No. 22

Aer Lingus International Airlines Ltd., Vickers Viscount 808, EI-AKK, accident at Bristol (Lulsgate) Airport, England, on 21 September 1967. Civil Accident Report No. EW/C/0187, released by the Board of Trade, United Kingdom, on 20 December 1968. C.A.P. 313

1.- Investigation

1.1 History of the flight

Before leaving Dublin no landing forecast for Lulsgate was available but the forecast conditions for Filton, 10 miles north of Lulsgate, were well above the company minima of 260 ft critical height and 800 m RVR. About 25 minutes before commencing the approach to land and whilst the aircraft was on the airway near Strumble, the latest weather conditions for Lulsgate, obtained by radio from air traffic control, showed that there was 3/8 cloud at 1 000 ft, visibility was 1 500 m with the sun tending to disperse cloud and mist. After leaving the airway, the aircraft was positioned by Lulsgate radar for an approach to runway 28 on a right-hand base leg. At 0752 hours GMT before the final approach was commenced, the latest weather conditions were passed by the Lulsgate radar controller who was also the approach controller; these conditions showed a surface wind northerly 8 to 10 kt, QFE 979, QNH 1 001, visibility in mist 1 800 m. During the final turn on to the approach at 6 miles, the aircraft drifted to the left of the extended centre line which was regained closing from left to right during the final descent. At five miles from touchdown, still to the left of the centre line, a descent from 1 500 ft (QFE) was commenced at a rate of 300 ft per mile with advisory altitudes being passed every half mile. The air was calm and the commander was able to achieve a high degree of precision during the approach; heights were accurately flown during the descent and the aircraft's track, converging on the centre line, was steady. When the aircraft was between 3 and 3½ miles from touchdown, the controller informed it that visibility had deteriorated to 1 200 m. At two miles, when steering 295°, the aircraft intercepted the approach centre line and its heading was corrected to 290°; at one and a half miles at 500 ft, a further heading correction was made on to 287°. A drift to the right, away from the centre line, became apparent when the aircraft was between 1 and 1½ miles from touchdown and the controller gave further corrections to the left to 285° and 280°. At one mile from touchdown at 350 feet, a further left correction to 275° was given but the aircraft continued to track to the right of the centre line. At half a mile from touchdown, when the talk-down was complete, the controller informed the aircraft it was well to the right of the centre line and that it should overshoot if the runway was not in sight. Shortly afterwards the aircraft was seen, by a controller, heading towards the control tower before commencing its corrective turn to the left.

The commander, who was at the controls of the aircraft, said it was possible to refer to the ground and natural horizon until passing through about 650 ft when a thin layer of cloud followed by misty conditions required the remainder of the approach to be made on instruments. Whilst descending through 300 ft, the commander asked the co-pilot if he could see anything but just as he replied in the negative the commander saw the approach lights ahead and to his left and he promptly commenced an 'S' turn to line up

with t.em. As he did so he called for 40° of flap and less power in order to reduce the airspeed from 130 kt to about 112 kt. During this phase, he lost contact with the lights "for some seconds" but he elected to continue the approach because the last reported visibility was 1 200 m and he was confident the runway lights would shortly appear ahead. When they came into view the aircraft was over the left-hand side of the runway and not properly aligned with it; the commander said he attempted to turn on to the runway centre line as he flared out for the landing. During this manoeuvre, although he was not aware of it, the starboard wing tip and No. 4 propeller struck the runway; the aircraft then touched down on all its wheels with considerable port drift. The commander took overshoot action, applying full power, calling for 20° of flap and the undercarriage to be raised; the airspeed had, in the meanwhile, fallen below 100 kt. The commander realised that the aircraft was not accelerating normally and saw that it was headed towards buildings on the northern perimeter of the aerodrome; rather than risk flying into these obstructions, he flew the aircraft on to the ground with its undercarriage retracting. The aircraft touched down starboard wing first, ground-looped to the right as it slid along the remaining section of the adjacent runway, then crashed tail first through a fence. Ten of the occupants of the passenger cabin were injured, three of them seriously; fire did not break out; rescue and fire vehicles arrived promptly on the scene. The accident occurred at 0759 hours.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal			
Non-fatal	2	8	
None	2	9	

1.3 Damage to aircraft

The aircraft was damaged beyond repair.

1.4 Other damage

The surface of runway 34 and the boundary fence were damaged.

