Lockhart River.
A flawed investigation.

Prepared by Professional Aviators Investigative Network.

Executive summary.

One of 25 categories in a research project being undertaken by a small, privately funded group of qualified, experienced aviation professionals focuses on Coronial recommendations made in response to fatal accidents involving aircraft. Part of the research evaluates the response to realistic Coronial recommendations made, in two areas; (i) action taken by the Civil Aviation Safety Authority (CASA) in response, (ii) the seemingly large variation in the numbers, but not in essence of Coronial recommendation made after inquiry into those accidents.

The results are, we believe of interest and value to the Coronial inquiry system. It appears, at face value that where a CASA legal representative is assisting, there are usually a lesser number of 'soft' recommendations made. Where the Coroner is unassisted by the CASA, there are on average double the recommendations made, many are 'sharp edged', insightful, relevant and worthy of response.

One of the cases examined in this manner was the Lockhart River accident, May 5, 2005. From a public safety point of view the case was and remains significant, the Coronial inquest was one of several focus points.

A similar pattern emerged from the research; it was noted that the Barrister assisting normally represents the CASA, it appears that essential information from the Australian Transport Safety Bureau (ATSB), other relevant sources and potentially pivotal CASA employee testimony was, for various reasons either not heard; or, not examined.

The accident has now been examined from an operational standpoint; many areas of 'operational' and legal significance had not, in our opinion been satisfactorily addressed or presented. These important, directly related elements, whilst technical are relatively straight forward and may be readily comprehended by 'the man in the street'. We believe that this information, properly presented could have greatly assisted the Coroner to formulate a decision with greater clarity.

From an industry point of view, it appears that the inquiry was ruthlessly driven to an almost forgone conclusion; primarily by the omission of what is believed to be important information for the Coroner to consider; the inability of the court to interview essential witnesses and examine that testimony. Some of the Coroners remarks seem to reflect this.

It is impossible to conduct research of this kind without at least minimal contact with people who have some form of vested interest in the accident. As a result of telephone conversations with surviving family members this small part of the research project and the Lockhart River research data has been provided to those people and dedicated to the fifteen lives lost that day.

INDEX:-

1) Preamble.

May 7, 2005 a Fairchild Metroliner, operated by Transair Pty Ltd was involved in a Controlled Flight Into Terrain (CFIT) event in which fifteen people were killed. There were 4 parties directly related to the accident; the determination of to what degree they were or were not culpable is not within the ambit of this report.

One shortcoming, in our view, of the ATSB is that, unlike the USA National Transport Safety Bureau (NTSB), ATSB does not find a "most probable cause" of an accident, and present 'ranked' contributory causes.

This report has been compiled by a small team of aviation professionals at the request of Lockhart River victims family members in an attempt to provide an understanding of the many and varied events which ultimately led to tragedy.

2) Introduction.

To better comprehend the nature of this accident it is essential to understand, of its self, what it was. Without a clear understanding of these elements, it is impossible to accurately determine the individual links which, inevitably led to this probably avoidable accident occurring. The end result is self evident.

This form of accident is 'pandemic' and treated as a very serious risk to public transport by air. Most air carriers and most National Aviation Authorities (NAA) treat the issue with a great degree of respect, the Australian Transport Safety Bureau (ATSB) certainly does; although they appear powerless to affect meaningful, systematic change within the existing ethos, despite increasing Australian CFIT events.

The Australian Transport Safety Bureau (ATSB) Report 20060352 is available for additional detailed reference. Appendix (1) an extract from that report, is provided to assist in defining not only the true nature of this event, but defining the underlying chain of events, the easily identifiable causes of the event and the simple, inexpensive methods provided for ensuring that CFIT risk is reduced to the lowest possible level.

It can be agreed that CFIT is essentially a 'human factors' related event. The is little or no disagreement between experts that a loss of situational awareness, both vertically and laterally creates a marked increase in the inherent risk associated with air operations.

The chain of events leading to this CFIT event when analysed without obfuscation and with clarity becomes a matter which begs many serious questions about the manner in which the safety of the Australian travelling public is managed.

This report is presented in 4 parts and asks:-

Part 1 Questions of the pilot.

Part 2 Questions of the Operator.

Part 3 Questions of the ATSB.

Part 4 Questions of the CASA.

This report does not seek to lay blame, but to lay bare the circumstances surrounding the event; and, to provide in part some explanations which may avoid a future repetition.

From a legal and operational standpoint the case appears at first glance, simple. At face value, this was a rogue operator and a 'hot shot' pilot which, in concert produced one of Australia's worst air accidents.

The reader needs to examine their own mind regarding this simplistic statement. It is altogether too easy to accept this as fact and allow this flawed precursor to colour or detract from the merits of further argument which may be complex and unpleasant.

3) Questions of the Pilot.

It is not the writers intention to defend or speculate on the reasons why a particular pilot behaves in one way; or, acts in a particular manner during a critical phase of flight. It is acceptable for the aircrew behaviour to measured against accepted 'industry standards'.

In the normal course of events, the industry, **not the Authority**, has a system for identifying, dealing with and, where necessary isolating most of the unstable, dangerous or, inherently rogue elements. Unsuitable people may pass through a flight school phase, qualify and acquire a first job quite easily. Further down the career road to enter an 'airline' environment there are some serious barriers raised which fairly effectively 'weed out' those not suitable.

Should the rogue candidate avoid or slip through this system, the safety net of the company Training and Checking System (TCS) provides an effective last line of defence.

In the 'smaller' airline operations the early safety nets may be bypassed, but this is usually more than balanced by the TCS as the TCS pilots are flying 'on line' almost everyday and intimately know and understand their charges. So the balance is maintained.

