JABATAN PENERBANGAN AWAM

AIRCRAFT TYPE & REGISTRATION	:	PIPER PA28-180 9M-ASK
ENGINE	:	AVCO LYCOMING O-360A4A
REGISTERED OWNER	:	MR. M.K. GRAHAM SABAH FLYING CLUB KOTA KINABALU
CREW	:	AIRCRAFT COMMANDER - FATAL
PASSENGERS	:	NONE
PLACE OF ACCIDENT	:	PRIVATE AIRSTRIP, SABAH PALM ESTATE APPROX 177°22'E 5°97'N
DATE AND TIME	:	6TH FEBRUARY 1982, BETWEEN 16.00 AND 17.00 LT.

SUMMARY

The aircraft was operating between the airstrips on the two adjacent palm oil estates of Sabah Palm & Palmol. On take-off from Sabah Palm the aircraft apparently stalled and descended inverted into a section of oil palm.

The Report concludes that the probable cause of the accident was an attempt to avoid contact with the oil palm following a swing on take-off from a soft and wet runway.

1. INVESTIGATION

1.1 History of the flight (all times local)

The aircraft commander was a medical practicioner resident in Sandakan, who had held appointments for several years as the visiting doctor for the Palmol and Sabah Palm estates, both having airstrips which are about 10 km apart. At the time of the accident, the aircraft was taking-off for Palmol after a routine visit to Sabah Palm.

The aircraft departed from Sandakan at 14.06 on 6th February 1982, the last ATC communication being a call at 14.28 estimating landing at Sabah Palm in five minutes. A witness confirms the aircraft landed in an easterly direction after a downwind approach to a left base leg. As no notice of arrival had been given, the aircraft was not met and the pilot eventually obtained a ride to the estate office from a passing motor cyclist.

At about 15.20, transport was requested back to the airstrip; depending on exigent circumstances, it was the pilot's routine to make a night-stop at one or other of the estates.

The evidence of the estate driver establishes that the pilot completed a pre-flight inspection of the aircraft and airstrip and initially decided to stop at Sabah Palm for the night; he then changed his mind and decided to proceed to Palmol.

There are no witnesses' to the actual crash but three people, including the estate driver, watched the take-off. All agree that the aircraft swung to the left during the take-off run and oscillated in pitch or roll or both before disappearing from sight over a section of oil palm which forms the left boundary of the airstrip. Similarly, there is agreement that the crash occurred immediately after take-off and the engine could be heard until impact.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	1	N/A	N/A
Other	N/A	N/A	N/A

1.3 Damage to aircraft

Extensive damage from impact destroyed the fuselage forward of the rear seats and the mainplanes were distorted from inertia loads, with some secondary damage from oil palm and contact with the ground.

1.4 Other Damage - Broken fronds on several oil palms.

1.5 Crew information

Pilot	:	Age 43 years
Licence	:	Malaysian PPL No. 2170 and UK PPL 25720A
R/T Licence	:	Issued 2/7/81
Aircraft ratings	:	Landplanes Group 'A'
Medical examination	:	22/5/81
Total flying hours	:	72 hrs 30 approx
Flying hours on type as Pl	:	7 hrs 20 approx

Before obtaining a PPL, the pilot had flown as a passenger to Sabah Palm and Palmol on many occasions.

The pilot had flown for 12 hours in Sabah as a student between 1970 and 1977. In April and May 1981 he attended a PPL course in the United Kingdom, passing the appropriate aircraft rating examination on 8th May 1981, total hours on the course being 44 hours 05 with time to go solo 23 hrs 30.

After return to Sabah he obtained a further 3 hrs 35 experience in August 1981 on the PA28-180. His instructor was of the opinion that the candidate was rather 'rusty' and needed to practice further exercises in the vicinity of an airfield; he also considered that route checks were required before clearance could be given to operate to short fields such as Palmol, Sabah Palm and Mostyn. A further one hours experience was gained followed by dual short field practice at Kuala Penyu; clearance was then given for operation to that particular airstrip only.

There is no evidence that supervised route experience to Palmol, Sabah Palm or Mostyn was gained before the accident.

1.6 Aircraft information

The PA28-180 is a single engine low wing monoplane with fixed landing gear, powered by a 180 HP Lycoming horizontally opposed engines.

Manufacturer	:	Piper Aircraft Corporation
Date of manufacture	:	1973
Certificate of Airworthiness	:	No.M.140, valid to 5/11/82
Certificates of Maintenance		
A/C	:	Valid until 13/3/82 or 2716 hrs 55
R	:	Valid until 22/10/82
Total time flown	:	2640 hrs 40

The aircraft records were examined and all mandatory requirements were found to be in compliance. There was no record of any problems with the braking system

which could have had a bearing on the swing during the take-off run.

