ROYAL AERONAUTICAL SOCIETY
LOUGHBOROUGH BRANCH

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Air Accident Investigation Branch
Peter Coombs (retired AAIB Inspector)

The speaker had recently retired after 47 years as a member of the UK AAIB team and had considerable experience that referred to incidents and accidents ranging from small to large aircraft. Largely, examples presented were related to commercial aircraft, although he showed that some military aircraft were occasionally investigated too. Exemplifying the breadth and interest of the work involved he referred to having involvement in approximately 250 investigations covering both accidents and major incidents to civil and military aircraft. The civil accidents covered those occurring within UK territory and surrounding waters and UK administered Overseas Territories as well as participating in investigations overseas to British and Overseas Territories registered, British operated, British designed and manufactured aircraft and those incorporating major UK designed/ developed components (engines, Landing gears, automatic systems etc.). A Military safety Branch has been set up in recent years with the result that AAIB Engineering Investigators are no longer initially called out to advise military Boards of Enquiry, though interaction continued up to the time of the lecturer's recent retirement.

The first acknowledged accident investigation was conducted in the USA in 1908. It took place because the passenger was a military officer who lost his life whilst on duty during peacetime. (A corresponding investigation would have taken place had he, for example, been run over by a horse towing an artillery piece). The concept of airworthiness was un-known and, having produced a report, the US military authorities did not consider it appropriate to set up a standing body to investigate future aircraft losses. In contrast, in 1912, following a number of accidents in the UK, the Royal Aero Club set up a standing Public Safety and Accidents Investigation Committee having realised that having already lost a number of their pioneer members in aircraft accidents there was every chance accidents would continue to occur.

Trident – Staines, near Heathrow 26 June 1972. On departure the aircraft entered a deep stall and crashed in open ground soon after departure. There were no survivors of 118 people on board. Unacceptable cockpit operational procedures caused the loss of control.

International civil aviation is enabled by the setting up of internationally agreed Standards and Recommended Practices in the operation of aircraft in and over territories other than those of registry of the specific aircraft in question. These practices are laid down in the Convention of the International Civil Aviation Organisation, (ICAO) dawn up in 1944. There are few countries in the world that have not now signed up to the ICAO convention. Each topic

requiring international co-ordination (Aircrew Licencing, Airport design, Airworthiness certification, Weather reporting, Air traffic control, Aircraft maintenance, etc. etc. etc.) is fully defined in a detailed annex to the Convention relating to that specific subject. The process of investigation of accidents to aircraft flying on international routes was allocated Annex no 13.

In the UK, as in most countries, reports become publicly available documents and usually incorporate recommendations directed at regulators. The AAIB is part of the Department for Transport. In principle it reports directly to the relevant Minister. It is deliberately separated from any regulator to make it free to comment on the effectiveness or otherwise of regulations and regulatory activity. Those regulators commented upon can be the UK Civil Aviation Authority, the American Federal Aviation Administration, the European Air Safety Agency or other national bodies depending on the circumstances and causes of the accident or incident. Reports avoid apportioning blame but are directed at identifying what went wrong to enable regulators to come up with requirements for changed procedures, modified aircraft or any other change that would reduce the possibility of a repetition.

The AAIB is based at Aldershot, a short distance from what was the Royal Aircraft Establishment (RAE) at Farnborough. At the current time, there are around 54 employees, comprising 28 inspectors, 17 administrators, hangar staff and an IT support team. These collect data from FDR (flight-data recorder) and CVR (cockpit voice recorder). The recorders provide information that cannot be gathered any other way. The time-based recordings reveal the timing, sequence and content of events. A point to note is that, called 'black-boxes' by the press, the units are usually painted red. Each also has a transponder element that assists in determining the location of the recorders. AIB was set up in 1919 as a civil organisation though it initially also investigated RAF accidents. It was subsumed fully into the RAF in 1939 (when most civil aviation ceased) and returned to being a civil organisation under the Ministry of Civil Aviation at the end of WW2. It has been in a number of 'Ministries' over subsequent years. Governance of aspects of aviation regulation was somewhat scattered

