

JABATAN PENERBANGAN AWAM MALAYSIA

PIPER CHEROKEE ACCIDENT AT ULU BERNAM.

Aircraft type and Registration : Piper Cherokee 180 9M-ASC.
Engine : Piston 180 BHP Lycoming O-360-A4A.
Registered Owner : Royal Selangor Flying Club.
Crew : Two.
Passengers : Two One with slight injury.
Cargo : Nil.
Place of accident : Ulu Bernam. At the treshold of runway 35 .
Date and time : 3rd. August, 1981 at approx 1320 GH (LT)

Synopsis.

The aircraft piloted by two crew and carrying two passengers took off from Ulu Bernam at 1317 hours (LT) for Subang. Ulu Bernam is a typical rural airstrip (grass) with a length of 1200 feet and is constructed over a very flat land about 19 feet above mean sea level. The airstrip is being maintained by Bernam Oil palm Ltd to service its requirement and at the same time provides an ideal airstrip for the training programme required by private and Club Operators. On the day of the accident, the observed weather around the airstrip was fair. There was no significant low cloud, wind was around 10 kts coming from the sea and the temperature recorded in Setiawan was 35°C. The first abnormal sign noticed by both pilots was the extra ordinary long take off run required. During the roll, both pilots observed that the aircraft acceleration was not normal. This could be clearly seen as the speed achieved was only 40 - 45 M.P.H. at half way point. At this juncture no action was taken to abort the flight. As they continued the take off, the aircraft was rotated at 50 M.P.H., 643 feet from the edge of the runway and got lifted off about 300 feet from the end of the runway. Since they were in a critical situation where they would run short of runway length the selection of the aircraft attitude was more than the critical angle of attack. There was no way that the aircraft could behave normally except to enter into a stall. Although the aircraft gained height to about 10 feet above the ground, it finally began to sink. In a stall, some of the primary controls were ineffective and because they were quite close to the ground, no positive recovery could be taken. The next moment the aircraft left wing tip struck the ground followed by other minor multiple strikes on the bushes which were about 6 feet fall. The initial impact on the left wing could have caused the left wing to be

completely detached and due to the presence of the bushes it helped to cushion the impact thus saving other parts of the aircraft from being severely damaged. Finally the aircraft skidded on the ground for about 23 feet before coming to a complete rest cocked 40° right of the take off direction.

INVESTIGATION.

1. History of the flight.

The Captain of the aircraft, being an instructor of the Royal Selangor Flying Club (RSFC) planned to fly from Sempang to Benta, Gua Musang, Ulu Bernam and Sempang. The flight was to consist of a cross country short strip familiarization check on Mr. Eric Baxendale who was also operating under category P1/US. This check ride was also part of the 3 monthly check, as Mr. Eric last flight on the Piper Cherokee was on the 25th. May, 1981. Following the standard Club practice, Mr. Eric Baxendale prepared the flight log, flight plan, and other ground preparation while the Instructor only exercised his supervision. The weight and loading of the aircraft was worked out before the flight and by using the charts provided in the briefing room (Club house), the all up weight and centre of gravity of the aircraft were found to be within limit. (However the Charts used by the pilots were found to be outdated as the basic weight of the aircraft had increased to 1600 lbs or an increment of 62 lbs. This resulted in a take off weight of 2468 lbs at Sempang whereby the maximum all up weight of the aircraft (2450 lb) had been inadvertently exceeded). Prior to take off, the Instructor briefed the pilot on the sortie and special emphasis was stressed on the Short field landing and take off technique on this particular type of aircraft.

