A.F

FC/AIR/3035 - Accidents - UN Aircraft

14/11/1962 - 28/05/1964

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14 November 1962

TO : See Distribution List

FROM : Air Commodore J. C. Varma, Air Commander

SUBJECT : SARAH Equipment - Search and Rescue

1. The use of Search and Rescue Aid to Homing (SARAH) can be a valuable asset to aircrews of ONUC aircraft operating in the Congo in the event of accident or forced landing. The proper understanding and use of this equipment by all aircrews can speed up the Search and Rescue operation. Special search aircraft equipped with airborne SARAH receiver can cover a much larger area in a shorter space of time than the normal visual search technique utilizing a number of aircraft.

2. The SARAH beacon or transmitter are carried in seat packs or Mae Wests of crews of jet aircraft and emergency packs of other aircraft. The beacon consists of a battery, a collapsible aerial, a press-to-talk button, a continuous wave transmission button, a compact curved case which will fit the contour of the body in the Mae West, and operating instructions. The shelf life of the battery is two years. The beacon is pulsed in such a way that the battery life is rated at 35 hours continuous beacon transmission and reduced to a few hours on voice transmission. The aerial broadcasts 360 degrees on a horizontal plane with an area of zero field or nul-existing above the aerial. Voice communication between two beacons is impossible, however, voice communication on UHF Frequency 243.0 MCS, between the SARAH aircraft and beacon can be conducted at a maximum range of 5 miles and at a lower altitude. Search aircraft can pick up the steady beacon note in ideal conditions at a maximum of 70 miles from 10,000 feet over water. This range is reduced dependent on the terrain and conditions. One test in the Congo showed a reduced range down to 20/25 miles from 10,000 feet.

3. New SARAH transmitter batteries have been received at N'Djili and are being issued to Squadrons and installed in aircraft. Canvass bags are being provided to hold one transmitter and spare battery and are being installed in the crew compartment of Dakota aircraft. They are also being provided to the Light Aircraft Squadron for installation in the Otter and

.../Helicopter

Helicopter and a Telecom NCO is visiting units in the field. OC's of Squadrons are to ensure that aircraft on detachment are suitably equipped in the near future. OC Canberra Squadron is taking action for Canberra aircrew to carry SARAH in their Mae Wests. The Air Base Commander, Kamina, is to draw equipment from N'Djili and in conjunction with J-29 Squadron and F-86 Squadron OC's devise a method of carrying SARAH. The emergency seat parks for J-29 crews may be suitable and most practical method of carrying for bail-outs and forced landings.

4. Aircrews are to be briefed on the use of SARAH equipment. The important thing to remember is the battery life of 35 hours on beacon transmission which is drastically reduced to a few hours for voice operation. Therefore, the beacon should not be turned on immediately after a crash landing. A period of time normally elapses when an aircraft is reported overdue, a communication check is carried out, and a search is organized and aircraft are made available. Search and Rescue instructions are outlined in ONUC Air Staff Instructions paragraphs 1.4.7 and 1.4.8. It is difficult to lay down firm instructions for the hours of operation of SARAH equipment since there are so many variables to be considered. As a guide, two hours after crash landing would be a reasonable time to start transmitting on a schedule and the first and second day of search operations the most probable time of establishing contact. Steady transmissions from 0900Z / 1200Z hours and 1500Z-1800Z would be the most likely hours for a schedule and aircraft to be in the search area. This is dependent on the distance from the operating base, briefing hours, duration of the flight with morning and afternoon details. No night operation are planned. Voice transmissions should not be made until aircraft engines are heard or aircraft is seen in order to conserve battery life.

There are presently two aircraft equipped with SARAH Receivers capable of homing on a SARAH transmitter, namely, DAKOTA 215 and Transair C-46 C.F.P. Two additional sets are available for installation whenever the wiring and balance of items ordered are received in the near future.

Attached is a précis on the Airborne SARAH receiver which is published in order to give aircrews an understanding of methods used in carrying out a search. Also the C-47 Squadron crews are being checked out on this equipment with one crew fully trained.

.../May

May the above instructions be incorporated in Base Operation Instructions and Squadron Orders and brought to the attention of all aircrews.

(J. C. VARMA) Air Commodore
Air Commander

Distribution:

Air Base Commander, N'Djili (3)
" " " Kamina (3)
" " " Elisabethville (3)
" " " Albertville (3)
CO C-47 Squadron N'Djili (10)
CO Canberra Squadron N'Djili (8)
CO Light Aircraft Squadron N'Djili (8)
Detachments Squadrons, Stanleyville (3)
Transair Sweden (3)

+ + +

Force Commander
Air Commander
Senior Air Staff Officer
Chief Transport Officer
Chief Fighter Operations
Flight Safety Officer
FAA Inspectors
Duty Operations Officer
Telecom Officer

# SARAH TRANSMITTER-RECEIVER TYPE R825

## PROVISIONAL OPERATING INSTRUCTIONS

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| 3. | Confirmatory Action | 3 |
| 4. | Initial Homing Phase | 3 |
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| 6. | Final Approach and Speech Communication | 5 |
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NOTE: Figure 1 is a non-reproducible print of R825 equipment. Examination of actual equipment will serve in lieu of this print.

## OPERATIONAL PROCEDURE DURING AN AIRBORNE SEARCH

Fig. 3 (Guide to Operation) shows the sequence of event during an airborne search and Fig. 4 the characteristics of the beacon radiation around the null point. The search operator should be well exercised on these diagrams before undertaking a ssarch.

1. PREPARATION FOR USE

(a) Place the main distribution switch at SARAH and switch on the relevant power supplies.

(b) Allow approximately two minutes for the Transmitter-Receiver to stabilize.

(c) Turn the left-hand (function) switch (Fig.2) to the RXB position.

(d) Turn the GAIN control clockwise until a green trace appears on the CRT screen. Adjust the SHIFT control to bring the whole trace on to the screen.

(e) Adjust the FOCUS control to obtain a bright and sharp trace.

(f) Adjust the GAIN control so that "grass" just appears on the trace, but do not allow the grass to swamp the screen.

(g) Turn the SEARCH/HOME switch to SLOW. The port and starboard antennas are now being selected at a rate of fix cycles per minute, i.e., each is connected in turn to the receiver for 5 seconds, followed by a rapid changeover to the other.

(h) Turn the function switch to the XTAL CHECK position. A series of crystal-controlled pulses should now appear on each side of the trace, indicating that the Transmitter-Receiver is functioning on the correct frequency. Adjust TURN RX control for maximum and reduce GAIN control as necessary.

(j) Turn the function switch to the SEARCH position and ensure that the automatic frequency sweep is operating. This is visible as a regularly-recurring change in the pulse amplitude, as displayed on the screen, twelve times per minute. The frequency sweep ensures that a beacon is not missed because of some small discrepancy in its nominal frequency.

(k) Return the function switch to the RXB position. The Transmitter-Receiver is now correctly adjusted.

(m) Carry out the Long-range Search procedure detailed below.

2. LONG RANGE SEARCH

A search should initially be made at the highest possible altitude, to ensure maximum range of reception. At an altitude of 10,000 ft, for example, the beacon signal can be detected at a range of more than 70 statute miles, over sea.

The antennas have been positioned specifically to provide maximum search coverage on each beam, with an adequate forward-looking range for homing purposes. Thus, standard search patterns such as "Creeping Line Ahead" can be followed with advantage.

Throughout the search, carefully observe the trace on the CRT screen as the port and starboard antennas are alternately selected. A beacon signal, when first detected, will appear only momentarily as the receiver tunes through it and confirmat y action should immediately be taken as described in the following section.

3. CONFIRMATORY ACTION

Assuming that a "Creeping Line Ahead" search is being carried out, and that the beacon signal appears on the port side, the aircraft should maintain its present heading. When the signal reappears (after 10 seconds) its amplitude will be greater as the point of maximum search antenna sensitivity is approached. This may give a sufficiently positive identification of the signal to enable Homing to proceed (see Section 4).

If there is difficulty in indentifying the signal, the aircraft should turn through 180° (in this case, to port) and arrive on a course about five miles inwards towards the suspected position of the beacon. Watch for the momentary reappearance of the signal (in this case, on the starboard side). Should there be no positive identification of a beacon signal, resume the original course and continue the search.

When a beacon signal has been identified, turn the SEARCH/HOME switch to the SLOW position and adjust the TUNE RX control for maximum signal amplitude.

If the beacon signal appears on both port and starboard sides, the aircraft should be directed towards the larger signal until the signal pulses are equal on both sides of the CRT trace. The procedure given in Section 4, paragraphs (a), (b), (c), (g), (h), and (j) below can then be followed:

4. INITIAL HOMING PHASE

The operating procedure during this part of the search is given below:

(a) Turn the SEARCH/HOME switch to FAST. The port and starboard antennas are now being selected at a rate of 30 cycles per minute, i.e., each is connected in turn to the receiver for one second, followed by a rapid changeover to the other.

(b) Check that the receiver is tuned exactly to the beacon signal.

(c) If more than one beacon signal is observed, rotate the SHIFT control to centre the selected signal between the horizontal graticule lines.

(d) At this stage the signal may appear only on the port or starboard side of the vertical trace. The aircraft should therefore turn through 90° to port if the signal is on the port side or to starboard if the signal is on the starboard side - while the trace is carefully watched.

(e) During this manoeuvre, the signal will gradually fall on the side at which it was first seen and begin to rise on the other side as the aircraft turns towards the direction of the beacon. When the signals appear equal on both sides, the aircraft heading should be steadied and this course maintained.

(f) Alternatively, at extreme range, the signal may disappear as the aircraft approaches the 90° bearing. If the signal is lost, the aircraft should fly a weaving course 45° to either side of the new line of flight as a confirmatory check on the presence of the signal.

(g) When a useful signal amplitude has been obtained on the CRT screen, direct the aircraft on to the correct course as indicated by the relative signal amplitudes alternately displayed to port and starboard of the trace.

(h) If the amplitude is greater on one side than the other, the aircraft should fly in the direction of the larger signal, in steps of 10° from the original line of flight, until the displayed pulses are equal on both sides.

(j) Carry out the close-range homing operation detailed in the following section.

5. SECOND HOMING PHASE

(a) Turn the SEARCH/HOME switch to HOME. The port and starboard antennas are now being selected at a rate of 600 cycles per minute and, because of the long persistence of the CRT screen, the signal will now appear on both sides of the trace simultaneously.

(b) Throughout the homing phase, an equal signal amplitude should be maintained on each side of the trace.

(c) Adjust the GAIN control as required, so that the signal amplitude just reaches the outer vertical lines of the graticule.

(d) During the homing phase, the aircraft should gradually reduce altitude to the final approach height of approximately 500 ft.

CAUTION: If the aircraft reduces altitude too quickly, the beacon signal may be lost.

(e) When a signal of sufficient amplitude has been obtained, tune the transmitter as follows:

(1) Check that the receiver is correctly tuned, as described in section 3 above.

(2) Turn the function switch to the TXB/TUNE TX position.

(3) Adjust the TUNE TX control so that the amplitude of the displayed signal is a maximum, reducing the gain as necessary.

(4) Return the function switch to the RXB position.

(f) The Transmitter is now tuned to the beacon ready for speech transmission.

6. FINAL APPROACH AND SPEECH COMMUNICATION

(a) Continue the homing procedure, always maintaining a display of equal amplitude on each side of the trace and readjusting the GAIN control as required.

(b) As the final approach is made to the beacon, the signal display will rapidly increase to a maximum amplitude and then as rapidly decrease to zero (see Fig. 4 for Beacon Radiation Pattern).

The beacon is now immediately below the aircraft.

At this point the aircraft's position should be fixed, using any dependable visual means or any available navigational aid, and transmitted to the appropriate rescue authority.

(c) The signal will reappear as the aircraft continues on course. When this occurs, the aircraft should turn to port and orbit around the position where the zero signal was obtained.

NOTE: In the RX R/T position of the function switch, antenna switching ceases and the port antenna is continuously connected to the receiver for speech reception. A port orbit places this antenna nearer to the beacon.

(d) At this stage, the survivor may decide to use the Speech Unit of his beacon to make R/T contact with the aircraft. When speech transmission begins, the single pulse displayed during normal beacon transmission will change to two or three pulses, which will "jitter" about their relative positions on the trace in

accordance with the speech modulation.

(3) Immediately these characteristic signals are seen, turn the SARAH-INTERCOM switch on the SARAH Audio Selector Box to SARAH (green light only on) or BOTH (both lights on) position, and the Function switch to RX R/T to receive the survivor's message.

NOTE: (1) At all times during a SARAH search the SARAH operator's microphone and headset should be plugged into the jacks on the front of the Audio Selector Box.

(2) For two-way communication with the pilot without modulation of the SARAH transmitter, turn the Audio Selector Switch to INTERCOM (red light only on) position.

(3) When the Audio Selector Switch is in the BOTH position the pilot can monitor the two-way communication with the survivor.

(f) To reply when the survivor's message ends, press the Press-to-Talk button on the microphone. Do not use the TX R/T position of the function switch as this position is non-operative on RCAF equipment.

NOTE: When the survivor has pressed his LISTEN button for speech reception, the CRT display will consist of several small signal pulses equally spaced down the trace. This can be verified by turning the function switch to the RX B position and observing the display.

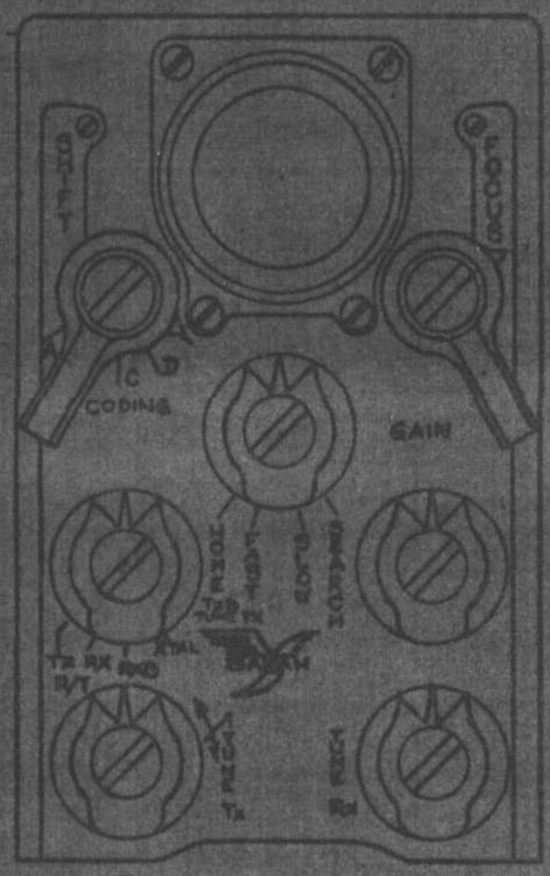
7. STANDBY OPERATION

The search aircraft may not be equipped to rescue a survivor. In this event the aircraft may stand by until a suitably-fitted aircraft or surface vessel arrives.

