5002-3796
vol 2.

Document disclosed under the *Access to Information Act*
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FILE NO. 5002 - 3796 VOLUME NO. 2

VOL. 2 5002 - 3796

DEPARTMENT OF TRANSPORT

Confidential

FROM July 12-1969
TO AUG 24, 1970

IMPORTANT — NOTIFY RECORDS WHEN FILE IS PASSED DIRECT TO ANOTHER SECTION

AIRCRAFT ACCIDENT
please pass quickly

SUBJECT AIRCRAFT
SUB-SUBJECT ACCIDENTS-GENERAL
FILE TITLE CF - WMO HILLER FH 1100 - NEAR FORT LANGLEY, B.C.
14-3-68

(1) DATE LEFT RECORDS	(2) PURPOSE FOR WHICH REFERRED (IF PURPOSE FOR WHICH REFERRED CANNOT BE EXPRESSED IN ONE LINE ADD MEMO TO FILE AND ENTER HERE "WITH MEMO")	(3) REFER FILE TO	(4) ENTER DATE TO BRING FORWARD WHEN REQUIRED	(5) USER'S INITIAL TO SHOW ACTION COMPLETED
	MEMO JAN. 19/70 FROM CAIE	CAE ②		PN.
	— —	CAIE ①		lol
	REQ. MR. LE CHEMINANT	CAIE		lol
	Task force.	CAIO		
JAN 7 1971		CAIO -5		DP
	3394	CAIO ①		
	3535	CAIO		
		CAIE		lol
	Amended final rpt	CAIO		
	16205	CAIO		Hot
	mem 7-7-70	CAIE		Original
JUL 15 1970	Amended final report	CAIO		
	15772	CAIO		Hot
	19987	CAIO		Hot
	20004	CAIO		Hot
	Stats	CAIO		
DEC 4 1970	Mr. Lafontaine	CARL ①		
		CAIO	19-1-71	
	C.A. Cowle	CARL		
	Smallwood	CARL		
	6390	CAIO-3		
		CAIO		
FEB 1 1971	B.F. 19.1.71	CAIO		

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02-001

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THIS COVER MUST NOT BE FOLDED UNDER FILE

CORRESPONDENCE TRANSFER AND CROSS-INDEX

SUBJECT	FILE NUMBER	INITIALS

NEW FILE COVER OPENED BY_____

CHECKED BY_____

IMPORTANT

1.—Records is established to serve you, and satisfactory service is largely dependent upon your prompt return of this file. This file is charged to your Division or Section and you are responsible for its return unless you notify Records to transfer the charge to another Section, otherwise the file remains charged to you until it is returned.

2.—Instructions for use of file cover—

Column 1—Records enters the date on which the file is routed to the user.

2—Shows the reason for the routing.

3—Shows where it is routed and enables the user to indicate additional routing.

4—Provides for the user to bring forward the file at a later date, if necessary.

5—Provides space for the user to initial the entry when action is completed.

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CANADA

DATED FROM..... FILE No.....

TO..... VOLUME No.....

CLOSED VOLUME

DO NOT PLACE ANY CORRESPONDENCE ON THIS FILE

FOR SUBSEQUENT CORRESPONDENCE SEE:

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5002-3796 (CAIO)

Ottawa, Ontario,
23 October, 1970.

Mr. W.E. Allan,
Columbia Customs Brokers Ltd.,
P.O. Box 512,
Vancouver Int'l Airport, B.C.

Re: Your letter of inquiry dated October 15, 1970.

Dear Sir:

The report of the accident to aircraft CF-WMO on 14 March, 1968 will be ready in approximately six weeks. This estimate is based on the investigation proceeding without unforeseen delays.

Your inquiry has been recorded and on release of the report you will be sent a copy.

Yours truly,

H.A. Fawcett,
for Chief, Accident Investigation,
Civil Aviation Branch.

HAF/BG

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349 IB 1228 C/466

5002-3796 (CAIU)

Ottawa, Ontario,
23 October, 1970.

Mr. F.F. Taylor,
Branch Manager,
Underwriters Adjustment
Bureau Ltd.,
333 River Road,
Suite 1735,
Ottawa 7, Ontario.

Re: Your letter of inquiry dated August 26, 1970.

Dear Sir:

The report of the accident to aircraft CF-WMO on 14 March, 1968 will be ready in approximately six weeks. This estimate is based on the investigation proceeding without unforeseen delays.

Your inquiry has been recorded and on release of the report you will be sent a copy.

Yours truly,

H.A. Fawcett,
for Chief, Accident Investigation,
Civil Aviation Branch.

HAF/EG

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20004 5002-3796

G. M. PELTON, President
V. O. WALSH, General Manager
H. P. BOUDREAULT
Executive Adjuster

F. M. GRAY, C.A.,
Executive Adjuster

J. A. BELL
Executive Adjuster

Underwriters Adjustment Bureau Ltd.

CABLE ADDRESS
ASSESSORS TORONTO
TELEX 06-217531

ONTARIO DIVISION

PLEASE
REPLY TO
80 ARGYLE AVE.
OTTAWA, ONT.
TEL. 232-3593
AND PLEASE QUOTE
OUR LOSS NUMBER

349 IB 1228 C/466

CA10

October 15/70

Dept. of Transport,
Chief Accident Investigation Division,
OTTAWA, Ontario.

Attn Mr. DeNiverville

RE: Reference 5002 3796

Dear Sir:

We are writing further to our correspondence of June 25/70, and August 26th.

When the accident report regardingyour above reference number is available, we would be very pleased if you could send it to us in the enclosed self-addressed envelope.

Thanking you for your co-operation, we remain,

yours very truly,

F. F. Taylor,
Branch Manager

FFT:c

000495

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CAIO
15/7

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5002-3796

COLUMBIA CUSTOMS BROKERS LTD. 19987



o CUSTOMS CONSULTANTS
o IMPORTS
o EXPORTS
o DRAWBACKS

P.O. BOX 512
VANCOUVER INT'L AIRPORT
B.C.
PHONE 273-5477

October 15, 1970.

CA10

The Ministry of Transport,
Chief of Aircraft Accident
Investigation Division,
#3 Temporary Bldg.,
Ottawa, Ontario.

Reference: Helicopter CF-WMO, FH1100 Fairchild Hiller

Gentlemen:

The above helicopter crashed on March 14, 1968 in an open field approximately six miles north of Aldergrove, B.C.

Our client, Okanagan Helicopters Ltd. was the owner of this aircraft.

We have been asked to recover the Federal Sales Tax paid at the time of entry into Canada on the grounds that the crash was the result of a mechanical failure and the machine would be considered faulty and claim would be made as "Goods Not According to Order".

The Vancouver office of the Department of Transport advises that a summary report has not yet been completed.

As the report will no doubt be of considerable assistance in settling the claim and as a considerable period of time has elapsed since the crash, it would be greatly appreciated if you would advise the writer when the report will be completed.

If already completed, could we be supplied with a copy.

Yours very truly,

COLUMBIA CUSTOMS BROKERS LTD.

W.E. Allan

WA/sl

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CP10
15/7

9

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5002-3796

G. M. PELTON, *President*
V. O. WALSH, *General Manager*
H. P. BOUDREAULT
Executive Adjuster

F. M. GRAY, C.A.,
Executive Adjuster

15772

J. A. BELL
Executive Adjuster

Underwriters Adjustment Bureau Ltd.

CABLE ADDRESS
ASSESSORS TORONTO
TELEX 06-217531

ONTARIO DIVISION

PLEASE
REPLY TO
[redacted]
333 RIVER RD., SUITE 1735
OTTAWA 7, ONTARIO
TEL. 746-0035

349 IB 1228 C/466

CA10

Dept. of Transport,
Chief Accident Investigation Division,
OTTAWA, Ontario.

August 26th., 1970

Attn. Mr. DeNiverville

RE: Reference 5002, 3796.

Dear Sir:

We are writing further to our correspondence of June 25th.

If the accident report, your reference 5002, 3796 is now available, we would be very pleased if it could be forwarded to us in the enclosed self-addressed envelope.

Yours very truly,

F. F. Taylor,
Branch Manager

FFT:c
cc. UAB Toronto.
H. Alan Robertson
file 330 68131 C/450

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DEPARTMENT OF TRANSPORT
ROUTE SLIP

MINISTERE DES TRANSPORTS
BORDEREAU D'ACHEMINEMENT

TO: Name - *Nom*	Routing Symbol Symbole d'acheminement	Date
A: CAIE		7-7-70
		☐ Comment *Observations*
		☐ For your information *Pour votre gouverne*
		☐ Per our conversation *Selon notre conversation*
		☐ Approval *Approbation*
		☐ Discuss with me *Discuter avec moi*
		☐ Take appropriate action *Prendre les mesures appropriées*

REMARKS:
REMARQUES:

A few minor changes have been made to this report since you last saw it. Would you like to comment again before publication.

(1) Agree re c/o to report as written with the exception of the extended stabilizer is at a shorter angle of incidence than attached by root fairings (different stabilizer).

C.J. McCutcheon
A/CAIE
July 14, 1970.

FROM:
DE: H.A. Fawcett

Routing Symbol
Symbole d'acheminement
CAIO

000501

02-0091
1-66

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

REFER TO REPORT NO.
REF. RAPPORT N°
3796

AIRCRAFT TYPE — *Type aéronef*	REGISTRATION — *Immatriculation*	DATE-TIME — *Date-Heure*	OPERATION — *Opération*
Hiller FH-1100	CF-WMO	14Mar68 1158 PST	Commercial
PLACE — *Endroit*		LATITUDE	LONGITUDE
near Fort Langley, BC		49/08N	122/28W

LOCALE — *Scène*

Hilly terrain covered with brush and trees at 260 ft asl

WEATHER — *Conditions météorologiques*

Cloud about 2000 overcast, visibility good, wind SSE at 20 gusting to 25 mph; moderate turbulence reported.

PILOT / PILOTE	LICENCE	TOTAL HOURS — *Heures totales*		TOTAL HOURS, LAST 90 DAYS — *Total d'heures (90 derniers jours)*	
	Commercial	4293	ALL TYPES — *Tous types*	150	ALL TYPES — *Tous types*
		110	ON TYPE — *Type en cause*	52	ON TYPE — *Type en cause*

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While in fast cruising flight at about 500 feet the helicopter partially disintegrated and crashed.

The main rotor mast had failed after being struck twice by the teetering stops. These teetering stop impacts could have been initiated by one or both of these:

- excessive blade flapping due to gust loads
- the pilot attempting to compensate for the turbulence by rapid control movements.

Several contributory conditions were present prior to the accident:

- in high-speed flight and with aft C of G, (calculated) the required forward cyclic would tilt the rotor near to its forward limit bringing the teetering stops close to the mast.
- this helicopter was manufactured with less than the specified teeter angular movement
- with the extended horizontal stabilizer, high-speed forward flight would require an extra increment of forward cyclic and hence rotor disc tilt.
- the published operating instructions did not adequately define the safe operating limits.

After the accident operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to inspect and ensure the proper specified teeter angular dimension, and by Service Bulletin FH-1100-62-1 to remove the stabilizer extensions on FH-1100's not equipped with floats.

	TOTAL	FATALITIES — *Pertes de vie*	SERIOUS INJURIES — *Blessures graves*	MINOR INJURIES — *Blessures légères*
CREW — *Équipage*	1	1		
PASSENGERS				
OTHERS — *Autres*				

ASSIGNED CAUSE(S) — *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft

Incorrect manufacture of teetering stops.

Inadequate design of the extended horizontal stabilizer.

AJC/JDS
10-12-70

ENTERED IN REGISTER
PREV. LIC. & REF.
ENTERED ON CARDS
CODED TO DATE

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

DRAFT

REFER TO REPORT NO. / REF. RAPPORT N° 3796

AIRCRAFT TYPE — *Type aéronef*	REGISTRATION — *Immatriculation*	DATE-TIME — *Date-Heure*	OPERATION — *Opération*
Hiller FH-1100	CF-WMO	14MAR68 1158 PST	Commercial
PLACE — *Endroit*		LATITUDE	LONGITUDE
Near Fort Langley, BC		49/08N	122/28W

LOCALE — *Scène*
Hilly terrain covered with brush and trees at 260' asl.

WEATHER — *Conditions météorologiques*
Overcast cloud at about 2000', visibility good, wind SSE at 20 gusting to 25 mph; moderate turbulence reported.

PILOT / PILOTE	LICENCE	TOTAL HOURS — *Heures totales*		TOTAL HOURS, LAST 90 DAYS — *Total d'heures (90 derniers jours)*	
	Commercial	4293	ALL TYPES — *Tous types*	150	ALL TYPES — *Tous types*
		110	ON TYPE — *Type en cause*	52	ON TYPE — *Type en cause*

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While in fast cruising flight at about 500 feet the helicopter partially disintegrated and crashed.

The main rotor mast had failed after being struck twice by the teetering stops. These teetering stop impacts could have been initiated by one or both of these:

(a) excessive blade flapping due to gust loads

use dash

(b) the pilot attempting to compensate for the turbulence by rapid control movements.

Several contributory conditions were present prior to the accident:

(a) in high-speed flight and with aft C of G, (calculated) the required forward cyclic would tilt the rotor near to its forward limit bringing the teetering stops close to the mast.

(b) this helicopter was manufactured with less than the ~~designed~~ specified teeter angular movement

(c) with the extended horizontal stabilizer, HIGH-SPEED FORWARD FLIGHT would require an extra increment of forward cyclic and hence rotor disc tilt

(d) the published operating instructions did not adequately define the safe

	TOTAL	FATALITIES — *Pertes de vie*	SERIOUS INJURIES — *Blessures graves*	MINOR INJURIES — *Blessures légères*
CREW — *Équipage*	1	1		
PASSENGERS				
OTHERS — *Autres*				

OVER

ASSIGNED CAUSE(S) — *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft.
Incorrect manufacture of teetering stops.
Inadequate design of the horizontal stabilizer extensions.
extended

AJC/LG

INV | CA.C | EDIT

APPROVED
CAI

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operating limits

After the accident operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to inspect and ensure the proper specified teeter angular dimension, and by Service Bulletin FH-1100-62-1 to remove the stabilizer extensions on FH-1100s not equipped with floats.

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5002-3796

F. M. GRAY, C.A., *Executive Adjuster*
G. M. PELTON, *President*
V. O. WALSH, *General Manager*
H. P. BOUDREAULT *Executive Adjuster*
J. A. BELL *Executive Adjuster*

10205

Underwriters Adjustment Bureau Ltd.

CABLE ADDRESS
ASSESSORS TORONTO
TELEX 06-217531

ONTARIO DIVISION

PLEASE
REPLY TO
80 ARGYLE AVE.
OTTAWA, ONT.
TEL. 232-3593
AND PLEASE QUOTE
OUR LOSS NUMBER

349 IB 1228 C/466

June 25, 1970

Department of Transport,
Chief Accident Investigation Division,
Ottawa, Ontario.

Attn. Mr. DeNiverville

CA10

RE: Reference 5002 3796.

Dear Sir:

Thank you for copies of reports sent to us recently.

It would appear there is only one report outstanding, your reference 5002 3796.

We would ask that when this report is available it be forwarded to us in the enclosed self-addressed envelope.

Thanking you for your co-operation, in this regard, we remain,

Yours very truly,

F.F. Taylor,
Branch Manager

FFT:c

000505

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UNDERWRITERS ADJUSTMENT BUREAU LTD.

80 ARGYLE AVE.

OTTAWA, ONT., CANADA

ADJUSTER
FILE# 466

000507

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

DRAFT

REFER TO REPORT NO.
REF. RAPPORT N°
3796

AIRCRAFT TYPE — *Type aéronef*	REGISTRATION — *Immatriculation*	DATE-TIME — *Date-Heure*	OPERATION — *Opération*
Hiller FH-1100	CF-WMO	14MAR68 1158 PST	Commercial
PLACE — *Endroit*		LATITUDE	LONGITUDE
Near Fort Langley, B.C.		49/08N	122/28W

LOCALE — *Scène*
Hilly terrain covered with brush and trees at 260' asl.

WEATHER — *Conditions météorologiques*
Overcast cloud at about 2000', visibility good, wind SSE at 20 gusting to 25 mph; moderate turbulence reported.

PILOT / PILOTE	LICENCE	TOTAL HOURS — *Heures totales*		TOTAL HOURS, LAST 90 DAYS — *Total d'heures (90 derniers jours)*	
	Commercial	4293	ALL TYPES — *Tous types*	150	ALL TYPES — *Tous types*
		110	ON TYPE — *Type en cause*	52	ON TYPE — *Type en cause*

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While in fast cruising flight at about 500 feet the helicopter partially disintegrated and crashed.

The main rotor mast had failed after being struck twice by the teetering stops. These teetering stop impacts could have been initiated by one or both of these:

a) excessive blade flapping due to gust loads

b) the pilot attempting to compensate for the turbulence by rapid control movements.

Several contributory conditions were present prior to the accident:

a) in high-speed flight and with aft C of G, (CALCULATED) the required forward cyclic would tilt the motor near to its forward limit bringing the teetering stops close to the mast.

b) this helicopter was manufactured with less than the designed teeter angular movement

c) the extended horizontal stabilizer would require an extra increment of forward cyclic and hence rotor disc tilt.

~~d) the C of G was established as being in aft position on this aircraft (over)~~

	TOTAL	FATALITIES — *Pertes de vie*	SERIOUS INJURIES — *Blessures graves*	MINOR INJURIES — *Blessures légères*
CREW — *Équipage*	1	1		
PASSENGERS				
OTHERS — *Autres*				

ASSIGNED CAUSE(S) — *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft.

Incorrect manufacture of teeter stops

AJC/LG

Inadequate design of the horizontal stabilizer extension

INV | CAIE | ÉDIT

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After the accident operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to inspect and ensure the proper specified teeter angular dimension, and by Service Bulletin FH-1100-62-1 to remove the stabilizer extensions on FH-1100s not equipped with floats.

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

REDRAFT

REFER TO REPORT NO.
REF. RAPPORT N°
3796

AIRCRAFT TYPE — *Type aéronef*	REGISTRATION — *Immatriculation*	DATE-TIME — *Date-Heure*	OPERATION — *Opération*
Hiller FH-1100	CF-WMO	14Mar68 1158 PST	Commercial

PLACE — *Endroit*	LATITUDE	LONGITUDE
near Fort Langley, B.C.	49/08N	122/28W

LOCALE — *Scène*
Hilly terrain covered with brush and trees at 260' asl

WEATHER — *Conditions météorologiques*
Overcast cloud at about 2000', visibility good, wind SSE at 20 gusting to 25 mph; moderate turbulence reported

PILOT / PILOTE	LICENCE	TOTAL HOURS — *Heures totales*	TOTAL HOURS, LAST 90 DAYS — *Total d'heures (90 derniers jours)*
	Commercial	4293 ALL TYPES — *Tous types* 110 ON TYPE — *Type en cause*	150 ALL TYPES — *Tous types* 52 ON TYPE — *Type en cause*

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While in fast cruising flight at about 500 feet, the helicopter partially disintegrated and crashed.

The main rotor mast failed after being struck twice by the teetering stops.

In high-speed flight and with aft C of G the required forward cyclic would tilt ~~the disc~~ the ~~axis of rotation~~ DETOR close to its forward limit bringing the teetering stops close to the mast. ~~It was calculated that~~ [the C of G was established as being in an aft position on this aircraft. The extended horizontal stabilizer would require further forward cyclic and greater rotor disc tilt. In addition, ...]

Turbulent air could cause excessive blade flapping due to ~~the~~ fluctuating disc loading in the or as a result of the pilot attempting to compensate by rapid control movements.

After the accident, operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to inspect and ensure the proper specified teeter angular dimension, and by Service Bulletin FH-1100-62-1 to remove the stabilizer extensions for non-float equipped FH-1100 helicopters. ~~This helicopter had less teeter angular movement than specified.~~

	TOTAL	FATALITIES — *Pertes de vie*	SERIOUS INJURIES — *Blessures graves*	MINOR INJURIES — *Blessures légères*
CREW — *Équipage*	1	1		
PASSENGERS				
OTHERS — *Autres*				

ASSIGNED CAUSE(S) — *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft.

~~The teetering stop impacts could have been induced by turbulence by excessive blade flapping in the turbulence (a) and/or, the pilot attempting to (b) maintain flight by rapid control movements.~~

INT	CAIE	EDIT

23-0014 AJC/SG
12-69

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DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While in fast cruising flight at about 500 feet the helicopter partially disintegrated and crashed. Several circumstances ~~cont~~ conditions ~~existed combined to~~ were contributory present prior the accident:

The main rotor mast had failed after being struck twice by the teetering stops. In high-speed flight and with aft C of G the required forward cyclic would tilt the rotor close to its forward limit bringing the teetering stops close to the mast. (This helicopter WAS MANUFACTURED WITH LESS THAN THE DESIGNED had ~~less~~ teeter angular movement ~~than specified.~~) The extended horizontal stabilizer would require further forward cyclic and greater rotor disc tilt. In addition, the C of G was established as being in an aft position on this aircraft.

The teetering stop impacts could have been induced ~~in the turbulence~~ by one or both of these: (a) excessive blade flapping DUE TO GUST LOADS (b) the pilot attempting to ~~maintain level flight~~ COMPENSATE FOR THE TURBULENCE by rapid control movements.

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

After the accident operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to inspect and ensure the proper specified teeter angular dimension, and by Service Bulletin FH-1100-62-1 to remove the stabilizer extensions on FH-1100s not equipped with floats.

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

DRAFT

REFER TO REPORT NO.
REF. RAPPORT N°
3796

AIRCRAFT TYPE – *Type aéronef*	REGISTRATION – *Immatriculation*	DATE-TIME – *Date-Heure*	OPERATION – *Opération*
Hiller FH-1100	CF-WMO	14Mar68 1158 PST	Commercial

PLACE – *Endroit*	LATITUDE	LONGITUDE
near Fort Langley, B.C.	49/08N	122/28W

LOCALE – *Scène*
Hilly terrain covered with brush and trees at 260' asl

WEATHER – *Conditions météorologiques*
Overcast cloud at about 2000', vis good, wind SSE at 20 gusting to 25 mph; moderate turbulence reported

PILOT / PILOTE	LICENCE	TOTAL HOURS – *Heures totales*	TOTAL HOURS, LAST 90 DAYS – *Total d'heures (90 derniers jours)*
	Commercial	4293 ALL TYPES – *Tous types* 110 ON TYPE – *Type en cause*	150 ALL TYPES – *Tous types* 52 ON TYPE – *Type en cause*

DESCRIPTION OF OCCURRENCE – *Description de l'événement*

While in fast cruising flight at about 500' the helicopter partially disintegrated and crashed.

The main rotor mast ~~head~~ failed after being struck twice by the teetering stops. In high speed flight, the considerable forward cyclic required would tilt the rotor axis near the limits of its movement. Such tilting would bring the teetering stops very close to the rotor mast. In the turbulent air that was present the ~~advancing~~ blades would be flapping; this could cause the advancing blade teetering stop to strike the mast.

(After the accident, operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to modify the teetering stops to permit ~~an increased~~ the specific angular movement. ~~Also, as the forward cyclic increases the tail-down component from rotor wash, operators~~ were advised by Service Bulletin FH-1100-62-1 that stabilizer extensions were to be removed on all skid-equipped FH-1100 helicopters.)

this statement meaningless. agreed.

	TOTAL	FATALITIES – *Pertes de vie*	SERIOUS INJURIES – *Blessures graves*	MINOR INJURIES – *Blessures légères*
CREW – *Équipage*	1	1		
PASSENGERS				
OTHERS – *Autres*				

ASSIGNED CAUSE(S) – *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft.

INV. | CAIO | EDIT
AJC/SG

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

It was calculated that the CG was in an aft position on this aircraft. The extended horizontal stabilizer would require further pound cyclic and greater rotor disc tilt.

Turbulent air could cause excessive blade flapping due to the fluctuating disc loading or as a result of the pilot attempting to compensate by rapid cyclic movements.

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While in fast cruising flight at about 500 feet, the helicopter partially disintegrated and crashed.

The main rotor mast failed after being struck twice by the teetering stops. In high-speed flight and with aft C_xG_x the required forward cyclic would tilt (flap) the axis of rotation close to its forward limit bringing the teetering stops close to the mast. Turbulent air could cause the blades to flap downward still further and allow the teetering stops to strike the mast.

After the accident, operators were advised by manufacturer's Service Bulletin FH 1100-51-3 to inspect and insure the proper specified teeter angular dimension, and by Service Bulletin FH 1100-62-1 to remove the stabilizer extensions for non-float equipped FH 1100 helicopters.

Use of the extended stabilizer necessitates additional forward cyclic travel, which increases the flapping angle. This helicopter had less teeter angular movement than specified.

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DEPARTMENT OF TRANSPORT / **MINISTERE DES TRANSPORTS**

ROUTE SLIP / **BORDEREAU D'ACHEMINEMENT**

TO: Name - *Nom*	Routing Symbol Symbole d'acheminement	Date
A: CAIO		☐ Comment *Observations*
		☐ For your information *Pour votre gouverne*
		☐ Per our conversation *Selon notre conversation*
		☐ Approval *Approbation*
		☐ Discuss with me *Discuter avec moi*
		☐ Take appropriate action *Prendre les mesures appropriées*

(2) Suggest this change to S.M.O. when I see him later today

REMARKS:
REMARQUES:

(1) Report revised as per attached sheet.

Would you please insert Engineering Lab report 24/68 copy 4 in accident report as appendix 20. This is probably in volume 1 of this file.

Suggest this report be referred to in the text of report

Oct 1/68.

FROM: *DE:* C.J.W. Hill

Routing Symbol *Symbole d'acheminement*

000515

02-0091
1-66

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

DEPARTMENT OF TRANSPORT

ROUTE SLIP

MINISTÈRE DES TRANSPORTS

BORDEREAU D'ACHEMINEMENT

TO: Name - *Nom*	Routing Symbol Symbole d'acheminement	Date
A: CAIE		☐ Comment *Observations*
		☐ For your information *Pour votre gouverne*
		☐ Per our conversation *Selon notre conversation*
		☐ Approval *Approbation*
		☐ Discuss with me *Discuter avec moi*
		☐ Take appropriate action *Prendre les mesures appropriées*

REMARKS:
REMARQUES:

Chen -
could you initial
report as agreeing or
suggest changes.

FROM:
DE:

Routing Symbol
Symbole d'acheminement
CA10-2

02-0091
1-66

000516

DESCRIPTION OF OCCURRENCE – *Description de l'événement*

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While in fast cruising flight at about 500' the helicopter partially disintegrated and crashed.

The main rotor mast had failed after being struck twice by the teetering stops. In high-speed flight, the considerable forward cyclic required would tilt the rotor axis forward to near the limits of ~~the rotor axis~~ its movement ~~relative to the mast~~. Such tilting would bring the teetering stops very close to the rotor mast. In the turbulent air that was present the advancing blades could be flapping; this could cause the advancing blade teetering stop to strike the mast.

(After the accident, operators were advised by the manufacturer's Service Bulletin FH-1100-51-3 to modify the teetering stops to permit an increased angular movement. Also, as the forward cyclic increases the tail-down component from rotor wash, operators (over)

	TOTAL	FATALITIES – *Pertes de vie*	SERIOUS INJURIES – *Blessures graves*	MINOR INJURIES – *Blessures légères*
CREW – *Équipage*	1	1		
PASSENGERS				
OTHERS – *Autres*				

000517

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were advised by Service Bulletin FH-1100-62-1 that stabilizer extensions were to be removed on all skid-equipped FH-1100 helicopters.)

