

CAV/ACC/26/71

EAST AFRICAN COMMUNITY,
ACCIDENT INVESTIGATION BRANCH,
P.O. BOX 30163,
NAIROBI.

FEBRUARY, 1972

The Chairman,
Communications Council.

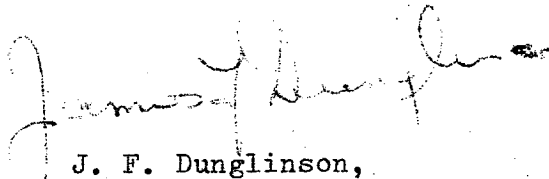
Sir,

I have the honour to submit a report by Mr. P.D.G. Griggs, Inspector of Accidents, into the circumstances of the accident to Cessna 401, Aircraft Registration Number 9X R-MB, which occurred on the 11th July, 1971, three miles north-east of Bugarama Village, Tanzania.

I have the honour to be,

Sir,

Your obedient servant,



J. F. Dunlinson,

DEPUTY CHIEF INSPECTOR OF ACCIDENTS

JFD/MWT

CAV/ACC/26/71

ACCIDENT INVESTIGATION BRANCH

CIVIL AIRCRAFT ACCIDENT

Report on the accident to Cessna 401,
Aircraft Registration Number
9X R-MB, which occurred on
the 11th July, 1971 three
miles north-east of
Bugarama Village,
Tanzania.

E A S T A F R I C A N C O M M U N I T Y

ACCIDENT REPORT
ACCIDENT INVESTIGATION BRANCH

Civil Aircraft Accident Report No. CAV/ACC/26/71

AIRCRAFT: Cessna 401. 9X R-MB
ENGINE: Two Continental TS10-520E.

REGISTERED OWNER AND OPERATOR : Societe de Transport Arien Rwandaise (S.T.A.R.)

PILOT: Mr. M. J. Lescot.

PASSENGERS: Six.

PLACE OF ACCIDENT: Three miles north-east of Bugarama Village, Tanzania.

DATE AND TIME: 11th July, 1971 at approximately 2230 hours.

ALL TIMES IN THIS REPORT ARE G.M.T.

S U M M A R Y

On a charter flight to the Rwanda Government from Nairobi to Kigali, the pilot was unable to locate the destination aerodrome or proceed to a suitable alternate. The pilot subsequently jettisoned remaining fuel and made a night forced landing three miles from Bugarama Village, Tanzania.

The aircraft was substantially damaged, but as far as is known, only minor injuries were sustained by the occupants. There was no fire.

1. INVESTIGATION

1.1. History of the Flight

Preparations for the flight from Nairobi to Kigali were commenced at 1745 hours on 11th July, 1971 for a 1915 hours departure. At 1800 hours while filing the flight plan at Nairobi Airport, the pilot was informed by the Briefing Officer that the intended flight, as planned, would arrive outside the normal hours of operation of Kigali; namely 0400 to 1600 hours. The attention of the pilot was also drawn to relevant Notices to Airmen and to the Rwanda Aeronautical Information Publication which contains, inter-alia, the following information:

1.1. History of the Flight (Cont'd)

- "Extract 1. RAC 02/6.1 - As a rule overflying Rwanda at night is prohibited.
- Extract 2. AGA 02/33 - The hours of operation of Kigali Airport are the same as those of the ATC Services, namely 0400 to 1600 GMT, and on request. The request to obtain permission to use Kigali Airport outside normal daily opening hours should reach Kigali ATC during the normal hours of operation allowing sufficient time for the acknowledgement and the despatch of the reply approving the flight before the aircraft enters Rwanda Airspace, and in all cases before 1600 GMT.
- Extract 3. MET 01/2.3 - The hours of operation of the Kigali Meteorological office are from 0400 to 1600 GMT.
- Extract 4. COM. 1.1. All Tower and Approach. VHF and HF communications facilities sunrise to sunset and on request."

The pilot, on being reminded of these restrictions, implied that as he was carrying a Minister of the Rwanda Government he had prior authorisation from that Government to fly in Rwanda Airspace and land at Kigali at night. The flight plan was accepted by the Briefing Officer on this understanding at 1800 hours.

