability:

1. Communication Systems and Low-Level Flight:

- The **RT-1046** would allow communication with other aircraft, ground stations, or command centers, which is crucial during **tactical flight** or **low-level operations**.
- In low-level flying, particularly in combat or tactical missions, the **radar altimeter** provides the pilot with precise altitude data, which is vital for safe maneuvering and terrain-following.
- The **RT-1046** could potentially be used to report or coordinate the aircraft's position, mission details, or issues related to low-level flight, where accurate altitude information from the radar altimeter would be essential.

2. Safety and Coordination:

- If a malfunction occurs in the **radar altimeter** or if there are concerns about the aircraft's altitude during critical flight phases (such as bombing runs or low-level navigation), the aircraft may need to **communicate with support** using the **RT-1046** or other radio systems. The communication would be vital for **mission coordination** and could be used to report problems with the radar altimeter or other systems.

3. Integrated Systems in A-7D Operations:

- Although the **RT-1046** itself doesn't interface with the radar altimeter, **mission planning** and **tactical execution** often involve using both systems in parallel. The radar altimeter provides real-time altitude data, and the RT-1046 allows communication for mission adjustments, threat awareness, and coordination with other assets.

Maintenance and Troubleshooting:

- If there is a problem with the **RT-1046 UHF radio** or **radar altimeter** during flight, both systems could impact **flight safety**. However, **troubleshooting is done separately**:
 - **RT-1046 issues** might involve checking the radio's power supply, signal strength, frequency tuning, antenna connection, and system integration.
 - **Radars altimeter issues** would involve checking the **radar altimeter's transmitter, receiver, and antennas** for malfunctions or calibration errors, as well as inspecting the system for **electrical faults or damage**.

Summary:

The **RT-1046** (UHF radio transceiver) and the **radar altimeter** on the **A-7D Corsair II** are both important systems but serve different roles. The **RT-1046** is used for communication, while the **radar altimeter** provides accurate altitude information relative to the ground. Although they don't interact directly, both systems are crucial for tactical operations, particularly in low-level flying, where **accurate altitude** data (from the radar altimeter) and **secure communication** (via the RT-1046) are essential for mission success and safety.

A-7D FLR

ChatGPT said:

The **FLR** on the **A-7D Corsair II** refers to the **Forward Looking Radar**. This radar system is primarily used for navigation, targeting, and helping the pilot during low-level flight operations by providing critical information about the terrain and obstacles ahead of the aircraft.

Here are some key details about the **A-7D's FLR** system:

1. Purpose of the Forward Looking Radar (FLR):

- The **Forward Looking Radar** is designed to assist the pilot in maintaining situational awareness, particularly during **low-altitude** flight.
- It is used to **detect terrain features, obstacles, and other aircraft** ahead of the aircraft, helping the pilot avoid collisions or terrain hazards.
- In **low-altitude missions**, such as **low-level bombing**, this radar is essential for ensuring that the aircraft maintains safe altitude and avoids terrain or structures that could cause a crash.

2. Operational Functionality:

- The **FLR** works by emitting radio waves, similar to a radar altimeter, but instead of measuring altitude, it scans the terrain ahead of the aircraft for obstacles or features.
- The system then provides the pilot with a **terrain display**, allowing them to better navigate in difficult visual conditions (e.g., poor weather, low visibility).
- It is particularly useful for **terrain-following flight**, where the aircraft follows the contours of the ground to avoid detection by enemy radar and to stay under radar coverage.

3. Terrain-Following Radar (TFR):

- The **FLR** system on the A-7D is often integrated with **Terrain-Following Radar (TFR)** capabilities, allowing the aircraft to fly autonomously at low altitudes while maintaining a safe clearance from the ground. The radar system helps to adjust the aircraft's altitude to match the terrain, preventing the plane from inadvertently flying into obstacles or the ground.
- In this way, the **FLR** can automatically adjust the aircraft's flight path, ensuring a safe and stable flight profile during high-speed low-altitude operations.

4. Flight Profile Integration:

- The **FLR** is especially important during **combat missions** that involve low-altitude penetration of enemy airspace, where maintaining a precise flight path is critical. The radar assists the pilot by automatically adjusting altitude and speed, ensuring that the aircraft stays on course without relying entirely on visual cues.
- It also helps during **night** and **adverse weather conditions** by allowing pilots to continue operations when visibility is limited.

5. Connection to Other Systems:

- The **FLR** is integrated into the **A-7D's avionics suite**, often working alongside other systems like the **Targeting Systems** and **Navigation Radar** to provide a comprehensive picture of the environment around the aircraft.
- The **FLR** may also interface with the **Weapons Systems** to provide accurate targeting information in **low-level strike missions**, ensuring that bombs or missiles are released at the correct time and angle.

Conclusion:

The **Forward Looking Radar (FLR)** on the **A-7D Corsair II** plays a crucial role in enhancing the aircraft's ability to navigate and perform low-altitude missions safely. It provides real-time terrain information, assists in avoiding obstacles, and supports terrain-following capabilities. This radar system is integral for mission success, particularly when flying in hostile or visually obscured environments.

A-7D FLR ACTO 781 entry: FLR in Priority, no FLR ranging at release. "Write up left open due to lack of test equipment." If the FLR on an A-7D has this reported malfunction, and the malfunction of the FLR here is not fixed, is the A-7D airworthy for an IFR low altitude mission in low to no visibility?

ChatGPT said:

In the case of the **A-7D Corsair II** with the **FLR malfunction** as described in the **AFTO 781A entry** ("FLR in Priority, no FLR ranging at release. Write up left open due to lack of test equipment"), the **airworthiness** of the aircraft for an **IFR (Instrument Flight Rules) low-altitude mission in low to no visibility** would be significantly impacted. Here's why:

Role of the FLR System:

The **FLR (Flight Control Radar)** system is integral to the A-7D's **navigation** and **targeting** systems. It helps with precise **rangefinding** and **terrain following** during low-altitude, high-speed missions, particularly in challenging environments such as **low visibility** conditions. This system allows the aircraft to **maintain safe altitude** above the ground and to **track targets** accurately during bombing or strike missions.

Impact of the FLR Malfunction:

1. **FLR Ranging Failure:**
 - The **FLR ranging system** is crucial for **altitude awareness** and safe flight in **low-altitude** environments, particularly when the aircraft is flying **at or near terrain**. If the **FLR is not providing accurate ranging information**, the **pilot could have difficulty maintaining safe separation from the ground** during low-level operations, especially in **low visibility** conditions (e.g., **fog, clouds, or night flights**).
 - The malfunction would affect the ability of the aircraft to detect and avoid terrain in low visibility, making it potentially **unsafe** for these types of missions.
2. **IFR Operations:**

- **IFR** missions are conducted when visual references to the ground or sky are not available—such as in **low visibility** or **bad weather** conditions. In these situations, pilots rely on **instrumentation** like the **FLR** to ensure they are flying at safe altitudes above the terrain.
- Since the **FLR malfunction** impedes accurate altitude reading and terrain-following, the aircraft **cannot rely on the FLR system** for proper altitude control during an IFR mission, especially in low visibility. This makes the aircraft **unsuitable for IFR low-altitude operations** until the issue is resolved.

3. Safety Concerns:

- **Low-altitude missions in low to no visibility** rely heavily on systems like the **FLR** to ensure the aircraft doesn't inadvertently fly into the terrain. Without accurate **altitude ranging**, the risk of **controlled flight into terrain (CFIT)** significantly increases. This makes the aircraft unsafe for these types of operations.
- **FLR in Priority** suggests that the system is supposed to be in an operational mode but isn't functioning properly, which could indicate that the system is partially operational but still inadequate for the requirements of a safe low-altitude mission in reduced visibility.

Conclusion: Is the A-7D Airworthy for an IFR Low-Altitude Mission?

- **No, the A-7D is likely not airworthy for an IFR low-altitude mission in low to no visibility** if the **FLR malfunction is not fixed**.
- The **FLR malfunction** compromises the aircraft's ability to maintain safe altitude and terrain clearance, which is essential for conducting IFR operations, particularly in low visibility conditions. **Without the FLR system functioning properly**, the aircraft would be operating with an increased risk of collision with terrain or other hazards, making it unsafe for such missions.

Recommendation: The aircraft should be **grounded or restricted from IFR low-altitude missions until the FLR system is repaired or a temporary solution is found**. If the aircraft is needed for such missions urgently, a **workaround or alternate system** must be in place, **but generally, a fully operational FLR is critical for such operations**.

A-7D where No FLR ranging at release (VIS Attack or CCIP)

ChatGPT said:

In the **A-7D Corsair II**, when performing **Visual Attack (VIS Attack)** or **Continuous Calculated Impact Point (CCIP)** bombing, the **Forward-Looking Radar (FLR)** is typically not used for **ranging** at the time of **bomb release**. Here's why and how these two attack modes differ from using the FLR for bomb release:

1. VIS Attack (Visual Attack):

- **Visual Attack (VIS)** relies on the pilot's **visual references** to target and release bombs. In this mode, the pilot is visually guiding the aircraft and using the aircraft's **sight or targeting system** to manually align the weapon release with the target.
- Since **VIS Attack** is based on visual cues, the **FLR** is not involved in providing **range or distance information** for the weapon release. Instead, the pilot directly observes the target, using **bomb sight systems** or the **HUD (Heads-Up Display)** to ensure the correct release point.
- **Bomb Release:** The bomb release is typically initiated when the pilot has visual confirmation of the target and uses the aircraft's bombing computer or sighting system to calculate the release point. **FLR** is not utilized for distance calculation in this mode.