1.5 Crew information

Commander

Captain Patrick Vincent Donoghue, aged 33, commenced employment with Aer Lingus in May 1962, and was appointed captain on Viscount aircraft in April 1965. Captain Donoghue had a valid airline transport pilot's licence and instrument rating, issued by the Republic of Ireland; he was last medically examined on 14 September 1967 and was in good health. According to company records Captain Donoghue had a total flying experience of 5 005 hours at the time of the accident; 3 163 hours were in command, of which over 1 300 were on Viscounts. Captain Donoghue was considered by his company to be an above average Viscount pilot, an assessment he had consistently maintained since converting to type. His most recent line and competency checks had been in February and April 1967 respectively.

Co-pilot

First Officer Niall O'Farrell, aged 26, commenced employment with Aer Lingus in January 1965; he held a valid senior commercial pilot's licence and an instrument rating issued by the Republic of Ireland. Mr. O'Farrell was last medically examined on 27 June 1967 and was in good health. His total flying experience amounted to 2 200 hours, of which 592 were as co-pilot on Viscounts. Mr. O'Farrell satisfactorily completed line and competency checks in March and April 1967 respectively and he was assessed by his company as a high average co-pilot.

1.6 Aircraft information

The aircraft was manufactured by Vickers Armstrongs (Aircraft) Ltd., Weybridge, and was registered in the Republic of Ireland on 14 June 1958 in the name of its present owner. Its certificate of airworthiness in the transport of passengers category was last renewed on 4 June 1967, and it had been maintained in accordance with an approved maintenance schedule; it had flown 214 hours since its last periodic inspection and 18 375 hours since new. Its weight at the time of the accident was approximately 23 505 kg; the balance chart shows it was loaded correctly with the centre of gravity in mid-range. The maximum certificated landing weight was 26 989 kg and there was no weight restriction for landing at Lulsgate.

There were no apparent defects in the aircraft, its instruments, engines, or systems before the accident.

1.7 Meteorological information

Synoptic situation

On the morning of the accident, a depression over the North Sea was slow moving and with high pressure to the west of Ireland a mainly northerly airstream was over the Irish Sea. Over the southern half of England pressure was slack and the airstream slow-moving; winds at 2 000 ft were northerly, 15 to 20 kt in the west becoming 5 to 10 kt in the east.

Weather

Visibility was 30 km gradually reducing eastwards to 5 km east of Cardiff; inland over England fog was widespread but clearing. In the west there was 2/8 to 5/8 cumulus cloud, base 1 200 to 1 500 ft with tops 10 000 to 12 000 ft with isolated showers, but towards Cardiff and eastwards cloud becoming 1/8 to 3/8 stratocumulus, base 3 000 to 4 000 ft. Freezing level was 6 000 ft.

Local weather conditions

An appraisal of weather conditions in the Somerset-Gloucester area, made subsequent to the accident by the Meteorological Office, showed the following:

> "At 0600 hours, fog was patchy over the area with visibilities between 700 m and 2.8 km being reported. Wind was calm or light northerly with variable 1/8 to 5/8 cloud. By 0700 hours, fog had thickened and visibility was generally 300 to 900 m on low ground with some thicker patches of 100 m. By 0800 hours, fog was clearing though thick patches

still persisted over low ground in Somerset; visibilities were improving towards 2 km and the wind picking up to 5 kt from the NNW. Some slight drifting of the thicker fog patches would be likely over ground exposed to the north and northwest, also as the fog lifted from the valleys to higher ground before clearing. Around Bristol Airport area at the time of the accident (0759 hours), reports indicate that visibility was mainly around 1 000 m but thicker patches were likely in nearby valleys and these patches were in the process of clearing. The amount of wind shear on the approach was unlikely to be significant. The pressure gradient was slack with the wind at 2 000 ft around 350° 10 kt and a temperature of plus 7° centigrade. The vertical temperature distribution showed a maximum temperature of about plus 10° centigrade at about 700 ft AMSL with an inversion below that level. The fog would have been maintained within the inversion and fog near the airport would have been shallow. The maximum temperature difference through the inversion would have been about 5° but at the time of the accident might have been less."

