

Number 94 1976

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AUSTRALIAN DEPARTMENT OF TRANSPORT







Safety Digest recognised the 40th anniversary of Australia's first major airline disaster with a special article and an editorial. The Digest's purpose in giving emphasis to this historic accident - the loss of the illfated Avro 10 Southern Cloud -was to examine the circumstances which led to it in the light of today's craft engaged on ostensibly VFR flights since that time, knowledge, and to review what had been learned from harsh operational experience since that time.

We saw that the Southern Cloud disaster was the first of a whole series of Australian airline accidents problems. So much so that, of the 19 issues of the Digest which, over the years, have each played a highly significant part in the development of Australia's airways system as we know it today. We saw too, that as a result general aviation aircraft in which weather was a major of those accidents and the costly object lessons derived contributing factor. Again and again, it seems, these oftfrom them, flights conducted on Australian air routes today are as safe as it is humanly possible to make them.

Thus, while in many ways, it was obvious that we had learned a very great deal in those 40 years, in other ways it was clear that we had learned precious little. For in that very same issue of the Digest there were reviews of no fewer than five recent fatal accidents resulting from (depicted with some of its sister aircraft in this issue) essentially the same root cause as had destroyed the Southern Cloud so many years before. Nor were these simply to be dismissed as the final indiscretions of a few

Just over five years ago, in March 1971, Aviation low-time private pilots. On the contrary, the aeroplane types involved were representative of the full range of light aircraft operations - from a Twin Otter, through modern light piston-engined twins and a high performance single to a basic club trainer.

> Despite these findings, weather accidents to airhave regrettably remained very much with us. Indeed, as far as general aviation is concerned, accidents of this type continue to be one of Australia's major air safety published since March 1971, 13 have contained one or more reviews of catastrophic accidents to Australian repeated warnings in the form of Digest articles examining substantially similar tragedies, go unheeded.

Soon now, it will be time to remember another significant 40th anniversary - one that could be called Australia's second air safety milestone. This of course, was the disappearance of the Stinson Tri-Motor VH-UHH





between Brisbane and Sydney early in 1937. As older readers well remember, this event was to prove far more than just an aeroplane accident. Rather, the late Bernard O'Reilly's dramatic single-handed discovery of the wreck in the almost impenetrable rain forests of the precipitous MacPherson Ranges, days after the official search had been called off, and his subsequent leadership in the rescue of the two emaciated survivors, has become an epic in the annals of our nation's history.

But like the Southern Cloud disaster, and indeed in common with most of the other accidents in the series to which our airways development owes so much, the Stinson crash was an accident brought about by unexpectedly severe weather. It is thus worthwhile, not only to reexamine the events that led to it, together with the progress that resulted from it, but to allow its circumstances to remind us again that weather, as a foe in aviation, is still far from conquered. In fact, in this same issue of the Digest, there are reviews of two quite recent fatal accidents - one overseas, one here in Australia which manifest the truth of this statement only too well. A full review of this absorbing lesson from the past will be found on page 14.





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THE BREAKING Point

After departing from Broken Hill, N.S.W., on a private VFR flight to Moorabbin, Victoria, a Cessna 310 failed to call at its first nominated reporting point, and nothing further was heard from it. An intensive air and ground search was conducted in poor weather for five days before the aircraft's wreckage was located, 82 kilometres northeast of its planned track. All six persons on board had been killed.

The party aboard the 310 had flown to Broken Hill from Moorabbin to attend a weekend race meeting, arriving there on the Friday with the intention of returning on the Monday morning. The aircraft was refuelled on arrival and left parked at the aerodrome throughout the weekend. The weather on the Monday morning proved unfavourable for VFR flying and so the party postponed their return trip until the following day.

The weather at Broken Hill on the Tuesday morning was better, and before leaving his hotel for the aerodrome, the pilot telephoned the Flight Service Unit to obtain the forecast for the Broken Hill area. This indicated that the weather was generally satisfactory, with fresh westerly winds, but there were areas of rain and drizzle associated with large cumulus clouds and isolated thunderstorms. The party left the hotel for the aerodrome shortly after 0930 hours local time and, on their way in the taxi, there was some discussion about diverting to look at the lakes at Menindee, some 90 kilometres to the east of Broken Hill. Nevertheless, the 'full reporting' flight plan which the pilot subsequently submitted to the FSU after obtaining a route forecast for the flight to Moorabbin from the Briefing Officer on duty, showed that the aircraft would fly a direct route to Moorabbin via Frank's Plains, Swan Hill, Bendigo and Melbourne.

Before boarding the aircraft, the pilot conducted a thorough pre-flight inspection and the aircraft reported taxi-ing at 1009 hours. It subsequently took off from runway 21 and reported departure at 1016 hours, cruising below 5000 feet, and estimating Frank's Plains at 1104 hours.

No further transmissions were received from it and after all attempts to contact the aircraft had proved unsuccessful, search and rescue procedures were commenced at 1120 hours. The wreckage was finally located five days later in wooded country near Wilkurra homestead, 210 kilometres south-east of Broken Hill and 160 kilometres north-east of Mildura.

Examination of the wreckage showed that both elevators, together with the port tailplane



and a major portion of the starboard tailplane, had separated from the aircraft before it struck the ground. These components were found scattered amongst the trees 550 metres short of the main wreckage. The heading of the aircraft at the time of impact had been about 290 degrees M, and it had made initial contact with the ground in a nose-down attitude while banked to starboard. Both engines had been switched off, and full flap selected before the aircraft struck the ground.

Detailed examination of the separated elevators and tailplane portions, showed that these had failed in flight as a result of aerodynamic overload. The failure had begun with a downward bending collapse of the port tailplane, under the effect of a substantial upelevator control input. There was no evidence of any constructional defect, nor of vibration or flutter having preceded the structural failure.

It was considered highly unlikely, in view of the nature of the overload failure, that this could have resulted, of itself, from an encounter with severe turbulence. Rather, the manner of failure

and a major portion of the starboard tailplane, had separated from the aircraft before it struck the ground. These components were found

The pilot had held a Commercial Licence for a number of years, and had accumulated nearly 1000 hours of aeronautical experience. It was evident however, that in recent years he had flown comparatively little and in the two-year period preceding the accident, he had logged only 43 hours.

Although the flight plan indicated that the aircraft would follow the direct track to Swan Hill, and the pilot gave an ETA for Frank's Plains on departure, it is apparent that he changed his mind, possibly after becoming airborne, and decided to proceed via the Menindee Lakes. This proposal had been discussed on at least two occasions while the party were at Broken Hill, and it seems likely that the pilot might have deferred the final decision until he could make an airborne assessment of the sight-seeing value of the diversion. The weather at Broken Hill at the time of departure was such as to have encouraged this change of plan.



No witness at Broken Hill aerodrome noticed what heading the 310 took up on its departure, but at 1025 hours local time, a grazier whose property lies between Broken Hill and Menindee saw an aircraft of the description of the 310 pass overhead on an easterly heading. The sky at the time was overcast with middle level cloud, and there were patches of cloud at lower levels. The aircraft was flying at about 2500 feet and disappeared from the witness's view when it passed behind a bank of this lower cloud.

Some minutes later, another witness on the northern shore of Lake Menindee heard what he believed was a light twin-engine aircraft pass over the lake on a south-easterly heading. Although the weather remained fine and the sky was clear in the distance to the north-east, the witness was not able to see the aircraft because of a bank of low cloud overhead. Thundery clouds were also visible at the time on the southwestern horizon.

From the witness's statements, as well as the area forecast, it was evident than an aircraft continuing to fly eastwards from Broken Hill on the day of the accident would have encountered increasing cloud and eventually thunderstorm activity. The pilot of a Comanche which departed Broken Hill 18 minutes before the Cessna 310 to fly the same planned route to Moorabbin, said that as far as Lake Mindona, 140 kilometres south-south-east of Broken Hill, the weather had been quite good. At this point, however, he had been forced to descend from his cruising level of 4500 feet, beneath a layer of heavy cloud with a base of about 2500 feet. Some 40 kilometres further on, the base lowered to 1500 feet and immediately to the east of track there was a well

developed storm. At this stage his forward visibility deteriorated to about six kilometres. After a few minutes the aircraft again emerged into clearer conditions, and he was able to continue the flight below a cloud base of about 2500 feet.

A witness at a station property only 18 kilometres west of the accident site said that the weather there was overcast throughout the day, with electrical storms passing through from west to east. There had been a lot of thunder and lightning in the middle of the day. The witness did not hear the Cessna 310 at any time.

From all the evidence it was clear that the pilot had been fully justified in deciding to undertake the flight from Broken Hill to Moorabbin. The weather at Broken Hill was quite good, and both the route forecast issued for the flight, and the area forecast, which the pilot had evidently obtained by telephone earlier in the morning, indicated that VFR flight on the planned route should have been possible. But in diverting to the east of the planned route, it is apparent that the aircraft was flying into an area of increasing cloud which was gradually developing into thunderstorm activity. Why the pilot elected to continue so far to the east of his planned track after passing over Menindee, and why he did not inform Broken Hill of his diversion, perhaps with a revised ETA for Frank's Plains can never be known. It can only be surmised that having reached the vicinity of the Menindee Lakes, he found it necessary to make wide diversions around large build-ups of cloud.

Similarly, it can never be known for certain how the pilot came to lose control of the aircraft

This page: The inverted wreckage viewed from the starboard side. The starboard wing struck the ground first and the aircraft somersaulted on to its back, impacting against the tree at the left of the oicture.

