

John McGarrigle Submissions

These submissions follow the Crown Submissions for ease of consideration. Lack of comment on any particular Crown submissions does not denote adoption of those submissions.

1. Legal Framework

No exception is taken to the Crown's description of the legal framework in paras 1, 2 and 3. In relation to para 4, it is submitted that the Sheriff ought not to adopt in whole the AAIB Report, rather the Sheriff should consider the evidence independently of this report and come to his own view in relation to these matters.

2. Proposed Findings in Fact

Again, the Sheriff is invited not to adopt the AAIB findings, causal factors and contributory factors identified in the conclusion to the AAIB but rather to consider the evidence heard and come to an independent view on these matters. The following paragraph numbering will follow the Crown numbering, for ease of use.

(7) No issue is taken with this finding in fact.

(8) Issue is taken with the sentence "A successful autorotation and flare recovery were not achieved" . It is submitted that it should read "Although autorotation was achieved twice, it was not sustained and flare recovery was not achieved" (Rooney, day 25 p. 166 ll. 2-5).

Otherwise no issue is taken with this finding in fact.

(9) No issue is taken with this finding in fact

(10) No issue is taken with this finding in fact

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(11) No issue is taken with this finding in fact

(12) No issue is taken with this finding in fact

(13) No issue is taken with this finding in fact

§(14) No issue taken with this finding in fact

(15) No issue is taken with this finding in fact

(16) In the final sentence, Delete “at least one” and replace with “one”. Otherwise no issue is taken with this finding in fact.

(17) No issue is taken with this finding in fact

(18) No issue is taken with this finding in fact

(19) No issue is taken with this finding in fact

(20) No issue is taken with this finding in fact

(21) No issue is taken with this finding in fact

(22) No issue is taken with this finding in fact

(23) No issue is taken with this finding in fact

§(24) No issue is taken with this finding in fact. Add “at the time of the incident it was not generally known among pilots flying the EC 135 that these two systems were independent of one another.”

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(25) No issue is taken with this finding in fact

(26) No issue is taken with this finding in fact

(27) No issue is taken with this finding in fact

(28) No issue is taken with this finding in fact

(29) No issue is taken with this finding in fact

(30) No issue is taken with this finding in fact

(31) No issue is taken with this finding in fact

(32) Delete and insert "It cannot be said for certain when the low fuel warnings illuminated but it is likely that by the time the aircraft reached Bothwell one if not both low fuel warnings were illuminated"

(33) No issue is taken with this finding in fact

(34) No issue is taken with this finding in fact

(35) No issue is taken with this finding in fact

(36) No issue is taken with this finding in fact

(37) No issue is taken with this finding in fact

(38) No issue is taken with this finding in fact

(39) No issue is taken with this finding in fact

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(40) No issue is taken with this finding in fact

(41) No issue is taken with this finding in fact

(42) No issue is taken with this finding in fact

(43) No issue is taken with this finding in fact

(44) Delete finding in fact and insert. "There is no direct evidence from which it can now be ascertained whether there was any contamination with water or not. However, at some point in the flight the fuel management system/CAD malfunctioned in some way, to cause Captain Trail to doubt the warnings/readings he was being shown and fail to notice that the fuel transfer pump switches were in the off position. Given the history of contamination giving rise to erroneous readings it can be inferred that there was contamination with water giving rise to faulty readings."

(45) Delete "in the lead up to" and insert "on the day of"

(46) No issue is taken with this finding in fact

(47) No issue is taken with this finding in fact

(48) No issue is taken with this finding in fact

(49) No issue is taken with this finding in fact

(50) No issue is taken with this finding in fact

APPENDIX

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The numbering will again follow the Crown numbering system for ease of comparison

1. It is a matter of agreement when and where each of the deaths occurred as per JM1
2. It is a matter of agreement as to when and where the aircraft crash occurred as per JM1
3. The causes of each of the deaths are a matter of agreement as per JM1
4. The cause or causes of the helicopter crash, including :-