Not so in this case; there is anecdotal, hearsay information that the pilot was prone to some of the more undesirable traits which, under reasonable circumstances would have been 'hammered out' by the TCS system or, the pilot's employment would have been terminated. This aircrew was not, on the available data, provided with either proper guidance, discipline, training or management.

In short, there was a normalised deficiency, produced by a failed, CASA approved and monitored, internal TCS.

The ATSB report mentions the difficulties many airline pilots have adapting to the new Global Navigation Satellite System (GNSS) based instrument approach procedures. The results of the ATSB survey were clear. Many pilots suffered situational awareness loss and had problems orienting to the 'distance' measuring protocols. These were pilots with sound training, a properly trained and accredited co pilot, correctly installed, fully functioning Global Positioning System units (GPS), unlimited reference material and, most importantly correctly written Standard Operating Procedures (SOP) within the Company Operations Manual (COM). This aircrew was not afforded these 'luxuries'.

Much has been made of the Captain's habitual disabling of the Ground Proximity Warning System (GPWS), or the co pilot's failure to report the events. Stand alone these are heinous, inexcusable criminal offences; however in this case there are extenuating circumstances which must be considered.

There is no evidence of the alleged GPWS malpractice being reported, reviewed or investigated; with the pilot either acquitted or being disciplined and retrained.

There is no evidence of an adequate, dedicated GPWS and GPS ground school or training module.

There is no evidence of a dedicated examination in operational procedures for the use of this sophisticated equipment.

There is no evidence of an adequate operations manual section dedicated to the operational use of the equipment or SOP in relation to the management of the associated warning systems.

There is no evidence of properly conducted CASA supervised route and port proving flights.

There is no evidence of an adequate, detailed route and port specific operating information and SOP instructions related to company operations at LHR.

There is no evidence that the LHR instrument approach 'difficulty factors' were ever addressed within the company safety management system or formally reported to the company. ...Cont/--

3) Questions of the Pilot. --/Cont...

There is no evidence that any form of LHR CFIT (Threat Error Management) analysis was conducted within the company safety management system or formally addressed by the company.

There is little evidence that mandatory, formal route and port training was provided or that a formal check flight to provide a company "Route Qualification" was conducted.

There is no evidence that the mountainous terrain to the West of the LHR aerodrome was provided due consideration and noted in the port SOP with regard local weather behaviour, wind produced mechanical turbulence, average weather pattern cloud base, acceptable procedure for 'cloud break' and visual approach, approach and landing wind shear prone areas and the wind directions which may produce the effect; or, even the humble caution defining how much water there may be on a runway to ensure a safe landing. These essential briefing items were not provided to the aircrew in any meaningful way.

There is no evidence that despite Transair and other operators experiencing GPWS warnings during the GNSS instrument approach at LHR that any action was taken by the operator or company aircrew to bring these events to the attention of the pertinent authority.

Note: Additionally there is supported conjecture that the GPS receiver suffered a repeated failure caused by it 'loosing' one satellite in the constellation and reverted to Deduced Reckoning (DR) mode, which may account for some flight path anomalies.

There is little evidence that despite these matters being a mandatory prerequisite for the issue of an approval to conduct this operation, that the local CASA office enforced the requirements, proactively encouraged an improved safety culture; or, actively became involved in attempting to correct the chronic, clearly deficient practices within this company, except in hindsight.

The pilot in command was clearly undisciplined, incorrectly trained, neither qualified or competent to operate a passenger service into a relatively high risk port.

The co pilot was clearly undisciplined, incorrectly trained, neither qualified or competent to operate a passenger service into a relatively high risk port.

The above comments on the aircrew are not, nor can they be considered the sole fault of the aircrew; essentially they are abandoned by the Training and Checking System, the company and the CASA to fend for themselves, unsupported, as best they may in what was a hostile, subsequently fatal environment.

The lack of training and guidance material precluded a less confident pilot acquiring, through research into the company manuals, the knowledge to safely operate a Regular Public Transport passenger service to this port.

The preceding points all indicate that there were chronic, serious, deeply entrenched anomalies allowed to exist within the company operating standards. Further, that aircrew who were aware of problematic operational elements had no support system through which their concerns could be voiced and fully addressed.

Taken individually, each of the previous points is a weak link in the safety chain, in combination the effects have been proven, once again to be lethal.

4) Questions of the Operator.

Acquiring an Air Operator Certificate (AOC) was, and so remains today a difficult goal to achieve. Financial aspects aside there are many complex administrative and operational challenges which must be overcome to achieve even the humble, basic light aircraft Charter certificate.

This company held a very sophisticated AOC in lay terms the certification level was equivalent Qantas Link. The approval authorised scheduled passenger airline operations, in medium weight, turbine powered, propeller driven aircraft under the Instrument Flight Rules (IFR) with a multi pilot crew, within Australia and internationally. To a layman, this may not appear to be anything other than one would expect when purchasing a ticket to travel on a particular air service.

To manage and operate such an air operating company requires many levels of dedicated management supported by a fully committed CEO. The lynch pins are always the Chief Pilot (CP), the Head of Training and Checking (HOTAC) and the Maintenance Manager (MM). Even in a small company were multi tasking is a financial reality, the incumbent is always the 'busiest' person. The sheer volume of 'paperwork' required to meet the mandatory imposts of providing an air service alone demands almost full time employment.

The aircrew involved in the accident were, theoretically, to be afforded the protection and support of an over sighted, sound company operational, administrative and maintenance infrastructure.

There is ample evidence that this was not the case.