Opposite page — top left: The separated starboard tailplane lying upside down where it fell, 550 metres short of the main impact point.

Top right: Diagram of 310's tailplane and elevators, showing in-flight failures.

Centre: Close up of inboard edge of port tailplane, showing downward-bending failure of front spar.

Bottom: The nature of the country in which the aircraft crashed is shown in this aerial view of the main wreckage. The obviously steep final descent path is evident from the lack of damage to the surrounding scrub.



to the extent that it entered a high speed dive. However, as in other fatal accidents in similar circumstances, it is possible that the pilot, while endeavouring to maintain visual flight in deteriorating conditions, unintentionally flew into turbulent cloud. In an aircraft as fast as a Cessna 310, this can happen very easily indeed, especially if rain is obscuring forward visibility. In such a situation a pilot can find himself completely enveloped in heavy cloud almost before he realises it. There is also the possibility that the aircraft was upset by severe turbulence associated with the thunderstorm activity, without actually flying into cloud.

Although the pilot had logged 10 hours of dual instrument experience, this had been gained some years before, and while there is no reason to doubt that he would have been capable of maintaining control of the aircraft by reference to instruments in favorable conditions, it could have been a very different matter if the aircraft had flown into the sort of turbulence generated in and near cumulonimbus cloud.

It is thus apparent that the pilot lost control of the aircraft, either as a result of disorientation or an upset, with the result that it entered a high speed dive. Whether at this stage there was sufficient height remaining for recovery to be effected without damaging the aircraft cannot be known. In any case, the recovery action taken was such as to impose loads on the tail surfaces in excess of their designed structural strength.

Cause: The probable cause of the accident was an encounter with severe weather in which the pilot was unable to retain control of the aircraft.

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While making a VOR-DME approach to land at Douglas Municipal Airport, Charlotte, North Carolina, in conditions of patchy, dense ground fog, a DC-9 crashed six kilometres short of the runway threshold. The aircraft was destroyed by impact and fire, and 72 of the 82 occupants received fatal injuries.



The DC-9 was on a scheduled passenger flight from Charleston, South Carolina, to Chicago, Illinois, with an en route stop at Charlotte. It had departed Charleston at 0700 hours local time and was cleared to Charlotte on an IFR flight plan. The first officer was flying the aircraft while the captain handled all radio transmissions and checklist items.

During the 34-minute flight from Charleston, numerous radio contacts were maintained with the Atlanta air route traffic control centre and subsequently with the Charlotte approach and local controller. The Charlotte Airport Terminal Information Service was broadcasting the weather as 'sky partially obscured; estimated ceiling 4000 broken, 12,000 broken; visibility 11/2 (one kilometre) in ground fog . . . wind 360 degrees at five ... VOR 36 approach in use ... At 0725:05 hours Atlanta cleared the aircraft to contact Charlotte Approach Control which provided the aircraft with vectors to the final approach course for runway 36. At 0731:09 the final approach controller cleared the flight for a VOR 36 approach and stated 'You're six miles (11 kilometres) south of Ross Intersection'.

Ross Intersection is the final approach fix for runway 36 at Charlotte, and at 0732:01 the captain told the first officer that the upcoming fix point was 'Ross, five point five, eighteen hundred'. This meant that Ross was located 5.5 nautical miles (10 kilometres) from the VOR facility on the airport with a minimum crossing altitude of 1800 feet above mean sea level. At 0733:17 the captain said 'There's Ross. Now we can go down'. At 0733:36 the captain advised Charlotte Tower that they had passed the Ross Intersection, and the aircraft was cleared to land. Twenty-two seconds later the DC-9 struck trees and crashed, three kilometres beyond the Ross Intersection.

According to the cockpit voice recorder, the flight crew had engaged intermittently in conversations not pertinent to the operation of the aircraft for about 15 minutes prior to impact.

(Condensed from Safety Information Release issued by National Transportation Safety Board, U.S.A.)



These conversations covered a number of subjects, from politics to used cars, both crew members expressing strong views and mild aggravation concerning the subjects discussed. The National Transportation Safety Board believes these conversations were distractive and reflected a casual mood and a lax cockpit atmosphere which continued throughout the remainder of the approach and contributed to the accident.

At 0732:13 the flight crew had begun a discussion about Carowinds Tower, a lighted structure in an amusement park ahead of them. This discussion lasted 35 seconds, during which time a considerable degree of the flight crew's attention was directed outside the cockpit. This particular distraction assumes significance, the Board believes, because it was during this period that the DC-9, while still short of the Ross Intersection, descended below the 1800 feet AMSL altitude (1074 feet above airport elevation) which should have been maintained until after it crossed Ross Intersection

The flight data recorder showed that at 0733:24, as the aircraft passed over Ross, its altitude was 1350 feet AMSL or 450 feet below the prescribed crossing altitude. This meant that it was only 624 feet above the airport. The flight data recorder also showed that the aircraft had crossed the Ross Intersection at an airspeed of 168 knots instead of the recommended airspeed of 122 knots for its weight at this point. The captain did not make the required call-out at Ross, which should have included the altitude above the airport and any deviation from the recommended approach airspeed.

Evidence obtained from the cockpit voice recorder also revealed that at 0732:41, during the latter part of the crew's discussion of Carowinds Tower, the terrain warning alert sounded in the cockpit, signifying that the DC-9 was 1000 feet above the ground. This warning should have been particularly significant to the flight crew and had it been heeded, they would have been aware that the aircraft had prematurely descended through the final approach fix at Ross. Obviously, the Board said, because the descent continued unchecked, the crew were not so alerted.

Not only did the captain fail to make the required calls of altitude and airspeed over Ross Intersection, but shortly after crossing Ross he failed to make the required call as the aircraft passed through 500 feet above airport elevation. Finally, he neglected to make the required call when the aircraft descended through an altitude of 100 feet above the minimum descent altitude, which is 394 feet above the elevation of the airport.

The Board was unable to determine the precise reasons for the almost total lack of altitude awareness on the part of the crew throughout the approach, but it considered several possibilities which could explain the DC-9's approach, described by a number of witnesses who saw it just before the crash as 'much lower' than they were accustomed to.

One possibility considered was that the crew,

because of the extended duration of flight above a low, patchy fog bank, with intermittent ground contact, might have relaxed their instrument scan and relied more heavily upon visual cues to fly the approach.



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Another possible reason for the crew's lack of

altitude awareness involves the inter-relationship Low level view of wreckage trail look between the two different altitude measurements, QNH and QFE. The QNH measurement is altitude above mean sea level while the QFE is altitude above airport elevation. When the DC-9 came within range of Charlotte, in accordance with the operator's procedures, the No. 1 altimeter on the captain's panel and the altimeter on the first officer's panel were set to QFE, while the No. 2 or lower altimeter on the captain's panel was set on ONH. At 0732:01 hours the captain, in briefing the first officer on the upcoming final approach fix at Ross, gave the crossing altitude in the QNH figure of 1800 feet, rather than the QFE

ing in direction of impact.



Above: Fireman hosing the still smouldering tail section of the aircraft. The engines can be seen in the foreground.

Opposite page: Profile of final approach to point of impact, and transcript of cockpit voice recording.

altitude of 1074 feet. Because the crew's primary altimeters were set for QFE, this was obviously not sound operating practice, and the Board concluded that when such a system is being utilized, pilots should take particular care that all altitude references during the approach be made in terms of QFE figures.

As a result, the first officer might have accepted the 1800 feet QNH figure as a QFE, particularly as his attention was diverted by the discussion of Carowinds Tower and he might not have cross-referenced his own approach plate. This in turn might have led the first officer to misread his altimeter by 1000 feet and to conduct the remainder of the approach as if the aircraft were 1000 feet higher than its actual altitude.

The Board found that neither the aircraft, its components and systems, nor the ground facilities were involved in the cause of this accident. It concluded that by virtue of their training, experience, cockpit instrumentation, navigational aids, and approach plates, the crew were well equipped to accomplish the approach to Charlotte safely and there was no causal factor beyond themselves which would account for their failure to do so. 'The overall lack of cockpit discipline was manifested in a number of respects, where the flight crew failed to adhere to recommended or required procedures', the Board said.

The Board also commented that, from pilot testimony taken at the public enquiry into the accident, it appeared that the crew's disregard of the terrain warning signal in this instance may be indicative of the attitudes of many other pilots who are inclined to regard the signal 'as more of a nuisance than a warning'. If this is so, the Board believes that airline pilots should reexamine their attitude to the terrain warning alert, lest the purpose for which this device was installed be defeated.

Even before this accident, the Board had issued two safety recommendations to the Federal Aviation Agency with a view to improving professional standards among pilots. These recommendations had cited five previous approach accidents involving airline aircraft as examples of 'a casual acceptance of the flight environment'. The Charlotte crash once again reflected 'serious lapses in expected professional conduct' and 'exemplifies the absolute necessity for strict adherence to prescribed procedures, particularly those pertaining to altitude awareness, during an instrument approach'.

