No. 52

Ansett-A.N.A., Viscount, VH-TVC, accident 2.8 NM from Sydney Airport, New South Wales, Australia on 30 November 1961. Report, dated 29 August 1962, of the Chairman of the Board of Accident Inquiry, Australia.

Circumstances

The aircraft was engaged on a scheduled transport service from Sydney to Canberra. It carried a crew of four and eleven passengers. According to the approved flight plan, the pilot proposed to proceed to Canberra via the 222 track to Marulan, the first reporting point. At the time of departure this was changed, because of inbound traffic, to the 244 diversion, which avoids Botany Bay. At 1915:43* the Approach Controller instructed the flight to "continue runway heading to 3 000 ft before turning left and to pass over the field at 5 000 ft or above." The flight was then cleared for take-off from runway 07.

At 1921:50 the Approach Controller asked the aircraft to report its altitude. It was at 6 000 ft. Shortly thereafter (at 1922:05) the controller communicated as follows:" ... now if you haven't passed over the field you can proceed via the 217 from Padstow. The 222 is available, but I suggest the 217 due to the storm to the south of the field. Report setting course from Padstow 217." The flight acknowledged at 1922:20 hours. None of the messages that followed from the Approach Controller were answered.

Between 1925 and 1926 hours the aircraft plunged into Botany Bay, killing all aboard.

* All times are Eastern Standard Time.

Investigation and Evidence

The Aircraft's History

VH-TVC was originally built by the manufacturer as a model 720 Viscount. It had been modified to meet the requirements of Trans-Australia Airlines and was redesignated as model 720C.

It was introduced into regular public transport service in December 1954 and was operated and maintained entirely by Trans-Australia Airlines until March 1960 when it was made available to Ansett-A.N.A. under a cross charter agreement. Trans-Australia Airlines retained responsibility for overhaul of the aircraft, its engines and other components, and Ansett-A.N.A. was responsible for all scheduled maintenance inspections and rectification of defects.

At the time of the accident the aircraft had flown a total of 16 946 hours including 9 797 hours since its last complete overhaul. The certificate of airworthiness was renewed on 2 December 1960 and was valid until 1 December 1961. Some minor deficiencies disclosed by the maintenance records were noted, but none of these had any bearing on the accident.

On 28 November 1961 the aircraft was inspected in view of the renewal of its certificate of airworthiness, and the Department required rectification of four minor items.

The Crew's Experience

The pilot's total flying experience amounted to 16 016 hours of which 12 362 hours had been in command including 802 hours on Viscount 720 aircraft and 1 946 hours on Viscount 747 aircraft. He held a

first class airline transport pilot's licence valid until 28 February 1962. He also held a first class instrument rating for ADF, ILS and DME procedures. His records showed that he was a competent and careful commander, and there was no evidence to suggest that he failed in any way to perform the duties required of him on the night in question.

In June 1960 the co-pilot's licence was endorsed to permit him to act as first officer on Viscount 720 and 747 aircraft. His total flying experience amounted to 4 145 hours, including 609 hours on Viscount 720 aircraft and 1 122 hours on other types of Viscount aircraft. He held a second class airline transport pilot's licence valid until 31 May 1962. He also had a second class instrument rating for ADF, ILS and DME procedures.

Both pilots were in good health and had normal rest periods before the fatal flight.

Preceding flights of VH-TVC on 30 November

The aircraft had been used on two flights on 30 November prior to the accident. The first was from Sydney to Canberra in overcast and rainy weather. The flight conditions were slightly bumpy but not severe. Prior to the return flight to Sydney the aircraft was inspected. In the descent from Marulan there was "moderate turbulence". No defects in the aircraft were noted at any time.

Weather briefing prior to the subject flight

The flight and aerodrome forecasts given to the pilot by the domestic forecaster showed rain and scattered thunderstorms with moderate to heavy turbulence. The forecaster told the captain that a line of storms had been reported by Brookvale Radar at 1700 hours. The storms were 40 miles to the west and were apparently moving eastward. Because of the thunderstorm activity a SIGMET had been out all day. There were varying reports of turbulence including some which indicated a considerable amount.