To assist in directing a rescue craft to the survivor, turn the function switch to TX B/TUNE TX. The Transmitter Receiver is now transmitting a pulse signal of similar type to that emitted by the beacon, with the advantage of greater range conferred by the height of the aircraft. A rescue craft, even if based a considerable distance from the survivor's position, will thus be able to use its SARAH equipment to pinpoint this position.

For example, a launch can receive signals over a range exceeding 40 miles from an aircraft circling at 5,000 ft., and will home on these signals until it approaches within 6 to 7 miles of the survivor. At this point the launch will begin to pick up signals from the survivor's own beacon transmitter and will thenceforward home directly on to him.

IMPORTANT NOTE: When the survivor has been rescued, switch off his beacon at the earliest opportunity to prevent further radiation of the pulse signal.

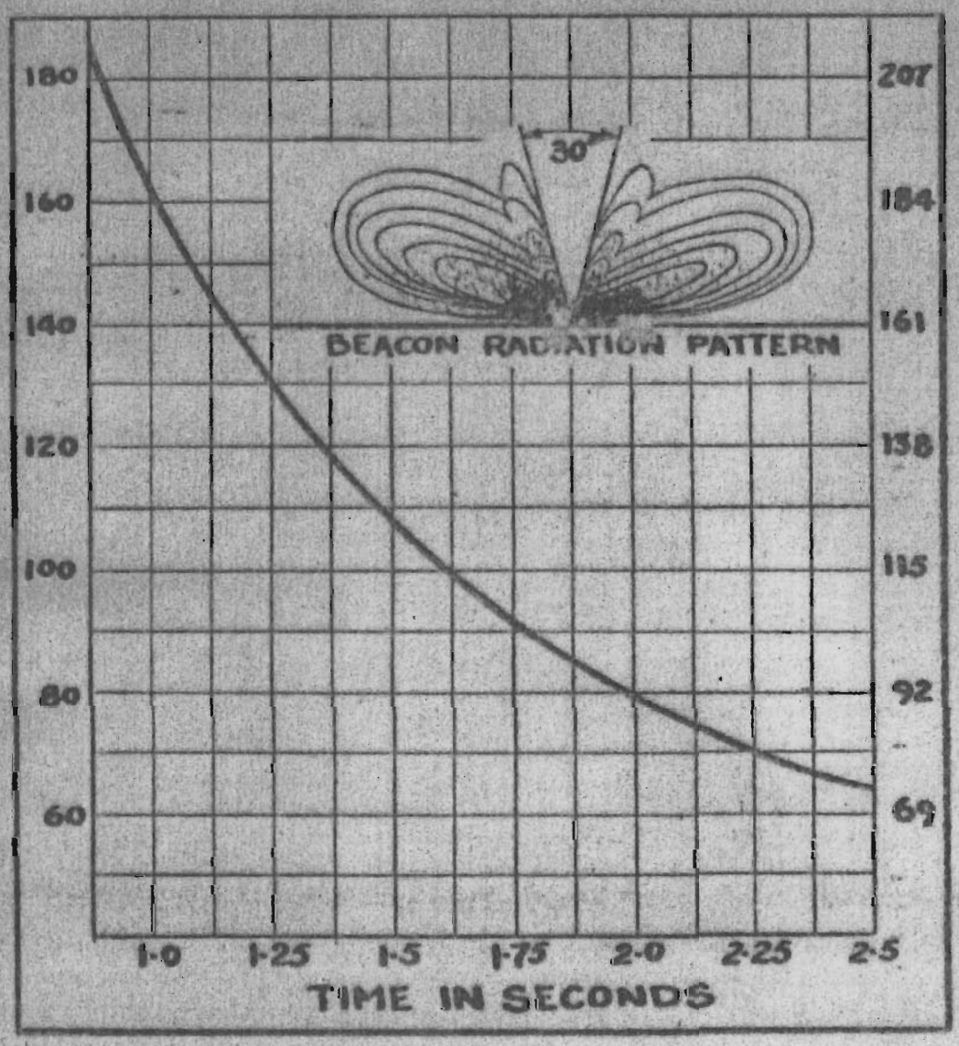

TX
RX
TX
RX
TX
RX

| CONDITION | TYPICAL ALTITUDE | RECEIVER PICTURE | REMARKS |
|---|---|---|---|
| earch phase before reception f Beacon signal. | Aircraft 10,000 feet Helicopter 3,000 feet Surface vessel aerial height 25 ft. | | Centre switch on SEARCH. GAIN set for appearance of green trace, and increase until "grass" just reaches inner graticule lines. Left-hand(function) switch to RX.B. |
| Search phase on reception of Beacon signal Beacon on port side. | Aircraft 10,000 feet Helicopter 3,000 feet Surface vessel aerial height 25 ft. | | Centre switch to SLOW TUNE RX control tuned manually for maximum signal. Centre switch to FAST. |
| Beginning of homing phase. | Aircraft 5,000 feet Helicopter 1,500 feet Surface vessel aerial height 25 ft. | | SHIFT adjusted to bring beacon pulse between horizontal graticule lines. Turn towards larger signal to equalize. |
| Transmitter tuning | | | During early homing set function switch to TUNE TX. Tune transmitter to receiver for maximum signal, adjusting GAIN as necessary. Return function switch to RX.B. |
| ate homing phase. | 800 feet | | GAIN control adjusted during homing to keep signal between outer graticule lines. Centre switch to HOME for accurate homing display. |
| ircraft goes through null nd obtains fix. | 500 feet | | Beacon signal increases rapidly and suddenly vanishes as aircraft passes overhead. |
| eacon signal reappears after null. | 500 feet | | Aircraft orbits to port around survivor ready for speech reception. Thus, Beacon signal on port side. |
| Speech from Beacon (received on port aerial). | 500 feet | | P.R.F. of Beacon modulated by voice. Function switch at RX.B To listen, turn switch to RX.R/T. |
| eacon on LISTEN. (Signal received on port aerial). | 500 feet | | Function switch at RX.B. Searcher clearly knows that he can talk and be heard. Turn left hand switch to TX.R/T, press P. to T. switch and talk. |

NOTE: If the craft cannot rescue survivors the receiver may be switched to TX.B. Other rescue craft can then home on the longer-ranged signal. Aircraft should climb to a higher altitude to increase range of transmission.

| | | | |
|---|---|---|---|
| Three Beacons: 1 on port, 2 on starboard. | C B A | | Pulse spacing characterizes 3 different Beacons. |
| Three Beacons: 2 on port. Aircraft homing on Beacon "A". | C B A | | Homing may be done on one Beacon at a time - approx. range indicatin (relative amplitude of pulse) shows which one to "fix" first. |

FIG.3—GUIDE TO OPERATION—TRANSMITTER-RECEIVER TYPE R825




SPEED OF SEARCH AIRCRAFT PLOTTED AGAINST TIME FOR PASSAGE OF NULL ZONE OVER BEACON AT 500 FT.

SPEED IN KNOTS AT L.H. SIDE; IN M.P.H. AT R.H. SIDE

INSET SHOWS BEACON RADIATION PATTERN

FIG. 4 RADIATION DATA

3075

GGW/jmg
cc: Force Commander
Air Commander
Prop Surv Bd
Legal Claims
Pur + Supp

28 May 1964

To : Chief of Military Personnel

From : Air Commander

Subject: Ground accident involving Transair Sweden and ONUC Movement Control

..... 1. Enclosed are three copies of the subject report for the perusal and comments of the Force Commander.

2. Since it is ~~very likely~~ possible that Transair Sweden will claim against ONUC for the damage to their aircraft described in this report, it is suggested that the sections concerned (Purchase and Supply, Legal Claims, Property Survey Board) be given copies of the report after the Force Commander has attached his comments.

(G G Wright) G/C
Air Commander

| Category | Date | Aircraft | Unit | Description | Damage | Remarks |
|---|---|---|---|---|---|---|
| Incident | 18 Jul 63 | C-47 208 | C-47 Squadron | Lost engine 60 miles NW E'ville; unable to feather & lost altitude to 500'; threw out cargo; feathered engine on third attempt and landed at E'ville | Valve rocker assembly #7 engine pitted and worn causing piston rod to break and engine failure; suspect feather relay system malfunction; engine change | Board of Inquiry. Recommend air tests and feathering check periodically of all C-47 a/c/ recommend write-off 2614# meat 3 boxes with personal equipment and PX stores. |
| ANC Accident | 25 Aug 63 | ANC Tiger Moth PTP 44 | ANC N'Dolo LEO | Tiger Moth flown by ANC cadets on recce of LEO at low altitude lost engine and crashed in native quarters Kaniambo suburb of LEO | A/C struck roof of house telephone pole and wrapped around tree next to brick house in built-up area. A/C completely written off two pilots miraculously escaped fatal injuries and hospitalised with minor cuts | Aircraft flying at too low an altitude over city; unable to make open area after engine failure and crashed; case handled by ANC authorities. |

SUMMARY MAY-AUG/63 - 9 CASES

ACCIDENTS ONE 201 damaged taxying into ditch with no brakes.
ONE (ANC) Tiger Moth crash Leopoldville

INCIDENTS FOUR Four A/C engine failure emergency landings - Nil damage

CASE HISTORY THREE TWO Refuelling - one Holding

SUMMARY PREVIOUS PERIOD 1 JAN- 30 APR - 12 CASES

ACCIDENTS THREE - ONE C47 swung landing, One J29 Engine failure, One Helicopter Engine Failure

SIX - THREE damaged ground firing Two forced landing, One Taxying

THREE - Damage by trucks and equipment

H.V. Peterson S/L
(H. V. PETERSON) S/L
Flight Safety Officer
ONUC

FORCE COMMANDER FILE COPY

Seen 9/9-63

# ONUC ACCIDENT AND INCIDENT SUMMARY

## MAY 1963 ONWARDS 30 AUGUST 1963

| Category | Date | Aircraft | Unit | Description | Damage | Remarks |
|---|---|---|---|---|---|---|
| Incident | 30 May 63 | OD-ADV DC-4 | TMA | Aircraft landed at Kikwit on 3 engines | Repair to oil tank leak | Friction of metal parts eventually caused fracture of oil tank in wheel nacelle; a/c repaired and flown out. Inspection of other DC-4s |
| Incident | 30 May 63 | DC-3 | Air Congo | A/C landed at Kikwit one engine feathered | Nil | Aircraft repaired and flown out. |
| Case history | 27 May 63 | OO-SJD Boeing 707 | Sabena | Report a/c circled Kamina 50 mins before obtaining landing clearance | Nil | Check on facts and memo to all concerned 31 May 63 to improve notification procedure |
| Incident | 18 Jun 63 | Otter 302 | Eville Det | A/C enroute Kolwezi to Dilolo developed engine trouble and carried out forced landing Kisenga | Nil Aircraft repaired and flown out to Kolwezi | D-14 action requested. completed by pilot but not complete BY TECHNICAL OFFICER |
| Case history | 24 Jun 63 | C-124 | A'ville | Report aircraft had water in tanks after refuelling | Nil Engine cut on run-up | Report by Base Commander POL Air Congo notified |
| INCIDENT | 1 July 63 | C-47 | Kolwezi | Report S/F 5 lost engine after take-off Kolwezi | Nil Feathered engine and landed | Drained tanks; one drum kerosene put on board by mistake D-14 action |
| Accident | 12 Jul 63 | C-47 201 | C-47 Squadron | After landing lost brakes while taxiing and ended up in ditch | Two propellors damaged; wing bent & requires wing change; brakes and hydraulic system u/s | A/C flown to N'djili for wing change; D-14 action; failure in brake system |

X

UNCLASSIFIED

AIRBASE COMMANDER ELISABETHVILLE

Info: Air Base Commander N'djili (copy)
CO C-47 Squadron, N'djili (copy)

AO 15 FROM AIR COMMANDER. BOARD OF INQUIRY IS HEREBY APPOINTED IN ACCORDANCE WITH ONUC/ASI 1.4.4. TO INVESTIGATE, MAKE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS ON ACCIDENT OF C47 UN 218 FLYING OUT OF ELISABETHVILLE ON 18 JULY. BOARD IS COMPOSED OF FOLLOWIMG:

| | | |
|---|---|---|
| PRESIDENT | 87791 MAJOR CHRISTIANSEN, O | BASE COMMANDER |
| MEMBER | 19863 S/L PETERSON, H V | FLIGHT SAFETY OFF |
| MEMBER | 85496 MAJOR TANDERO, G | TECHNICAL OFFICER |
| MEMBER | CAPT AASAN | CHIEF MOVEMENT CONTROL, EVILLE |

Drafted & Authorised by: Air Commander

18 July 1963

cc: Force Commander
Chief of Staff
Air Commander (2)
Chief Air Tpt Off
Flt Saf Off
Mov Con, LEO
CLO

RECEIVED
1965 JUL 18 PM 3:50

RECEIVED
1965 JUL 18 PM 4:00

COPY

XX

FROM : ONUC HQ LEO

TO : HQ KAT AREA EVILLE

SECRET FC/1855 4 JUNE 63. FOR WORKU FROM FORCE COMDR.

ALPHA. RHODESIAN AIRCRAFT DAMAGED LAST YEAR NOW AT MANONO WILL BE REPATRIATED TO RHODESIA.

BRAVO. RHODESIAN CREW AND TECHNICIAN REPORTING TO EVILLE WILL BE FLOWN IN SUITABLE UN PLANE TO MANONO. RHODESIANS WILL BE IN CIVILIAN ATTIRE.

CHARLIE. YOU WILL PROVIDE SUFFICIENT TROOPS ON THE SAME AIRCRAFT FOR PROTECTION OF RHODESIANS. TROOPS WILL REMAIN AT MANONO UNTIL RHODESIAN PLANE IS REPAIRED AND DEPARTS.

DELTA. AGREEMENT FROM CENTRAL GOVERNMENT FOR THIS MOVE BEING SOUGHT.

ECHO. NO REPEAT NO MOVEMENT TO MANONO BEFORE CLEARANCE FROM ME.

FOXTROT. FURTHER INSTRUCTIONS LATER.

cc: Mr. Dorsinville
Air Comdr
COS
Air Ops
Mil.Ops.
Mil.Info.