2. CCIP (Continuous Calculated Impact Point):

- **CCIP** is a mode that calculates the aircraft's **continuously calculated bomb release point**, which is computed using the aircraft's flight path, altitude, speed, and the current target position.
- While CCIP mode uses the aircraft's avionics and targeting computer to provide accurate bombing solutions, it **does not rely on the FLR** for range information at bomb release. The FLR is not used to determine the precise **range or distance to the target** during the bomb drop.
- The **CCIP mode** works by projecting a **continuously updated impact point** on the pilot's heads-up display (HUD), allowing the pilot to release the bomb at the calculated point. The aircraft's bomb release is based on real-time **computations** of the trajectory, and no radar ranging is required for this mode of attack.

The key distinction in **CCIP** is that it primarily uses the aircraft's own **navigation and flight parameters** (e.g., altitude, speed, attitude, and heading) to calculate where the bomb should hit. The FLR, which is used for terrain following or avoiding obstacles, isn't integrated into the release calculation for these bombing modes.

3. Role of FLR in A-7D Operations:

- The **FLR** in the **A-7D** is designed for **terrain-following flight** and **low-level navigation**, especially in environments where the pilot needs to avoid terrain or obstacles. However, it does not play a role in **bomb release** calculations for **VIS Attack** or **CCIP** modes.
- The FLR is more typically used for **situational awareness** during **low-level flying** and for **maintaining altitude** in relation to the terrain rather than providing data for weapon release calculations.

Conclusion:

In both **Visual Attack (VIS Attack)** and **Continuous Calculated Impact Point (CCIP)** bombing modes on the **A-7D Corsair II**, the **Forward-Looking Radar (FLR)** does not provide **ranging information** at the time of bomb release. The **VIS Attack** relies on the pilot's visual cues and sighting systems, while the **CCIP** mode uses the aircraft's own flight data to compute the optimal release point without the need for radar-assisted ranging. The FLR is primarily used for **terrain-following and situational awareness**, but not directly for bomb release in these modes.

A-7D single hydraulic system and vulnerabilities

ChatGPT said:

The **A-7D Corsair II** fighter aircraft, like many other tactical aircraft, utilized a **single hydraulic system** for its flight control, landing gear, brakes, and other critical functions. This single hydraulic system was a key part of the aircraft's design, but it also presented certain vulnerabilities. Here's a breakdown of its components and the vulnerabilities associated with them:

Single Hydraulic System Overview:

The **hydraulic system** on the A-7D was responsible for:

1. **Flight controls:** Moving the ailerons, elevators, rudder, and other control surfaces.
2. **Landing gear:** Extending and retracting the landing gear.
3. **Brakes:** Activating the aircraft's braking system.
4. **Speed brakes:** Extending and retracting the speed brakes to assist in rapid deceleration.

The **single hydraulic system** means that all of these critical functions were dependent on one hydraulic circuit. This hydraulic system was pressurized by an engine-driven pump, and it could store hydraulic fluid in a reservoir, which was then distributed throughout the aircraft to power the hydraulic actuators.

Vulnerabilities of the Single Hydraulic System:

1. **Complete Loss of Hydraulic Power:**
 - If the single hydraulic system failed (due to damage to the hydraulic lines, loss of fluid, or pump failure), the aircraft could lose all powered control surfaces, landing gear operation, and braking. This would severely affect the pilot's ability to control the aircraft, land safely, or even decelerate after landing.
 - In a worst-case scenario, if the hydraulic system failed completely, the pilot would have to rely on **manual controls** (if available) for flight surfaces. However, on the A-7D, the manual backup systems were limited, and control could be compromised.
2. **Hydraulic Line Damage:**
 - Combat damage or mechanical failure could damage the hydraulic lines or fittings. Since the A-7D only had one hydraulic system, damage to any of these lines could cause a loss of hydraulic pressure, leading to the failure of the systems that rely on hydraulics.
 - If a hydraulic line were to rupture or be damaged during combat or while performing aggressive maneuvers, it could result in a complete failure of the flight controls or landing gear systems.

3. **Pressure Loss:**

- Loss of hydraulic pressure, whether due to a leak, a pump failure, or other reasons, could render the aircraft inoperable. A sudden or gradual loss of pressure would degrade the effectiveness of the flight controls, making the aircraft difficult to handle.

4. **Landing Gear Failure:**

- The landing gear system relied heavily on the hydraulic system. If the hydraulic system failed, the pilot might have difficulty extending or retracting the landing gear. In the event of a failure during landing, the aircraft might be unable to safely deploy the landing gear, which could result in a **belly landing** or serious damage to the aircraft.

5. **Braking System Failure:**

- Without hydraulics, the aircraft's braking system would be rendered inoperative. This could create challenges in slowing down the aircraft on landing or in emergency situations where rapid deceleration is necessary.

6. **Speed Brake and Flap Control:**

- The aircraft's speed brakes and certain flap functions also relied on hydraulic power. A loss of hydraulic pressure could compromise the ability to deploy the speed brakes or adjust the flaps, affecting the aircraft's performance during landing or evasive maneuvers.

7. **Vulnerability to Combat Damage:**

- In a combat environment, the aircraft's hydraulic system is vulnerable to damage from enemy fire or debris. If any part of the hydraulic system is hit, it could cause a **complete loss of flight control** or affect critical systems like the **landing gear** or **brakes**.

Mitigation Measures and Redundancy:

While the **A-7D** had a single hydraulic system, there were design features and procedures aimed at mitigating some of these risks:

- **Hydraulic Fluid Reservoir:** The system included a reservoir to store hydraulic fluid, which would provide some temporary relief if the system experienced a minor leak or failure.
- **Backup Systems:** The A-7D had some **manual backup control mechanisms** for flight surfaces, though these were not as effective as the hydraulic-powered controls.
- **Routine Maintenance:** Regular inspection and maintenance of the hydraulic system were critical to ensure reliability, especially in a combat environment.
- **Pre-flight Checks:** Pre-flight checks would typically involve verifying the hydraulic fluid levels, pressure, and overall integrity of the hydraulic system to reduce the likelihood of failure during the mission.

Conclusion:

The **single hydraulic system** on the **A-7D** was a significant vulnerability because if it failed, the aircraft could lose control over essential systems like flight controls, landing gear, brakes, and speed brakes. While the system was designed to be robust, combat damage, mechanical failure, or other issues could quickly lead to catastrophic results. This vulnerability was somewhat mitigated by manual backup systems and regular maintenance, but **the single hydraulic system remained a critical weak point in the aircraft's overall design.**

Why would an A-7D fighter pilot employ the speed brake on a high speed medium altitude to low altitude descent before transitioning to level the plane to a neutral position above the terrain

ChatGPT said:

An A-7D fighter pilot would employ the speed brake during a high-speed, medium-altitude to low-altitude descent before transitioning to level flight for several key reasons related to flight dynamics and mission objectives:

1. **Controlled Deceleration:** The speed brake is deployed to help **rapidly reduce the aircraft's speed**. During a high-speed descent, the aircraft is gaining speed due to gravity and aerodynamic forces. **By extending the speed brakes, the pilot can increase drag**, which will help slow the aircraft down to a **safer, more controlled speed for low-altitude flight**. **This is particularly important when transitioning to a low-altitude, high-agility environment where precise control is crucial.**
2. **Increase in Rate of Descent:** The speed brake, when deployed, causes additional drag and helps the aircraft **descend more quickly** without relying entirely on pitch control. This is useful when the pilot needs to descend quickly to avoid enemy radar detection, enter a tactical engagement zone, or descend to a lower altitude for a bombing or strafing run.
3. **Prevent Over-speeding:** When descending at high speeds, especially in a fighter like the A-7D, the aircraft might exceed its **maximum safe operating speed** (Vne or Vmo) or risk damaging the airframe. The speed brake allows the pilot to **control the descent rate** and prevent overspeeding, which could damage the aircraft or reduce maneuverability at low altitudes.
4. **Enhanced Maneuverability for Terrain Following:** As the pilot approaches lower altitudes, especially over hostile terrain, they may want to employ **terrain-following techniques**. By using the speed brake, the pilot can **smoothly reduce the aircraft's speed** and adjust the nose attitude for more precise, controlled flight near the terrain. This helps maintain a **neutral nose position** relative to the terrain, ensuring that the aircraft remains in a stable, level attitude and avoids excessive climb or descent during the transition.
5. **Separation from Threats:** In combat situations, a high-speed descent followed by a quick transition to a lower altitude is a common tactic to evade radar tracking or incoming missiles. The **speed brake** helps manage the aircraft's trajectory during this maneuver, keeping it **in a controlled position** for a rapid, low-level cruise once the speed is reduced to an appropriate level.
6. **Stabilizing the Aircraft:** The **speed brake can help stabilize the aircraft** during rapid transitions between different flight phases (from high-speed descent to low-altitude cruise). Without it, the aircraft might oscillate or become too fast, making it more difficult for the pilot to transition smoothly into a low-altitude, level flight path.

Overall, the speed brake provides the pilot with a means of **fine-tuning the descent** and ensuring the aircraft's speed, attitude, and trajectory are optimal for a safe, controlled, and effective transition to low-altitude cruise or terrain-following flight.

An A-7D descending quickly from medium to low altitude employs speed brake and releases just before transitioning to level low altitude flight, what position would the nose of the aircraft be in normally

ChatGPT said:

In this scenario, when an A-7D (or any similar fighter aircraft) is descending quickly from medium to low altitude, employing the speed brakes, and then transitioning to level low-altitude flight, the nose of the aircraft would typically be in a **slightly downward or neutral attitude** before leveling out.