As the result of their investigation, the National Transportation Safety Board determined that the probable cause of the accident was 'the flight crew's lack of altitude awareness at critical points during the approach, due to poor cockpit discipline, in that the crew did not follow prescribed procedures'.



ocal			31:07	CAM I:	Lordered
ime				CAM II	I thought about getting one
728:30	CAM II:	* * elected representatives	31:09	RDO APP:	Eastern Two Twelve turn right heading three
	CAM I:	Oh yeah, after * *			five zero, cleared VOR three six approach.
28:34	CAM I:	Right, I heard this morning the news while			You're six miles south of Ross Intersection.
	1	I was	31:15	RDO I:	OK, three fifty, cleared for approach
28:37	CAM I:	Might stop proceedings against impeachment	31:20	SOUND OF	PITCH TRIM
	BEEP SOUL	ND SIMILAR TO ALTITUDE ALERT	31:28	CAM II:	and the second state of th
28:44	CAM I:	Because you can't have a \$ pardon for	31:31	SOUND OF	ALTITUDE ALERT
28.40	CAMI	Old Ford's beginning to take some of his hard hards	31:34	SOUND OF	SEAT MOVEMENT
20.43	BDO ABB	Forters Turches they left be directed to the	31:36	CAM I:	There's Carowinds, I think that's what that is
20.00	RDO AFF.	Tue few see Festers Tue Tue to the set	31:39	RDO APP:	Eastern Two Twelve, you resume normal speed,
20.07	RDO APP.	Two four zero, Eastern Two Twelve, we re at six			tower one eighteen one
29.00	RDO APP.	Eastern Two Twelve	31:42	RDO I:	One eighteen one, Two Twelve, good day
29.02	RDUT:	All right, down to four	31:47	RDO I:	Hello-ah-Charlotte Tower, its Eastern Two
29:05	CAIVI II:	Fifteen degrees please	-		Twelve, we're about five miles south of Ross
29:14	RDO APP:	Eastern Two Twelve, contact Charlotte Approach	31:51	RDO TOWER	R: Eastern Two Twelve, continue number two
20.10	PDOL	One sinction path is a said de	31:54	SOUND OF	ALTITUDE ALERT
29.10	RDOI:	One hineteen nothing, good day	31:57	SOUND OF	PITCH TRIM
29:30	RDUT	to four, we're turning to two forty	32.01	CAM I:	Ross, five point five, eighteen hundred
29:34	RDO APP:	Eastern Two Twelve, continue heading two four	32.13	CAM I:	Carowinds
		zero, descend and maintain three thousand	32:17	CAM II:	Ah, that tower, would that tower be it or not?
29:38	RDO I:	All right, on down to three	32:20	CAM I:	No I
29:46	CAM II:	One thing that kills me, is the \$\phi\$ mess and all \$\phi\$	32:21	CAM I:	* * Carowinds, I don't think it is
		that's going on now. We should be taking some	32.26	CAM I:	We're too far, too far in. Carowinds is in back of us
20.54	CAMIL	t Araba and taking and anen Arbins the	32:27	CAM II:	I believe it is
23.04	CAW II.	hought they got so much real estate so much	32:29	CAM I:	By 🕸 that looks like it, you know, its * * Carowinds
		land, they bought an island for seventeen	32:33	CAM I:	Yeah, that's the tower
		million dollars off Carolina they * *	32:34	CAM II:	Gear down please, before landing
30:01	CAM II:	The stock market and the \$\$ Swiss are going to	32:36	CAM I:	That's what that is
		sink our 🕸 money, gold over there	32:37	SOUND SIM	ILAR TO GEAR EXTENSION
30:26	RDO-1:	Okay	32:41	SOUND OF	TERRAIN WARNING
30:28	SOUND SIN	ALAR TO PITCH TRIM	32.44	CAM I	Carowinds
30:32	CAM I:	Yes sir boy, they got the money don't they, they	32:48	CAM I:	That's Carowinds there
		got so 🛱 much money * *	32:52	SOUND SIM	ILAR TO SPOILERS BEING ARMED
30:35	CAM II:	That stuff is coming in at such a fantastic rate	32:54	CAM I:	No smoke, * * yeah, radar's up
30:38	CAM II:	Yeah I think, 🌣 if we don't do something by	33:12	CAM ?:	Three ninety four
The second		nineteen eighty, they'll own the world	33:13	CAM ?:	Got them
	CAM I:	they owned it all at one time	33:17	CAM I:	There's ah, Ross, now we can go on down
30:43	CAM II:	That's right	33:22	CAM II:	How about fifty degrees, please
30:46	CAM II:	I'll be willing to go back to one car and ah, a	33:24	SOUND OF C	CLICK
		lot of other restrictions if we can get something going	33:25	CAM I:	Fifty
30:52	CAM I:	Yeah	33:36	RDOI:	Ah, Eastern Two Twelve, by Ross
30:55	CAM II:	And, ah, get rid of my little old money	33:44	RDO TOWER:	Eastern Two Twelve, clear to land, three six
	CAM I:	Be willing to do that	33:52	CAM I:	Yeah, we're all ready
30:56	CAM I:	Just as well	33:55	CAM I:	All we got to do is find the airport
30:59	CAM I:	I'm car poor. I got, well I just got two now. I	33:57	CAM I:	Yeah
31.00	CANA	Just gave one to my boy, but I'm buying this new one	33:57.3	CAM II:	
01.00	CAM II:	Yean	33.58	INITIAL IMPA	(CT

LEGEND

RDO: APP TOWER

CAM: COCKPIT AREA MICROPHONE RADIO VOICE IDENTIFIED AS CAPTAIN'S VOICE IDENTIFIED AS FIRST OFFICER'S CHARLOTTE APPROACH CONTROL CHARLOTTE TOWER NON-PERTINENT WORD UNINTELLIGIBLE WORD

Thund (Condensed from report issued by

While a *FH227 was making an ILS approach to land at St. Louis, a severe thunderstorm with heavy rain, strong winds and roll clouds moved across the runway threshold and the approach path. After passing the outer marker, the aircraft descended below the glideslope, entered heavy rain, was struck by lightning and crashed. Of the 44 occupants only six, including the two pilots, survived the impact and subsequent fire.

National Transportation Safety Board, U.S.A.)

* NOTE: The FH227 is a Fokker Friendship built under licence in the United States by the Fairchild Hiller Corporation.

The aircraft was making a scheduled passenger flight to St. Louis from Nashville, Tennessee, with four intermediate landings. It had departed Marion, Illinois, the last scheduled port of call at 1705 hours local time. The flight had proceeded en route to St. Louis under radar surveillance and, at 1727 hours, the aircraft was requested to make a 360 degree turn to keep clear of weather. Shortly afterwards at 1730 hours, the aircraft contacted the St. Louis approach control and acknowledged receipt of the terminal weather information. The weather information being broadcast was 'estimated ceiling 400 feet broken, visibility five miles (eight kilometres), haze and smog, wind 120 degrees at eight knots'. Between 1732 and 1739 hours, approach control vectored the aircraft through an area of thunderstorm cells that lay to the south and south-east of the airport and at 1740 hours it was cleared for an ILS approach to runway 30L and instructed to call the St. Louis tower. The aircraft called the tower and was cleared to land, the tower reporting the wind as '... gusting right now it's 220. It's been around to about 340 degrees holding at 20, but occasional gusts up to 35'.

Two minutes later St. Louis tower called the aircraft again to advise 'it looks like a heavy rain shower moving right across the approach end of the runway now', and the first officer replied, 'Roger we see it'.

About a minute later the aircraft crashed into a residential area just under four kilometres south-east of the approach end of the runway and 214 metres south of its extended centre line.

Investigation

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The aircraft had first struck tree tops about 55 feet above the ground. Eighty-five metres further along the flight path the port wing had struck more trees, and 60 metres further on again the aircraft itself had collided with a large sycamore tree and descended to the ground. It was evident that the aircraft was in a steep nose-up attitude at the moment of impact with the sycamore tree. Both wings had separated from the centre section just outboard of the engines, and the centre section subsequently separated from the aircraft completely, leaving a large hole in the fuselage. Examination of the damaged engines indicated that both propellers had been under power at the moment of impact. There was no evidence of any inflight malfunction or failure of the aircraft's structure, engines or systems which could have affected its performance before striking the trees, nor was there any evidence of fire in flight. The aircraft was examined for evidence of lightning damage and about 75 pits, ranging in diameter from about one, to three or four millimetres, were found spaced at random along the entire underside of the fuselage. Several similar pits were found on the upper surface of the port aileron, but there was no other evidence of electrical arcing or burning.

The thunderstorms which moved across the St. Louis airport and the surrounding area from the south-west just before the accident occurred, were obviously severe. The storms were more intense within a small area along the localiser

were at the airport itself. Trees surrounding the accident site were damaged by wind, the heaviest damage occurring within an area extending from a short distance north-west of the accident site to about one and a half kilometres southeast, and about 800 metres either side of the localiser course. It was estimated that winds of about 60 knots would have been required to cause this damage.

Witnesses eight kilometres south-east of the accident site, had seen a mass of debris, rotating anti-clockwise near the ground, at about the time of the accident. The wind had also damaged trees and blown the roof off a large building, carrying it for a distance of about 100 metres. The tower controller at St. Louis airport said

course where the accident occurred, than they Shortly afterwards, according to the witness, the aircraft was struck by lightning just outboard of the port engine. This was followed by a flash of fire, after which the aircraft again lost altitude and after several apparent 'evasive manoeuvres', it disappeared into the rain and trees.