The aircrew involved in the accident were, theoretically, to be afforded the protection of a fully functioning Training and Checking System to prevent potentially dangerous, unsafe practices and procedures becoming the accepted 'norm'.

There is ample evidence that this was not the case.

The aircrew involved in the accident were, theoretically, to be afforded the protection of a Safety Management reporting system through which anomalies, potential and real hazards to operational safety could be brought to the attention of and addressed by management.

There is ample evidence that this was not the case.

The aircrew involved in the accident were, theoretically, to be afforded the protection of a routes and ports SOP which, through developed experience would provide clearly defined limitations for instrument approach, aircraft speed profile management and highlighted potential areas of high CFIT risk management.

There is ample evidence that this was not the case.

The aircrew involved in the accident were, theoretically, to be afforded the protection of properly constructed Company Operations Manual (COM) which, as a last resort would supply the information required to enable an aircrew to safely and legally conduct any proposed operation.

There is ample evidence that this was not the case.

Extract: from a 'standard' Company Operations Manual.

1) The company directors are aware of, and have considered pertinent regulatory material and acknowledge, that as a Company officers, there is a duty to exercise care and diligence under the Civil Aviation Act 1988 (the Act) [CAA 28 BE], with regard to the activities conducted under the Air Operator Certification.

2) The Chief Executive Officer (CEO) as "the operator" is to ensure that the company obligations in relation to flying operations are met, conducted in compliance with the regulations and in the manner prescribed within the Company Operations Manual (COM).

5) Questions of the ATSB.

It is unfortunate that the ATSB are effectively prevented from becoming actively involved with a company until it is too late. The ATSB appears to suffer a lack of power, funds and resources which prevents proactive services being available to the industry.

An examination of the reports generated after the event clearly define the ATSB frustration and impotence in this matter. It is believed that this element alone casts serious doubt over the integrity of the subsequent investigations.

The ATSB raised many questions which have remained **firmly unanswered**. Appendix 2 to this document provides ATSB appendices G and H. There are no conclusions drawn within this document related to G and H, however it is strongly recommended that they be independently and forensically examined, by a competent, court appointed expert from an independent NAA. A representative of the USA National Transport Safety Bureau (NTSB), an independent agency of the USA Government, would be most appropriate as the precedent has been set.

The following 'links' are provided for convenience.

http://www.atsb.gov.au/publications/recommendations/2007/r20070002.aspx

http://www.atsb.gov.au/publications/recommendations/2007/r20070004.aspx

http://www.atsb.gov.au/publications/recommendations/2007/r20070005.aspx

http://www.atsb.gov.au/publications/recommendations/2007/r20070008.aspx

There are many other documents available under the Freedom of Information Act (FOI) which, under close scrutiny express the ATSB frustration with the restrictions, prohibitions and interference with even simple tasks associated with providing a definitive outcome to their investigation:-

*"The ATSB is concerned that the flight test **did not provide a true validation test** as the TAWS Class B (TAWS-B) as fitted to the test aircraft is a reduced capability system aimed at reducing the cost of the equipment for use in general aviation. The primary difference between TAWS-A and TAWS-B is that TAWS-B does not include the basic GPWS components, which are dependent upon a height input from a radio altimeter. As such, it is our understanding that **the aircraft was not appropriately equipped** to conduct flying to validate (or otherwise) the activation of the ground proximity" warning system mode 2A warnings that was the subject of ATSB recommendations R20070005 and R20070008."*

*ATSB....."included that Honeywell had conducted Lockhart River Runway 12 RNAV (GNSS) approach simulations (using groundspeeds typical of a Category B and C aircraft) for the constant angle approach along the recommended 3.49 degree profile and a step-down approach along the segment minimum safe altitudes (see page 68 and Appendix C of the final report). The simulations indicated that mode 2A alerts and warnings **should** be generated during both the constant angle and step-down approaches at both speeds when in the approach flap configuration. These alerts and warnings occurred in the vicinity of South Pap."*

*ATSB - "The final report also included information on reports received by the ATSB following the accident involving VH-TFU from the pilots of two aircraft, **that they could not conduct the Lockhart River Runway 12 RNAV approach without the GPWS announcing 'terrain terrain pull up pull up'**. This was reported to occur in both aircraft types (one was a Category B performance aircraft and the other Category C). The occurrence was always after passing LHRWF inbound and the pilots reported that the warnings had occurred while the aircraft were on the published constant angle approach path with the autopilot coupled to the flight management system, in the approach configuration, and within the appropriate approach speeds for the aircraft category."*

The highlighted text defines an anomaly which should have been identified at the CASA over sighted 'proving flight' stage, the pertinent authority notified and the company prevented from using this approach until the issue was resolved beyond doubt.

It has been noted that the Coroner 'picked up' on this element in his report and failed to see why CASA didn't include the ATSB in the re enactment of the Metro flight.

6) Questions of the CASA.

There are numerous, serious questions which need to be asked of the CASA relating to their conduct in this matter, after the event. No conclusions will be drawn in this document on those matters which are best dealt with by a court or a Royal Commission.

Matters of great concern commence with the initial issue of the various approvals, permissions, delegations and operating privileges which Transair acquired over a relatively short period of time.

It appears that the mandatory proving flights [CAR 222] were either not conducted; or, conducted in a 'slip shod' manner.

It appears that the Company Operations Manual, accepted by CASA was substandard, not utilised as part of the company safety culture armoury; nor, competently assessed as being suitable for the proposed operation.

It appears that the Training and Checking system accepted and formally approved by CASA was substandard, not effectively utilised, not correctly managed and incapable of providing the level of flight safety protection expected and legally required.

