

Extracts from DDAAFS Safety Magazine

“SIFTING THROUGH THE EVIDENCE”

18 April 1999 (F-111G A8-291) – 8th F-111 accident – ground impact Pulau Island Malaysia

Overview

During a night simulated maritime strike attack, the aircraft impacted trees on an 1100 ft ridge on Pulau Aur (Aur Island), 24 nm to the south east of Pulau Tioman (Tioman Island), and off Malaysia’s east coast. The aircraft was destroyed during the impact and subsequent fire. Both crew members were killed.

The incident crew were leading a flight of two F-111G aircraft conducting an unopposed maritime strike against a naval task force during an Integrated Air Defence System (IADS) Exercise. Weather conditions in the vicinity of the accident included medium and high level cloud layers with little moonlight resulting in an extremely dark night.¹

Crew

Pilot: Cat A – 2121 hrs total time / 1016.4 hrs F-111; current (qualified test pilot)

Navigator: Cat C – 2682 hrs total time / 926.5 hrs F-111; current



¹ SAR crews reported that it was very difficult to see the island that the aircraft had impacted.

Accident Summary

The mission involved simulated AGM-84 Harpoon anti-ship missile strikes by the two F-111G aircraft against the naval task force that was positioned to the south east of Aur Island in the South China Sea. The incident crew were lead for the mission. Planning for the mission was completed in phases, mainly because the information required was received at intervals from the Exercise tasking authority. Some of the basic mission planning had been completed before the deployment (master map² for mission planning showing airspace restrictions and other pertinent Exercise information and basic mission data-point load). The incident navigator carried out the final specific planning (including the attack profile) with some assistance from the other navigator in the formation. A late change in routing had been received by the tasking authority, effectively allowing 'free play' in the exercise area. However, the new tracks were probably not drawn on the maps (the second navigator did not amend his map) and the original and potentially misleading information was not removed from the mission cards or maps – the change in waypoint routing significantly altered ingress heading and distance to run.³ Input by the incident pilot during mission planning was minimal as his focus that afternoon was on the development of an engine test schedule that 82 Wing had tasked him with. The second pilot had no input into the planning as his offers of assistance had been declined by the incident navigator because he had the matter suitably in hand.

The briefed tactic was to ingress at low level and splitting to fly either side of Tioman Island (inside the 10 nm restricted area) to use terrain shielding and minimise detection by the naval task force, before turning back onto attack heading and climbing to acquire and designate the target. Post simulated missile launch, the aircraft would then fly the missile flightpath at low level for a simultaneous target overflight. The only briefing relating to terrain concerned the larger (Tioman) island. There was no mention of the two smaller islands (which included Aur Island that the incident aircraft impacted) on ingress heading. However, the incident navigator did stress the importance of using the attack radar to clear ahead and not to overfly any radar returns. There was also no mention of the use of the TFR system for ingress to the target post weapon release. (After the brief, the second crew decided to fly all low level segments on TFR as a consequence of the pilot's lack of currency and the crew's concern with obstacles in the South China Sea operating area.) Flight authorisation was accomplished by the incident navigator.

² The master map was not prepared specifically for the deployment and had been used in previous IADS exercises. The map did not include the recently issued restricted zone and requirement for exercise aircraft to remain outside a 10 nm radius of Tioman Island. The route planned by the incident navigator infringed this restricted area.

³ The crews used maps that had been prepared the previous Friday as the routing to the exercise area was standard and had been flown before. However, the map was not amended to include the route to the initial point or target ingress, with neither the ingress track, distance to run nor heading marked, and accordingly provided no cues to enhance situational awareness of aircraft track and proximity to the islands. This lack of map detail for target ingress was a widely accepted practice on the grounds that maritime strike missions involve moving targets and therefore the position of the targeted forces cannot be determined with any certainty, particularly in the planning stage. While this may be practical for Blue Water (open ocean) maritime operations, it is not necessarily suitable for operations in the littoral environment as such an omission would reduce crew situational awareness in relation to the proximity of land masses and obstructions in the operating area. The mission cards likewise did not provide adequate cues to assist situational awareness of track proximity to the islands. Further, the mission planning was flawed as a result since the simulated Harpoon missile would have likewise impacted Aur Island and not reached the intended target.

Accident reconstruction indicates that the incident crew used TFR during the low level overwater segment to Tioman Island. In the targeting phase the pilot disengaged the TFR system. The navigator experienced some difficulty in targeting the naval task force and may have become task saturated during the targeting process – the F-111G is not Harpoon capable and requires the navigator to effect a time consuming work-around procedure to get the required aircraft system indications for simulated weapon release. Once the targeting was complete the pilot manually descended the aircraft to 1000 ft AMSL (TFR was not used). The navigator was then preoccupied with compiling the information required for the ‘Bruiser’ radio call that informs the targeted naval force of F-111 weapon release, and did not observe the radar returns of the two smaller islands directly ahead of the aircraft. At five seconds before aircraft impact the radar altimeter’s low altitude audible warning sounded and the radar altitude bars were visible in the attack radar – the latter warning is unique to the F-111G.⁴ Indications are that the pilot may have responded to an unexpected visual sighting and attempted to climb the aircraft, however the aircraft impacted trees on a ridge on the island, killing both members instantly.

