RAS 5412 72-22-ISFSI — Applicant Exhibit 191 — Rec'd 7/1/02

AFI 51-503 ACCIDENT INVESTIGATION REPORT

I. AUTHORITY: Pursuant to the provisions of Air Force Instruction (AFI) 51-503, on 16 May 97, Lieutenant General Carl E. Franklin, the Commander, 9th Air Force, appointed Lt Col Timothy J. Hoy to conduct an aircraft accident investigation of an F-16CG (89-2095) accident that occurred on 21 Apr 97 near Pearson, Georgia. This accident resulted in no casualties. The pilot sustained no discernible injuries. The aircraft was destroyed entirely. Minimal private property damage was sustained - primarily timber on a logging reservation. The investigation was conducted from on or about 19 May 97 to on or about 5 June 1997. Technical advisors were: Capt M. Richardson Hyman, Jr., USAF (Legal Advisor);SMSgt Alfred L. Benson, USAF; (Maintenance Advisor); and Mr. Mark Kaestner, OC-ALC/LPARA (Technical Advisor).

II. PURPOSE: An aircraft accident investigation was convened pursuant to the provisions of AFI 51-503. This investigation was held separate and apart from the safety investigation conducted under AFI 91-204. The purpose of this investigation was to find and preserve evidence to use in claims, litigation, disciplinary actions, adverse administrative proceedings, and for all other purposes. The report is available for public dissemination under the Freedom of Information Act, 5 U.S.C. Section 552 and AFI 37-131.

SUMMARY OF FACTS

1. FLIGHT HISTORY: On 21 April 1997, 1Lt Joseph C. Thomas, 68th Fighter Squadron, Moody Air Force Base, Georgia, was number two of a two ship surface attack tactics (SAT) mission from Moody Air Force Base, Georgia. The flight was filed as call sign Python 11 (consisting of Python 11 and Python 12) and departed Moody AFB at 0926 EDT. The flight lead was Captain Michael D. Lay. Python 11 flight maneuvered to the north at low altitude (5000 feet above ground level (AGL) and below) until established in the operating area. The mishap aircraft was conducting simulated air-to-ground weapons deliveries and employing element tactics in the military operating area (MOA)-2 north north-east of Moody AFB. On target egress, following the second element attack, the aircraft experienced an uncommanded engine rollback/flameout while in low altitude tactical formation (less than 1000 feet AGL). The pilot reported a corresponding lack of response to engine throttle movement and noticed the engine speed (RPM) decreasing. The red glareshield "ENGINE" warning light illuminated followed by a vocal message unit "WARNING, WARNING" at which time 1Lt Thomas positioned the cockpit engine control switch to secondary (SEC). Moments later, the main and standby aircraft electrical generators fell off line as the engine rpm, now below 50 percent, continued to decrease. 1Lt Thomas transmitted a "knock-it-off," initiated a 12-15 degree nose-high climb exchanging excess airspeed for altitude, and reached

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approximately 2800 feet AGL. He jettisoned the two external 370 gallon wing fuel tanks just prior to reaching the apex of his zoom maneuver. Climbing through approximately 2000 feet AGL Python 12 began a left turn after being given a reference heading of south west towards Moody AFB by Python 11. Python 12 continued this shallow bank (30-45 degrees) turn for 120 degrees until stabilizing at 220 degree aircraft reference heading. It was during this turn that 1Lt Thomas cycled the throttle to "off" and then to a mid-range position, started the on-board jet fuel starter (JFS) after rolling out, and attempted an engine restart. 1Lt Thomas successfully ejected at 1500 feet AGL after engine rpm readings indicated an unsuccessful airstart. The aircraft impacted at approximately 0946 hours EDT 7.5 NM SSW of Pearson, Ga, N3112.063, W8257.499. 1Lt Thomas sustained no injuries. News media interest in this accident was moderately low.

2. MISSION: The mission was initially scheduled and planned as a four-ship SAT sortie with numbers one and three (the mishap pilot) conducting flight lead upgrades. Number one (Captain Lay) was conducting a four-ship SAT extra, while number three (1Lt Thomas) was accomplishing the #3 of a four-ship flight upgrade in accordance with the 2-ship upgrade syllabus. The mission was formation low altitude tactical navigation (LATN) followed by low altitude tactical attacks against targets of opportunity in the working area (Tab V-50).