It appears that at least one of the TCS pilots was not a competent "Multi crew" instructor. This is apparent in the standard and qualification of the aircrew in question at LHR.

It appears that the delegation to conduct TCS operations was acquired in an 'easier' more relaxed environment than that normally associated with such a privilege being issued for Regular Public Transport (RPT) operations.

It appears that despite several concerns being raised by qualified CASA personnel and others, this operation was, like 'Topsy', allowed to grow almost unhindered by the normal, expected constraints placed on air operators at any level.

It appears that the operation was allowed to continue with apparent deficient practices despite clear indications that there was "something seriously wrong".

The CASA **is** legally and morally responsible to the Australian travelling public for competently assessing **all** the elements of an Air Operator Certification.

The history of this company and the CASA management of it's progress is a litany of shortcomings and precisely demonstrates how to end fifteen lives at the end of a long chain of events, which the CASA is publicly responsible for over sighting.

This definitive statement of the CASA attitude was mentioned in the Supreme Court of WA recently.

"It's also true that Federal Court Justice Kenny struck out the claim against CASA and its Deputy Director Terry Farquharson (and others) on the basis, in broad terms, ***that CASA and its officers owe no duty of care to the public in the performance of their duties".***

Should the Lockhart River inquiry be reopened with all the available evidence and previously 'unavailable' witnesses reviewed ?.

Is there a case for CASA to answer ?.

Are there substantive grounds for a Royal Commission into the CASA ?.

We believe so.

ATSB Appendices to LHR.

Analysis - ATSB 200501977.

Editorial Pre amble.

Everyone enjoys a good story, well told; it is a deeply entrenched part of human kinds development from its origins up to today. Mostly, human beings relate to a clearly defined entertaining story, the lesson or objective of the story is most apparent and easily understood then.

During some of the darker periods in history, it has not been possible for many authors to tell their story in a clear, concise manner thus the message and lesson must be camouflaged and the informed reader must glean the true meaning by being able to interpret or 'read' the subtext and extract the subtle messaging from under the cover of the outer, defensive layers.

Australian Transport Safety Bureau (ATSB) seems an unlikely candidate for this form delivery; their report with the mundane title 200501977 appears to be the least likely candidate to tell a story which has all the ingredients of a first class thriller. But it has; in spades. Properly read, it provides all the essential elements of a classic; although the purist would decry the lack of a love interest, this is the only element missing.

200501977 contains a modest two hundred and forty six pages which can be skimmed through in about thirty minutes, the readers eyes glazing over somewhere during that period. This is a reader mistake. To properly read the report the reader must first understand the nature of a long running battle between two powerful entities for power, money, influence and kudos. The history of these rival groups is coloured, metaphorically speaking, in blood.

In today's world, the Civil Aviation Safety Authority (CASA) is in the political ascendancy, attracts the media attention, enjoys well filled coffers and basks in the security of public confidence.

The ATSB is chronically under funded, attracts very little media attention and the general public have only a vague notion that it exists. And so, the ATSB must be careful to protect it's rice bowl, not rock too many boats and mind it's manners.

How then can the ATSB weave the unpleasant truths about an aviation disaster into the fabric of the public lives, when their very existence is a daily struggle. Their answer is in subtle, cleverly camouflaged writing which, correctly interpreted, inevitably leads the informed reader to the correct answer.

This report seeks to guide the reader along the path as closely to the truth as possible.

Appendix A.

There are established protocols which must be followed for many reasons; evidence of standard data analysis being one of these. In appendix A the Flight Data Recorder is analysed in a manner which is technically correct and factual.

a) Page A-26 (28) mentions ATSB report 20060005 requiring rectification of an error the "Pitch" measuring parameter. It is of interest to establish clearly when the CASA made the orders for this rectification and how it was determined that all the affected units were in fact modified.

> ***ATSB. Safety Recommendation.*** *20060005.*
>
> *The Australian Transport Safety Bureau recommends that the Civil Aviation Safety Authority review the maintenance requirements for cockpit voice recording systems and flight data recording systems against international standards such as EUROCAE ED-112 and ICAO Annex 6 with the aim of improving their reliability and increasing the availability of data to investigators.*

b) Page A-50 (52) presents data which relates to the position of the flight controls during the last 5 minutes of the flight. It is noteworthy that there is relatively large ratio (frequency and direction) of aileron inputs to a small amount of rudder input.

(i) The flight control actions demonstrate a flawed handling technique for this aircraft; the Metro requires constant rudder input if a 'turn' is to be effective and importantly 'balanced'. To produce an accurate balanced turn onto a selected heading, rudder authority to begin and end the process is essential. The data clearly demonstrates flawed initial flight training on type and that the incorrect technique has been allowed to develop over a period of time into a normalised deficiency (bad habit).

> ***ATSB. Pilot inputs – final 10 seconds of recorded data*** *The final 10 seconds of recorded data showed that the aircraft was experiencing turbulence as evidenced by fluctuations in the vertical acceleration parameter. Small pitch and yaw control inputs were evident as small elevator and rudder position changes. Larger roll control inputs were evident as aileron position changes. The roll inputs were applied in the opposite sense to the aircraft bank angle showing that the aircraft attitude was being actively controlled by the handling pilot.*

(ii) This is clearly defined in figure A-58 page A-81 (85). The large roll control input compared to the small (negligible) changes to direction (heading).

c) The table A-7 page 67 (69) presents data describing an approach using the GNSS system.

(i) The table provides evidence of a notable speed and profile compromise. On average the speed profile is approximately 20 Knots (38kph) in excess of 'sensible' correct operating practice for the aircraft type, during a weather critical instrument approach. This profile does not reflect sound company operating practice, training or enforcement of SOP. Clearly this habit is repeated on the accident date.