1.6.1 Aircraft loading

The aircraft was last weighed on 25th May 1978, the basic weight and index being recorded as 1567 lbs and 87.2" respectively. Using these figures, the total fuel recorded in the technical log and estimated weights for pilot and baggage, take-off weight was calculated as 2006 lbs with a C.G. position of 87.89" aft of datum. The approved limitations are 2450 lbs MTOW and CG limits between 82" and 93" aft of datum; the loading was thus within limits.

1.7 Meteorology

The official forecast for the area within a 50 miles radius of Sandakan issued on 6th February 1982 at 06.00 hours (valid for twelve hours) was:

Wind	:	1000' 020°/10 knots
	:	3000' 010°/10 knots
	:	5000' 040°/ 5 knots
Weather	:	Tempo from 06.00 to 10.00 hours - Moderate rain
Surface visibility	:	7 km
Cloud	:	1/8 cb base 1400' tops 30000' 5/8 sc base 2000' tops 6000'

There was a heavy rainstorm about half an hour before the aircraft landed. At take-off, the sky was overcast but it was not raining and the visibility was about 8 kilometres.

Actual measured rainfall figures in millimetres in the area for the period in question was as follows:

	1.8 Km NE of airstrip	2.8 Km NNW of airstrip	5.9 Km NNE of airstrip
31/1	-	2.0	0.2
1/2	1.0	-	-
2/2	-	-	-
3/2	5.9	8.3	4.0
4/2	13.2	9.8	16.9
5/2	6.35	6.2	9.0
6/2 7/2	17.5	6.6	7.1

There was only a small amount of rain after the accident and before the accident site investigation was made.

1.8 Aids to navigation - Not relevant to the accident

1.9 Communications

No calls were recorded by Sandakan ATC before take-off and it is unlikely that any were made, as a successful transmission would probably not have been possible until the aircraft was airborne.

1.10 Accident site

The airstrip at Sabah Palm is approximately 1870 feet long, with an average width of 65 feet, on a heading of 047°/227°. The surface has a variable texture, with some areas reinforced with gravel, the remainder being grass. Parallel with the full length of the eastern side of the strip and approximately 90 feet from the edge of the runway is a block of established oil palm some 40 to 50 feet high, with a strip of rough ground in between.

When inspected one and a half days after the accident the surface was found to be extremely wet in places, with a value of probably Delta to Echo on the Civil Department scale (see Appendix 'A') in the two worst places in the section of the runway under consideration. It was obvious that the surface has been used frequently by vehicles and it was only with difficulty that the relevant landing and take-off wheel marks could be identified.

The take-off marks ran for approximately 1100 feet, starting from a point slightly to the left of centre and then curving towards the left hand, eastern, edge of the strip to give a heading divergence of between 20° and 30° from runway centreline. From the estimated take-off point to the edge of the oil palm on the divergent heading is a distance of approximately 190 feet, with the point of impact somewhat further again amongst the palms.

A few broken branches were found in the oil palm, with a possible impact mark on one trunk.

1.11 Flight Recorders - Not fitted or required.

1.12 Wreckage

The wreckage was found on a heading of approximately 240° in an inverted wings level position with the belly skin at an angle of about 20° from the vertical. Extensive impact damage had distorted the forward fuselage, the engine and mountings having folded up (in the true sense) and back to force the instrument panel back into the front seats.

Both mainplanes had pivoted forward as a result of inertia forces, but only the starboard wing tip had actually contacted the ground. A large, smooth, dent was found just inboard of the starboard wing fairing; the orientation was such that it could only have been made with the aircraft inverted and the

dimensions were consistent with contact with the trunk of an oil palm. The mainwheels were free to turn with no apparent damage to the brakes. Pieces of oil palm leaves were found jammed in the rudder/vertical stabiliser intersection and the rudder tip was severely distorted to port; it was considered that the damage could only have occurred with the aircraft inverted.

The pilot's seat belt anchorages were intact; the lap straps had been cut and the diagonal strap was not connected.

1.12.1 Systems

Due to impact damage it was not possible to move any of the controls except elevator trim but an end to end inspection of the control runs revealed no evidence of any pre-existing failure. The elevator trim was set slightly aft of neutral and the flaps were selected to the 25° (second notch) position.

Both fuel tanks contained a considerable quantity of fuel, with the port tank selected and fuel was found in the firewall strainer.