Having prepared the flight plan, the captain presented it and discussed the weather with the Air Traffic Control Briefing Officer. The latter suggested that the captain, when taxying, should request the latest information from the tower on the approaching bad weather.

Prior to departure the captain did receive instructions and advice from the tower.

Loading of the aircraft

The aircraft's take-off weight was 51 976 lb, and the estimated landing weight was 50 096 lb. The permissible maximum take-off weight for the flight to Canberra was 59 380 lb. The aircraft's weight and centre of gravity were within limits.

Pre-flight inspections and checks

All pre-flight inspections and checks were satisfactorily completed.

Reconstruction of the flight

The events leading up to the accident were based on the communications exchanged between the aircraft and the traffic control officers at the aerodrome. This material is presented under "Circumstances".

The Wreckage - General

The absence of reports from people in the densely populated area over which the aircraft had been operating when communication was lost led to the belief that it had crashed into the sea. The morning of 1 December, a portion of the upholstery of a pilot's seat was found floating in Botany Bay, and it was identified as coming from a Viscount aircraft. Within two hours thereafter the partly submerged starboard outer wing was found in Botany Bay about 1 500 ft north of Bonna Point. A little later the main wreckage was located in 25 ft of

water some 8 350 ft north of the point at which the starboard outer wing was found.

The location and condition of the wreckage when recovered were of considerable significance in aiding the investigators in their search for the cause of the disaster. The starboard outer wing was more or less intact but the main wreckage, which included the starboard inner wing, was greatly disintegrated. The condition of the wreckage, together with the fact that the starboard outer wing was found at such a distance from the main wreckage, led to the conclusion that the starboard outer wing had separated in flight and that it was the immediate cause of the disaster.

Examination of the wreckage

Experiments were carried out with a view to determining the height at which the separation of the starboard outer wing and tailplane took place. It was possible to estimate within reasonable limits the position from which each relevant piece of wreckage probably fell.

The conclusion was reached that the aircraft broke up in flight at an altitude within the range of 3 500 to 5 500 ft and at a distance between 5 000 and 7 000 ft due south of the main wreckage.

The experiments indicated that the break-up did not occur at the maximum height which the aircraft must be assumed to have reached in the course of its flight. At 1921:53 hours the aircraft reported its altitude as being 6 000 ft. Some twenty-seven seconds later it was still in flight and apparently not in difficulties. By that time, in normal flight its altitude would have been over 6 500 ft. It was assumed that it continued to climb for at least another minute and that it probably approached a height of 8 000 ft. None of the experiments undertaken in relation to the terminal velocity of pieces of wreckage suggested a break-up at such a height. Other factors also supported the view that the altitude at break-up was appreciably less than 7 000 to 8 000 ft.

The Chairman of the Board was of the opinion that the break-up did occur at an appreciably lower altitude than the maximum which the aircraft attained in the course of its flight.

The experiments supported two other conclusions which the Chairman accepted:

1. A flight path having a substantial northerly component at break-up is indicated.

2. The failure of the starboard wing and subsequent failure of the starboard tailplane occurred within a very short interval of time, and it appears that the aircraft travelled less than 1 500 ft between wing and tailplane failure.

Structural soundness of starboard outer wing

The wing was subjected to routine x-ray tests on 31 October and 1 November 1961. No abnormalities were found on those occasions.

Examination of the wreckage disclosed that the main spar lower boom of the wing failed in tension at a point about 6 ft outboard of the spar joint (wing station 323).

A portion of the lower spar boom containing the tensile fracture and a secondary crack running outboard from it was removed from the wing and was examined by the Defence Standards Laboratories, Sydney. The examination disclosed that the material of the boom complied with the appropriate specification, that the fracture resulted from tensile overloading, and that there was no evidence of pre-existing defects which could have caused premature failure. It was concluded that fatigue of metal and stress corrosion could be eliminated as causes of the failure and that the spar boom had been subjected to some load greater than that which it was designed to withstand. A piece of the lower spar boom immediately inboard of the primary failure was not recovered, but the Chairman did not believe that its

recovery and examination would have affected these conclusions.