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DESCRIPTION OF OCCURRENCE – *Description de l'événement*

While in fast cruising flight at about 500', the helicopter's main rotor came off and the aircraft crashed.

The rotor mast had failed after being struck twice by the teetering stops. With the helicopter in cruise flight the degree of forward tilt would be increased with: the high forward speed, the C of G near the aft limit and the tail down component of the rotor downwash on the extended horizontal stabilizer. Under these conditions the excessive flapping of the advancing blades due to the turbulent air could cause the teetering stops of the advancing blade to strike the mast.

The teetering stops on this helicopter allowed a total angular movement of about 18.5°, whereas the manufacturer's specification requires a teetering angle of each blade of 10° (+30' - 0'). After the accident, operators were advised by Service Bulletin FH-1100-51-3 to check the teetering angle and modify if necessary.

Operators were also advised by Service Bulletin FH-1100-62-1 that the extensions to the stabilizer were to be removed on all skid equipped helicopters.

F000519

TOTAL	FATALITIES	SERIOUS INJURIES	MINOR INJURIES

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

REDRAFT

REFER TO REPORT NO.
REF. RAPPORT N° 3796

AIRCRAFT TYPE — *Type aéronef*	REGISTRATION — *Immatriculation*	DATE-TIME — *Date-Heure*	OPERATION — *Opération*
Hiller FH-1100	CF-WMO	14Mar 68 1158 PST	Commercial

PLACE — *Endroit*	LATITUDE	LONGITUDE
near Fort Langley, B.C.	49/08N	122/28W

LOCALE — *Scène*
Hilly terrain covered with brush and trees at 260' asl.

WEATHER — *Conditions météorologiques*
Overcast cloud at about 2000', vis good, wind SSE at 20 gusting to 25 mph; moderate turbulence reported — add Turbulence

PILOT / PILOTE	LICENCE	TOTAL HOURS — *Heures totales*		TOTAL HOURS, LAST 90 DAYS — *Total d'heures (90 derniers jours)*	
	Commercial	4293	ALL TYPES — *Tous types*	150	ALL TYPES — *Tous types*
		110	ON TYPE — *Type en cause*	52	ON TYPE — *Type en cause*

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While the helicopter was in cruising flight at about 500 feet (several witnesses saw not recorded) it break up in the air and fall to the ground.

With the helicopter in high-speed flight, considerable forward cyclic would be required to counteract the tail-down component due to the horizontal stabilizer and ~~the aft~~ ~~position~~ of the C. of G. The forward cyclic would ~~position~~ the rotor ~~in a leading edge down position~~ relative to the mast. The turbulent air that was present could cause flapping of the advancing blades to exceed the available angular movement of the main rotor ~~blades~~. This could result in the advancing blade teetering stop striking the mast.

The main rotor mast ~~failed after it was~~ had being struck twice by the teetering stops. These stops allowed a total angular movement of about 18.5°, whereas the manufacturer's specification requires a teetering angle for each blade of 10° (+30' - 0'). Subsequent to the accident, operators were advised by Service Bulletin FH-1100-51-3 of the manufacturer's specification and the method to modify teetering stops to increase the angular movement.

~~Subsequent to the accident~~, Operators were also advised by Service Bulletin FH-1100-62-1 that the extensions to the stabilizer were to be removed on all skid equipped FH-1100 helicopters.

	TOTAL	FATALITIES — *Pertes de vie*	SERIOUS INJURIES — *Blessures graves*	MINOR INJURIES — *Blessures légères*
CREW — *Équipage*	1	1		
PASSENGERS				
OTHERS — *Autres*				

ASSIGNED CAUSE(S) — *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft.

AJC/SG
(28-4-70)

INV	CAIO	EDIT

INV	CAIO	EDIT

INV	CAIO	EDIT

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

AIRCRAFT ACCIDENT REPORT
RAPPORT D'ACCIDENT D'AVIATION

DRAFT

REFER TO REPORT NO.
REF. RAPPORT N°
3796

AIRCRAFT TYPE — *Type aéronef*	REGISTRATION — *Immatriculation*	DATE-TIME — *Date-Heure*	OPERATION — *Opération*
Hiller FH-1100	CF-WMO	14MAR68 1158 PST	Commercial
PLACE — *Endroit*		LATITUDE	LONGITUDE
Near Fort Langley, B.C.			

LOCALE — *Scène*
Hilly terrain covered with brush and trees at 260' asl.

WEATHER — *Conditions météorologiques*
Overcast cloud at about 2000', visibility good, wind SSE of 20 gusting to 25 mph.

PILOT PILOTE	LICENCE	TOTAL HOURS — *Heures totales*	TOTAL HOURS, LAST 90 DAYS — *Total d'heures (90 derniers jours)*
		4293 ALL TYPES — *Tous types* 110 ON TYPE — *Type en cause*	150 ALL TYPES — *Tous types* 52 ON TYPE — *Type en cause*

DESCRIPTION OF OCCURRENCE — *Description de l'événement*

While the helicopter was in cruising flight at about 500 feet several witnesses saw it break up in the air and fall to the ground.

The main rotor mast failed when struck by the teetering stops while the blades were flapping excessively. Contributing factors were:

a) moderate turbulence

– b) main rotor flapping angle was about 18.5°, (SB FH-1100-51-3 of May 27, 1968 requires flapping angle of 20° (+1°-0°).

– c) extended horizontal stabilizer installed, (SB FH-1100-62-1 of June 17, 1968 requires extensions be removed.)

connect cause better

	TOTAL	FATALITIES — *Pertes de vie*	SERIOUS INJURIES — *Blessures graves*	MINOR INJURIES — *Blessures légères*
CREW — *Équipage*	1	1		
PASSENGERS				
OTHERS — *Autres*				

ASSIGNED CAUSE(S) — *Cause(s) assignée(s)*

Inadequate data to safely operate the aircraft.

INV	CAIO	EDIT

(CATB requested this report 17. 3. 70)

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P.C.A.
VANCOUVER

5002-715 (PCA)

5002-3796 (CAIO)

C.A.I.
OTTAWA

26 May, 1970

Accident - Hiller FH-1100, CF-WMO
- 14 March, 1968

1. This refers to your memorandum of April 30, 1970, enquiring of the status of the report of the referenced aircraft.

2. I regret the delay in answering, but I was withholding reply because it appeared as if this report was almost ready for release. Unfortunately, further complications have arisen and there will be some further delay. I hesitate to predict a probable date of completion.

3. You may advise the enquirers that we appreciate their desire to have a copy of this report as quickly as possible. We will do our best to keep the delay to a minimum.

H.A. Fawcett,
for Chief, Accident Investigation.

HAF/SG

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MEMORANDUM

CLASSIFICATION

TO
A

C.A.I., OTTAWA

YOUR FILE No. 5002-3796
Votre dossier

OUR FILE No. 5002-715(PCA)
Notre dossier 5008-WMO

FROM
De

P.C.A., VANCOUVER

DATE April 30, 1970

FOLD

SUBJECT
Sujet

Accident - Hiller FH-1100, CF-WMO
14 March, 1968

3535

CA10

1. This is in reference to my letter of January 30, 1970 and your reply of February 12 concerning the availability of the report in respect of the subject accident.

2. The company concerned were advised following your letter that they could anticipate receiving a copy of the report about the end of March. May we be advised if the report is now available?

W. M. Johnson,
Regional Controller, Civil Aviation

000523

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183
CAE

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

349 IB 1228
C/466

~~5002-3915~~ (CAIO)
~~5002-3615~~ "
~~5002-3786~~ "
~~5002-4414~~ "
5002-3796 "

Ottawa, Ontario,
11 May, 1970.

Underwriters Adjustment
Bureau Ltd.,
80 Argyle Avenue,
Ottawa, Ontario.

Attn: Mr. F.F. Taylor
Branch Manager

Dear Sir:

Enclosed are copies of the approved reports of the accidents requested in your letter of April 29, 1970 except the accident to Hiller FH-1100, CF-WMO, 14 March, 1968.

The report of the accident to the Hiller has not yet been completed, however be assured your request is on our file and a copy will be forwarded to you as soon as it is approved.

Yours truly,

H.A. Fawcett,
for Chief, Accident Investigation,
Civil Aviation Branch.

Encl.

HAF/SG

Document disclosed under the Access to Information Act
Document divulgué en vertu de la Loi sur l'accès à l'information

5002-3915
5002-3615
5002-3786
5002-4414
5002-3796

G. M. PELTON, *President*
V. O. WALSH, *General Manager*
H. P. BOUDREAULT
Executive Adjuster

F. M. GRAY, C.A.,
Executive Adjuster

J. A. BELL
Executive Adjuster

Underwriters Adjustment Bureau Ltd.

CABLE ADDRESS
ASSESSORS TORONTO
TELEX 06-217531

ONTARIO DIVISION

PLEASE
REPLY TO
80 ARGYLE AVE.
OTTAWA, ONT.
TEL. 232-3593
AND PLEASE QUOTE
OUR LOSS NUMBER

3397

349 IB 1228 C/466

Chief, Accident Investigation Division,
Department of Transport,
OTTAWA, Ontario.

April 29,1970

CA10

RE: Associated Aviation Underwriters

Gentlemen:

We are acting in this case for Associated Aviation Underwriters, and have had a request from our Toronto Office for reports pertaining to five accidents.

We understand that the final reports are available on three of the five, and we would be pleased with copies of these reports along with whatever details on technical or lab reports that can be turned over to us at this time.

The three in question are as follows:-

5002 -3915, 5002-3615 , 5002-3786

We are also interested in two other occurrences, and would be very pleased if we might be put on the waiting list for these final reports when available.

The two in question are as follows:-

5002-4414, 5002-3796

Yours very truly,

F. F.Taylor,
Branch Manager

FFT:c

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CAE
18/3



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330-68131-C450

Dormant Filing

~~5002-4414~~ (CAIO)
~~5002-3813~~ "
~~5002-3813~~ "
~~5002-3788~~ "
5002-3796 "

P. A.

Ottawa, Ontario,
26 March, 1970.

Underwriters Adjustment
Bureau Ltd.,
P.O. Box No. 7031,
Adelaide St. P.O.,
Toronto 210, Ontario.

Attn: Mr. Alan Robertson

Dear Sir:

Enclosed are copies of the approved reports of the accidents requested in your letter of March 16, 1970 except the accident to Hiller FH-1100, CF-WMO, 14 March, 1968.

The report of the accident to the Hiller has not yet been completed, however be assured your request is on our file and a copy will be forwarded to you as soon as it is approved.

Yours truly,

H.A. Fawcett

H.A. Fawcett,
for Chief, Accident Investigation,
Civil Aviation Branch.

Encls.
HAF/SG

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APPENDICES

1. LIST OF RELATED FACTORS.

2. VIOLATIONS, DEFICIENCIES AND IRREGULARITIES.

3. INVESTIGATION COST AND TIME DETAILS.

4. DIAGRAM OF ACCIDENT AREA. (A) Map of Area 1:25,000
(B) Survey Scatter Plot of Wreckage.
(C) Sketch of Area Location of Witnesses.

5. PHOTOGRAPHS.

6. WITNESSES STATEMENTS (LIST BELOW) A, B, C, ETC.

s.19(1)

(A) Statement of [redacted]
(B) "
(C) "
(D) "
(E) "
(F) "

Statements of personnel other than direct eye-witnesses

(G) Statement of [redacted]
(H) "
(I) "
(J) "

7. CREW LIST (INCLUDE ADDRESS)

DETAILS OF INJURIES.
CORONER'S REPORT.

8. PASSENGER LIST (INCLUDE ADDRESS)

DETAILS OF INJURIES.
CORONER'S REPORT.

9. ADDITIONAL WEATHER INFORMATION (WHEN REQUIRED)

(LIST AND NUMBER ANY ADDITIONAL APPENDICES BELOW).

10. Engine examination report submitted by R.M.Logan, D.O.T.
11. Engine examination report subm itted by R. W. Hatch, Allison Representative
12. Aircraft examination report submitted by J.G. Baker, Fairchild Hiller Representative
13. Hydraulic component test report submitted by Master Instruments, Vancouver Airport
14. Chemical and serology analysis report submitted by RCMPolice Laboratory, Vancouver
15. Pathological report
16. R.C.M.Police report
17. Statement of fact to the Coroner
18. Correspondence to Fairchild Hiller
19. Correspondence to ADMA, Ottawa
20. Laboratory report No. 24/68
21. Correspondence to CAIE, Ottawa
22. Measurements of Blade Flap Angle by Okanagan Helicopters

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PART 1 INTRODUCTION

ACCIDENT DETAILS

LOCATION	ALTITUDE A.S.L.	LATITUDE	LONGITUDE	DATE AND TIME (STANDARD)
Approx 5 miles east Fort Langley, B.C.	250'	49° 08' N	122° 28' W	March 14, 1968 Approx 11:58 PST

OPERATOR

Okanagan Helicopters Ltd.

EXTENT OF DAMAGE
DESTROYED [X] SUBSTANTIAL [ ] MINOR [ ] NIL [ ]

NUMBER OF CREW	NUMBER KILLED	NUMBER INJURED	
		SERIOUS	MINOR
One	One		

NUMBER OF PASSENGERS	NUMBER KILLED	NUMBER INJURED	
		SERIOUS	MINOR
None	None		

TYPE OF OPERATION	ATB LICENCE NUMBER UNDER WHICH OPERATION WAS BEING CARRIED OUT	CLASS OF SERVICE
3.3 Commercial (Ferry)	512/50 (H)	4 (ABC)

TYPE OF ACCIDENT

5.22 Airframe Air

PART 2 FACTS ASCERTAINED BY INVESTIGATION

AIRCRAFT

AIRCRAFT TYPE	REGISTRATION	MAKER'S SERIAL NO.
Hiller FH-1100	CF-WMO	96

REGISTERED OWNER
Okanagan Helicopters Ltd., Vancouver International Airport, B.C.

AIRCRAFT UNDERCARRIAGE
LANDPLANE [X] SEAPLANE [ ] SKIPLANE [ ] AMPHIBIAN [ ] SKI-WHEEL [ ] WHEEL-FLOAT [ ]

SEATING ARRANGEMENT

Two front, three rear

ENGINE AND PROPELLER *(for helicopters type in appropriate information on hubs, main rotors and tail rotors)*

NO.	ENGINE TYPE	MAKER'S SERIAL NO.
1	Allison 250-C18	CA - E800374
2		
3		
4		

NO.	PROPELLER TYPE	HUB MODEL AND SERIAL NO.	BLADE MODEL AND SERIAL NO.
1			
2			
3			
4			

HELICOPTERS
MAIN ROTOR HUB, SERIAL NO 65
MAIN ROTOR BLADES, SERIAL NO 316, 317
TAIL ROTOR HUB, SERIAL NO 58
TAIL ROTOR BLADES, SERIAL NO 416, 421

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WRECKAGE

GENERAL OBSERVATIONS (GIVE DETAILS OF MARKS ON GROUND, CONDITION OF GROUND, POSITION OF WRECKAGE, RELEVANT MATTER PICKED UP AWAY FROM WRECKAGE, A WRECKAGE DIAGRAM SHOULD BE INCLUDED WHERE THE WRECKAGE IS SCATTERED)

The main body of the wreckage was located in a heavily wooded section of a farmyard situated on a bluff, 3 miles south of the Fraser River and approximately 5½ miles SE of Fort Langley, B.C. This bluff was at an elevation of 250' above sea level.

The major portion of the aircraft struck the ground in a near vertical attitude on an approximate heading of 065°m. The main rotor and hub assembly attached to the broken top section of the main rotor mast were located approximately 350' south of the impact area.

The remainder of the scattered wreckage, consisting of over 260 items in all, covered an area of about 10 acres on a bearing of 350°T from the main wreckage. Some papers from the cabin area were located on the same bearing over 1½ miles from the accident scene.

A map of the area and a scatter plot is attached as Appendix 4 (A) and 4 (B) respectively.

CONDITION OF WRECKAGE (DESCRIBE IN DETAIL)

The surveyed scatter plot showing the location of the wreckage is attached as Appendix 4(B).

UNDERCARRIAGE The right hand skid and struts were with the main wreckage. The front section of the skid had broken off at the front strut attachment point and had been driven into the ground in a near vertical attitude.

The left hand skid and struts were found as indicated in Appendix 4 (B). The rear strut was fractured at the mid-point by a main rotor blade strike. This strike occurred in an upward and outward direction from the helicopter under surface, fracturing the strut, upper strut attachment and rear torsion bar.

MAIN ROTOR The main rotor mast had fractured just below the teeter steps contact point. The mast showed slight ovaling at the fracture area and had been struck heavily by the teeter steps. The complete main rotor head, blades and section of mast were located as shown in Appendix 4 (B). The blue blade had very little damage but had a negative coning bend out toward the tip. The yellow blade was extensively damaged from metal and tree strikes and was twisted and bent downward at the tip. Both incidence pushrods had fractured, one rod was lying with the head, and the other rod was with the main wreckage. The blue blade drag link attachment bolt had sheared at the threaded end and pulled loose from the blade. The blade had rotated forward in the grip and struck the leading edge of the blade on the grip face.

ENGINE & TRANSMISSION The engine was extensively damaged by fire. The accessory gearbox case was broken. The mounts were broken in several places but the engine was being held in position by the controls, plumbing and electrical wiring.

The transmission was still in position. The lower case and accessory drive case, hydraulic pumps, and plumbing, were damaged by fire and impact. The flight controls were still intact from the engine compartment deck up to the top side of the swash plate. The hydraulic cylinders were fire scorched but appeared undamaged. The transmission input one-way clutch and drive quill had been forced forward into the case.

CABIN & FUSELAGE had been destroyed by impact and fire. The fuselage below the engine compartment and all controls were also destroyed by fire.

TAIL BOOM & ROTOR The tail boom was severed just aft of the attachment bulkhead and was lying a short distance from the main wreckage. The tail rotor pylon was severed from the tail boom and this section, including the tail rotor gearbox and tail rotor, were located with the main wreckage. The tail rotor blades were severed just outboard from the root

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ends. The outer sections of the tail rotor blades were found as shown in Appendix 4 (B)

Miscellaneous pieces of the helicopter radio, instruments, structure, etc., were located as shown in Appendix 4 (B) and Appendix 5.

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WRECKAGE (Continued)

TECHNICAL EXAMINATION OF WRECKAGE (LIST AND REMARK UPON ANY TECHNICAL DEFECTS IN AIRFRAME, ENGINE(S) OR ACCESSORIES, DISCOVERED DURING INVESTIGATION; IF NOTED INCLUDE DETAILS OF OPERATING LIFE AND TIME SINCE MANUFACTURE AND OVERHAUL)

A survey plot was made of the wreckage area giving locations of main and scattered wreckage and is attached as Appendix 4 (B). The wreckage was then transported to Vancouver Airport for examination and a mock-up of the helicopter fuselage was constructed to determine the sequence of break-up. All systems, components, and structure were examined, where possible, for evidence of failure prior to the initial break-up, and ground impact and fire damage. Chemical and serology examinations were conducted by the RCMPolice Laboratory, Vancouver, to determine if there had been any bird or foreign object strikes, and where possible the location of rotor blade strikes in relation to the helicopter structure. The results of the examinations are:

1. POWERPLANT: The engine was dismantled and examined as shown in the appendices #10 and #11. No preimpact failures were found. Internal evidence indicates that the engine was still developing power at impact, however, the percentage of power could not be established.

2. INSTRUMENTS: The volt-ammeter, oil temperature, exhaust temperature, gas generator tachometer, dual tachometer and altimeter were examined as shown in Appendix #20 and it is concluded from the engine instruments that the engine was still developing power at impact.

3. MAIN ROTOR SHAFT: Metallurgical examination of the shaft failure was carried out as shown in Appendix #20. No defects were found but the shaft had been subjected to a bending overload coupled with a torsional load. Evidence indicates that the shaft was driving the main rotor at the time of failure.

4. VERTICAL FIN AND TAIL ROTOR BLADE FAILURE: Examination of the fin and tail rotor blades as shown in Appendix #20, showed no defects. The failure resulted from excessive flapping and possible bending of the tail rotor blades which caused the rotor tips to strike the fin leading edge.

5. FLIGHT CONTROLS & HYDRAULIC SYSTEM: All systems had extreme fire damage. The flight controls above the engine deck to the swash plate were intact except for impact damage. The incidence pushrods between the swash plate and main rotor had been intact until after the main rotor shaft failure. Evidence of flattening and marks on the pushrods and main rotor shaft showed that the pushrods failed as they were twisted around the rotor shaft. Also, following the shaft failure the rotor hub had lifted and was then brought down again marking the yellow blade teeter stop by the fractured end of the rotor shaft. This downward movement

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TECHNICAL INVESTIGATION AND TESTS (GIVE DETAILS)

Included in above.

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TECHNICAL EXAMINATION & INVESTIGATION - Continued from Page 6

of the hub and rotor following the shaft failure was most likely caused by negative blade angle from the pushrods still being attached to the swash plate.

The flight control rods and bellcranks below the engine deck and forward to the cockpit controls had been destroyed by fire. However, all control rod ends with small sections of pushrod still attached and bellcrank hinge bearings were accounted for. There was no evidence of failure of the rod ends or hinge points. The fore and aft and the lateral pitch trim actuators were badly damaged by impact and fire, but showed no evidence of malfunction. The hydraulic control power cylinders had impact damage and some slight fire damage. The cylinders were bench checked for operation as shown in Appendic #13, and were found to operate normally. Both hydraulic power packs were badly damaged by fire and could not be bench checked. Visual examination showed no evidence of pre-impact failure.

6. TRANSMISSION: Examination of the transmission and disassembly showed all gears and drives to be normal, except for impact damage. The oneway drive showed no evidence of pre-impact failure.

7. TAIL ROTOR GEARBOX & PITCH CHANGE MECHANISM: Except for a bent tail rotor shaft, the gearbox was intact. The bent shaft had to be cut in order to dismantle and examine the drives and pitch change mechanism. Examination showed no evidence of failure or malfunction prior to impact.

8. FUSELAGE & UNDERCARRIAGE: The main cabin area and lower rear fuselage below the engine deck was almost completely destroyed by fire. A mock-up was built from the recovered pieces and examined for rotor blade strikes and possible failures prior to the aerial disintegration. This examination showed a rotor blade strike; on the windshield bow about 8" to the right of the centre line; on the single side band radio and grill on top of the instrument console; on the right front corner of the battery and battery quick disconnect; and the right hand rudder pedal. These strikes all appeared to be inwards and down. A further strike had occurred to the left undercarriage rear support strut about 12" from the torque tube. This strike was from below the helicopter and from the centre line outwards toward the left as viewed with the helicopter in a normal upright position. There was no evidence of blade strikes on the tail boom or rear fuselage. The tail boom separated from the main fuselage during ground impact in a near vertical nose down attitude.

9. MAIN ROTOR: Examination of the main rotor head and blades showed no evidence of pre-strike failure. Chemical laboratory examination of the damaged rotor blade was carried out to determine, where possible, if a bird strike had occurred, and to locate the damaged areas of the blade in relation to strikes on the helicopter structure. The results of this examination are shown in Appendix #11. The main rotor hub and teeter stop flapping travel was measured by using a serviceable rotor shaft. From neutral to down stop on Blue blade measured 9½°. From neutral to down stop on Yellow blade measured 9°. Hiller aircraft specifications for blade flap angle are neutral to down 10° plus 30' minus zero. A check carried out by the Okanagan Helicopters Ltd., Vancouver, on other Hiller FH-1100 helicopters revealed that the majority of the helicopters had less travel than specified. See Appendix #22.

10. WINDSHIELD: Ballistics examination of some pieces of perspex were carried out with negative results. One piece of windshield perspex with a blood stain was examined as shown in Appendix #10. This stain was identified as human blood, group "O".

All the available evidence indicates that the helicopter had been serviceable and functioning normally prior to the main rotor flapping and fracturing the main rotor shaft.

An estimated weight and balance shows that the helicopter was being operated within limits but with an aft Centre of Gravity at about 101.0" Normal operating C of G limits are 95.5" to 101.5".

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CREW

NAME	AGE	NAME	AGE
Par Frederick Raymond Fletcher	41		
DUTY		**DUTY**	
Pilot-in-Command			
TYPE OF LICENCE		**TYPE OF LICENCE**	
Airline Transport VRA-1078			
AIRCRAFT CLASS AND TYPE RATINGS		**AIRCRAFT TYPE AND CLASS RATINGS**	
Aeroplanes, single and multi-engine land and sea and helicopter			
INSTRUMENT RATING	**DATE OF LAST CHECK**	**INSTRUMENT RATING**	**DATE OF LAST CHECK**
Class I	Jan.22,1968		
INSTRUCTORS RATING	**DATE OF LAST CHECK**	**INSTRUCTORS RATING**	**DATE OF LAST CHECK**
Class III ,	-		
AIRCRAFT TYPES FLOWN		**AIRCRAFT TYPES FLOWN**	
Piper - Apache, Commanche, Aztec C, Colt, Clipper Piper - Tri-Pacer, J3, Super Cub, Super Cruiser, Cherokee Cessna - 120, 140, 150, 170, 172, 175, 180, 206, 210 DeHavilland - Beaver, Otter, Dove Lockheed 18 - Loadstar Fleet 80 Taylorcraft Stinson Voyageur Aeronca Champ Beech 18 Bell 47, 206 Hiller UH12, FH 1100			
TIME ON ACCIDENT TYPE	**TIME ON TYPE WITHIN PAST 90 DAYS**	**TIME ON ACCIDENT TYPE**	**TIME ON TYPE WITHIN PAST 90 DAYS**
110 hrs	52 hrs		
TOTAL TIME WITHIN PAST 90 DAYS	**GRAND TOTAL**	**TOTAL TIME WITHIN PAST 90 DAYS**	**GRAND TOTAL**
150 hrs	4293 hrs		

SUB-DIVIDE INTO PILOT-IN-COMMAND AND CO-PILOT, DAY/NIGHT AS NECESSARY, WHEN ACCIDENT INVOLVES A SKIPLANE, FLOAT PLANE, HELICOPTER OR GLIDER, A SUITABLE BREAKDOWN OF THE PILOT'S EXPERIENCE MUST BE PROVIDED. IN CASES OF HELICOPTER ACCIDENTS GIVE TOTAL TIME ON HELICOPTER AS WELL AS EXPERIENCE ON SPECIFIC TYPE OF HELICOPTER.

Total fixed wing flying time - 2548 hrs.
" rotary wing " " - 1745 hrs.

All times as taken from Pilot*s personal papers found i n the wreckage area.

HISTORY OF CREW MEMBERS CONCERNED WITH ACCIDENT. (GIVE FULL DETAILS OF TRAINING, TOTAL AND RECENT EXPERIENCE; WHERE ACCIDENT INVOLVES SPECIAL CIRCUMSTANCES, SUCH AS NIGHT OR INSTRUMENT FLYING, GIVE FULL DETAILS OF EXPERIENCE OF RELEVANT CREW MEMBERS IN THIS REGARD AND GIVE DETAILS OF ANY PREVIOUS ACCIDENTS.)