Lt.Col.J.I.Cooney
Force Commander
4 June 1963

FORCE COMMANDER
FILE REF COPY

JMH/FC

# GUIDE

# FOR PERSONNEL APPOINTED

# AS MEMBERS OF A BOARD OF ENQUIRY

# INTO AIRCRAFT ACCIDENTS

* * * * *

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| CHAPTER 2 | - | Responsibilities of the Board Members |
| CHAPTER 3 | - | The Investigation |
| APPENDIX "A" | - | Sample Board of Enquiry |
| APPENDIX "B" | - | List of Common Errors in the Proceedings of a Board of Enquiry |
| APPENDIX "C" | - | Sample UN Crash Message |

## CHAPTER 1

## BOARDS OF ENQUIRY

1. The purpose of accident investigation is to determine what happened, why it happened and how it happened, in order to keep it from happening again. Accidents are almost always destructive and often tragic. It has been proved repeatedly that intensive investigation and reporting will in most cases reveal the cause factors and point the way to the prevention of similar accidents.

2. The Air Commander will appoint a Board of Enquiry when required. The duties of each board member will take precedence over all of his normal duties. Each board member must become familiar with all the pertinent directives before serving and must engage personally in the investigation and in preparing the formal report. The following instructions apply:

(1) Each board will have one or more members equal to or senior in rank to the operator, supervisor, or individual operating or directly responsible for the operation of the aircraft or vehicle involved.

(2) The Air Commander will insure that no board member had a personal interest in the investigation, and that each one is able to act impartially.

(3) The Air Commander will insure that the board consists of members of different nationalities and must include at least one, and no more than two, persons of the same nationality as the individual primarily involved in the accident.

(4) The President of the Board should not be of the same nationality as the person(s) directly involved, if at all possible.

(5) Required membership. The president must be a rated pilot officer; there must be at least four voting members as follows:

(a) A pilot officer with wide experience, preferably qualified in the aircraft type and model involved.

(b) An officer qualified in aircraft maintenance and engineering.

(c) An experienced Air Force flight surgeon or a medical officer in aviation medicine; if neither is available, an experienced Air Force or Army medical officer (only in event of injuries, death or deemed necessary by the Air Commander).

.../...

(d) The Flight Safety Officer or the UN civilian aircraft inspectors.

(e) A qualified Air Force Communications officer: when air traffic control, air communications personnel/facilities are known or suspected to have been a cause of the accident.

(f) A qualified weather officer: when weather/weather service is known or suspected to have been a cause of the accident.

(g) A representative of the commander whose aircraft/operator was involved in the accident.

(6) Optional Assistance at the Air Commander's Discretion. The Air Commander may invite as advisors or consultants to the investigating board:

(a) Additional personnel as he deems necessary; however, it must be clearly defined whether they are members of the board and have a vote or are only as consultants, e.g. legal officer.

## CHAPTER 2

## RESPONSIBILITIES OF THE BOARD MEMBERS

3. Accident investigation is a specialized job, and in the air contingents' home countries this is carried out by specialists. However, in the United Nations Organization such specialists are not always available; therefore the object of this guide is to assist board members in becoming investigating officers by outlining tested and proven methods of investigation. Like crime detection and medical diagnosis, it often entails a microscopic search for unknowns. Every factor, however remote or small, must be discovered, weighed, and considered in order to reconstruct what actually occurred. In several instances, successive accidents have occurred without the prime cause being discovered because investigators lacked the zeal, the ability, or the knowledge to get all the factors.

4. Nothing is more important in accident investigation than the investigator himself. Here are some of the qualities you must have to be a good investigator;

(a) Interest in the Job - This is a fundamental requirement. You must possess a real desire to tackle the problem for the good of the United Nations.

(b) Avid Curiosity - You must be obsessed with a desire to know all that can possibly be learned about the case at hand.

(c) Analytical Mind - You must have a natural or cultivated ability to visualize possibilities and correlate evidence.

(d) Perseverance - Make up your mind to carry the investigation through to ultimate success regardless of the blind leads, conflicting evidence, or other discouragements encountered.

(e) Infinite Patience - Do not neglect small details. Develop the ability to follow small or obscure clues.

(f) Sound Judgement - Learn how to weigh evidence properly and to understand and evaluate probabilities.

(g) Tact and Diplomacy - Develop the ability to inspire confidence and respect and to elicit information from affected or prejudiced persons.

.../...

(h) Absolute Integrity - Be above influence from any source. Concentrate on truth alone. Respect and live up to the trust placed in you.

(j) Experience - Learn as fast as you can. Develop your technical knowledge. Call on experts for assistance whenever you feel your own experience is too limited to cope with a problem.

5. Essentials of good investigation include the following:

(a) Promptness -

(i) Get to the scene of the accident as soon as possible before evidence is disturbed.

(ii) Prevent unnecessary handling or moving of wreckage.

(iii) List witnesses for later questioning.

(iv) Follow clues while they are fresh.

(b) Thoroughness -

(i) Examine all evidence in minute detail.

(ii) Take nothing for granted.

(iii) Do not jump to conclusions.

(iv) Follow every clue to the limits of usefulness.

(v) Question all witnesses or persons having knowledge of any phase of the accident.

(vi) Preserve wreckage or evidence until the investigation is satisfactorily completed.

(vii) Nothing is too much trouble which will help prevent a similar accident or the loss of one life.

(c) System -

(i) Conduct a planned investigation.

(ii) Lay out logical courses of procedure.

(iii) Do not leap to hasty conclusions which tend to curtail the investigation.

(d) Accuracy -

(i) Guesses, rumours, or half-truths have no place in an accident record.

(ii) Statements must be verified or be subject to verifications.

(iii) Theories are useful only in the absence of facts and must be well substantiated.

(iv) All evidence must be recorded accurately.

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# CHAPTER 3

## THE INVESTIGATION

6. The investigation of an aircraft accident consists of collecting all of the facts and circumstances known about the accident, deducing the sequences which occurred, and then determining why these events did occur. Investigators must remember that although an obvious personnel error or materiel failure may have been the direct cause of the accident, the contributing or underlying factors which in turn caused the error or failure are often the most important. The investigation of an accident is seldom simple; however, no stone should be left unturned in pursuing the investigation.

### Reconstructing of Evidence

7. Make every effort to reconstruct the events that culminated in the accident. This will aid greatly in planning a logical investigation. You must first determine how the airplane reached the position and attitude in which it came to rest. An overall survey of the accident scene and a study of the relative position of parts of the wreckage will establish the type of accident.

8. The path of the aircraft may be deduced by careful examination of ground marks and scars upon trees, shrubs, rocks, poles, power lines, etc. Wing tips, propellers, landing gear, etc., leave tell-tale marks or bits of evidence at points of contact with fixed objects. Ground scars and broken trees or brush will assist in establishing the angle and attitude in which the aircraft contacted the ground.

### Evidence at the Scene of the Crash

9. How to Read the Evidence - In certain accidents such as those involving structural failure, fire or explosion in the air, evidence may be widely scattered along the flight path. Bits of wing surface, fabric, control surfaces, miscellaneous parts may furnish the clues to disintegration or fire which resulted in the accident. All such parts should be located and

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information about them tied into the accident story. Disintegration in flight, however, does not necessarily indicate an explosion or fire. An airplane in flight, particularly in a dive or pull out at excessive speed, is subjected to undue stress. Failure at its weakest point may cause instantaneous disintegration of the whole structure with an accompanying noise resembling an explosion. Fire may follow structural failure as fuel vapours escape. Other types of accidents may also be identified by study of the distribution of the wreckage:

(a) Dives into the ground - When wreckage is confined to a small circular area around a deep ground scar, it is safe to assume that the aircraft dove into the ground at a steep angle. In such cases the aircraft and engine or engines will most likely be completely demolished and many parts buried in the crater formed at impact.

(b) Spins - Spin accidents also leave a small concentrated pattern, but the ground scar is more shallow and indicates a rotary motion. One wing (towards the inside of the spin) will usually have taken most of the impact while the outside wing will show less damage and may even be thrown forward. The fuselage will usually be broken off in several places and the tail section thrown in the direction of spin rotation.

(c) Low-Level Flights - A long narrow distribution of wreckage indicates a flat approach suggesting a forced landing, instrument flight at insufficient altitude, or buzzing. Propeller marks will usually be found and their spacing may indicate engine speed and power output at impact. The extent to which, and direction in which, propeller blades are bent will also indicate relative power output.

(d) Loss of Control - Many accidents have occurred through loss of control during instrument flight. Under such circumstances the aircraft frequently strikes the ground during a steep loose spiral with wings almost vertical to the ground. In such cases the point at which the wing struck the ground will yield bits of metal or small pieces of glass from navigation lights.

Preservation of Evidence and Special Tests

10. Preservation of evidence to support conclusions regarding an accident is an important to the investigator as it is to the prosecuting attorney. in a court of law. All physical evidence having a direct bearing on the accident should be photographed as found in the wreckage before being removed. After removal of the parts from the scene of the accident, close-up photographs of the suspected parts should be made and the negative should be suitably marked to indicate the point of interest if found necessary.

11. Parts of sub-assemblies suspected of failure, mechanical trouble, or faulty design, must be wrapped or boxed to prevent loss or further damage. Carefully tag or mark parts to identify them in relation to the accident (place, date, make, identification number of aircraft) and in respect to their location in the aircraft. The tag should also contain a brief statement regarding the suspected relationship of the parts to the causes of the accident so that proper tests may be made of such parts. Some examples of parts which may be tested and preserved as described above are:

(a) All parts suspected of initial failure, improper heat treatment, incorrect specifications, etc.
(b) All parts that seem faulty in design or workmanship.
(c) Plumbing not properly supported, subject to excessive vibration.
(d) Ruptured plumbing or fittings.
(e) Faulty or suspected instruments, auto pilots, etc.
(f) Faulty or suspected wiring, electrical or radio equipment.
(g) Defective engines, propellers, or accessories such as carburettors, governors, superchargers, etc.

12. In cases of engine failure, or specific failure where malfunctioning of parts is not discovered, specimens of fuel and oil for qualitative laboratory analysis should be obtained. Such samples will be preserved in clean containers and identified as suggested above. Give the location at which the specimen was obtained. Fuel and oil systems should also be investigated for the presence of foreign matter at the accident scene. Foreign matter discovered in fuel or oil strainers should then be preserved for analysis.

13. When engine failure has been reasonably well established and the cause remains obscure, it will be necessary that a teardown inspection of the engine be conducted. Final reports of accidents should not be delayed for the results of special tests or inspections. Have the reports transmitted as soon as possible and include the explanation that special tests are being conducted. When the supplementary information becomes available, it should be identified as to date and place of accident and aircraft identification and made part of the original investigation.

14. Other special tests include flights in similar aircraft, simulating the conditions under which the accident occurred. Findings from such tests are admissible to substantiate possible cause factors deduced from other phases of the investigation.

Examination of the Wreckage

15. This is generally one of the most important phases of the investigation and should be carried out as thoroughly and quickly as possible. Delay may result in the loss of vital evidence, due to corrosion of broken surfaces when exposed to the elements or to loss by souvenir hunters. It is impossible to give a complete list of items to examine since each case is different and must be dealt with according to its merits and the evidence available. However, the following may help:

(a) Wreckage and Terrain - The importance of obtaining all available information on the condition of the wreckage and all marks and indications on the surrounding terrain cannot be over-estimated; frequently seemingly unimportant notes obviate the necessity of revisiting the scene of the accident at a later date. Cooperation at the nearest air base is to be requested in order to preserve the wreckage as nearly intact as possible until release by the responsible officer. Wreckage should not be left any longer than necessary on an airport, or in a village, and should be carefully stored where it is not likely to be disturbed until all possible data have been assembled. A plot sketch of known scattered parts, drawn to scale, should be made showing the point of first contact with nearby obstruction on

the ground, the relative positions of the wreckage and bodies and all nearby marks pertinent to the accident. Identify the bodies and each part of the aircraft shown on the sketch. Photographs should be obtained showing the general disposition of the wreckage and any other important details. Hazards in the immediate vicinity of the accident such as trees, obstructions, pole lines, etc., should be shown. Indicate the flight path of the aircraft on a suitable map or sketch, including the positions and names of persons who saw and heard the aircraft and where they thought they saw or heard it. Any other sketches, maps or photographs which might aid in the evaluation should also be obtained.

(b) Power Plants - Usually, only a cursory examination of the power plant can be made at the scene of the crash. If, in the opinion of the investigator, it appears that a thorough examination of the power plant is required, arrangements should normally be made to move it to the nearest place, where adequate facilities are available for disassembly and check. See that all the blades of the propeller are there. Note the direction and extent of bends. If the blades are bent rearward at the tips, the indication is that little or no power was being developed. However, if the blades are bent forward, the indication is that the engine was developing normal or greater power. Both of the above indications depend to a great extent on the angle at which the aircraft struck the ground. Check the power system from tank to combustion chamber. Check the ignition system. Check the power plant installation, such as fuel lines, oil lines, ignition wiring, etc. Check for water, corrosion, or sediment in fuel and oil system. The oil strainer and sump should be checked for metal particles. If fuel or oil contamination is indicated, obtain sample of approximately one gallon for laboratory analysis.

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(c) Engines and Engine Installation Troubles - If engine trouble was a factor in the accident, determine, if possible, exactly what part failed or malfunctioned, what the circumstances were and completely identify the part as to make, model and serial number. If an engine teardown is made, submit the findings in the form of additional information when it becomes available, making reference to the date of occurrence of the accident, and aircraft identification and number. Check all the maintenance and engineering forms for previous malfunctions and EO compliance. Sketches or photographs showing the failure are extremely important in evaluating the nature of the trouble and in identifying the exact cause. If parts are small, have them bench checked. The position of the engine controls as well as the reading on the engine instruments should be carefully noted. These may indicate whether or not they were properly actuated in flight. If structural parts of the engine failed, identify the parts and then describe the nature of the failure. For example "Crankshaft broke in fillet at number one connecting rod throw", "exhaust valve stem broke due to fatigue just below head". If there are any unusual signs of wear such as scoring, burning, cracks, etc., describe them and their location.

(d) Investigators should be on guard concerning the proper assignment of causes of engine failure symptoms. The list below is a rough guide to the causes of engine troubles. Note the fact that several of them have similar symptoms.

(i) Carburettor icing may usually be indicated by a gradual decrease in power, sputtering, erratic increases and decreases in power, intermittently rough operation.

(ii) Ignition troubles frequently cause intermittent rough operation with backfiring.

(iii) Running out of fuel is indicated by sputtering, erratic increases and decreases of power.

(iv) An inadequate fuel flow, indicating obstructed or broken lines, causes sputtering and roughness.

(v) Smoke from burning oil is blue-white in colour, whereas gasoline smoke is black and smoke from glycol is white.

(vi) It is particularly important to check the amount of fuel on board the airplane at its last point of departure. If carburettors are disassembled, make careful notes of anything unusual especially as to whether they are dry, the amount of fuel in them, any foreign matter, or damaged parts.