Here's a breakdown of the flight dynamics:

1. **Descent Phase:** During the high-speed descent, the aircraft would likely have the nose slightly down to maintain a good descent rate. Speed brakes are deployed to increase drag and further reduce speed while controlling the descent rate.
2. **Speed Brake Deployment:** As the speed brakes are extended, the aircraft will experience an increase in drag, causing the nose to pitch up slightly due to the additional drag force on the aircraft's fuselage. This can create a momentary nose-up tendency.
3. **Transition to Level Flight:** Just before the aircraft transitions to level low-altitude flight, the pilot will likely use **back pressure on the control stick** to raise the nose slightly in anticipation of leveling the aircraft. This allows the aircraft to stabilize in a neutral or level attitude once the speed brakes are retracted, and the aircraft has slowed to a more controlled cruise speed.
4. **Nose Position at Transition:** At the moment of transition to level flight, the nose would generally be in a **neutral or slightly upward** position (around 0° to a few degrees above the horizon), depending on the aircraft's descent rate and speed at that moment.

This is a balance of drag, thrust, and control input to ensure a smooth transition from the descent into a stable, level low-altitude cruise.

A-7D if the rudder servo leaks, and the rudder servo is replaced, and the rudder servo leaks again, and the rudder servo is replaced again, and the rudder servo then "leaks beyond limits" more than before what could be causing the continuing leaks

ChatGPT said:

If the rudder servo on the **A-7D** continues to leak, even after replacement, and the leakage worsens over time, it suggests that the issue may not solely be with the **rudder servo itself**, but rather with other components or conditions in the hydraulic system. Here are some potential causes for these continuing and worsening leaks:

1. Hydraulic Pressure Issues (Overpressure or Fluctuations):

- If there is a **hydraulic pressure issue** in the system (such as **overpressure or pressure spikes**), this could place excessive stress on the **rudder servo** and cause it to leak more quickly after replacement.
- A malfunctioning pressure relief valve or an issue with the **hydraulic pump** might result in pressure fluctuations that exceed the servo's design limits, leading to accelerated wear and leaks. This would explain why the **replacement servos** continue to fail.

2. Contamination in the Hydraulic System:

- **Contaminants** (such as dirt, metal particles, or degraded hydraulic fluid) in the hydraulic system can cause damage to seals and internal components of the rudder servo. Over time, these contaminants can lead to increased leakage as they wear down the seals or cause abrasive damage.
- If **hydraulic filters** are clogged or the system is not being properly maintained, contamination can persist and cause repeated failure of the rudder servo.

3. Improper Installation or Seal Damage:

- If the **rudder servo** is being improperly installed during replacement (e.g., over-tightening, misalignment, or failure to follow the correct installation procedures), this could damage the seals and lead to further leaks.
- Another possibility is that the **seals** used in the replacement servos are defective or of lower quality, resulting in failure to properly contain the hydraulic fluid.

4. Faulty or Incorrect Hydraulic Fluid:

- The wrong type of hydraulic fluid or **incompatible hydraulic fluid** could be causing the seals within the rudder servo to degrade. If the fluid's viscosity, additives, or chemical composition are not in line with the specifications for the A-7D, it could damage seals and lead to leaks.
- Inadequate fluid levels or contamination could also cause hydraulic components to operate incorrectly, increasing wear on the rudder servo and leading to leaks.

5. Faulty Servo Design or Manufacturing Defect:

- It's possible that the **replacement rudder servos** themselves have a **manufacturing defect** or design flaw. If the servos are not built to proper tolerances or the quality control is inadequate, the replacement servos may be more prone to leaks.
- Even after replacing the servo twice, if the replacements are faulty or improperly built, they would continue to leak.

6. Excessive Load or Stress on the Rudder System:

- If the aircraft is experiencing **excessive forces on the rudder**, either from aggressive maneuvers, incorrect trim settings, or environmental factors (such as turbulent conditions), this could place more stress on the rudder servo and lead to excessive wear on the seals.
- A **misaligned rudder** or **improper balance of control surfaces** could also create undue stress, leading to premature wear on the servo.

7. Improper System Pressure Setting or Valve Malfunction:

- The rudder servo relies on precise pressure levels. If there is a malfunction in the **hydraulic pressure regulation valves**, such as the **pressure reducing valve** or **priority valve**, they may not be regulating the system's pressure correctly, causing the servo to be exposed to higher-than-expected pressure and leading to leaks.

Conclusion:

The **continuing and worsening leaks after multiple rudder servo replacements likely indicate that the issue is not isolated to just the servos themselves, but may be related to a broader hydraulic system issue such as overpressure, contamination, faulty seals, or improper installation procedures.**

Additionally, the servo might be exposed to **excessive forces** or **incorrect hydraulic fluid**, which accelerates wear and causes the leaks to recur.

To resolve the problem:

1. **Inspect the hydraulic system** for any overpressure or pressure regulation issues.
2. Ensure the system is free from contamination, and that the filters are clean and functioning.
3. Verify the proper type and quality of hydraulic fluid is being used.
4. Double-check the installation procedures and ensure that the correct **OEM parts** and seals are used during replacement.
5. **Consider a thorough system-wide inspection** of the hydraulic system, including valves, pressure settings, and the integrity of other hydraulic components to identify any underlying issues.

Where was the PMDS Tape stored on an A-7D aircraft

ChatGPT said:

The **PMDS (Post-Mission Data Storage)** tape on the A-7D aircraft was typically stored in the **Data Storage Unit (DSU)**, which was located in the aircraft's avionics bay.

The PMDS tape was used for **recording mission data**, such as flight parameters, targeting information, and weapon system performance, to allow for post-mission analysis and debriefing. The tape could be removed after the flight for detailed analysis and review of the mission's performance. This was particularly useful for improving tactics, identifying areas for training, and ensuring system functionality.

In the A-7D, this data storage system was part of the aircraft's **Avionics and Electronic Warfare (EW) systems**, which were essential for the aircraft's precision strike and tactical capabilities. The data from the PMDS tape helped maintain and improve mission effectiveness by providing valuable feedback to both pilots and maintenance crews.

What was the rudder servo on an A-7D

ChatGPT said:

The **rudder servo** on the **A-7D Corsair II** is part of the **flight control system** that helps manage and adjust the movement of the aircraft's rudder. **The rudder is a critical control surface on the tailplane of the aircraft, responsible for controlling yaw (the left and right movement of the aircraft around its vertical axis).** The rudder servo is an important component in the operation of the rudder.

Rudder Servo in the A-7D:

The **rudder servo is a hydraulic actuator** that assists in the movement of the rudder. It is powered by the aircraft's **hydraulic system**, which provides the necessary force to move the rudder in response to the pilot's inputs.

- **Purpose:** The rudder servo helps to move the rudder to the desired position based on control inputs from the pilot. By moving the rudder, the aircraft can correct its yaw, which is important for maintaining stability and control, particularly during turns, crosswind landings, or evasive maneuvers.
- **Hydraulic System:** The rudder servo is typically powered by the aircraft's **primary hydraulic system**. In the case of the A-7D, the **hydraulic system** provides the force needed to move the control surfaces (such as the rudder and ailerons) and operates the flight control servos.
- **Flight Control System:** **The rudder servo works in conjunction with other control surfaces like the elevator and ailerons, with each having its own servo systems. Together, they allow the pilot to maneuver the aircraft in three-dimensional space.**

Location and Operation:

- The **rudder servo** is located within the **tail section** of the A-7D, close to the rudder itself. It is integrated into the **tailplane structure** and works as part of the overall **flight control system**.
- The **pilot's rudder inputs** are translated into hydraulic pressure that moves the servo, which then adjusts the rudder's position. The **hydraulic fluid** flows through the servo and exerts force on the rudder's control surfaces, **enabling precise control over the aircraft's yaw.**

Summary:

The rudder servo in the A-7D Corsair II is a hydraulic actuator that controls the movement of the rudder. It's part of the aircraft's hydraulic flight control system, which **allows the pilot to control the aircraft's yaw and stabilize the aircraft during flight maneuvers.**

If a Fire Warning Light on an A-7D is INOPERABLE, is the aircraft air worthy

ChatGPT said:

The **fire warning system** on an aircraft like the **A-7D Corsair II** is a critical safety feature designed to alert the pilot to the presence of a fire or overheat condition in key areas, such as the engine, engine bay, and avionics bays.

If the **fire warning light** is **inoperable**, it means that the pilot will not be alerted to a potential fire in the affected areas, which poses a significant safety risk.

Airworthiness Consideration:

In general, if the **fire warning light** is inoperable, the aircraft **may not be considered airworthy**. Here's why:

1. **Safety Risk:** A malfunctioning fire warning system removes a critical layer of safety. Fires, especially in-flight, can rapidly escalate and cause catastrophic damage to the aircraft. Without the warning light, the pilot may not become aware of a fire until it's too late, particularly in areas that are difficult to monitor visually, such as the engine or fuel systems.
2. **Regulatory Requirements:** According to **FAA regulations (14 CFR Part 91)** and **military airworthiness standards**, all safety-critical systems, including fire warning systems, must be fully operational for an aircraft to be considered airworthy. If a fire warning light is inoperable, it could be considered a **deficiency** that compromises the aircraft's airworthiness.
3. **Military Maintenance Guidelines:** In the military, aircraft must be certified for flight after every **maintenance check**. If an essential warning system like the fire warning light is not working, the aircraft would likely be considered unfit for flight until it's repaired or appropriately addressed.

Possible Solutions:

1. **Maintenance and Repair:** The fire warning light should be repaired or replaced before the aircraft is cleared for flight.
2. **Redundancy or Temporary Systems:** If the aircraft has a **redundant fire warning system** or if the aircraft is in a controlled test environment with adequate safety measures, it may be temporarily allowed to fly with specific waivers. However, this would be the exception, not the rule, and typically requires a **formal flight clearance**.

Conclusion:

Without a functioning fire warning system, an **A-7D Corsair II** would **not be considered airworthy** due to the **significant safety risks involved**. The fire warning system is essential for the pilot's safety, and any inoperable critical warning system would require repair before the aircraft is cleared for flight.