Impact forces would not have been sufficiently high to provide reliable evidence of illumination of any warning lights from filament examination.

1.12.2 Power plant

There was very little distortion to the propeller and the appearance of the spark plugs was normal. Engine controls had suffered considerable damage, but the mixture control was still free and was found midway between 'lean' and 'rich'; the magneto switch was selected to 'both'.

The tachometer pointer was found jammed at 2600 rpm (2700 maximum rpm limitation) as a result of impact damage to the case; the instrument, which is of the drag-cup type, was disassembled and the pointer returned to zero under it's own spring action when the distortion was relieved.

1.12.3 Flight instruments, switch selections and radio

Airspeed indicator	Zero
Altimeter	-100' on 29.78" Hg
Air conditioner	OFF
Battery	ON
Alternator	ON
VHF communications	121.47 Mhz
VHF navigation	113.05 Mhz
ADF	340 Kcs

1.13 Fire - Not applicable

1.14 Medical and pathological information

The cause of death was asphyxia secondary to fractured ribs and contused lungs.

1.15 Survival

Although the pilot was reported to be alive immediately after the accident he was dead when examined by a medical officer after evacuation to Sandakan Airport by helicopter. The Principal Medical Officer for the area considers that the accident was non-survivable; the absence of any on-site crash rescue equipment is thus immaterial.

The estate driver went immediately to the accident site and realised that equipment was necessary to extricate the pilot from the wreckage. This had to be obtained from the oil mill on the estate, which took some time, together with collection of the estate dresser to give first aid.

Witnesses' confirm that only the lap straps were fastened although the fact that the diagonal strap was not utilised would not have prevented the injuries which were the cause of death.

1.16 Tests and research

As the aircraft was operating on a private flight, there was no obligation for the airfield performance requirements of the Air Navigation Order to be complied with.

The aircraft Owners Handbook contains no data for operation of the aircraft from wet grass airfields, performance information being related to hard dry surfaces. The aircraft manufacturer confirmed that no other measured data was published and provided the following information:

GIVEN CONDITIONS: Known aircraft configuration, gross weight, estimated density altitude of 1500 feet, take-off speed of 43-52 knots, zero wind, hard dry surface:

Take-off run	:	850 feet
Take-off distance	:	1875 feet

The manufacturer commented that using estimated corrections for short dry grass and a take-off weight of 2006 lbs, the following would apply:

Take-off and screen height speeds	:	reduction of 6 knots
Take-off run	:	603 feet
Take-off distance	:	1303 feet

The measured take-off run and the take-off distance to the effective 50 feet screen height of the oil palm were 1100 feet and 1300 feet respectively.

2. ANALYSIS AND CONCLUSIONS

2.1 Analysis

There is evidence that the pilot had doubts about taking-off, presumably as a result of his inspection of the condition of the airstrip.

Rainfall after the accident was such that the conditions seen during the site investigation were representative of those existing at the time of the accident.

It is not possible to form any accurate assessment of the aircraft speed at take-off. Nevertheless, the actual ground roll, taken together with the runway surface condition suggests that the acceleration was poor. Further evidence to this theory is contributed by the deep wheel marks in several places.

Theoretically, allowing for the safety margin in the estimated take-off distance required, it should have been possible for the aircraft to clear the oil palm. This assumes that the aircraft became airborne at the recommended speed.

In the actual event, the aircraft probably became airborne at a lower speed for reasons previously explained or because the pilot considered he was committed to a take-off as a result of the swing to the left towards the oil palm.

From an examination of the wreckage, it is clear that the aircraft struck the ground inverted at a steep pitch angle under power with the wings essentially level.

On the assumption that the aircraft was airborne below the recommended speed, the safety margin over the stall speed would have been eroded. A significant up elevator input in an attempt to clear the oil palm would have reduced the margin even further, probably to an incipient stall conditions.

Under these circumstances, a right roll input away from the obstruction would almost inevitably have produced a power-on stall. The characteristics of the aircraft are such that it would have stalled asymmetrically and flicked on it's back; recovery would have been impossible from such a low altitude.

2.2 Conclusions

(a) the pilot was properly licenced but inexperienced in operations from short airfields. He had not followed a recommendation from a qualified flying instructor that he should gain further supervised route experience of operations into nominated short airfields, including Sabah Palm.

(b) the aircraft had been maintained in accordance with a maintenance schedule approved by the Civil Aviation Department.

(c) loading was within the certificated weight and CG limits.

(d) there was no evidence of pre-crash failure of the aircraft, it's systems or the engine.

(e) the runway surface condition was marginal for operation.