Capacity to withstand stress in flight

The elimination of structural defect of the wing as the cause of its separation from the aircraft leads naturally to the conclusion that the aircraft encountered some force in flight which was greater than it was designed to withstand.

The British Civil Airworthiness Regulations require, as a safety factor, that the strength of the structure shall be such that it is able to withstand loads one and one half times greater than those indicated by the gust envelope.

VH-TVC was constructed in accordance with these regulations.

After the accident Vickers-Armstrongs (Aircraft) Limited were asked to prepare a gust envelope applicable to a Viscount 720 aircraft with a weight of 51 990 lb, a centre of gravity at 0.1975 of the mean chord and flying at an altitude of 6 000 ft. These specifications correspond with the weight and centre of gravity of the subject aircraft on the night of the accident, and the altitude of the aircraft at 1921:53 hours. The gust envelope prepared by the aircraft company indicated that the maximum gust the wing would have withstood at a speed of 165 kt would have been in the order of 184 fps, and 166 fps at a speed of 180 kt. These gusts, far in excess of anything that has ever been recorded, were excluded as possibilities. By reference to the gust envelope it was demonstrated that at speeds below 260 kt it was not possible for the wing to fail due to gust loading alone. In these circumstances the aircraft would stall.

This examination of the capacity of the aircraft to withstand gusts at the speed at which it may reasonably be assumed to have been travelling confirmed that the wing did not become detached at the maximum height which the aircraft must be presumed to have attained.

Consideration of the capacity of the aircraft to withstand stress, loaded as on this night, indicated that at speeds below 260 kt the wing would not break on rapid application of the elevator. Furthermore, at 300 kt it requires a gust of at least 88 fps to break the wing and at 400 kt one of 54 fps. These combinations are such remote possibilities as to lead to the view that the wing failure was induced by something more than gust and speed alone.

It was concluded that when the aircraft was at its maximum altitude something happened to cause an upset as a result of which the control of the aircraft was momentarily lost. The loss of control led to a rapid involuntary descent and the speed of the aircraft, the attempts of the pilot to recover control, together with turbulence, imposed on the wing a load which it was not designed to bear. The attempts which the pilot would make to recover control could impose manoeuvre loads on the aircraft which, combined with gusts of moderate intensity would, at a speed in excess of 260 kt, result in failure of the wing. This conclusion was accepted by the Chairman of the Board of Inquiry as the most probable cause of the accident.

Cause of the accident

A number of happenings such as error, distraction or sudden incapacity of the pilot might have led to loss of control. However, the communications exchanged between the aircraft and the traffic control officers indicated that nothing out of the ordinary had occurred up to within three minutes of the accident.

Malfunctioning of the aircraft, its instruments or systems was also considered. Due to the destruction in the pilot's cabin, an effective check of the instruments was not possible. However, the aircraft's maintenance record immediately prior to the flight made this appear unlikely. There was no evidence of fire, explosion or lightning strike.

The weather conditions at and in the vicinity of Sydney aerodrome on the

evening of 30 November showed that turbulence, at times of an extreme character, was being experienced by aircraft entering and leaving the field. Thunderstorms and lightning were prevalent and at the time of VH-TVC's departure the ceiling was about 800 ft. The actual conditions existing at 6 000 to 8 000 ft are not known. The presence of turbulence seems highly probable, and its presence to a degree which would render control of the aircraft difficult, was not impossible. Vivid lightning might have interfered with the pilot's vision.

Considering all the evidence, it was concluded that weather conditions constituted the most likely explanation of the initial departure of the aircraft from the flight path it was following a minute or two before the accident.

The final descent

The most reasonable explanation for it is that control of the aircraft was lost to a substantial degree when the aircraft was flying at an altitude over 6 500 ft and thereupon the aircraft descended rapidly at increasing speed. In such a situation the pilot would try by any means possible to recover control. The wing would thus be subjected to severe strain induced not only by the speed but also by loads imposed by the manoeuvre to regain control and by any turbulence it encountered. A degree of turbulence, which might prove crucial in these circumstances, is not improbable.