See Page 7 (B)

WEATHER (Use plain language, not Met. Symbols)

CEILING OR CLOUD CONDITION	VISIBILITY	TEMPERATURE	
1500 to 2000' overcast	Good - occasional showers in area	42° F	
DEW POINT	**WIND VELOCITY**	**ALTIMETER SETTING**	**CLOUD TYPES**
Unknown	SSE 20 gusting 25 MPH	Unknown	Strato-cumulus

PAGE 7A TO BE COMPLETED WHEN WEATHER WAS A FACTOR.

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THIS PAGE TO BE COMPLETED WHEN WEATHER WAS A FACTOR IN THE ACCIDENT. THE WEATHER TO BE DISCUSSED AND INFORMATION TO BE PROVIDED UNDER THE FOLLOWING HEADINGS:

A) DID THE PILOT OBTAIN WEATHER INFORMATION?

B) IF YES, WHAT WAS THE SOURCE AND WHAT INFORMATION WAS PROVIDED?

C) WEATHER FORECAST FOR THE APPROPRIATE PERIOD, BOTH AREA AND TERMINAL.

D) AN OFFICIAL METEOROLOGICAL AFTERCAST OF THE ACTUAL WEATHER CONDITIONS OVER THE ROUTE OF THE FLIGHT.

E) CONDITIONS WHICH MIGHT PRODUCE ICING (CARBURETTOR OR AIRFRAME).

F) CONDITIONS WHICH MIGHT PRODUCE TURBULENCE.

NOTE: THE FOLLOWING MATERIAL IS TO BE ATTACHED AS APPENDIX 9.

APPROPRIATE FORECASTS, OBSERVATIONS AND SYNOPTIC CHARTS AND VERTICAL CROSS-SECTION SHOWING THE POSITION OF FRONTS AT THE TIME OF THE ACCIDENT.

A) Unknown.

B) Unknown.

C) The forecast for the Vancouver area issued at 17:30Z on the 14th is as follows:

PROGNOSIS - A defused arctic front is quasistationary in a line south of Calgary - near Kamloops - West of Smithers, at 1800Z. A low, centred 175 miles west of Tofino at 1800Z is moving northeastward and will be just west of Spring Island by 0600Z and is filling. The airmass is moist and unstable becoming stable north of the arctic front.

CLOUDS & WEATHER - A scattered layer based at 1000 ft and topped at 2000 ft. A second layer of strato cumulus and heavy cumulus cloud based at 2000 to 3000 ft and topped at 6000 to 12000 ft. A third layer based at 9000 ft and topped at 12000 ft. Visibility occasionally 2 to 4 miles in rainshowers with a few heavy cumulus topped at 15000 along the coastal mountains. Mountain passes frequently obscured ½ to 1 mile in light snow showers. Surface winds from 130°m at 25 MPH with gusts in the exposed areas.

ICING - Light rime icing except moderate clear icing in the heavy cumulus. Freezing level 3500 ft.

TURBULENCE - Moderate near heavy cumulus.

ACTUAL WEATHER REPORTS - for 1900Z and 2000Z

1900Z - Abbotsford - Special. Estimated ceiling 2000 ft broken 4000 ft broken, 20 miles visibility in very light rain showers, barometric pressure 1008.8 mlbs, temperature 47°, dewpoint 39°F, wind from 170° at 14 MPH. Altimeter setting 29.78" Hg, 8/10 heavy cumulus, 1/10 strato cumulus.

2000Z - Abbotsford - 1500 ft scattered, estimated 2000 ft broken, 4000 ft overcast. Visibility 15 miles in very light rainshowers. Barometric pressure 1009.5 mlbs. Temperature 46°F, dewpoint 37°F, wind from 190 at 18 MPH. Altimeter setting 29.80 inches, 2/10 cumulo fractus, 5/10 heavy cumulus, 3/10 strato.

D) There were no fronts in the area, but a deep low pressure area centered about 300 miles west of Vancouver Island, had produced a fairly brisk southwesterly flow of moist unstable air over southwestern B.C. This airstream given additional orographic lift over the coast mountains produced extensive cumulus and heavy cumulus clouds with tops 12 to 14000 ft and occasional showers.

E) Not pertinent.

F) Flight in or near the vicinity of the heavy cumulus type cloud could have encountered moderate turbulence also with a surface wind as reported by Abbotsford of 18 MPH with gusts light to moderate, mechanical turbulence would be generated in the vicinity of uneven terrain.

Further to this, it may be noted that an investigator was at the time of the accident, situated in a light aircraft enroute toward Abbotsford Airport, approximately 4 miles south of the accident site, at 1500 ft above ground, and was experiencing moderate turbulence with occasional severe jolts during the flight from Langley, B.C.

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PILOT HISTORY

Par Fredrick Raymond Fletcher

1. Initial medical examination completed April 15/48, assessed A1.

2. Completed training with the Canadian Aircraft Co., and the Regina Flying Club, with a toral flying time of 13:10 dual and 12:20 solo, August 1948.

3. All examinations completed August 3/48, assessed passed.

4. Issued Private Pilot Certificate No.7400 Aug.3/48, valid for DH 82 Taylor Cub and Piper type aircraft.

5. Licence endorsed for Fleet 80 and Cessna 120 type aircraft Dec.9/48.

6. Involved in an accident, as Pilot-in-Command, of Aeronca aircraft CF-FMU on March 5/50. Pilot received serious injuries, one passenger killed.

7. Licence re-instated after successful completion of another flight test and written examination on Air Regulations, June 23/51

8. Enrolled with the Regina Flying Club Aug.18/51, to undertake an approved course of Commercial Pilot training. Total flying experience 111:15 hrs.

9. Private Pilot Certificate endorsed "valid for night flying" Sept.8/51.

10. Completed Commercial Course on Oct.10/51. Total flying hours on course 55:30 hrs.

11. Completed Commercial Pilot Flight test Oct.11/51, assessed passed.

12. Completed Commercial examinations with the following results:

CP1	84%	CP5	82%
CP2	88%	CP6	86%
CP3	69%		

13. Issued Commercial Pilot Licence #C5872 on October 30/51, valid for Aeroplanes, single engine land.

14. Completed Flying Instructor's Categorization flight test June 29,1955, passed, awarded Category III.

15. Attempted Senior Commercial exam SAIA - failed, 58%, Feb.19/57

16. Attempted Instructors written exam FI1 part II, passed - 86%, May 25/61.

17. Completed a conversion course to Seaplanes, licence endorsed, Nov.9/62.

18. Completed conversion course to multi-engine aircraft, Dec.20/62 - licence endorsed.

19. Completed Helicopter endorsement exam HE1, March 9/65, passed 72%.

20. Completed conversion course to Helicopters March 30/65, consisting of 25 hrs of flight instruction. Licence #C5872 endorsed to include Bell 47 series helicopters.

21. Completed type training on Hiller 12E helicopters, licence endorsed for Hiller 12E May 6/65.

22. Involved in an Accident as Pilot-in-Command of Bell 47G3B helicopter CF-OKU on March 15/66. Pilot seriously injured. Aircraft struck an unmarked power line and crashed into river.

23. Completed a practical flight test with DOT Inspector, following accident, Oct.28/66 - passed.

24. Medical examination report dated Aug.3/66, assessment withheld pending further review.

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PILOT HISTORY continued

25. Medical report assessed 1,1,1,1, Oct.28/66.

26. Attempted written exams for Senior Commercial Licence with the following results:

SA1D	- passed	84%
SA2A	- passed	87%
SA3	- passed	70%
SA4	- passed	88%
SA6C	- passed	86.4%
SA7C	- passed	83.3%

27. Issued Senior Commercial licence #VRS 663 valid for Aeroplanes single and multi-engine land and sea and helicopters Bell 47, Hiller UH12, Jan.23/67.

28. Attempted Instrument Rating exam IR-1, passed 78% Aug.16/67.

29. Completed training for issuance of Glider licence Sept.10/67.

30. Issued Glider Licence #VRG 168 Sept.18/67.

31. Completed conversion course to Hiller FH1100, licence endorsed Feb.2/68.

32. Attempted Instrument flight test January 5/68, assessed - failed.

33. Re-attempted flight test Jan.22/68 - awarded Class I rating.

34. Issued Airline Transport Licence #VRA 1078 Jan22/68. Total flying experience 3829:35 hrs.

35. Completed conversion course to Bell 206 helicopters - licence endorsed Feb7/68.

36. No further record of any infractions, violations, accidents or incidents on file.

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NAVIGATION AIDS

SPECIFY AIDS AVAILABLE ON THIS FLIGHT

L.F.Range
ADF

SPECIFY AIDS FITTED TO AIRCRAFT

VHF Radio

AIDS USED AND THEIR EFFECTIVENESS

VHF radio used by pilot to pass position report by Ladner.

MAPS, RADIO FACILITY CHARTS, ETC., ON BOARD AIRCRAFT

Suitable maps for the area were on board the helicopter.

AIR TRAFFIC CONTROL AND COMMUNICATIONS

DATA ON COMMUNICATIONS AND THEIR FUNCTIONING. (EXTRACTS FROM RADIO LOGS OR RECORDINGS AS APPROPRIATE.)

Not pertinent.

TYPE OF FLIGHT CONTROL
NONE [X] CONTROL TOWER [ ] TERMINAL CONTROL [ ] CENTRE CONTROL [ ] COMPANY ONLY [ ]

TYPE OF CLEARANCE
NONE [X] VFR [ ] IFR [ ] SPECIAL VFR [ ] DVFR [ ] CONTROLLED VFR [ ] OTHER [ ]

AIR TRAFFIC CONTROL INSTRUCTIONS ISSUED AND RECEIVED

Not pertinent.

AIR TRAFFIC CONTROL CLEARANCES ISSUED AND ACCEPTED

None.

WAS FLIGHT PLAN OR FLIGHT NOTIFICATION FILED? IF YES, INDICATE HOW FILED, WHERE AND DETAILS PROVIDED.

No - Company aware of flight and destination.

FIRE FIGHTING EQUIPMENT

AIRCRAFT — WAS THERE ANY FIRE?
YES [X] NO [ ] IN AIR [ ] ON GROUND [ ]

IF YES, THE FOLLOWING INFORMATION IS TO BE PROVIDED.
WHAT CAUSED THE FIRE?

Possible heat from engine or electrical sparks ignited fuel from ruptured fuel cell on impact.

WHAT TYPE OF EXTINGUISHING SYSTEM WAS INSTALLED IN THE AIRCRAFT?

Hand portable.

SPECIFY TYPE OF EXTINGUISHING AGENT.

Dry chemical.

PORTABLE [X] ONE SHOT [ ] TWO SHOT [ ] THREE SHOT [ ]

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FIRE FIGHTING EQUIPMENT (Continued)

WAS THE FIRE EXTINGUISHING SYSTEM USED? IF SO, GIVE DETAILS.

No.

GROUND – FIRE FIGHTING OR CRASH EQUIPMENT USED AND ITS EFFECTIVENESS.

None used or available

HOW LONG DID IT TAKE RESCUE, FIRE AND MEDICAL SERVICES TO REACH THE SCENE? STATE ANY FACTORS INVOLVED WITH COMMENT ON TIME INTERVAL.

RCMP on the scene within 15 minutes.

WATER OPERATIONS

FOR ACCIDENTS ON WATER INVOLVING AIRCRAFT WHICH ARE REQUIRED BY LAW TO CARRY LIFE JACKETS AND/OR RAFTS, PROVIDE INFORMATION ON THEIR USE AND EFFECTIVENESS.

Not applicable.

ACCIDENT AREA

DETAILS OF THE ACCIDENT AREA AND ITS LOCATION ARE TO BE GIVEN, A SKETCH SHOULD BE INCLUDED AS APPENDIX 4. WHEN THE ACCIDENT OCCURS ON AN AERODROME, LICENCED OR UNLICENCED, GIVE DESCRIPTION OF INSTALLATIONS, LENGTH OF RUNWAYS USED AND CONDITION. COMPLETE INFORMATION OF ANY AREA USED FOR TAKE-OFF OR LANDING MUST BE PROVIDED.

The accident occurred at an elevation of 260' ASL on the top of a ridge in an area known locally as Jackman Hill, approximately 3 miles south of the Fraser River and 5 miles north of the townsite of Aldergrove, B.C. The ridge is completely covered by trees and brush, with the trees averaging 80 to 100 ft in height.

Approximately 600 yds north of the accident site the contour of the land drops sharply to join the Fraser River lowlands at an elevation of 60 to 70 ft ASL.

A map and sketch of the area is attached as Appendix 4 (A) and 4 (B) respectively.

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PART 3 EXAMINATION OF EVIDENCE

RECONSTRUCTION OF FLIGHT AND SUMMARY OF EVENTS (INCLUDE TIME, DATE AND PLACE OF TAKE-OFF AND PROPOSED DESTINATION(S).

The pilot, alone on board Hiller FH 1100 CF-WMO, departed Vancouver Airport at approximately 11:45 PST, on March 14, 1968, to proceed to Ruby Creek, B.C. The aircraft was required in this area to replace another helicopter which was involved in an accident earlier on the same day.

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After take-off, the pilot passed a position report that he was by Ladner and indicated that he would call and report by Langley. There were no apparent indications of any malfunctions or irregularities at this time.

Further along the flight path the aircraft was observed by a [redacted] who is also an FH 1100 pilot, to be flying in a west to east direction at an approximate elevation of 500 ft. He states that the helicopter was moving at a fairly fast cruising speed in view of an apparent 10 - 20 MPH southeast wind, and that the helicopter was encountering turbulence as the blades would make the occasional slapping sound.

Shortly thereafter the helicopter was observed, by a number of witnesses, to apparently disintegrate and fall towards the ground in a steep nose down attitude into the trees on Jackman Hill.

The aircraft exploded on impact and was destroyed. The pilot was killed.

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DISCUSSION OF EVIDENCE

The helicopter had reported leaving Vancouver Airport at about 11:45 PST on March 14,1968. The accident occurred at about 11:58 PST or a few minutes earlier as indicated by the time at which the RCMPolice Detachment were notified. The distance, Vancouver to accident site, on a straight track of 095°T is about 32 miles. The wind estimated 193°T at 20 MPH. Using the elapsed time of 13 minutes, the straight track distance 32 miles and the wind of 193° at 20 MPH, calculations showed a ground speed of 148 MPH and an airspeed of 147 MPH. The FAA tupe specifications H2WE for FH-1100 shows a V n e of 127 MPH on skid gear.

As the above calculations cannot be accepted as being too accurate, it can only be assumed that the helicopter was being operated at or near its V n e (maximum speed) during the flight between Vancouver Airport and the accident site.

General weather information indicates that moderate turbulence could be expected in the vicinity of heavy cumulus clouds. An instructor from the Fort Langley Seaplane School located about 3½ miles NW of the accident site, stated that he had carried out a check flight at about 10:00 PST and had experienced moderate to extreme turbulence in the Fort Langley area. He had then cancelled all float flying. Flying recommenced at the floatplane base at 16:00 and that light to moderate turbulence was encounted in the circuit area. This instructor has also instructed on sailplanes in this area and he further states that "This particular area, where the crash occurred, can be depended upon to produce turbulence at any time of the daylight hours, which is capitalized on by glider or sailplane pilots during the soaring season.

Other persons in a light aircraft arrived over the accident site about 10 to 15 minutes after the accident occurred. They indicate that turbulence in the area was moderate to occasionally heavy.

Attempts carried out by the National Research Council Laboratory, to duplicate conditions at the scene, by using a scale model of the accident area in a water tunnel, has proved inconclusive.

Several witnesses located near the accident site saw and heard the helicopter. The majority indicate the direction of flight as being from west to east. Two witnesses appear to have the directions reversed.

Estimates of the height at which the helicopter was seen above the trees varies from 75 to 200'. The helicopter was seen flying straight and level and suddenly a large object flew off the top and the helicopter started to fall in a sharp nose down angle toward the trees. One witness heard a rolling hammering noise, which he states he had heard before when helicopters make a turn, followed by a sharp metallic crack. Others heard a loud sharp crack, others a bang, preceding the descent of the helicopter. The majority of witnesses describe the helicopter as going almost straight down in a sharp nose down angle. One witness stated that he saw the helicopter tumbling end over end toward the ground. One other witness states that the helicopter seemed to be going west toward Vancouver, it was flying straight and level when there was a loud sharp crack and a long object flew off the top. The helicopter made a sharp right turn toward the north, tilted over on its side and headed down, nose first, at about an 80° angle. This statement, if the direction of flight was reversed, would be fairly consistent with what might be expected to happen following loss of the main rotor.

Examination of the helicopter parts not consumed by fire including engine and controls, determined that there was no evidence of failure or malfunction prior to the loss of the main rotor.

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SUMMATION

While in level cruise flight the helicopters main rotor mast failed due to an overstress condition caused by severe flapping. The aircraft pitched forward and struck the ground in a near vertical, nose down, attitude.

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rotor. The engine was developing power when the main rotor shaft failed, and was still running at impact. Metallurgical examination of the failed main rotor shaft indicates that there were no material defects. The shaft had been subjected to a bending overload coupled with a torsional load.

Examination of the main rotor showed the blue blade to be undamaged except for a negative coning toward the tip. Part of this bending may have occurred at impact with the ground. The tip of the blade was resting on a moss and grass covered root area at the base of a small tree. The hub and remainder of the blade was in a soft mud and water covered area with the hub buried about level with the surface. The yellow blade was twisted and torn with evidence of several strikes on the leading edge and both surfaces. This blade was examined using chemical composition analysis of particles to determine which blade areas had struck specific components of the helicopter, also to determine if the rotor may have struck a bird or other foreign object. No evidence indicating a bird strike was found and foreign object strikes are considered improbable. Three strike areas were identified; one, at Area "B" on the blade contacting the battery quick disconnect; second, at Area "D" on the blade contacting the single-side-band radio grill cover; third, at the blade tip lower surface had contacted the right hand rudder pedal horizontal foot rest.

The battery and connector, and radio grill, had been struck in a downward direction. The rudder pedal appeared to have been struck with the blade descending in a flat angle onto the pedal.

A further blade strike was evident on the left rear undercarriage strut with the strike being from below and behind the strut in an outward direction. The location on the blade causing this strike, could not be identified. Examination of the rotor hub, shaft, and incidence control rods showed that the shaft had been struck several times by the teeter stops; the shaft failed allowing the hub and rotor to slow down in relation to the lower shaft and swashplate thereby wrapping the incidence control rods around the shaft and marking it before both rods also failed. A mark on the lower surface of the yellow blade teeter stop indicates that following the shaft failure the hub may have lifted up changed the incidence to the blades through the still connected incidence rods causing the hub to descend striking the fractured end of the shaft against the teeter stop. A subsequent check of the hub teeter stops showed that the rotor flapping angle travel was below the minimum travel as specified by the manufacturer.

Ballistic examination of several areas of recovered perspex were negative, also nitrate tests. Analysis of a suspected blood spot on a piece of perspex confirmed it to be human blood.

Examination and tests showed no evidence of control or hydraulic system failure or malfunction. Tail rotor strikes and blade failure were caused by excessive flapping and bending of the blades following the main rotor shaft failure. A trajectory analysis conducted by Headquarters Engineering Laboratory, established the helicopter to be about 475' above ground when the shaft failure occurred.

Information obtained from a pilot in the Pacific Region, indicates that when he was operating at about 120 MPH he lowered the collective control quite rapidly to go into autorotation in order to make a fast letdown into a mountain valley. The helicopter immediately pitched nose down about 20-30° with a rapid buildup of speed. Recovery was affected by keeping the cyclic pitch in its original position and increasing collective pitch.

Data from flight performance analysis test conducted by the manufacturer on this type of helicopter is not available for use in determining the cause of the accident. However, hearsay information obtained from other sources indicates that this type of helicopter will pitch nose down excessively, following a rapid movement of the collective control toward low pitch, when the helicopter is being operated at high speed, causing the main rotor to flap close to its maximum limits. Also, that operation of the helicopter with a light load and aft C of G position will create the most adverse flapping conditions. It was also felt that the extended horizontal stabilizer adds to the instability in the above conditions.

CONCLUSIONS

1. The pilot had a valid Airline Transport Licence and had acquired a total of 4293:00 hrs of which 1745:00 hrs had been on rotary wing aircraft. He had flown 110:00 hrs on the type, of which 52:00 hrs had been in the past 90 days. He had flown a total of 150:00 hrs in the past 90 days and is considered competent to have conducted the flight.

2. The physical evidence and tests carried out showed no evidence of failure or malfunction of the helicopter prior to the teeter stops striking the main rotor shaft. Examination of the teeter stops and rotor flapping angle travel indicate that the travel was restricted to less than the minimums allowable as specified by the manufacturer.

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3. Moderate to severe turbulence was present in the area, as experienced by other aircraft prior to and immediately following the accident.

4. The helicopter has been found to be unstable during rapid collective control movements at high cruise speeds.

5. Examination of other FH-1100 helicopters by Okanagan Helicopters Ltd., indicates that the manufacturer has not ensured that the specified teeter stop angular dimensions have been within tolerances. Also, that the specifications were not made available to the operators prior to the accident.

6. Information on the accident flight indicates that the helicopter was being operated at close to maximum cruise speed, lightly loaded, and with an aft C of G position.

In summation it is concluded that the helicopter was being operated at close to maximum cruise speed, lightly loaded with an aft positioned C of G, in moderate to severe turbulence, and that the main rotor flapping travel was below the manufacturers specified limits. The pilot in encountering severe turbulence would have attempted to reduce his forward speed by lowering the collective control reducing power and pitch. The severity of the turbulence would govern the speed of his reactions and may have caused involuntary movement of the control at the same time. The helicopter would pitch nose down, and being close to the terrain, the pilot would spontaneously apply aft cyclic control to correct his attitude. These rapid movements combined with turbulence and below minimum flapping angle travel caused the teeter stop to strike and fracture the mast. One other probability which cannot be ruled out is that the helicopter encountered severe turbulence at high cruise speed causing the main rotor to flap beyond the available limits and fracture the mast.

SEQUENCE OF BREAKUP

Physical evidence of marks on the main rotor hub, teeter stops, mast and incidence rods, indicate that the main rotor mast failed due to excessive flapping. Following the mast failure the main rotor yellow blade struck the forward fuselage about 8" to the right of the centre line in a downward direction into the battery, radio and instrument console area. The direction and location of strike marks indicate only one blade strike in the forward fuselage and that the mast was fractured prior to the strike. A further blade strike was evident on the left hand rear undercarriage strut which had occurred from being struck from below the helicopter. Tail rotor strikes on the rear pylon indicate excessive flapping of the tail rotor blades caused by a swinging of the fuselage body following loss of the main rotor. Successive fuselage breakup occurred following the rotor strikes as the fuselage fell towards the ground. The fuselage struck the ground in a near vertical nosedown attitude and burned.

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[redacted]

Hiller FH 1100
CF-WMO 5002-3796

PART 4 CONCLUSION

PROBABLE CAUSE(S)

PRIMARY

6.4.4. Helicopter main rotor mast failure.

6.8.9. Turbulence in flight.

~~SECONDARY~~ 6.10.4 Manufacturer: Inadequate inspection following assembly, or instructions to operators of design specifications.

RECOMMENDATIONS

It is recommended that Headquarters conduct an investigation in conjunction with Department of Justice, to establish a procedure of obtaining all information on specifications, tests, etc., from manufacturers, and/or other establishments, pertinent to the investigation of aircraft accidents. That this information, if proprietary, could be used in the investigation if necessary to determine the probable cause of the accident. If used, Headquarters may then request that the accident report, or portions thereof, be privileged.

This is a very good point. Action will be taken to attempt to resolve this problem, which is a continuing one. [illegible] 11-7-71.

NOTIFICATION

DATE	TIME	METHOD OF NOTIFICATION
March 14, 1969	13:30 PST	Vancouver RCC - by phone.

24 June 1969
DATE

[signature]
INVESTIGATOR

June 25, 1969
DATE

D. M. Young
INVESTIGATOR

DATE

INVESTIGATOR

Reviewed and Recommended for Approval:

25 June 69
DATE

C. Leyland
REGIONAL SUPERINTENDENT ACCIDENT INVESTIGATION

Approved:

July 11/69
DATE

[signature]
REGIONAL CONTROLLER CIVIL AVIATION

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APPENDIX I

RELATED FACTORS

0	SEAT BELT FAILED		0	EXCEED MAX. PERM. X-WIND COMP.	
1	SEAT BELT NOT USED		1	EXCEED MAXIMUM GROSS	
3	SHOULDER HARNESS USED		3	EXCEED T.O. GROSS	
5	SHOULDER HARNESS INSTALL. - NOT USED		5	EXCEED LANDING GROSS	
7	SEAT BELT SIGN ON		7	IMPROPER C.G.	
9	SEAT BELT SIGN OFF		9	ACCIDENT IN WATER	
0	OXYGEN USED		0	FIRE AFTER IMPACT	X
1	OXYGEN NOT USED		1	FIRE CRASH CREWS	
3	SUN GLARE		3	DITCHING	
5	SMOKE IN COCKPIT		5	AIRPORT/AERODROME HAZARD	
7	FOGGING WINDSHIELD		7	RADIO MAINTENANCE	
9	RESTRICT, WINDSHIELD		9	ICE-FROST ON ACFT SURFACES	
0	S.W.I. INSTALL - OPER		0	NUMBER OCCUPANTS EVACUATED (Deceased)	1
1	FLIGHT RECORDER		1	FAILURE SEAT-TIE DOWN	
3	AUTO-PILOT		3	COCKPIT DESIGN	
5	GUST LOCKS		5	COCKPIT LIGHTING	
7	CROSSWIND GEAR		7	VIOLATION	
9	ANTI-COLLISION LIGHT		9		
0	PILOT WAIVER		0	AUTOPSY (YES)	X
1	PILOT FATIGUE		1	AUTOPSY REQUESTED (YES)	X
3	PILOT PHYSICAL HANDICAP		3	AIRBORNE RADAR (WX) (YES)	
5	CREW TRAIN, DEFICIENCY		5	HIGH INTENSITY LIGHTING (YES)	
7	LACK CREW CO-ORDINATION		7	STOLEN AIRCRAFT	
9	JET INTAKE DANGER		9	INTOXICATION	
0	FUEL EXHAUSTION		0	SEARCH - RESCUE	
1	FUEL INADEQUATE		1	SUICIDE	
3	DUMPED FUEL		3	GLASSY WATER	
5	FUEL NOT DUMPED		5	WHITE OUT	
7	CARBURETTOR ICE		7		
9	JETTISON CARGO		9		
0	UNWANTED PROP REV.				
1	UNWANTED PROP. FEATHER				
3	OVERSPEED				
5	UNABLE TO FEATHER				
7	UNABLE TO CONTROL PROP.				
9	EVASIVE ACTION				

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APPENDIX 2

VILOATIONS, DEFICIENCIES, IRREGULARITIES

None

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APPENDIX 3

INVESTIGATION COST AND TIME DETAILS

1. DATE AND TIME OF ARRIVAL OF INVESTIGATORS AT THE ACCIDENT SCENE.

March 14, 1968 - 14:30 hours.