The aircraft took off from Sempang with two passengers at 10:35 (LT) using zero flap setting and a rotate speed of 80 M.P.H. Although the take off was uneventful, the pilot did remark to the Instructor that the aircraft was tail heavy and the take off run was rather long. The sortie went smoothly as planned and landed at Benta at 1100 (LT) where one landing and take off were carried out. From Benta the aircraft proceeded to Gua Musang where a full stop landing was made. After about 15 mins. on the ground the aircraft took off again for Ulu Bernam. The take off at Gua Musang was made using Short take off technique where the flap was selected to 25 degrees and a rotate speed of 50 MPH was used. Approaching Ulu Bernam airstrip, the wind was observed to be from 200°/10 knots, thus R/W 17 was chosen for landing. The landing was normal and the aircraft stopped in about 2/3 rds the length

of the strip at 13.15 (LT). During back tracking for a take off using R/W 17, the pilots observed that the ground was slightly rutted and some loose newly mown grass was lying on the surface. The pilots did not consider this would cause a hazard to the take off as it was only about 150 feet long stretching from the edge of the runway 17 to the two markers.

Ulu Bernam, being a coastal airstrip had no significant low cloud below 2000 feet and wind was coming from the sea about $200^{\circ}/10$ knots. The weather was generally fair as the visibility was bad due to the haze and temperature was high approximately 35°C . This temperature was used ^{using} the _^ actual weather recorded in Setiawan at 1330 Lt as the actual weather information could not be obtained for Ulu Bernam. The actual temperature at Ulu Bernam could even be more as Ulu Bernam was less affected by the sea breeze due to its location. (Setiawan - 7 n.m. from the coast. Ulu Bernam - 20 NM. from the coast).

The pilot lined up the aircraft about 80 feet from the edge of the airstrip. Prior to the roll, engine check and pre take off vital actions were carried out. At this point, no discrepancy in the function of the engine, flight controls or other systems were reported. The pilots did not check the outside air temperature and the take off performance of the aircraft. The initial roll was sluggish as the aircraft rolled over the patch that stretched over 150 feet. Thinking that the pilot was unintentionally braking the aircraft the instructor reminded him to move his feet down. Passing the half way point the speed was only indicating 40 - 45 MPH. At this juncture, the pilots did not attempt to abort the take off as they still had about 850 feet to go. Throughout the roll the speed was fluctuating ± 5 MPH and the control column was moved forward to keep the nose wheel firm on the ground. The aircraft was rotated at about 50 - 55 MPH on the command of the instructor which was about 643 feet from the edge. As the aircraft was reluctant to lift off, both pilots had an uncomfortable feeling as they could not see the edge of runway and also the bushes which were about 6 feet tall. They were caught in a critical and tight situation as they had passed the point for safe aborting aggravated by a situation where they were close to the end of airstrip. Knowing that the end of the airstrip was nearing the pilots were apprehensive on whether they could get out of the situation. The attitude of the aircraft was further increased and finally the aircraft lifted off (about 300 feet from the edge and approximately 4 second from the point of rotation).

The attitude selected was strongly believed to have exceeded the critical angle of attack thus entering into a stall which caused a destruction in lift. This could be easily identified due to the illumination of the stall warning light. The aircraft gained height to about 10 feet and immediately began to sink. No positive recovery could be taken as the aircraft was close to the ground and some of the primary controls were ineffective.

The instructor fearing for the worse, took over controls. As nothing much could be done the left wing struck the soft ground followed by other multiple strikes on the bushes. The initial impact could have caused the wing to be completely detached and the presence of the bushes helped to prevent from being severely damaged. Just before the initial impact the left wing was slightly low (having an approximate bank of 18°). As the left wing was the advancing wing the shock absorbed by the wing tip was transmitted diagonally. This caused distortion at the roof of the trailing edge of the left wing. It was also felt that the aircraft was on 192° heading and while the aircraft was skidding the right horizontal stabilizer was hooked to an object which acted as a pivot point and caused the aircraft to cack to the right. It skidded on its belly for about 23 feet before coming to a complete rest cocked 40° right of the take off direction. The path taken by the aircraft after the initial impact, could not be accurately determined as the aircraft was salvaged and the bushes were cleared before the investigating team arrived. Immediately after the aircraft came to a stop, the Captain opened the door and switched off all switches and fuel cock. The occupant left the aircraft in an orderly and quiet manner.