This sequence of events is not inconsistent with the estimated speed of the aircraft at the time of impact with the water, the time sequence of the entire flight, the lateral displacement of the aircraft in the latter part of its flight and with the conclusion that the flight path of the aircraft at that time had a substantial northerly component.

Examination of engines Nos. 2, 3 and 4 indicated they were operating at impact with propeller blade angles of 53°. From this it was concluded that if the engines were operating at the lowest revolutions for flight, i.e. 10 400 rpm, the speed of the aircraft at impact would not have been less than 300 kt. If they were rotating at a higher speed, the maximum being 14 500 rpm, the speed of the aircraft could have been as high as 400 kt.

It was then concluded that the failure of the starboard outer wing was probably induced by a combination of manoeuvre and gust loading when the speed of the aircraft was in excess of 260 kt.

Weather conditions

The questions arose as to whether -

1) the aircraft should have embarked upon the flight when it did; or

2) whether it should have been permitted to do so.

Considerable evidence was provided as to actual weather experienced in the vicinity of the airport between 1830 and 1930 hours. During that period storms moved across the area from west to east, accompanied at times by heavy rain, thunder and lightning. The actual ranifall at the airport was not as heavy as at other places in the vicinity. The rain gauges indicated heavy rain in or about the area in which the aircraft was cleared to fly at its departure time.

In communications passed from officers at the airport to one another and to aircraft in flight, there were frequent references to turbulence, occasionally severe, particularly to the west and south of the airport.

Many comments made regarding the weather indicated the existence of somewhat abnormal conditions. One pilot, who landed at 1925 hours, said the weather around the airport was the worst that he had ever seen.

The evidence of civilians confirmed the weather picture conveyed by other sources, i.e. that a storm of some intensity accompanied by thunder, lightning, somewhat unusual cloud formation, and in a number of places very heavy rain, passed over the area between 1900 and 1930 hours.

This general picture was substantiated by evidence of the Superintendent of the Development Section of the Bureau of Meteorology, who, following the accident, supervised an analysis of the weather prevailing in the Sydney area on 30 November 1961.

There were major thunderstorms in the area moving from west to east at 10 kt. They appear to have intensified and slowed down over the Sydney area. At least two major cells were in the thunderstorm that moved across Botany Bay. The rainfall at Cronulla was unusual for the Sydney area, and it was classed as very heavy.

It was found that at the time of the departure of VH-TVC the storm had passed over the airport and over the area in which it would fly via the 244 diversion. It was suggested that the centre of the storm had then moved over to the Kurnell area. The Chairman was of the opinion that at the time of the flight, thunderstorm conditions still prevailed over the area in which the aircraft was directed to fly. He believed that they were of such a character as to call for some consideration, at or about the time of departure, as to whether the aircraft should be permitted to fly along the route it was cleared to take prior to reaching Padstow.

Thunderstorms and their hazards

There have, in fact, been few accidents directly caused by thunderstorm activity. One fatality which bears a somewhat striking resemblance to the accident under consideration occurred to a Vickers Viscount at Maryland, U.S.A. on 12 May 1959.* The Civil Aeronautics Board concluded that an inflight disintegration of the aircraft was caused by aerodynamic loads imposed on the aircraft, which exceeded its design strength. The loads were generated by an excessive airspeed combined with turbulence and manoeuvre loads, following a loss of control in extreme turbulence. The evidence clearly showed the existence of large rapidly developing thunderstorms in the area of the accident.

Despite the frequent occurrences of thunderstorms in Australia, and the widespread extension of aircraft operations since the war, no accident to a commercial aircraft has been attributed to thunderstorms. Reports of turbulence encountered in thunderstorms sometimes of an extreme character are not infrequent, but the absence of accidents resulting therefrom indicates that pilots have been successful in avoiding or in countering their worst effects.

Knowledge on the subject of thunderstorms has been greatly enhanced in recent years by the publication in 1949 in the U.S.A. of a report of the Department of Commerce entitled "The Thunderstorm" The report, based upon a project which was scientifically designed to examine the nature of thunderstorm activity and its effects, described three stages of a thunderstorm's life cycle:-

1) the cumulus stage characterized by up draughts throughout the cell;

2) the mature stage characterized by the presence of both up draughts and down draughts at least in the lower half of the cell; and

3) the dissipating or decaying stage characterized by weak down draughts prevailing throughout the cell.