Board Findings

The Board made the following findings:

1. The primary causes of the accident, listed in approximate sequence rather than in any order of significance were:
 - a. Inadequate pre-flight preparation for the mission, in particular:
 - failure to realise the probable aircraft track relationship to the smaller islands in the planning stage,
 - the accident navigator’s failure to adequately brief the threat posed by the smaller islands, and
 - the accident pilot’s failure to adequately check the aircraft route proposed by the navigator and realise the significance of the topography of the smaller islands.
 - b. Failure of the pilot to use all the aircraft systems available to him to reduce the hazard posed by the smaller islands.
 - c. Failure of the navigator to prioritise his cockpit workload so that he could identify and help avoid the primary terrain hazard.
 - d. Low crew numbers and high operational tempo leading to the development of a culture where aircrew fail to check other individual’s preparation and contribution to mission planning.

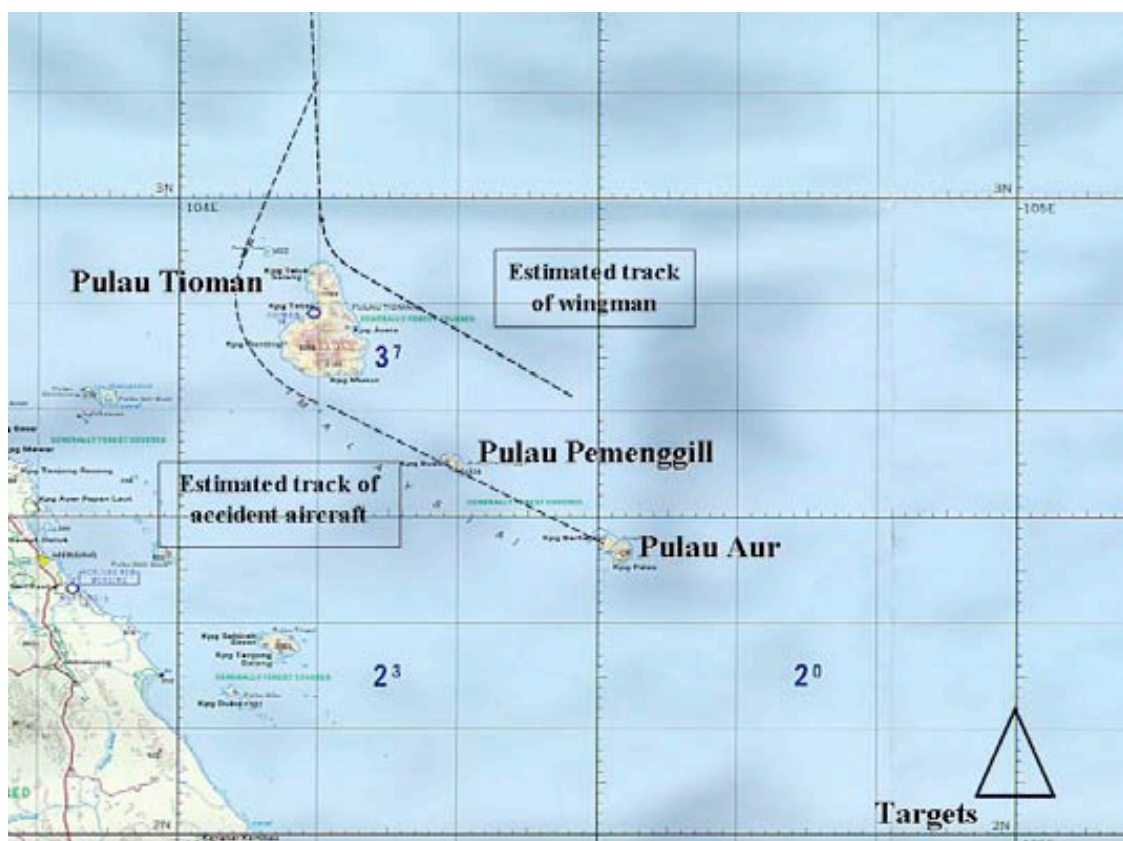
⁴ The RADALT is not specifically designed as a ground proximity warning system though it can be used as such to a limited degree (it only provides an indication of distance between the aircraft and terrain directly below it). Given the pilot had set the altitude bug to the intended cruise altitude of 1000 ft AMSL and the lack of guidance in relation to crew response to RADALT warnings, it is debatable whether the pilot would have interpreted the RADALT warning as an indication of rapid ground approach requiring an urgent response, or simply as an indication that the aircraft had drifted below the intended flight altitude requiring some minor correction.