> The captain of a Boeing 727 which had landed on runway 30L only a minute and a half before the accident, said that because of a strong updraught, he had experienced difficulty in slowing his aircraft to the correct final approach speed. Because he was unable to establish the desired configuration he had executed a missed approach. This captain said that he was clear of cloud about 1000 feet above the ground and seven kilometres south-east of the runway but about 500 metres to his left there was a 'wall of

captain could only recall hearing something like hail hitting the aircraft, pushing the throttles forward and applying back pressure on the control column. His next recollection was becoming conscious in the wreckage, feeling an injury to his head, seeing fire and attempting to free himself and the first officer from the wreckage.

The terminal weather forecast for St. Louis at the time of the accident was difficult to reconcile with the weather radar summary issued at 1640 hours. The terminal forecast issued at 1140 hours, predicting nothing worse than occasional ceilings of 3000 feet overcast cloud with an 11 kilometre visibility in thunderstorms and moderate showers, remained unchanged until 1740 hours. This should have been amended to reflect the conditions indicated in the radar summaries. Had it been done, pilots would have been

the airport and that the aircraft emerged from this cloud about 11 kilometres south-east of the outer marker. From this point on, until after it had passed the outer marker, the aircraft was essentially in visual conditions. It was not possible to determine the reason for the aircraft descending below the ILS glide path after passing the outer marker but the Board believed that it was the result of the strong downdraughts and severe thunderstorms near the localiser course. It is also possible that the captain descended in order to remain below cloud so as to maintain visual reference with the ground as he continued the approach.

The area and terminal aviation weather forecasts did not provide significant information about the location and severity of the storms in the area. Severe weather warnings mean more to a pilot than just a warning of potential hazards. They also stimulate him to think of alternative courses of action if severe conditions materialise. Such warnings also may confirm what the pilot suspects but is unable to verify, because of equipment limitations, cockpit workload, his position relative to the severe weather, and existing flight conditions. To be effective, however, these warnings must be timely.

In this case the captain derived all his information as to the location and severity of the thunderstorm activity visually, and from the aircraft's weather radar. This information was adequate, but the fact that the captain could see the runway through the rain might have misled him as to the intensity of the thunderstorm. However, other cues should have been as visible to him as they were to other pilots on the approach. These cues, coupled with his extensive pilot experience, should have alerted the captain to the possibility of turbulence and downdraughts in the vicinity of the heavy rain and the roll clouds preceding the thunderstorm. These clouds are a direct indication of the severity of thunderstorm activity and should be avoided by a substantial distance. As well, the surface wind information and heavy rain observation provided by the controller should have alerted him to the fact that he was continuing the approach into difficult conditions. At the very least he was faced with landing the aircraft in heavy rain on a wet runway in a strong crosswind. Cause

Rescuers at work amongst the shattered wreckage of the FH 227. The aircraft had come down in a suburban stree



that he had lost sight of the aircraft during its approach because of the rain. Up to that time he had observed the aircraft executing what port. appeared to be a normal ILS approach. He continued to follow the aircraft's progress on the tower radar. When he saw the radar track of the aircraft move to the left of the localiser course he tried unsuccessfully to call the aircraft. He lost radar contact when the aircraft was about four kilometres from the runway.

An aeronautically qualified witness who was about 370 metres north-west of the accident site at the time said that he had watched the aircraft executing what appeared to be a normal ILS approach, but as it continued the approach it suddenly climbed about 450 feet then rapidly descended to about 200 feet above the ground.

water' that paralleled the localiser course and curved around the south-west corner of the air-

The captain of the FH227 involved in the accident later recalled overshooting the localiser course and disconnecting the auto-pilot to make the necessary correction. He had been able to see the runway from beyond the outer marker and, even after the tower had informed him of the heavy rain over the approach end of the runway, he could still see the runway threshold through the rain. The captain remembered that, as the approach continued inbound, he saw what appeared to be a roll cloud below to his left and parallel to the localiser course, as well as a wall of clouds along the southern and western boundaries of the airport. From this point on, the

alerted to the fact that thunderstorms were moving into the area.

Because the squall line was moving at 30 knots in a north-easterly direction, downdraught velocities would be increased along its northern leading edge. As a result, surface winds of up to 90 knots could have existed along the leading edge of the squall line as it moved at right angles to the localiser course. An aircraft north of the squall line would be flying into an area of strong of the weather conditions at the terminal area by updraughts, but once having flown into the line, the flight crew and the flight dispatcher. would encounter strong downdraughts. Analysis

The board concluded that the captain continued the approach through an area of thunderstorm cells to the south and south-east of

The National Transportation Safety Board determined that the probable cause of the accident was the aircraft's encounter with a downdraught following the captain's decision to initiate and continue an instrument approach into a thunderstorm. The captain's decision probably was influenced by the lack of a timely issuance of a severe weather warning by the National Weather Service, and the improper assessment



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SSON FROM THE PAST

It was early afternoon at Archerfield Aerodrome; a moist, warm rather windy afternoon with the threat of rain from the grey overcast cloud. On the apron in front of Airlines of Australia's hangar stood two of the company's smart blue Stinson trimotors, both of which had flown services from Sydney that morning.

The Stinsons were the last word in airline comfort and speed. Up to the time that the company had introduced them nearly a year before, Australia's rapidly developing airline network was still very much a 100 mph affair. For the most part, the main routes were still being flown by trusty De Havilland biplane airliners - twinengined Dragons, Dragon Rapides and Dragonflies, as well as stately four-engined DH-86s. On some routes also, a few well-used Avro 10s similar to the ill-fated Southern Cloud. which had disappeared without trace six years before — were still giving faithful service. Air travel in Australia thus remained a rather wearisome business, especially on long trips, or when there were strong headwinds. But with the coming of Airlines of Australia's Stinsons, the whole con

cept of air travel had changed. A clean engines, had become familiar daily monoplane design with a retractable events. In isolated pockets of habitaundercarriage, trailing edge flaps, and tion on the coast, and in the nearby variable pitch propellers had produced ranges just inland, people had even a 170 mph airliner, and the era of swift learned to set their clocks by them. comfortable air travel was at last a Here now, at Brisbane's civil reality in Australia. With the advent aerodome, VH-UHH, one of the two of ANA's eagerly awaited 'giant' DC- Stinsons on the apron, was being 2s, as well as Ansett's dynamic prepared for the regular afternoon ser-Lockheed 10s, still several months in vice to Sydney via Lismore, departing the future, the new Stinsons were an at 1300 hours. This day, as it did four instant success. In service, they were proving all that the company had hoped for, cutting previous timetables almost in half, and enhancing the enviable reputation for reliability which the airline had already established with its older aircraft on the Sydney-Brisbane route. Throughout the 800 kilometres of coastline between Sydney and Brisbane, the regular passage of the dark blue Stinsons, with the characteristic, high-pitched whine from their three Lycoming radial

The Stinson Story

VU-JIRN



times a week, the afternoon Stinson service to Sydney provided a through connection with the company's route from Townsville and Rockhampton.

The aircraft from Rockhampton, a Monospar, had arrived at Archerfield only a few minutes before, its passengers finding the Brisbane weather a sharp contrast to the clear sunny conditions that had prevailed for most of their flight down the Queensland coast.

There was a slight delay in the departure arrangements for VH-UHH, with several matters for decision. The weather was not good over much of the north coast of N.S.W., with gale force winds, resulting from a deep depression off the coast, producing heavy seas and bringing cloudy

> The ill-fated Stinson VH-UHH at Archerfield with othe Airlines of Australia aircraft a few weeks before its last flight

conditions and widespread rain. The coast between Tweed Heads and Port Macquarie was receiving the worst of the battering, but the effects tended to be fairly localised and, inland from the coast, flying conditions improved rapidly. For the pilot-in-command of VH-UHH, Captain Rex Boyden, the weather, though boisterous, gave no real cause for concern. He had flown from Sydney that morning via Grafton, and knew quite well what could be expected on the coast, as well as the fact that better conditions existed inland.

Rather, Captain Boyden's main concern was with his scheduled landing at Lismore, where four passengers were booked to join the aircraft. Lismore had received a lot of rain, which had affected the surface of the aerodrome, and a telephone call to the company's agent there had confirmed the fact that the tops of the surrounding hills were in cloud. Altogether it was by no means certain that the scheduled landing at Lismore could be accomplished, and the necessity to overfly this port of call was a distinct possibility.

Another difficulty was an administrative hitch in booking arrangements concerning an intending Sydney passenger who had arrived on the aircraft from Rockhampton. This passenger was adamant that his return booking had been made in Sydney before he left for Queensland several days before, but a telephone call to the company's city office failed to trace any record of it. Allowing for the four seats which had been allocated for the Lismore passengers, the aircraft was already fully booked. If the additional passenger was taken, and a landing at Lismore proved possible, someone would obviously miss out. Nevertheless the passenger was insistent, and as the landing at Lismore seemed unlikely, he was finally permitted to board the aircraft.

Lastly, there was a further slight delay because of the last-minute arrival of one of the passengers booked from Brisbane. This passenger had declined a seat on the company's service car from the city because a business colleague was driving him directly to the aerodrome.

But finally all was ready. The passengers' luggage and the mailbags were loaded into the aircraft's lockers, the captain and co-pilot took their seats, the cabin door was closed and the steps were rolled away. The three radial engines were started, and the aircraft taxied out and across to the north-western corner of the all-over field. A few minutes later it took off









Opposite page — top: Cockpit and instrument panel of Stinson Tri-motor. The aircraft involved in the accident was fitted with dual controls.