In order to follow the sequence of events leading to the accident it is revealed at this juncture that, contrary to the pilot's understanding, arrangements for the terminal and alternate aerodromes to be available outside normal hours had not been put into effect. In consequence, Kigali and Bujumbura Aerodromes closed at 1600 hours and the flight plan and departure messages were not received at Kigali until 12th July, 1971 - the day following the accident. It was only at this stage, after exchanges of messages between Kigali and Nairobi, that anxiety was felt for the safety of the aircraft and its occupants.

The aircraft departed from Nairobi Airport at 1830 hrs (45 minutes before planned estimated time of departure) on a direct track to Kigali where the aircraft was estimated to arrive two hours later at 2030 hours. The aircraft had a total endurance of 4 hours 30 minutes. The flight was carried out at a cruising level of flight level 120 and visual navigational fixes were obtained by the pilot at 1935 hours - abeam Musoma, at 1945 hours - abeam Mwanza and at 2000 hours - abeam Bukoba. The pilot reported crossing the boundary of the East Africa/Rwanda Flight Information Region to Eastair Centre at 2008 hours. After crossing the FIR

1.1.

History of the Flight (Cont'd)

boundary, the pilot made repeated unsuccessful attempts to establish contact with Kigali on VHF and to obtain radio navigational guidance from that aerodrome. It is mentioned here that in normal circumstances, the aircraft at this phase of the flight would have been in range of these facilities. The pilot was unaware, however, that with the exception of those serviceable navigational aids operating on a continuous basis (see paragraph 1.8), all facilities had closed down at 1600 hours.

At 2040 hours (10 minutes after estimated time of arrival) the pilot saw lights on the ground. He descended the aircraft to flight level 100 and circled the lights. He was, however, unable to identify the lights as Kigali Township or Aerodrome.

At this juncture it is reasonable to consider three possibilities as to why the pilot was unable to identify Kigali.

1. The lights the pilot saw were in fact Kigali Township but ground fog reported to be in the area at the time obscured some lights and made identification difficult.
2. The possibility of a power failure at Kigali Township rendering all or some of the town lighting unserviceable. In this regard investigation reveals that Kigali did in fact suffer a power failure on the night of 11th July, 1971. The failure, however, occurred at 1630 hours and power was restored at 1900 hours. This possibility can therefore be ruled out.
3. The wind shear mentioned at paragraph 1.7 (Meteorological Information) was encountered for a period between the western shores of Lake Victoria and the FIR boundary, resulting in port drift and placing the aircraft south of track at the time of ETA. In this event the lights seen by the pilot were probably not those of Kigali.

It has been calculated by dead-reckoning that the third possibility is probably the correct one and that at 2040 hours the aircraft was south of track (see Appendix A). Notwithstanding this probability, the aircraft should have been in a geographical position at this time to enable the pilot to locate Kigali visually or by radio navigational means. Account must be taken, however, of the fact that the only serviceable radio navigational aids operating at Kigali on a 24 hour basis during the subject period were in the medium frequency band and may have been subject to the errors and limitations encountered on this band at night. Had the pilot been able to locate Kigali, the possibility of alerting the aerodrome authorities or effecting a safe landing, at night, at an unmanned aerodrome is a matter for conjecture.

1.1.

History of the Flight (Cont'd)

Repeated attempts to establish contact with the Kigali or the nominated alternate, Bujumbura, were unsuccessful and at 2055 hours the pilot, still unable to locate Kigali, set course for Entebbe Airport and climbed to Flight Level 140. The decision to divert to Entebbe was made in spite of the fact that a NOTAM was in force to the effect that the borders between Uganda and Tanzania, and Uganda and Rwanda were closed to all operations. Having altered course the pilot obtained radio navigational guidance from Entebbe which, by interpretation, indicated a track of 050°(M) to Entebbe Airport. Communication with Entebbe on VHF was not possible at this range - approximately 150 nautical miles.

At 2100 hours, on informing the passengers that they were diverting to Entebbe, the pilot was instructed by a passenger of ministerial rank not to proceed to Entebbe or overfly Uganda airspace. In light of these instructions, the pilot considered he had no option but to return to the Kigali area and to attempt once again to locate the aerodrome. He had no contact with any aeronautical mobile station and was therefore unable to inform air traffic control of the situation. At this time (2105 hours) the aircraft had a remaining endurance of approximately 1 hour 55 minutes thus placing all airports operating on a 24 hour basis (other than Entebbe) outside effective range.