Observations by Lulsgate ATC

The following conditions were observed by air traffic control officers at Lulsgate during the 34-minute period preceding the accident:

Time	Observations and remarks
0725 hours	Visibility 1 500 m with the sun tending to disperse cloud and mist, cloud 3/8 at 1 000 ft, 3/8 at 3 000 ft, wind northerly at 5 to 6 kt. (Passed to aircraft at 0726 hours)
0740 hours	Visibility 2 km, 2/8 cloud at 1 000 ft, surface wind 010/06 kt.
0745 to 0752 hours	Visibility 1 800 m (passed to aircraft 0752 hours)
0755 hours	Visibility varying between 1 187 and 1 647 m, the lowest visibility of 1 097 m was also assessed at this time but was recorded at about 0757 hours for routine transmission to the parent meteorological office. (Visibility of 1 200 m with a deterioration warning was passed to aircraft at approximately 0757 hours)
0759 hours	According to air traffic control, visibility did not reduce significantly from the lowest assessment of 1 097 m; when the aircraft crashed its rudder could be clearly seen from the control tower, about 900 m distant, and visibility reference points at 950 and 1 000 m were both in view. Another ATC officer observed the aircraft during its final approach heading towards the control tower, at about $\frac{1}{2}$ - $\frac{3}{4}$ mile range.

Ground level eyewitnesses

A witness located to the right of the approach centre line and about 400 m from the beginning of the runway said that, at the time of the accident, there was thick fog which reduced visibility in that position to less than 50 yd. Patches of fog were also observed on the main Bristol-Lulsgate road (A38) about 20 minutes before the accident. Two ground level eyewitnesses on the aerodrome assessed the visibility at less than 1 000 m across the aerodrome at approximately right angles to the aircraft's landing path.

Measurement of Runway Visual Range (RVR) and visibility

Runway visual range is measured at Lulsgate when the visibility falls below 1 100 m. According to air traffic control, Lulsgate, it takes approximately 10 minutes to position an observer on the aerodrome and obtain an RVR reading; in this instance, the deterioration from 1 800 m (0752) to 1 097 m (0755) was so rapid it was not possible to obtain an RVR reading before the aircraft landed; had the aircraft overshot, it would have been possible to do so before a second approach was made.

Visibilities above 1 100 m are assessed by reference to landmarks and buildings of known distances from the control tower; these distances were agreed with the parent meteorological station (Glamorgan) and are checked annually. There is, however, some difficulty in assessing visibilities between 1 000 and 1 500 m across the aerodrome because of an insufficiency of prominent features. On the aerodrome there are two hangars, one at 950 m and the other at 1 000 m; visibilities greater than 1 000 m and less than 1 500 m can only be estimated. The first two reference points bear roughly west and south-west from the control tower and are to the right and left of runway 28; a third point, 1 500 m distant, bears roughly north-east from the control tower. It is therefore difficult to decide precisely when an RVR reading becomes necessary.

According to ATC Lulsgate, both the 950-metre and 1 000-metre points were clearly visible from the control tower whilst the aircraft was approaching to land.

1.8 Aids to navigation

Ground aids

The ground navigational aid relevant to the aircraft's approach to runway 28 was a Plessey 424 radar with dual head presentation, one of which was awaiting modification was not in operation. Because there was no back-up capability, the installation was promulgated as unserviceable in a Class I NOTAM (Notices to Airmen) on 23 August 1967. This notification was received by Shannon Aeronautical Information Service (AIS) and, on 24 August, it was included in a bulletin of pre-flight navigational warnings which are issued, together with any daily amendments, by the Department of Transport and Power AIS Briefing Unit at Dublin Airport. The unserviceable status of Bristol radar continued to be published in the daily amendment sheet until 27 August, when it was withdrawn on the advice of Aer Lingus aircrew because they gained the impression, through usage, that Bristol radar would in fact be available if required. Since Aer Lingus at Dublin were the only users of Bristol NOTAM information, the NOTAM entry on the bulletin was withdrawn in order to avoid confusion. Briefing officers were aware that the facility would be made available and it was customary for them to query the serviceability state of Bristol radar by telephone or telex, when enquiring about the weather, before briefing the crews and despatching their aircraft.

The equipment was flight checked shortly after the accident by the Civil Aviation Flying Unit and their inspection revealed no gross error in azimuth for the approach to runway 28, but the range error at one nautical mile from touchdown point on this runway was 76 ft outside the tolerance of ± 484 ft which is applied by the Board of Trade to its own installations. Bristol radar is not subject to this ruling as it is privately owned and operated by the Municipal authority.