Avro 748 – Nailstone, Leics. 26 June 1981. Separation of aft cabin door, surprisingly occurring during descent, caused the door to become impaled on tailplane leading-edge. This caused sudden migration of stagnation point of flow over tailplane as wing lift coefficient increased during deceleration. This in turn caused dramatic pitch trim change and reversal of pitch control forces at the control column. The net result was that the aircraft became unflyable, having developed a divergent undulating flight path putting the pilot 'out of phase' with the pitch variation which in turn overloaded the structure causing both wings to separate. All three crew members were killed.

until 1972 when all such functions were combined in the new CAA, leaving the AIB entirely separate and independently situated within the Department of Trade and Industry. Thus, contrary to widespread relief, the AIB (now AAIB) is not part of the CAA.

He outlined the three categories of AAID Inspectors.

1. Operations Inspector – is a qualified professional fixed-wing or rotary-wing pilot, often ex-military, and they maintain a valid licence.
2. Engineering Inspector – may have an engineering degree, and must have experience in industry, airlines or service organisations, and most but not all have private pilot's licences.
3. Engineering Inspector (FDR/CVR) – again needs an engineering degree plus experience in airlines or services. They will have knowledge of aircraft performance and aircraft systems.

The AAIB depends on its own capabilities, and accept support from specialists, such as manufacturers, universities, X-ray spectro-graphers, Met Office staff, and others, as necessary, from the RAF (Royal Air Force) and NATS (National Air Traffic Service). Ministry of Defence specialists can be called on for photographs and other assistance, and may call upon many more sources. Each investigation will call on the sources that it needs most, so those mentioned here can be regarded as an example, and it is possible that other sources will be used as and when necessary.

The legal format of any report will be in accord with ICAO requirements so that information, irrespective of the location, will meet the requirements of ICAO Annex 13. There are requirements to fulfil that determine the scale of any investigation. Usually, an accident will have involved:

1. Any person suffered death or had significant injury
2. The aircraft suffered damage or there was a structural failure
3. The aircraft is missing or is completely inaccessible.

The investigators are expected to invite participation from investigating bodies of the states of design and manufacture of the aircraft, state of registration and state of origin of major components (engines etc). Each delegation is expected to be headed up by an Accredited Representative, an Inspector from the relevant national investigating body. The investigating body of the state of occurrence has overall responsibility and produces the final report, though representations are normally welcomed from organisations (manufacturers, operators etc) both inside and outside the nation of occurrence. Those from outside are expected to

RAF Chinook helicopter – RAF Odiham (Almost certainly after 1981 – no actual date). Incorrect fitment of thrust race during overhaul of rear gearbox caused loss of axial location of drive pinion as aircraft lifted off, permitting pinion to loose tooth engagement with meshing ring gear. Hence front and rear rotors became unsynchronised and blades collided causing disruption of latter and shedding of tip weights with complete separation of front gearbox. There was damage to the structure and engine components, but no fatalities occurred on board.

channel their contribution through the relevant Accredited Representative.

We were shown photographs of a number of the accidents our speaker recalled from his experience, and these certainly showed that no two investigations were ever likely to be the same as any others.

This is a very condensed review of the presentation which was well illustrated, and did follow a track that was proof that in this occupation it is necessary to acknowledge and use the working systems that bring together data from different sources. Situations will vary from task to task, with little expectation of homogeneity.

The adage that "a picture can be worth a thousand words" is certainly a worthy aspect in this case. Some pictures are presented and captioned here, and supporting them is a recording of the session in which the speaker's personal description adds dimensions it is difficult to gather in words here. As many an investigator, he confessed a desire to have an excuse to investigate an accident that involved a Bermuda-licenced aircraft (regarded as British) that would surely have be located in the warm mid-Atlantic island. When he found that several aircraft were a long way from Bermuda, and some were in service in Russia, the accident he was called on to investigate had occurred on the freezing trans-Siberian railway track.

The meeting was well attended with similar proportions of people on-line and in the lecture room amounting to an overall attendance of about 110 people.

Notes written by Mike Hirst and Peter Coombs