A-7D Radar Altimeter. Was it possible for the radar altimeter to be angled incorrectly if it malfunctioned?

ChatGPT said:

Yes, it was **possible** for the radar altimeter on the A-7D Corsair II to be **angled incorrectly** or otherwise malfunction in a way that caused **inaccurate readings**, though such issues were generally rare and typically tied **to installation errors, damage, or system failures**.

Here's how and why this could happen:

1. Physical Misalignment or Installation Issues

The radar altimeter antenna(s), typically mounted on the belly of the aircraft, needed to be **precisely aligned downward** to measure the distance to the ground directly beneath the aircraft. If the antenna became **bent, misaligned, or was improperly mounted**, it could skew the angle of the radar beam. This might cause:

- False altitude readings
- Failure to detect terrain directly beneath
- Reduced accuracy at lower altitudes

2. Damage or Warping

Any **structural damage** to the aircraft belly (from a hard landing, debris impact, or corrosion) could cause **physical misalignment** of the radar altimeter antenna or interfere with its signal.

3. Electronic or Component Malfunction

Even if the antenna was correctly positioned, internal faults in the radar altimeter system—such as:

- Power supply issues
- Signal processing faults
- Interference —could cause the system to report incorrect altitudes.

4. Environmental or Operational Factors

Flying over **uneven terrain, water**, or during **steep banked turns** could affect radar reflection quality. These conditions might not necessarily involve a malfunction but could still **fool the system** into reading incorrect altitudes.

TL;DR

Yes, the radar altimeter on the A-7D could be angled incorrectly if it malfunctioned—especially due to physical misalignment, damage, or installation error. This would cause inaccurate altitude readings, which could be dangerous during low-level flight or landing.

Are you looking into a specific incident or doing a tech deep-dive?

You said:

A-7D Radar Altimeter. Was it possible for an electrical surge or interference to cause the radar altimeter to angle incorrectly?

ChatGPT said:

Great question—and one that gets into the difference between **physical orientation** and **electronic function**.

Short Answer:

An electrical surge or interference could cause the radar altimeter to malfunction and give incorrect readings, but it could not physically change the angle of the radar altimeter. The antenna is mechanically fixed in place on the airframe—so its physical angle can't be altered by electronics alone.

But let's break that down a bit more:

1. Radar Altimeter Basics (A-7D context)

The A-7D Corsair II used a radar altimeter (likely similar to the AN/APN-194 or related systems), which sent a radar signal straight down and measured the time it took to bounce back—calculating the distance to the ground directly below.

The **antenna(s)** were **fixed**—typically flush-mounted on the underside of the fuselage—so the radar beam was always aimed **downward**, perpendicular to the aircraft's belly.

2. Electrical Surge / Interference Possibilities

While a surge or **EMI (electromagnetic interference)** couldn't rotate or tilt the antenna, it could affect:

- **Transmitter power output** (weakened or distorted radar signal)
- **Receiver sensitivity**
- **Signal processing electronics** (introducing false returns or noise)
- **Display system** (showing the pilot the wrong altitude)

For example:

- A power surge could damage internal circuits and lead to erroneous altitude readings.
- EMI from another onboard system (especially in older analog aircraft like the A-7D) might cause the radar altimeter to **lock onto false returns**, especially over sloped or non-uniform terrain.

This could **simulate** the *effect* of the radar being mis-aimed—because the system might start interpreting reflections from terrain not directly below the aircraft, but **it would be a processing or signal issue, not a mechanical angling of the antenna**.

3. Could This Look Like a Tilted Antenna?

Yes, in terms of **symptoms**. If a radar altimeter was:

- receiving returns from a side lobe,
- picking up reflections from terrain at an angle,
- or misprocessing weak signals due to interference—

—it might display altitude that doesn't match what's directly underneath, *as if* the radar beam were off-axis. But again, this would be an **electronic or signal artifact**, not a physical change in angle.

Conclusion:

- ◆ **No**, electrical surges or interference **could not angle the radar altimeter physically**.
- ◆ **Yes**, they **could cause it to behave** *as if* it were mis-aimed—by degrading signal accuracy, corrupting data, or confusing the system.

AF Form 711, USAF MISHAP Report and AF Form 711b, AIRCRAFT FLIGHT MISHAP REPORT. WHAT ARE THESE FORMS TODAY, WHAT ARE THEY CALLED, AND WHICH ONE CONTAINS CLASSIFIED OR CONFIDENTIAL INFORMATION

ChatGPT said:

AF Form 711B, titled "USAF Mishap Report," is utilized by the United States Air Force (USAF) to document and report aviation incidents and accidents. This form captures essential details such as the date, time, location, personnel involved, and a narrative of the mishap, serving as a crucial tool for safety analysis and the development of preventive measures. The latest edition of AF Form 711B was released on November 1, 2003. [Finder Doc | +1AF Forms+1AF Forms+1Finder Doc | +1TemplateRoller+1AF Forms+1](#)

Regarding the classification of information, AF Form 711B contains sections that may include privileged or confidential data, especially in parts detailing witness statements and investigative findings. Such information is typically protected to ensure the integrity of the investigative process and to encourage open communication. Access to these sensitive sections is generally restricted to individuals with a need-to-know basis, and the reports are handled following strict security protocols. [Manuals+](#)

It's important to note that mishap reporting and classification procedures can evolve over time. Therefore, for the most current and detailed information, it's advisable to consult the latest USAF directives or contact the appropriate safety office.

USAF SERIES

A-7D

FLIGHT MANUAL

AIRCRAFT

LTV AEROSPACE CORPORATION
N0001967-C-0143
N0001971-C-0470

THIS PUBLICATION IS INCOMPLETE WITHOUT T.O. 1A-7D-1A
SUPPLEMENT FLIGHT MANUAL.

THIS CHANGE SUPERSEDES OPERATIONAL SUPPLEMENT .52.
REFER TO SAFETY SUPPLEMENT INDEX T.O. 0-1-1-5 FOR THE
CURRENT STATUS OF FLIGHT MANUALS, SAFETY/
OPERATIONAL SUPPLEMENTS AND FLIGHT CREW CHECKLISTS.



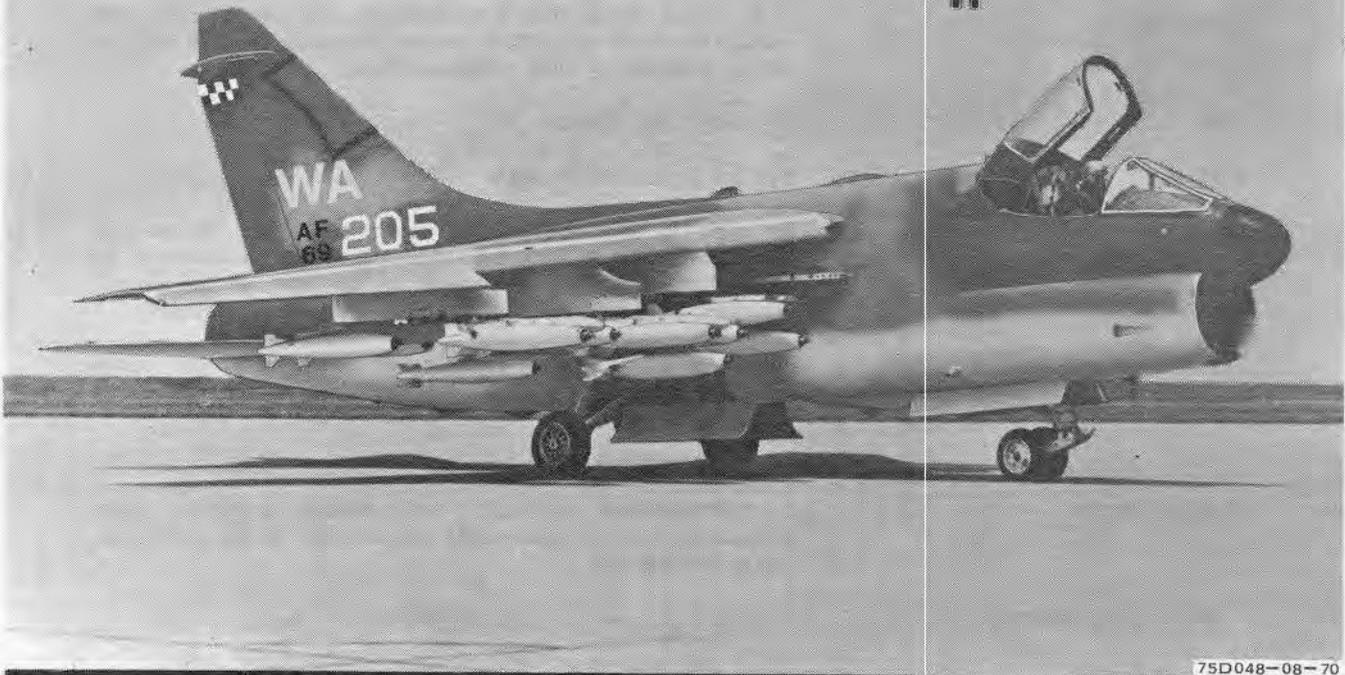
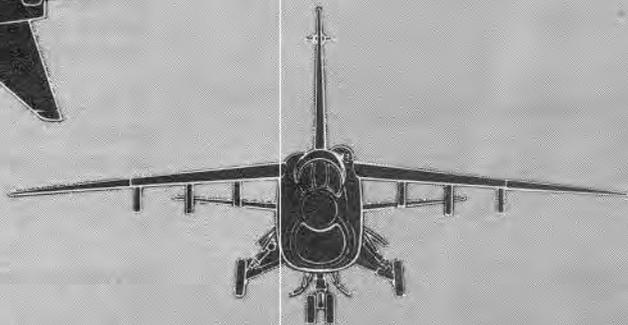
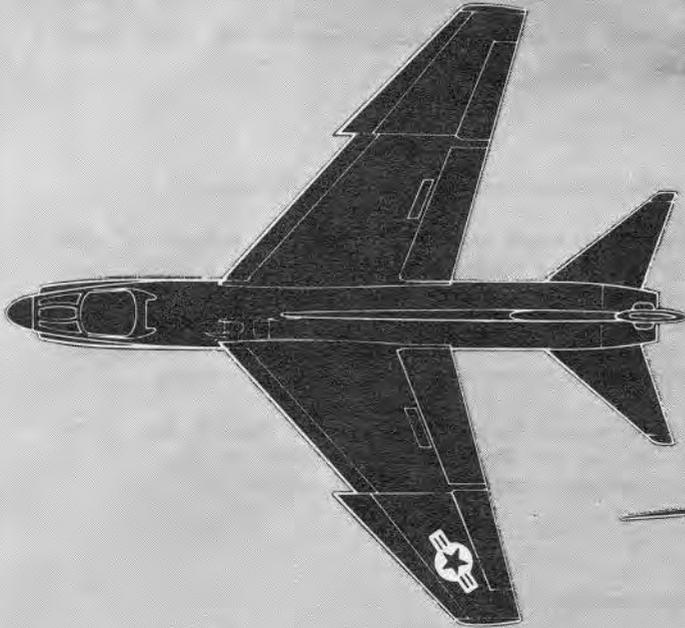
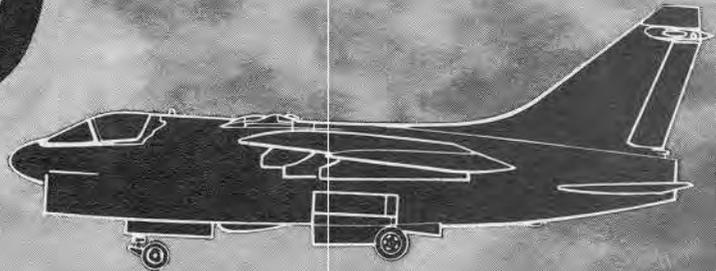
COMMANDERS ARE RESPONSIBLE FOR BRINGING THIS PUBLICATION TO THE ATTENTION OF ALL AFFECTED PERSONNEL.