Airborne aids

The aircraft was equipped with:

Collins Integrated Flight System
Twin VHF communication transmitter/receiver
H/F transmitter/receiver
Twin VHF navigation receivers and omnibearing selector
Twin ADF receivers
Twin RMI
Marker beacon receivers
Transponder

Maps and charts

The crew were in possession of the appropriate maps, radio navigation charts and airfield approach charts. Company weather minima for the various let-down and instrument approach procedures are printed on the relevant approach charts.

Operations manual

An operations manual, issued on the authority of the Flight Operation Manager of Aer Lingus, was carried in the aircraft; it contained, inter alia, instructions and guidance with regard to approaching to land under instrument meteorological conditions. The following extracts from the manual are considered relevant:

(a) "Critical Height: That height above aerodrome level at which the the captain must break off his approach, unless he is satisfied that he has established his position and can continue the approach and landing solely by reference to the runway threshold, runway lighting or approach lighting, and without further reference to non-visual aids."

(b) "Critical Height Related to ILS or Radar Approach: The aircraft will not maintain critical height in an endeavour to pick up the lead-in lights, or in an endeavour to line up subsequently with the runway. If an aircraft is not in a position to land after reaching critical height OVERSHOOT ACTION SHOULD BE TAKEN."

(c) "General Policy: At an airport where the visibility or cloud base is reported to be less than the company minima, an approach shall not be continued below critical height unless, when reaching critical height, the captain is satisfied that the reported visibility or cloud is inaccurate and that he has adequate slant visibility to complete the approach and landing, visually, in safety. In this context, "adequate slant visibility" may be defined as a figure at least equivalent to the minimum runway visual range for the runway in question. Captains should

bear in mind that slant visibility under certain conditions of ground fog may suddenly decrease close to the ground. An exception to this occurs when the visibility, passed to the aircraft, is in the form of an RVR. In this case, captains must not descend (except in an emergency) below critical height, unless the last RVR received is equal to or greater than the visibility minimum listed for the particular let-down."

The manual also contained a temporary revision (No. 8/67) which deals with landing minima for French airfields and the procedure to be adopted if meteorological conditions, on arrival, are reported to be slightly below company minima. In a table related to a situation where RVR or meteorological visibility deteriorate below company minima when below critical height, the stipulated action is "Break off approach procedure immediately unless it is considered that this manoeuvre is less safe than continuing the approach."

There were no specific instructions in the Viscount Operations Manual to cater for a situation during an approach to any other airfield when visual contact is lost below critical height, except for that which could be applied in the foregoing sub-paragraph (b), but the meaning of its last sentence is not clear.

1.9 Communications

Communication between the aircraft and air traffic control was entirely satisfactory; speech recording equipment was in use and a transcript was compiled of all radio messages which passed between the aircraft, London airways and Bristol (Lulsgate) ATC.

1.10 Aerodrome and ground facilities

Runway 28 is 1 600 m long and 46 m wide; it has a slight uphill gradient and its published elevation is 620 ft AMSL. The landing threshold is displaced approximately 100 m from the beginning of the paved surface. Seven centre line high intensity approach lights, with one cross-bar, extending 410 m from the beginning of the runway are installed on the approach and these were switched on and serviceable. The runway threshold is marked by green omnidirectional wing bar lights which were on and serviceable. Runway lighting is elevated high intensity and was switched to a top setting at the time of the accident. A single system VASI (visual approach slope indicator) is installed and was switched on and serviceable. All lighting installations were checked by the duty technician during the previous evening. Routine checks of VHF communication channels, Radar (Plessey 424), NDB and VDF installations were made during the early hours of the morning of the accident, all of which were serviceable.

1.11 Flight recorders

No flight recorder fitted.