4.1 Captain Traill switched the fuel transfer pumps off. This may have been in response to a transfer pump caution having been generated as described by the Crown in para 4.1.1. It may also have been attributable to the fact that the prime pumps were situated directly beside and were of the same size, shape and were activated the same way as the fuel transfer pumps and Captain Traill meant to turn them off. The Court heard that the turning of the fuel transfer pumps off could be easily identified by the pilot monitoring fuel levels, as the fuel in the left and right tank would be used up, which whilst the fuel in the main tank would remain constant, and eventually fuel warnings would come on. This would prompt a pilot to switch on the fuel transfer pumps on again, rectifying the situation. Given Captain Traill was a very experienced pilot it is not likely that he would have missed this. A reasonable inference to draw is that there was some reason that he was not able to ascertain that the fuel transfer pumps has been switched off. Given that since 2003 there has been a history of erroneous fuel readings it is reasonable to infer that some error in the fuel display/warning system caused him to be unsure of the display/warnings or not have confidence that it was correct. In such circumstances it is likely that he would have used the "tried and tested" method of calculating how much fuel he had left by estimating his original total of fuel and calculating how long he could spend in the air with that fuel. As is known, had the fuel transfer pumps been switched on, there would have been sufficient time to get back to the base. The helicopter cockpit is, necessarily, a complicated environment in which there is a degree of 'visual clutter' (vid. Prof. Dalton, day 31, p. 92 l. 12-. p. 93 l. 1) The

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possibility that the design and location of the fuel transfer pumps would give rise to the possibility of erroneous selection by a pilot was acknowledged by the manufacturer in the aftermath of the accident, by the introduction of tactile switch covers on EC-135 aircraft, which would have the effect of rendering them more distinguishable from other switches (vid. Prof. Dalton, day 31, p. 93 l. 10- p. 94 l. 9).

4.2 The pilots checklist was available to the pilot, as per the Crown submissions on this point at 4.2.1

4.3 It was within the competence of a helicopter pilot qualified to fly G-SPAO on police duties to comply with the Pilot's Checklist as per the Crown submissions at 4.3.1

4.4. At what stage in flight did the low fuel warnings likely occur.

It cannot be said for certain when the low fuel warnings illuminated but it is likely that by the time the aircraft reached Bothwell one if not both low fuel warnings were ill

4.5 It is not known why, having acknowledged the low fuel warnings the pilot did not complete the actions in the Pilot's checklist. There was no voice recorder in the cockpit (CVFDR) and it is not known why the other crew members did not tell Captain Traill they wished him to land the aircraft, or used their police radio to make contact with those on the ground to alert them to any concern which they may have had that Captain Traill was disregarding alerts provided by the helicopter's instrumentation. Given the fact that minor tasks were being completed shortly before the accident, it does not appear that those within the aircraft were concerned, or at least concerned enough to make a complaint. Given Captain Traill's "above average" competence as a pilot, and the views expressed as to the competence and diligence of the police air observers, it is submitted that on balance of probabilities some issue with the fuel readings/warnings caused the pilot not to rely on these warnings, and the air observers to be satisfied with this decision on the part of the

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pilot, and thereafter for the pilot to fail to complete the actions in the Pilot's Checklist.

4.6 The practical effect of the intermittent low fuel warning was that Captain Trill may have doubted the veracity of the warning, and having made that initial assessment, not re-assessed that view, even in light of further warnings in the form of the second warning light. Reference is made to the evidence of Prof. Dalton, expanding on the terms of her report, in describing the 'cry wolf' effect (Dalton day 31 p. 96 l. 19- p. 98 l. 1). Whilst the Crown at para 4.6.3 indicate that the second warning light would have provided corroboration that something was indeed wrong, equally it could have provided the same corroboration that there was some error with the warning system. Further reference is made to the evidence of Prof. Dalton, expanding on the terms of her report, on the phenomenon known as 'confirmation bias' (Dalton p. 98 l. 2- p. 100 l. 14).

4.7 There was no evidence led of instances in which other low fuel warnings not being followed.

4.8 It is submitted that the pilot believed that the fuel transfer pumps were working. There is no reason for him to have switched them off. There is no evidence and no suggestion that he deliberately starved the aircraft of fuel to cause a crash. It is submitted that there is reason to believe that he selected the prime pumps in error believing them to be the fuel transfer pumps. The Crown submissions para 4.8.2 suggests that photos show one of the prime pumps was off – by the time the AAIB examined the aircraft the switches were both on. There is no direct evidence to support what position they were pre-crash but it is likely that at least one of the prime pump switches was on prior to the crash, given the initial photo evidence.

4.9 It is submitted that given there was no evidence that the pilot deliberately starved the aircraft of fuel it is submitted that it is a reasonable inference that he believed the fuel transfer pumps were working ; had he not believed otherwise, he would have landed the aircraft. We support the hypothesis as set out at paras 4.9.1