3. BRIEFING AND PREFLIGHT: Crew rest was adequate. Both Captain Lay and 1Lt Thomas mission planned the day prior (Sunday) (Tab V-59). 1Lt Thomas arrived for work on the 21st at approximately 0610 for a mass briefing at 0630. The mass briefing lasted approximately 15 minutes and was followed by the Python 11 flight briefing. The briefings were adequate and covered all pertinent and required items in accordance with MCM 11-F16. Prior to the pilots departing the squadron, the squadron's top three supervisor changed the flight from a four-ship to a two-ship. This was the result of maintenance being able to supply only three of the four aircraft, and directing the third aircraft to proceed as single-ship due to mitigating pilot training requirements, i.e. the pilot required back seat landings for instructor pilot training. There was adequate time for Captain Lay and 1Lt Thomas to thoroughly discuss these changes and adapt their mission as already briefed in the aircraft/pilot fallout portion of Captain Lay's briefing. Aircraft preflight and start were normal (Tabs V-49,71).

4. FLIGHT: Python 11 flight departed Moody AFB single-ship, twenty second afterburner takeoffs, en route to MOA-2. The flight performed a G-awareness maneuver consisting of two 90 degree turns as well as weapon system checks. The flight conducted fuel checks just after takeoff and the G-awareness exercise. Once established in the working area, the flight maneuvered at low altitude in tactical formation searching for suitable targets of opportunity. The flight then set up for a ten mile ingress from the north. Python 12 requested and received approval to transition to his low-show attack, dive toss versus a 20 degree climbing attack, due to weather. Both aircraft ingressed at 510 knots and 500 feet AGL in a line-abreast tactical formation as briefed, with Python

12 on the left or east side of the formation. Both aircraft actioned left (south south-east) at approximately five miles from the target and conducted separate climbing attacks. Neither pilot reached successful release parameters; however, airspeed and altitude were well above the minimums required for the maneuver (Tab V-51).

Following the first attack, both aircraft initiated hard right turns through west towards north and descended back below 1000 feet AGL. Python 12 transitioned back to the right side (east) of the formation and the formation egressed to the north. After re-establishing tactical formation at low altitude, Python 11 transmitted a terminate, cameras off, and continued to the north to set up for the next attack. Both pilots agreed to repeat the first attack using the same ingress procedures and attacks (Tab V-51). The second attack was performed identical to the first. Both aircraft achieved satisfactory simulated weapons delivery parameters and again performed right turning escape maneuvers to the north.

Both pilots initially had difficulty visually acquiring each other during the early stages of the egress. However, timely radio communications and adherence to the briefed plan ensured deconfliction until each pilot visually acquired the other aircraft (Tabs V-52,81). Python flight was heading north at 450-480 knots and at 500 feet AGL when Python 11 called for a terminate. Around this time Python 12 began a shallow climb out of the low altitude environment followed immediately by "knock-it-off, I've got an engine problem" radio call and zoomed the aircraft in response to the engine malfunction (Tab V-82). Python 12 began a left, shallow-bank turn towards Moody AFB, cycled the throttle to off and then mid-range, jettisoned the external wing fuel tanks, and started the on-board jet fuel starter (Tab V-82). The mishap aircraft obtained approximately 2800 feet AGL (Tab O-28) and transitioned to a shallow dive heading 220 degrees. The mishap pilot continued monitoring the engine rpm gauge and ejected at 1500 feet AGL after not seeing a positive indication of a successful restart (Tab V-83). Python 11 maneuvered to a mile trail position slightly high and aft of Python 12 and monitored the zoom, glide, and ejection sequence. Python 12 landed in a clearing while the aircraft impacted in a heavily forested area. Python 11 contacted Moody Approach Control prior to Python 12 ejecting and informed them that Python 12 in MOA-2 declared an emergency for engine problems. Python 11 and 12 established radio communications on standard search and rescue back-up frequency of 282.8, and the mishap pilot informed lead that he was OK. Python 11 informed the Moody Supervisor of Flying that Python 12 ejected and then established a search and rescue orbit overhead until having to return to base for fuel termination (Tab V-53).

5. <u>IMPACT:</u> The aircraft impacted the ground (N3112.063, W8257.499) at 0946 EDT, 21 April 1997, in the MOA 2, Lowndes County, Georgia, 7.5 miles south southwest of Pearson. Approximate aircraft parameters were: heading 180 degrees, 179 knots indicated airspeed, ten degrees nose down, and shallow left bank (Tabs O, R, V). The aircraft was destroyed upon ground impact, with the wreckage strewn along a 180 degree axis, approximately 60 meters wide by 160 meters long (Tab R).