2. METHOD OF TRANSPORTATION.

D.O.T. Vehicle #52-8021

D.O.T. Aircraft CF-DTI

3. TOTAL CAR MILES D.O.T. CAR.

685 miles

4. D.O.T. AIRCRAFT TYPE AND TOTAL HOURS.

DeHavilland DHC2 - 6 hours

5. TOTAL MAN-HOURS.

210 hours

6. TOTAL EXPENDITURE.

$164.00

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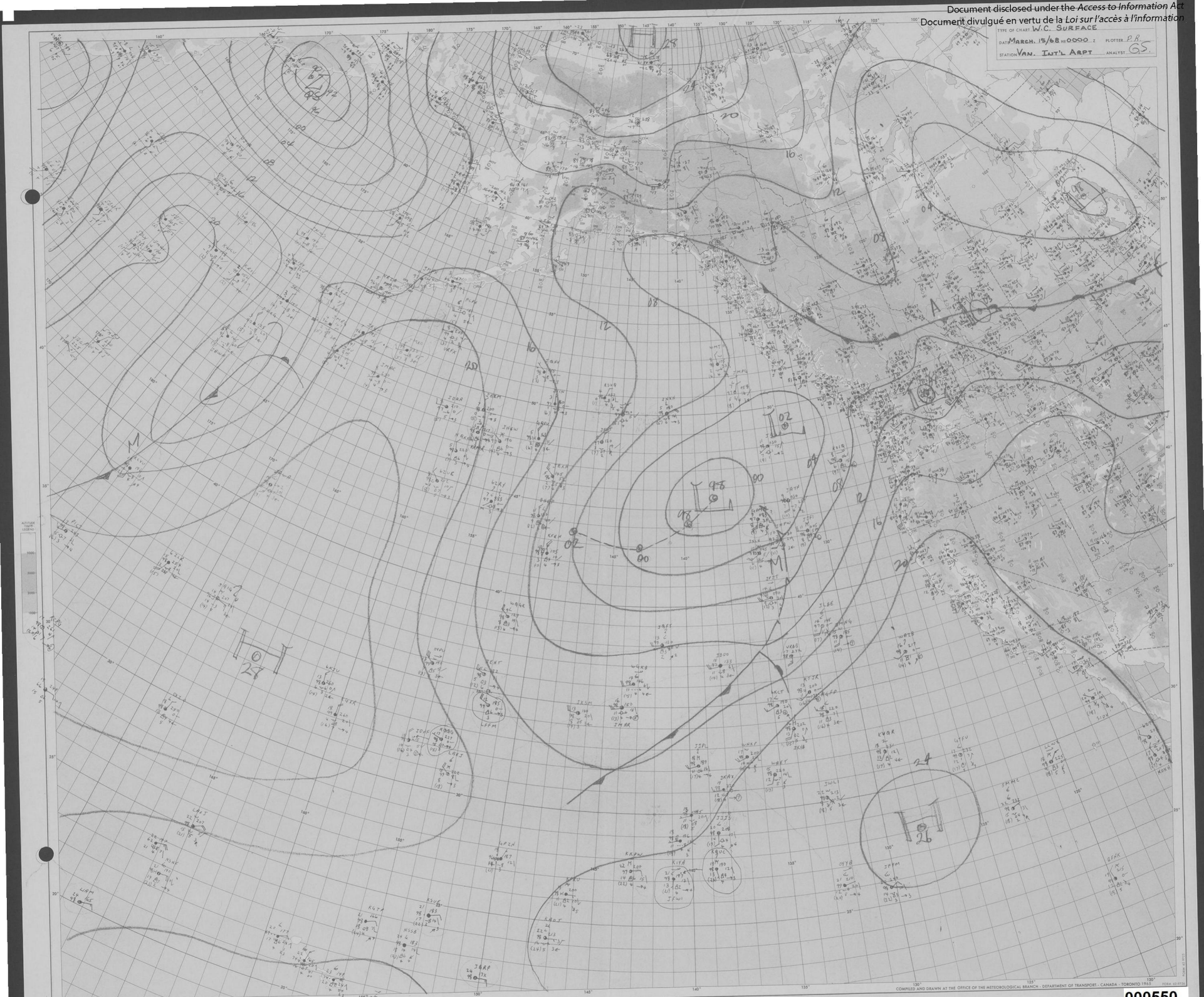
TYPE OF CHART W.C. SURFACE
DATE MARCH. 15/68 H 0000 Z PLOTTER PR
STATION VAN. INT'L ARPT ANALYST GS



POLAR STEREOGRAPHIC PROJECTION SCALE 1:10,000,000 TRUE AT 60° N

COMPILED AND DRAWN AT THE OFFICE OF THE METEOROLOGICAL BRANCH - DEPARTMENT OF TRANSPORT - CANADA - TORONTO 1965

000550

Document disclosed under the A
Document divulgué en vertu de la *Loi sur l'acc* *nforma*

appendix 4(B)

Document divulgué en vertu de la *Loi sur l'accès à l'informati*

DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

IF UNDELIVERED RETURN TO POINT OF MAILING
EN CAS DE NON-LIVRAISON RENVOYER À L'EXPÉDITEUR

OFFICE AT 739 West Hastings St.
BUREAU DE Vancouver 1, B.C.

02-0038

ON HER MAJESTY'S SERVICE
SERVICE DE SA MAJESTÉ

CANADA
POSTAGE PAID
PORT PAYÉ

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

TYPE OF CHART W.C. SURFACE
DATE MARCH 14/68 1800 Z PLOTTER JMR
STATION VAN. INT'L AIRPORT ANALYST GS

COMPILED AND DRAWN AT THE OFFICE OF THE METEOROLOGICAL BRANCH - DEPARTMENT OF TRANSPORT - CANADA -

POLAR STEREOGRAPHIC PROJECTION SCALE 1:10,000,000 TRUE AT 60° N

000553

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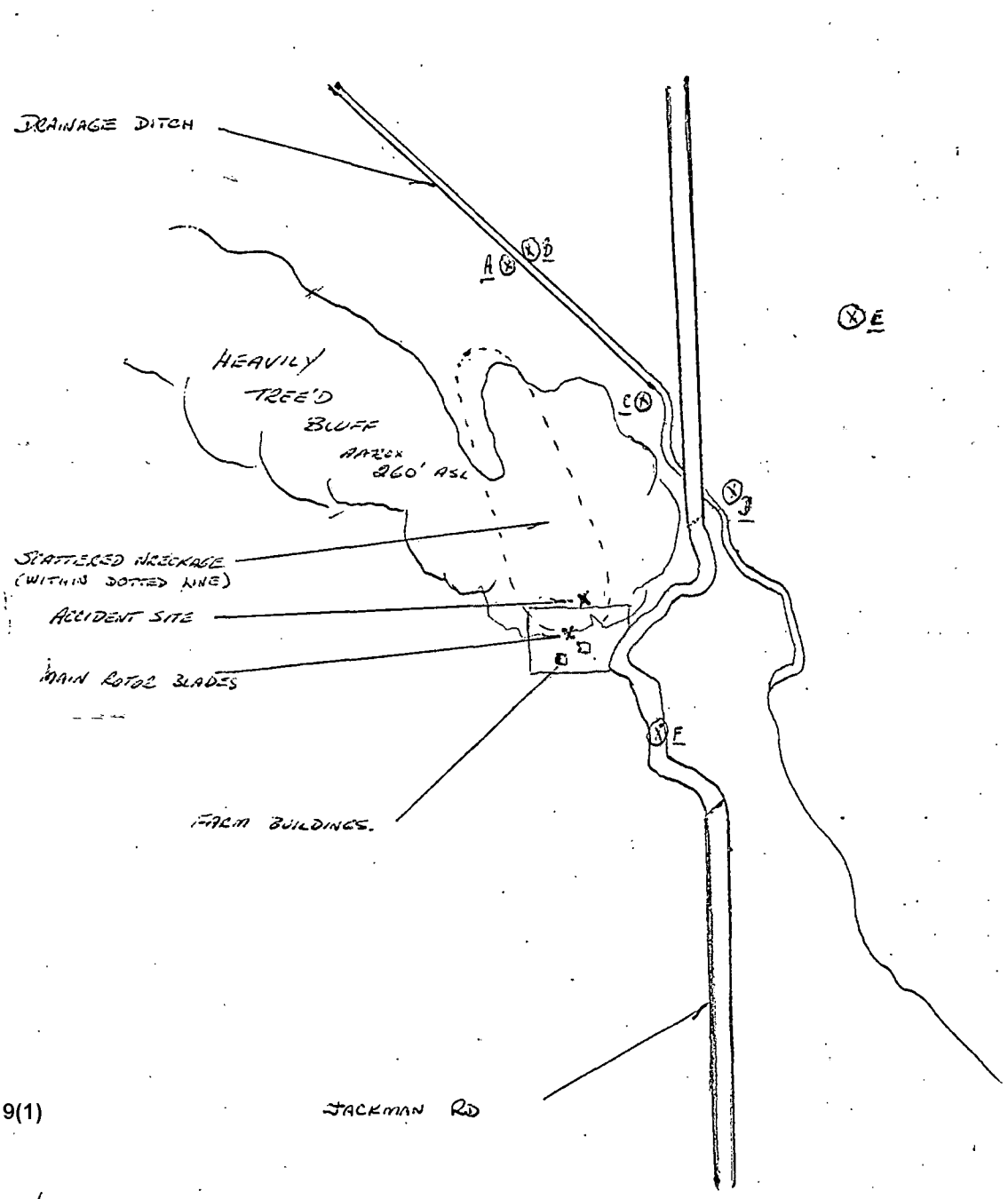
APPENDIX 4 (C)



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LEGEND.

⊗ = LOCATION OF WITNESSES

A = [redacted]
B =
C =
D =
E =
F =

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APPENDIX 5



1. View of main wreckage area indicated by arrow.



2. View of general area looking southeast. Main wreckage area is located just off left side of photograph.



3. View of main rotor as found about 420 feet south of main wreckage.

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4. View of main rotor blue blade showing downward bending toward tip.



5. Further view of blue blade.



6. View of main rotor head as found.

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7. View of main rotor yellow blade.



8. Further view of yellow blade as found in trees.



9. Further view of yellow blade showing gouged areas.

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10. View of yellow blade damage.



11. View of rotor head teeter stops and fractured mast.



12. Further view of mast showing flapping marks below fracture.

ARROW SHOWS MAIN ROTOR MAST MARK ON TEETER STOP.

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13. View of burnt out main wreckage looking northeast.



14. Further view of wreckage.



15. View of engine compartment area.

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16. View of wreckage looking southwest. Arrow indicates tail rotor gearbox.



17. Further view of main wreckage area.



18. View of tail boom.

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19. View of main transmission and controls.



20. View of rotor mast.



21. View of rotor mast fracture.

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22. View of rotor mast and twisting of the incidence pushrods around mast.
Arrow (1) indicates pushrod shown in photo 23.
Arrow (2) indicates pushrod shown in photo 25 and corresponding mark on photo 24.



23. View of incidence pushrod markings. Arrow indicates marks on rod and mast.



24. View of mast showing mark indicated by arrows caused by incidence pushrod shown in photo 25

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25. View of incidence pushrod showing mark indicated by arrows caused by rotor mast.
Pushrod partial fracture occurred after salvage.



26. View of upper end of incidence pushrod shown in photo 25.
Note flattening of tube at fracture.



27. View of lower end of incidence pushrod and damage to swashplate attachment.

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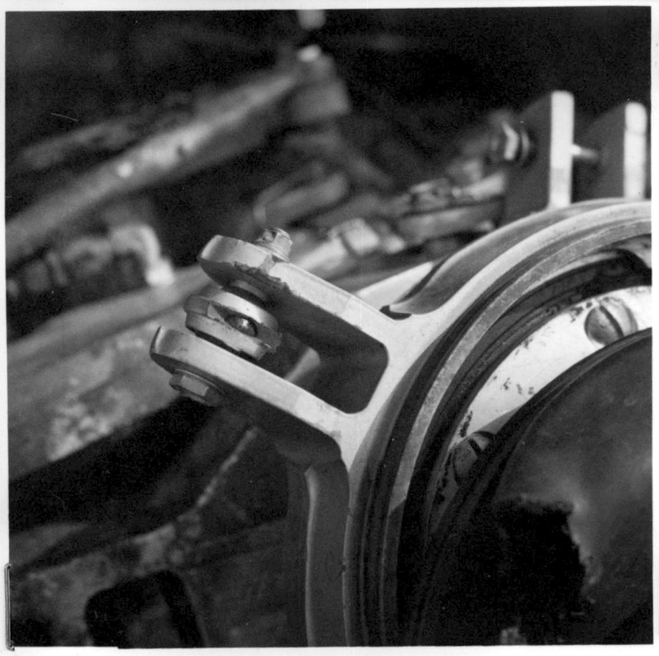

28. View of swashplate incidence pushrod attachment opposite to one in photo 27.



29. Further view of swashplate and pushrod.



30. View of upper end incidence pushrod attachment.

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31. View of main rotor blue blade drag link attachment bolt. Arrow indicates partial shearing of bolt.



32. View of fractured swashplate drive link.



33. Further view of swashplate drive link.

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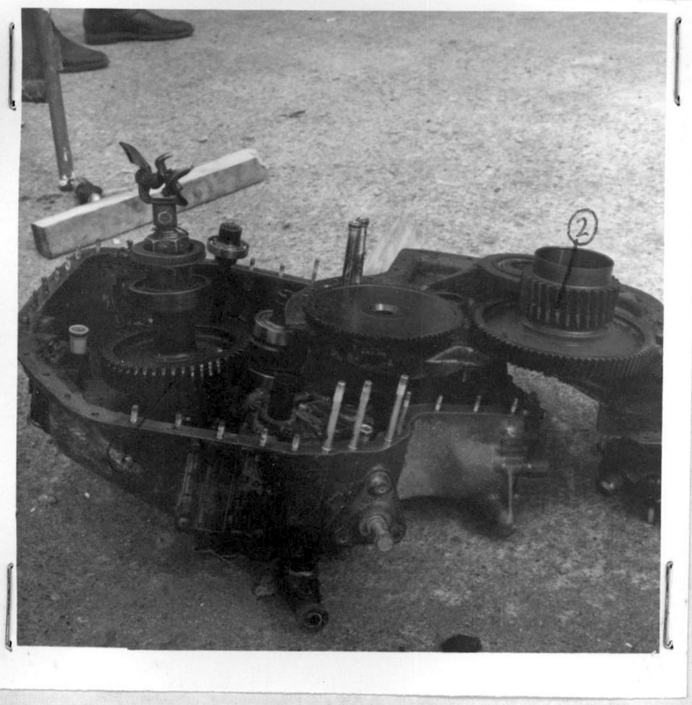

34. View of accessory drive gearbox.
Arrow (1) indicates damaged power output gear.
Arrow (2) indicates damaged torquemeter gear.



35. Further view of damaged power output gear teeth.



36. View of front diffuser case and vanes showing rub marks in inner ring caused by centrifugal impeller.

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37. View of battery imbedded in ground.



38. View of battery impact area showing approximate angle of penetration.



39. View of battery as removed, showing area of main rotor blade strike in front left corner.

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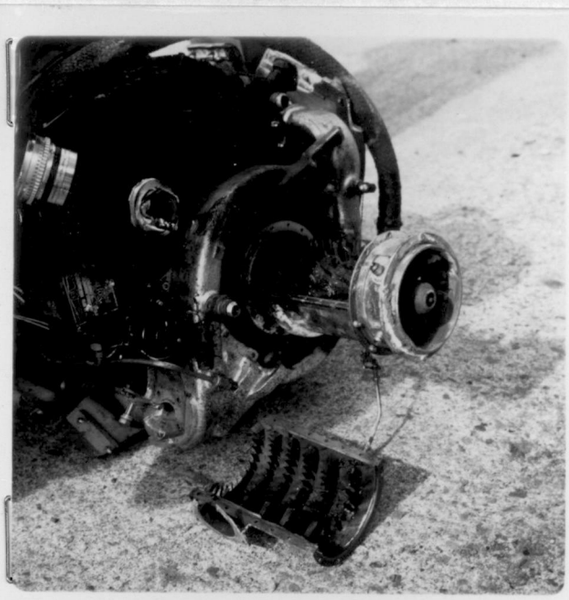
40. View of instrument panel.



41. View of engine compressor showing rotor blades and stators.



42. View of tail rotor gearbox and damage to pylon.

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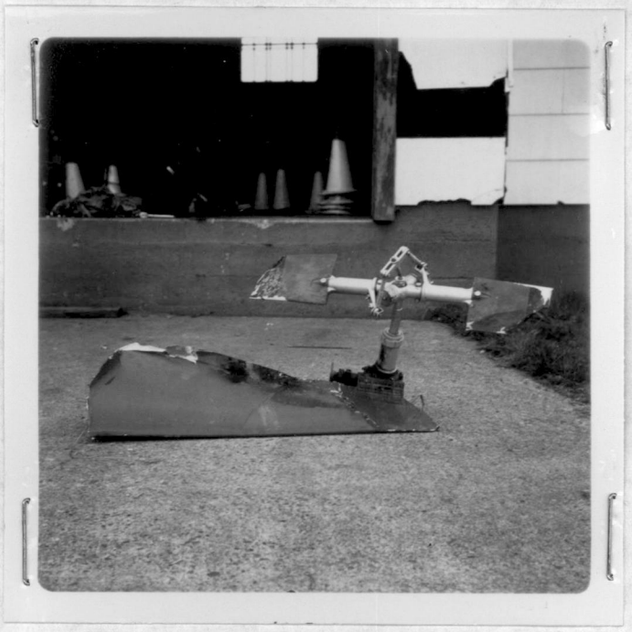
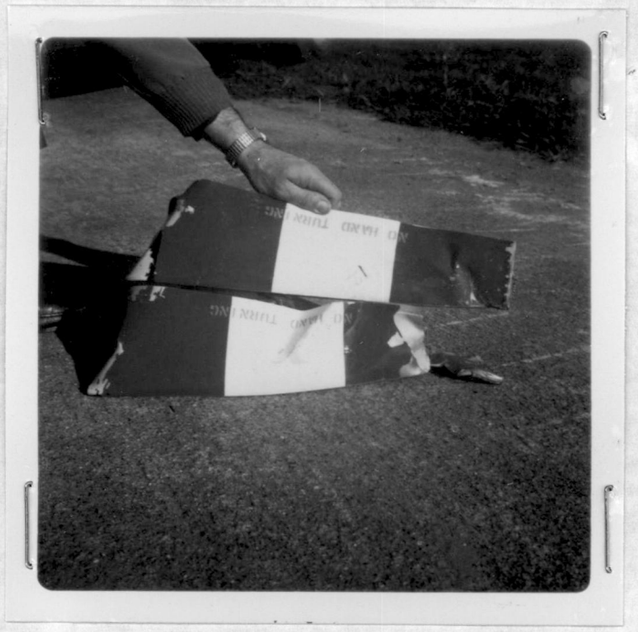


43. View of tail rotor, gearbox and severed pylon.



44. View of severed tail rotor blades.



45. View of rear tail rotor drive cover showing strike marks caused by tail rotor blades.

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46. View of tail boom, severed pylon and tail rotor driveshaft.



47. View of severed tail rotor driveshaft. Arrow indicates tail rotor blade strike.



48. View of pylon main support spar. Arrow indicates tail rotor blade strike.

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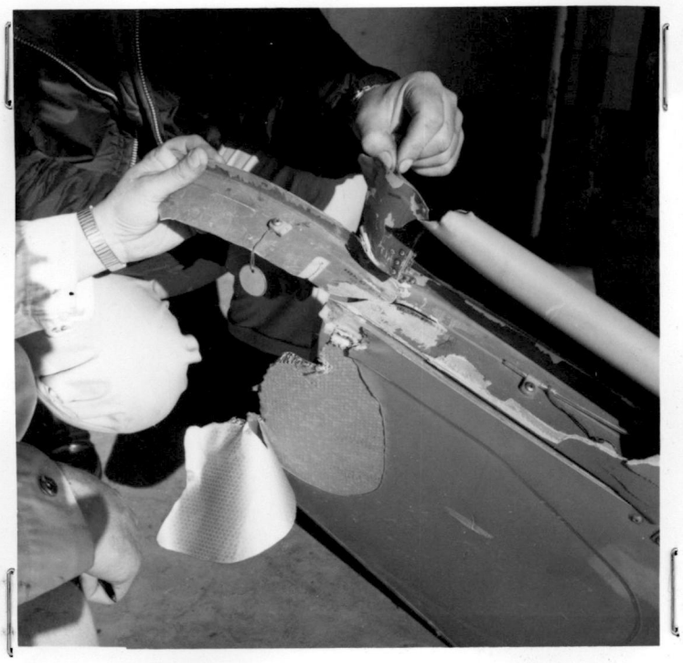

49. View of fractured pylon support spar and section of tail rotor blade tip which caused strike.



50. View of tail boom pylon and driveshaft cover.

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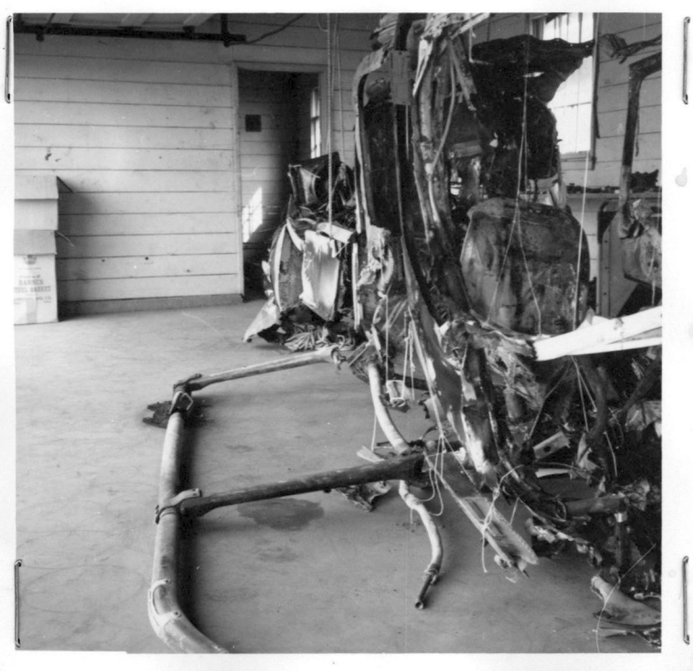

51. View of right undercarriage skid and side of helicopter at mockup.

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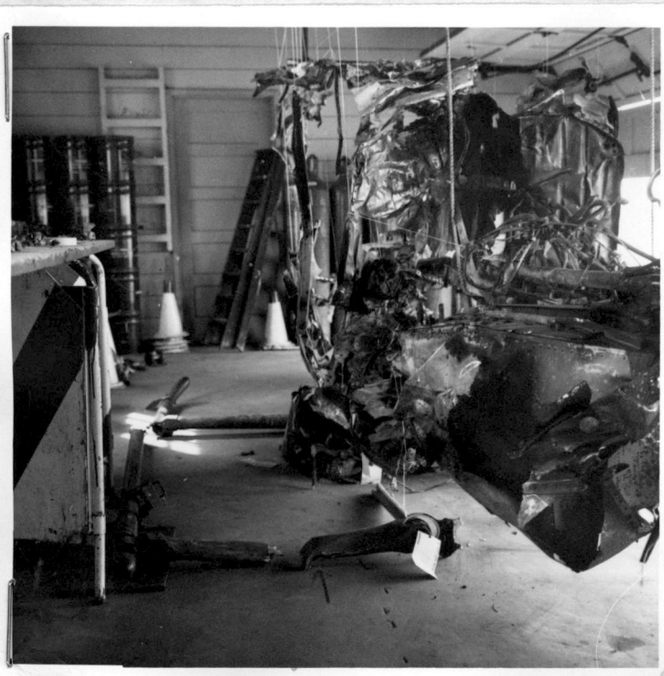
52. View of right side of cabin area.



53. View of lower fuselage and engine area right side.



54. View of left side looking forward. Arrow indicates left rear under-carriage strut fracture area caused by main rotor blade strike.

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55. View of left side of cabin area.



56. View of left undercarriage skid.



57. View of cabin area interior.

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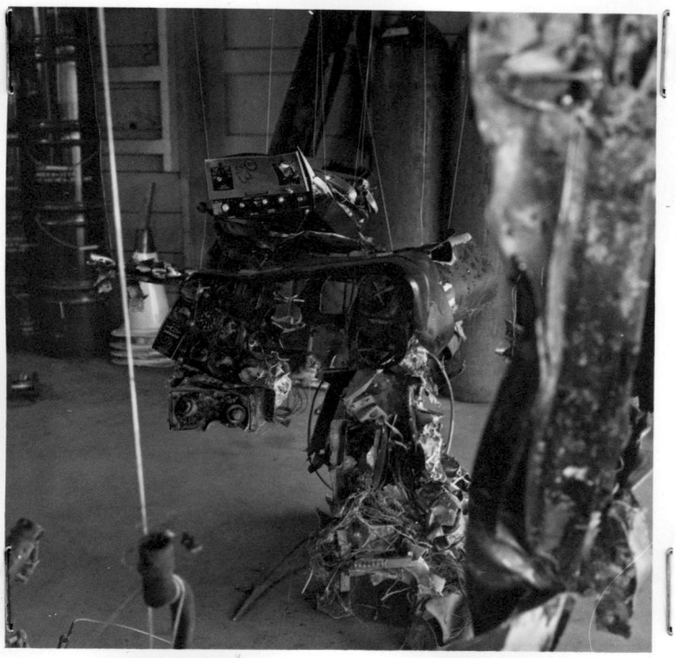

58. View of instrument console and radio equipment.



59. View of console, battery rack, and heater, left side.



60. View of console, battery rack, and heater right side.

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61. View of right front cabin area.

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APPENDIX 6 (A)

s.19(1)

STATEMENT of [redacted]

On March 14, 1968 at approximately 11:30 I was walking on Jackman Road towards the north and about 1/2 mile south of Dorflingers farm. I heard a helicopter coming over from the direction of Abbotsford. I looked up and saw the helicopter, he appeared to be about 200 feet above ground and flying in a straight line. I could hear the motor running. The helicopter was about even with Jackman road and north of me when I heard a bang and the helicopter started to fall. I did not see anything come off of the helicopter. The helicopter disappeared into the trees and there was a loud crash which shook the ground and then I saw smoke rising. During this time it was raining but visibility was good.

I did not see any birds around the area when I heard the bang nor did I see any smoke come from the helicopter following the bang in the air.

When I heard the bang the nose of the helicopter went down and it started to tumble end over end towards the ground.

[redacted]

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APPENDIX 6 (B)

s.19(1)

STATEMENT of [redacted]

On the 14th March 1968 at approximately 11:50 AM I was just going into the house for lunch when I heard what sounded like a helicopter approaching so I turned to look for it and as soon as it came out from behind a large tree I was in good view of it. It was heading in a southeasterly direction as though it was coming from Vancouver. It was level above the trees, above the bluff. Where I was situated the wind was fairly gusty and the engine noises faded in and out. As I was watching I saw something fly away from the top of the helicopter, this was fairly long and it flashed as though it was a piece of aluminum. Whatever this was it continued to fly in the air. The helicopter then came straight down, nose first, into the trees and it appeared to be in one piece as it entered the top of the trees. I then heard the thump as it crashed and saw a cloud of smoke come up.

The weather at the time was cloudy, there was no rain at that moment and the visibility was good. I could see that the color of the helicopter was sort of orange.

Before the piece flew off I would say I had the helicopter in site for only a second or two after it came out from behind this large tree in my yard.

I saw nothing else in the air at the time, in the form of other aircraft or birds.