Each transmittal of this document outside the Department of Defense must have approval of the issuing Service.

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE.

Exhibit 09 at pg. 001

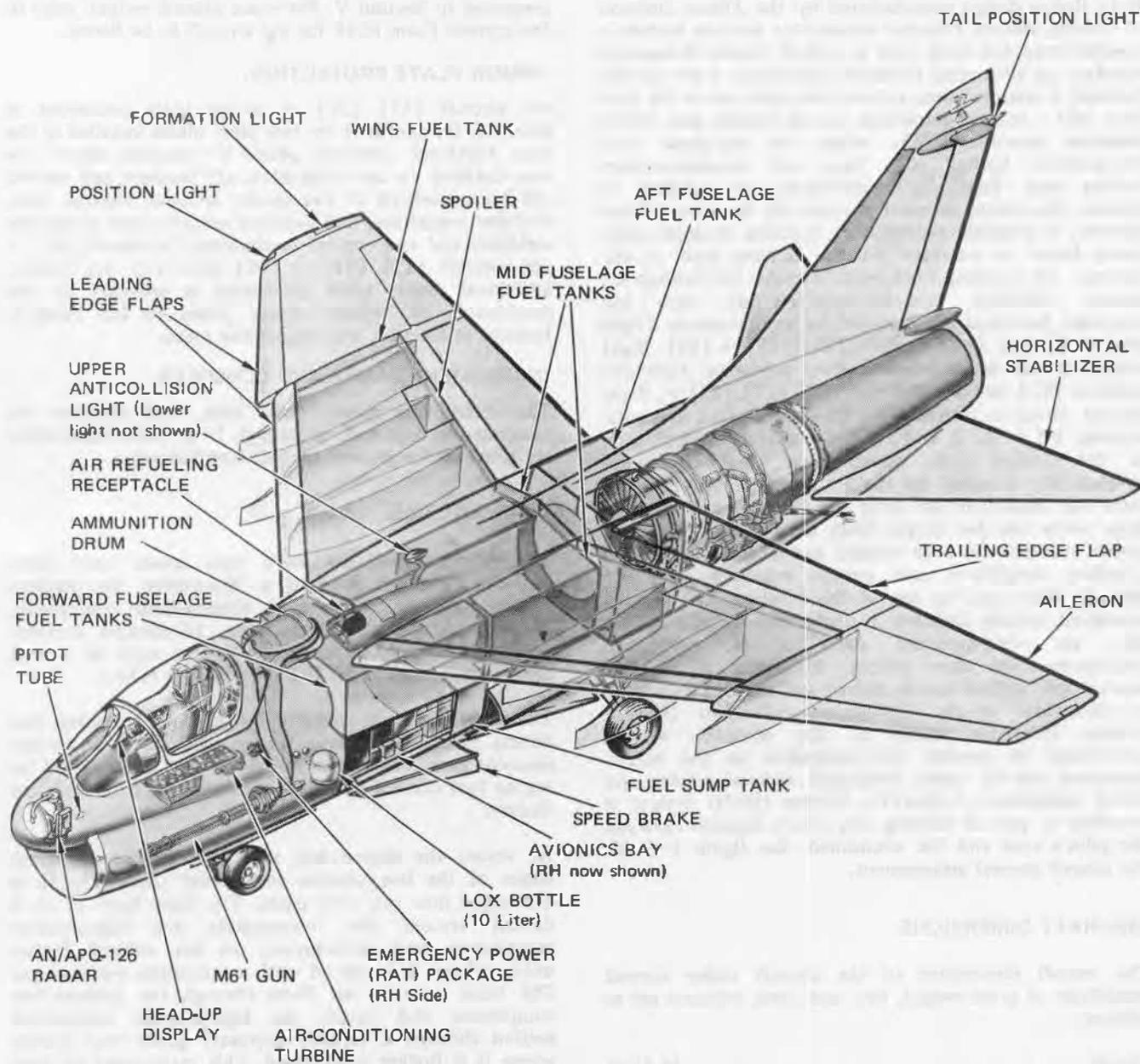
A-7D



75D048-08-70

Exhibit 09 at pg. 002

GENERAL ARRANGEMENT



75D091-05--70

If the altimeter automatically reverts to STBY, an attempt should be made to reset to the servoed mode. If the fault condition was temporary, the altimeter will reset and the STBY flag will disappear.

The altimeter setting is entered in the normal manner and can be set over a range from 28.10 to 31.00. A field elevation check should be made in both the pneumatic and servoed modes of operation, using the normal ± 75 feet as the maximum allowable error in either case. In addition, indications in the two modes should correspond to within 75 feet.

CAUTION

During normal use of the barometric setting system, momentary locking of the barocounters may be experienced. If this occurs, do not force the setting. Application of force may cause internal gear disengagement and result in excessive altitude errors in both pneumatic (STBY) and servo (RESET) mode. If locking occurs, the required setting may sometimes be attained by rotating the knob a full turn in the opposite direction and carefully re-approaching the required setting.

Note

If altimeter setting knob can be moved in or out and the pointer moves without a corresponding change of the barometric setting when the knob is rotated, accurate altimeter settings cannot be made.

In the event of loss of the barometric altimeter and the radar altimeter, the cabin altimeter can be used for rough estimation of altitude below 8,000 feet. Most accurate altitude readings are made while maintaining a constant altitude. Because of instrument lag, changing altitude results in erroneous indication.

At high airspeeds, the differences between servoed and pneumatic indications can be as much as 1,000 feet.

AIRSPEED – MACH INDICATOR.

An AVU-8/A Airspeed – Mach indicator is installed on the instrument panel. A pointer indicates airspeed below 0.5 Mach and both airspeed and Mach number at 0.5 Mach and above. The range of the instrument is from 80 to 850 knots of airspeed and from 0.5 to 2.2 Mach. The calibrated operating altitude is from minus 1,000 feet to plus 80,000 feet. A maximum allowable speed pointer indicates, in terms of indicated airspeed, the specific airspeed value which has been preset into the indicator. An airspeed setting index is incorporated on the dial face which can be

manually set by a control knob (SET INDEX) located on the lower right corner of the case. The airspeed index is set by rotating the knob left or right over the range of 100 to 700 knots indicated airspeed. Electrical power for instrument lighting is controlled by rotation of the FLIGHT INST control on the right console.

TRUE AIRSPEED INDICATOR.

The true airspeed indicator receives inputs from the Air Data Computer to provide a continuous display of true airspeed. A flag covers the true airspeed indication when the Air Data Computer system is inoperative. On aircraft → [16] [18] → [26], the true airspeed indicator is located on the instrument panel. On [17] [27] →, the indicator is located on the right console.

RADAR ALTIMETER.

An AN/APN-141(V) Radar Altimeter provides a continuous, highly accurate indication of absolute altitude from 0 (± 5 feet) to 5,000 feet above terrain or water. The equipment is accurate within plus or minus 5 feet or plus or minus 5 percent of absolute altitude, whichever is greater. The radar altimeter supplies altitude information to the Forward Looking Radar and to the Head-Up Display.

The altitude indicator is located on the instrument panel. The indicator has a dial graduated from 0 to 5,000 feet, a pointer, an OFF flap, a low altitude limit indexer, and a mask. The dial is graduated in 10-foot increments between 0 and 200 feet, 50-foot increments between 200 and 600 feet, 100-foot increments between 600 and 2,000 feet, and 500-foot increments between 2,000 and 5,000 feet. The OFF flag is visible when the set is off, when pointer indication is unreliable, or when airplane altitude is above 5,000 feet.