6. EGRESS SYSTEM: The accident pilot initiated ejection at approximately 1500 feet AGL by pulling the ejection control handle located between his legs in the seat. The Advanced Concept Ejection System (ACES II) environmental sensor and recovery sequencer correctly sensed Mode I ejection parameters. Mode I is for ejections with speeds less than 250 knots equivalent airspeed at sea level and for altitudes from ground level to 15,000 feet mean sea level. This Mode differs from Modes II and III in that the seat drogue parachute does not deploy thereby reducing time required for personnel recovery parachute deployment and inflation. Due to insufficient parachute opening shock associated with lower altitude and airspeed, the left side parachute riser temporary tacking did not break, allowing the forward and rear riser straps to separate fully and expose the red four line release jettison lanyard loop used by the pilot to steer the parachute (Tab J-23). All other indications are that the system functioned as designed during the ejection episode.

7. PERSONAL AND SURVIVAL EQUIPMENT: All inspections of the mishap pilot's personal equipment and aircraft survival equipment were current. The only equipment used was the radio and it performed uneventfully.

8. RESCUE: Rescue efforts were initiated immediately (0945 EDT) by Python 11 (the flight lead). The following actions were taken:

a. Python 11 viewed the ejection sequence from a position approximately 1 to 1.5 miles offset to the right rear side and slightly high of the mishap aircraft. He instituted a search and rescue (SAR) orbit over the crash site. Python 11 remained in the orbit relaying information to responding units. Python 11 established radio contact on frequency 282.8 and relayed instructions to the mishap pilot on the ground (Tab V-53).

b. The mishap pilot landed in a large clearing and was easily visible from the air. The mishap pilot walked towards some loggers he saw working approximately 300 yards away and waited for crash response personnel to pick him up. At 1030, the Georgia State Patrol picked up 1Lt Thomas and brought him to the Flight Surgeon and ambulance. He was then transported to the Moody AFB Hospital via Air Force ambulance.

9. CRASH RESPONSE: The mishap aircraft impacted the ground in a heavily forested swamp area. Access to the site was made possible by using several trails used by logging trucks. Response personnel had to cut their way through thick undergrowth approximately 100 meters to reach the impact. Civil engineering built a road from the existing logging trails to the crash site to assist in the extraction of wreckage. The external wing fuel tanks also impacted the ground in very dense forest and were virtually impossible to see from the air. Information from the pilot assisted in located them. Response personnel had to cut two separate trails approximately 200 meters long through dense foliage to reach them. The mishap aircraft ejection seat and canopy came to rest in a lightly forested area and were easily accessible (Tabs R, S).

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10. MAINTENANCE DOCCUMENTATION: All current Air Force Technical Order (AFTO) Forms 781 were recovered (Tab U). A review of these forms did not reveal any evidence of maintenance discrepancies which could have contributed to the accident. A review of the open Time Compliance Technical Orders (TCTO) did not reveal any evidence relating to the accident. All scheduled inspections were current and in order (Tab H). A review of the Oil Analysis records showed that they had been accomplished and were within technical data limits. The last oil analysis was accomplished after the last flight before the mishap on 19 April 1997 (Tab U-41). A review of all unscheduled maintenance performed during the 120 days prior to the accident indicated nothing relative to the accident (Tab U). No discrepancies were noted in maintenance procedures, practices, or performance on this aircraft which appear to relate to this accident.

11. MAINTENANCE PERSONNEL AND SUPERVISION: All active maintenance forms and witness testimonies revealed no discrepancies in the maintenance, preflight and servicing performed on the aircraft prior to the accident (Tabs U, V-8,10,12,13,14). A review of the Core Automated Maintenance System (CAMS) did not reveal any evidence of maintenance discrepancies which may have contributed to the accident (Tab U-33). A review of the crew chiefs' AF Forms 623 (On the Job Training Records) and AF Forms 797 (Job Qualification Standard Continuation/Command JQS) indicate that he was properly trained and had the level of experience required to perform his duties. Maintenance personnel and supervision do not appear to be related to this accident.