(e) Jet Engines - Examination of jet engines in the field mainly involves visual inspection. Such items as fuel and oil filters, if readily accessible, can be removed, checked and replaced and a note in writing made to this effect. Before removing a part, scribe a mating mark on adjacent fixed and removable parts so that the part removed can be replaced in its correct position. Do not hasten to move or change the relative position of the engine and airframe or broken pieces lying round about. Try to determine from eye witnesses, gouges or marks on the ground, and dirt, pieces of wood or other foreign material jammed into nooks and crannies of the engine, just what magnitude of impact force was applied to the engine. With this information, impact failures can often be separated from "in flight" failures.

(f) Turbine Area

(i) Inspect the turbine area of the fuselage and engine exhaust for jagged slotted holes indicating a thrown turbine blade.

(ii) Check area for local torching or burning indicating a severe overtemperature condition.

(iii) Check for any missing turbine blades or nozzle diaphragm blades.

(iv) Mark the relative position of turbine and shroud ring and then check for turbine bearing failure by lifting the turbine vertically. Vertical movement indicates possible bearing failure.

(v) If the engine is reasonably intact try to rotate turbine using moderate force, i.e., hand or small lever. Failure to rotate may mean bearing seizure.

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(vi) Bearing failure in an intact engine is also revealed by a pronounced difference in the clearance between top and bottom turbine blades and shroud ring.

(vii) Check for overtemperature by inspecting turbine blade tips for plastic flow or burning of the trailing edge tips of the blades. Normally an overheating of the blades will be first revealed at this part of the blade.

(viii) The shroud ring will often be warped from an overtemperature condition.

(ix) Check for aluminization of turbine blades and nozzle diaphragm blades in the case of axial flow engines indicating a possible overtemperature and compressor stall condition. (But this may also indicate a compressor blade failure when heat was present).

(x) A question usually arises whether or not the engine was wind-milling or under power at the time of impact. This can often be determined by inspection of the turbine blades and shroud ring. A wind-milling turbine normally will have only the tips bent and the amount of bending varies around the blade periphery. The blades, upon impact and displacement of the wheel, (if any), will not gouge deeply into the shroud ring, nor will the gouge marks be found to an even depth on the circumference shroud ring. A turbine rotating under high speed will normally result in a more uniform bending of the blades around the periphery. If bending occurs nearer to the blade root than to the tip, it must be caused by forces due to high rotational speed. The shroud ring will be more or less evenly milled out in this case.

(g) <u>Combustion Chamber Area</u>

(i) Check adjacent airframe and engine flame tubes for holes which appear to have been burned through by a torching effect.

(ii) Check interconnector pipes for failure and local burning.

(h) Compressor and Accessories Area

(i) On axial flow engines check the compressor and stator blades. If all stages are severely damaged or wiped out with the exception of the last stage stator blades, then thrust bearing failure has likely occurred.

(ii) If blading is reasonably intact check for possible individual or local blade failure.

(iii) Check the blades of the last two or three stages of compressor for burning. A severe compresor stall will often melt the blades of these stages.

(iv) Check fuel and oil lines for continuity. Plugged lines can be checked by removing and gently blowing through them, taking care to point the exhaust end down over a piece of white paper to catch any foreign material.

(v) Check fuel and oil filters for contamination. It is advisable to replace these parts after inspection. Fuel lines on the engine can be disconnected and a check made for the presence of fuel. This fuel should be placed in a clean container for possible analysis. If lines are full then fuel starvation at that location in the fuel system can be discounted.

(vi) Check if accessories can be turned by hand. Failure of the drive shafts due to impact is usually revealed by a bend in the shaft and is normally accompanied by local failure of the hold-down flanges or studs.

(j) Finally, if the engine has broken apart so that any bearings are exposed, check bearings for over-heat, i.e. discolouration varying from light orange to blue. Check ball cages and balls or rollers for deformation. Look for balls that are split in two. If failures occurred in flight, then scavenge oil filters should contain pieces of failed bearing material.

16 In order to obtain a general picture as to the probable attitude of the aircraft upon first contact with the ground, study the overall distribution of the wreckage, the marks on the ground, and the distortion and damage

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on the major parts. In disintegration in the air, parts of the aircraft which are located farthest from the main wreckage should be given careful scrutiny as these parts may have been the first to leave the aircraft and may contain a clue to the accident. In high altitude disintegration, heavy parts will have steep trajectories and lighter parts will be carried by wind. In low altitude disintegration, heavy parts will be carried by momentum further from the main wreckage along the direction of flight, than lighter parts. The edges of the fracture should be examined with the aid of a highpower magnifying glass to determine the nature of the separation, i.e. fatigue, tension, compression, torsion, etc. Determine the loading and CG of the aircraft prior to the accident. Ascertain whether the landing gear was up or down. Also the position of the flaps. On the control surfaces, examine all hinges, bell cranks, "push-pull" tubes, cables, pulleys, balances and tab mechanisms. Check for proper lubrication of all moving parts and the possibility of their having jammed. Note particularly broken control linkage. Determine if failures are the result of excessive wear, design, neglect, or impact.

17. Accidents in which the aircraft itself is a cause may be placed in the following two distinct categories for the purpose of investigation:

(a) Loss of adequate strength or of functioning ability of any part of the structure, controls, accessories, etc., of which the following are examples:

(i) Fabric failure is relatively easy to establish, the most obvious indication being signs of fraying of the edges due to flapping. However, during impact, the fabric is apt to become crimped in places, and especially when in bad condition, may have a somewhat similar appearance. Consequently, it is quite necessary in practically each instance to assemble together all available fabric and to correlate the crimped places with fractures and deformation of the internal structure. In cases of fabric failure it is also necessary to establish the condition of the cloth and of the dope, and to examine the stitching and reinforcing tape, which often may contribute to the failure.

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(ii) Fractures in the primary structure of the wings, fuselage, and tail sometimes are also difficult to establish. Unless there is conclusive evidence beforehand that a failure had occurred in the air, it is necessary to make the most detailed inspection of every failed part to establish, if possible, any unusual features. In most cases, failure of the primary structure will be caused by poor design (particularly on new models), faulty material, improper assembly, previously weakened parts, etc. It should be remembered that very often relatively light overall impact loads will result in especially severe local stresses, while high overall air loads will not necessarily produce high stresses in all parts of the airplane.

(iii) The complete control system obviously must be traced out and carefully inspected for control cable separation, jamming, hydraulic line or actuator leaks and electrical trim switch shorts due to foreign material. Separation and/or jamming is apt to be present in some form or another after a hard impact of the aircraft with the ground; therefore, a careful analysis should be made of every fracture and jammed part to ascertain its nature. It is unlikely that an accident is due to failure of a control cable in flight since these cables have such a large margin of safety. However, cable failures in flight have occurred. When this has happened, examination of the fracture reveals weakening of the cable by rubbing, fraying, corrosion, and the breaking of the individual strands which obviously was not discovered by maintenance on inspection. Unwinding of the turnbuckle attachment due either to incorrect safetying or lack of it has been another cause factor. Jamming of cables during flight can usually be detected by fore and aft markings, whereas the jamming of cables as a result of ground impact is evidenced by a mark in only one direction. If failure has occurred in the air

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to aircraft with either hydraulic control or hydraulic boost controls, inside surfaces of the aircraft will be saturated with fluid. However, on the other hand there will be little or no evidence of saturation if failure occurs as a result of only ground impact. Trim switch terminals may have tell-tale marks indicating shorting but in most cases the foreign material which may have caused the short will be lost in the wreckage.

(iv) All control surfaces should be checked to ascertain that the balance weights are attached or accounted for. This is very important since disintegrations have occurred which were the result of the loss of control surface balance weights that instituted catastrophic vibrations.

(b) Altered flight and operational characteristics of the aircraft by virtue of improper installation, rigging, loading, etc., of which the following are examples:

(i) The loading of the aircraft, including the total weight and the location of the centre of gravity, is apt to have a marked influence on the performance and stability. It is, therefore, important to establish the two values and compare them with the approved ones listed in the specifications for the aircraft. In this connection, the weights and location of passengers, crew, baggage, fuel and any additional equipment should be obtained, if possible. An attempt should also be made to ascertain the basic weight and CG location of the airplane with a view to any alterations which may have been performed since the aircraft left the factory.

(ii) Control surface travel, especially on the rudder and elevator, should be given due consideration. Deviations from the approved values given in the Aircraft Specifications may be due to an improper installation of the control system or of the stops. Both the lack of sufficient travel and the presence of too much travel may easily contribute to or cause an accident. Also, settings of all trim tabs, flaps, etc., should be noted.

(iii) Alteration or elimination of certain parts, especially

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within control systems, such as bungees, counterweights, operational handles or levers, etc., should be checked, by referring either to approved drawings or by comparing with other airplanes of the same type.

18. It should be realized by the investigator that accidents involving technical phases of the aircraft, as described in this section, require considerably more study and specialized investigation. In many cases, this cannot be accomplished entirely in the field, and, instead the work must be continued at a depot or the factory. In any event, it is absolutely essential that, in case of mechanical failure of the aircraft, adequate photographs be taken, and the pertinent failed parts retained for future disposition. Descriptive sketches and explanatory material accompanying the parts may be very helpful.

19. If a control was used improperly because of its design, or if one control was mistakenly operated when the pilot intended to actuate another, the location, size, shape, or mode of operation of the control may have been an underlying cause. Any special or unusual flight characteristics encountered for a particular configuration if passed on to other operating personnel may prevent future similar accidents.

Proper Identification of Failed or Malfunctioning Parts Necessary

20. This section is equally applicable to all the aspects of material troubles which are described in the sections which follow. One of the most important items concerning failed or malfunctioning parts is proper identification of the nature of the trouble, the model designation, part number and manufacturer. For example, if a report is received which indicates merely that the "landing gear folded", "axle broke", "strut failed at weld", "oleo pulled out", the report is useless for further analysis. Specific information on the part that failed, how the failure occurred, descriptive information of the conditions resulting in the failure, the exact model designation, part number and manufacturer are required. In the event of an airframe or engine failure, the report should indicate, if possible, whether the failed part was original or replacement. Accident reports received which do not adequately identify failed or malfunctioning parts caused additional time consuming correspondence. It is much

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simpler, less bothersome, and more constructive to forward a complete, accurate report the first time. The appropriate section of the accident report form or additional pages should be completed with detailed information concerning failures and malfunctioning which were direct causes of the accident or if such troubles become apparent as factors contributing to the severity of the damage and injury. Co-ordination of investigatory efforts with engineering or maintenance personnel is essential for proper evaluation of failures discovered in the course of investigation. Do not hesitate to request technical assistance.

21. The propellers will be carefully inspected and all damage reported in detail. If any blade is broken, it will be determined, if possible, whether such break was caused by contact with the ground or by structural failure, and every effort will be made to locate any missing parts. The probable propeller setting and power condition (power-on or power-off) will be determined. Should a structural failure be indicated permission will be obtained so that the parts may be shipped to the appropriate place for examination. In all instances, properly identify the propeller by manufacturer, model and serial number.

Fire

22. Fires may have destroyed much of the evidence of causes contributing to an accident; nevertheless, a thorough examination of the wreckage must be completed. Extra care and attention must be given to whatever evidence is available. It should be definitely determined whether fire preceded the crash and if so, when, where, and how the fire originated and how it caused the accident. Information on fire in flight is valuable as a guide to corrections in design and to the development of fire warning and fire extinguishing systems. Fire frequently occurs following even minor accidents. Information concerning how the fire started and was fed will assist in developing successful fire prevention and fire extinguishing methods.

23. It will be important to report where the fire started, how it spread and was fed, what colour it was, its odor, whether or not fire extinguishers were available, what type and make they were and whether they functioned.

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Methods of fighting fires following crashes and of making forced entries into crashed or burning aircraft have been the subject of much study and research because effective methods are a means of saving lives and valuable equipment. All available facts on this subject should invariably be unearthed and reported. In this regard, it should be noted whether or not escape from the burning plane was successful, whether emergency exits could not be used because of the fire area. Concerning ground fire fighting equipment, reports should indicate the type of equipment, whether it was available, how long it required to reach the scene of the crash and the effectiveness of the types of equipment used.

24. Never assume that the causes of an accident cannot be determined merely because fire has damaged the structure of the aircraft. Fuel, electrical, control and hydraulic systems may have escaped serious damage. Valve positions can usually be ascertained; and the condition of the tanks will frequently indicate whether or not they contained fuel or oil at the time of the fire. Information as to whether fuel or oil tanks broke or collapsed in the crash is important. Engines may be seriously damaged externally by fire while internal failure or defects will not be effected.

25. The source of the fire can frequently be localized at the point of greatest damage or at a point indicating the greatest amount of heat. A broken or leaking fuel or oil line which causes a fire can frequently be located by careful inspection of the damage.

26. Fire is one of the airman's greatest hazards. Every possible step should be taken to ascertain what causes fires, how they can best be fought and how they can be prevented.

Structural Failure

27. In case of an accident which may have been due to structural failure, the damaged components will, insofar as possible, be arranged in their correct relative positions during the course of the investigation and particular attention will be paid to all failed parts, especially with

regard to the direction in which they may have failed or of the forces which are believed to have contributed to or caused the failure. A careful search will be made for any missing parts and any part not found will be listed in the report.

28. When the investigator determines that an aircraft has been modified or altered, a thorough investigation will be conducted to determine to what extent such alteration or change may have contributed to the accident. Thorough inspection should be made of repairs and replacement parts, especially with reference to the identification of proper workmanship in fittings, welds, spars, cables, tubing, splices, sheet metal work and other parts. Intensive inspection will disclose whether improper materials or poor workmanship may have been a contributing cause in the accident or the cause of a failure which increased the severity of the crash. Photographs of failed or broken parts are of inestimable value to the reviewing personnel and may provide a definite means of arriving at and substantiating certain conclusions.

29. Reports on failures of control surface hinges, attaching structure, hinge, ribs, etc., should indicate whether or not the aircraft had been subjected to extreme gusts such as when tied down in high winds with controls free. Point out also whether or not the aircraft has been subjected to hard use in flight, such as might occur during aerobatics or in flights through turbulent air. Operation from rough fields may be an underlying cause for failure of materiel. Any evidence of repeated activity such as the hammering of control surfaces against their stops should be reported.

30. In the event a wing failure has occurred, it is not sufficient to report witnesses' statements to the effect that one or the other wing failed under given circumstances. Technical information with regard to wing and control surfaces such as conditions of control surface hinges, balance weights and attachments, spars, spar caps, and the like may prove to be the most important links in determining the initial point of failure.

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Oxygen and Associated Equipment

31. Where conditions associated with the use of oxygen may have a bearing on the accident, the following information should be included in the investigation:

(a) A statement of the aero-medical indoctrination received by the pilot including date of last formal training and decompression chamber run.