At 2120 hours, the pilot estimated he was again in the Kigali area, but he was still unable to locate the aerodrome. Visibility was poor and taking into account high ground in the vicinity he carried out the following square search pattern:-

<u>Heading (M)</u>	<u>Time Min.</u>
180°	5
090°	5
000°	10
270°	10
180°	15
090°	15
	<hr/>
	60
	<hr/>

It has been calculated by dead-reckoning that at the end of this period (2220 hours) the most probable position (MPP) of the aircraft was approximately 55 nautical miles south-south-east of Kigali and close to the position where the aircraft forced landed. (See Appendix A).

1.1. History of the Flight (Cont'd)

At 2220 hours the pilot sighted an area relatively obstacle free and well lighted by bush fires. Since at this time the remaining fuel allowed for further flight of approximately only 30 minutes, the pilot elected to make a forced landing in the area.

The pilot descended the aircraft and made several low approaches over the area in order to select the most suitable site for a forced landing. He then transmitted Distress Calls on VHF and HF none of which were recorded by Eastair Centre. (see paragraph 1.9.). After jettisoning remaining fuel and switching off all electrical circuits the pilot conducted a wheels-up, flapless approach to land, with engines cut at a speed of 120 knots. The aircraft struck the ground at 85 knots in a slightly nose up attitude to allow for the upward slope of the ground. After striking the ground the aircraft decelerated rapidly, striking small trees and boulders, coming to rest 200 feet from the point of impact. When the aircraft came to rest the pilot organised a rapid evacuation of passengers through the main door which was at ground level. The accident occurred, as near as it can be estimated, at 2230 hours.

1.2. Injuries to Persons

Injuries	Crew	Passenger	Others
Fatal	-	-	-
Non-Fatal	-	See note below	
None	-	See note below	

Note: It is understood that the occupants may have sustained minor or superficial injuries but no medical evidence has been submitted to verify this by the Rwanda Authorities.

1.3. Damage to Aircraft

On impact, the port engine and the port wing outboard of the main spar assembly were sheared from the fuselage and suffered extensive damage. The starboard wing, outboard of the starboard engine, was also fractured. The starboard engine, although still attached to the wing mounting, suffered extensive damage. The nose and belly of the aircraft including nose wheel and main landing gear were also substantially damaged. The flight deck, aircraft cabin interior and tail assembly suffered relatively minor damage. Summarising; the aircraft is damaged beyond repair but has limited salvage value.

1.4. Other Damage

None

1.5. Crew Information

The pilot, Joseph Maurice Lescot, aged 46 years, is a holder of Rwanda Commercial Pilot's Licence No. 014/01 issued on 17th November, 1964, valid until 24th July, 1971 and endorsed for all multi-engined aeroplanes of up to 12,500 lb. in weight. Additionally, Mr. Lescot holds an Instrument Rating, Night Rating and Instructor's Rating. Mr. Lescot also holds a Burundi Commercial Pilot's Licence No. 334/F valid until 19th September, 1971.

At the time of the accident Mr. Lescot had a total of 11,045 hours flying experience of which 600 hours were on Cessna 401 type aircraft.

1.6. Aircraft Information

The aircraft, a Cessna 401, Serial No. 401-0129, powered by two Continental TS10-520-E engines was constructed by the Cessna Aircraft Corporation, Wichita, Kansas, U.S.A. in 1967.

In May, 1971, the aircraft was registered by the Ministere des Postes-Telecommunications et du Transport, Direction de l'Aeronautique of the Republic of Rwanda in the name of Societe de Transport Aerien Rwandaise (S.T.A.R.) P.O. Box 110, Kigali, Republic of Rwanda, and given the registration number 9X R-MB.

The Rwanda Certificate of Airworthiness in the Public Transport Category was issued on 29th May, 1971 valid until 28th November, 1971.