(f) acceleration was poor and the aircraft swung during the take-off run as a result of the soft condition of the runway surface. The aircraft became airborne at a speed below that recommended; subsequent pitch and roll inputs in an endeavour to avoid collision with the oil palm resulted in a power-on stall, followed by the aircraft rolling on to it's back.

3. RECOMMENDATIONS

That the Civil Aviation Department ensures that candidates for Private Pilots Licences have been adequately trained on:

(a) the effect of the surface condition of the runway on the estimated take-off roll and distance figures given in aircraft owners manuals;

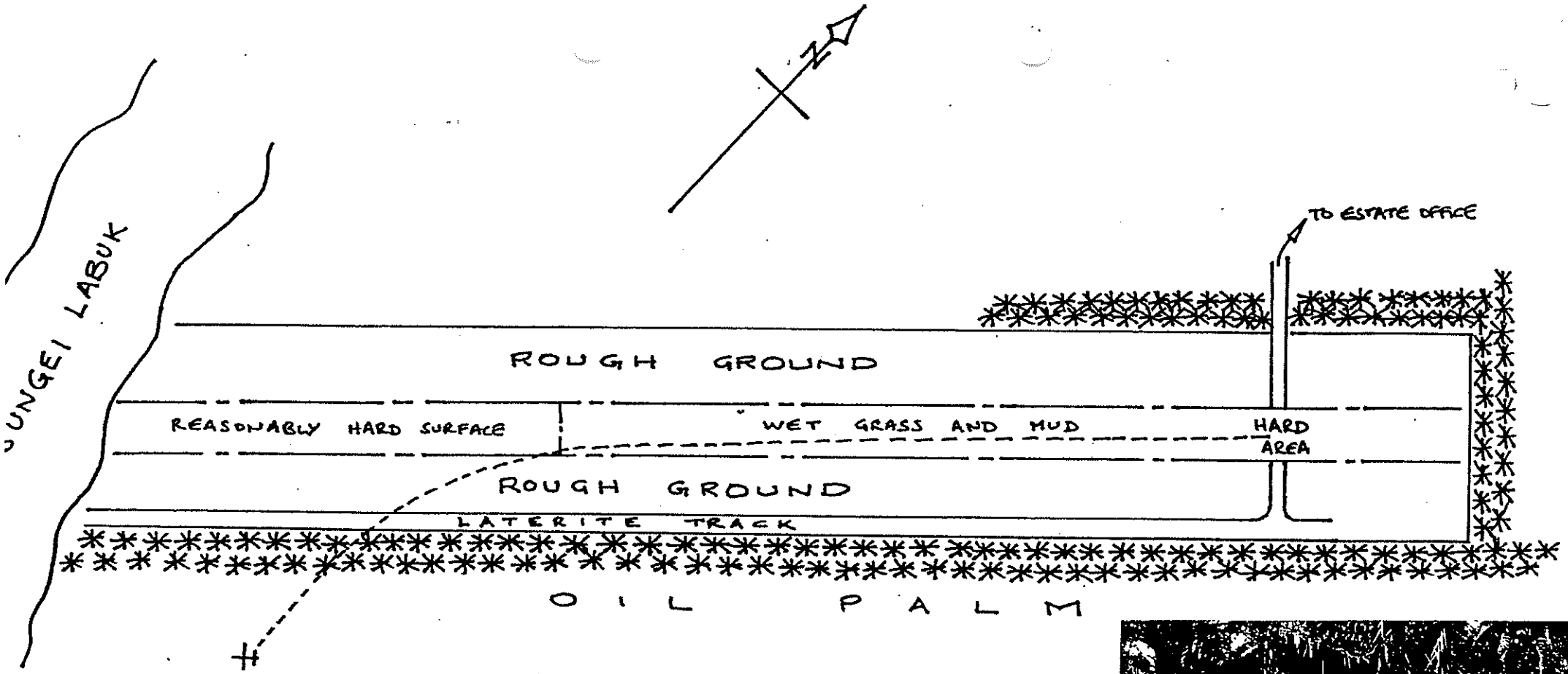
(b) the procedures to be followed when poor acceleration or a swing occurs during the take-off roll.

APPENDIX 'A'

CIVIL AVIATION DEPARTMENT

CLASSIFICATION OF RUNWAYS AND SURFACE CONDITIONS

CODE	CONDITION
ALPHA	Hard and dry
BRAVO	Hard but rain in the past 12 hours or heavy dew.
CHARLIE	Firm with soft patches
DELTA	Soft and wet
ECHO	Soft with surface water
FOXTROT	Flooded



SABAH PALM AIRSTRIP ~ NOT TO SCALE