(b) Training received by the pilot on the oxygen system in the particular aircraft type.

(c) Type of helmet and mask suspension used by pilot and date of last mask check by the Safety Equipment Section, if applicable.

(d) Serviceability of the aircraft oxygen system (include information on its operation on previous flight and log book entries on previous unserviceabilities) and whether system was fully charged prior to flight.

(e) Date system was last purged.

(f) Compliance with applicable EOs.

(g) Type of regulators and date of installation.

(h) Emergency and bailout assembly stowage and local instructions for its use.

32. When possible, evidence should be included in the investigation on the condition of the helmet and mask assembly, oxygen lines and connections. Regulators, if operable, should be checked on a test stand if possible. Contents of oxygen bottles and condition of emergency and bailout assembly noted.

Ejector Seats and Canopies

33. If the aircraft has crashed with a jettisonable canopy still intact the following should be included in the investigation:

(a) Check the prime remover to ensure the ground locking pin was removed.

(b) Check the jettison linkage to the canopy locks and firing seat, to establish if an attempt was made to jettison that a malfunction may have prevented. If the canopy was jettisoned and the seat not ejected, carry out similar examination on seat ejection mechanism.

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Anti-Buffet Helmets and Harness and Seats

34. Whether or not the occupants were injured in the crash of or forced landing of an aircraft, the following information should be included in the investigation with respect to seats and safety belts:

(a) Type of seat, i.e. fixed, movable, aft facing, etc.

(b) If seat failed, how it failed.

(c) What seats were or were not occupied.

(d) Type of seat belt or harness.

(e) Whether fastened or unfastened.

(f) How long installed in aircraft and general condition of harness.

(g) Photograph of cabin or cockpit area showing, instrument panels, seats, seat anchorages, safety belts, shoulder harnesses (and their anchorages) and either the cockpit or cabin area immediately surrounding the seats and anchorages. Where personnel have been injured or killed the damage depicted in the photographs should be correlated in some way with the injuries sustained.

Note: If crew were fitted with anti-buffet helmets, a short description of what part helmets played in preventing injury in relation to the above factors should also be included in the investigation. Helmets should be retained for further study by Flight Safety Department in home country of contingent involved.

Controls

35. All controls should be traced out and carefully inspected, hinges between movable and fixed surfaces will be given minute inspection, and a careful check made so that all parts may be accounted for. Details as to how the failure occurred, and the parts that failed or jammed, should be noted. For example, the accident report on an aircraft in which the rudder and tail wheel controls are inter-connected, stated merely that the tail wheel was forced too far to the right and jammed. Engineering personnel had not been requested to determine the exact cause. Therefore, it could not be determined whether the tail wheel mechanism actually jammed or the jamming occurred in the rudder system, pedals, or the cable control system. Corrective action, based on such a report, was impossible.

Instruments

36. Where instrument failure or malfunction was conceivably a factor, both engine and navigation instruments will be carefully inspected and the readings recorded together with the investigator's comment on their condition, maintenance history and probable accuracy. Photographs of the instrument panel showing the readings of all instruments, including a clock, may prove extremely important.

Communication Equipment

37. When the use or functioning of radio equipment might have been a pertinent factor, the investigator should determine, if possible, the settings of all pertinent switches and controls. Check the maintenance forms for any history of radio trouble. In some instrument flying accidents involving inexperienced personnel, it may be discovered that pilots, co-pilots, navigators, or radiomen did not make the best use of the equipment on board. The maintenance record of the equipment may have some bearing on the degree of reliance placed on the equipment by flight personnel. If the accident was one in which bad weather was a factor, question the pilots concerning the reliability of the radios, static conditions, use of any special landing or flight radio aids.

Electrical Systems

38. Specific information is required concerning electrical difficulties discovered in the field in order to implement a programme for establishing standards of safety for electrical equipment and systems used in aircraft. The type of information required in the cases of failures involving electrical equipment or systems is as follows:

(a) If the trouble can be definitely traced to a specific electrical component, an indication of how or why it failed is exceedingly helpful. Identification of the component by the official nomenclature and part number is essential. To report only that an electrical short circuit caused trouble is of little value. However, corrective action can be taken if the report states, for example, that the insulation failed at a particular point in a well-identified specific unit.

.../...

(b) If the trouble was the malfunctioning of a system, it should be determined whether the original cause of the trouble was the failure of an electrical component or the failure of a mechanical device upon which the proper functioning of the electrical system depended. An example of the latter is the failure or the maladjustment of a mechanical linkage for actuating a limit switch in a landing gear system causing the failure of the electrical retraction system.

(c) If an electrical fire has caused the complete disintegration of an electrical component, it is usually not sufficient to conclude that the component itself was the original cause of the trouble. A complete story of the conditions existing before and at the time of the failure is needed and may have to be pieced together by interrogation of the pilot and by a complete investigation of other parts of the electrical system. Many times the weakest link in an electrical system fails when it may not have been the initial reason for the trouble. With this in mind, therefore, it is important to report all the factors leading up to the trouble so that a proper analysis can be made and corrective action initiated. For example, the burning out of an inverter may be due to an excessive voltage from the generator caused by the opening of the resistor in the voltage regulator.

(d) In certain types of electrical system troubles, it also is important to know if the pilot was fully cognizant of how the system should function and if he made use of the warnings and indication that were given. It will be helpful to know if the system complexities tended to confuse the pilot or if he was called upon to concentrate on too many things simultaneously.

(e) If wiring is at fault, it should be determined if it was due to improper terminal connections, routine clamping, protection against chafing, etc., and if the wire was protected by a circuit breaker or fuse.

.../...

(f) From the accident report, it should be possible to determine if a recurrence of the trouble can be prevented by better operating procedure, more adequate warning devices, etc.

Recorded Evidence

39. Investigating teams should scrutinize all related tape recordings and log extracts in control towers, GCA units, and other ground facilities that may record significant events leading to the accident.

Sabotage

40. The possibility of sabotage being the cause of an accident should never be ignored. Although sabotage is normally associated with the subversive activities of an unfriendly government, the acts committed by an individual because of discontent or a grudge can be just as disastrous.

41. Sabotage can take many forms. Explosives, incendiaries, pollution of the fuel or oil system and alteration of a vital component are all effective tools of the saboteur. Items such as improperly tightened bolts, hose clamps, etc., may be the result of carelessness, or poor maintenance procedures, or they may have been deliberate omissions. The attitudes and actions of the personnel who have been associated with the aircraft in question may indicate a probability of sabotage even when the mechanical aspects of an investigation have revealed no similar indications.

Parachute Jumps

42. When serious or fatal injury results from a parachute jump, the following information should be obtained:

(a) Make, type, and serial number of chute worn;

(b) Date of manufacture;

(c) Record of repairs;

(d) Repacking date;

(e) Drop tests and all other pertinent information;

(f) Obtain statements from eye-witnesses indicating the altitude of the jump, altitude of chute opening, and any other information pertinent to the accident;

.../...

(g) If possible, relate the injury to the following phases of escape - leaving the aircraft, impact with aircraft, structure, opening shock, falling out of the chute, landing or drag prior to release;

(h) Note available information on the airman's ability to release himself from the chute.

Forced Landing on Water (Ditching)

43. Where aircraft designed for landing solely on the ground have been forced to land upon water, complete information is important as a basis for recommending changes in equipment and in procedures.

Discipline

44. Discipline of the highest order is a prerequisite to continued safe operation. Inadequate discipline frequently causes accidents both in the air and on the ground.

45. Adherence to regulations and policies which govern the pilot's conduct while in flight must be ascertained. Did the pilot follow his proposed plan? Did he violate existing regulations through failure in communications or maintenance of prescribed altitude? Did he attempt IFR without proper authority? Did he attempt to utilize facilities for which he was not qualified?

46. Good air discipline is frequently modified because the pilot's ground discipline has been extremely poor. Did he show negligence in his flight planning? Did he fail to check his crew members, the aircraft and its equipment? Did he have available the latest navigational aids? Did he forget maps or facility charts? Did he overlook special equipment for a particular flight, such as life rafts, oxygen equipment or emergency accessories? In short, did he demonstrate the qualities of a responsible captain?

Human Factors

47. In the investigation of accidents it is imperative that human as well as mechanical factors be given proper consideration. Mistakes made by pilots and crew members are among the most frequent of accident causes. Investigating personnel should not fall into the error of jumping to conclusions regarding

an occurrence. The pilot's side of the story should be given proper value. The pilot who insists that the reason for his groundlooping an airplane was a dragging brake, and one who says that the gear indicated it was down and locked prior to a landing in which the gear collapsed, as well as the pilot who insists that the control tower gave an erroneous instruction may all be telling the truth. Evidence is necessary to substantiate or refute such contentions.

48. Assuming, for the moment, that pilot error is a primary cause of an accident, it is of very great importance to determine precisely what the error was. It is not sufficient to report merely that a pilot exercised poor judgement or displayed inadequate technique. An exact description of the procedure which was in error is necessary in order that the information may be evaluated and used as a basis for corrective action. This may, for example, take the form of an explanation of the entire method followed in lowering the gear, indicating in what particular respect the method was incorrect; the manner in which the pilot attempted to avoid a groundloop or the procedure which was followed which resulted in the groundloop; the attempts made by the pilot to obtain adequate weather information, the route flown, the amount of preparation for a flight - these are the ingredients which make up sound objective investigation.

49. A common failing of investigating officers is to limit their efforts to determining the direct cause of an accident. It is not enough to establish that a pilot error was made. Why was the error made? Was the pilot qualified to undertake the mission? Had he been properly checked out in the aircraft, on the oxygen system, instrument flying, loading, etc? Who was responsible for briefing the pilot and what briefing was given? Were alternates established in case of incoming bad weather? Were pilots briefed on how to get there? Each accident must be examined according to the circumstances. There are few, however, in which the question of adequate supervision does not arise. In all flying establishments there are officers charged with supervisory responsibilities. It is the duty of an investigating officer to determine what supervision was exercised and to clearly establish failings in this regard.

.../...

50. Physical or psychological factors frequently underlie the commission of an unsafe act. The medical officer should be requested to participate in determining such facts, if there is any suspicion of their existence. Poor eyesight, heart trouble, diabetes and the like, may actually be underlying factors.

51. When there is evidence that the pilot might have been incapacitated during the flight, the investigator should check his past history from a medical standpoint. If an autopsy has been performed, the pathologist's findings and the results of any special tests for hypoxia, carbon monoxide, intoxication, etc., should be included.

52. Ask the pilot point blank whether or not he has ever been involved in an accident before or been held responsible for a violation. Repeaters have been found to be responsible for a large proportion of accidents. Specific remedial action in terms of check flight, coaching in specialized information or additional training in certain aspects of flying may be indicated by the type of accidents in which the pilot has been involved. Ascertain the pilot's flying history. Close scrutiny should be given the previous three month period. This flight record may be of importance in revealing possible fatigue due to excessive flying or insufficient flying to maintain a satisfactory degree of proficiency. The pilot's outside interests, activities and personal habits should also be investigated; determine whether the drinking of intoxicants or other irregular habits may have been a contributory cause.

53. The conclusions of many investigations point towards a mistake or an error of judgement of the pilot. These conclusions are certainly true, but it is necessary to analyse the causes still further and determine the part which is played in them by sensory illusions.

54. Normally the pilot locates himself in space by observation of the ground or by reading his instruments. The reading of the instruments gives him exact information but observation of the ground can lead him to commit errors. Under certain conditions visual stimuli set up by observation of the ground do not give the exact sensation of the position of the aircraft in space. Here are examples:

(a) In flight under conditions of bad visibility over an area without landmarks such as calm water, simple observation of the area does not permit the determination of the position of the aircraft in space with respect to any of the three axis of freedom.

(b) In the case of observing a distant light in the course of a night flight the sensation with respect to the directional axis is excellent, although a feeling with respect to the horizontal and vertical axis does not exist.

(c) The visual stimuli from the observation of some snow surfaces or glassy water do not permit an estimate of height above the surface.

55. There is also the effect of acceleration to be considered when the pilot is not maintaining constant speed and direction and is subject to forces in addition to that of gravity. The combined effect of gravity and acceleration forces will modify a pilot's sensory perceptives and can deprive him of any knowledge of his exact position in space. Serious errors will then be committed.

56. The pilot may have a certain awareness of his error, but it is impossible to evaluate it because in the course of making the error he has imagined himself in a certain fixed position relative to the ground. But when emerging from clouds or when visibility improves the pilot looks at the ground and visual stimuli seen may give him his exact position. If this corresponds with what he had previously imagined, no adaption is necessary. On the other hand, if the previously imagined position is false there exists a conflict between the previous sensation and that which has just been experienced by the visual stimuli of the objects seen in their real positions. If these stimuli are not sufficiently precise to yield an exact sensation of position, the illusion continues and may be extremely dangerous. A number of cases where aircraft have flown into the ground at night or in low visibility conditions can be attributed to errors of this nature. A recent accident in which the aircraft badly undershot the runway during an instrument approach was believed due to a sensory illusion of height experienced by the captain. When investigating "pilot error" accidents, the part that might be played by sensory illusions should not be overlooked.

Examining Witnesses

57. Efforts to locate witnesses should not be confined to the actual scene of the accident in cases of suspected engine or structural failure, weather accidents, fire in flight, etc.. A nominal amount of effort may reveal witnesses to important events along the course of the flight where the trouble first developed. The importance of witnesses' testimony cannot be overstressed. Witnesses' statements and physical evidence at the scene of the crash go hand in hand in determining accident cause factors. One may complement or clarify the other. Investigatory personnel should bear in mind the fact that statements which may be available immediately following an accident may be difficult or impossible to secure from witnesses or participants at some subsequent time. It is important that all desired information and data be secured as promptly as possible from these persons.

58. Testimony by witnesses, especially those who have been injured or those who have been involved in the accident, may contain many inaccuracies. It is essential, nevertheless, that a non-critical transcript of such testimony be taken for subsequent evaluation. The witnesses should be encouraged to supplement or to modify their original statements, if on further thought they wish to reveal additional information. Such additions, however, should be recorded without modifying the text of the original statement.

59. Allow the witnesses complete freedom in describing the events pertinent to the accident. Leading questions or interruptions may change his course of thoughts or associations and lead to omission of significant details. Relatively long periods of silence, during which the investigator maintains an attitude of attention, frequently stimulates a witness to make further statements. When he has made available all the facts that he wishes to discuss, specific questions should be raised. These statements will include all pertinent information including the exact time, altitude, direction and attitude of flight, any unusual manoeuvres or circumstances, current weather conditions, etc..

APPENDIX "A"

UNITED NATIONS

PROCEEDINGS OF A
BOARD OF ENQUIRY
INTO AN
AIRCRAFT ACCIDENT
INVOLVING

1. Aircraft Type ..... Registration .....

Place ..... Date .....