[redacted]

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APPENDIX 6 (C)

s.19(1)

STATEMENT of [redacted]

On March 14, 1968 at about 11:45 PST I was outside in front of my house when I heard a helicopter and saw it opposite to my place on top of Jackman hill just north of Dorflinger's house. The helicopter seemed to be going west towards Vancouver at about 75 feet above the tree tops.

The helicopter was making a loud humming noise which they always seem to make as they go into a turn. The helicopter was flying straight and level. There was a loud sharp crack and some long object flew off the top of the helicopter. Then the helicopter made a sharp right turn toward the north tilted over on its side and headed down, nose first, at about an 80° angle. The tail assembly was still on as far as I could see. When the tail disappeared behind the trees there was a loud thump. I did not see any smoke rising from the area as it was hidden by the trees.

When the piece flew off of the helicopter I did not see any smoke nor did I see any other pieces fall from the helicopter and I did not hear any other noise except the humming noise described above.

The weather at the time was cloudy, overcast, and a steady light wind blowing toward the west where I was located. I do not think it was raining at the time.

I did not see anything else in the air close to the helicopter at the time.

[redacted]

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APPENDIX 6 (D)

s.19(1)

STATEMENT of [redacted]

At around noon on the 14th March 1968 I was situated in my barn with my tractor running when I heard a loud noise outside and I went out and looked up the hill toward the southwest in time to see the helicopter heading down into the trees at the top of the hill. It appeared falling toward the east at a very sharp angle. There were a number of light objects still in the air and appeared to be drifting in a northerly direction as they were falling. I heard a loud thud and an explosion as the aircraft hit the ground and then there was a large puff of smoke.

The weather at the time was cloudy and if it was raining it was not very hard. The wind was not very strong where I was situated.

I saw no other objects in the form of bird or aircraft in the air at the time.

When I first saw the helicopter I would estimate he was possibly about 100 ft above the top of the trees at the top of the bluff.

[redacted]

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s.19(1)

APPENDIX 6 (E)

STATEMENT o [redacted]

On March 14, 1968 at a little before 12:00 I was with another fellow, [redacted] sitting on the dike of the drainage ditch below the bluff and about 1/4 mile north of the accident area.

I heard a helicopter flying and the noise was a normal chopping sound that I have heard before. I was aware of this sound for maybe 30 seconds but I had not looked at the helicopter. I then heard a sputtering noise as if the motor was not right, this sound was louder than the chopping sound and I could not hear the chopping sound any longer. The spluttering lasted for only a moment and then it stopped also. I looked up and saw a helicopter above the trees on the bluff and to the south of me. The helicopter was horizontal when I first saw it and it immediately tilted front end down. At the same time as I first saw the helicopter tilt there was a lot of small pieces of debris floating or flying around the helicopter. I did not see any large objects falling but there were very small pieces in front of the helicopter and slightly larger objects around the rear both above and below it.

The nose of the helicopter tilted down and the helicopter fell in a very steep nose down angle to the ground. The helicopter went out of sight in the trees and I heard a thud immediately followed by another noise like lighting gas fumes. I did not see any smoke when the helicopter tilted, during the fall or when it disappeared.

The weather at the time was cloudy, no rain and no wind where I was located. There appeared to be a wind blowing up where the debris was as it was fluttering and drifting toward the northwest.

[redacted]

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

s.19(1)

APPENDIX 6 (F)

STATEMENT of [redacted]

On the 14th March 1968 shortly before noon I was sitting with my friend [redacted] on the south side of the drainage ditch approximately 1/4 mile north of the bluff where the accident occurred. While we were eating lunch I suddenly heard a helicopter in our general area making an unusual sound like a rolling hammering noise. I've heard this before when helicopters fly near and make a turn. Immediately after this sound I heard a sharp metalic crack. I looked around and saw a number of light objects floating around and then I noticed the helicopter angling in toward the tree tops in a west to east direction, there was no sounds of engines or anything at this time as it was falling. The next thing I heard was a helluva bang as it hit the ground. Approximately 2 seconds later there was an explosion and I saw a cloud of smoke rise up from the trees.

I did not see any other flying objects such as birds or other aircraft around the area at the time.

The weather where we were situated was cloudy with no rain or wind.

[redacted]

Document disclosed under the *Access to Information Act*
Document divulgué en vertu de la *Loi sur l'accès à l'information*

APPENDIX 6 (G)

s.19(1)

STATEMENT of [redacted]

I am employed by [redacted] as a flying instructor.

On the 14th March 1968 information was received that an aircraft accident had occurred near the Jackman hill and as I was already planning to proceed to Abbotsford I was requested to go to that area and investigate.

I left Langley in a PA-28 aircraft about noon with three other people on board and proceeded to the area. A wide circle was made of the area and a column of smoke was noticed in a bush area. Closer investigation showed that an aircraft was burning and there were people on the scene.

Weather conditions at take-off, the wind at Langley was SSE at approximately 15 + 25 and I would expect the wind at the scene to be at least that. Turbulence in the area was moderate to occasionally heavy with a broken cloud base 1500 to 2000 ft above ground. Some shower activity in evidence but none at the scene when I arrived.

I informed Abbotsford tower of the accident by radio and then proceeded to Abbotsford airport and landed.

Approximate flying time from take-off to sighting the wreckage would be ten or fifteen minutes.

[redacted]

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APPENDIX 6 (H)

s.19(1)

STATEMENT of [redacted]

At approximately 12:15 on the 14th March 1968 I took-off from Langley Airport in Cherokee aircraft CF- (?) . I was situated in the rear seat as a passenger. The purpose of the flight was to fly to Abbotsford airport, however, prior to take-off the pilot received a request to fly over the accident area for confirmation purposes.

At take-off the ceiling was approximately 12 to 15 hundred feet and the wind was in the area of 20 to 25 MPH from the southeast and it was quite gusty. The flight over to the area was moderately turbulent with the occasional severe gust which would lift us out of our seats. Over the area we were getting the same conditions. The wreckage was still aflame and smoking on our arrival over the area and it would appear that the ambulance had already arrived, the attendants were standing beside the wreckage with the stretcher.

[redacted]

Document disclosed under the *Access to Information Act*
Document divulgué en vertu de la *Loi sur l'accès à l'information*

s.19(1)

APPENDIX 6 (I)

STATEMENT of [redacted]

I am employed by [redacted] in the position of Flying Instructor at [redacted]. On March 14th, 1968 the writer was informed of a helicopter crash in the Fort Langley area at approximately 11:15 AM. Prior to receiving this call all float flying had been cancelled at 10:00 AM due to increasing turbulence. A turbulence check had been carried out by the writer and I would say the turbulence to range from moderate to extreme.

Looking to the east from the floatplane base I could see heavy rain over Ruskin Lake, which is opposite the crash area, which decreased to light shower activity on the south side of the river. It was also noted that the winds which I would judge to be blowing from a south, south-westerly direction, with an approximate wind speed of 15 to 25 MPH, which caused smoke from a small sawmill to be flat on the river.

The ceiling at that time would be 1500 - 2000'. This particular area, where the crash occurred, can be depended upon to produce turbulence at anytime of the daylight hours, which is capitalized on by glider or sailplane pilots during the soaring season. The writer uses the area over the river as a demonstration to all float pilots during their training to be aware of possible turbulence when flying to Harrison Lake.

Flying commenced again at the floatplane base at 1600 hrs and light to moderate turbulence was encountered in the circuit area.

[redacted]

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APPENDIX 6 (J)

s.19(1)

STATEMENT of [redacted]

At approximately 11:15 AM March 14, 1968 I heard an approaching helicopter. I stepped outside to see who it was and noted it was an FH1100 on a west to east course. The aircraft's track was between our house and 64th avenue (Bose Rd), and paralleling Bose Road at an approximate altitude of 500 feet.

The FH1100 was red and white in Okanagan Helicopter's paint scheme.

There was some turbulence apparently, as the blades would occasionally make slapping sounds.

The helicopter was moving at a fairly fast cruising speed as compared to the taylorcraft and Fleet Canucks seen doing training work in our area.

I fly the FH1100 and my speed observations are usually made from the aircraft, thus I would not attempt to estimate his speed as a ground observer. I did admire how quick it was moving particularly in view of an apparent 10 - 20 MPH southeast wind somewhat against his line of flight.

I walked back into the house and observed the FH1100 from our kitchen window until it was out of sight several miles to the east. There was no apparent deviation in its path during the time I watched it.

[redacted]

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APPENDIX 7

CREW LIST

PILOT

NAME: Par Frederick Raymond Fletcher.

ADDRESS: C/O Okanagan Helicopters Ltd.,
Vancouver International Airport, B.C.

INJURIES: Pathological Report - Appendix 15.

CORONER'S REPORT: Appendix 16.

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APPENDIX 9.

Document divulgué en vertu de la *Loi sur l'accès à l'information*

MEMORANDUM

CLASSIFICATION

TO
A R.D.A.S., Vancouver
Attention: Accident Investigation

YOUR FILE No.
Votre dossier

OUR FILE No. 5002-1 (MEV)
Notre dossier

AIR SERVICES REGISTRY
VANCOUVER
MAR 21 1968
File 5002-713

FROM
De O.I.C., Weather Office, Vancouver

DATE March 21,1968.

FOLD

SUBJECT
Sujet Accident -CF-WMO-March 14,1968.

1. Attached are copies of the forecast, actual weather and an aftercast of weather conditions about the time of the accident to CF-W.M.O. 02911

2. Pireps from aircraft in the vicinity at the time did not reveal anything since the aircraft were flying above the cloud tops at about 13000 feet.

D. Starkan
for Officer-in-Charge,
Weather Office, Vancouver.

Encls.

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MEMORANDUM

CLASSIFICATION

TO
A

R.D.A.S., Vancouver
Attention: Accident Investigation,
Mr. Young

YOUR FILE No.
Votre dossier

AIR SERVICES REGISTRY
JUL 1 1968
File 5002 - 715

OUR FILE No.
Notre dossier 5002-1 (MEV)

FROM
De

O.I.C., Weather Office, Vancouver

DATE

July 12, 1968.

FOLD

SUBJECT
Sujet

Aircraft Accident - CF-WMO.

33228

1. Enclosed as requested by phone are four copies of the surface chart for March 14th 1800Z and March 15th 0000Z, together with one copy of the 500mb chart for March 14th 1200Z and March 15th 0000Z.

D. Stanley

Officer-in-Charge,
for Weather Office, Vancouver.

Attachs.

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AFTERCAST

There were no fronts in the area, but a deep low pressure area, centred about 300 miles west of Vancouver Island, had produced a fairly brisk southwesterly flow of moist unstable air over southwestern B.C. This airstream given additional orographic lift over the coast mountains produced extensive cumulus and heavy cumulus with tops 12 to 14 thousand and occasional showers. With the freezing level near 3500 feet MSL snow would be likely down to 2000-2500 feet. There were no reports of turbulence or icing but there was to be at least moderate turbulence and icing in the heavier convective cloud.

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141900Z
VR 20⊖M26⊖40⊖90⊕20 082/47/42/1414/976/CF2SC5SC1AC2
XX S E20⊖40⊖20RW-- 088/47/39/1714/978/CU+3SC1 QAGOM RNWY 06
TIL 2000Z

142000Z
VR 17⊖M21⊖30⊖90⊕20 089/46/40/ 1613/978/ CF1SC2SC1AC1
XX 15⊖E20⊖40⊖15RW-- 095/46/37/1918/980/CF2CU+5SC3 40⊖ OCNLY
⊖ HI CLD ABV LW SF E QAGOM RNWY 06 TIL 2100Z

VR S 142040Z 17⊖20⊖M26⊖70⊕12RW- 1608 CF1CU4SC4AS1

XX S142040Z 15⊖E20⊖40⊖10RW- 1825 CF4CU+4SC2

142100Z
VR 16⊖26⊖M35⊖70⊕10RW- 096/46/41/1613/980/ CF1SC3SC5AS1 120
XX 15⊖E20⊖40⊖10RW- 102/45/40/1823/982/ CF3CU+4SC3 222

FA VR1 141730Z
18-06Z
HTS ASL UNLESS NOTED
PROG
DFUS ARCTIC FNT QSTNRY S CALGARY-NR KAMLOOPS-W SMITHERS AT 1800Z.
LOW 175 MI W TOFINO AT 1800Z MVG NEWD TO JUST W SPRING ISLAND BY
0600Z AND FILG. AMS MOIST UNSTBL BCMG STBL N ARCTIC FNT

VR-1
S COAST RGN
CLDS AND WX. 10⊖20 20-30⊖SCCU+60-120 90⊖120 OCNL 2-4RW-
WITH FEW CU+150 ALG CSTL MTNS. MTN PASSES FQTLY OBSCD 1/2-1SW-.
SFC WNDS 1325+ XPOSD AREAS

ICG. LGT RIME ICGIC XCP MDT CLR CU+. FRLVL 35

TURBC MDT NR CU+

FD VR1 141730Z
18-00Z

VR-1
S COAST RGN
6-1615/-5 10-1620/-12 14-1720/-21 18-1820/-31 22-1820/-41

FT2 VR1 141630Z
17-17Z

VR XX 20⊖C40⊖90⊕ OCNLY 15⊖C30⊕ RW- 0915. 0400Z C40⊖1000
END

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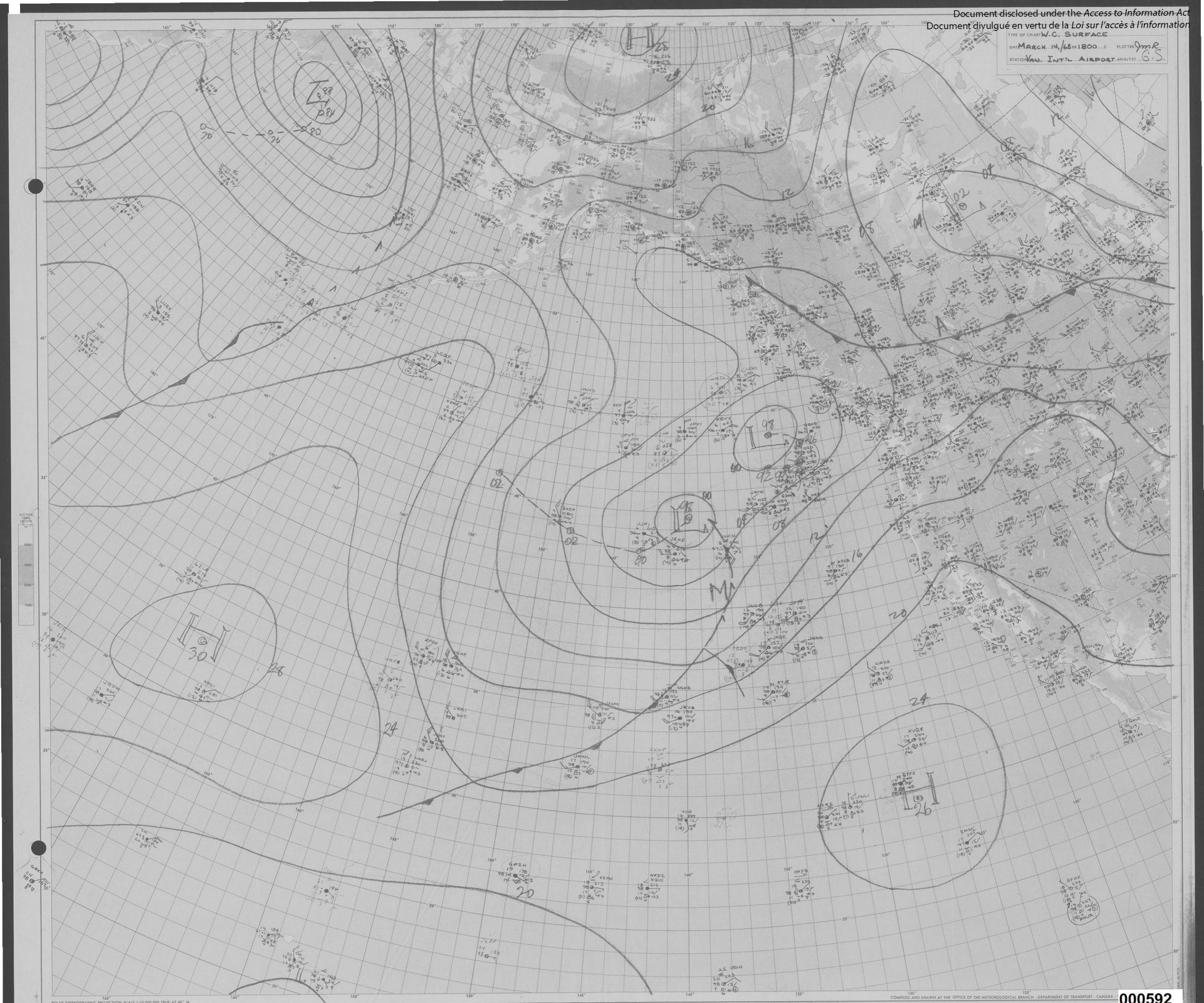
TYPE OF CHART W.C. SURFACE
DATE MARCH 14/68 HR 1800 Z PLOTTER JMR
STATION VAN. INT'L AIRPORT ANALYST B.S.



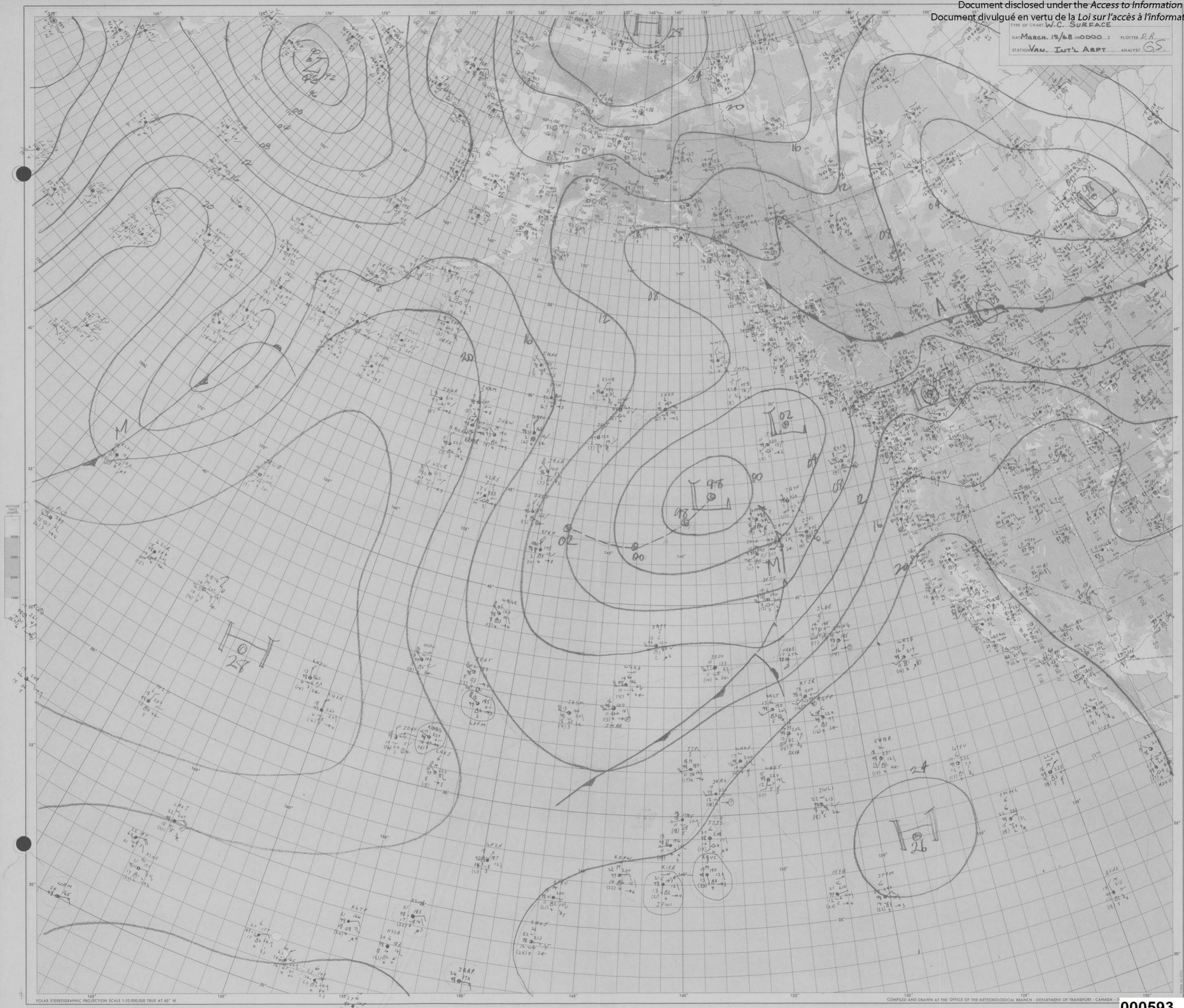
POLAR STEREOGRAPHIC PROJECTION SCALE 1:10,000,000 TRUE AT 60° N

COMPILED AND DRAWN AT THE OFFICE OF THE METEOROLOGICAL BRANCH - DEPARTMENT OF TRANSPORT - CANADA

000592

Document disclosed under the *Access to Information Act*
Document divulgué en vertu de la *Loi sur l'accès à l'information*

TYPE OF CHART W.C. SURFACE
DATE MARCH. 15/68 H0000 Z PLOTTER P.R.
STATION VAN. INT'L ARPT ANALYST GS



POLAR STEREOGRAPHIC PROJECTION SCALE 1:10,000,000 TRUE AT 60° N

COMPILED AND DRAWN AT THE OFFICE OF THE METEOROLOGICAL BRANCH - DEPARTMENT OF TRANSPORT - CANADA

000593

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APPENDIX 10

ENGINE EXAMINATION REPORT (Hiller FH-1100, CF-WMO) March 25, 1968

NOTE - All position references are viewed from the aft end of engine.

1.0 Introduction
Allison 250-C18 engine - Serial No. CAE 800374.

1.1 The helicopter crashed and was partly consumed by fire north and east of Langley, B.C. on March 14, 1968.

1.2 The engine appeared relatively intact and in the correct position in the structure when first examined at the accident site. Closer examination showed the following:

1.2.1 The engine mounting pads (side) were attached to the support structure, but the support structure was broken free of the airframe. The engine was held in position by the plumbing, wiring and controls only. The bottom mount pad was broken.

1.2.2. The aft end of the engine to transmission driveshaft was attached, but telescoped and had pushed the power take-off gearshaft aft, fracturing the accessory gearbox aft housing. The torquemeter, power take-off gearshaft and other gears were exposed. The oil cooler fan driveshaft was also still attached to the power take-off gearshaft.

1.2.3 Fire, which had consumed a good portion of the helicopter (forward of and below the firewall) had done some minor damage to the engine, particularly to the compression section. The plastic liner of this section was seen to be burned at the forward end.

1.2.4 The compression front support had received a blow and was pushed slightly in towards its centre at about the 5 o'clock position and the compressor rotor would not turn. That portion of the turbine section visible through the exhaust air outlet appeared to be undamaged although the left exhaust air outlet had been crushed.

1.2.5 The gas producer fuel control lever was positioned about 1/8" off the full power stop, but the control linkage had been pulled and bent.

1.2.6 The magnetic plugs checked clear on an ohmmeter check. The bottom plug was found to be dirty with non-magnetic particles.

1.3 The engine was removed from the wreckage and was transported to Vancouver on Monday, March 18, 1968.

2.0 Strip Examination
A strip examination was conducted by "Sparky" Penrose, Bob Hatch (Allison Representatives) and Jack Burgess of Standard Aero, and was witnessed by Bob Logan of D.O.T.

2.1 Compressor Section Serial No. CAC 20412

2.1.1 The front support had a strike at 9 o'clock on its front flange and the flange was bent aft to the 10 o'clock position. The aft flange also is bent to the rear at 10 o'clock. The inlet guide vane at the 8 o'clock position is bent, 3/16" from the inboard end at the trailing edge and 1/2" from the inboard end at the leading edge. The inlet guide vane at the 10 o'clock position is slightly bowed. Both vanes are bent in the same direction, i.e. counter clockwise.

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2.1.2 The right hand half of the compressor case has burning, blistering and distortion of the thermo-plastic lining. This is greatest at the first stage and becomes progressively less to the sixth stage where it is heat discolored from deep tan to brown, but not apparently distorted or blistered. A heavy blade rub and cut mark is apparent from 10 o'clock to 4:30 o'clock at the sixth stage. The five stators from 2 o'clock to 4 o'clock in the first stage have contact marks and slight rotational bends on their leading edge ends. There is a heavy ash deposit on the first three stages and on two blades (at about 3:30 o'clock) of the fourth stage.

2.1.3 The left hand half of the compressor case has a bend on the forward flange which matches the aft flange bend on the front support. There is major blistering, distortion and burning of the thermo-plastic lining in the first four stages. This is most severe from 10 o'clock to 11 o'clock. There has been more than normal machining of the thermo-plastic (heaviest about 10 o'clock) on stages 2, 3, 4, 5 and 6. The sixth stage has very minor heat discoloration, but is machined quite deeply.

2.1.4 The compressor rotor assembly has fire product on the rotor blades - most pronounced on the first four stages. Number one bearing is good but was not removed since there appears to be crud interfering with release of the split ring. There is a slight clockwise bend (from case contact) on the forward 1/16" of the ends of all 16 first stage blades. There are slight nicks on the leading edges of at least six first stage blades.

2.1.5 The aft face of the impeller has continuous rub marks around a 1/8" width at the outer periphery. About one inch radially in towards the shaft, another circular rub mark extends completely around the inner periphery of the flat face. Heat discoloration from brown to blue is evident on these marks. The outer labrynth seal knife edges have cuts of metal swarf adhering to their forward edges. The inner labrynth seal knife edges have similar pieces of metal adhering to them.

2.1.6 There are external impact marks on the diffuser scroll with a nick in the aft outer case at about 12:30 o'clock. There is a gouge on the forward side of the outer case about 6 o'clock and an impact rub and dent on the center of the scroll about 6:30 o'clock.

2.1.7 The impeller has machined into the aft face of the front difusser, from about 2 o'clock to 9:30 o'clock, with deepest scoring between 4:30 and 7:30 o'clock.

2.1.8 There are rub marks from the impeller aft face on the front face of the rear diffuser. These marks are on the outer periphery of the plate from about 1:30 to 5 o'clock with a small region of heat discoloration from about 3:00 to 4:00 o'clock. Around the inboard periphery there are rub marks from about 1:00 to 4:30 o'clock. The entire inner mark is heat discolored blue. The forward corner of the labrynth seal is worn (over about half the width of the inner face) from about 3 o'clock to 7 o'clock. The oil seal breather tube (the outer portion) is bent aft through about 60° at the clip.

2.2 Accessory Gearbox Section. Serial No. CAG-20324.

2.2.1 The power take-off gearshaft was driven to the rear at impact, breaking three pieces out of the gearbox aft case and disrupting the gear train. The largest piece of broken case contained the gas producer idler gear-shaft and oil separator. The oil separator gear has seven nicked teeth on the large gear and the forward portion of its shaft is badly chewed and worn next to the gear. This piece also contains the starter generator gear shaft and the adjacent idler gear.

2.2.1.1 The second largest broken piece contains the idler gear adjacent to the last mentioned, the fuel pump gearshaft, the accessory drive gearshaft and the idler between the latter two gears. These last four gears appear to be in good condition.

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2.2.1.2 The smallest broken piece was from the aft power take-off gearshaft bearing support and did not contain any gears. The bearing itself had been broken away from the case.