1.2 Injuries to person - Mr. K.L. Sakraney had laceration on two of his knuckles.

1.3 Damage to Aircraft. - The left wing was detached from the fuselage and the left side of the fuselage at the wing to fuselage attachment was badly dented.

1.4 Other Damage. - A total area of 240sq. ft (mostly bushes) was damaged as a result of the accident.

1.5. Crew Information

Captain:	Age 30 years.
Licence:	CPL valid until 31st. January, 1982.
RT Rating:	Valid until 27th. January, 1982.
Aircraft Rating:	Group A PPL.

Medical certificate: Valid until 27 January, 1982.
Last Competency check: 24th. June, 1981.
Total flying hours: 43.15 with RSFC and 2800 hrs with TUDM.
Total hours on type: 11.10.
Pilot : Age 57 years.
Licence: PPL Group A valid until 28th. February, 1982.
RT Ratings: Valid until 30th. April, 1982.
Aircraft rating: Group A PPL.
Medical Certificate: Valid until 28th. February, 1982 (Holder
to wear spectacles which correc for Distant)
Last Competency check: 7th. June, 1981.
Total flying hours: 225:35.
Total hours on type 67:00.

1.6. AIRCRAFT INFORMATION.

Manufacturer : Piper Aircraft Cooperation, USA.
Date of Manufacture : 1972.
Registered Owner : Royal Selangor Flying Club.
Certificate Airworthiness: Transport Category (Passenger) Valid
until 16th. July, 1982.
Total Aircraft Hours : 4985-53.
Flying time since last
check: 33 hours 58 minutes.
Engine type : Avco Lycoming O-360-A4A.

1.7 Meteorological Information.

Due to the unavailability of a meteorological station in Ulu Bernam, the actual weather information could not be obtained . However, the actual weather recorded in Setiawan could be used to represent Ulu Bernam as the two locations are only 40 NM. apart. Generally the weather was fair due to reduced visibility (≥ 10 km) and high temperature. Being 7 nm inland Setiawan recorded 35°C at 1330 (Lt). Ulu Bernam, situated 20 nm from the coast could even experience a higher temperature as it was less affected by the sea breeze. A high temperature of 35°C would reduced the engine performance drastidally thus played a vital role in prolôging the point of lift off from resting position in the take off performance.

No significant low cloud was observed at the time of the accident. the : cloud existed at that moment were 2/8 CU 2200ft and 5/8 Ci 30,000ft. The wind was about 5 - 10kts and being part of the sea breeze it was coming

from 200° degrees. Ulu Bernam was believed to be having a QNH (Milibars) of 100%. Being situated on a very flat land and experiencing a very light wind the chances of having a strong gust or turbulence were not likely.

The pilots did not notice the actual temperature of Ulu Bernam as they failed to check the temperature indicator. Wind of about 10 knots coming from the seas was observed but the existence of gust or turbulence was not mentioned.

1.8. Aids to Navigation.

Not available.

1.9 Communication

No communication with Lumpur as they were far and low.

1.10 Aerodrome Information

Ulu Bernam airstrip is situated on a very flat land about 10 feet above mean sea level. It is a grass strip and being maintained by Bernam Oil palm Ltd. The strip is aligned along 350°/170°. Although it is 1700 feet in length, only 1200 feet is certified safe for normal operation. It has a single wind sock, located at threshold runway 17. On the day of the accident the airstrip was dry. The ground before the two marker for runway 17 was slightly rutted and some loose newly mown grass was lying on the surface. It stretched for about 150 feet and although it could cause a take off hazard, it was well outside the boundary certified for safe operation.

1.11. Flight Recorders Nil.

1.12 Wreckage and Impact Information

The aircraft crashed into soft marshy ground and was moved to higher ground to avoid the tide water from flooding the aircraft. In the process, various shrubs and undergrowth at the crash site were cut to fill up the soft ground and facilitate moving the aircraft to higher ground.