Parent Unit .....

---

2. Board Convened by .....

Appointment .....

Authority .....

---

3. Composition of Board

| | Rank | Initials | Name | Trade | Service |
|---|---|---|---|---|---|
| President | | | | | |
| Member | | | | | |
| Member | | | | | |
| Member | | | | | |
| Member | | | | | |
| Member | | | | | |
| Member | | | | | |

---

4. Terms of Reference (as instructed by Air Commander)

(a) To investigate and report on the circumstances surrounding the accident which resulted in the .....
(details, e.g. crash etc.)

of ..... aircraft ..... No. ..... on .....
(type) (date)

---

.../...

5. Crew Information — Crew Members Involved

| Crew Function | Number | Rank | Name | Initials | Unit | Service | Class of Injury |
|---|---|---|---|---|---|---|---|

6. Passenger Information — Passengers Involved

| Number | Rank | Name | Initials | Unit | Service | Injury |
|---|---|---|---|---|---|---|

7. Flying History of Pilots (nearest hour)

| Name | Total hours all a/c | Instrument | On type involved | | | Last three months | | |
|---|---|---|---|---|---|---|---|---|
| | | | Dual | 1P | 2P | Total | on type | Night Inst't |

8. Aircraft Loading Data

Basic Weight .....

Max Permissible Take Off Weight .....

Weight this Take Off .....

Max Permissible Landing Weight .....

Weight this Landing .....

Permissible C/G Range ..... Fwd .....Aft

Calculated C/G Position at Time of Accident .....

9. That the evidence obtained by the Board is as set out in the evidence of the following

..... witnesses on the following ..... pages.
(number) (number)

# INDEX


| SUBJECT | PAGE |
|---|---|
| Index | 1 |
| Accident Narrative | 2 |
| Appendix "A" - Crash Area Map - 1: 1,000,000 | 3 |
| Appendix "B" - Wreckage Pattern Schematic | 4 |
| 1st Witness | 5 |
| 2nd Witness - Technical Witness | 6 |
| Exhibit I - Photostatic Copy or Technical Report | 7 |
| 3rd Witness - Medical Statement | 8 |
| Statement by the Board of Enquiry | 9 |
| Appendix "C" - Photographs taken at the scene of the accident | 10 |
| Board Findings and Recommendations | 11 |
| Air Commander's Remarks | 12 |


Note: The index page will be made up on completion of the board, and page numbering will be consecutive from page 1 - the Index. Where statements require more than one page the page numbering will follow the normal sequence.

## ACCIDENT NARRATIVE

This narrative, prepared by the Board, is simply a history of the accident, listing in chronological order all pertinent circumstances up to the actual time of the accident. This narrative should acquaint the reader with all known facts, circumstances and events which preceded the actual crash. It should not contain conclusions or opinions of the Board which are more properly included in the statement following the examination of witnesses.

APPENDIX "A"
To Board of Enquiry
Date:

1: 1,000,000 CRASH AREA MAP

Crash Site _____
Lat. & Long. or Place Name

APPENDIX "B"
to Board of Enquiry
Date:

## WRECKAGE PATTERN SCHEMATIC

A schematic drawing of the wreckage distribution showing pertinent detail of impact point, direction of flight, etc.

First Witness

I am (Number, Rank, Initial, Surname, Trade) and state that the following information is correct.

Q.

A.

Q.

A.

Q.

A.

Q.

A.

Q.

A.

Signature
(Name typed)

## Statement of Technical Witness

### Second Witness

I am (Number, Rank, Initial, Surname, Trade) and state that the following information is correct. I was requested by the Air Commander to assist in the investigation.

The statement should include a detailed report of the aircraft flight angle and attitude at time of impact, airspeed and engine power settings, breakup sequence, wreckage distribution, and engine and airframe serviceability prior to crash. Reference should also be made to aircraft serviceability records and maintenance practices with respect to the particular aircraft. Some conclusions may be added if there are indications of material or mechanical failure. The statement should be restricted to the technical aspects of the crash.

Additional technical evidence such as Technical Representative's Reports, photostatic copies of aero engine and airframe logs, will be presented as exhibits and follow the technical statement as is indicated by this sample board.

Note: If this statement is made by the Technical Member of the Board it will appear in the proceedings as the Statement of Technical Member rather than Statement of Technical Witness.

EXHIBIT 1
to Board of Enquiry
Date:

PHOTOSTATIC COPY OR TECHNICAL REPORT

**Note:** Detailed technical reports, photostatic copies of aero-engine logs, airframe logs, weather forecasts or any pertinent documents should be shown as exhibits.

## MEDICAL STATEMENT

Third Witness

I am (Number, Rank, Initial, Surname) Medical Officer and state that the following information is correct.

A Medical Officer may appear as a witness to the Board of Enquiry if a medical member is not a member of the Board. When the Medical Officer is a member of the Board and cannot present evidence as a witness he shall submit a written report of the human factors concerning the aircrew members involved in the crash. It is desirable that this report refer to any past medical history of the individual that might have a bearing on his actions, i.e. recent reported and treated ailments, pre-flight rest, food, liquor, or drug intake. Reference should be made to post-crash medical tests for presence of carbon monoxide, alcohol, hypoxia, or other conditions of the blood and tissues. The aircrew members status on high altitude indoctrination and current medical category shall be included. The relevant medical documents shall be presented and attached as an exhibit. The autopsy report may be included as an exhibit, or if deemed by the president or medical member to be unsuitable for inclusion, a paraphrasing or summary of the findings by the medical member, should be included. Photographs of bodies at the crash scene or at any stage of post morten examination are useful and desirable for investigation and as such should be examined by the board, but they should not be included in the Proceedings of the Board except under the most extraordinary circumstances and only then with restricted body exposure. Medical material arising out of investigations should be forwarded to the senior medical staff officer for confidential filing, regardless of whether or not it was included in the Proceedings of the Board.

_____
Signature

## STATEMENT BY THE BOARD OF ENQUIRY

The statement is a summary of all the factors relating to the accident, a tie-in of all known circumstances and witness reports to give a complete picture of the occurrence. Every avenue of possible cause factors should be discussed including theories and assumptions.

The board should indicate the manner in which it undertook the investigation of the accident to fulfil the terms of reference. Times and places of the board convening and recessing are to be indicated.

Conclusions may be noted but no findings should appear in this statement.

Any statement made by a witness or specialist with which the board does not concur should be discussed. Individual board members not in agreement with the results of the investigation are at liberty to indicate so and should attach a statement outlining their reasons for non-concurrence.

The board in its statement should introduce appendices or present exhibits which were not previously introduced or presented by a witness or member.

APPENDIX "C"
to Board of Enquiry
Date:

## PHOTOGRAPHS TAKEN AT THE SCENE OF THE ACCIDENT

Note: Only photographs that portray a required fact should be included as an exhibit. The photos should be properly labelled. The photographer should obtain a series of pictures starting from the initial contact point and proceeding along the path of disintegration, showing major aircraft components and including close-ups of pertinent parts and technical factors. Unless personnel are required in the photos for the definite purpose of indicating a factor, no photo should show unrelated people gathered around the wreckage - (clear the area). When photos are taken they should be reproduced in a scale large enough to show clearly the desired detail.

## FINDINGS

1. The cause of the accident.
2. Contributing factors: (a) (b)
3. Whether all flying and aircraft maintenance orders were complied with.
4. Whether the pilot was killed or injured in the accident.
5. Whether the pilot was to blame for the accident.

## RECOMMENDATIONS

1.
2.
3.

Note: Recommendations should arise directly from the findings and should be valid corrective measures.

Signature of President of Board _____

" " Member of Board _____

" " " " " _____

" " " " " _____

" " " " " _____

" " " " " _____

## AIR COMMANDER'S REMARKS

(to include his assesament as to cause and views on the Board's Findings and Recommendations)

## LIST OF COMMON ERRORS IN PROCEEDINGS OF BOARDS OF ENQUIRY

1. The ranks, initials, names, trade, service of the president and members not stated correctly.

2. The pages of the proceedings not numbered consecutively commencing with the index page as "1".

3. Not prefacing the evidence of witnesses with their full particulars and the requisite preamble.

4. Signature of witness not obtained on each and every page on which his evidence appears.

5. Recording evidence that has no bearing on the matter under investigation, and then making recommendation from this evidence.

6. Not designating the exhibits by letters, e.g. "Exhibit A, B, C, etc."

7. Not making mention of the appendices and exhibits in the body of the proceedings.

8. Findings not based on evidence as recorded.

9. Cause of accident not stated correctly.

10. Failing to make recommendations when called for by terms of reference.

11. Recording the evidence of more than one witness on the same page.

12. Failure of board to express opinion as to assessment of blame.

13. Failing to comply with specific orders prescribed for investigations into aircraft accidents.

# KEY
# TO FORMAT USED
# IN ALL AIR ACCIDENT MESSAGES

A. Red - Fatalities, Blue - Injuries, White - No Injuries

B. Name of Aircraft Unit

C. Place, Date and Time of Accident

D. Number of Aircraft

E. Number, Name, Rank of Pilot and Injuries Sustained

F. Names and Injuries of Other Crew Members and Passengers

G. Category of Damage to Aircraft

H. Nature of Duty at Time of Accident

I. Short Description of Accident

J. Cause of Accident

K. What Investigation Projected

---

Reference para. G above:

The key to category of aircraft damage is as follows:

Cat. A. Complete damage beyond economical repairs

Cat. B. Repairable by factory overhaul

Cat. C. Repairable on site by change of major components

Cat. D. Repairable on site within 36 hours

Cat. E. Fly in repair

CRK/jmg

Drafted by: Air Commander

4 April 1963

To : Dr. R. J. Bunche, Under-Secretary for Special Political Affairs

From : Lt Gen Kebbede Guebre, Force Commander, ONUC

Subject: Board of Enquiry - Crash Swedish J-29 Kamina - 16 March 1962

1. Reference is made to your memorandum dated 19 March 1963, subject as above.

2. I agree that the practice of permitting non-UN personnel to fly contingent-owned aircraft could lead to complications, such as claims for reimbursement, in case of accidents.

..... 3. Attached please find copy of an amendment to our AIR STAFF INSTRUCTIONS where a new sub-paragraph, 2(d), has been added. This sub-paragraph has been written in consultation with our Legal Advisors.

KG.

(Kebbede Guebre) Lt Gen
Force Commander

cc: Force Cmdr
Air Cmdr

CRK/jmg

Drafted by: Air Commander

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(Kebbede Guebre) Lt Gen
Force Commander

cc: Force Cmdr
Air Cmdr

Memo dated 19/3/63
Returned to A/Order 2/4/63

29 March 1963

To : Dr. R. Bunche
Under Secretary for Political Affairs, UN HQ, New York

From : Lt.Gen. Kebbede Guebre
Force Commander, ONUC, Leopoldville KG.

Subject: Report by Board of Inquiry on Accident to Helicopter 19939 at Elisabethville 24 December 1962

... I enclose herewith copy of Proceedings of Board of Inquiry into the above accident.

I agree with the Findings of the Board and I endorse their recommendation in respect of Nurse Irene Lissens ops de Beck.

29 March 1963

To : Dr. R. Bunche
Under Secretary for Political Affairs, UN HQ, New York

From : Lt.Gen. Kebbede Guebre
Force Commander, ONUC, Leopoldville KG.

Subject: Report by Board of Inquiry on Accident to Helicopter 19939 at Elisabethville 24 December 1962

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I agree with the Findings of the Board and I endorse their recommendation in respect of Nurse Irene Lissens ops de Beck.

25 March 1963

To: Mr. B. Twigt
Chief Administrative Officer

From: Lt.Gen. Kebbede Guebre
Force Commander.

KG.

Subject: Report by Board of Inquiry on Accident to Helicopter 19939 at Elisabethville 24 December 1962

... I enclose herewith copy of Proceedings of Board of Inquiry into the above accident.

I agree with the Findings of the Board and I endorse their recommendation in respect of Nurse Irene Lissens ops de Beck.

UNITED NATIONS — NATIONS UNIES

INDICATE PRECEDENCE

| LTF | | SVC Service | | FFFFF Routine | XXX | SSSSS Priority | | PRIORITE NATIONS | |
|---|---|---|---|---|---|---|---|---|---|

Priorité Nations traffic is strictly limited.

NR HQ LEOPOLDVILLE

Address es) TO : AIR BASE COMMANDER, N'DJILI

INFO: AIR BASE COMMANDER, ELISABETHVILLE

(TEXT & SIGNATURE) insert prefix &/or number as required USE DOUBLE SPACING.

AO 023. FROM AIR COMMANDER. REFERENCE BOARD OF INQUIRY ON HELICOPTER 19939 24 DECEMBER 62. REQUEST FURTHER INFORMATION ON THE SPECIAL RECOMMENDATION OF THE BOARD OF INQUIRY FOR A SUITABLE AWARD FOR NURSE IRENE LISSENS OP DE BECK FOR HER BRAVERY DURING THIS ACCIDENT. NOT SUFFICIENT INFORMATION AVAILABLE IN THE PROCEEDINGS TO WRITE UP A SUITABLE CITATION AND COVERING LETTER TO THE INTERNATIONAL RED CROSS. REQUEST MAJOR SABELSTROM PRESIDENT PROVIDE MORE DETAILS AND CONTACT PERSONNEL INVOLVED THROUGH AIR BASE COMMANDER AT ELISABETHVILLE IF NECESSARY. ALSO PROVIDE LIST OF PERSONAL LOSSES SO THAT CLAIM ACTION MAY BE INITIATED.

RECEIVED 1963 FEB -1 PM 2:54

Drafted by: S/L N.V. Peterson
Flight Safety Officer

Authorised: Major General Kaldager
Air Commander

Date: 31 January 1963

cc: Force Commander
Air Commander
Flight Safety Officer

2.500 x 200 — Imp. Plateau 11267

T. O. R.

T. O. D.

BY :

Drafted by :
Authorized :
Date :

HVP/jmg

1 March 1963

To : Dr. Ralph Bunche, New York

From : Force Commander, ONUC

Subject : Board of Inquiry Format

1. The standard procedure and format for use in conducting Boards of Inquiry for aircraft accidents has been studied by specialist officers at ONUC Headquarters. It is comprehensive and detailed in all respects and contains vital information for conducting an investigation. There are no suggestions to be made on improving the contents of this document. ..... One copy is returned as requested.

2. The format for the Proceedings of a Board of Inquiry is basically the same as the form D6 presently in use at ONUC and which is distributed to all Air Base Commanders and units, through the medium of ONUC Air Staff Instructions.