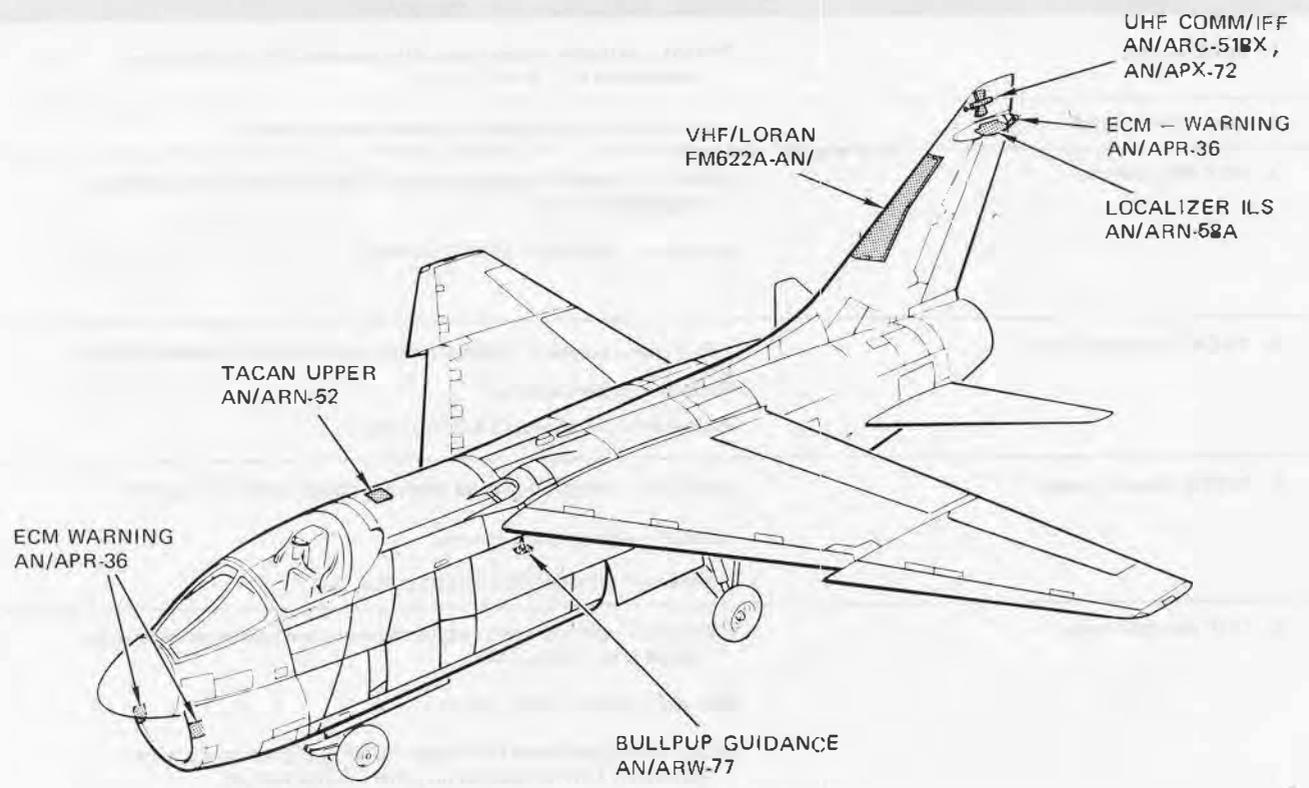
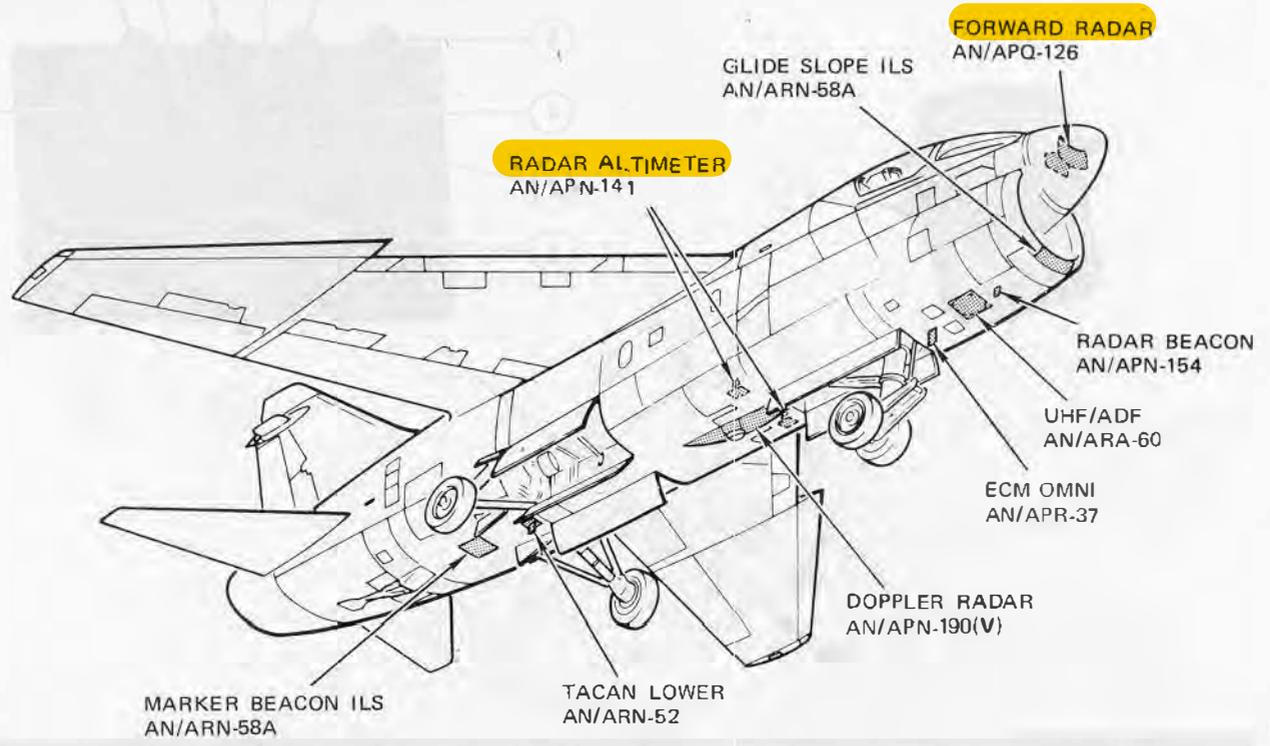
Operating limits vary with altitude. At 5,000 feet absolute, the radar altimeter should operate normally with a 30-degree bank angle or with a 50-degree climb or dive angle.

Operation.

The system should be ready for operation after a 3-minute warmup period.

A control knob, located on the height indicator, is rotated clockwise to turn the set on and is used to set a low altitude limit index marker. The knob is also used to perform a self-test function. Pressing the control knob causes the range integrator and transmitter section to operate in the low altitude mode and causes ramp triggering operation in the high altitude mode. If the set is working properly, a resulting indication of 0 (+10, -5) feet is displayed, regardless of actual aircraft altitude. When the aircraft descends below the altitude selected by the index marker, a warning light on the instrument panel illuminates. In flight, with the set operating, pressing the

ANTENNA LOCATIONS



750 92-07-71

Exhibit 09 at pg. 005

Ailerons And Spoiler-Deflectors.

Lateral control is very effective and may even be noticeably effective during high speed taxi. In flight, the ailerons induce some adverse yaw; however, this yaw decreases as airspeed increases and becomes slightly favorable at higher Mach numbers. As an aileron moves upward to create roll, a spoiler-deflector is operated in conjunction with the aileron to provide increased roll rate and counteract yaw. The spoiler extends up into the airstream, disrupting the airflow, and decreases lift on the wing. The deflector extends down into the airstream and acts as a scoop to direct airflow over the wing surface behind the spoiler, which prevents flow separation.

Rudder.

The rudder is effective at all speeds above 40 to 50 knots. With heavy wing stores, the minimum effective speed is somewhat higher.

SECONDARY CONTROLS.

Flaps.

The aircraft accelerates smoothly as the flaps are retracted. As the flaps retract, pitch attitude must be increased to offset a slight settling effect. Pitch trim and trim rate are sufficient to reduce stick force to zero during flap retraction. If trim is not used, a pull force of approximately 10 to 15 pounds is required to overcome the pitch change if full flaps are used. Pull force is significantly less when using partial flaps for takeoff. Flap extension requires nosedown trim of equal magnitude.

Speed Brake.

The speed brake can be extended at any speed and is very effective. A mild noseup pitch tendency is apparent as the brake extends. Three or four pounds of stick force is required to overcome full extension pitch change at lower airspeeds while about 10 pounds of push force is required at high subsonic speeds. A directional trim change may occur when more than 40° of speed brake is extended. Airframe buffet accompanies 60° of brake extension. Buffet due to the extended brake varies from light at the lower airspeeds to moderate at high subsonic speeds. Buffet does not interfere significantly with target tracking.

When the speed brake is extended at airspeeds over approximately 450 KIAS, full extension of the brakes is not available until airspeed is reduced.

Trim.

For normal operation, particularly below 15,000 feet, the aircraft should be flown as near "in trim" as possible. At high airspeeds where horizontal stabilizer effectiveness is high, the control system is least sensitive when operated near trim.

FLIGHT CHARACTERISTICS WITH FAILED PC SYSTEMS.

AIRCRAFT → [16] [18] → [26]

Loss of either PC system reduces power to the flight controls by one-half and results in a slight reduction in control effectiveness at high airspeeds.

AIRCRAFT [17] [27] →

Flying qualities with a single PC system failure are unchanged except for a slight reduction in aileron effectiveness at high speed/low altitude. No additional flight restrictions are imposed on the aircraft by loss of a single PC system failure.