2.2.2 The fuel control gearshaft (which also drives the N_1 tachometer generator) has 23 nicked and broken teeth. The N_1 tachometer generator was broken away from the forward case, 3/4" forward of its mount pad. The power turbine governor gearshaft (which also drives the N_2 tachometer generator) and the adjacent idler gear were undamaged.

2.2.3 The power take-off gearshaft had only one either unmarked or unbroken tooth. The other teeth were either chipped or broken on one or both ends. At one location three adjacent teeth had a concave wear pattern with evidence of overheat (bluing). The torque meter gear was lying against this position when found.

2.2.4 The output gearshaft bearing in the front case had eleven rollers missing and the inner race was still on the shaft. The bearing and adjacent case were impact marked and generally chewed up. The aft end of the gearbox to transmission drive shaft was accordioned and splayed onto the front of the output gearshaft. The bearing was on the aft end of the shaft and intact.

2.2.5 The torquemeter outer gear appeared to be in good condition, but its forward rim has rub marks all the way around. The aft portion of all teeth of the small gear were worn and broken off to a depth of about 1/16" and a width of about 1/2". The adjacent forward face of the large wheel has tooth scrape marks and metal smears all the way around. The output gearshaft was found with its teeth resting against this face.

2.2.6 When dismantling the oil pumps it was found that the bottom right attachment screw, although wire locked, was not right. The oil pumps, both scavange and pressure, had a few magnetic and non-magnetic metal particles in their chambers and on a few teeth. The upper gear of the pressure pump had machined a small amount of metal from the forward face of the aft cover plate. The major cutting extended from 12 o'clock to 6 o'clock, with some from 4 o'clock to 6 o'clock

2.2.7 Accessories and Miscellaneous

2.2.7.1 The bleed air control valve is open about 3/16" and covered by fire product.

2.2.7.2 The anti-icing valve is stuck in a nearly open position.

2.2.7.3 The ignition exciter is partly soot covered and the case is slightly fire damaged but appears to be in good condition and was not dismantled.

2.2.7.4 The oil filter is clean and wet with oil.

2.2.7.5 The power turbine governor is externally undamaged and was not dismantled.

2.2.7.6 The gas producer fuel control is externally undamaged and was not dismantled

2.2.7.7. The fuel pump and filter assembly is externally undamaged and the pump was not dismantled. The filter was checked and was clean with about one-half teaspoon of fuel in the chamber.

2.2.7.8 The burner drain valve was in good condition.

2.2.7.9 The spark igniter is internally soot covered, but appears to be in good condition.

2.2.7.10 The fuel nozzle appears to be in good condition.

2.2.7.11 Both ends of the fuel control accumulator are bent, but the double check valve appears to be in good condition.

2.2.7.12 The starter generator was removed and the shaft was found to be sheared.

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2.3 Turbine Section Serial No.

2.3.1 The forward (number 5) bearing in the exhaust collector support was partially seized, but there were no indications of bearing overheating and the partial seizure appeared to be caused by post accident dirt in the bearing. The dirt was typical of ground and fire product. The left exhaust outlet was crushed in and closed, while the right one was somewhat crushed downwards. The fore and aft top case section between the two exhaust outlets is broken off near the front end and the turbine assembly is bent slightly down from its normal configuration.

2.3.2 The right compressor discharge air tube has an impact dent 1 1/8" forward of the aft end and two compression (accordion type) buckles at the forward end, one 2 1/2" from the forward end (Mainly on the outboard side). The other is about 1/2" from the forward end and concentrated mainly on the inboard side. The left hand tube is crushed over most of its length with the forward end outboard and upward at an angle of about 45°.

2.3.3 On the power turbine rotor assembly, the inner periphery of the fourth stage nozzle rim is marked quite heavily between 1:30 and 4 o'clock by the fourth stage wheel - the forward corner of the rim. There are no similar marks from the third stage wheel. The assembly was not dismantled because of a lack of suitable tools. The fourth stage nozzle outer ring aft end has left a shiny impression (polished) on the outer rim of the third stage nozzle from about 3 o'clock to 11 o'clock, i.e. from 11 o'clock to 3 o'clock is not shiny. Pieces of metal swarf are adhering to the outer portion of the third stage nozzle blades from 5 o'clock to 8:30 o'clock - mainly on the inner periphery of the rim.

2.3.4 The gas producer turbine turns freely and was not dismantled because of a lack of suitable tools.

2.4 Combustion Section
Outer Case Serial No. 1398. Liner Serial No. BL10012.

2.4.1 The left compressor discharge air tube female fitting is bent inboard. (The aft tube was against the forward attachment flange of the outer combustion case). The central and left central portion of the outer combustion case is crumpled downwards, but has made only a small dent in the central top of the combustion liner, which is otherwise intact.

2.4.2 There is a fair amount of carbon deposited in the aft portion of the combustion liner.

— 11 —

OTHER SERIAL NUMBERS FOUND

Fuel Pump (Engine)	1116	Rear Diffuser	DEO 1938
Main Rotor Hub	65	P.T. Governor	3714
Blue Blade	317	Starter Generator	1316
Yellow Blade	316	Compressor bleed Valve	103-722
Transmission	1032	Double check valve	989
Forward Section G.P. Turbine	BU 158	Spark Igniter	2159
Power Turbine No.4 Nozzle	BL 10182	Fuel Nozzle	AG 8118
Exhaust Output Turbine Support	A 589	GP Fuel Control	199575
		Tail Fin (Vertical)	181

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APPENDIX II

3/17/68

SUBJECT: Field Investigation of Okanagan FH1100 Helicopter Accident near Vancouver, B.C., Mar. 14, 1968

The Accident

What - FH-1100 Helicopter owned and operated by Okanagan Helicopter Ltd. Ship No. 96, Canadian Registration No. CF-HMO.
Allison 250-C18 Engine S/N 800374
A/C time 40:30 Engine time 40:30

Where - The accident occurred approximately 35 to 40 miles ESE of Vancouver, B.C. Canada, or about 6 miles east and 2 miles north of Langley, B.C.

When - The accident occurred at approximately 11:53 AM PST on Thursday, Mar.14,1968. The helicopter was cruising from Vancouver to Ruby Creek near Hope to replace an S55 helicopter damaged earlier the same day.

Who - The Pilot, Mr. Par Frederick Fletcher was flying alone and was killed. Mr. Fletcher, 41, had _____ years helicopter experience, _____ hours, _____ hours in turbine, _____ hours in FH1100.

Weather - The weather was cloudy but not raining. Wind was gusty 15 to 25 MPH from SE. Temperature about 47° F.

Witnesses -
There were several witnesses to the accident. [redacted] and [redacted] who were working on a dike approximately 1/4 mile from the accident gave statements to the newspaper. We have not seen their statements as given to the DOT, however, the jist of their observations were as follows:

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They heard an explosion and looked up to see the helicopter starting to fall; it nosed over and went straight down with a lot of pieces floating in the air. It hit the ground 6 or 7 seconds later followed by another explosion. Since it went into woods on a ridge above their location they would have been unable to observe the actual ground impact.

The Investigation -

People involved -

Tom Young	DOT, Vancouver, In charge
Roy Jobling	DOT, Vancouver
Bob Logan	DOT, Ottawa
Gordon Askins	Ch.Engr. Okanagan
Rod Fraser	Ch. Insp. Okanagan
Al Bonnel	Ch.Adv. Design, Fairchild Hiller
Jim Baker	Service, Fairchild Hiller.
Len Gaubis	Ch. Des. Engr. Fairchild Hiller
Glen Pearson	Local Service, Fairchild Hiller
Jack Burgess	Serv.Engr. Standard Aero Eng.
Sparky Penrose	Serv. Rep. Allison
R. Hatch	Rel. Engr. Allison

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General Plan -

Since the wreckage was scattered over a large area it was necessary to first search the area to locate as many pieces as possible. Each location was marked with yellow ribbons. A survey line was run thru the area of wreckage and the location of each piece was established and plotted by surveyors. The pieces were then picked up and collected for pickup and transportation to a D.O.T. hanger for reconstruction.

The main wreckage was dismantled and removed in sections which could be carried out of the woods. The ground was carefully sifted after each piece was removed to get everything possible.

The wreckage was carried out of the woods on March 17 and 18th and transported to a D.O.T. hanger later on the 18th. Cleanup, layout, and identification of the wreckage details was started on the 19th.

Wreckage Description -

The main wreckage and most of the pieces that came down separately were in a wooded area. Most of them were along a path about 400 yds long and 100 yes wide. Some paper was found up to 1 mile away. The distribution of the major items is shown in the attached chart.

Most of the helicopter, including the engine, was found at the main wreckage site. It came practically straight down and hit nose first as indicated by the forward 30" of the RH landing skid which was driven straight into the ground and broken off. After initial impact it went over on its back and the tail boom separated and lay about 20 ft beyond the main wreckage.

The tail rotor was severed from the boom at a point 18" above the aft end of the boom and was near the main wreckage. The outer 18" was slashed from both blades. These sections were found back up the wreckage path 100 to 200 yds. A 1 1/2" section was severed from one blade tip and also found separately.

The main rotor fell intact about 150 yards south, or to the right, of the main wreckage. The hub separated from the mast adjacent to the stops. The stops had contacted with enough force to slightly flatten the shaft. The blue blades sustained practically no damage except for a slight negative coning. The yellow blades sustained severe damage in the outer 1/2 of span. Most of the damage occurred at the trailing edge. Evidence found on other parts in the wreckage indicated that a main rotor blade had passed through the front of the bubble and taken off the left landing skid.

A 6" piece of 1" dia aluminum tube was found that was bent into a Vee and exhibited grey and black paint smears that matched the grey and black paint used on the top and bottom of the rotor blades. This was part of the horizontal bow inside the bubble and was oriented by an attached bracket to a point about 8" right of center. This indicated that the main rotor entered just to right of the battery, went through the upper part of the console, out the left side and took off the left landing skid.

The battery (Sonotone) went two feet into the ground about 80' to the right and slightly ahead of the main wreckage. The battery cover was knocked off and was severely bowed.

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Fire - Although an explosion was reported preceding the fall of the aircraft there was no evidence that any fire existed prior to ground impact. The tail boom was thrown clear of the main wreckage and was completely free of smoke, soot, or fire damage.

A fire erupted after ground impact however which destroyed a good deal of the wreckage ahead of the engine. The engine was also surrounded by fire but sustained little fire dam age except for the compressor.

Engine Condition -

The engine lay on its left side in its approximate normal position. It was intact except for a section of the gearbox cover containing the fuel pump, spare pad, and output pad. This damage was apparently caused by the vertical impact which jammed the engine against the output shaft. The combustion case and exhaust collector were partially crushed. Neither N_1 or N_2 could be rotated prior to disassembly but examination thru the compressor inlet and exhaust outlet indicated no evidence of internal failure. The engine mounts held at the engine but separated at all attachments to the airframe.

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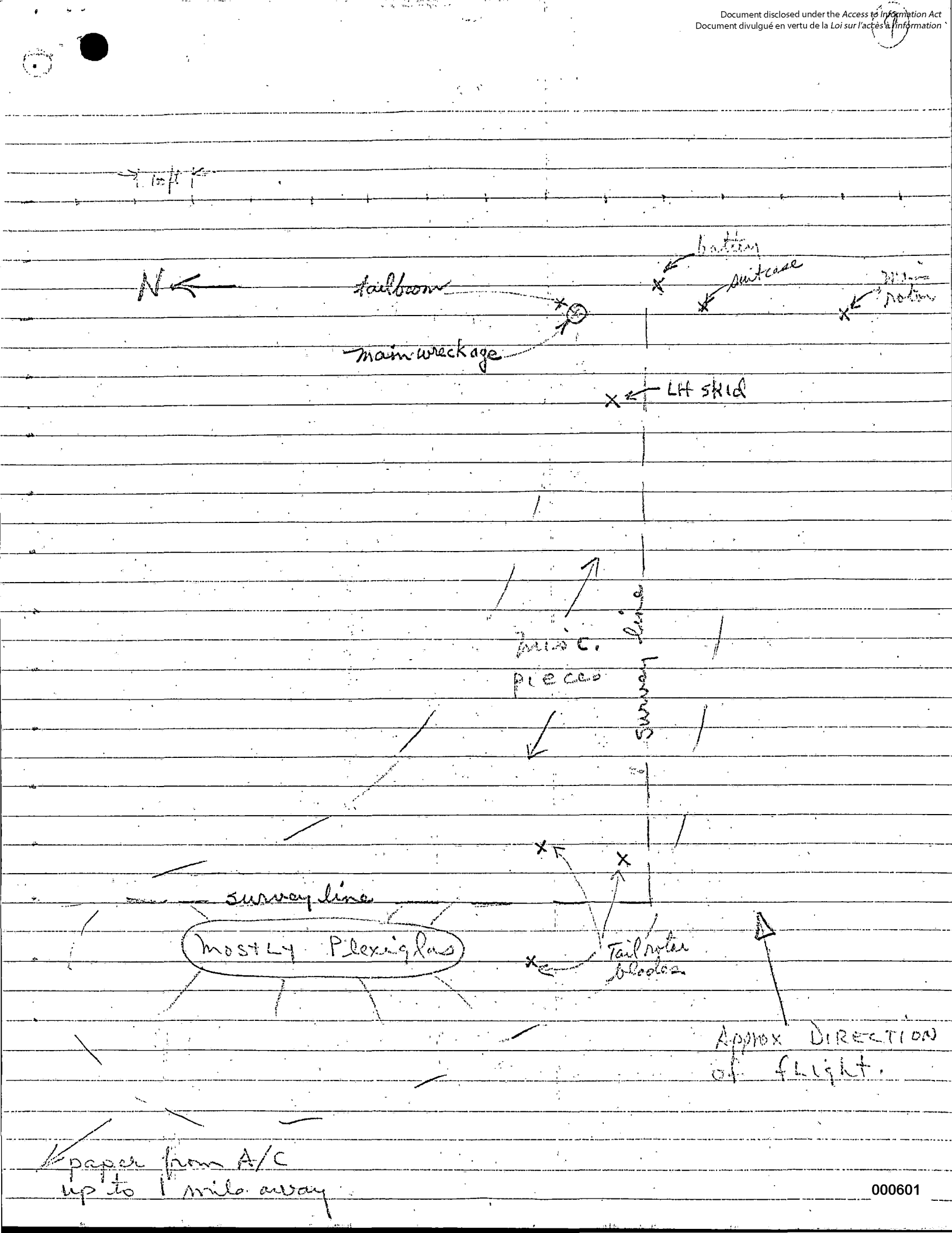

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3/19/68

SUBJECT: Engine Examination at D.O.T. Facility, Vancouver Airport.

Identification -

Engine S/N	CAE 800374
Gear-box	CAG 20374
Turbine	CAT 20055
Compressor	CAC 20412
Fuel Control	199575
Governor	3714
Fuel Pumps	1115
Double Check Valve	989
Fuel Nozzle	AG811B
Ignitor Plug	2159
Compressor Bleed Valve	103-722

Damage Description

Gear-box -

Front case and mounts intact.
Left hand section of rear cover containing fuel pumps and spare pad broken free but held by tubing.
Rear output drive pad broken out.
Gearing exposed. All intact and in normal position except output shaft which is skewed about 5° to 10° due to loss of rear bearing cage support.
Pinion to torquemeter gear mesh OK.
Torquemeter gear to output gear mesh damaged. Aft 50% of all torquemeter gear teeth worn or stripped at tip. All output gear teeth visible are runover at the aft corner of the tip.
Accessory gear trains appear undamaged.
Pulled oil filter - clean.

Removed rear gear-box cover to examine gear damage more closely.

Gear damage confined to output gear / torquemeter gear mesh.

All T.M. gear teeth sheared and/or worn off from aft edge 1/2"x 1/16".

Damage on output gear teeth varies from light to heavy. One segment of 21 teeth damaged at aft end from bare contact, progressively to 1/2" wide in a cow direction. Two adjacent teeth are worn off 1/16"x 3/4" from fwd end and have a burned appearance indicating substantial contact with torquemeter gear. Twelve other teeth are damaged to a lesser degree from the fwd. edge.

Power train bearings OK except for front output shaft bearing which was damaged by impact.

Oil pump disassembled. A few metal chips present. Appear to be magnesium sheared from pump cover by pump gears.

Compressor -

Intact and in normal position to engine. Heat damaged and rusted on outside.

Front support bent inward at left hand anti-ice inlet fitting. Related strut slightly buckled.

Diffuser intact.

Compressor bleed valve is 1/4" open and has heavy deposit of mud, soot, etc., on valve face and seat.

Anti-icing air valve jammed in partially open position.

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Removed lower compressor case -
Found blading intact.

The plastic lining was in various stages of disintegration due to fire. It was almost completely missing from some areas in the first three stages and deformed and cracked in the fourth and fifth stages. The plastic in the sixth stage was not deteriorated but was darkened to a medium brown color and there was some evidence of light blade tip rub remaining.

There was a fairly heavy deposit of burned plastic on most of the blading. One first stage blade was slightly curled at trailing edge tip. Additional light F.O.D. may be obscured by the plastic deposit.

Removed compressor from engine for further disassembly to expose the centrifugal stage.

Removed upper case -
Somewhat less heat damage to plastic than noted in lower case.

Evidence of very heavy blade tip rub about 90° in all stages. About .015" deep in first and second stages. Heaviest rub oriented at 9:00 position (looking fwd). This is in line with impact damage noted on fwd flange of front support.

Front bearing turns freely.

Removed compressor rotor assembly from diffuser scroll.
Heavy rub on face of front diffuser about 180°. Heaviest rub about .015" deep and oriented at 7:30 position (looking fwd).

Rear compressor bearing turns freely.

Turbine -
The turbine unit is bent downward from its normal position to the engine due to fracture and 1/4" separation at the upper support of the exhaust collector.

The left exhaust duct is smashed closed. Some observation of the 4th stage turbine blading was obtained through the right duct. Blading appears undamaged.

Removed combustion casing and liner -
Very small deposit of loose dirt or carbon found inside combustion casing. Brownish deposit inside right hand armpit area. Left hand armpit area relatively clean.

The turbine inlet appears undamaged. No unusual deposits noted.

Removed turbine unit from engine for additional examination -
N_1 and N_2 coupling shafts intact. Light rub on O.D. of N_1 shaft.

Gas producer turbine turns freely. Power turbine locked tight.

Separated gas producer from power turbine -
No blade damage evident.

Gas producer rotor turns freely. Power turbine rotor still tight, apparently locked by distortion of exhaust collector.

Removed power turbine rotor from exhaust collector -
Evidence of 4th stage blade tip knife seal rub through approximate 80° segment. Not certain of orientation.

All turbine bearings in good condition except #5 (power turbine front) which is contaminated with dirt.

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Miscellaneous Observations

No fuel found in any lines of fuel system.

Lower mag plug dirty, sump full of mud.

Left hand air tube mashed flat and pulled out of diffuser.
Right hand tube OK.

Removed fuel filter - clean, about 1/2 tsp of clean fuel in bowl.

Ignitor plug has normal deposit.
No evidence of recent sparking.

Fuel nozzle normal.

Starter - generator shaft sheared.

Summary of findings

1. No evidence of engine failure was found. All damage and/or abnormal conditions are associated with impact.

2. There was evidence of both N_1 and N_2 engine rotation at impact.

N_1 rotation indicated By;
   (a) Relatively heavy machining of the plastic lining in the axial compressor stages.

   (b) Heavy machining of front diffuser 180° by compressor impeller.

   (c) Starter - generator shaft sheared.

N_2 rotation indicated by;
   (a) Severe gear tooth damage at output gear / torquemeter gear mesh.

   (b) 4th stage turbine blade tip seal rub.

3. It is not considered possible to make a reliable estimate of engine speed at impact by the physical evidence available. However, it is considered reasonable to conclude that the engine was running at substantial speed as opposed to being in some stage of rundown at the time of impact.

"R. W. Hatch"

Reliability Engineer
Reliability Department
Allison Division GMC

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APPENDIX 12

FAIRCHILD HILLER
AIRCRAFT DIVISION

7 June 1968

Ref: SD-68-5635-JGB/mjb

AA

AIR SERVICE BRANCH
VANCOUVER
JUN 10 1968
File 5002-715

Mr. Tom Young
Department of Transport
Ministere Des Transports
739 West Hastings Street
Vancouver 1, B.C., Canada

Dear Tom:

Thanks for the print on the scatter pattern for the CF-WMO accident. Your letter 5002-715 requested information regarding the effects of rapid reduction of collective control near VNE and the effect of turbulence.

We are presently conducting a flight and analytical test program to determine if certain combinations of unusual flight conditions and turbulence could cause a safety of flight situation. We expect to have this testing completed the early part of June. At this time all operators will be advised of our recommendations. We will send you a copy of this report.

You also requested the force on the hydraulic power cylinder. The maximum feed-back force on the power cylinders are:

Longitudinal	-	912 pounds
Lateral	-	972 pounds
Collective	-	456 pounds

Also enclosed is a copy of the accident report you requested

Very truly yours,

FAIRCHILD HILLER CORPORATION
Aircraft Division

J. G. Baker
Supervisor, Service

Enclosure

HAGERSTOWN, MARYLAND 21740 TELEPHONE: AREA CODE 301, 733-3600

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FAIRCHILD HILLER
AIRCRAFT DIVISION

INTER-OFFICE COMMUNICATION

Subject: Trip to Okanagan to Investigate Accident - FH-1100, S/N 96

To: Messrs. B. Davis, E. Morton

Date: 25 March 1968

In reply refer to: E-68PR1074

From: A. Bonnell, J. Baker

The subject aircraft was totally destroyed in an accident at 11:43 A.M. on Thursday March 14, 1968. The aircraft was being ferried from Vancouver Airport to a construction site near Hope, British Columbia to relieve a S-55 helicopter that had been damaged by rotor blade contact with a high-line tower. The Okanagan pilot, Par Fletcher, age 41, was fatally injured in the accident.

After a phone report from Okanagan, Glen Pearson, local area F-H service rep, was dispatched to Vancouver arriving at 6:00 P.M. March 14th. He immediately contacted Gordon Askin, Okanagan Maintenance Superintendent, and made arrangements to proceed to the scene with DOT and Okanagan representatives.

The writers, J. Baker, F-H Service and A. Bonnell, Engineering, along with L. Gaubis, Engineering were dispatched to Vancouver Friday morning March 15th, arriving at 5:00 P.M. Our mission was to render assistance in the accident investigation.

Upon arrival we met Glen Pearson who introduced us to T. Young, DOT representative in charge of the investigation. Mr. Young explained the accident area was under quarantine by DOT. We were welcomed to accompany the investigators the next morning. We were free to look and photograph but not to handle any of the wreckage until cataloguing by a survey team was completed. Any infractions of this rule could result in being barred from the area. (Mr. Young stated that Glen Pearson had assisted in the preliminary investigation on the previous day and had been very helpful).

Saturday, March 16th

Glen Pearson, L. Gaubis and the writers proceeded to the scene where we met DOT and Allison representatives. After touring the crash site, Mr. Young asked if we would assist in locating and marking pieces of wreckage, for cataloguing by the survey team.

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The wreckage was scattered for over a quarter of a mile along a ridge covered with dense woods. The survey team was in the process of plotting a reference line with which to map the wreckage pattern. The balance of the day was spent locating and flagging pieces of wreckage. The scatter pattern determined is approximately as described on the map, Attachment 1. Because of the dense underbrush, distances are estimated.

Sunday, March 17th

Sunday we continued marking scatter pattern parts and moved the main wreckage out of the woods to a clear area. Sifted ashes for parts. Counted rod ends to establish completeness of control system. Started to gather parts from the scatter pattern that had been catalogued by the survey team.

Monday, March 18th

Finished gathering parts from the scatter pattern. Moved wreckage to DOT Building, Vancouver Airport. Interviewed witnesses.

Tuesday, March 19th

Layout of wreckage in DOT building. Layout of control system for check of hinge points. Upper controls were determined to be intact when rotor mast broke (See summary). Started reconstructing enclosure plexiglass to check for strike marks.

Wednesday, March 20th

Opened transmission. All parts appeared normal except for impact damage. Allison representatives completed engine disassembly. It was determined that the engine was running on impact. Completed assembly of glass enclosure for R.C.M.P. ballistics inspector on Friday. Matched strike marks in attempt to determine sequence of events.

Thursday, March 21th

Departed Vancouver.

SUMMARY

Weather conditions were as follows:

Overcast, approximately 3,000 feet
OAT 40° F
Wind from South/East at 15-20 mph
Moderate to severe turbulence in the area
No precipitation

Aircraft was flying on Southeasternly heading. After crossing Frazer River Valley it crossed a wooded ridge approximately 200 ft. elevation. Shortly after crossing this ridge line something caused the aircraft to go out of control.

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After the main rotor assembly separated from the aircraft, the yellow-tipped blade penetrated the forward, right-hand section of the cockpit in the area of the battery and instrument console. The strike was trailing edge first. The tip section contacted the right-hand rudder pedal assembly.

The same blade also contacted the left-hand rear landing gear strut about 12" from the torque tube. The strut was broken by the impact and it along with the skid runner separated from the aircraft.

The tail rotor struck the pylon spar breaking both blades approximately 8" from the root. One blade tip, 1 1/2" long was broken off on contact with the spar. It has not been determined what caused the tail rotor to contact the pylon spar. There is no evidence of any foreign object striking the tail rotor.

The body section of the helicopter impacted in a nose down attitude, coming to rest in an inverted position. The aircraft body in the area of the fuel cell was destroyed in the resulting fire.