---Cont.--/

Appendix A.--/--Cont.

d) The table A-10 page A-90 (92) presents data describing the turbulence during the approach using the GNSS system.

(i) Due to its design, the Metro is 'sensitive' in the pitch (nose up and down) attitude. Excess speed during an approach in turbulence is actively discouraged as it can lead to Pilot Induced Oscillation (PIO) which are difficult to counter in turbulent conditions. Operators normally clearly define a range of speed options for pilots to comply with, this is usually rigorously enforced during any form of TCS operations. Indeed, good speed and profile control are one of the hallmarks of a professional airman.

ATSB. Turbulence *As indicated by increasing activity in the vertical acceleration trace, examination of the last 25 seconds of recorded data showed that the turbulence experienced by the aircraft increased. During this period the aircraft would have been under the increasing influence of mechanical turbulence from the South Pap ridge line.*

Appendix A - In summary.

The ATSB have examined the available data which indicates that the aircraft was, for all practical purposes, functioning normally with the exception of a flawed data recording line (CVR/FDR/GPWS). They have been to some trouble to point out the salient details of the flight profile which indicate a high speed, high profile descent into turbulent, cloudy conditions.

There can be little doubt that the handling technique for the aircraft was fatally flawed, that normalised deficiencies were entrenched and that an accident or incident because of this was inevitable.

These habits do not spontaneously appear. They are learned or tacitly approved during training and 'reinforced' during operating practice over a period of time.

The question begged is how can these habits develop ?. The answers are self evident and may be found in the execution of the factual Training and Checking protocols.

The questions, 'how' did the Training and Checking system become approved ?, and 'why' was it allowed to continue, for an extended period, without let or hindrance from the controlling authority, to become a clearly defined failed system? remain unanswered.

Appendix B.

a) Page B-20 (118).

> *ATSB - GPWS alerts recorded were MINIMUMS (mode 6 GPWS alert), SINKRATE (mode 1 GPWS alert), DON'T SINK (mode 3 GPWS Alert), TOO LOW GEAR (Mode 4A GPWS alert),* ***TOO LOW TERRAIN (Mode 4C GPWS alert),*** *TOO LOW (mode 4 GPWS alert) and GLIDESLOPE (mode 5 GPWS Alert). The recording was also examined to determine the mode of flight when the GPWS annunciation occurred. Although the GPWS GLIDESLOPE alert recorded at 31:18 appeared to be recorded while the aircraft was on the ground, the actual mode of flight, when the GPWS alerts were recorded, could not be positively determined due to the interference and fragmented recording, see Table B-2.*

(i) Of it's self the paragraph above is innocuous, the table B-2 a simple list of the GPWS warnings which were ignored or not correctly responded to, it is of some interest.

b) This paragraph and table debunk the assertion that this was a 'renegade' pilot who habitually turned off the GPWS. If the warnings occurred, in the correct place; it begs the question why were these vital warning ignored over an extended period during a weather critical instrument approach, in turbulence over hostile terrain. During the approach any one of these warnings should, normally produce only one possible response from the command pilot. "Ground Warning – Going around".

> *ATSB – page B-26 (124). However, since the Bias Generator circuit provides the record bias signal to each of the four Record Amplifier circuit cards as well as the erase head, it is the most likely cause of the anomaly that was observed.*
>
> *In either case, the failure would have been easy to detect, even with a casual evaluation of the real time CVR monitor audio output or with the CVR 'push-to-test' activation. In the case of the 'push-to-test' activation, the test meter indication (needle deflection) would have been intermittent rather than continuous.*

d) Perhaps, a small part of the answer is contained within the paragraph above, it is not too long a bow to draw to infer that; perhaps, spurious warning were common place and aircrew only paid lip service to checking the equipment and had little faith in its integrity.

The question deserves an answer, if only to eliminate the possibility.

> *ATSB page B-39 (137). The operator subsequently issued a NOTAC36 No: C17, dated 28/07/05: Test Procedure for CVR and FDR. The NOTAC mentioned that crews had not been testing the CVR and FDR prior to flight and directed aircrews to test the units prior to each flight, and to use the AFM for guidance. The NOTAC indicated that the pre-flight checklist would be amended to include a functional test of the CVR and FDR. The operator reported that revision two of the pre-flight checklist was issued on 20 September 2006 which included a test of the CVR and FDR system.*
>
> *ATSB page B-41 (139). Specialist examination of the CVR unit and recording, by the ATSB and international equivalent agencies, found that a fault, that had not been discovered or diagnosed by the flight crew, had been present in the CVR unit, at least since the 27 April, and had stopped the unit from functioning as intended. As a consequence, the recorded data contained fragments of audio, other noises and pulsed interference signals. Other than conversation relating to the airways clearance issued on the 27 April and the 4 May 2005, the date of the recordings, or relevance to the accident, could not be determined.*

Appendix B.- In summary.

The finding of the ATSB indicate several issues which require explanation. An important element is the attitude of the company and the aircrew to establishing the integrity of ancillary though critical safety equipment.

Appendix C.

a) Appendix C is an interesting inclusion, at face value it simply provides extracts from the manufacturer, Honeywell. Perhaps it is coincidental that the graphic depicts the exact crash scenario.

b) To understand the meaning, it is essential at this juncture to examine the cornerstones of a sound, well managed flying operation.