1.12 Wreckage

Inspection at the scene of the accident showed the aircraft first struck the surface of runway 28 with the starboard wing tip at a point 19 ft 6 in to the left of the runway centre line, and 483 ft from the displaced threshold. At the same time, No. 4 propeller made contact with the ground as evidenced by 44 blade slash marks equally spaced at 33-inch intervals; paint and marks on the runway surface indicated progressive flattening of the blade contacts towards the end of the slash mark sequence. The aircraft subsequently touched down on the runway on all wheels 384 ft beyond the point where initial contact was made by the wing tip. Examination of tire marks on the runway surface showed the nose wheel

tire contact to be 3 ft 6 in to the right of the starboard main gear tire marks, thus indicating considerable drift to port at touchdown. The tire marks continued for approximately 400 ft veering to the right across the runway; they ceased as they neared the right-hand edge. The aircraft then became airborne for about 600 ft and passed over the area of grass until the starboard wing tip dug into the ground just before the edge of the upwind section of runway 34. The aircraft then slid along the surface of runway 34, ground-looping to the right; Nos. 3 and 4 propellers made heavy contact gouging the tarmac surface. The aircraft came to rest in a field 300 ft from the end of the runway, having crashed tail first through the aerodrome boundary fence. In penetrating the fence, the starboard wing was severely damaged by impact with a tree stump and the starboard tip section was torn off. The starboard outer fuel bag had torn open and there was considerable spillage of kerosene.

The fuselage was severely distorted and torn open on the starboard side between the wing root fillet and the rear entrance door. The passenger cabin floor was badly buckled but no seats were detached although parts of the floor, and the seats alongside the port windows, were pushed upwards. The safety belts were undamaged. A removable bulkhead by the port side rear entrance door, on the aft face of which was a folding seat which had been occupied by an air hostess, had collapsed rearwards. The undercarriage main gear was retracted and the nose gear was approximately three-quarters retracted; the nose wheel doors had jammed due to structural distortion. Port and starboard wing flaps, with the exception of the starboard outer section, were almost completely destroyed during the collision with the fence; the flap selector lever was set at 20°. All flying controls and their associated circuits were serviceable except for damage caused by ground impact. The condition of all propeller units, as apparent on external inspection, was consistent with them being driven under a degree of power at the time of impact; No. 2 propeller complete with reduction gear, had torn off during the latter part of the ground slide.

Because of the reported sub-normal acceleration during the attempted overshoot, Nos. 3 and 4 engines and propellers were subjected to detailed strip examination.

Calculations based on an assumed forward speed of 107 kt (target threshold speed for weight) indicated that No. 4 propeller was functioning within its normal range of pitch angle commensurate with an engine rpm of about 10 600 at the time of the first impact with runway 28. Strip inspection revealed that No. 4 propeller blades had almost achieved a feathered angle during the ground slide on runway 34; nothing untoward was found in No. 4 propeller control system which could have prevented normal operation. The change in pitch angle which apparently occurred between the initial and subsequent impacts cannot be fully explained but, as No. 4 propeller had no known defects and was operating normally before it struck runway 28, it would be reasonable to suppose that twisting and bending forces, together with the rapid opening of the throttles during the attempted overshoot, might well have resulted in spurious signals which caused the blade angle to coarsen.

Detailed examination of both starboard engines revealed no evidence of pre-crash failure and, with the exception of No. 4 engine, all damage was consistent with impact. In No. 4 engine, one high pressure turbine blade had failed with very slight secondary damage to the nozzle box but the condition of the failed blade indicated that the engine had run for some hours since the failure.

1.13 Fire

There was no fire. No. 1 engine fire extinguisher did not discharge because its associated inertia switches had not operated. Nos. 2, 3 and 4 engine fire extinguishers had operated.

1.14 Survival aspects

All passengers and cabin staff were strapped in for landing and injuries were confined to passengers seated in the last four rows of seats and the cabin staff. The latter had occupied two rearward-facing occasional seats attached to the aft side of two removable bulkheads, one of which was torn loose during the rearwards retardation. The injuries sustained resulted from the apparently greater side forces generated in the after cabin than those which existed over the wing or in the forward section of the fuselage. The majority of the injuries were due to sudden contact with seat arm rests, window frames and side structure as the aircraft struck the ground and ground-looped during its crash landing. Although the fuselage skin ruptured alongside a row of seats, no one was injured through contact with the jagged edges of the exposed torn metal.

Two pallet loads of freight, 59 and 565 kg respectively, which were stowed in the front compartment, remained securely lashed down.

1.15 Tests and research

None.