Bottom: Passenger cabin of the Stinson, looking forward towards the cockpit. Note the window in the bulkhead door. The three passengers who survived the crash were seated in the window seats on the port side. Top: Two of the aircraft taking part in the search. A Stinson Tri-motor and an Avro 10, both belonging to Airlines of Australia, await an improvement in the weather at Old Bar aerodrome on the N.S.W. north coast.

Centre: Panoramic view of the Lamington National Park, showing ridges and valleys of the MacPherson Range. It gives a vivid impression of the rugged nature of the country in which the Stinson crashed. Bottom: Crew of the ill-fated aircraft, Captain Rex Boyden (left) and co-pilot B. Shepherd.



into the fresh south-easterly breeze and, climbing as it went, set course beneath the cloud base towards the distant MacPherson Ranges on the New South Wales border. The date was Friday, 19th February, 1937.

The Stinson was due over Lismore just before 1400 hours, where the company's agent and the four passengers booked on the aircraft were waiting hopefully in case the scheduled landing proved possible after all. But VH-UHH carried no radio, and when nothing was heard of it over Lismore, no one, other than the passengers who had missed the flight, was greatly perturbed. It was simply assumed that, because of the weather conditions, Captain Boyden had deliberately bypassed the town and continued directly to Sydney, perhaps flying further inland to avoid the high winds and low cloud on the coast. The fact that the captain had taken the additional passenger at Archerfield also added weight to this view.

But in Sydney later that afternoon, when the Stinson failed to arrived as expected at about 1730 hours, there was first of all wonder, then concern, and finally real anxiety for the safety of the aircraft. At first it was hoped that the Stinson had been forced to make an unscheduled landing at some landing ground inaccessible to a telephone, and that some word of its safe arrival would be received before long. But as this initial optimism gradually faded with the passing of the hours, the worst fears became a reality and, by 2030 hours, the company's head office was faced with the fact that the aircraft was now three hours overdue and missing. In addition to notifying the Civil Aviation Branch (then part of the Commonwealth Department of Defence) the company's Brisbane office was informed and arrangements were put in hand for an aerial search to commence early the following morning from both Brisbane and Sydney.

At first light on Saturday, 20th February, 1937, two of the company's Stinsons took off from Archerfield to begin working over the route south from Brisbane, while its two Avro 10s left from Mascot to comb the countryside northwards. At first the search operation was seriously hampered by the high winds and low cloud, but as conditions gradually improved, a great variety of other civil aircraft of all types and sizes joined the Hawker Demons of the RAAF for what was to become the greatest aerial search since the loss of the Southern Cloud, and indeed one of the most intensive in

Australia's aeronautical history.

Because of the many seemingly reliable reports that the missing Stinson had tracked via the coast from Brisbane, and had actually been sighted in flight only about 40 kilometres north of Sydney, the search was concentrated on the southern portion of the route. From the almost overwhelming weight of witness evidence (apparently based on sightings of the sister aircraft which flew the earlier service to Sydney that day) it seemed highly unlikely that anything could have befallen the missing Stinson early in its flight from Brisbane. Consequently, although the areas north of Lismore were searched from the air at least once as the weather permitted, they received scant attention by comparison with the intensive combing accorded the coastal area to the south of Lake Macquarie - in particular the hills and gorges which surround Broken Bay and the Hawkesbury River Valley.

But as the days dragged on without uncovering a single clue to the fate of the missing aircraft, it was finally concluded that the Stinson, somehow affected by the violent coastal weather, had crashed into the sea with the loss of all on board. Thus, a week after it had begun, the official search effort was reluctantly brought to a close and the Air Accidents Investigation Committee made plans to commence an official enquiry. In banner headlines, a Sydney newspaper asked, 'Is it another Southern Cloud?'

But at his little mountain property deep in the MacPherson Ranges close to the New South Wales-Queensland border, there was a bushman who thought differently. Although the weather on the mountains, particularly the force of the wind, had been the worst for many years on the day the Stinson disappeared, friends and neighbouring families living on the northern side of the MacPherson Ranges assured him they had seen the Stinson that day, tracking towards the ranges in the direction of Lismore. Yet the newspapers, when they finally reached him several days later, reported that intending passengers had waited in vain at Lismore for the Stinson to arrive. To Bernard O'Reilly, after he had thought about it, there could be only one answer — and that answer was lying somewhere in the jungle covered gorges of the MacPherson Ranges.

On a survey map of the MacPhersons, which he had at his house, O'Reilly drew a pencil line from where his friends and neighbours had last seen the Stinson, along the direct line

of flight towards Lismore. This plotted line crossed four high ridges. spurs jutting out in a westerly direction from the main range which forms the N.S.W.-Queensland border. O'Reilly reasoned that, if the missing Stinson was to be found in this area, it would be on the northern slopes of one of these ridges.

crash, the late Bernard O'Reilly found the wreck single-handed amid the of his lone search, conveys some idea almost impenetrable rain forest of the MacPherson Ranges, then led a rescue party back to the accident site to save the lives of the two survivors, has passed into Australian history. Ironically, the survivors were John Proud, the man who would not have been on the aircraft had he not insisted, and Joseph Binstead, who would have mis-

Below: View of the wreckage, showing the steep nose down attitude in which the aircraft came to rest. The only portion not gutted by fire was the centre engine, cowling and propeller. - Herald-Sun photograph.

been running late because of Proud's insistance. The full story of O'Reilly's epic achievement, his almost incredible feat of endurance, and his organisation of the dramatic rescue operation is a thrilling one indeed. A moving and authentic first-hand account of it all is found in O'Reilly's own book Green Mountains, publish-The story of how, 10 days after the ed in 1940,* and the following extract. describing the events of the second day of the difficulties he faced, and the feelings he experienced, in finding the remains of the missing aircraft and its two pitiful survivors:

By 8 a.m. I was on the summit of Mount Throakban waiting for the clouds to lift sufficiently to permit me a view. For 15 minutes I stood in the cool moist wind, looking into a sed the flight at Archerfield had it not grey blank, then suddenly the racing clouds

> Since reprinted and published in paperback form by W. R Smith and Paterson Pty. Ltd., Brishane



split, and a vast green sea of ranges and gorges came into view to the west. It gave a good view of the three remaining ridges in the plotted line of flight. Here and there were creamy white splashes which I knew to be trees in bloom, then suddenly I saw something which made me jump. Eight miles away, on the third range, Lamington Plateau, just where it swelled up to join the border range, was a treetop which was light brown. In spring, when trees are getting fresh leaf growths, it is not uncommon to see a brownish treetop, but this was late summer. The tree must have been dying. What had caused it? Natural causes? No, trees dying like that, die a branch at a time. Lightning perhaps? But why in all the ocean of trees was this one freshly killed tree situated where the pencil line crossed my map? Fire? No natural fire had occurred in that dripping rain forest since the world began. But a hundred gallons of petrol ... Swiftly the clammy clouds swooped down again. I put down my head and tore into the soaking green jungle

Below: Map showing direct track from Archerfield to Lismore and site of acciden



in my haste to traverse the gorges and jungle ranges which lay between me and that clue. The going was all blind and I did not see that tree again until I was 20 yards from it, eight hours later.

Hours of climbing and descending went by. At one point on the edge of a 2000 foot cliff I looked across the northern rivers of New South Wales, spread out like a green map and dotted with farm houses which looked like mushrooms. Just a brief glance at it, then I was scrambling down the next gorge

Progress up the next ridge was very slow. At this stage weariness was beginning to overtake me. The cheerlessness of the dripping underbrush, the grey swirl of the clouds through the timber, the silence of the birds and the lack of human company, all combined to bring my spirits to their lowest ebb. It was one p.m. when the top of the third range was reached. A close check was kept on these ranges so that my approximate position on the map could be estimated. Some time was wasted looking for a break in the trees which might permit a glimpse towards Lamington Plateau. I climbed a tree, but its top was in the clouds and a view was impossible. What should I do now?

The answer was startling. From the direction of Lamington Plateau about three miles away, came a short clear human call - then another. A human voice in that green wilderness - what could it mean? My first thought was that the call came from where my pencil line crossed the map - from where that dead tree was. Reason ruled this out - human endurance could not have gone so far. No, the calls came from some other searcher - someone as foolish as myself, looking in that vast area for a wreck which evidence had shown to be in the sea near Sydney

It was only about three miles to the top of Lamington Plateau but there was a range and two gorges in between. Three hours later, about four o'clock in the afternoon, I stood on the lip of what I believed to be Lamington Plateau. If I had held a straight course, my position would now be near that dead tree which I had seen eight hours earlier. But there had been no sun and no visibility, so perhaps my reckoning was all wrong. This, too, was the location of those calls. Well that could easily be tested - just a matter of waiting until my breath came back for one big 'Coo-ee'. It echoed sharply across the gorge - a pause - then came the mystery call again, but this time so clear and close, that it had the effect of a physical shock. It could not have been more than 200 yards down through the timber to the left! I answered sharply and started down in that direction. A second voice joined the first. We exchanged calls to guide me through the thickly meshed tangle.

Only 20 yards away now. What was this? A big gap in the treetops just ahead! I tore a piece of vine aside to get a better view. The great tree beside the gap was blackened by fire right to its branches. A numbness shot through my limbs, a sort of coldness that was worse than pain or shock, but was a combination of all three, a feeling that has stayed with me, and it is with me now even as I

write. Before I looked down I knew what I would see - a mass of smashed and charred metal. It was more than that - it was a horrible unclean thing, which held the trapped remains of what once were men, a repulsive thing which I could not go near. The voices came again from below the wreck. Two voices - men alive - but in what condition? I stood for a moment afraid to go on to them, afraid of what I would see.