(i) The Civil Aviation Regulations require that an air operator provide an exposition; usually entitled the Company Operations Manual (or similar) it is required, by strict liability law carrying criminal penalties to provide detailed operational data. The exercise is designed to produce a 'rock solid' foundation supporting all facets of the proposed Air Operator Certificate (AOC). The CASA for the last few years have blurred the distinction as to whether the exposition is "accepted" or "approved". Notwithstanding the fine legal distinctions made, in reality if the Flight Operations Inspector dealing does not "like" what is presented the manual will neither be accepted or approved. In short, the CASA delegate 'must be satisfied'.

(ii) The Transair general COM (Parts A and B) represents one of worst examples of an operations manual the editors of this report have seen. At no time would such a manual have been accepted by any of the Authorities dealt with, certainly not in Australia as we understand it. And yet it was.

(iii) One of the more critical areas which must be addressed in an operation which utilises transport category aircraft, and 'junior' aircrew is the transition to 'airline' standard operations. Clearly defined written instructions, guidance and education is an unwritten although mandatory precursor to 'writing' the manual. This is particularly important when sophisticated ancillary equipment is introduced to the aircrew for the first time.

d) The ATSB report presents on page C-64 (152) a graphic which defines the exact nature of the CFIT event. The 'callout's' (warnings) are bolded. Examination of the Transair COM omits any reference to the essential "Terrain" warning and provides no guidance on the procedure to follow should this callout be made.

e) The acceptance or approval of this single item only permits 1 of 3 conclusions to be drawn:-

- Incompetence.
- Ignorance.
- Indifference.

f) None of these conclusions are acceptable from a national safety authority charged with the oversight of the public travelling by air.

Note: Examples of fully approved operational COM are available for comparison. It is noted that neither the ATSB or the CASA chose to trouble the Coroner with such trivial matters.

Appendix D.

> *ATSB page D2 (156)* ***Checked baggage weight*** *A passenger/cargo manifest document was subsequently provided to the investigation and indicated that only one piece of baggage, weighing 15 kg, was checked in by a passenger at Bamaga for the flight to Cairns. There was no record of other passenger baggage being checked in at Bamaga. However, several suitcases were found at the accident site. The estimation of the total baggage checked in at Bamaga was 255 kg, which assumed that the other 12 passengers each checked in a 20 kg bag, which was a standard airline allowance.*
>
> *ATSB page D-3 (158)* ***Passenger loading.*** *The passengers on the flight from Cairns to Bamaga had been assigned seats by the ground agent in Cairns prior to departure. This seat assignment was completed using a seat allocation chart provided by the operator.*
>
> *Interviews with the passengers revealed that when they boarded the aircraft they could sit wherever they desired and the crew did not enforce the assigned seating allocation as determined by the agent. The actual seating of the passengers for the flight from Bamaga to Lockhart River could not be ascertained, as the disruption of the aircraft during the impact sequence did not allow the determination of the seating positions of occupants.*

a) It is important to note that the aircrew and ground agent, not just the PIC were involved in the accident and the attendant details. The above situation would not be tolerated by any responsible management, the offending aircrew would be identified and, in all probability have their employment terminated. In a normal operation the aircrew would simply reject the load without documentation and a reassessment of the aircraft weight and balance limitations. Should the PIC have accepted the load, the co pilot should refuse to fly the aircraft in an illegal condition, a report to the company should have ended the discussion. This incident once again points to severe normalised deficiencies not only in the company 'culture', TCS procedures and to COM requirement, but to a complete lack of oversight by the controlling authority.

Appendix D – In summary.

This appendix perhaps sums up the culture which was allowed to develop at Transair.

a) It is SOP in the humblest of operations to duplicate the passenger manifest, it is reflex action to leave a duplicated copy of the aircraft load and 'trim' sheet at a departure port, these are all documented requirements.

Apart from being illegal, it is impractical. The pragmatic mind almost automatically arrives in fairly short order at the vexed question of post accident insurance. It is essential that the operator be able to establish that the aircraft was at all times during the conduct of the operation within the mandated limitations and constraints of the law.

Here again the issue of oversight is raised, a routine audit would expect to see duplicate load and trim sheets for intermediate and terminating ports. The CASA should with some precision be able to 'track', on paper, the progress of a flight defining all the pertinent parameters to within a reasonable tolerance for error.

Appendix E – In summary.

The voice tapes indicate generally a fairly poor standard of radio procedure which is indicative of poor TCS and cockpit discipline, whilst this in itself is not inherently dangerous it points to another small hole in Reason's famous cheese lining up.

The first indicator is where the aircraft informs Air Traffic Services that it has "left" the cruising altitude and is requesting traffic for descent. Native common sense would dictate that the descent profile may need to accommodate separation from known traffic, therefore it would be sensible to have prior knowledge of that traffic before commencing a descent at 1500 feet per minute at a speed of 480 Kph.

There was traffic for the arrival at LHR. It is noteworthy that at no time did the aircrew attempt to establish positive separation from the opposite direction traffic. Potentially overshoot from the instrument approach would be conducted at low level, in poor conditions at about the time the aircraft VH-PAR would be in close proximity. It is noteworthy that a discussion related to the ambient conditions was entered into, but positive separation was not mentioned.

There are three speculative conclusions which may drawn.

(i) The crew had poor situational awareness related to conflicting traffic and had not considered or planned for a missed approach.

(ii) The increase in descent profile was triggered by a report of the cloud base from VH-PAR, that information prompting an increase descent rate on the expectation of becoming visual. (Radio call time line v Descent profile).

(iii) The determination to become visual and 'beat' the opposing aircraft into the circling area, thus assuring priority for landing had some bearing on subsequent command decisions.

The above reflects the actions of an overconfident, 'junior pilot' error in judgement; one is left wondering if, perhaps the TCS had been fully competent the 'inexperienced' thought process would have been noted and corrected.