Kebbede Guebre

(Kebbede Guebre) Lt Gen
Force Commander

cc: Force Cmdr
Air Cmdr
FAA Inspectors
Flight Safety Off

HVP/jmg

1 March 1963

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Kebbede Guebre

(Kebbede Guebre) Lt Gen
Force Commander

cc: Force Cmdr
Air Cmdr
FAA Inspectors
Flight Safety Off

ORGANISATION DES NATIONS UNIES AU CONGO

UNITED NATIONS ORGANIZATION IN THE CONGO

BOITE POSTALE 7248
LEOPOLDVILLE
REPUBLIQUE DU CONGO
CABLE: ONUC. LEOPOLDVILLE

23 February 1963

INTEROFFICE MEMORANDUM

To: Air Commander

From: Force Commander.

... Attached letter and file have been received from Dr.Bunche, New York.

I should like you to study the draft document enclosed and let me have your suggestions for return to New York.

Kebbede Guebre Lt.Gen.
Kebbede Guebre

23 February 1963

INTEROFFICE MEMORANDUM

To: Air Commander

From: Force Commander.

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KG.

Lt.Gen.
Kebbede Guebre

3935

File

UNITED NATIONS NATIONS UNIES

INTEROFFICE MEMORANDUM

TO: Lt. General Kebbede Guebre
Force Commander, ONUC

Date: 20 February 1963

FILE NO.:

THROUGH:

BY POUCH

FROM: R.J. Bunche, Under-Secretary
for Special Political Affairs

SUBJECT:

It has been observed over the years that there is a requirement for a document containing a standard procedure or format to be used in ONUC for presenting Boards of Enquiry into aircraft accidents involving UN or contingent-owned aircraft.

I understand that our Air Adviser, Squadron Leader Harrison, discussed this with ONUC's previous Air Commander as well as the Flight Safety Officer, and they agreed with the proposal that such a document should be compiled. Furthermore, since the same personnel are not always available to be members of the Board and all members have varying degrees of experience in such matters, additional information has been added which should help the members in their investigation.

Accordingly, I would be appreciative if you would have your staff study the attached document and if you would submit your suggestions on it so that they may be considered prior to final circulation of the document. I have attached two copies so that you may retain one and return the other one with the proposed alterations or insertions. I also enclose, for your retention, a copy of USAF publication "Prevention Investigation Reporting" which may be of interest to your Flight Safety Officer.

RCB

COPY

UNITED NATIONS NATIONS UNIES
INTEROFFICE MEMORANDUM

To: Lt.Gen. Kebbede Guebre
Force Commander, ONUC

Date 20 February 1963

From R.J.Bunche, Under Secretary
for Special Political Affairs.

It has been observed over the years that there is a requirement for a document containing a standard procedure or format to be used in ONUC for presenting Boards of Enquiry into aircraft accidents involving UN or contingent-owned aircraft.

I understand that our Air Adviser, Squadron Leader Harrison discussed this with ONUC's previous Air Commander as well as the Flight Safety Officer, and they agreed with the proposal that such a document should be compiled. Furthermore, since the same personnel are not always available to be members of the Board and all members have varying degrees of experience in such matters, additional information has been added which should help the members in their investigation.

Accordingly, I would be appreciative if you would have your staff study the attached document and if you would submit your suggestions on it so that they may be considered prior to final circulation of the document. I have attached two copies so that you may retain one and return the other one with the proposed alterations or insertions. I also enclose, for your retention, a copy of USAF publication "Prevention Investigation Reporting" which may be of interest to your Flight Safety Officer.

10 April 1962

To: Col. J. Guha, Chief of Staff

From: Military Assistant to the Force Commander

The Acting Force Commander has read the findings of the Court of Inquiry convened to investigate damage to aircraft belonging to Panama Airways at N'Djili on 18 November 1961.

Gen. Yacob notices that, among other things, the Court found that Movement Control, N'Djili, is often working under bad conditions due to insufficient loading equipment, lack of flood lights, unqualified personnel and the number of aircraft to be loaded within a certain period of time. Furthermore, the work performed sometimes exceeds the safety limits.

Based on the findings of the Court, the Acting Force Commander wishes to have this situation investigated with a view to improving the loading equipment, flood lights and the qualifications of the personnel. He would like to be informed of the steps taken to rectify this situation.

_____ Lt. Col.
( J. I. Cooney )

JIC/ajg

cc: Chief Logistics Officer

CR.13 (4-59)

ROUTING SLIP

Comments for the record should not be written on this slip. REFERRAL SHEET PT.108 should be used instead.

TO:

Air Commander

| | | | |
|---|---|---|---|
| | APPROVAL | | YOUR INFORMATION |
| | MAY WE CONFER? | | AS REQUESTED |
| | YOUR SIGNATURE | ✓ | FOR ACTION |
| | NOTE AND FILE | | REPLY FOR MY SIGNATURE |
| | NOTE AND RETURN | | PREPARE DRAFT |
| | YOUR COMMENTS | | ATTACH RELATED PAPERS |

Sir

The Acting Force Commander would like to have a full report on this incident. Should the compilation of a full report take some time he would like to get off an interim report as soon as possible should such be feasible

| DATE: | FROM: |
|---|---|
| 6/4. | MH/FC |

INCOMING CODE CABLE.

ROUTINE.

To : Gen. Yacob, Leopoldville.
From : Mr. Bunche, New York.
Date : 5 April 1962.
No. : 2529.

Ref ONUC 2298.

Please send full details of Unations airoraft accident at Manono airstrip.

cc c/o Commission ✓
CCS

cc. Mr. Gardiner
SMU

Pro

M1

Gmafc 1/4

RECEIVED
O.N.U.C.

~~UC 123~~

Crashes UN aircraft

UC 123

54

CUG 027

6,13,1

PRIORITY NATIONS ''''' CUA CUE

FM 25ETH BN MANONO

TO ZEN/HQ SECTOR ALBERTVILLE

ZEN/AIR OPS ALBERTVILLE

CUA/HQ ONUC LEOPOLDVILLE

CUA/AIR OPS LEOPOLDVILLE

CUE/HQ KAT COMD ELISABETHVILLE

CUE/AIR OPS ELISABETHVILLE

BT

UNCLAS A 1627 UN A/C SE-CFC GOT AN ACCIDENT(CRASHED) WHILE LANDING AND DIVED TO THE SIDE OF THE RUNWAY. EXCEPT THIS A/C IS REMOVED FROM THE PLACE IS IS NOW NO A/C CAN LAND IN MANONO. SO SUPPLIES CAN NOT BE TPT TO UN FORCE IN MANONO. SO PLEASE GIVE US THE AUTHORITY TO REMOVE THE A/C AS SOON AS POSSIBLE SO THAT ANOTHER A/C AND LAND. EXCEPT HELICOPTER NO A/C CAN LAND. CONFWRM. ACK

BT

CFN A 1627

31/1620Z MAR CUG

Crashes
UN Ac

UC 126

CUG 021

PRIORITY NATIONS ***** CUA CUE

DE CUG 021/31

CUA CUA ZRR2

FM 25 FTH BN MANONO

TO ZEN/HQ SECTOR A ALBERTVILLE

ZEN/AIR OPS ALBERTVILLE

CUE/HQ KAT CTMD ELISABETHVILLE

CUE/AIR OIS ELISABETHVILLE

CUA/HQ ONUC LEOPOLDVILLE

CUA/AIR OPS LEOPOLDVILLE

BT

UNCLAS A 1626 UN A/C CVB SE-CFC CRASHED AFTER LANDING IN MANONO AT 1600B GOING TO THE SIDE OF THE RUNWAY. CREWS ALL SAFE EXCEPT MINOR INJURY. PLEASE TAKE IMMEDIATE ACTION FOR THIS UNFORTUNATE ACCIDENT. CONFIRM

BT

CFN A 1626 1600

31/1610Z MAR CUG

UC 120

CUG021

PRIORITY NATIONS ***** CUA CUE

DE CUG 021/31

CUA CUA ZBB2

FM 25 ETN BN MANONO

TO ZEN/HQ SECTOR A ALBERTVILLE

ZEN/AIR OPS ALBERTVILLE

CUE/HQ KAT CTMD ELISABETHVILLE

CUE/AIR OIS ELISABETHVILLE

CUA/HQ ONUC LEOPOLDVILLE

CUA/AIR OPS LEOPOLDVILLE

BT

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BT

CFN A 1626 1600

31/1610Z MAR CUG

4

MEMORANDUM

29 Jan 62

To : Officer in charge

From : Force Commander

A United Nations chartered aircraft DC4 number 350.E belonging to African Airways landed at LUANDA in ANGOLA at 15.26Z on 27 Jan, having apparently lost its way on its flight from GOMA to LEO. On board the aircraft were the following:-

Capt PELLERIN (Canadian)
W/O2 OTHUOU (MSF)
W/O2 ISMNIL "
W/O2 MOHD "
Cl AB HASSAN "
Cpl BASRI "
TIR SHAN "
Civ Mr. ESHIUMO
Civ Mr. AKWAMBA

Col WOLDE YOHANNIS (~~Indian~~) Ethiopian
Maj ABATE "
Capt HAILU "
Lt GEREMEN "
LAV JP BHAT (Indian)
SIG M GANESAN (Indian)

The following were crew members :
Robert DESKIVER (US)

Robert EISINER (US)

I would be obliged if you could take steps on the diplomatic level to arrange the release of the aircraft and its occupants.

(Sean Mac Eoin) Lt-Gen

Air Ops

ORGANISATION DES NATIONS UNIES AU CONGO

UNITED NATIONS ORGANIZATION IN THE CONGO

BOITE POSTALE 7248
LEOPOLDVILLE
REPUBLIQUE DU CONGO
CABLE: ONUC. LEOPOLDVILLE

Air Acc

13 January 1962

To: Force Commander, ONUC

From: Air Commander

Subject: Report on Accident to Air Panama HP-312

On Thursday, 11 January 1962, HP-312 departed Kamina for Luluabourg at 1312Z estimating Luluabourg in one hour and 35 minutes flight time. Flight level was 6,500 ft., fuel endurance 4 hours, radio frequencies 4 enroute air-to-ground contact 118.1 Mcs. and 88.20 Kcs. Load consisted of 10 Indian Troops, 2 Norwegian, 1 Ethiopian, 1 Canadian and 2 civilians, Mr. Rinaldi and Mr. Husler. Cargo consisted of 3 mail bags to Indian post, 1 mail bag to Swedish post, 4 envelopes and 1 carton to ONUC Medical Depot.

At 1506Z, 19 minutes past its estimated time of arrival at Luluabourg, Kamina radio requested from Luluabourg HP-312's landing time. Luluabourg replied no contact yet with HP-312. Luluabourg radio then made several calls on both radio frequencies attempting to contact HP-312, but without result. At 1555Z, Luluabourg radio heard call from HP-312 stating that he was returning to Kamina due to fuel shortage. At 1600Z a Sabena aircraft which was enroute from Kamina to Leopoldville, call sign QO-CBF, made contact with HP-312. HP-312 stated, "we failed to find Luluabourg" and asked CBF if the Kamina radio beacon was in operation. At 1604Z, HP-312 reported to CBF that he had 5 to 10 minutes fuel remaining. At 1610Z, HP-312 reported that he was landing on a road near a village and was trying to avoid trees. At 1625Z, Leopoldville Flight Information Centre, Air Panama, Air Operations, and Movement Control were advised of the incident.

A search was initiated immediately upon receipt of the warning with search headquarters located at Kamina and Col. Eberstall was in charge of the operation. The aircraft put at the disposal of the searchmaster were: 5 charter aircraft, 3 United Nations helicopters, 1 Indian Air Force Canberra, 3 United Nations C-47's and 3 United Nations light aircraft.

At about 0500Z, 12 January, Kamina radio received a call from HP-312 on 88.20 Kcs. stating that he had force-landed near the village of Manianuna. This village is located approximately 96 nautical miles WNW of Kamina. The searchmaster, upon receipt of the message, dispatched an aircraft to ascertain exact location of HP-312. Once the position was confirmed, 3 helicopters were sent to the crash site to airlift passengers and crew.

.../..

At 1200Z, 12 January, 5 passengers arrived at Kamina by first helicopter, the balance of passengers and crew arrived at Kamina by 1700Z, 12 January. 3 passengers and 2 crew returned to Leopoldville on 12 January, the 13 remaining passengers will be returning to Leopoldville today.

A significant factor which contributed to this aircraft becoming lost was that the Luluabourg non-directionalbeacon, VHF direction finder and the omni-range were inoperative because of power failure from 1200Z to 1800Z on 11 January. Further, ICAO staff at Luluabourg failed to warn Air Operations Leopoldville, Flight Information and other aerodromes on the status of their navigational aids. Nil injuries.

Sqdn/Ldr.
(R. J. Lemieux)
for Air Commander

RJL/ajg

13th., January, 1962

To ; Force Commander

From : Air Commander

Subject : Public Commission of Enquiry - Rhodesia

1. Attached please find a copy of a letter to the President, Board of Enquiry which was prepared by me on 5th. October, 1961. As indicated in it I do not possess any pertinent knowledge relative to that particular trip and I therefore do not desire to participate as a witness.

2. In addition to the belief that I cannot contribute materially to the Commission I would point out that I have made firm plans to proceed to Canada on 18th. January, 1962. This trip is at the request of the Canadian authorities and and I believe should have precedence.

3. I request your support of my plan to proceed to Canada on 18th. January.

(H.A. Morrison)
AIR COMMANDER.

Air Commodore

13 January 1962

To: Force Commander, ONUC

From: Air Commander

Subject: Report on Accident to Air Panama HP-312

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A search was initiated immediately upon receipt of the warning with search headquarters located at Kamina and Col. Eberstall was in charge of the operation. The aircraft put at the disposal of the searchmaster were: 5 charter aircraft, 3 United Nations helicopters, 1 Indian Air Force Canberra, 3 United Nations C-47's and 3 United Nations light aircraft.

At about 0500Z, 12 January, Kamina radio received a call from HP-312 on 88.20 Kcs. stating that he had force-landed near the village of Manianuna. This village is located approximately 96 nautical miles WNW of Kamina. The searchmaster, upon receipt of the message, dispatched an aircraft to ascertain exact location of HP-312. Once the position was confirmed, 3 helicopters were sent to the crash site to airlift passengers and crew.

.../..

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A significant factor which contributed to this aircraft becoming lost was that the Luluabourg non-directional beacon, VHF direction finder and the omni-range were inoperative because of power failure from 1200Z to 1800Z on 11 January. Further, ICAO staff at Luluabourg failed to warn Air Operations Leopoldville, Flight Information and other aerodromes on the status of their navigational aids. Nil injuries.

Sqdn/Ldr.
(R. J. Lemieux)
for Air Commander

RJL/ajg

OUTGOING CODE CABLE IMMEDIATE

To: SECGEN

From: M/C DOIN

Date: 12 January 1962

No.: ONUC 302

Further to our 297

All passengers who were on board the C-46 together with the Captain and First Officer have now been taken to Kamina and will be flown to Leopoldville this evening.