PC 2 and PC 3 System Failure.

With loss of both PC 2 and PC 3 systems, aileron deflection available through the roll trim system is $\pm 13^\circ$ at a 1° per second rate. Manual lateral control is lost, but with the AFCS CONT AUG or ATTD engaged and roll AFCS operating, adequate lateral control is available to the limits of AFCS authority ($\pm 10^\circ$ of aileron deflection about the trim position and 24° of spoiler deflection). Approximately one-half lateral stick movement provides the $\pm 10^\circ$ aileron deflection. Further lateral stick displacement has no effect. If roll AFCS is not available, or if CONT AUG is not engaged, roll trim is the only available lateral control. Roll trim provides adequate lateral control for cruise in normal flight attitudes, but only affords marginal control at low speeds.

WARNING

A landing should not be attempted with only the PC 1 system operating unless roll AFCS is engaged and operating.

Note

Lateral control is available only through the use of roll trim if CONT AUG is not engaged or if roll AFCS is out. Roll trim only is marginal for cruising in normal flight and is inadequate for landing.

Since the rudder is powered by PC 2 and PC 3, neither yaw control nor yaw trim is available. A slight steady sideslip may exist, and a shallow bank angle may be required to maintain heading. Yaw damping is essentially the same as that of the normal aircraft with yaw stab OFF. Longitudinal stability and pitch control are essentially unchanged.

Control is adequate in the landing configuration with CONT AUG ON; however, a 1-cycle per second pilot induced lateral oscillation may develop if the pilot

ALL WEATHER OPERATION



SECTION VII

TABLE OF CONTENTS.

<i>Title</i>	<i>Page</i>
Instrument Flight Procedures	7-1
Ice And Rain	7-6
Turbulence And Thunderstorms	7-6
Night Flying	7-8
Cold Weather Operation	7-8
Hot Weather And Desert Operation	7-9

In general, this section consists of procedures and information which differ from, or are supplementary to, the normal operating procedures in Section II. Except for some repetition necessary for emphasis or clarity, only those procedures required for all-weather operation are discussed.

INSTRUMENT FLIGHT PROCEDURES.

Aircraft handling characteristics and stability provide for proper attitude control and should not present a problem during flight under instrument flight conditions. The AFCS functions of ATTD HOLD, NAV/HDG SEL, and ALTITUDE HOLD, when properly used, reduce the pilot's control workload and allow more time for planning ahead and communicating. **Maximum use of the AFCS is recommended during instrument flight.** Instrument flight

planning shall take into account possible delays in departure, climb to assigned altitude, holding, and descent. These factors shall be considered and proper allowances made for all known or suspected deviations.

Note

Prior to an instrument takeoff, the IMS should be allowed to achieve a good ground alignment (IMS not aligned light out). Failure to do so causes the HUD Flightpath Marker and pitch lines to shift noticeably and provide erroneous information at approximately 80 KIAS during the takeoff roll. This is a result of erroneous computed velocity and the large resolution of the display. HUD scales information are usable as are ADI attitude and heading. The HUD display gradually improves and is completely usable 3 minutes after good Doppler information is received.

GROUND OPERATION.

Operate the aircraft and systems as conditions dictate. Refer to Cold Weather Operation, this section, if appropriate. Rain removal or rain repel should be used when needed to improve forward visibility.

BEFORE INSTRUMENT TAKEOFF.

1. Navigation aids set as desired.
2. Heading Mode -- MAN HDG to provide ADI steering on runway heading.



Spatial Disorientation Visual Illusions

SPATIAL DISORIENTATION: *Seeing Is Not Believing*

Spatial Orientation

Our natural ability to maintain our body orientation and/or posture in relation to the surrounding environment at rest and during motion. Genetically speaking, humans are designed to maintain spatial orientation on the ground. The flight environment is hostile and unfamiliar to the human body; it creates sensory conflicts and illusions that make spatial orientation difficult, and, in some cases, even impossible to achieve. Statistics show that between 5 to 10% of all general aviation accidents can be attributed to spatial disorientation, and 90% of these accidents are fatal.

Spatial Orientation on the Ground

Good spatial orientation on the ground relies on the effective perception, integration, and interpretation of visual, vestibular (organs of equilibrium located in the inner ear), and proprioceptive (receptors located in the skin, muscles, tendons, and joints) sensory information. Changes in linear acceleration, angular acceleration, and gravity are detected by the vestibular system and the proprioceptive receptors, and then compared in the brain with visual information (Figure 1).

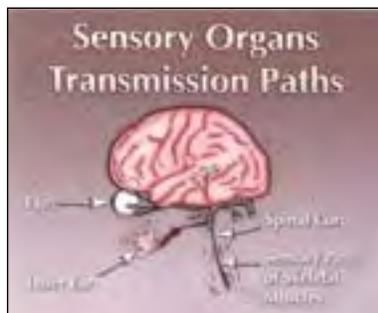


Figure 1

Spatial Orientation In Flight

Spatial orientation in flight is sometimes difficult to achieve because the various types of sensory stimuli (visual, vestibular, and proprioceptive) vary in magnitude, direction, and frequency. Any differences or discrepancies between visual, vestibular, and proprioceptive sensory inputs result in a “sensory mismatch” that can produce illusions and lead to spatial disorientation.

Vision and Spatial Orientation

Visual references provide the most important sensory information to maintain spatial orientation on the ground and during flight, especially when the body and/or the environment are in motion. Even birds, reputable flyers, are unable to maintain spatial orientation and fly safely when deprived of vision (due to clouds or fog). Only bats have developed the ability to fly without vision by replacing their vision with auditory echolocation. So, it should not be any surprise to us that, when we fly under conditions of limited visibility, we have problems maintaining spatial orientation.

Central Vision

Central vision, also known as foveal vision, is involved with the identification of objects and the perception of colors. During instrument flight rules (IFR) flights, central vision allows pilots to acquire information from the flight instruments that is processed by the brain to provide orientational information. During visual flight rules (VFR) flights, central vision allows pilots to acquire external information (monocular and binocular) to make judgments of distance, speed, and depth.

Peripheral Vision

Peripheral vision, also known as ambient vision, is involved with the perception of movement (self and surrounding environment) and provides peripheral reference cues to maintain spatial orientation. This capability enables orientation independent from central vision, and that is why we can walk while reading. With peripheral vision, motion of the surrounding environment produces a perception of self-motion even if we are standing or sitting still.

Visual References

Visual references that provide information about distance, speed, and depth of visualized objects include:

- Comparative size of known objects at different distances.
- Comparative form or shape of known objects at different distances.
- Relative velocity of images moving across the retina. Nearby objects are perceived as moving faster than distant objects.
- Interposition of known objects. One object placed in front of another is perceived as being closer to the observer.
- Varying texture or contrast of known objects at different distances. Object detail and contrast are lost with distance.
- Differences in illumination perspective of objects due to light and shadows.
- Differences in aerial perspective of visualized objects. More distant objects are seen as bluish and blurry.

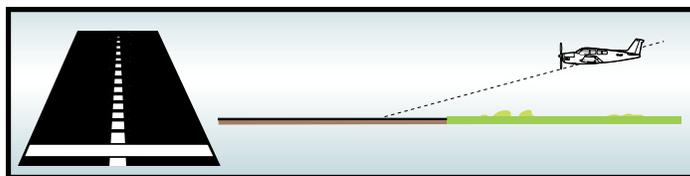
The flight attitude of an airplane is generally determined by the pilot's visual reference to the natural horizon. When the natural horizon is obscured, attitude can sometimes be maintained by visual reference to the surface below. If neither horizon nor surface visual references exist, the airplane's attitude can only be determined by artificial means such as an attitude indicator or other flight instruments. Surface references or the natural horizon may at times become obscured by smoke, fog, smog, haze, dust, ice particles, or other phenomena, although visibility may be above VFR minimums. This is especially true at airports located adjacent to large bodies of water or sparsely populated areas, where few, if any, surface references are available. Lack of horizon or surface reference is common on over-water flights, at night, or in low visibility conditions.

Visual Illusions

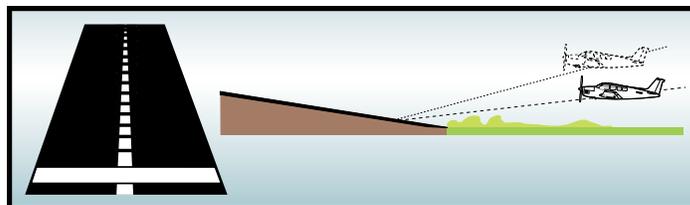
Visual illusions are familiar to most of us. As children, we learned that railroad tracks—contrary to what our eyes showed us—don't come to a point at the horizon. Even under conditions of good visibility, you can experience visual illusions including:

Aerial Perspective Illusions may make you change (increase or decrease) the slope of your final approach. They are caused by runways with different widths, upsloping or downsloping runways, and upsloping or downsloping final approach terrain.

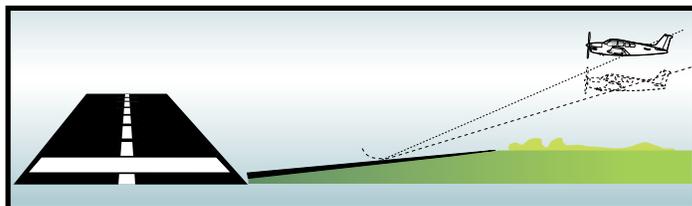
Pilots learn to recognize a normal final approach by developing and recalling a mental image of the expected relationship between the length and the width of an average runway, such as that exemplified in Figure 2.