Inspection of the accident site showed that the aircraft had struck soft ground left wing low. The impact caused the aircraft to yaw to the left and it then skidded sideways for some 30 feet and finally resting in soft

marshy ground in the direction of 210° (magnetic).

The left wing was served at the wing to fuselage attachment. The left side of the fuselage near the wing attachment was badly compressed inwards. Starboard wing attachment lower skin showed skin buckling at the wing to fuselage attachment.

The right lower tubular member and both top tubular members to the nose strut were sheared. The engine bottom cowling was crushed inwards and cut open by displacement of the nose strut. The engine lower bulkhead was buckled.

Both the engine and propeller were intact and did not sustain any damage.

1.13 Medical and Pathological Information

Pre accident - normal.

Post accident- Mr. K.L. Sakraney suffered laceration on two of his knuckles.

1.14 Fire - nil

1.15 Survival Aspect

The crash was surviveable because the aircraft's dynamic energy was absorbed by the soft ground and bushes. The attitude of the aircraft during the initial impact was high and the speed was only about 50 M.P.H. However, had there been a post crash fire, the story might have been different.

Crash dynamic.

Other than the left wing and nose wheel, the airframe hold together very well. Using the formula for rectangular pulse pattern, the main wreckage was calculated to have decelerated with a force of 3.73 G

1.16 Test and Research

Research made using the Piper owner's handbook revealed that the aircraft had a take off distance over 50 feet barrier, S.L. std temp, of 1625 feet. With an average temperature of 30°C, the take off distance indicated an increase of more than 1800 feet. The aircraft also had a normal climbing gradient of 2.56° and using this gradient the obstacles found at the end of the runway could only be cleared by 10 feet. The decision made by the pilots to execute a take off at Ulu Bernam and Gua Musang was questionable

as the length of both airfields were less than 1800 feet.

2. ANALYSIS

2.1 The aircraft. Throughout the flight no discrepancy in the function of the engine, flight controls or other system were reported. Post crash investigation also revealed that all systems were in a satisfactory condition. Although there had been no written report of malfunction in the technical log book, a number of verbal complaints were made on the aircraft performance. There had been several occasions where a sink was encountered if the aircraft was rotated at a speed of 50 M.P.H. Though the owner's handbook suggested the useage of 50 - 60 M.P.H. for rotation speed, it clearly cautioned against premature raising of the nose as it could delay the lift off. It was also a well known fact that for short field performance, the aircraft should be rotated at the lowest possible speed to an angle whereby the wings would generate maximum lift. However rotation beyond this would drastically reduce whatever lift that had been generated. This fine point is termed as critical angle of attack.

On the day of the accident, it was reported by the pilots that the pilot rotated the aircraft steeper than normal. Though the aircraft gained height initially it began to sink after a short period of time. This strongly supported the theory of the aircraft being rotated to an angle where it initially provided sufficient lift to effect lift off but after which the continued rotation beyond the critical angle of attack caused the lift to deteriorate thus resulting in the reported sink which for all intent and purposes was a stall. On the day of the accident the aircraft started with 25° flap. Although the stall was not violent, the attitude of the aircraft was not extremely high. This infact was a common characteristic of a stall with flap. A pilot who had little experience on stalling with flap in this particular aircraft might not be aware of this phenomenon.

2.2. Weather Generally the weather was fair with a visibility of less than 10 km. The temperature at Ulu Bernam was believed to be 35°C or more. A temperature of 35°C would increase the take off distance dramatically due to the IAS/TAS relationship. Further to this, the high temperature would also reduce the engine performance

of the aircraft due to lower air density. At 35°C, a length of 2020 feet would be required to clear 50 feet barrier and out of which 960 feet would be used for ground run. At 30°C, it would require 1800 feet and 800 feet respectively.

2.3. Airfield. The airfield was in a satisfactory condition except for an area (length 150 feet) situated just before the 'L' shaped markers for runway 17. The area was slightly rutted and some loose newly mown grass was lying on the surface. As this part of the airstrip was used for the take off, it would create more drag on the wheels that would delay the lift off.