The development of the cycle to the mature stage is marked by the first precipitation from the storm and the down draught

* A summary of this accident appears in ICAO Circular 62-AN/57 (Aircraft Accident Digest No. 11, Summary No. 32).

thereby introduced gradually spreads throughout the cell. The point at which the strongest down draught occurs is closely associated with the heaviest rainfall. Also, the greatest turbulence in the thunderstorm is associated with the highest water concentrations at all levels within the storm.

The very heavy rain experienced in some quarters, at least in the area within the vicinity of Sydney Airport on the night of the accident, indicates the presence of conditions in which considerable turbulence would have been present.

The conditions in Sydney on the night in question indicated that the phenomena were somewhat complex in character and that turbulence of a significant degree might have been encountered in comparatively widely separate regions.

Draughts and gusts are the factors which affect the aircraft. The draughts "cause systematic changes in the altitude of the plane or carry it upwards or downwards" whereas gusts "cause pitching, rolling and yawing, and accelerations of the plane without a systematic change in altitude".

The clearance and its relation to weather conditions

The weather conditions under consideration are those likely to be encountered after entering cloud at the airport and in the flight to Padstow.

The route designated by the captain was the 222 track, the normal route to Canberra, which would have taken him across Botany Bay. However, this was changed at 1915 to the 244 diversion, which avoids Botany Bay. This route change was prescribed by the Air Traffic Controller because the 222 diversion was not available because of inbound aircraft. His choice was made without regard to the weather conditions, but based on information that another aircraft VH-TFF, due for departure at about 1950 hours would probably request the 244 diversion to 37 miles DME from Sydney in order to avoid a storm which would probably be located at that time on the 222 track. In the conditions prevailing on that night it could have little relationship to the conditions which VH-TVC might encounter between 1915 and 1930 hours in the immediate vicinity of the airport.

The senior approach controller gave the aircraft directions to follow on departing the airport. The aircraft was to continue the runway heading to 3 000 ft before turning left and was to pass over the field at 5 000 ft or above.

The Chairman believed that the choice of a left turn rather than a right turn had little to do with weather considerations. The directions as to altitude in the final take-off direction were, it was believed, dictated solely by traffic separation considerations and without regard to the weather conditions likely to be encountered at the altitudes indicated.

When an aircraft is at cruising altitude the pilot has much more room for manoeuvring than when flying in restricted air space allotted to him at an airport for take-off or landing. Regarding VH-TVC, it was given precise instructions as to the course it was to take on its departure from the airport. The opinion of the Chairman was that, in circumstances such as those existing that night, it is of the utmost importance that an aircraft should not be required to follow a precise path which may, when it is in relatively low altitudes, lead it into conditions in which extreme turbulence may be encountered. If it is impossible to say with reasonable certainty that such conditions will not be encountered along that path, a clearance for that path should not be given.

Responsibilities regarding weather

The immediate problem was related to weather conditions in the immediate vicinity of the airport.

The senior approach controller, with 15 years experience as an air traffic controller, was on duty at the relevant time. He was primarily concerned with landing and take-off. His conception of his duties was, it is believed, consistent with the information available to him. He had the Sydney Airport forecast covering his period of duty and also relied on his own observation of weather conditions. He had acted as radar controller for 3 hours to 1800 hours and was acquainted with such weather conditions as the radar disclosed during that period. He also had such information as came to him from aircraft approaching and leaving the airport. He had no information of conditions immediately above the airport at 5 000 ft, and it does not appear that he ever directed his attention deliberately to the question of what conditions might be encountered on the immediate flight path allotted to VH-TVC. In his view, the weather conditions were not such as to call for any consideration. When asked if he would be worried about turbulence 6 000 ft up, he said he would if he knew it were there.