12. ENGINE, FUEL, HYDRAULIC, AND OIL INSPECTION ANALYSIS: Examination of the turbo-machinery revealed no major discrepancies. The ground impact and/or subsequent ground fire damaged two key engine accessories, the Afterburner Fan Temperature Control and Engine Monitoring System Processor and Computer, and no significant testing could be accomplished. Examination of other engine accessories, with the exception of the Main Engine Control (MEC), also revealed no significant findings (Tab J). The MEC analysis revealed anomalies in the hydroclone filter assembly (Tab J-10). The fuel extracted from both external wing fuel tanks was contaminated with water and dirt from the ground impact. Fuel from Moody's Bulk Tank # 3, refueling truck 911-142, and Sheppard AFB, TX, truck 97L017 were within required standards (Tabs J, O). No hydraulic fluid analysis was performed because the aircraft was last serviced at Nellis AFB, NV, and the cart used at Nellis was refilled prior to a sample being taken (Tab J). No detailed oil analysis could be performed due to impact and post impact fire damage; however, the lube and scavenge pump internal gearing appeared to be in good condition showing no evidence of unusual wear or loss of oil prior to impact. The pump filter screen also showed no evidence of significant blockage.

13. AIRCRAFT AND AIRFRAME SYSTEMS: All hydraulic, electrical, mechanical, and avionics systems do not appear to be factors in this accident.

a. Examination of the reports on the engine and its components, with the exception of the MEC, indicated no major discrepancies (Tabs J, O).

b. Examination of the report on the flight controls and the data from the seat data recorder shows that the flight controls were operating in the primary mode at the time of the pilot's ejection (Tab J-14). Mishap pilot testimony indicates the flight controls were responsive to his inputs and not a factor (Tab V-82).

c. The electrical, fuel and hydraulic systems appeared to be functional at the time the of impact. Although the B hydraulic system, main and standby electrical generators dropped off line when the engine rpm decreased below 50 percent, the aircraft's emergency power unit functioned properly and supplied adequate hydraulic pressure and electrical power to both fly the aircraft and maintain power to essential avionics components (Tab J-18). Examination of the report on the aircraft instruments revealed that all flight, engine, and miscellaneous instruments and warning lights indicated the aircraft did not have an instrument failure prior to impact (Tab J-26).

14. OPERATIONS PERSONNEL AND SUPERVISION: The mission was authorized by Captain Bache, RNLAF, 68th Fighter Squadron Assistant Operations Officer, in accordance with AFI 11-206 and AFI 11-401. The morning mass briefing was conducted by Captain Donehower using the 68th Fighter Squadron mass briefing book. Captain Lay conducted the Python flight briefing using a guide in accordance with MCM 11-F16 (Tab O-47).

15. PILOT QUALIFICATIONS: 1Lt Thomas was current and qualified to perform the mission in accordance with the letter of all applicable instructions and regulations. He is an F-16 Wingman with 724.2 total flying hours. Of these, 433.1 hours were in the F-16 (Tab G-4). 1Lt Thomas' skills as a young pilot were, and are now, highly regarded by his peers and supervisory personnel (Tabs V-1,15,19,22,34). 1Lt Thomas was current in all training events.

30/60/90 Day Flying Summary (Tab G-3)

30 Day	8.3 hours/ 6 sorties
60 Day	29.0 hours/ 12 sorties
90 Day	58.7 hours/ 25 sorties

16. MEDICAL: 1Lt Thomas was medically qualified for flight duty. His last physical examination was conducted on 1 April 1996 and was current until 31 May 1997. No medical defects or diseases which could have contributed to this mishap were noted. His

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medical records reveal no chronic illnesses. Likewise, there were no indications of current medications or medical waivers. A review of all toxicology reports revealed no indication of unauthorized drug use. Similarly, these reports revealed no alcohol relation to the mishap (Tabs V-42, X).

17. NAVAIDS AND FACILITIES: There were no notices to airmen (NOTAMS) pertaining to navigational aids or facilities on 21 April 1997 that affected Python 11 flight's mission. All relevant navigational aids and facilities were functional. The NOTAM system is continually displayed and updated on a computer monitor (no paper copies) from base operations to all flying units.

18. WEATHER: The weather at Moody AFB during the mission was scattered cloud layers at 500 feet, 10,000 feet, and 25,000 feet with 5 miles visibility due to fog and haze. The weather to the north of Moody AFB where the mishap occurred was better than the Moody AFB forecast. Python Flight was able to maintain visual flight rules throughout the flight. However, the scattered clouds forced the flight to switch from the primary attack profile to a backup plan (Tabs V-50,77). Weather was not a factor in the accident.