A. Bonnell
A. Bonnell

J. Baker
J. Baker

cc: J. Burke
J. Grabber (2)
H. Hockett (2)
R. Lessard
J. Lovell
D. Meadowcroft (2)
R. Peck (2)
W. Rosborough
J. Sweely
L. Gaubis

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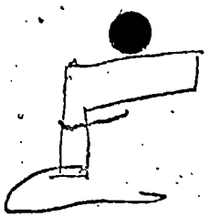
ATTACHMENT #1

Form

SHEET #1



Typ Comm Equip Lt

Trees End

CM Filter C
Type 455-24
Mfg No 2783 - 6-01

Radio ID Plate

100 yds

#1 #2 TR

#3 FB Control Overhead Panel

Topdown & Bubble

Pylon TR drive cover plates flipped out

15 in sect of

25 yds

Jacket in trees

Flt Report Book

5 in sect MR Blade

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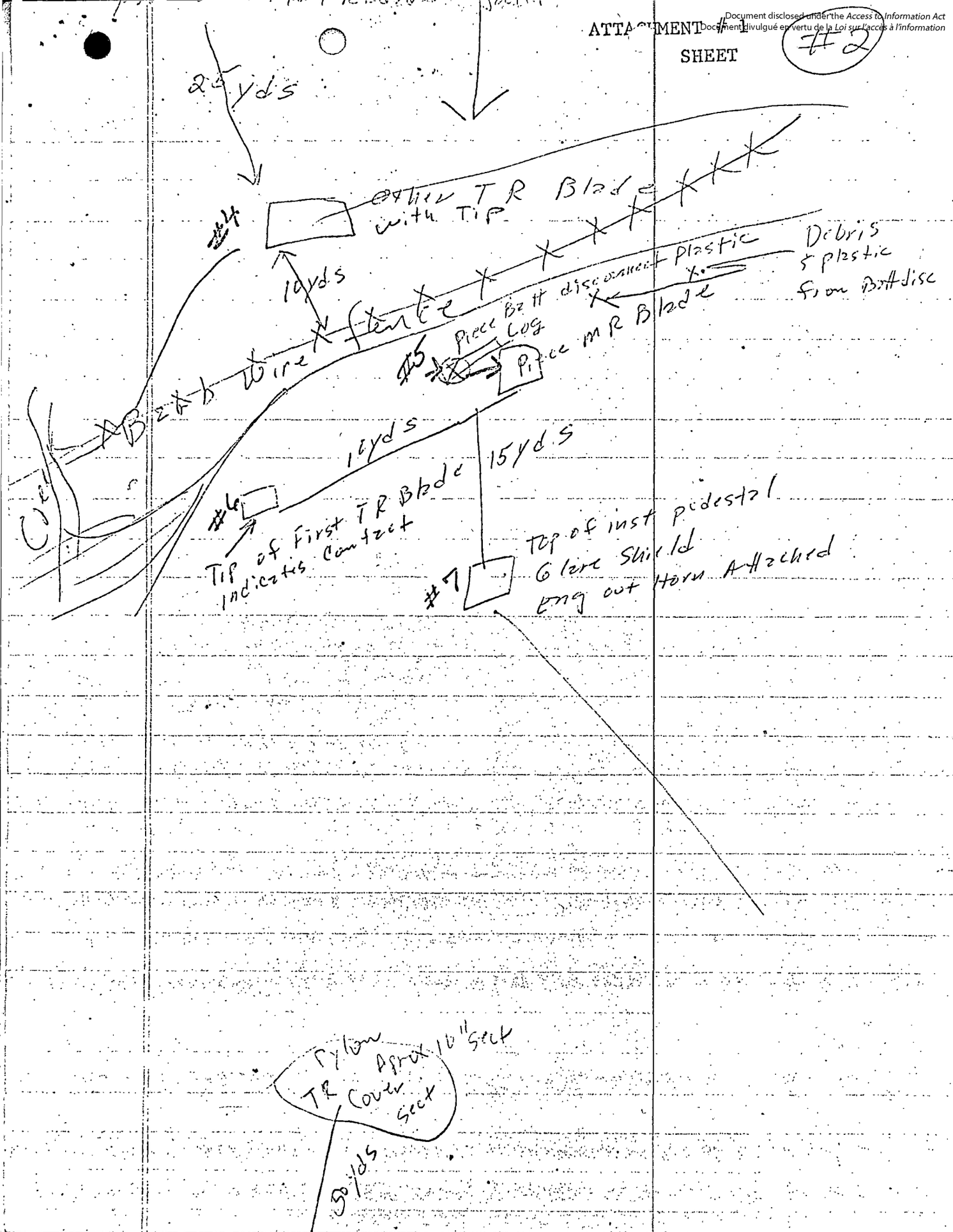
ATTACHMENT #1
SHEET

#2



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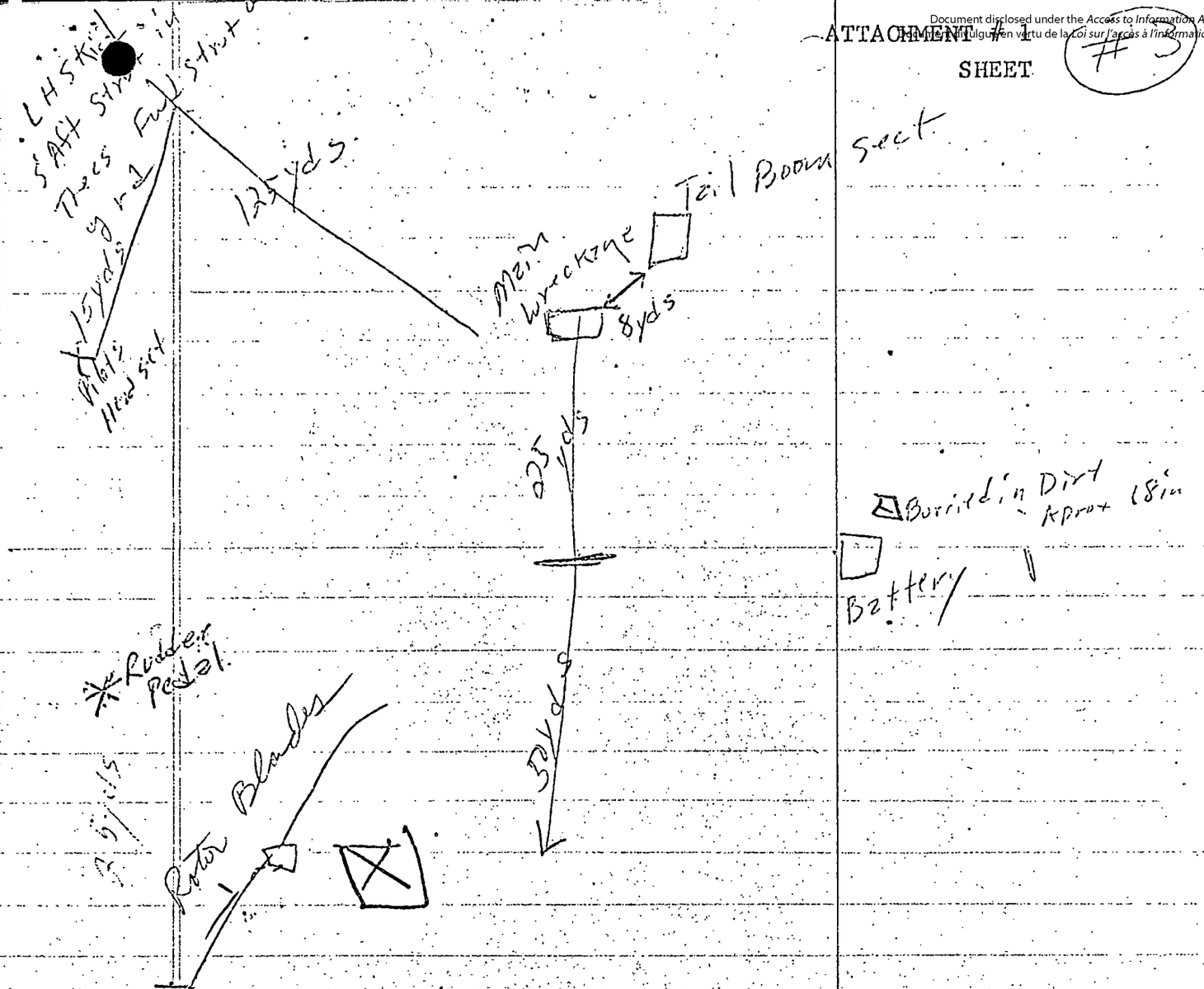
ATTACHMENT # 1

SHEET

#3



F2rm

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APPENDIX 13

MASTER INSTRUMENTS LTD.
VANCOUVER INTERNATIONAL AIRPORT
BRITISH COLUMBIA, CANADA

Telephone:
278-6131
AREA CODE 604
TELEX No. 04-50300

April 15, 1968

AIR SERVICES BRANCH
VANCOUVER
APR 18 1968
File 5062-715

Department of Transport Aviation Division
Accident Investigation Branch
739 West Hastings Street
Vancouver, B. C.

Attention: Mr. Tom Young

Dear Sir:

Functional tests were completed in our shop on April 10, 1968 on the following hydraulic units and observed by Mr. Tom Young

The tests were completed according to the Manufacturer's Specifications.

Power Cylinder, Part No. 9710, Serial No. S159:

Internal Leakage Test	Neutral	8 cc/min.
" " "	Extended	Negligible
" " "	Retracted	Negligible

Pilot valve force - normal.

Power Cylinder, Part No. 9720, Serial No. T525:

Internal Leakage Test	Neutral	20 cc/min.
" " "	Extended	10 cc/min.
" " "	Retracted	10 cc/min.

Pilot valve force - normal.

Power Cylinder, Part No. 9720, Serial No. T601:

Internal Leakage Test	Neutral	12 cc/min.
" " "	Extended	6 cc/min.
" " "	Retracted	8 cc/min.

Pilot valve force - normal.

General operation of the above cylinders was satisfactory.

continued.....

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Lock and Load Limiter, Part No. 8810, Serial No. 511:

Cracking Pressure	11 p.s.i.
Reseat	11 p.s.i.

Lock and Load Limiter, Part No. 8810, Serial No. 242:

Cracking Pressure	9 p.s.i.
Reseat	9 p.s.i.

Relief Valve, Part No. 8720, Serial No. 427:

Cracking Pressure	24.5 p.s.i.
Reseat	24.5 p.s.i.

Relief Valve, Part No. 8720, Serial No. 501:

Cracking Pressure	22 p.s.i.
Reseat	22 p.s.i.

General operation of the four preceding units was normal.

Yours very truly,

MASTER INSTRUMENTS LIMITED

W. Madill

WM:dp

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A P P E N D I X 14

I N D E X of main rotor (yellow) blade areas designated in RCMP chemical analysis report. All measurements taken from the blade root attachment bolt hole outwards toward blade tip.

Area "A"	89"	on blade leading edge
Area "B"	109"	on blade leading edge
Area "C"	147"	on blade leading edge and lower surface
Area "D"	60" to 70"	on blade leading edge and upper and lower surface
Area "E"	154"	on blade upper surface mid point between leading and trailing edges
Area "F"	158" to 162"	on blade leading edge upper surface

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C-430
REV. 1-4-66

ROYAL CANADIAN MOUNTED POLICE — GENDARMERIE ROYALE DU CANADA
CRIME DETECTION LABORATORY REPORT – RAPPORT DES LABORATOIRES JUDICIAIRES

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IL EST INTERDIT DE PUBLIER EN TOUT OU EN PARTIE CE RAPPORT OU TOUTE DOCUMENTATION PHOTOGRAPHIQUE OU AUTRE S'Y RAPPORTANT SANS LE CONSENTEMENT PAR ÉCRIT DU COMMISSAIRE DE LA GENDARMERIE ROYALE DU CANADA.

"HQ" FILE NO. – DOSSIER "QG" NO	LAB. FILE NO. – DOSSIER DU LAB. NO	DATE
	392-968	10 April 1968

YOUR REF. NO. – VOTRE RÉF. NO	ENCLOSURES – PIÈCES JOINTES	PLACE – LIEU
		Vancouver, B.C.
	LABORATORY REPORT NO. – RAPPORT DU LABORATOIRE NO: 1	

SECTION	CLASSIFICATION
CHEMISTRY	C.N. 51 & 81

FOR – DESTINATAIRE
Regional Director Air Services, Department of Transport, 739 W. Hastings St., Vancouver, B.C. (Att: Mr. T. Young)

REFERENCE – RÉFÉRENCE
Crash of Hiller FH 1100 Helicopter CF-WMO - Nr. Langley, B.C.

COPIES TO – COPIES À
Officer i/c Scientific Services, Crime Detection Laboratories, RCMP, Ottawa, Ont.

1. GENERAL: The following exhibits were received personally from Mr. T. Young, Dept. of Transport at Vancouver International Airport on March 21, 1968:

Exhibit 14 - Battery
" 56 - Bent metal tube
" 64 - Battery connector, green plastic
" 96 - Piece of perspex with adherant black substance
" 88 - Metal grid from radio
" 98 - Broken section of rotor blade
" 158 - Perspex section, with apparent blood stain
" 193 - Perspex section, with adherant black substance

The following exhibits were received personally at the Crime Detection Laboratory Vancouver on March 22, 1968:

Exhibit 25 - Left u/c skid, aft section
" 26 - Left u/c skid, forward section
" LA - Battery cable
" LB - Left u/c strut, aft
" LC - One rotor blade

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Re: Crash of Hiller FH 1100 Helicopter CF/WMO - Nr. Langley, B.C.

1. GENERAL:(Cont'd.)

The following exhibit was received personally at the Crime Detection Laboratory Vancouver on March 29, 1968:

Exhibit LD - Polythene bag containing four paint sections (labelled LD1, LD2, LD3 and LD4) with orange/white and in some cases other layers.

2. PURPOSE: To compare foreign material (eg paint) on exhibit LC et al with native material on other exhibits.

3. DATA: All exhibits were examined microscopically. Where apparent foreign material was observed, samples were taken. Exhibit LC was marked into areas A, B, C, D and E and samples were taken, labelled and examined microscopically.

From exhibit LC, area A(leading edge of rotor):

LC1 - trace of thin plastic material with adhering black paint.

LC2 - thin plastic material with embedded trace of bright green substance.

From exhibit LC, area B(underside of rotor):

LC3 - paint chip, 2 layer orange/white with trace of black material on white layer; paint chip, 2 layer, silvery-grey/black; traces of colourless material resembling perspex.

LC4 - native black paint scrapings; traces of turquoise-green plastic material containing colourless fibres.

From exhibit LC, area C

LC5 - (from leading edge of rotor) thin plastic strip. Trace contamination with yellow paint.

LC6 - (from underside of rotor) - Native black paint scrapings.

LC7 - (from upper side of rotor) - Native grey paint, top layer. (upper side of rotor has a 2 layer paint, grey(top)/yellow.)

LC8 - (from underside of rotor) - Native black paint, top layer. (Underside of rotor has a 2 layer paint, black(top)/yellow)

LC9 - (from upper side of rotor) - Native grey paint scrapings.

.....3

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Re: Crash of Hiller FH 1100 Helicopter CF-WMO - Nr. Langley, B.C.

3. DATA: (Cont'd.)

On exhibit LC, area D:

Striations on edge and surface of rotor. Insufficient foreign material for examination.

From exhibit LC, area E:

LC10 - (from upper side of rotor). Foreign black paint scrapings.

LC11 - (from underside of rotor, within cut). Paint chip, 3 layer, thick clear plastic(top)/orange/ traces of material including very pale yellowish and black substances.

Exhibit 14 was marked into areas B1, B2 and B3: samples were taken, labelled and examined microscopically.

From exhibit 14, broken plastic connector.

Exhibit 14(1): turquoise-green plastic with colourless fibres throughout.

From exhibit 14, area B1, foreign material.

Exhibit 14(B1): Thin colourless plastic strip with embedded turquoise-green plastic with colourless fibres. Thin colourless plastic strip streaked with black paint with traces of embedded turquoise-green plastic with colourless fibres.

From exhibit 14, area B2, foreign material.

Exhibit 14(B2): Traces of grey paint scrapings; yellow paint scrapings; 2-3 minute chips of a 2-layer grey/yellow paint; turquoise-green plastic with colourless fibres; traces of thin plastic.

From exhibit 14, area B3, foreign material.

Exhibit 14(B3): Black paint scrapings.

Exhibit 88 was examined and apparent foreign samples removed from same were examined microscopically.

Exhibit 88(a): Pieces of clear plastic.

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Re: Crash of Hiller FH 1100 Helicopter CF-WMO - Nr. Langley, B.C.

3. DATA: (Cont'd.)

Exhibit 88(b): Metal filing; metal filing with adherant pale blue crystalline or plastic material; loose pale blue crystalline or plastic material; chip of black paint; chip of grey/yellow paint; white fibrous material with embedded traces of colourless plastic and metal.

Exhibit 88(c): 2 layer paint, grey/yellow

Exhibit 88(d): Native black paint

From exhibits LB, 25, 56, 96 and 193 samples were removed, labelled and examined microscopically.

Exhibit LB(a): Native paint, 2 layer orange(top)/yellow.

" LB(b): Foreign black paint near fractured end.

" 25(a): Black paint from broken section.

" 56(a): Grey paint scrapings; 2 layer black/grey paint chip.

" 96(a): Foreign black paint-like material from surfaces of perspex.

" 193(a): Foreign black paint-like material from surface of perspex; soil-like material.

" 193(b): Native sample of clear perspex for comparison purposes.

The very small quantities of most samples of foreign material precluded spectrographic examination. Significant components of the following samples were analysed by pyrolysis gas chromatography: LC1, LC2, LC3, LC5, LC6, LC7, LC8, LC9, LC10, LC11; 14(B1), 14(B3); 88(a), 88(c), 88(d); LB(b); 25(a), 56(a), 96(a); 193(a), 193(b).

4. CONCLUSIONS: The term "chemical composition" as used below refers to the chromatograms obtained by pyrolysis gas chromatography. This technique gives an indirect determination of the organic constitution of the samples and is used comparatively.

(1) The chemical composition of plastic samples from the rotor edge (exhibits LC1, LC2 and LC5) is the same, indicating a common origin.

.....5

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Re: Crash of Hiller FH 1100 Helicopter CF-HMO - Nr. Langley, B.C.

4. CONCLUSIONS: (Cont'd.)

(2) The chemical composition of the plastic on the battery in area B1, (Exhibit 14B1) is the same, indicating a common origin.

(3) The chemical composition of the plastic in exhibits LC1, LC2 and LC5 differs from that in exhibit 14 B1, indicating a different origin.

(4) No sample of plastic was received with a composition comparable to that in exhibit 14 B1.

(5) The turquoise-green plastic with the colourless fibres embedded in the plastic in exhibit 14 B1 originated from exhibit 14(1) or exhibit 64.

(6) From conclusion (5) and striations on the battery (exhibit 14) it appears that exhibit 14(1) and/or exhibit 64 were struck from above.

(7) The 2 layer grey/yellow paint in area B2 of exhibit 14(exhibit 14 B2) originated on the upper side of the rotor.

(8) The black paint in area B3 of exhibit 14 (exhibit 14 B3) has a chemical composition similar to the black paint in the underside of the rotor (exhibit LC8), and different from that on the radio grill (exhibit 88(d).

(9) The turquoise-green plastic with the colourless fibres in exhibit LC4 originated from exhibit 14(1) and/or exhibit 64 implying that the battery connector was in contact with the underside of the rotor in area B.

(10) The 2 layer orange/white paint chip (exhibit LC3) removed from area B of the rotor has an identical composition to a 2-layer orange/white paint chip cut from exhibit LD3 indicating a common origin.

(11) The radio grill (exhibit 88) was struck by area D of the rotor from comparison of striations in the rotor with the metal lattice of the grill.

(12) The 2-layer grey/yellow paint (exhibit 88(c)) recovered from exhibit 88 originated on the upper side of the rotor.

(13) The clear plastic material (exhibit 88(a)) recovered from exhibit 88 has a different chemical composition from the perspex of the cabin "bubble" and from other plastic exhibits examined.

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Re: Crash of Hiller FH 1100 Helicopter CF-WMO - Nr. Langley, B.C.

4. CONCLUSIONS: (Cont'd.)

(14) The foreign black paint on the rotor upper side in area E (exhibit LC10) had a different composition from the black paints on exhibits 25 (a), 88(d) or LC8.

(15) The bright green substance in exhibit LC2 did not originate from exhibit 14(B1) or exhibit 64.

(16) The physical nature and chemical composition of exhibit LC11 do not correspond to those of any other exhibit examined.

(17) The foreign black paint on the left u/c strut aft (exhibit LB(b)) has a chemical composition similar to that of the rotor underside (exhibit LC8).

(18) Insufficient grey paint was recovered from exhibit 56 for analysis.

(19) The foreign black paint on exhibit 96(a) has a chemical composition similar to that on the underside of the rotor (exhibit LC8).

(20) The foreign black paint on exhibit 193(b) has a composition similar to that on the underside of the rotor (exhibit LC8). However, the nature of the pattern indicates that this paint was probably accidentally sprayed onto this surface, as opposed to deposited by collision. A nitrate test was negative.

5. REMARKS:

Exhibit 158 was turned over personally to C/M F.M. Ferris of the Serology Section on March 22, 1968 and received back personally from C/M F.M. Ferris on March 29, 1968.

Exhibits LB, LC, 25 and 26 were returned personally to Mr. Chandler, Dept. of Transport at the Crime Detection Laboratory on March 26, 1968.

The remaining exhibits were returned personally to Mr. Young, Dept. of Transport on April 10, 1968 at the Crime Detection Laboratory.

Submitted by:

A.D. Beveridge, B.Sc., Ph.D., A.R.I.C.
Chemistry Section.

Approved by:

D.M.Duke, B.A., S/Insp.,
Officer i/c Vancouver Laboratory.

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C-430*
REV. 1-4-66

ROYAL CANADIAN MOUNTED POLICE — GENDARMERIE ROYALE DU CANADA
CRIME DETECTION LABORATORY REPORT – RAPPORT DES LABORATOIRES JUDICIAIRES

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"HQ" FILE NO. – DOSSIER "QG" Nº	LAB. FILE NO. – DOSSIER DU LAB. Nº	DATE
	392-968	1 April 1968
YOUR REF. NO. – VOTRE RÉF. Nº	ENCLOSURES – PIÈCES JOINTES: –	PLACE – LIEU: Vancouver, B.C.
	LABORATORY REPORT NO. / RAPPORT DU LABORATOIRE Nº: 1	
SECTION: SEROLOGY	CLASSIFICATION: C.N. 27	

FOR – DESTINATAIRE

Regional Director Air Services, Department of Transport Att:Mr. Young
739 W Hastings Street, Vancouver, B.C.

REFERENCE – RÉFÉRENCE

Crash of Hiller FH 1100 Helicopter
CF - WMO - Nr. Langley, B.C.

COPIES TO – COPIES À

Officer i/c Scientific Services, C.I.D. Labs., R.C.M.P., Ottawa, Ont.

1. GENERAL: The following exhibit was received personally from Dr. A.D. Beveridge of the Crime Detection Laboratory Chemistry Section on March 22, 1968:

Exhibit #158 - One piece of transparent material said to be from helicopter.

2. PURPOSE: To conduct a serological examination on exhibit #158.

3. DATA: Exhibit #158 was examined (1) for the presence of blood and (2) to determine the species origin of any blood present.

4. CONCLUSION: Human blood of Group O was found to be present on exhibit #158 - one piece of transparent material, said to be from helicopter.

5. REMARKS: Exhibit #158 was returned to Dr. A.D. Beveridge of the Laboratory Chemistry Section on March 29, 1968.

Submitted by:
F. M. Ferris
(Mrs.) F.M. Ferris, B.A., R.T.,
Serology Section

Approved by:
D.M. Duke
D.M. Duke, B.A., S/Insp.
Officer i/c Vancouver Lab.

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APPENDIX 15

PATHOLOGICAL REPORT — ROYAL COLUMBIAN HOSPITAL
March 18/68 Tissue No. 68-MS-43

Patient FLETCHER, Frederick Raymond

Physician Coroner L. M. McDonald

REPORT OF FINDINGS

GROSS CIRCUMSTANCES OF DEATH:

The body of this middle-aged white male was found at the site of a helicopter crash in the municipality of Langley, B.C. on the 14th of March 1968.

Tentative identification was made as that of the pilot Mr. Frederick Raymond Fletcher.

The autopsy was performed at 10:30 AM at the Columbia Funeral Home in the city of Langley on the 15th of March 1968.

The body was identified by Mr. A. Anderson as that found at the scene of the crash.

GROSS AUTOPSY FINDINGS:

The body was that of a middle-aged white male, which had received multiple injuries and which had been burnt extensively. The body was sufficiently burned that facial features could not be recognised. Most of the clothing had been burnt from the body.

There was a penetrating would in the right temple measuring approximately 1.5 cm. in diameter. The margins of this would were scorched however the adjecent would was fragmented and irregular in shape indicating penetration by a blunt object. The brain adjacent to the wound was macerated.

The anterior of the chest wall was badly burned with very little remaining of the pectoral muscles. Portions of the sternum and rib cage had been completely burned away, more so on the right side of the chest leaving a gaping hole some 7 CM. in diameter. The anterior abdominal wall had been burnt away and portions of the small bowel badly burned. The left leg had a jagged compound fracture just above the knee extending to the femur and most of the surrounding soft tissue. In addition there was a compound fracture of the tibia and fibula just above the ankle. On the right leg the skin of the thigh had been burned away and portions of the muscles remained only. The right foot had been burned off and portions of the charred calcaneous was all that could be identified. The limbs were badly scorched.

INTERNAL EXAMINATION:

THORAX: The lungs were partially collapsed and surrounded by congealed and hemolyzed blood. The lung parenchyma was partially burned and grossly distorted by heat.

HEART: There were three lacerations extending into the heart, one in the anterior surface of the right ventricle measuring approx 1.5 cm. in length, one in the anterior surface of the left ventricle measuring approx. 1 cm. in length, and one in the posterior surface of the left ventricle measuring approx 2 cm. in length. Each of these lacerations extended through the full thickness of the myocardium. Associated with these lacerations were lacerations in the pericardium. There were two major lacerations in the aorta, one just above the aortic valve, there was almost a complete transection of the aorta at this point.

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The second linear transection of the aorta curve in the arch extending a length of 4 cm. at the site of origin of the great vessels. No blood remained in the heart or the great vessels and repeated attempts of aspiration of all the major vessels in the body failed to produce sufficient blood for blood alcohol examination.

ABDOMEN: The abdomen was grossly distorted by the fire and all abdominal organs showed the effect of extreme heat with extreme edema and in some areas charring of tissues. Grossly the organs appeared unremarkable.

ANATOMICAL DIAGNOSIS:

1. SEVERE TRAUMA INCLUDING PENETRATING WOUND OF THE SKULL.
2. MULTIPLE FRACTURES TO LEGS.
3. MULTIPLE LACERATIONS OF HEART.
4. MULTIPLE LACERATIONS OF AORTA.
5. EXTENSIVE BURNS TO THE ENTIRE BODY.

CAUSE OF DEATH:

PENETRATING WOUND OF SKULL AND LACERATIONS TO HEART AND AORTA.

"A. E. GRANT"
A. E. Grant, M.D. - Pathologist

AEG:id

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APPENDIX 16

"E" Division
C.I.B.

YOUR No.
VOTRE Nº

OUR No. 68E-500-453
NOTRE Nº

Victoria, B. C.
29 May 1968

Regional Director,
Air Services,
Civil Aviation,
Department of Transport,
739 West Hastings Street,
Vancouver 1, B. C.

AIR SERVICES REGISTRY
VANCOUVER
MAY 30 1968
File 5002-715

Dear Sir:

Re: Par Frederick Raymond FLETCHER - Accidental Death (Aircraft Accident) - Nr. Aldergrove, B. C. - 14 March 1968

Further to my memorandum of 10 April 1968, attached please find a copy of Langley Municipal Detachment report dated 23 May 1968, covering the results of the Coroner's inquest.