2.- Analysis and Conclusions

2.1 Analysis

When the radar controller completed his talk-down the aircraft was half a mile from touchdown; he was aware that the aircraft was ill-positioned for a landing and he rightly advised it to overshoot if the runway was not in sight. On seeing the approach lights ahead and to his left, the commander attempted to regain the centre line by making an "S" turn side-step manoeuvre which, according to the evidence, was commenced from a lateral displacement of between 60 and 150 m to the right of the approach centre line when the aircraft was less than 1 000 m from the runway threshold; such a manoeuvre is not easily completed when so close to the runway. Tests carried out on transport aircraft, which included the Viscount, at the RAE in 1955 and 1956 (Aeronautical Research Council R & M No. 3347, HMSO, 1964), showed that 12 to 18 seconds are required to complete this manoeuvre if commenced 1 800 m from the runway, assuming the runway to be in sight throughout the manoeuvre, which was not so in this instance. It would, nonetheless, seem that on reaching critical height and observing the approach lights on his left, the commander was satisfied "that he had established his position and could continue his approach and landing solely by reference to the runway .... or approach lighting" (Aer Lingus Operations Manual); but when he lost contact with the approach lights during this final phase, it would have been a prudent act of airmanship for him to have discontinued the approach.

The Aer Lingus Operations Manual does not specify what action the commander should take when visual reference is lost below critical height. This is universally recognised as a difficult situation, but due to the large number of factors involved it is not practicable to provide specific instructions or positive guidance to meet every case. Hence, the aircraft commander, in the full knowledge of the manoeuvre to which he is already committed, has to assess any other factors pertinent to the particular situation and act accordingly. On this occasion, in retrospect, it is felt that the commander made a mistake in attempting to correct his lateral displacement when so close to the runway threshold without being able to see the runway or its lighting. Failure to overshoot at this juncture, or later, when the approach lights were obscured, did not, in itself, cause the accident but it led to a situation which could well have been avoided had the approach been discontinued.

The commander continued the approach, descending without proper visual guidance, in the belief that the runway would shortly appear ahead because he had been very recently informed that visibility was 1 200 m. Visibility on the aerodrome was not in fact significantly less but there was an unobserved patch of shallow fog lying on the approach to runway 28 near the aerodrome boundary and there is reason to believe this obscured the approach lights, and probably the runway lights, as the aircraft approached the aerodrome boundary.

When the runway came into view the aircraft was not in a position to land; it was at an angle to the runway heading, passing over the left-hand side and at flare-out height. Whilst attempting to re-position to the centre of the runway, the starboard wing tip and No. 4 propeller struck the surface - a situation which could have been avoided had overshoot action been taken, even at that late stage, instead of attempting a further correction at a height which was too low to permit the safe application of bank.

It appears likely that when No. 4 propeller struck the runway, it was damaged to a degree which seriously reduced its propulsive capability; in overshooting at or below 100 kt and with full power selected on the remaining engines, directional control of the aircraft was probably impaired as well as performance. As may be seen from the reconstructed path (Figures 1 and 2), after striking the runway the aircraft was probably yawing and, banking gently to the right under the influence of asymmetric power or as the result of imbalance created by the initial impact with the runway. Had the decision to crash-land been deferred for but a brief period, the consequences might well have been disastrous.

2.2 Conclusions

(a) Findings

The aircraft was airworthy and correctly loaded.

The crew were properly licensed.

There were no pre-crash defects in the aircraft, its related equipment or propulsive systems.

Flight inspection of the Plessey 424 radar installation at Lulsgate revealed no significant errors in azimuth and only a small error in range at one mile from touchdown.

The commander continued the approach when visual guidance became obscured below critical height.

A crash landing became necessary during an attempted overshoot after the aircraft had touched the ground and sustained damage during a turn at a low height.

(b) Causes or Probable cause(s)

The accident was caused by an attempt to align the aircraft with the runway at too low a height following the commander's incorrect decision to continue the approach when visual guidance became obscured below critical height.

Scheduled international
Landing - go-around
Wing tip landing
Pilot - continued IFR below minima

ICAO Ref: AR/076/67

ACCIDENT TO VICKERS VISCOUNT 808, EI-AKK, OF AER LINGUS INTERNATIONAL AIRLINES LTD. AT BRISTOL (LULSGATE) AIRPORT, ENGLAND, ON 21 SEPTEMBER 1967