At the time of the accident the airframe and engine hours were :-

	<u>Hrs</u>	<u>Mins.</u>
Total airframe hours	1060	45
Hours since last 100 hours inspection on 3.3.71	90	30
Hours since last Certificate of Maintenance on 9.7.71	5	05
Port engine (Serial No. 165186-7E) total hours	1060	45
Port engine hours since last overhaul on 3.3.71	90	30
Starboard engine (Serial No. 206413-70E) total hours	90	30

Starboard engine .../7

1.6. Aircraft Information (Cont'd)

	<u>Hrs</u>	<u>Mins</u>
Starboard engine hours since last overhaul (new engine fitted 3.3.71)	90	30
Port propellor (Serial No. 673761) total hours	90	30
Port propellor hours since last overhaul 3.3.71	90	30
Starboard propellor (Serial No. 696722) total hours	1012	00
Starboard propellor hours since last overhaul 3.3.71	921	00

The last major overhaul of the airframe and engine was carried out in accordance with manufacturer's recommendations in March 1971, and certified with the appropriate East African Maintenance Engineer's Licences.

The weight of the aircraft was below maximum authorised weight, and the centre of gravity was within the prescribed limits.

1.7. Meteorological Information

A route forecast for the period 1800 to 2359 hours 11th July, 1971, provided by the Nairobi Airport Meteorological Forecast Office for the purpose of this investigation, shows that the weather en-route was mainly fair apart from scattered cumulonimbus cloud over Lake Victoria. The pilot in his statement, however, reported the presence of fog in the Kigali area between 2030 and 2230 hours.

Information supplied by the East African Meteorological Department also for the purpose of this investigation shows that the upper winds for the subject period in respect of Kigoma and Mwanza, which are the nearest upper air stations to Kigali, were as follows:

	<u>10,000 feet</u>	<u>14,000 feet</u>
Kigoma	060°/15 knots	320°/20 knots
Mwanza	060°/06 knots	130°/25 knots

This would indicate that some wind shear existed between Mwanza and Kigoma although the exact location of the shear cannot be determined.

As the Meteorological Officer at Kigali closed down at 1600 hours on 11th July, 1971 in accordance with the published hours of availability, neither the actual nor forecast weather reports are available for the subject period in respect of Kigali Aerodrome.

1.7. Meteorological Information (Cont'd)

The duty Meteorological Forecaster at the Nairobi Airport Forecast Officer stated in his report that the pilot did not request meteorological documentation and therefore no documentation was prepared. At approximately 1800 hours, however, a person believed to be Mr. Lescot called into the forecast office for meteorological briefing prior to departure. He was informed that meteorological documentation for the route and destination aerodrome was not readily available. The person left without further briefing.

1.8. Aids to Navigation

Radio aids to navigation at Kigali are:

VOR	'KNM'	H24
NDB	'KLI'	H24
LOM	'LI'	H24
LMM	'L2'	On request
VDF		Daylight hours

Notices to Airmen were in force at the time of the accident to the effect that the VDF and VOR were un-serviceable. Additionally, the Aerodrome Light Beacon was notified as un-serviceable.

1.9. Communications

1.9.1. Aeronautical Mobile Service

Normal VHF communications were maintained between the aircraft and various air traffic control services appropriate to the route as far as the East African FIR boundary, where the pilot reported his position at 2008 hours.

The flight progress strip at Eastair Centre showed, at 1948, a request to establish contact with Kigali. This was recorded by the VHF Monitor as "9X R-MB reported in contact with Kigali." This caused some confusion during the subsequent search for the aircraft until the transcript of the tape recording was made on the following day - 12th July, 1971. The transcript of the tape for this period is as follows:-

1.9. Communications (Cont'd)

1.9.1. Aeronautical Mobile Service (Cont'd)

<u>Time</u>	<u>Frome</u>	<u>To</u>	<u>Massage</u>
1948	9X R-MB	Eastair Centre	"Operations normal-permission to leave your frequency and contact Kigali"
	Eastair Centre	9X R-MB'	"Roger - check back crossing the FIR boundary 2015"
	9X R-MB	Eastair Centre	"Estimate FIR boundary 2015"
	Eastair Centre	9X R-MB	"Roger - establish contact with Kigali and report on this frequency or HF crossing the FIR boundary"
	9X R-MB	Eastair Centre	"Roger"
2008	9X R-MB	Eastair Centre	"FIR boundary present time - permission to leave"
	Eastair Centre	9X R-MB	"Roger - continue with Kigali"

Although the tape was played back for further two hours there were no further recorded calls from the accident aircraft either on VHF or HF.