19. GOVERNING DIRECTIVES AND PUBLICATIONS:

Primary regulations applicable to this mission were:

AFI 11-206, General Flight Rules
AFI 11-401, Flight Management
AFI 11-204, Aircrew and Weapons Director Procedures for Air Operations
MCM 3-3, Vol 3, Mission Employment Tactics, F-16
MCM 11-F16, F-16 Operational Procedures
T.O. 1F-16CG-1 Flight Manual
347th Wing In-flight Guide

TIMOTHY J. HOY, Lt Col, USAF
Investigating Officer

STATEMENT OF OPINION

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

1. It is my opinion after reviewing all the analysis reports, documentation, and witness testimony, and other related evidence that this accident was the result of a malfunction in the engine's Main Engine Control (MEC) component. The malfunction caused the engine rpm to rollback in the primary (PRI) and secondary (SEC) engine operating modes. It rendered the engine unrecoverable/unrestartable regardless of pilot actions.

2. A flameout is normally indicated by a decrease in FTIT and engine rpm decaying below in-flight idle (approximately 70 percent rpm). Loss of thrust and lack of response to throttle movement confirm the flameout. The ENGINE warning light illuminates when engine rpm goes below 60 percent. Additionally, the MAIN and STANDBY generators fall of line below 50 percent rpm and the EPU should start running.

3. The cause of an engine flameout is normally attributable to an engine control failure, fuel starvation, fuel system malfunction, or fuel cutoff due to engine overspeed protection. If the engine flames out, two features may instantly restart the engine. The mishap engine was equipped with an auto-relight feature which should reinitiate the engine automatically upon a flameout. Also, the engine has the ability to automatically transfer to SEC if faults are detected in PRI. If there is a problem unique to the primary mode, the engine should engage immediately. If these features perform as designed, the restart may take place instantly and the flameout may not even be noticeable (except for the illumination of the SEC caution light). If the flameout progresses to the point that it is noticeable, the proper protocol requires the pilot to retard the throttle to OFF and then to a midrange power setting.

4. A successful restart depends on many variables: cause of flameout, type of fuel, altitude, airspeed, and engine rpm when the airstart is attempted. High engine rpm is the most important variable and provides the best chance of a successful restart. The airstart must be initiated as soon as it becomes apparent that engine rpm has decayed below in-flight idle or upon illumination of the ENGINE warning light. Engine

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instrument indications and no response to throttle movement confirm a flameout. An airstart can be rapid if light-off occurs above 60 percent rpm. Airstarts initiated below 50 percent engine rpm are slower to light off and may require up to 90 seconds to regain usable thrust.

5. Although the mishap pilot was slow to react to the decreasing engine rpm, his initial reaction to switch the engine to the SEC mode should have recovered the engine if the problem was unique to the primary mode. He stated that he manually selected SEC upon hearing the audible "Warning-Warning" message which was generated 1.5 seconds after the engine rpm decelerated through 60 percent. This action would have stopped the rpm decrease in an engine with no core damage and an operational fuel system, but in this case it did not. The rpm continued decreasing to approximately 40 percent according to pilot testimony coupled with the main and standby generators falling off line (<50 percent) (Tabs J, V-82). The mishap aircraft's fuel system and core engine analysis indicated no pre-impact malfunctions which would have prevented this engine from recovering (Tab J). Therefore, the fuel system and core engine may be effectively and conclusively eliminated as the cause of the engine malfunction.

6. The engine failure experienced by the mishap pilot was not indicative of a catastrophic engine flameout. Engine tests showed that during low altitude, high airspeed flameouts the engine rpm decreases rapidly. In this case, the rpm decrease was slow and gradual - more indicative of a rollback than the rate associated with a total flameout. Transient model predictions for the F110 engine estimate that it would take a little more than five seconds for the rpm to decrease from 80 to 50 percent. The 80 and 50 percent rpm values were chosen based on estimations of throttle position at the time the malfunction occurred and a lower end setting identifiable by data recovered from aircraft data recorders and actions taken by the pilot based on his testimony. This timing is critical and is the basis for not categorizing this engine problem as a catastrophic flameout.