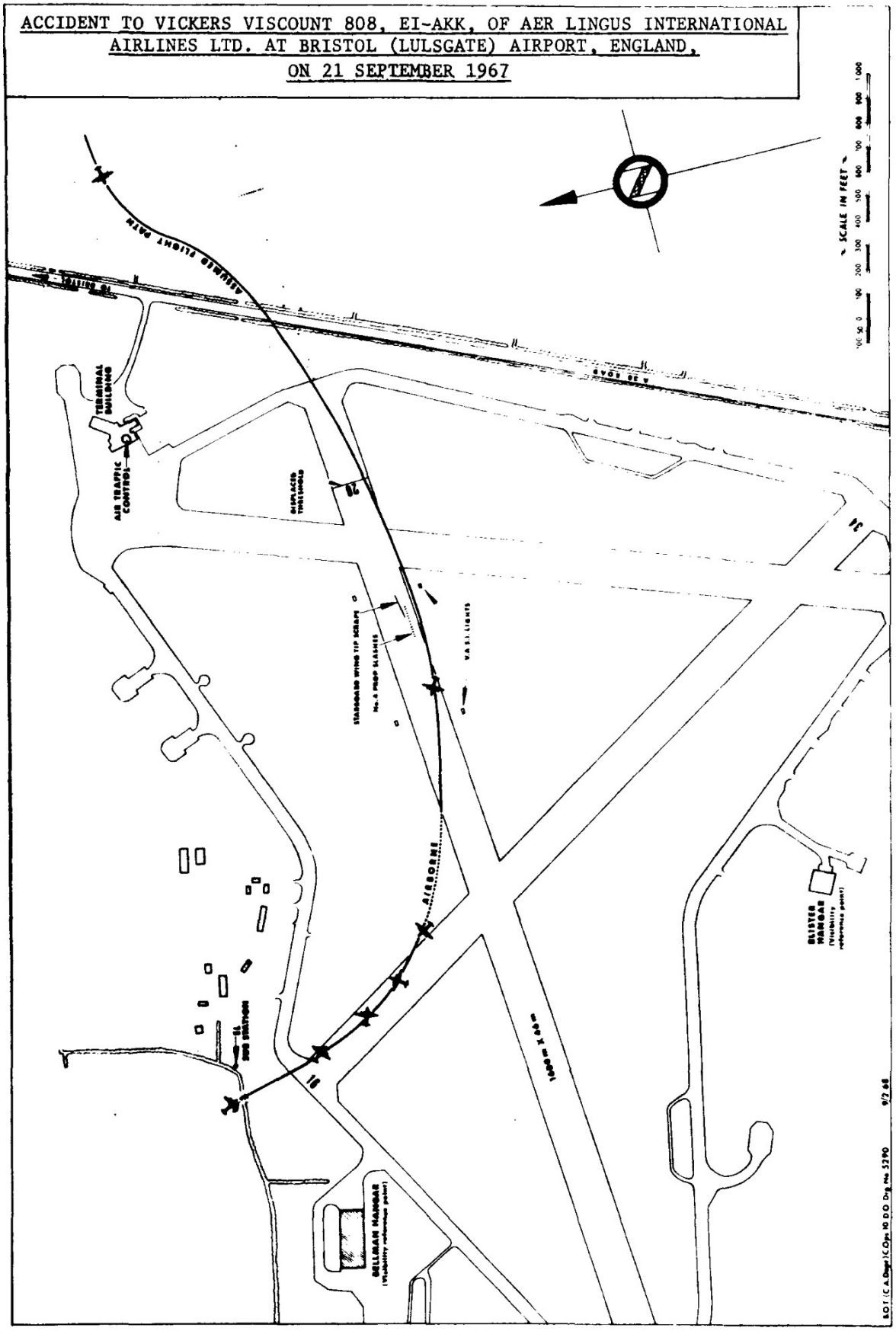

Fig. 22-1

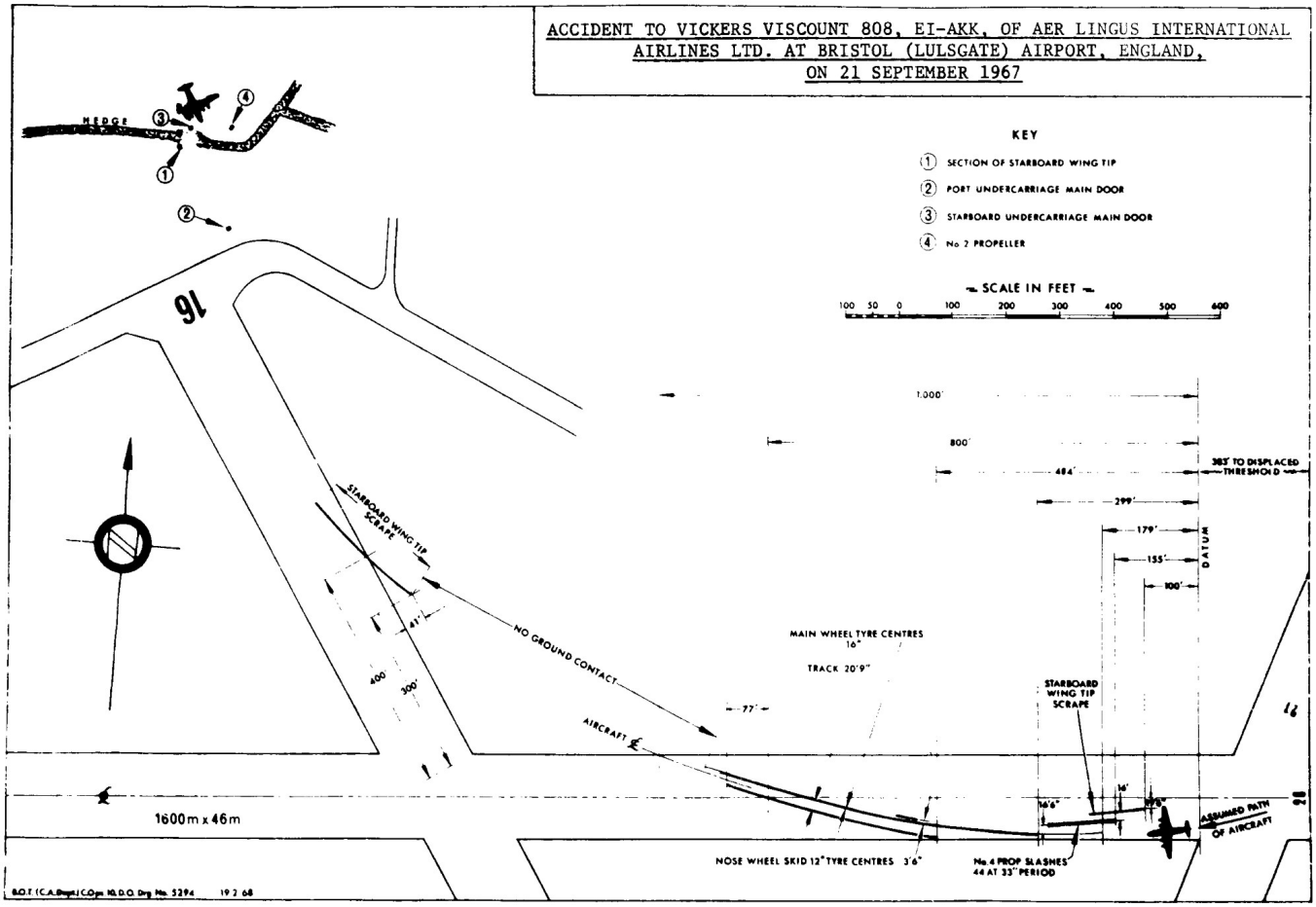
ACCIDENT TO VICKERS VISCOUNT 808, EI-AKK, OF AER LINGUS INTERNATIONAL AIRLINES LTD. AT BRISTOL (LULSGATE) AIRPORT, ENGLAND, ON 21 SEPTEMBER 1967
KEY
1 SECTION OF STARBOARD WING TIP
2 PORT UNDERCARRIAGE MAIN DOOR
3 STARBOARD UNDERCARRIAGE MAIN DOOR
4 No 2 PROPELLER
SCALE IN FEET
100 50 0 100 200 300 400 500 600
HEDGE
16
1,000'
800'
484'
383' TO DISPLACED THRESHOLD
299'
179'
155'
100'
DATUM
STARBOARD WING TIP SCRAPE
NO GROUND CONTACT
AIRCRAFT
MAIN WHEEL TYRE CENTRES 16'
TRACK 20'9"
77'
400
300'
STARBOARD WING TIP SCRAPE
16'6"
16'
9'6"
ASSUMED PATH OF AIRCRAFT
1600m x 46m
NOSE WHEEL SKID 12"TYRE CENTRES 3'6"
No 4 PROP SLASHES 44 AT 33" PERIOD
B.O.T. (C.A. Dept.) C.O. pn. M.D.D. Drg No. 5294 19 2 68

Fig. 22-2