1.9.2. Aeronautical Fixed Service

The flight plan and departure messages were sent from Nairobi Airport to the Nairobi Communications Centre for onward transmission to the addressees at 1807 hours and 1835 hours respectively and were cleared to one addressee (Eastair Centre) at 111814 and 111839 hours respectively. The Nairobi Communications Centre was unable to transmit the messages to the other addressee, Kigali Tower, since the radio teletype link (RTTY) Nairobi-Kigali closes daily at 1600 hours unless a special request is received from Kigali Control Authority or any other appropriate authority one hour before normal closing time. It is mentioned here that unless a special

1.9. Communications (Cont'd)

1.9.2. Aeronautical Fixed Service (Cont'd)

request is received, a message received after 1600 hours is left pending for onward transmission until the next day at 0400 hours when this particular circuit normally opens. The messages in question were not therefore re-transmitted to Kigali until 0429 hours on 12th July, 1971 - the day after the accident occurred. It will be appreciated that the operator manning the RTTY circuit is neither authorised nor has time to read the text of all messages. He merely checks the list of addressees in order to clear the message. This is in compliance with the procedures contained in International Civil Aviation Organization document Annex 10 Part II. It will also be appreciated that it is not incumbent upon the duty air traffic controller at Eastair Centre, as one addressee, to check whether messages have been cleared to other addressees listed in the message.

1.10. Aerodrome and Ground Facilities

Kigali Aerodrome, elevation 4892 feet, has one laterite surface runway 11351 feet in length which provides take off and landing directions of 10/28. Low intensity runway edge lighting (white) and green threshold lights are provided but no approach lighting, with the exception of VASIS, on runway 10. Other lighting consists of Aerodrome Beacon (flashing white/green), obstruction lights and emergency goose-necks.

The aerodrome and ATC hours of operation are 0400 to 1600 hours daily and on request.

It is mentioned here that since the aerodrome had not been properly alerted to accept the flight outside normal hours of operation, the above facilities were not available during the subject period.

1.11. Flight Recorders

No flight recorder was fitted or required by Rwanda Air Navigation Regulations to be fitted.

1.12. The Wreckage

The wreckage of the aircraft was located approximately 3 miles north-east of Bugarama Village, Tanzania.

Inspection of the site showed that the aircraft struck rising ground in a slightly nose-up attitude compatible with a flapless, wheels-up forced landing. The area in which the aircraft forced landed had recently been subject to extensive bush fires.

1.12. The Wreckage (Cont'd)

Almost immediately after impact, the starboard wing struck a small tree shearing off that part of the main plane assembly outboard of the starboard engine. The aircraft carried forward along the ground in the same direction striking boulders and small trees coming to rest 200 feet from the point of impact with the nose of the aircraft riding up over a large boulder. Apart from the starboard wing tip and wing tip fuel tank the wreckage was contained within a small radius centred where the aircraft came to rest. The fuselage was relatively intact. There was no evidence of any pre-crash failure or malfunction of either the aircraft or the engines or ancillary equipment.

1.13. Fire

There was no evidence of fire associated with the aircraft, although as mentioned in paragraph 1.12. the area in which the aircraft was located had been previously subject to widespread bush fires.

1.14. Survival Aspects

Evacuation of the pilot and passengers from the aircraft was not difficult because the fuselage was at ground level and relatively intact.

1.15. Tests and Research

None required.

1.16. Other Information

None.

2. ANALYSIS AND CONCLUSIONS

2.1. Analysis

It is clear from the evidence available that the accident resulted from a forced landing precipitated by impending fuel exhaustion of the aircraft. This followed the discovery by the pilot, at the conclusion of the flight, that neither the destination aerodrome nor an alternate aerodrome was available for a landing. It is pertinent however, to consider the circumstances which led the pilot into a situation where he had no alternative but to carry out a forced landing, at night, in inhospitable terrain.