The training records of the aircrew should, in a perfect world, have a short, perhaps terse note reflecting that a similar event had been noted and briefed.

There is no doubt that the two aircraft were in a serious, high collision risk confrontation. The Metro expecting the instrument approach minima at the same time as the opposing aircraft would be joining the landing pattern. The Metro being below and behind the conflicting traffic when executing the overshoot procedure would compound an already dangerous situation, the overshoot path being across the logical flight path of the inbound aircraft.

Appendix F.

Passed over without comment save for mentioning extensive anecdotal evidence which indicates that in it's haste be become a 'world leader' in GNSS approach design, the Australian Authority approved a basically flawed instrument approach. This discussion is not within the ambit of this report.

Appendix G.

a) This appendix deals with the Transair CASA approved Company Operations Manual. The writers have had access to a non certified copy of the Transair COM the comments raised by that preview are not included herein.

Note: Examples of fully approved operational COM are available for comparison. It is noted that neither the ATSB or the CASA chose to trouble the Coroner with such trivial matters.

b) This report will comment on the extracts provided by the ATSB for the Coroner. In order to save time; tedious, lengthy subjective comparisons between COM will be avoided; the following comments are offered:-

(i) Refer ATSB page G-1 (201) the sub paragraph 8.3.2.6 GPS Non Precision Approaches. Assume you are a new start pilot, then read the section, then decide if it makes sense to you. A well constructed directive should leave a layman with an impression that if the 'technical' aspects were explained, the rest would be comprehensible. This section does not achieve this goal. It makes many assumptions, provides no valuable information and leaves the reader 'clueless'.

(ii) ATSB page G-2 (202) the sub paragraph 8.3.27 presents a similar offering and is, in our opinion, completely unacceptable. The section presents as if being written by a person who has only the slimmest of holds on the GPS system and little experience of 'teaching' the subject.

d) ATSB page G9-10 (210) sub paragraph 8.3.5 should be compared to the data provided by Honeywell and the ATSB. The section omits "**Terrain"** warnings and avoids making unambiguously clear that this warning requires immediate over shoot action.

c) Rather than belabour the reader with more of the same comments the report offers 3 considered opinions:-

(i) The COM has been constructed to satisfy the basic tenet of 'providing a manual' and of paying lip service to the requirements of the aviation regulatory suite. Akin to being promised the world and being given an atlas.

(ii) That the manual should never have been 'accepted' by the CASA. How the company convinced a regulatory body to accept the manual is a question this report cannot answer.

(iii) The aircrew of the flight being considered were routinely operating in direct conflict with the edicts of the COM and aviation law.

Appendix G – In summary.

It is apparent although perhaps excusable that the aircrew were 'making up' their own SOP as they went along. The lack of clearly defined operating parameters provided in the COM allowed them to do little else. Clearly, there was no support system to provide correct operational guidance, mentoring or education.

More worldly wise pilots, not captive to the company ethos would have forcefully brought these facts to the attention of the persons responsible for inflicting this travesty on an unsuspecting public.

Appendix H.

a) This section of the ATSB report, when read in conjunction with public statements, Coroner Barnes questions and comments, findings, evidence presented and CASA statements provide a single summary question.

b) What was the real, radical cause of this accident?.

c) It is not within the ambit of this report to recommend or suggest remedies for satisfactorily correcting and ensuring that the oversight of public air transport is conducted competently, honestly, with clarity and an understanding of the air transport industry.

d) It is within the scope of the report to ask of the Coronial system for full public disclosure of all CASA documentation associated with Transair and the CASA involvement both prior and subsequent to the accident investigations.

e) It is within the scope of the report to ask that all CASA personnel who were associated with Transair, including the delegates who signed operational approvals are interviewed, their statements be examined independently and should it be deemed necessary, an inquiry into the CASA management of Transair and the subsequent inquiry be publicly conducted.

f) It is within the scope of the report to ask for full public disclosure of all ATSB documentation associated with Transair and the ATSB involvement with the subsequent investigations.

Extract ATSB 20060352.

2 THE MAGNITUDE OF CFIT.

The evolution of the aviation industry has taken place at a rapid rate. Significant advancements in technology, particularly in the commercial aviation sector, have seen the reciprocating engine replaced by the jet engine, basic instrument gauges replaced by glass cockpits, vastly improved navigational aids, and enhanced air traffic control (ATC) facilities. Coupled with a better appreciation of human factors and excellent training and educational practices, the number of aircraft accidents has reduced.

In 1947, commercial aviation transported approximately nine million passengers and experienced about 600 fatalities. By comparison, over the 3 years from 2002 to 2005, commercial aviation flew an average of 2.4 billion passengers per year and experienced about 500 fatalities (Burin, 2006b). In general terms, this equates to one fatality per 15,000 passengers (1947) compared with one fatality per 4.8 million passengers (2005). It is expected that the number of people choosing to travel by air will continue to grow. Within the Asia Pacific region, passenger movements were forecast to increase on average by 6.8 per cent annually between 2005 and 2009 (IATA, 2005).

While air travel remains one of the safest modes of transport, controlled flight into terrain (CFIT) continues to remain one of the leading causes of commercial aircraft accidents. More than 35,000 people have lost their lives in CFIT accidents from the emergence of civil aviation in the 1920s to the turn of the century (Bateman, 1999).

2.1 What is CFIT?

The definition of CFIT used by different organisations varies slightly. The definition used in this report was developed by identifying the common elements contained in these definitions. Some of the definitions examined included those used by the International Civil Aviation Organization (ICAO), the Flight Safety Foundation (FSF) and the United States Federal Aviation Administration (FAA).