2.4. Weight During the accident the weight of the aircraft was within limit. However the all up weight of the aircraft was inadvertently exceeded at Sempang during his first take off.

2.5. Instructor He had relatively little experience flying the Piper Cherokee in the short strip role. Most of this flying hours were accumulated when flying the RMAF multi engined aircraft. Evidence strongly suggested that his conversion on the Piper aircraft was not carried out in a proper manner. On the day of the accident the all up weight of the aircraft was inadvertently exceeded at Sempang and although the charts used were inaccurate and out dated, it was his responsibility to shoulder any blame. The instructor also failed to check the take off performance and outside air temperature prior to take off in Ulu Bernam and Gua Musang. Had he checked the performance of the aircraft, the sortie could have been abandoned as the take off distance over 50 feet barrier was more than the airfield length for both airstrips. As an instructor, he lacked proper supervision and detection of fault on the pilot. This could be clearly seen, as improper technique used were not detected and corrected. It was therefore safe to assume that the instructor lacked knowledge of the aircraft and the at the same time displaying a complacency attitude which could have contributed towards the accident.

2.5. PILOT

The pilot had a total flying hours of about 225.40 over a period of 10 years. Out of 225.40 hours, 67 hours was on Piper Cherokee. On the day of the accident, the pilot did all the ground preparation and planning plus having control the aircraft until the sink. Although his planning was not

correct , the flight was carried out as the Captain had no objection to his planning. The pilot also did not check the take off performance of the aircraft from the owner's handbook and procedures required were based on past experience and standard practice. His technique for short field take off was questionable as he did not line up the aircraft at the edge and during the roll, the control column was slightly forward. This would cause more profile drag thus increasing the take off distance.

3. CONCLUSION AND FINDING

From the analysis gathered, the aircraft was rotated to an angle which exceeded the critical angle of attack resulting in a stall. This accident was a result of having caught in a critical situation leaving little room for escape.

Following are the contributory factors.

- a. Both the Instructor and pilot did not work out the take off performance of the aircraft prior to the take off at Ulu Bernam or Gua Musang . The sortie could have been abandoned thus preventing the accident, if only they had checked the take off performance graph.
- b. The temperature at Ulu Bernam was high which resulted in a longer take off distance.
- c. The stretch which was rutted and covered with newly mown grass did play a part in delaying the lift off at Ulu Bernam.
- d. The pilot did not use the correct technique for the short take off resulting in a longer take off distance. This reflected the quality of training he received during his conversion. The instructor also failed to detect this . Again pointing to the quality of training.
- e. The quality of the check out, the instructor received for his type rating plus the inaccurate charts provided by the Royal Selangor Flying Club clearly displayed the lack of supervisory guidance and standard.

4. SAFETY RECOMMENDATION.

1. Royal Selangor Flying Club is to ensure that all pilots are ^{to} work out the take off and landing performance chart for every take off and landing.

This is more so when operating in more than one airstrip for one particular sortie.

2. Both the Instructor and pilot be retrained for a minimum of 2 hours followed by a check out by a DCA Examiner.
3. As the information for the take off performance in the Piper owner's handbook is restrictive (Does not cater for various weight and wind condition), Royal Selangor Flying Club is to write to the Piper Company as soon as possible for the information.
4. Royal Selangor Flying Club is to review the feasibility of the short field operation for all the airfields. Those found marginal, are to be put to a stop. The study report is to be submitted to DCA as soon as possible.
5. The all up weight and balance charts and CG - moment envelope provided by the Club are to be revised. Some of the charts are found to be inaccurate (e.g. Basic weight of 9M-ASC has increased).
6. The takeoff performance of the aircraft is to be reduced by 10 percent. The recommended rotational speed of 50 M.P.H. is too marginal for comfort, thus a speed of 60 M.P.H. is to be used for the minimum rotational speed.

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(Capt. Syed Zainal)