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– 4.9.4 in the Crown submissions. It is submitted that there is every possibility that the aircraft’s sensors were contaminated with water. In particular it is submitted that nothing should be taken from the fact that the AAIB “checked thoroughly” – the methodology was simply looking to see if they could see micro droplets and putting there “hands in there”. This was after the aircraft had crashed, been lifted out of the Clutha, and transported for the AAIB to examine. It is submitted no weight should be placed on the fact that the AAIB examination did not show evidence of micro droplets of water in such circumstances given that there was every possibility for any droplets to become dislodged and the methodology of testing for it was far from conclusive. It is submitted there is also nothing to be taken from the fact that earlier in the day the fuel system was indicating correctly. This evidence is entirely neutral in assessing whether on the flight in question it was working correctly. If it was the case that Captain Traill received a low fuel warning when he knew that there was still at least 130kg of fuel in the aircraft he would have known at that stage that he was not in a low fuel situation and the warning was an error. The intermittent nature of the warning is likely to have contributed to his scepticism. If he did carry out a check (and there is no evidence either way) he may have simply fallen foul to “confirmation bias” – having made one error in choosing the prime pumps, continued to do so when he looked up to check they were on. Again, whilst there is inevitable a degree of speculation on these matters, the actions of Captain Traill should be examined against his background of his history of flying, his examination results and the view that his colleagues had of him as a safe pilot. As the Crown accepts at para 4.9.19 if the CAD was misreading to show that the fuel in the main tank was decreasing this would just confirm that there was no problem with the fuel transfer from the main tank. As is accepted by the Crown at para 4.9.22 there was at least an approximate 15 minute period where, after switching off the pumps there was a “distorting effect” where it would show as if the transfer pumps were on. The Crown suggests that after this period the supply tanks would start to reduce and the main tank remain constant. However, because of the “distorting effect” Captain Traill is likely to have had confirmed in his mind that the transfer pumps were on and operating properly, and that he had not switched anything on/off meantime and

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therefore the fuel transfer pumps being off would not be the cause of the problem. The over-readings described by the Crown at para 4.9.23 would further lead Captain Traill to consider there was a misreading problem with the fuel, rather than the fuel not being correctly pumped out of the main tank. The Court now knows from evidence as per para 4.9.23 that the difference in the level of fuel in the tanks is likely to be anomalous: however, it is not clear on what view that evidence can shed light on the considerations of Captain Traill or any other pilot when confronted with this scenario.

It is submitted that it is on balance of probabilities likely that Captain Traill was presented with misleading indications on the CAD and if and when this has caused him to check the switches, he has looked and “confirmed” what he already thought, that he had switched them on. Thus, in his mind the CAD misreadings were not capable of being understood as a result of the fuel transfer pumps being switched off, but rather a problem with the fuel sensors and CAD warning system. It is necessary to consider the actions and omissions of those aboard G-SPAO in light of the widespread awareness of fuel indication problems among pilots flying the EC-135 (e.g. Bryers, day 24, p. 52 l. 20- p. 53 l. 10; Rooney, day 24, p. 89 ll. 9-21; p. 92 l. 21- p. 93 l. 20); and indeed the knowledge that problems of this sort had been apparent specifically on G-SPAO since it entered into service.

4.10 It is submitted that a root cause of erroneous fuel indications were not adequately investigated and acted upon prior to the accident. Since 2003 both the manufacturer and operator knew that water was getting into the fuel sensor and causing misreadings. Paragraphs 4.10.4 and 4.10.5 of the Crown submissions are adopted. It is submitted that had these matters been dealt with timeously before the crash – it clearly having become a matter of priority only after the G-SPAO crash and G-NWEM incident – then Captain Traill would have had no reason to mistrust the fuel warnings/readings he was being given. Such confidence would have meant that he would not have to “second guess” what he was being told, and in the case of a low fuel warning put down the aircraft within the specified period. It is submitted that on the balance of probabilities the lack of confidence Captain Traill had in the

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fuel warning system was a contributory factor in the crash occurring. The issue is not whether a system could be built to completely eliminate water from the fuel system, rather the question should be whether there could be a design of fuel warning system which accurately reflects the amount of fuel whether contaminated with water, so that pilots have full confidence in the warning system.

4.11 Again, given Captain Traill's flying history and that of at least one of the air observers it is likely there was a failure/misreading of some part of the CAD which caused Captain Traill to fail to place confidence in what he was being told and not land within 10 minutes of the low fuel warning being activated.

4.12 After both engines flame out, the only option left to a pilot is to perform an autorotation.

4.13 The designed time intervals between flame outs was compromised due to the design of the fuel tank which allowed for fuel to spill from one tank to another. The Crown submission on this point from 4.13 to 4.13.14 are adopted. There was evidence that it was widely understood among EC-135 pilots that the fuel system was so designed as to permit a period between engine flameouts which was longer than the 32 second period between flameouts in the accident presently under consideration: vid. e.g. Rooney, day 24, p. 118 ll. 5-7 who described a 'common understanding' among pilots that the period in question was three minutes.