7. Data recorded from the Programmable Display Generator (PDG), Crash Survivable Flight Data Recorder (CSFDR), and Seat Data Recorder (SDR) was used to establish a time line of events as well as engine rpm indications. Even though the CSFDR failed seven minutes and 51 seconds into the flight, the time of its failure enabled me to synchronize the PDG and SDR data reference times (Tab AA-1). This synchronization established the elapsed time between when the engine transferred from the PRI to SEC mode and when the rpm decreased below 50 percent. The aircraft's program display generator (PDG) reports that the engine transferred to SEC (ENG 051 maintenance fault list) at a Fire Control Computer reference time of 22:54 (Tab J). This reference time equates to the approximate Seat Data Reference (SDR) time of approximately 16:13 (Tab O-27, AA-1). Aircraft flight parameters at this time are consistent with when 1Lt Thomas began to notice the engine was not responding to throttle inputs (Tab V-81). The engine transferred to SEC (either automatically or manually by the pilot) approximately 15 seconds before the

generators fell off line-indicating an rpm of 50 percent. Even if the engine automatically transferred itself to SEC at a high rpm when the malfunction occurred versus the less than 60 percent rpm if switched manually by the pilot, a deliberate, controlled rpm rollback is the only explanation for it taking 15 seconds to decrease to 50 percent. Cockpit indications of an automatic transfer to SEC are the illumination of the master caution light in conjunction with the SEC light on the caution panel, and an audible "Caution-Caution" voice message transmitted seven seconds after the illumination of the aforementioned SEC caution light.

8. There are several theories which could explain why 1Lt Thomas may not have noticed any indication of an automatic transfer. It is possible that 1Lt Thomas could have reset the master caution light prior to the audible voice caution message being transmitted. It is equally possible that he did not notice the illuminated SEC caution light because the decreasing rpm attracted all of his attention. By his own testimony, 1Lt Thomas' actions were cued by the voice message unit and not by engine performance instruments. 1Lt Thomas stated that his eyes are "globbed" to the rpm gauge, and it is reasonable to assume that if he did not know what the gauge directly below the rpm gauge, the engine FTIT (fan turbine inlet temperature) gauge, is indicating, he probably would not have noticed the master caution light on the other side of the cockpit as well as the SEC caution light on the panel 12 inches below the rpm gauge. The engine was in the SEC mode at impact, but I am unable to conclusively establish whether the engine automatically transferred to SEC or was solely commanded to SEC manually by the pilot. Regardless of how the engine transferred to SEC, the fact remains that this engine's rpm continued to decrease in the secondary mode. This clearly indicates a malfunction in the control system. Consequently, the investigation focused on problems in the engine's control system.

9. The Main Engine Control (MEC) is the only engine control component common to both operating modes. Tab J-10 identified an anomaly in the MEC's hydroclone filter assembly. This anomaly is consistent with the mid-stages of a hydroclone failure. A complete failure of the filter assembly has historically resulted in the total destruction of the extractor tube and most of the discharge screen. The debris from the destroyed tube and screen has, in other documented cases, found its way into the two pressure (PC) regulators which has caused the MEC to "go out of regulation." The extractor tube in this hydroclone filter had not completely failed. Initial evaluation of the MEC revealed no evidence of debris in the pressure regulators. A second teardown of the revealed minute foreign debris of an unspecified nature in the spring side of the PC regulator. It was determined this small piece of 300 series stainless steel was introduced into the MEC when the unit was manufactured. No evidence was found that showed the debris actually caused the regulator to malfunction.

10. All the data indicates a problem affecting the engine performance in both the PRI and SEC modes of operation. Systems affecting engine performance in both modes include the fuel control system, the engine core integrity, and the engine control system. Analytical data confirms that the fuel system and engine core functioned as

designed at all relevant times. The only remaining component which could have caused an uncommanded engine rpm rollback in both the PRI and SEC modes is the MEC, which analytical reports demonstrate had a malfunctioning hydroclone filter. It is not the position of this investigator that the evidence establishes by a clear and convincing standard of proof that the hydroclone filter failure caused the rollback in rpm, but rather that some malfunction in the MEC did cause such a rollback. While debris in the PC regulators may have caused the malfunction, that proposition is not supported by the standard of proof set forth in AFI 53-501. That some malfunction in the operation of the MEC caused the unrecoverable rollback in engine rpm is supported by the standard of proof. This standard is not only met by the successful and unequivocal elimination of the other systems common to both modes of operation, but is surpassed. At this point, while the MEC can be identified as the cause of the rollback, the actual malfunction within the main control cannot be determined by the standard of proof required by AFI 51-503. The resources necessary to perform the extensive analysis on the MEC required to identify the specific malfunction are not available to this investigation, and further investigation is unlikely to produce any material evidence which may narrow the cause to the specific reason or defect.

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