DEFINITION OF CFIT

For an accident or incident (occurrence) to be classified as a CFIT, it must satisfy the following criteria:

- the aircraft is under the control of the pilot(s);
- there is no defect or un serviceability that would prevent normal operation of the aircraft;
- there was an in-flight collision with terrain, water, or obstacles; and
- the pilot(s) had little or no awareness of the impending collision.

CFIT for the purposes of this report.

4 The intent of this criterion is to exclude collision with terrain (water and obstacles) accidents and incidents where events leading up to the occurrence, such as a mechanical malfunction, resulted in a degradation of aircraft performance.

Accidents that met the definition of a CFIT, but involved aircraft conducting low level operations, were excluded from this study.

When an occurrence is classified as CFIT, it is often assumed that the accident or incident occurred in conditions of reduced visibility, such as in instrument meteorological conditions (IMC) or at night, and that the surrounding terrain was mountainous. While this is often true, it is not always the case. It is possible for CFIT to occur in visual meteorological conditions (VMC) and/or areas absent of significant terrain features.

2.2 Why does CFIT occur?

It seems somewhat inconceivable that an aircraft capable of safe flight can be flown into terrain (water and obstacles) while under the control of the pilot. This raises the question, why does this happen? While CFIT accidents and incidents are often the product of a series of events, the investigation of CFIT over the years has identified loss of situational awareness as a key contributing factor. More specifically, a pilot's loss of vertical and/or horizontal situational awareness in relation to the terrain, obstacles or water.

SITUATIONAL AWARENESS

> *"Situation Awareness is the accurate perception of the factors and conditions that affect an aircraft and its flight crew during a defined period of time. In simplest terms, it is knowing what is going on around you – a concept embraced to the need to "think ahead of the aircraft"* (Schwartz, 1989 cited in Orlady & Orlady, 1999, p. 257).

Situational awareness covers five main areas:

1. Information on the physical state or condition of the aircraft.

2. The position of the aircraft with respect to the flight plan, to natural or manmade obstructions, and to other aircraft (place information).

3. The operating environment, including facilities, traffic density, and weather.

4. Temporal element and time, such as the time the aircraft will reach its destination, the time available for holding, the time limit for available fuel.

5. The state or condition of other members of the operating team and passengers, and cargo onboard.

For CFIT, the greatest concern is a loss of 'place information'. Once a pilot's mental picture of where they are at present, and where they will be in the future diminishes, safety becomes compromised. This is particularly crucial during those phases of flight when terrain clearance is unavoidably reduced (e.g. initial climb and approach). Reportedly, more than two-thirds of all CFIT accidents result from a loss of vertical situational awareness or an altitude error (Flight Safety Foundation, ICAO, & Federal Aviation Administration, 1996).

There are a number of factors that contribute to a loss of situational awareness. When comparing CFIT occurrences from the 1960s and 1970s to recent times, it is evident that despite the efforts of the international aviation community to reduce CFIT, some common factors have endured. These include those involving flight crew - the use of non-standard phraseology, non-compliance with procedures, fatigue, and visual illusions; ATC - the provision of erroneous altitude/heading directions; and weather, organisational issues, ambiguous aeronautical charts, and non-optimal approach procedure designs (Khatwa & Roelen, 1996).

Other factors that have played a part in CFIT accidents and incidents include 'get-home-itis', where the pilot becomes fixated on reaching the destination point at all costs (also know as 'press-on-itis'), and pilot workload. The latter is especially true for the approach and landing phase of flight where the pilot's workload becomes more demanding. In this phase, the pilot is interpreting approach charts, changing the aircraft's configuration, monitoring traffic, and monitoring the aircraft's altitude and airspeed.

In May 1999, the then Bureau of Air Safety Investigation, which was incorporated into the Australian Transport Safety Bureau (ATSB) from 1 July 1999, released the *Regional Airlines Safety Study Project Report*, which sought to identify safety deficiencies affecting regional airline operations in Australia. As part of this study, a survey was constructed and distributed to employees working within the regional airline industry including pilots, flight attendants, licensed aircraft maintenance engineers, and baggage handlers.

The survey focused on a number of aspects such as aircraft operations, flying training, cabin safety, safety culture, and instrument flying, in particular, instrument approach procedures. One of the key safety issues examined within the latter section was the loss of situational awareness, specifically, with respect to terrain clearance. While the results identified that only 5.7 per cent of the pilots had been surprised that the aircraft was closer to terrain than expected, the results were considered significant as the loss of situational awareness can result in a CFIT accident or incident.

This issue was also highlighted in a recent survey conducted by the ATSB, which examined pilot workload and perceived safety of area navigation global navigation satellite system (RNAV (GNSS)) approaches. The results of the survey indicated, with the exception of the NDB5 approach, that respondents had trouble maintaining situational awareness more often on an RNAV (GNSS) approach compared with the other types of approaches analysed in the report (Godley, 2006).

Generally, good situational awareness increases safety, reduces workload, enhances performance and improves decision making. Achieving and maintaining a high level of situation awareness is a product of good operating philosophy, training, standard operating procedures, and crew coordination (Orlady & Orlady, 1999).

While it is important to understand the circumstances leading to CFIT accidents and incidents, it is equally important to recognise that there are instances when a CFIT event was avoided. The analysis of potential CFIT, or controlled flight towards terrain (CFTT) occurrences, could provide a more complete picture of factors that could contribute to a CFIT, and perhaps identify those factors that prevented a CFTT becoming a CFIT. Accordingly, the ATSB will examine this subject in a separate research report.