The aircraft has been inspected by a maintenance officer, who has decided that it will not be possible to move it from its present position.

cc: Dr. S. Linner

Air Commander

OUTGOING CODE CABLE IMMEDIATE

To: SECGEN

From: MACEGIN

Date: 12 January 1962

No: ONUC 297

Further to my ONUC 292, the missing C-46 has now definitely been located near a place called Manianuna. This small town is located roughly half-way between Kamina and Kapanga. All on board are safe and well and the first helicopter was dispatched from Kamina at 0950 GMT with food and drinks. Fighter cover is being maintained over the area.

cc: Dr. S. Linner

Air Commander

OUTGOING CODE CABLE IMMEDIATE

Air Lift

To: SECGEN

From: MACEOIN

Date: 12 January 1962

No: ONUC 297

Further to my ONUC 292, the missing C-46 has now definitely been located near a place called Manianuna. This small town is located roughly half-way between Kamina and Kapanga. All on board are safe and well and the first helicopter was dispatched from Kamina at 0950 GMT with food and drinks. Fighter cover is being maintained over the area.

cc: Dr. S. Linner

Air Commander

ZIA ZIA ZIA

UCC14

CUL 008

PRIORITY NATIONS ''''' CUA CUK

DE CUL008/02

FM AIR OPS LULU

TO AIR OPS LEO

INFO AIR OPS KAMINA

RT

UNCLAS REF AO 7540. ALL NAV AIDS LULU U/S 1200. 1800Z DUE TO PWER CUT. WETHER OPS LULU 1200Z QAM 300 DEGREES 04 KTS QBA 25 KM QBB 1200 FT 1/8 1300FT 4/8 40000FT 7/8 . 1500Z QAM 350 DEGREES 3 KTS QBA 30 KM QBB 2000 FT 2/8 13000FT 7/8 . 1800Z QAM 060 DEGREES 02 KTS QBA 25 KM QBB 14000 FT 7/8. LULU TOWER HEARD WP 312 CALL LULU 2 TIMES AT 1908Z AND 1915Z. TOWER ANSWERED BUT NO CONTACT. TOWER IN CONTACT WITH OTHER A/C C DURING ACTUAL TIME

RT

CTN 7540 1200 1800 1200 300 04 25 1200 1/8 1300 4/8 40000 7/8 1500 350 3 30 2000 2/8 13000 7/8 1800 060 02 25 14000 7/8 312 2 1908 1915

12/0655Z JAN CUL

KAA

OUTGOING CODE CABLE IMMEDIATE

To : SECGEN

From : MACEOIN

Date : 11 January 1962

No : ONUC 270

Further to my ONUC 275.

We have now received details of personnel aboard the mis ing aircraft. The total arrived at amounts to eighteen persons and is subject to further checking. The crew consisted of Capt Schley and First Officer William Kemp both United States citzens. The military passengers consisted of ten Indians, Two Norwegians, One Ethiopian and One Canadian. There was also two UN civilians on board.

Colonel Everstal has taken charge of search operations and Five charter aircraft with seven UN aircraft are standing by to start searching for the missing plane at first light tomorrow. In addition three helicopters are available for rescue operations if required. The operation will be controlled from Kamina.

cc Dr Linner

Air Commander.

OUTGOING CODE CABLE IMMEDIATE

To : SECGEN

From : MACEOIN

Date : 11 January 1962

No : ONUC 273

Reports have been received that a C 46 aircraft number HP 312 and belonging to Air Panama on charter to UN is now overdue on a flight from Kamina to Luluaborg. The aircraft left Kamina at 1312 hours GMT and was due to arrive at Luluaborg at 1447 hours GMT. The last contact with the missing aircraft came from two messages received from another charter UN aircraft as follows :-

1600 hours Quote failed to find Luluaborg; Have five to ten minutes fuel remaining;Intend to land near a farm near a village unquote.

1610 hours quote Force landing now on a road trying to avoid trees unquote.

It is reported that a total of twenty persons was on board and the aircraft was commanded by Captain Schley. Arrangements for search operations are now in hand and full details will be passed onto you as soon as possible.

cc Dr Linner

Air Commander.

UC 172

CUL 039

PRIORITY NATIONS ***** CUA CUK

DE CUL 039/11

FM AIR OPS LULU

TO CUA/ONUC AIR OPS LEO

INFO CUK/AIR OPS KAMINA

BT

UNCLAS NIL

HOTEL PAPA 312 ATD KAMINA 1312Z ETA LULU 1447Z . 1540 1512Z A MESSAGE FROM HOTEL PAPA 312 WAS RECIEVED LULU STATING THAT HOTEL PAPA 312 WAS RETURNING TO KAMINA BECAUSE AIRCRAFT HAD VERY LITTLE FUEL LEFT. THIS WAS THE ONLY CONTACT BETWEEN HOTEL PAPA 312 AND LULU. AT 1600Z A MESSAGE WAS RECEIVED LULU FROM KAMINA STATING THAT HOTEL PAPA HAD MADE A CRASH LANDING ON A ROAD BETWEEN LULU AND KAMINA. AFTER THIS MESSAGE NO CONTACT KAMINA POSSIBLE. REQUEST ALL INFO AVAIL

BT

CPN 312 EQV 0447 1940 312 312 312 1600 312

11/1710Z JAN CUL

NNNN

DC 179

CUK 041

PRIORITY NATIONS ''''''' CUA CUG CUL CUK

DE CUK 41/11

FM LT COL KVESHTAAL KAMINA

TO CUA/AIR OPS LEOPOLDVILLE

CUG/AIR OPS ALBERTVILLE

CUL/AIR OPS LULUABOURG

CUK/AIR OPS ELISABETHVILLE

BT

Air Panama

UNCLAS UN REPORT ON MISSING A/C NP 312 C46

DEPARTED KAMINA 1312Z FL 65 ETA LULUABOURG 1447Z 20 PERSONS

ON BOARD CAPT SCHLEY ENDURANCE 4 HRS VHF CONTACT DEPARTING KAMINA

118.1 MC DID NOT CONTACT 8820 KCLS.

AT 1506Z KAMINA REQUEST LANDING TIME ON NP 312, NOT YET LANDED,

NO VHF CONTACT

Sabena Charter DC4

AT 1506/1517 CALLING NP 312 8820 KCLS , NO CONTACT

AT 1532Z FOLLOWING MSG SENT TO LEOPOLDVILLE FIC, AIR PANAMA AND

MOVEMENT CONTROL

Kamina Lulu

ALERT ON NP 312 DEP KESA 1312 FEBS ETA FEUA 1447Z QCA 4 HRS DID

NOT LAND LULUABOURG AT 1530Z NO QSO VHF AND HF FREQUENCIES.

AT 1552Z LULUABOURG ADVISES. CALLED BY NP 312 ON 8820 KC . KT

AT 1553Z KAMINA CALLED NP 312. NO CONTACT

AT 1555Z FROM LULUABOURG . UNDERSTAND NP 312 RETURNING KAMINA , SHORT

OF FUEL

Sabena Charter DC4

AT 1600Z QOCBF IN CONTACT MP 312 118.1 MC

AT 1601Z VIA QOCB , KAMINA REQUESTED HEADING: 1 ADING 130 DEGREES

FAILED TO FIND LULUABOURG ASKING IF KAMINA BEACON HAS OPERATING

AT 1604 REMAINING FUEL 5 TO 10 MINS. INTENDED TO LAND NEAR A FARM

NEAR A VILLAGE

AT 1610Z FORCE LANDING NOW ON A ROAD TRYING TO AVOID TREES.

AT 1625Z MSG TO LEOPOLDVILLE FIC AIR PANAMA MOV CONTROL, FOLLOWING

MSG RECEIVED FROM QOCBF ON 118.1 AT 1610Z. MP 312 RETURNING LULU-

KAMINA RUNNING OUT OF FUEL FORCE LANDING NOW ON A ROAD TRYING TO

AVOID THE TREES.

AT 1700Z ONE CANBERRA DEP FOR SEARCH

AT 1800Z A/C N 75416 DEP FOR SEARCH

BT

CFN 312 46 1312 65 1447 20 4 118.1 1506 312 1506/1517 312 8820 1532

312 1312 1447 4 1530 1552 312 8820 1553 312 1555 312 1600 312 118.1

1601 1 130 1604 5 10 1610 1625 118.NQYQP EQW QUPP QIPP UTRQY

QQXQURIZ JAN CUK

UC 182

CUK 043

PRIORITY NATIONS ''''' CUA

DE CUK 43/11

FM LT COL FVERSTAL KAMINA

TO AIR OPS HQ LEOPOLDVILLE

BT

UNCLAS NAME OF THE PAX MP 312

MED BBP FRA ALBERTVILLE TIL LEOPOLDVILLE

| | | |
|---|---|---|
| L/NK | SARM BRAN | INDIAN |
| SEP | P. M.NLURIUS | INDIAN |
| SEP | J.U. VASIL | INDIAN |
| SEP | HAMRIAR | INDIAN |
| SEP | BANW LAL | INDIAN |
| SEP | BAIMAL SINGH | INDIAN |
| SEP | MAHAN SINGH | INDIAN |
| HAV | SURJAT BAHN | INDIAN |
| HAV | SURAT BAHN | INDIAN |

MED BBP FRA ELISABETHVILLE TIL LEOPOLDVILLE

| | | |
|---|---|---|
| CIV | MR. RINDLDI | At Just See |
| CIV | MR. HUSLER | Swiss |
| SGT | WELLSBERY | CANADIAN |

CAPT HOLAND NORWEGIAN

MAJ GETACHEN ETHIOPIAN

L/NK BALWAN SINGH INDIAN

SGT SLAAKVIK NORWEGIAN

CARGO.

1 MAIBAG TO INDIAN FD POST

1 MAILBAG TO SWED FD POST

2 MAILBAGS TO INDIAN FD POST

9 ENVELOPE

1 CARTON TO ONUC MED DEP

4 ENVELOPES WITHOUT WAYBILLS.

BT

CFN 312 312 1 1 2 1 1 4

11/1832Z JAN CUK

NNNN

UNITED NATIONS — NATIONS UNIES

| INDICATE PRIORITY | SVC Service | FFFFF Routine | SSSSS Priority | PRIORITE NATIONS |
|---|---|---|---|---|

Priorité Nations traffic is strictly limited.

NR

Address(es)

To Col Quinn

From: Air Ops

(TEXT & SIGNATURE) insert prefix & / or number as required USE DOUBLE SPACING.

Re power failure at Lulu . Commercial power failure was cause of cut on 1 Dec between 1630Z and 1715Z . Two generator engines out of the five at the commercial power plant ~~have~~ had broken down previously. Remaining three were in order at time of power cut, however reason for complete cut with three generators unknown. These are reported ready to break down also within two to three weeks unless spares and technicians are made available to repair and overhaul.

A standby power plant located at airport but, it also was out of order due to burnt out winding in starter motor and therefore out of commission at time of power cut. Mr peche of ICAO is getting a complete report on power plant failure and status of generating equipment at time ~~fa~~ of power cut.

(RJ Lemieux) S/L
for C Air Ops O
2 Dec 61

C. 81471

T.O.R.

T.O.D.

BY :

Drafted by :

Authorized :

Date :

1961

O.N.U.C.

UCO 79

NLE 016

.....

UU

ZZ RGVPBA

DE RGVP 202017

Z 201230Z

FM RESCUE COORDINACION NBI

TO AIR OPS ONUC LEOPOLDVILLE

BT

UNCLAS RCC/1/20 INTALIAN 119 SURVIVORS SERGEANT SAVATORI SERGEANT MARIO SGT LUIGI ITALIAN AIR FORCE M/T SINGH INDIAN AIR FORCE MOHAMMED UAR STOP JEREMIAH IRISH STOP LAET TWO BOTH CIVILIANS OF ONUC STOP DEAD CAPT NISI MASTER SGT SAGLIMBENI GUISEPPE MASTER SGT GIOVANNI SGT TOMMA

BT

20/1235Z

O.N.U.C.

UC 21

K

CUG 004

PRIORITY NATIONS CUA

DE CUG 04/20

FM SEARCHMASTER ALBERTVILLE

TO AIR OPS LEOPOLDVILLE

BT

UNCLAS (.) IAF 6014 SIGHTED POSITION 0443S 3014E (.) WREAKAGE

SIGN OF LIFE TEMP CAMP (.) 72624 WITH PARA TEAM ENROUTE (.) WILL

ADVISE FURTHER

BT

CFN 6014 0443 3014 72624

20/0855Z NOV CUG

NNNN

MESSAGE PHONED FROM NDJILI AIRPORT, addressed to the UN FORCE DIRECTOR

Message coming from "Air Force rescue 72624, Kano":

Actual time of departure from Kano 191040Z. Destination was Ntebe. His estimated time en route 10 hours 14 minutes. Alternative is Nairobi.

Following information pertains to Italian C119 aircraft 6014.

1. Departed Entebbe 170910Z destination Leo with flight plan along following route. Entebbe via ADR 432 to position abeam Tabora beacon direct to Albertville direct Luluabourg direct Leo.

2. Last known radio report from aircraft was message passed at 170940Z directed to Usumbura however not received Usumbura ~~best~~ but received by Italian Air Force Ndjili advising ETA Leo 171655Z .

3. Following action has been taken;

(a) Nairobi Air Traffic Control Centre alerted and requested to check all airfields under control of Nairobi. Nil report.

(b) Follwing airfields in Congo advise Nil information about aircraft,

| | |
|---|---|
| Stanleyville | Bakwanga |
| Luluabourg | Manono |
| Albertville | Kabalo |
| Kamina | Kongolo |
| Elisabethville | |
| Bukavu | |
| Goma | |
| Kindu | |

(c) Airsearch being conducted along following tracks;

(i) Usumbura to Entebbe

(ii) Usumbura to Albertville

(iii) Albertville to Kabalo

(iv) Luluabourg to Kabalo

(d) One DC 4 type aircraft will be sent from Leopoldville to Albertville and then over route planned to be flown by C 119. This flight will be conducted in darkness. The DC4 will remain overnight in Entebbe and fly the reverse route during day light 19 Nov.

4. Planning following search operations :-

i) S/L Lemioux of R.C.A.F. will proceed Albertville morning 19 Nov. to assume duties of Search Master.

ii) Two R.C.A.F. C 119 aircraft to proceed Albertville morning 19 Nov. for search operations.

iii) DC3 from Elizabethville to proceed Albertville for search operations.

iv) Two DC3 aircraft from Bukavu to proceed Albertville for search operations.

5. Nairobi has ~~Shackalton type~~ LIGHT aircraft conducting air search in area Kigona, Tabora Mwanza