The pilot may refuse to take off if he considers the conditions hazardous. The captain of VH-TVC showed no hesitation at any time in undertaking the flight as scheduled. He had been briefed on the conditions. He may have acquired further information concerning the conditions in the immediate vicinity at time of take-off or from interception of communications with other aircraft. Except for that information, he had no precise knowledge of the conditions he might encounter at 5 000 ft and above on the flight path prescribed by the clearance. The instructions received by him on take-off were not such as to be questioned, and he could assume that they would not lead him into danger. No blame attaches to him for accepting the clearance he was given, and there are no reasons for doubting that he followed the instructions which were given to him.

The senior operations officer on duty could have delayed the aircraft's departure pending weather improvement. His responsibility extended to weather developments in regard to the whole route. There may be a gap which is not expressly covered in the realms of responsibility between his duties and those of the senior approach controller.

His is a very responsible task involving the proper consideration of flight plans for many aircraft with varying routes and destinations. It might well interfere with the proper discharge of these duties if, in addition, he were, in circumstances such as existed at the airport on 30 November, required to ask himself at the moment of take-off of each aircraft whether it should take off at that instant.

The Chairman concluded that in the conditions prevailing, it did not appear to be the clear responsibility of any officer to deliberate on the question whether turbulence which might be encountered immediately after take-off by VH-TVC called for a different flight path or for some delay in the departure of that aircraft. It is not possible to say that the consideration of that question would in fact have led to alteration or delay, but it could have been expressly faced and answered.

Meteorological services

The regulations make it clear that the Director General can either arrange with the Director of Meteorology for specific weather advice or make any other arrangements necessary for the purpose.

The Board was concerned in this inquiry with the absence of significant meteorological information relating to the airspace over and in the immediate vicinity of the airport and with the absence of any equipment capable of providing this information. As for conditions in the immediate vicinity of the airport, from time to time the senior approach controller must rely principally on visual observations. When considering thunderstorms at an altitude of 6 000 ft or above in that vicinity at a time when the cloud base is as low as

800 ft and horizontal visibility reduced to a few miles, visual observation alone is far from adequate.

Radar

Weather radar will undoubtedly provide added protection to aircraft from the dangers associated with thunderstorms. The "Thunderstorm" report indicated that maximum turbulence and draughts are coincidental in space with regions of high water content, and consequently are within the area delineated by the radar echo.

Airborne radar

The Department of Civil Aviation was very actively considering this problem prior to 30 November 1961, and after that date took prompt action to make this equipment mandatory in major types of commercial aircraft on the Australian register. The deadline given for its incorporation was 1 June 1963.

It should not be assumed that the presence of radar equipment in VH-TVC would necessarily have enabled the pilot to become aware of any significant turbulence in time to avoid it. There are limitations on the effectiveness of airborne radar in operating on a course such as the aircraft was cleared to follow immediately after take-off. Radar would have provided the pilot with some valuable information as to weather conditions in his immediate path which would not be apparent from visual observation.

Ground radar

The "Thunderstorm" report showed that most of the turbulence in the storms flown through was confined to the area delineated by the radar echo presented on the 'scope of the control radar on the ground'.

The radar fitted at the time in the Sydney Airport Tower could be used as a weather surveillance aid. However, that was its secondary role. The wave length on which this radar operates and its fundamental design, which gives it optimum efficiency in its primary role, automatically renders it significantly less efficient in its secondary role. It does, however, with special manipulation, give an indication of areas of heavy rain and can thus be used as an aid to pilots in avoiding these particular areas. On the night in question it was used frequently for this purpose. Its use in detecting storm centres in the airspace above the airport and its vicinity is limited in three ways:

1) by its inherent design;

2) because it is used primarily for ensuring aircraft separation clearance; and

3) because a large sector of the sky from about 30° above the horizon is not "seen" or scanned by the radar. The 'blind spot' is 3 miles in diameter at 5 000 ft and increases proportionally at higher altitudes. It was the weather conditions in this very region which were of crucial importance to the flight of VH-TVC.

There is a type of ground radar designed specifically for weather detection and surveillance. This type is to be installed in the Sydney area on top of the new Commonwealth Building when this building is completed. The equipment is to be under the control of the Commonwealth Meteorological Bureau and to be used as an aid to general weather forecasting. If information from that installation were readily made available at the airport in circumstances of thunderstorm activity it would enable the identification of regions of high water content and thus indicate the presence of turbulence in the vicinity of the airport.