Proud I saw first, his eyes far back in his head like a corpse, lying as he had lain for 10 days on that wet ground with a broken leg that was green and swelling. I thought, 'You've lain all these days in hell and now I'm too late to save you'. Who can describe the anguish I felt in that swift second? Then I turned to Binstead. He tried to shake hands - a poor hand that was like raw meat. His legs too, were like that, and his trousers were worn away from crawling over the rocks to bring water. There was some talk - lots of talk. The first sane remark I remember was Binstead's 'How about boiling the billy

* * *

From the evidence of these two surviving passengers, from meteorological reports and records, and from the accounts of the eye witnesses who saw the aircraft in flight shortly before it reached the MacPherson Ranges, the apparent cause of the accident was finally deduced. Evidently deciding to at least have a look at weather conditions in the Lismore area, Captain Boyden had set course as usual for this New South Wales town on his departure from Archerfield. This route, though it might avoid the heavy rain battering the coast itself, took the aircraft across several spurs, as well as the main ridge of the rugged and steep-sided MacPherson Ranges which rise in places to almost 4000 feet.

One of the eye witnesses to the aircraft's flight path, whose farm at the head of the Albert River valley was only eight kilometres north of the accident site, had watched the Stinson that day with more than usual interest. He was particularly attracted to it by the fact that it seemed to be flying right in the base of the cloud, at times passing briefly through lower patches. The overcast, though comparatively lowlying, was still well above the top of the surrounding mountain ridges, but further to the south in the direction of flight, the strong moisture-laden southerly wind was capping the ranges with a bank of cloud at lower level. The aircraft was certainly lower than usual on this part of its run to Sydney, but obviously had more than enough height to clear the mountains. The witness watched the Stinson as it continued its steady southward path, buffeted occasionally by turbulence but obviously operating normally, until it was lost to view behind the bank of cloud resting on the mountain top.

The two surviving passengers, both of whom had been sitting on the port side, also said that the aircraft was flying visually but almost in the base of the overlying cloud, as it approached the higher terrain of the MacPherson and it was raining. They passed over a number of small farms near the foot of the mountains, the last one terminating in the thick bush which aircraft's clearance from the ground. Stinson was not actually flying in ground was obscured by cloud and, from the increased sound of the had passed above the cap of cloud engines, it seemed that the aircraft was climbing.

The turbulence increased, then the cloud parted again and the passengers range. caught sight of tree tops uncomfortably close below. Concerned, the in the existing weather conditions, it passengers were initially reassured by the obviously relaxed expression of the co-pilot, whom they could see through the small circular window in the door to the flight deck. But their respite was short-lived. Within seconds the trees were only feet below the aircraft and the view through the windows on the other side of the cabin was suddenly filled by a heavily timbered mountain slope just off the starboard wing. Another glance towards the cockpit showed that the co-pilot's expression had changed to one of urgency and he ed was reaching across to manipulate something with his left hand. The Stinson lurched to starboard, then there was a splintering crash as it rode over the top of a large tree. A second impact followed as the aircraft plunged down into the dense jungle canopy, breaking off a second tree 10 metres above the ground. A third, violent impact occurred as the aircraft fell through the timber to the ground, coming to rest in a steep nose-down attitude against the trunk of a tree 45 metres high.

The passenger Proud, sitting in the front seat on the port side of the cabin, was the first to recover himself. Already the aircraft was on fire and access to the main cabin door was blocked by dense smoke. Glancing about him quickly, Proud saw that the second window on the port side had been sprung from its mounting in the impact. Though handicapped by a broken leg, he wrenched the window away and climbed out on to the damaged port wing. By this time, Binstead, seated in the third row of seats on the port side had regained consciousness. A big man, he squeezed

through the same opening with Proud's assistance. The third survivor of the crash itself, James Westray, also seated on the port side, quickly followed, sustaining some superficial burns from the now well alight interior. By the time the three men had made their escape, the cabin was a Ranges. The turbulence was moderate mass of flame and there was no hope of rescuing the other occupants. * *

It was evident to the investigation that, although the farmer watching the covers the ranges. From this point on aircraft only minutes before it crashed the terrain rose rapidly, decreasing the believed it had flown into cloud, the Soon afterwards their view of the cloud for any length of time. Rather it was lost to the farmer's view because it which the strong southerly wind, affected by pronounced orographic uplift, was producing in the lee of the

> No doubt anxious to remain visual seems that the captain deliberately kept below the main cloud base as he approached the high terrain. And on the face of it this should have posed no problem - the cloud base was certainly not high, but there should have been adequate clearance above the ridges which lay across the aircraft's flight path. Indeed, the Mt. Widgee ridge, which the aircraft was seen to cross shortly before it was lost to view, was actually higher than the ridge on which the aircraft subsequently crash-

> Why then did the aircraft crash? Why was the captain not able to continue the flight safely through the comparatively shallow corridor of visual airspace which lay between the main overcast and the tops of the remaining ridges? The answer is probably to be found in the unusual severity of the gale that was blowing at mountain-top height on the day of the accident, and in the actual location of the ridge on which the aircraft crashed

Although strong south-easterly winds were forecast for the northern section of the flight, it was only in the days following the accident that the true force of the gale became manifest. O'Reilly and some of his mountain neighbours described it as the wildest weather they had experienced for years. And The Sydney Morning Herald, reporting damage caused by heavy seas to wharf installations at Woolgoolga and Coffs Harbour, had no idea of the true magnitude of wrote of 'the cyclone which raged off the coast'. At sea, some of the existed in the lee of the ranges that passengers aboard the liner Taiping had sustained injuries from the violent

tain described as 'the worst he could remember'. And further north off the Queensland Coast, the motor vessel Babinda was actually disabled by the heavy seas and had to be taken in tow. In addition to all this evidence, the pilot of the Stinson which flew the Sydney-Brisbane service on the afternoon of the accident, reported that he had experienced exceptionally strong tail-winds from a point just south of the MacPherson Ranges.

Like the other high ridges that the aircraft had already crossed when the accident occurred, the one on which the aircraft crashed is actually a spur jutting out westwards from the main MacPherson Range on the N.S.W.-Queensland border. The site of the crash was very close to where this spur, the southernmost one on the aircraft's track, abuts the main range. While the more northerly mountain spurs further back along the aircraft's track would have been sheltered from the wind to some degree, this main range, which forms a veritable mountain wall more than 3000 feet high, rising almost vertically from the coastal plain, was exposed to the full force of the 60 knot gale. Such a situation could not fail to produce extremely powerful downdraughts on the lee side of the range and its immediately adjacent spurs. The Stinson's track to Lismore crossed the southernmost spur and the main range at a point where, because of the relative disposition of the terrain and wind direction, the downdraughts would have been at their most violent.

As the Stinson continued southward towards these two remaining ridges lying across its flight path, the captain would no doubt have maintained as much height as the overcast cloud would allow. But here, it seems, the base of the cloud lay closer to the ridge tops, and there was but a small clearance through which the aircraft would have to squeeze if visual contact were not to be lost. Approaching the spur on which the aircraft subsequently crashed, very near to where this ridge joins the main escarpment, the Stinson would have flown directly into the extremely severe but invisible down-rush of air and, too late to turn back, would have been carried below the summit where it plunged into the tree tops. Though prepared for some turbulence and strong headwinds over the mountain, it seems that the captain the downdraughts which would have day.

The dense overlying canopy of tree motion of the ship in weather the cap- foliage and the jungle undergrowth





Westray's burns from the subsequent aircraft has yet to be tackled; at pre- the next three months'. fire, were otherwise unhurt. From the sent it is only being toyed with', comevidence of the survivors, one can even mented another. be tempted to speculate that if the airwild and inaccessible rain forest and had disappeared and enabled the today. the flight of the Stinson remained a search efforts to locate the survivors mystery, like that of the Southern much more quickly. two other survivors.

attendant publicity, created something was to re-examine the Regulations of a furore amongst the air-minded with a view to enforcing the carriage public of the day. It brought to light of radio communication equipment in the startling fact that, though more all airline aircraft in the future, the

Sun photograph

Melbourne, Adelaide, Launceston and necessary. The loss of the Stinson, with all its Hobart. The Civil Aviation Branch



Above: One of the survivors being carried to safety on a make-shift stretcher — Herald

Minister said.