2.1. Analysis (Cont'd)

A pilot, in accordance with international aviation practice, shall satisfy himself before the aircraft takes off that the flight can be made safely, taking into account the latest information available as to the route and aerodrome to be used, the weather reports and forecasts available and any alternative course of action which can be adopted in case the flight cannot be completed as planned.

Evidence shows that in this regard the pilot did not follow these procedures in as much as he failed to:-

- (i) obtain proper meteorological briefing;
- (ii) ensure that the destination and alternate aerodrome would be available outside normal hours of operation;
- (iii) give sufficient weight to the implications arising from the closure to all operations of the borders between, Uganda and Tanzania, and Uganda and Rwanda.

Merit must be given however to the consideration that it would be unlikely for a pilot of Mr. Lescot's experience to jeopardise the safety of the aircraft and its occupants by planning a flight without being confident that adequate arrangements had been made to ensure the availability of terminal facilities.

In this regard there are several factors which should be considered.

According to a statement received from the Aerodrome Authority for Kigali, the air traffic control services at Kigali and the pilot agreed prior to the departure of the aircraft from Kigali that if the pilot decided to return outside normal hours of operation, he would, as soon as possible, send a message of his intentions. No message to this effect was received at Kigali before the aerodrome closed at 1600 hours.

Against this, however, it is considered that notwithstanding the above mentioned arrangement, it was unfortunate that the Kigali Aerodrome Authority closed down facilities without first checking with Nairobi that the flight - a government charter - was not returning that day to Kigali. Furthermore, investigation reveals that during the course of the Search and Rescue operation on 12th July, 1971 by the Nairobi Rescue Co-ordination Centre, a telephone call was made by an officer of the East African Directorate of Civil Aviation to the Rwanda Embassy in Kampala, Uganda, enquiring if the Embassy had any information to offer about the status of Kigali Aerodrome at the time of the accident. According to the statement made by the Directorate officer who initiated the call, verbal advice was received from the Embassy stating that in the circumstances, and as a government flight was involved, arrangements should have been made for Kigali Aerodrome to remain open.

2.1. Analysis (Cont'd)

More-over during the course of this investigation the Station Manager of Alitalia, Nairobi - handling agents for Societe de Transport Arien Rwandaise - advised verbally that as far as he was aware, authority had been obtained for the aircraft to proceed to Kigali at night, but he did not know the origin of the Authority.

From the evidence on this point it is concluded that notwithstanding the fact that the final responsibility for ensuring the flight can be safely made rests with the commander, a genuine misunderstanding existed between the pilot and the Rwanda Authorities regarding the arrangements to be put into effect for ensuring the availability of terminal and alternate facilities.

2.2. Conclusion

(a) Findings

- (i) The documentation of the aircraft was in order.
- (ii) The aircraft was on a commercial flight and maintenance had been carried out in accordance with the manufacturer's recommendations.
- (iii) No evidence was found of pre-crash failure or malfunction of the aircraft or its equipment.
- (iv) The weight of the aircraft and centre of gravity were within prescribed limits.
- (v) The pilot was correctly licensed and was sufficiently experienced to carry out the flight.
- (vi) Notwithstanding the probability that a misunderstanding existed regarding the arrangements to ensure terminal and alternate facilities were available, the pilot did not carry out proper pre-flight preparations to ensure the flight could be safely completed.
- (vii) In the circumstances Kigali Aerodrome Authorities were premature in closing the aerodrome facilities.

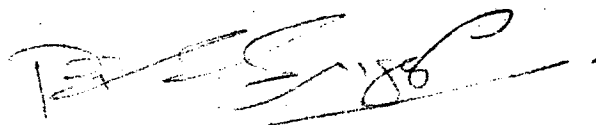
2.2. Conclusion (Cont'd)

(a) Findings (Cont'd)

- (viii) The pilot elected to carry out a forced landing in the most suitable area available at a time when sufficient fuel remained to allow control of the aircraft but insufficient fuel remained to permit flight to a suitable aerodrome.

(b) Probable Cause

The accident resulted from a forced landing precipitated by impending fuel exhaustion of the aircraft.



P. D. G. Griggs,

INSPECTOR OF ACCIDENTS

PDGG/MWT

21st February, 1972