The events of the night of 30 November suggest that more precise up-to-the-minute information as to weather conditions in the immediate vicinity is required when thunderstorms prevail. If ground radar is to be used for this purpose the facility should be located at a point which will enable it to scan the airspace over, and

in the vicinity of the airport. It would be necessary for suitable arrangements to be made whereby, in weather conditions involving possible hazards to aircraft in the vicinity of the airport, continuous observation of the moving weather pattern would be undertaken and constant information in relation thereto would be made available to air traffic controllers and pilots.

Was the clearance proper?

The immediate cause of the accident, established as a fact, was that the outer starboard wing separated in flight. It was apparent that turbulent weather conditions contributed in a marked degree to the accident. It would be wrong to conclude that the aircraft necessarily encountered turbulent conditions in flight, however it is the most probable initial factor. If this conclusion is sound, it follows that such conditions existed in the airspace above the airport or the immediate vicinity thereof.

The assessment of the actual weather conditions existing at the airport at the time of the aircraft's departure call for caution in dispatching aircraft into areas where significant turbulence might be encountered. In the conditions which prevailed the Chairman believed that take-off path prescribed for VH-TVC was not one in relation to which it could be said with any degree of certainty that it would not encounter such conditions. It was dictated by the requirements of separation of aircraft in the immediate vicinity without any deliberate consideration of the conditions which the aircraft might encounter on the path chosen for it. Other courses might have been taken, such as a delayed departure, the departure course which was chosen by another captain on a flight to Dubbo, or temporary closing of the airport. The Chairman concluded that the path chosen for VH-TVC was not determined with sufficient caution and that the clearance given was not based upon sound operational judgement. However, he did not believe that the granting of the clearance arose from any culpable fault on the part of any air traffic controller.

Some factors which might have contributed in some degree to the course followed are:

a) disinclination to interfere with the judgement of pilots in operational matters.

A disinclination to interfere should not inhibit appropriate action to deter.

b) the dangers associated with thunderstorm activity.

The Chairman felt that air traffic control officers at the airport were not as conscious of the hazards presented by these storms as a perusal of the publication "The Thunderstorm" would have made them.

The transcript of air traffic control tape recordings

In reaching conclusions regarding the conduct of the ATC officers at the airport on the night of 30 November the Chairman relied on the record of contemporaneous communications which passed between the ATC officers themselves and between them and aircraft approaching or leaving the airport. This proved to be a valuable source of reliable evidence and a useful corrective to the necessarily somewhat less precise details of events which the officers were able to collect after six months.

All members of the Board had some misgivings in the course of the inquiry that the full text of the transcript of these communications was not made available to the Board and to counsel assisting the Board at the commencement of the inquiry and before the relevant departmental officers were examined.

It was felt that the entire transcript might well have been revealed in the report of the Director of Air Safety Investigation. These records did not receive the same meticulous examination by departmental investigators as was applied to other aspects of the accident.

Probable Cause

During a descent in excess of 260 kt, the pilot's actions, when trying to regain control of the aircraft, caused the aircraft to exceed its stress limits. This factor together with speed and turbulence caused the starboard outer wing to fail.

Recommendations

1. The functions of the approach controller in relation to hazardous conditions likely to be encountered by an aircraft in the vicinity of Sydney airport require more precise definition. In particular, when thunderstorm activity is present at or in the vicinity of the airport he should be responsible for determining whether a departure path designated for an aircraft is not such as to lead the aircraft into regions where severe turbulence may be encountered.

2. When thunderstorm activity is present, he should be provided with the best current weather information pertinent to the assessment of the changing weather pattern.

3. Ground weather radar will greatly facilitate the provision of pertinent data. Such a facility should be capable of effectively scanning the region above the airport and its vicinity. With this in view it is recommended that any such facility used should be situated at such a distance from the airport as will ensure its effectiveness in relation to that region. In conditions of thunderstorm activity, constant contact between such radar and the tower should be maintained.

4. These recommendations may have relevance to other airports.

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ICAO Ref: AR/749

FIGURE 26

Viscount, VH-TVC
30/11/61