2. Contributing factors pertinent to the accident included the following:
- a. Work practices developed within the Eastern Australian Exercise Area that did not place a high priority on terrain influences during simulated maritime strike sorties.
 - b. Failure of the crew of the second aircraft to adequately convey the risks perceived in the mission and the measures subsequently discussed and implemented to mitigate against those risks.
 - c. Tasking of the incident pilot by higher authority (82 Wing) without the member's Commanding Officer's knowledge, and without adequate consideration of the additional workload such tasking would place on an individual.
 - d. Failure of the detachment to adequately mark all pertinent airspace on their master maps.
 - e. Failure of the Exercise authority to provide timely and accountable distribution of Exercise Instructions and associated Aircrew Information Publications (AIPs).
 - f. Lack of an independent flight authorisation.
 - g. Failure of the RAAF to:
 - promulgate a risk management policy for aircraft operations, and
 - educate aircrew in the procedures and practices to be adopted in identifying, analysing, addressing, monitoring and controlling risk.

Board Recommendations

Board recommendations included:

1. A review and implementation of policies for the use of aircraft systems (such as the radar altimeter) in the prevention of Controlled Flight into Terrain (CFIT) accidents.
2. The introduction of an enhanced Crew Resource Management (CRM) program within the RAAF that will address the problems of aircraft command and a number of other crew coordination and planning aspects identified during the Inquiry.
3. Ensure clearly defined objectives for forces deployed for exercises and operations to ensure sound tactical weapon application is maintained after a thorough risk assessment.
4. A thorough review of RAAF orders and policies and amendment thereof with regard to postings of executives and required refresher training.⁵
5. Introduction of formal risk assessment for RAAF (and ADF) air operations.
6. All F-111 crew carry a SAR commander's checklist.



Estimated track to impact point – aircraft A8-291

⁵ 82WG Standing Instructions did not specify a requirement for refresher training and no formal syllabus had been established for such training. Refresher training requirements were simply tailored for the particular needs of the individual. The incident navigator did not receive any formal refresher training on being posted back to flying duties following a two year staff tour.

Changes attributable to this accident

Changes to F-111 procedures and aircraft modifications that were more than likely influenced by this accident are as follows:

1. Eventual introduction of a formal risk assessment process (Aviation Risk Management) for ADF air operations.
2. Implementation of an F-111 specific CRM course.
3. Removal of the tailored refresher; all aircrew refreshers now use a single, comprehensive curriculum.
4. Stipulation that where possible, self-authorisation of flight should be avoided. Further, if a self-authorising officer is part of a formation, then they are required to maintain independence by limiting planning activities to weather and NOTAMS, aircraft allocation and domestic duties such as copying.
5. Specification that F-111 maritime strike profiles are to be commensurate with the aircraft's capabilities and roles. Accordingly, F-111G aircraft are not to simulate anti-ship missile attacks.
6. F-111C aircraft may only simulate anti-ship missile overfly post release in day VMC.⁶
7. The requirement for night/IMC operations below safety height within 25 nm of known land, obstructions, or in archipelagic regions to be conducted on Auto TF.⁷
8. Procedures for operations below safety height outside 25 nm of known land or obstructions were also developed, including the specification that the navigator's primary duty becomes obstacle/terrain clearance by radar monitoring.
9. The requirement for a serviceable attack radar (which was to be used in conjunction with the TFRs for terrain avoidance for any flight below safety height) was mandated.

⁶ This is the second F-111 accident occurring while simulating Harpoon missile flightpath.

⁷ Approximately one year after the accident another F-111 crew, while resetting for a night target attack, inadvertently found themselves within a quarter mile of the same island that A8-291 crashed into. The navigator did not see the island on radar because of task saturation and only realised where they were when he saw the lights of fishing vessels disappearing behind the dark land mass of the island. While the aircraft was not on a direct course with the island and the crew were flying with the TFRs engaged, it is disconcerting that all other defences had failed and that the TFR was effectively providing the last line of defence.

10. Guidance for the use of attack radar modes was developed. Specifically:
 - a. the time spent in GND VEL⁸ and AIR-TO-AIR modes was limited to time/distance previously cleared in GND AUTO, and
 - b. use of 80 nm (F-111G) and 48 nm (F-111C) radar ranges for terrain avoidance was discouraged.
11. Addition of a SAR Commanders checklist in the 82WG Aircrew Information Folder (AIF).
12. 82WG Standing Instructions specify required crew actions in the event of RADALT warnings.



Figure 1. Final impact crater – aircraft A8-291

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⁸ The GND VEL mode provides a ground velocity stabilised expansion of the area around the aimpoint cross-hairs and therefore does not provide the full radar picture ahead of the aircraft that GND AUTO provides.