The accident to VH-UHH also forcefully demonstrated the need for some form of radio navigation system on Australian air routes. Even before the accident, in fact for several months past, the 33 Megacycle Lorenz radio range system was being studied by the Department of Defence and an experimental installation had been undergoing tests in Melbourne. Now it was announced that these tests had beneath, seems to have cushioned to than six years had passed since the loss proved satisfactory and that the some extent the aircraft's descent to of the Southern Cloud, Com- Minister 'expected it would be decided the ground, and it appears that the monwealth regulations still did not to install the system at Brisbane, final impact was not as severe as might require the carriage of 'wireless' on Sydney and Melbourne'. The question have been expected. The three aircraft operating interstate airline was still to be settled finally, but a passengers who survived the accident services. 'This has astonished decision was expected within the next itself were obviously stunned, but members of Cabinet', one newspaper few days which would provide for the apart from Proud's broken leg and reported. 'The problem of wireless on installations to be undertaken 'within

The fact that these radio ranges were still not operational two years One point which clearly emerged later, when Australian National craft had not caught fire, most of during the subsequent enquiry into the Airways' DC-2 Kyeema flew into the those on board might have lived. But loss of VH-UHH, was the fact that if top of Mt. Dandenong, Victoria, while as it was the aftermath of the fire that it had carried radio and if it had been attempting to let down through cloud helped lead O'Reilly to the site of the making regular position reports, into Essendon, only serves to uncrash, who can tell whether they would though these would not have prevented derline how hard-won have been the have been found in time and rescued? the accident, they would have in- safety lessons which finally evolved the Or would they have all perished in that dicated the area in which the aircraft airways operational system we know

But that is another story. The real point is that today's standards, Cloud, for many years to come? As it Only a fortnight later, the Minister whether IFR or VFR, have been was, the third survivor of the crash, responsible for Civil Aviation an- bought at a very great price. To ignore James Westray, died after falling nounced that equipment had been those standards in individual down a cliff while attempting to walk ordered for the construction of two- operational decisions, is to negate all out of the ranges to bring help to the way aeronautical radio stations at that wealth of experience which has Brisbane, Sydney, Canberra, shown those standards to be

Left: The two survivors of the accident, John lerald-Sun photograph



Snatched from a Watery Grave

In recent issues of the Digest, two separate accidents involving Cessna 150 Aerobats stressed the almost inevitable result of loss of control at low level. In each case, the basic lesson to be drawn was simply that, at the very low height at which the pilot lost control, there was no hope of effecting a recovery before the aircraft struck the ground. This of course, was not the only lesson to emerge from these investigations. Misjudgement, mishandling and a lack of knowledge of the aircraft's limitations all played their part in the fact that the aircraft stalled in the first place.

Now, in the two further accidents described on these pages, this common thread is again apparent, though in these cases there is a significant difference both aircraft were being flown over the sea where, for the reasons discussed, pilot skill and concentration on the job in hand are, if anything, even more vital to the safety of the operation.

The aircraft involved in the first of these ac- around 100 feet. cidents, a near-new Cessna 150 Aerobat, was being flown solo by its owner, who held a private fish, the aircraft initially straightened out of its licence and had nearly 1000 hours aeronautical turns and began to head back in the direction of experience. Making a local flight from his the airstrip. But then first the port wing, and private airstrip near Albany, W.A., the pilot then the starboard wing, dropped and the airsighted a shoal of fish just off the shore of craft lost height until it struck the water in a Middleton Bay in King George Sound. The nose-down attitude, and somersaulted on to its pilot's son-in-law was a fisherman and, seeing back. The nearby fishing boat rescued the uninhis fishing boat nearby, the pilot decided to cir- jured pilot from the water and the aircraft sank cle the fish to attract the attention of those on within 30 seconds. board the boat.

Allowing the aircraft to descend to about 500 feet, the pilot lowered 20 degrees of flap and, setting the power at about 2300 rpm, he began a 45degree banked turn over the shoal which he con- and towed behind a launch to a wharf at Albany, tinued for about 10 orbits.

By this time, several witnesses on the nearby shore who had been watching the aircraft, had become concerned that it seemed to be flying too no defect could be found which might have conslowly. At times the aircraft lost height and tributed to the accident. The fuel tanks conthroughout its orbits, its height above the water tained more than adequate fuel and the fuel flow appeared to range from about 300 feet down to to the engine was unrestricted.

When the fishing boat reached the shoal of

The aircraft had sunk in about four metres of water. It was later recovered from the sea-bed where it was lifted from the water by a mobile crane. The airframe and engine were then subjected to a detailed technical examination, but



The pilot said later that when he had straightened out of the turns, he flew level for a few moments but then the port wing dropped and it was not until the angle of bank had reached 45 to 50 degrees that he was able to recover. He managed to level the wings but the aircraft then commenced to turn in the opposite direction and began to sink towards the water. The pilot added power but this seemed to have little effect, and he was unable to level the wings or arrest the descent. The starboard wing tip then struck the water, swinging the aircraft to the right. The nose and port wing impacted the water heavily, and the aircraft somersaulted on to its back.

Finding himself underwater, the pilot released his belt and extricated himself through the port side door, which had sprung open. After wading out along the undersurface of the port wing, which was then about one metre below the surface, he swam away from the sinking aircraft and was picked up a short time later by his sonin-law's boat.

* *

in a boat below which they were unable to see from where they were standing. The pilot however did not seem to have been aware of the aircraft's dangerously low speed. especially during these last two orbits. In fact, by

Although the pilot said he had maintained an indicated airspeed of 60 to 65 knots while circling the shoal, most of the witness evidence suggested that he was operating the aircraft at a slower speed and at a lower height than he believed at the time. Such witness comments as 'appeared to be flying at the stall', 'mushing attitude', 'little forward speed', as well as the pilot's own description of the control difficulty he experienced when he tried to level out, all indicated that the aircraft must have been close to by the port wing on impact with a stalled condition while it was circling the fish. As well, two of the witnesses who were on the golf course immediately inland from the beach, thought that the engine power decreased during the last two orbits. At the same time, they saw the pilot waving his arm out the port window and heard him shouting, apparently to someone

Top: Middleton Bay in King George Sound, showing location of accident site and private airstrip from which aircraft took off.

Bottom left: Aircraft being lifted from the water at Albany after being towed from site of crash. The diver handling the salvage operation is standing near the nose of the aircraft.

Bottom right: Damage sustained

his very actions, it is clear that he was not devoting anywhere near his full attention to the task of flying the aircraft at a time when his full concentration was essential. It seems he did not recognise the stall when the aircraft began to sink, as he evidently did not lower the nose or increase power sufficiently to regain flying speed.

The aircraft in the second accident was a Cessna 172 being used to photograph a Republic Seabee amphibian in flight over Port Phillip Bay, Victoria. The Seabee was operating a shark-spotting patrol over the beaches of Port Phillip Bay, and photographs of the aircraft were required for a newspaper article on this service.

The Seabee was normally flown at a height of about 500 feet on beach patrols and when sharks were sighted, it would dive low over them to indicate their position to swimmers and boats in the water. For the photographic flight, it was arranged that if sharks were found, the Seabee was to dive towards them in the usual way, while the 172 circled overhead photographing the Seabee with the sharks in the water below, if possible. A press photographer and a journalist were to travel in the 172, which was to be flown by a commercial pilot. As the left-hand window of the Cessna could be opened in flight, it was agreed that the photographer would occupy the left seat while the pilot would fly the aircraft from the right hand side. The other passenger would sit in the rear.

All taking part in the exercise assembled at Moorabbin Airport where they were briefed by the Seabee pilot on the procedures to be followed and the positioning of the 172 for the photographs. Flight details were then submitted by telephone to the Moorabbin briefing office and, a short time later, both aircraft took-off.

Departing from Moorabbin Airport, the Seabee first flew northwards along the coast at 500 feet towards Melbourne, with the Cessna following about a kilometre behind and 200 feet higher. To maintain station behind the Seabee, the pilot of the 172 found he had to reduce speed to about 70 knots, so he lowered between 10 and 15 degrees of flap. No sharks were to be seen, so the Seabee turned back and, with the 172 still above and behind, flew south along the coast as far as Portsea. Still no sharks were found, so the pilot of the Seabee called on the radio that he would fly out to the Mud Islands, near the entrance to the Bay.

Eventually, just west of the islands, near the edge of a sand bar, the Seabee pilot sighted a school of between 15 and 20 sharks. He orbited over the sharks, but because ripples on the water made them difficult to see, attempts to take the planned photographs were unsuccessful. After some 10 minutes therefore, it was suggested that the Seabee move clear to allow the Cessna to descend and photograph the sharks on their own. Lowering 30 degrees of flap, the pilot of the 172 let down to about 500 feet and reduced speed below 60 knots, using just enough power to maintain height.

Once settled in this configuration, the pilot

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flew two left orbits in a race-track pattern to enable the sharks to be photographed from the open window. As he began a third orbit he lost sight of the sharks and turned to ask the photographer if the aircraft was still positioned correctly. He then looked back through the right hand window to check that he was still clear of the Seabee and went to bank the aircraft into another left turn. As he began to roll into the turn, he glanced down at the instruments and was alarmed to see that the airspeed was low and that the aircraft was down to about 300 feet. Almost immediately, the port wing dropped and the aircraft fell away to the left in a steep spiral. He attempted to recover, firstly by using opposite aileron and rudder, and then forward elevator control and engine power but, though the aircraft began to respond, it was too low for recovery to be effected, and it struck the water in a nose-down, left wing low attitude.

Seeing the Cessna go down from a short distance away, the pilot of the Seabee immediately turned in towards it and prepared to alight alongside. Lowering flap, he touched down close to the 172, which was visible in the shallow water just below the surface. By the time the Seabee had lost way however, a speedboat which had been in the vicinity had already reached the Cessna and taken on board the two passengers. both of whom had been seriously injured. The pilot, who had suffered only minor injuries, was taken off a short time later by another speedboat which was also nearby.

The pilot was 25 years old and held a Commercial Licence with almost 400 hours aeronautical experience. He worked for the operating company on an ad hoc basis but had not flown 'beach patrols' in command over the water before and had only limited experience flying from the right hand control seat.