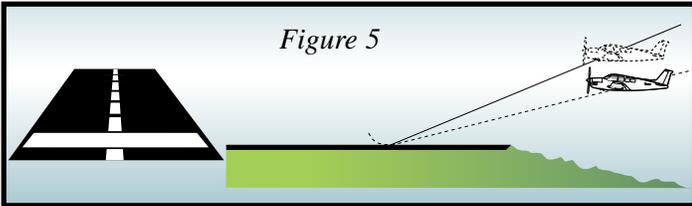
A final approach over a flat terrain with an **upsloping runway** may produce the visual illusion of a high-altitude final approach. If you believe this illusion, you may respond by pitching the aircraft nose down to decrease the altitude, which, if performed too close to the ground, may result in an accident (Figure 3).



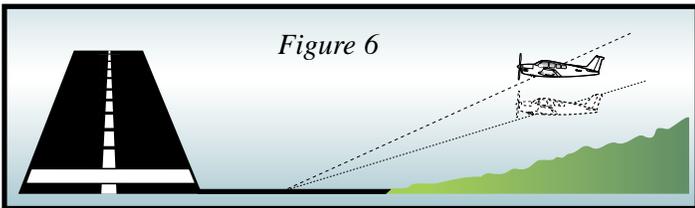
A final approach over a flat terrain with a **downsloping runway** may produce the visual illusion of a low-altitude final approach. If you believe this illusion, you may respond by pitching the aircraft nose up to increase the altitude, which may result in a low-altitude stall or missed approach (Figure 4).



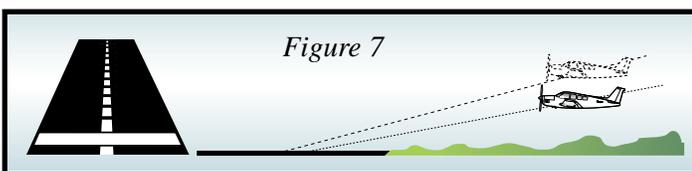
A final approach over an **upsloping terrain** with a flat runway may produce the visual illusion that the aircraft is higher than it actually is. If you believe this illusion, you may respond by pitching the aircraft nose-down to decrease the altitude, resulting in a lower approach. This may result in landing short or flaring short of the runway and risking a low-altitude stall. Pitching the aircraft nose-down will result in a low, dragged-in approach. If power settings are not adjusted, you may find yourself short of the runway, needing to add power to extend your flare. If you do not compensate with power, you will land short or stall short of the runway (Figure 5).



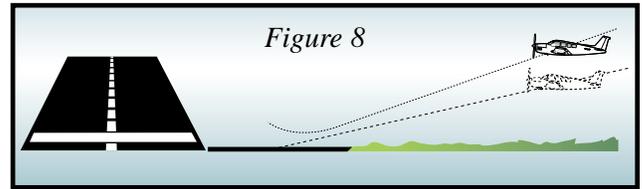
A final approach over a **downsloping terrain** with a flat runway may produce the visual illusion that the aircraft is lower than it actually is. If you believe this illusion, you may respond by pitching the aircraft's nose up to gain altitude. If this happens, you will land further down the runway than you intended (Figure 6).



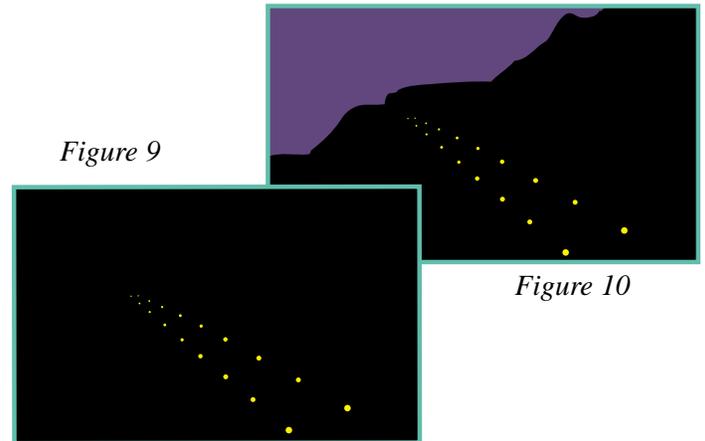
A final approach to an **unusually narrow** runway or an **unusually long** runway may produce the visual illusion of being too high. If you believe this illusion, you may pitch the aircraft's nose down to lose altitude. If this happens too close to the ground, you may land short of the runway and cause an accident (Figure 7).



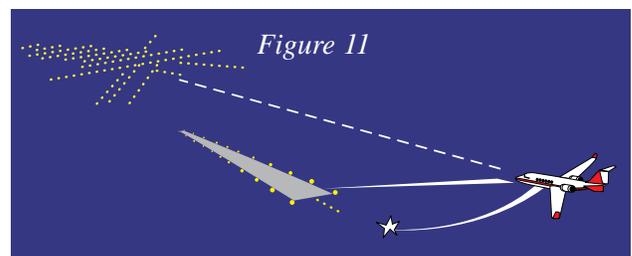
A final approach to an **unusually wide runway** may produce the visual illusion of being lower than you actually are. If you believe this illusion, you may respond by pitching the aircraft's nose up to gain altitude, which may result in a low-altitude stall or missed approach (Figure 8).



A Black-Hole Approach Illusion can happen during a final approach at night (no stars or moonlight) over water or unlighted terrain to a lighted runway beyond which the horizon is not visible. In the example shown in Figure 9, when peripheral visual cues are not available to help you orient yourself relative to the earth, you may have the illusion of being upright and may perceive the runway to be tilted left and upsloping. However, with the horizon visible (Figure 10) you can easily orient yourself correctly using your central vision.



A particularly hazardous black-hole illusion involves approaching a runway under conditions with no lights before the runway and with city lights or rising terrain beyond the runway. Those conditions may produce the visual illusion of a high-altitude final approach. If you believe this illusion you may respond by lowering your approach slope (Figure 11).



The **Autokinetic Illusion** gives you the impression that a stationary object is moving in front of the airplane's path; it is caused by staring at a fixed single point of light (ground light or a star) in a totally dark and featureless background. This illusion can cause a misperception that such a light is on a collision course with your aircraft (Figure 12).

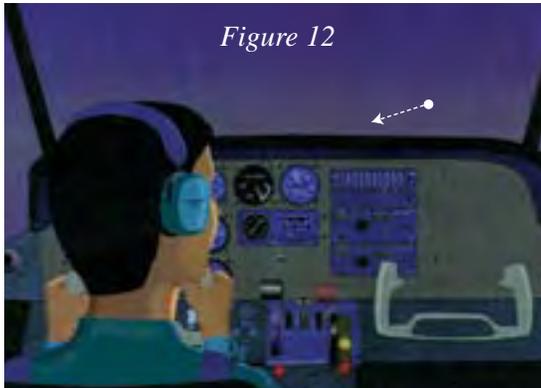


Figure 12

False Visual Reference Illusions may cause you to orient your aircraft in relation to a false horizon; these illusions are caused by flying over a banked cloud, night flying over featureless terrain with ground lights that are indistinguishable from a dark sky with stars, or night flying over a featureless terrain with a clearly defined pattern of ground lights and a dark, starless sky (Figure 13).

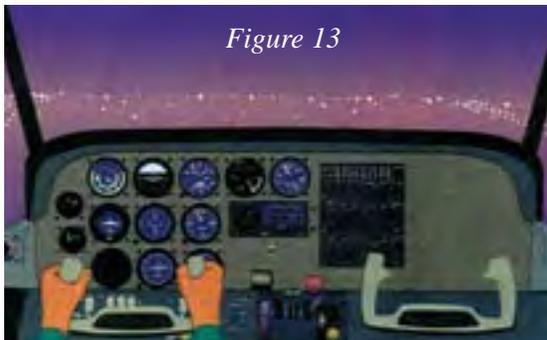


Figure 13

Vection Illusion: A common example is when you are stopped at a traffic light in your car and the car next to you edges forward. Your brain interprets this peripheral visual information as though you are moving backwards and makes you apply additional pressure to the brakes. A similar illusion can happen while taxiing an aircraft (Figure 14).

Figure 14



How to Prevent Spatial Disorientation

- Take the opportunity to personally experience sensory illusions in a Barany chair, a Vertigon, a GYRO, or a Virtual Reality Spatial Disorientation Demonstrator (VRSDD). By experiencing sensory illusions first-hand (on the ground), pilots are better prepared to recognize a sensory illusion when it happens during flight and to take immediate and appropriate action. The Aerospace Medical Education Division of the FAA Civil Aerospace Medical Institute offers spatial disorientation demonstrations with the GYRO and the VRSDD in Oklahoma City and at all of the major airshows in the continental U.S.
- Obtain training and maintain your proficiency in aircraft control by reference to instruments.
- When flying at night or in reduced visibility, use and rely on your flight instruments.
- Study and become familiar with unique geographical conditions where flight is intended.
- Do not attempt visual flight when there is a possibility of being trapped in deteriorating weather.
- If you experience a visual illusion during flight (most pilots do at one time or another), have confidence in your instruments and ignore all conflicting signals your body gives you. Accidents usually happen as a result of a pilot's indecision to rely on the instruments.
- If you are one of two pilots in an aircraft and you begin to experience a visual illusion, transfer control of the aircraft to the other pilot, since pilots seldom experience visual illusions at the same time.
- By being knowledgeable, relying on experience, and trusting your instruments, you will be contributing to keeping the skies safe for everyone.

Medical Facts for Pilots

Publication AM-400-00/1 (rev. 2/11)
 Revised by: Melchor J. Antuñano, M.D.
 FAA Civil Aerospace Medical Institute

To request copies, contact:
 FAA Civil Aerospace Medical Institute
 Shipping Clerk, AAM-400
 P.O. Box 25082 Oklahoma City, OK 73125
 (405) 954-4831

A complete list of pilot safety brochures
 is on the FAA Web site:
www.faa.gov/pilots/safety/pilotsafetybrochures/