4.14 Evidence was heard that after the second engine flamed out Captain Traill would have had one to two seconds to begin autorotation. On the evidence of Captain Rooney "Although autorotation was achieved twice, it was not sustained and flare recovery was not achieved" (Rooney, day 25 p. 166 ll. 2-5) , autorotation was carried out twice successfully by Captain Trail but was not sustained.

4.15 There was no evidence that the ability to carry out autorotation, flare recovery and landing was compromised by the design of the cockpit.

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5. The precautions, if any, which could reasonably have been taken, and which, had they been taken, might realistically have resulted in the helicopter crash being avoided, including whether the crash might realistically have been avoided:-
 - 5.1 If the fuel warning system is properly designed to cope with the possible ingress of microdroplets of water whilst still giving a consistent reliable reading, there would be no need for a warning that both pumps are turned off as it would be obvious if the main tank retained a constant level of fuel whilst the left and right tank amounts decreased that the fuel transfer pumps were off.
 - 5.2 It is undesirable to multiply unnecessarily the number of alerts, so as to create sources of distraction for the pilot in the demanding task of flying the helicopter, and for the air observers.
 - 5.3 The Crown submissions on this point are adopted
 - 5.4 The Crown submissions on this point are adopted.
 - 5.5 Designing the fuel tank system, and in particular the differential capacities of the supply tanks, so as to achieve the design objective of creating an interval of 3-4 minutes between engine flame-outs, or such other interval of time as would be represented by 4.5kg of fuel, or any other safe interval of time, is clearly desirable. Whilst the Crown states at para. 5.5.3 “there is no evidence that the accident would have been avoided even assuming that the time-equivalent of 4kg had been available to the pilot”, it was stressed by the pilots who gave evidence how little time Captain Traill had to react. Even had he an extra minute with one engine he may have been able to get the aircraft on the ground safely. The lag period which was built in was clearly a good idea – it would be a better idea to ensure that it works in practice. If it is not possible to accomplish that objective, in taking into account the profile of operations carried out by the helicopter in police service (e.g. repeated changes in attitude during flight, assignment to different tasks during the course of a mission) and balancing other design considerations, such as the construction of the fuel tanks so as to minimise risk of fire, then information should be promulgated among police users of the aircraft that it is not possible to rely upon the fuel supply system to provide a period of any specific duration between engine flameouts.
 - 5.6 The Crown submissions on this point are adopted.

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6. The defects, if any, in any system of working which contributed to the deaths or the accident, including:-

whether any aspect of the system of maintenance of G-SPAO, including its washing regime, contributed to the contamination of the fuel and/or the fuel tank system with water.

Evidence led confirmed that water was getting into the fuel tank and sensors via the cold wash and fueling the aircraft when it was raining. There was also evidence that it would be very difficult to ensure there was no water at all in a fuel tank. The issue was not that water was getting into the tank, but the water was interfering with the sensors for fuel readings. Whilst it cannot be ascertained if any water was in the sensors cannot be established by direct evidence, by inference of the actions of Captain Traill there was some reason on that particular flight that he did not trust the warnings he was being given. The inference which can be drawn from this is that water had got into the fuel and caused some misreadings.

6.2 No pre flight check procedures contributed to the accident.

6.3 Paragraphs 6.3. to 6.3.5 of the Crown submissions are adopted, as are paras 6.3.7 to 6.3.9 are adopted.

6.4 There is no evidence in relation to the day shift handing over the aircraft already fuelled to the night shift pilot contributed to the accident.

7.

7.1 The extent to which the AAIB Safety Recommendations have been adopted and implemented is adequately summarised in CP1423.

7.2 The Crown submission on this point are adopted.

7.3 Recommendations in relation to specific matters “which might realistically prevent other deaths in similar circumstances.”

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7.3.1 The installation of voice recorders/black boxes so as to provide a more complete record of events leading up to any future accident, and to assist in identifying the thought processes of the pilot and air observers so as to identify acts or omissions leading to the accident; and moreover to allow a better understanding of the conduct of operations and the dynamics between pilot and crew members, so that such errors/problems as may be apparent may be examined and training improved upon.

7.3.2 No “self-reporting” of landing below the minimum fuel amount – this should be reported by those carrying out the fueling of the aircraft, who will know if the aircraft lands below the minimum fuel amount.

7.3.3 The AAIB should consider adhering to short time limits to complete investigations and reports - such as the one it completed in relation to the Clutha accident – perhaps a time limit of 12 months or thereby. The delay which has been occasioned by waiting a number of years before the AAIB completes its report in order that the FAI can take place informed of its contents was too long and the delay in itself has caused considerable stress and upset for those who lost people in the accident.