By today's general aviation standards, the Republic Seabee is a slow aircraft and, to maintain station behind it, the Cessna had to be flown at a speed considerably less than normal cruising. The pilot of the 172 said later that, as he had slowed the Cessna at the start of the exercise to remain behind the Seabee, the stall warning horn had sounded. Yet later on, when he was preparing to photograph the sharks, he reduced speed even further and lowered considerably more flap. According to the evidence of the two passengers, the stall warning horn again sounded at this stage but it apparently went unheeded by the pilot.

In normal circumstances, a Cessna 172 should be able to recover from a stall within 300 feet quite comfortably. In the case of this accident, however, the pilot was undoubtedly taken by surprise and, at the low height at which the stall occurred, his reaction time would have been critical. At this stage of the flight also, the pilot's attention was diverted outside the aircraft, both in his efforts to keep the sharks in sight for the photographer, and in maintaining a lookout for the Seabee. No doubt the pilot's difficulties were compounded by his lack of experience in flying the aircraft from the right hand seat, but the fact remains that his pre-occupation with events outside the cockpit was at the expense of monitoring the aircraft's operation.

Circling at low speed close to the water demands a precision requiring all a pilot's skill and his undivided concentration. There are obvious difficulties in judging height and even in basic orientation over open water some distance from land, where a pilot has none of the surface features he is normally accustomed to using for outside reference. Furthermore, when flying at a low airspeed, even a moderately banked turn can increase the stalling speed to a critical value. Neither of these facts appears to have been appreciated by the pilots involved in these two accidents. As a result, while their attention was diverted away from the immediate task of flying, they stalled at a height which was too low for them to be able to regain control before their air-

craft struck the water.





Opposite page - top: Object of the 172's exercise. Sharks photographed from low level off Mud Islands immediately before the aircraft stalled and crashed. The camera which took this picture was recovered from the wreckage

Centre: Aerial photograph of the 172 lying in shallow water, shortly after the accident

Bottom: Distortion and buckling of the cockpit indicates the force with which the aircraft struck the water

This page: The submerged aircraft after the occupants had been rescued. Note the damage to the

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On a night VMC flight from Parkes to Quirindi, N.S.W., a Beech Bonanza was cruising at 5000 feet. There was no moon and the night was very dark; no horizon was visible, but on the ground the lights of towns and farm houses could be seen.

According to the pilot, having tracked over Wellington to what he believed was Coolah, he diverted to port to track visually towards the township of Premer, intending to avoid the higher areas of the Liverpool Ranges before resuming a direct track to Quirindi. When he estimated the aircraft was eight nautical miles (15 kilometres) south-east of Premer, he commenced descent and altered heading for Quirindi. During the descent, the pilot said, at what he believed was about 4700 feet, the aircraft entered heavy turbulence and scud and he checked the descent at that height. Two minutes later, while still being buffeted by the turbulence, there were two separate heavy thuds as the aircraft struck something in the darkness and poor visibility. The pilot immediately applied power, turned on to a north-easterly heading and climbed the aircraft to 7500 feet. He subsequently tracked to

Quirindi on the NDB where the aircraft landed safely.

After parking the aircraft for the night, the pilot said, he noticed that the HF aerial had broken away from its attachment at the port wing tip and was trailing from the V tailplane, but in the darkness he did not see any other damage. Next morning however, when he inspected the aircraft, he saw that there were dents in the port wing tip and in the leading edge of the starboard wing. Because of the height at which the aircraft had been flying when the impact occurred, the pilot concluded he had struck a flock of birds.

The pilot explained that after discussing the matter with another pilot at Quirindi, he decided that as the damage was only superficial, it would be quite safe for him to continue to Bankstown that night as he intended.

His flight to Bankstown was uneventful, but when the aircraft damage was examined in the morning, pieces of dead timber were found embedded in the buckled wing tip. This left no doubt that the aircraft had struck trees, apparently somewhere on a ridge top, during its



descent in the dark.

The margin by which this aircraft and its occupants avoided a violent and untimely end, if the pilot's recollection of the events are correct, on a dark, cloud-enshrouded mountain is frightening even to contemplate. Obviously in this case, if the Bonanza had been even a matter of centimetres lower when it struck the tops of the trees, the accident would have joined all those others that have been attributed to operating 'without adequate terrain clearance' and in 'conditions in which visual flight could not be maintained'.

The pilot was inexperienced in the conduct of night VMC flights, having obtained his rating only three weeks before and it was obvious that this particular flight had been poorly planned. Because of a lack of detail in the pilot's records, it was not possible to reconstruct the aircraft's flight path. For this reason, the location of the tree strike could not be determined. The height of the terrain in the area in which the pilot said he believed he was descending when the impacts occurred is a good deal less than 4700 feet AMSL, but there was no evidence that the aircraft's altimeter at the time.

The Visual Flight Guide requires that an aircraft engaged in night VMC operations be flown clear of cloud and at least 1000 feet above all obstructions within 10 nautical miles of either side of track, and within five nautical miles in front of and behind the aircraft. It seems, in view of what happened, that none of these conditions were met in this case, with near disastrous consequences.

Undoubtedly this pilot will remember his brush with death for as long as he continues to fly. It is to be hoped that he profits from it. But what of the rest of us who merely read of his experience? We would do well to learn from it too — for it is very unlikely that anyone could be so lucky again!

craft's altimeter was other than fully serviceable Above: Close-ups showing detail of

Above: Close-ups showing detail of damage sustained by the Bonanza. It is apparent the aircraft had struck the upper-most branches of a dead tree. From the nature and extent of the damage, it is not difficult to envisage the very narrow margin by which a major accident was averted.



Though hardly an air safety incident in the nor- and the area surrounding the Taipan! mal sense of the word, the unnerving situation described in this light-hearted little story could easily have developed into something far more serious ensconced in the luggage - had things worked out only a little differently!

pany representatives and them, with most of the commercial travellers as luggage, out to the aerodrome passengers, I was flying a Piper Navajo on an extended charter flight through North Queensland. Altogether, the the luggage, leaving it on the passengers had about 20 suitcases of samples and personal gear, so two cars or taxis were usually required to convey the party to and from the aerodrome each time we landed

We had started this parhad finished their business in 'snake'! At once the cabin grown into a two-metre

With a party of five com- Hughenden, I drove two of in a borrowed motor car. I opened up the aircraft for the two passengers and unloaded ground beside the aircraft while I went back into town to pick up the rest of the party. We finally departed Richmond at 1315 and half an hour later landed for the next round of calls at Julia Creek.

Two of the passengers had ticular day's work at disembarked and a third had cept that it was brown and Hughenden and flown on to begun to unload the luggage rather less than a metre long. tured as far as the cockpit -Richmond, our first port of compartment at the rear of But later that evening, around otherwise I am sure there call for the day. At 1230 the cabin when suddenly there the bar of the hotel where we would have been more to the hours, after my passengers went up a frenzied cry of were staying, it had soon story!

aeroplane was devoid of living beings — all except the snake which remained firmly compartment!

Now an impasse prevailed - no one was anxious to make the next move and in any case there didn't seem to be a weapon available with which to do battle with the stowaway. Eventually however, the situation was saved when one particularly bold passenger ventured to despatch it with a coat hanger from the same luggage compartment.

authority on snakes, so I can't say what variety it was, ex-

I can only guess that the unpleasant passenger had found its way up the stairs into the cabin while I was driving back into town for my second load of passengers; or else, perhaps more likely, it had slithered itself into one of the cases of samples while they were on the ground, and was later loaded aboard with the rest of the luggage.

I can only be thankful that the snake didn't decide to go exploring while we were in the air. One would hope of course that the passengers would have remained cool in the cir-No one in the party was an cumstances, and with a proper regard for the pilot's responsibilities, apprehended the stowaway before it ven-

Be cautious with caution

It is probably true to say past, with the comparatively low incidence of actual wake turbulence encounters in our day to day operations, effec- is taking off. tively testify to this.

But though prevention is always better than cure, there tion, caution is sometimes being taken to excess, apparently because of misunderstanof wake turbulence.

that most pilots in Australia to the flow of air traffic at procedures to separate a lan- been estimated that in nil today are wake turbulence major airports have ding aircraft from a preceding wind conditions, jet blast conscious. The extensive safe- sometimes been caused by un- aircraft taking off, are not from the engines of a Boeing ty education coverage this expected 'go arounds', ex- considered necessary. In such 747, operating at take-off subject has received in the ecuted by pilots of ap- a case of course, the thrust, will have decayed to proaching aircraft which have preceding aircraft's point of zero approximately 600 already been cleared to land rotation is a long way beyond metres behind the aircraft. behind a larger aircraft which where the landing aircraft From a standing start a Boe-

Various separation stan- down. dards have been devised with the aim of protecting aircraft which might tend to make is some evidence that in one operating in controlled air- pilots 'twitchy' in this situa- nature of Wake Turbulence particular operational situa- space from wake turbulence tion, is the possibility of en- and the problems of avoiding generated by preceding larger countering jet blast (not to be it, is to be published in Aviaaircraft. It is important to confused with wake tur- tion Safety Digest No. 95. A note however, that because an bulence) left by the aircraft similar discussion on the subdings concerning the nature aircraft taking off does not taking off. However, in- ject of Jet Blast is to appear in generate wake turbulence vestigation shows this fear a subsequent issue.

The fact is that disruptions **until** it rotates, special too, to be groundless. It has could be expected to touch ing 747 could be expected to

The other consideration seconds.

cover this distance in about 25

A full discussion of the