Yours truly,

H. L. Jordan, Insp.,
Asst. C.I.B. Officer

Enc

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ROYAL CANADIAN MOUNTED POLICE - GENDARMERIE ROYALE DU CANADA

6880

C 237
REV. 1-4-66

OTHER FILE REFERENCES: REF. AUTRES DOSSIERS:	DIVISION	DATE	RCMP FILE REFERENCES: REF. DOSSIERS GRC:
PCR 27 Mar 68	"E"	23 May 68	68-500-25
	SUB-DIVISION - SOUS-DIVISION: New Westminster		
	DETACHMENT - DÉTACHEMENT: Langley Municipal		

RE: OBJET: Par Frederick Raymond FLETCHER, - Accidental Death (Aircraft Accident) 14 Mar 68, near Aldergrove, B.C.. (Org.)

s.19(1)

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1. On May 13th, 1968, at 7.30 P.M., the Inquest into the listed death was re-commenced at the Langley Mun. Det., court room and the following persons gave evidence as indicated;

(a) Dr. A.E. GRANT,(Pathologist) Sworn, gave evidence as indicated in pathological report referred to in para. #12 pcr dated 27 Mar 68.
(b) Cpl. W.J.STACEY, Sworn, entered photographs, and sketch, gave evidence as outlined in pcr dated 27 Mar 68.
(c) Mr. J.KEEFER,Mun. Soliciter, entered a Statement of Fact received from the D.O.T., via registered mail. The contents of said statement were read into the record of the proceedings and contained no information not already reported upon and contained in initial report listed above.
(d) [redacted] evidence as contained in his statement.
(e) [redacted] gave evidence as contained in his statement.
(f) [redacted] evidence as contained in his statement.
(g) [redacted] gave evidence as contained in his statement. He was cross-examined with particular reference to the direction in which he first saw the helicopter flying by the Mun. Soliciter J.KEEFER, however, he did not vary from his original statement even though the weight of the evidence put to him clearly indicated that he was confused.
(h) Mr. [redacted] worn, gave evidence as contained in his statement.
(i) Mr. [redacted], gave evidence as contained in his statement.
(j) Mr. James Edward MURPHY, Vancouver Manager for OK Helicopters Ltd., Vancouver, B.C., Sworn, gave evidence of being a qualified helicopter pilot, familiar with the type of machine involved in the accident. Testified that he knew FLETCHER (deceased) and on the day of the crash he had observed him prior to take-off and also at take-off at Vancouver, B.C.. MURPHY stated that FLETCHER appeared sober, normal and in good health, and that he (MURPHY) considered him to be a competent helicopter pilot. He also stated that he was very familiar with the type of aircraft involved, he considered the one that had crashed to have been in good shape and could offer no positive conclusions that would explain why the machine in question came down.

2. OK Helicpoters Ltd., Vancouver, B.C., were represented at the Inquest by Mr. David HUTTON, of the Law Firm of Campney, Owen & Murphy, Vancouver, BC..

3. Upon being instructed by the Coroner and after due deliberation the Jury returned the following Verdict; We the Jury find that Par Frederick FLETCHER died as a result of a helicopter accident on the Jackman Road hill, Langley Municipality, in the County of Westminster, in the Province of British Columbia between the hours of 11.30 A.M., and 12.00 Noon March 14th, 1968. The Deceased died as a result of a penetrating wound to the skull and lacerations to the heart and aorta. Cause of the accident was undetermined.

3. All Effects listed on form C246 have been returned to the next of Kin and the completed form properly signed and initialled is held on file at this point. No representative of the W.C.B., attended this Inquest. Concluded here.

(W.J.Stacey)Cpl.,

(W.L.M)Sgt.,
i/c Det..

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"E" Division
C.I.B.

YOUR No.
VOTRE N°

OUR No. 68E-500-453
NOTRE N°

Victoria, B. C.
10 April 1968

AIR SERVICES REGISTRY
VANCOUVER
APR 1 1968
File 5002-715-AA

Regional Director,
Air Services,
Civil Aviation,
Department of Transport,
739 West Hastings Street,
Vancouver 1, B. C.

Dear Sir:

Re: Par Frederick Raymond FLETCHER - Accidental Death (Aircraft Accident) - Near Aldergrove, B. C. - 14 March 1968

Attached for your information please find a copy of our Langley Municipal Detachment report dated 27 March 1968, statements obtained from eye witnesses to this crash and copies of photographs which were taken at the scene of the accident.

Our investigation thus far has failed to indicate any suggestion of foul play and it would appear that the accident was a result of a mechanical malfunction.

Copies of subsequent reports will be forwarded upon receipt.

Yours truly,

H. L. Jordan, Insp.,
Asst. C.I.B. Officer

Enc

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ROYAL CANADIAN MOUNTED POLICE - GENDARMERIE ROYALE DU CANADA

RCMP C 6880

C 237
REV. 1-4-66

OTHER FILE REFERENCES: REF. AUTRES DOSSIERS:	DIVISION "E"	DATE 27 Mar 68	RCMP FILE REFERENCES: REF. DOSSIERS GRC:
First here.	SUB-DIVISION - SOUS-DIVISION New Westminster		
	DETACHMENT - DÉTACHEMENT Langley Municipal		68-500-25

RE: OBJET: Par Frederick Raymond FLETCHER, - Accidental Death(Aircraft accident) 14 Mar 68, near Aldergrove, B.C.. (Org.)

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1. At 11:58 A.M., 14 MAR 68, Mr. Karl DORFLINGER, 7025 Jackman Road, Aldergrove, B.C. contacted this office to advise that a helicopter had just crashed and was burning on his property in bushland adjacent to his buildings in an area known locally as the Jackman Hill, and located roughly midway between the town site of Aldergrove, B.C. and the Fraser River.

2. The writer accompanied by Cst. O. Forsyth made an immediate patrol to the area, approaching from the north on Jackman Road, and Sgt. W. Maguire, alone in another transport approached the area from the south on Jackman Road. This approach was necessitated by prior knowledge of an extensive washout on the Jackman road on the hill in question where the road descends to the bottomlands adjacent to the Fraser River. D.O.T. and AIR SEA RESCUE were on stand-by, awaiting confirmation of the accident from this office. The Jackman Hill at the crash area is 263' above sea level, according to local records, and is actually part of a ridge that parallels the Fraser River for some miles in either direction.

3. Upon arrival on foot at the top of the hill on the DORFLINGER property, Cst. Forsyth and myself were directed to the bushland area of his farm, which is north of his buildings (see Appendix "G"), and upon entering the bush came almost at once upon the main rotor of the helicopter. Proceeding farther into the bush which thickened to heavy bush we came upon the main wreckage of the helicopter which was burning, and contained, also, the burning remains of what was obviously one human body. (See photo #3). It was apparent that the body in the wreckage was beyond medical aid, and considering the existing conditions, burning aviation fuel and molten metal, it was decided that any attempt to remove the body at this time would be a futile and pointless endeavour and presented unwarranted danger to those present. It had commenced raining heavily and the existing bush conditions, coupled with deteriorating ground conditions ruled out the possibility of bringing in heavy fire fighting equipment and the use of hand equipment would have been valueless.

4. Sgt. Maguire, after viewing the immediate scene, proceeded back to the DORFLINGER residence to contact our Identification Section, the Department of Transport, Air Sea Rescue Center, New Westminster S/Div., and Okanagan Helicopters, Vancouver, B.C. Cst. Forsyth was detailed to the road entrance of the DORFLINGER property to control anticipated pedestrian and vehicular traffic, which was increasing in volume. DORFLINGER was retained as a guard at the main crash site, and the writer carried out a perimeter search of the crash area, trying to establish how large an area was involved and required guarding pending the arrival of the D.O.T. investigators. Other persons at the scene at this time were, with the exception of DORFLINGER, eye-witnesses who arrived in a couple of instances prior to the police, or who had identified themselves to us and come into the area upon our arrival. They are listed as follows, and their respective statements are attached as indicated.

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(a) [redacted] Appendix 'A'.

(Cont'd Page two)

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RCMP 6881

CONTINUATION C-237
REV. 1-4-65

RE: Par Frederick Raymond FLETCHER - Sudden Death

PAGE two

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(Cont'd from Page One)

4. (b) [redacted] -

APPENDIX 'B'

(c) [redacted] &

APPENDIX 'C'

(d) [redacted]

APPENDIX 'D'

(e) [redacted] Appendix 'E'

(f) [redacted] Appendix 'F'

5. The Air Sea Rescue helicopter, from Canadian Forces Base, Comox, Vancouver Island, arrived at the scene at approximately 1:15 P.M., crewed by Capt's R.O. HUGHES and R. RASMUSSEN, Sgt. R.N. GIRARD, and Cpl's K. NED and FRANK, and placed themselves at our disposal. They examined the scene on the ground and aloft and concurred with the police actions taken. They also provided an expendable body bag for the subsequent removal of the human remains. As they could provide no further assistance they departed the scene within the hour.

6. The following representatives of O.K. Helicopter's Ltd., Vancouver, B.C. arrived on the scene via helicopter.

(a) William Donovan CROWE, Pilot and Assistant President

(b) Gordon ASKIN, Chief Engineer

(c) Roderick FRASER, Chief Inspector

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Upon identifying themselves, they were allowed into the crash area, and also placed their pilot and helicopter at the disposal of our Identification Section and the writer for the purpose of photographs (See photo #1) and for an air examination and view of the crash site.

7. The following members of the D.O.T. arrived on the scene by car.

(a) C. LEYLAND, Regional Superintendent Aircraft Accident Investigation

(b) T.M. YOUNG, Aircraft Accident Investigation

(c) Roy JOBLING, Aircraft Accident Investigation

and assumed responsibility for the investigation. They were advised of our actions thus far and shown where we had found the rotor, main wreckage, and other components and articles originating from the crashed helicopter. They were advised of the eyewitnesses located and arrangements were concluded for interviewing them on the 15 MAR 68 at the Detachment office. The following guards were hired to protect the scene for the D.O.T. members.

(a) Robert GRIFFITHS - [redacted]

(b) Karl DORFLINGER - [redacted]

(Cont'd Page three

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RCMP 6881

CONTINUATION C-237
REV. 1-4-65

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RE: Par Frederick Raymond FLETCHER - Sudden Death

(Cont'd from Page two)

7. Guards hired, cont'd -

(c) Larry James JOINSON - [redacted]

(d) Conrad MILLER - [redacted]

and the appropriate returns (Form F95) have been submitted.

8. The only articles picked up at the scene prior to the arrival of the D.O.T. members were Items #'s 1, 2 & 3, as listed on form C 246, and they were so advised. The other Items listed were obtained after their arrival and moved only upon receipt of D.O.T. approval.

9. Investigation disclosed that the pilot and only occupant of the helicopter was:

Par Frederick Raymond FLETCHER (Divorced)
c/o Mrs. C. CRUISE - 6376 Collingwood St., Vancouver, B.C.
Born : 30 APR 26, Moose Jaw, Saskatchewan
Next of Kin: Mr. Fred C. FLETCHER (father)
4231 - 8th Ave., Regina, Sask.
Employed by: O.K. Helicopters Ltd., Vancouver, B.C.

The helicopter involved and flown by FLETCHER was:

(a) Fairchild - Hiller

(b) Model # FH - 1100

(c) Canadian Registration # CF-WMO

(d) Owned by O.K. Helicopters Ltd., Vancouver, B.C.

(e) Valued at $120,000.00

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10. The identity of FLETCHER was tentatively established at the crash site and he was then removed to the Columbia Funeral Home, Langley, B.C. His identity was confirmed by his father 15 MAR 68, after viewing the remains and an engraved Masonic Ring removed from the body that he had personally given to his son. A fellow pilot - William Donovan CROWE - O.K. Helicopters also saw FLETCHER take off from Vancouver Airport and confirmed that he was alone at this time.

11. Investigation has disclosed that this flight commenced in Vancouver, B.C., and was unscheduled. FLETCHER was a stand-by pilot. It was being made to the Ruby Creek area near Agassiz, B.C., to take over the charter duties of another O.K. Helicopter that had also crashed on the 14 MAR 68. Information from eye witnesses indicate that the aircraft was proceeding in a normal manner (see attached appendices). All of them agree that initially there was a loud abnormal sound, and then the aircraft fell towards the ground and disappeared below the tree-line, with the main fuselage apparently separated from the main rotor. An explosive sound

(cont'd page four)

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(Cont'd from Page three)

11. Cont'd.....An explosive sound was then heard followed by a pillar of smoke. Examination of the scene and the immediate area disclosed the main rotor in one location, the main wreckage in another location (as indicated in para #3), components and fragments of same scattered widely over a considerable area in a line running N.W. to S.E. (See appendix 'G'). Regarding the initial loud abnormal bang heard by the witnesses, they were questioned closely on this point, and it was established, with some degree of constancy, that the sound was of a mechanical rather than explosive nature. There were no birds seen by witnesses. This, together with the fact that the flight was unscheduled would appear to rule out the possibility of foul play with regard to the aircraft or pilot. The scattered pattern of the wreckage would indicate that the aircraft came apart in the air, as the density of the brush would preclude such lengthy scattering when the fuselage struck the ground.

12. Coroner L.M. McDonald was contacted, ordered removal of the body, an autopsy and an inquest. The autopsy was performed by Dr. A.E. Grant, 10:30 a.m., 15 MAR 68, at the Columbia Funeral Home, Langley, B.C. He confirmed FLETCHER's death at the time of the crash and his findings were:

(a) ANATOMICAL DIAGNOSIS:

1. SEVERE TRAUMA INCLUDING ONE PENETRATING WOUND OF THE SKULL.
2. MULTIPLE FRACTURES TO LEGS.
3. MULTIPLE LACERATIONS OF HEART.
4. MULTIPLE LACERATIONS OF AORTA.
5. EXTENSIVE BURNS TO THE ENTIRE BODY.

(b) CAUSE OF DEATH:

PENETRATING WOUND OF SKULL AND LACERATIONS TO HEART AND AORTA.

13. The Inquest was commenced at 4:00 P.M., 15 MAR 68 at the Columbia Funeral Home, Langley, B.C. for viewing and identification only, Coroner L.M. McDonald presiding, with the following Jury:

s.19(1)

Jens Anton JENSEN -
James Harry WARMAN
Peter WONG
Donald James KLICK
Stephen GANGER - 10
Joseph Hartwell YOUNG -
Dennis Gerald HORGAN -

Witnesses: Father (Sworn) identified FLETCHER. Inquest was then adjourned to 13 MAY 68 to permit D.C.T. to complete their investigation.

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(Cont'd from Page four)

14. The body of FLETCHER was cremated at the Vancouver Crematorium, Vancouver, B.C., 18 MAR 68. The ashes are still in their custody and it is the wish of the next-of-kin that they be scattered over the mountains. O.K. Helicopter officials advise that within the next 6 weeks when conditions are favourable the ashes will be scattered in the Crown Mountain area north of the Grouse Mountains, North Vancouver, B.C.

15. Next-of-Kin advised. C.O. advised Re: Telex #NWR 426. Forms C 246 completed and attached, original held at this point. Photos taken by Ident. backed and attached, together with Forms C 164. Appendices attached, original statements of witnesses held this point. Sketch of scene attached (Appendix 'G'). The Workmen's Compensation Board are being supplied with particulars of this incident and also advised of Inquest date. The provisions of para #16, AER - reg OP. Man. were complied with.

s.19(1)

16. Further to the statement of [redacted] (appendix 'f') it will be noted that his time reference is 9:30 A.M. This was brought to his attention after all other available witnesses had been questioned by the writer and he admitted that he had erred and his time estimate should have been around 12:00 NN on the day in question.

S.U.I.

D.D. 15-6-68

(W.J.R. Stacey) #16069.
Langley Municipal Det.

for (W.I.M.) Sgt., A/C.
i/c Det.

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68NW 500-39
CO "E" DIV RCMP

FORWARDED 2-4-68, for your information. The file subject left Vancouver in the aircraft, destination Ruby Creek, B.C. While passing over the DORFLINGER property near Aldergrove, B.C., an abnormal sound was heard by witnesses. The rotor blades separated from the fuselage and the aircraft crashed to the ground and burned. The file subject, who was the pilot and alone, was fatally injured and burned.

2. There was no indication of foul play in this case and it was determined that there was a mechanical malfunction. Refer to paragraph 11 in this connection.

3. The results of the autopsy and cause of death are given in paragraph 12. Results of the Inquest are awaited.

4. Copy of statements, photographs, Forms C-164 and C-246, sketch of the scene of the crash are attached as noted in paragraph 15.

S.U.I.

(H.E. Bloxham) Supt.,
O.C. New Westminster Sub/Division

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RE: OBJET.
Par FLETCHER - Sudden Death

PAGE

APPENDIX 'A'

1:45 P.m., 15 MAR 68

s.19(1)

STATEMENT of [redacted]

On March 14th, 1968, a little bit before twelve, I was sitting with my friend, [redacted] on the dike at the bottom of the bluff. From where I was sitting the helicopter was crossing my field of vision. I heard the helicopter before I looked at it. I wouldn't have bothered to look at the machine except that I heard this unusual sound, like a sharp crack and when I looked the helicopter was in a steep dive, and above it at least a tree length distance, was some fluttering objects. The 'copter made no noise as it was falling, and there was silence until it hit the ground. Then there was a hell of a bang! A second or so later there was a dull whoosh and then the smoke rose in the air. There was nothing that I could hear or see in the sky at the time I looked at the helicopter. It was cloudy, with no rain and no wind where I was sitting. I don't know which way the helicopter was going, but it fell from west to east.

WITNESS:

Cpl. W.J. Stacey,
R.C.M.P.

(Signed) [redacted]

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RCMP-GRC 6881

CONTINUATION - SUITE DE C237
REV. 1-4-66

RE: OBJET. Par FLETCHER - Sudden Death

PAGE

APPENDIX 'B'

12:40 P.M. 15 MAR 68

STATEMENT of [redacted]

On March 14th, 1968, I was sitting with my neighbour at lunch time on the dike about a quarter mile from the crash scene at the bottom of the bluff. My neighbour is [redacted] We were talking and we heard the helicopter was heading east, it was chopping away normally. I heard it approaching only for a short time, at the very most only thirty seconds. I looked at it because the motor didn't sound right and was louder than the chopping noise. Then there was a sputtering and all noise stopped. I saw the helicopter tilting over fairly high above the tree line, surrounded by drifting chunks. Then the helicopter nosed down steeply. The machine dove straight down without whirling or tumbling, and went out of sight into the trees. There was a thud and then a whoosh. I did not see any smoke until after I got to the crash area. It was cloudy at the time and not raining. There was no wind where I was at this time.

Witness:

Cpl. W.J. Stacey

(Signed) [redacted]

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12:15 P.M. 15 MAR 68

STATEMENT of [redacted]

Around noon, I'm not sure of the exact time on the 14th day of March, 1968, I was in my barn with the tractor running, when I heard a loud noise. I ran outside and saw this helicopter heading into the ground, surrounded by a lot of debris in the air, that I thought was paper or fabric. The machine appeared to be intact, the tail and body was in one piece. I was looking southwest, and the helicopter was falling from my right to my left in an easterly direction at a very steep angle. I heard a thud and an explosion followed by a cloud of smoke. I did not see the aircraft hit the ground. I can't say whether it was raining or not, and it was cloudy. It was not windy where I was in the valley. There were no other aircraft or birds in the air while I was looking at the helicopter. When I first saw the helicopter it was something like a hundred feet above the trees at the top of the bluff.

s.19(1)

Witness:

Cpl. W.J. Stacey,
R.C.M.P.

(Signed) [redacted]

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s.19(1)

11:50 A.M. 15 MAR 68

STATEMENT of [redacted]

On March 14th, 1968, at approximately 11:45 A.M., I had just stepped out in front of the house, and saw a helicopter on the top of the Jackman Hill, just north of Dorflinger's house. The helicopter seemed to be going west toward Vancouver. It was about 75 feet above the tree tops. There was a loud hammering noise like when they turn, and then there was a sharp crack. The helicopter was flying straight and level. After the loud crack some long object flew off of the machine from the top of it. I was about a quarter of a mile away and looking uphill. The 'copter made a sharp right turn to the north, tilted over on its side and headed down nose first at about an 80° angle. The tail assembly was still on as far as I could still see. It disappeared in the trees and there was a loud thump, the trees hid any smoke that might have come from the ground. I saw no other objects come off of the machine. It was overcast, with a steady wind at this time. I think the wind was blowing west, and very light. I don't think it was raining. I saw nothing in the air except the helicopter.

Witness:

Cpl. W.J. Stacey,
R.C.M.P.

Signed: [redacted]

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11:15 A.M. 15 MAR 68

STATEMENT of [redacted]

Around ten minutes to twelve I was going into the house for lunch and it was kind of windy. I heard a helicopter and saw it coming from the direction of Vancouver. The engine sounded odd. I had a good view of it. The helicopter was way higher than the trees on top of the bluff. I saw something fly off of the machine, it was quite long and fell over the back of the plane and flew away. Then the body of the helicopter seemed to fall straight down in one piece into the trees and then there was a cloud of smoke accompanied with a thump. It was cloudy at the time, but quite clear. It was not raining. The machine looked orange coloured. The machine was flying straight and level. The only thing I saw in the air at this time was the helicopter. I would be about a mile and one half away from the plane when this happened.

Witness:

Cpl. W.J. Stacey
R.C.M.P.

(Signed) [redacted]

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CMP-GRC 6881

CONTINUATION - SUITE DE C237
REV. 1-4-66

RE: OBJET.
Par FLETCHER - Sudden Death

PAGE

APPENDIX 'F'

10:45 A.M. 15 MAR 68

s.19(1)

STATEMENT of [redacted]

On March 14th, 1968, at approximately 9:30 A.M., I was on Jackman Road, walking north towards Karl DORFLINGER's about one half mile south of his farm. I heard a helicopter coming over from the east. It was coming from the direction of Abbotsford. I looked up, saw the helicopter at about 200 feet high, flying in a straight line. I could hear the motor running, then all of a sudden I heard a bang and the helicopter was even with Jackman Road, and ahead of me. The bang was dull like stumping powder. Then the helicopter started to fall and went into the bush. I did not see anything come off of the helicopter. There was another crash, very loud, which shook the ground, and then I could see smoke. It was raining, not too hard, I do not recall any wind. It was fairly clear and not hard to see. When I heard the bang I was watching the helicopter, and I did not see any smoke come from it. It started to tumble end over end into the bush. I did not see any lights on the helicopter.

Witness:

Cpl. W.J. Stacey

(Signed) [redacted]

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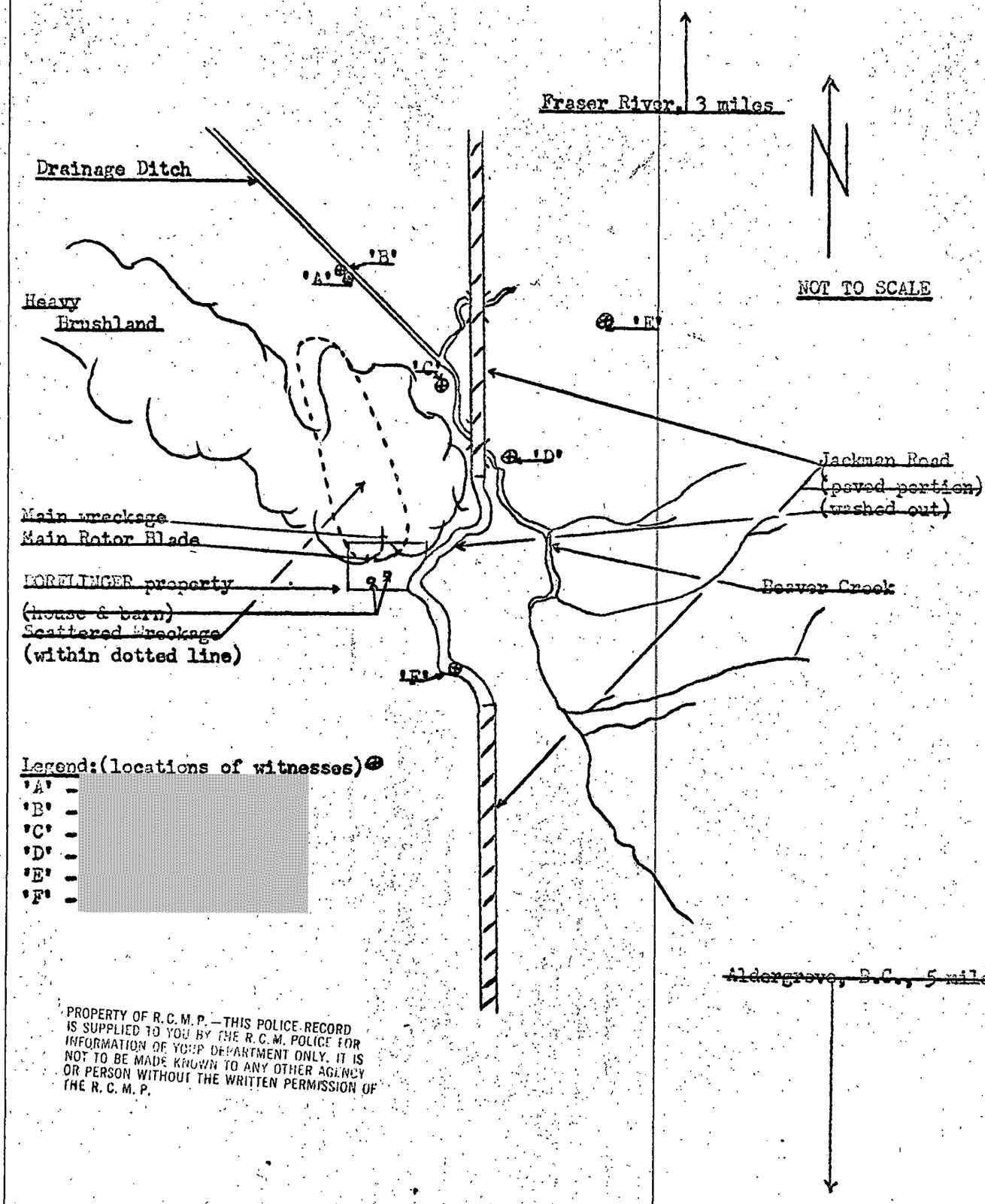
RE:
OBJET.

Par FLETCHER - Sudden Death

PAGE

APPENDIX 'G'



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APPENDIX 17

REGISTERED

5002-715 (AAV)

739 West Hastings Street,
Vancouver 1, B.C.
May 8, 1968.

The Coroner,
C/O R.C.M.Police,
Langley Municipal Detachment,
Box 280,
Langley, B.C.

Dear Sir:

The following is a statement of fact as determined in our investigation into the accident to Hiller FH-1100 helicopter, registration CF-NMO, March 14, 1968, approximately 5 miles east of Fort Langley, B.C., on behalf of the Department of Transport.

1. A Certificate of Registration had been issued for the helicopter and was valid at the time of the accident.

2. A Certificate of Airworthiness had been issued for the helicopter and was valid at the time of the accident.

3. The pilot held a valid Airline Transport Pilot Licence, endorsed for Hiller FH-1100 helicopters, and had adequate experience to conduct the flight.

4. Evidence at the accident scene indicates that the helicopter had started to disentigrate in the air. Parts of the helicopter and contents were strewn over a large area with the main rotor assembly located 420 feet southwest of the main wreckage. The helicopter fuselage had struck the ground, in a near vertical nose down attitude, and burned.

5. Examination of the wreckage shows no evidence of interior or exterior objects foreign to the helicopter having caused the initial breakup. Metallurgical examination of the main rotor shaft failure shows no evidence of material faults at the fracture.

6. The primary cause of this accident has not been determined and is still under investigation.

"R.J.J."
R. J. Jobling,
Accident Investigator

"Thomas M.Young"
T. M. Young,
Accident Investigator

000639

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APPENDIX 18

5002-715 (AAV)

739 West Hastings Street,
Vancouver 1, B.C.
May 15, 1968.

Fairchild Hiller,
Aircraft Division,
Hagerstown, Maryland.
U. S. A. 21740

ATTENTION: Mr. James G. Baker,
Supervisor, Field Services.

Dear Sirs:

RE: Accident Hiller FH-1100, CF-MMO
March 14, 1968

We are forwarding one copy of the completed wreckage scatter plot as requested by Mr. Baker, for your perusal and retention. We trust that this scatter plot will be of assistance to you in your investigation concerning this accident.

Also, with regard to the subject accident, we would appreciate receiving the performance data for FH-1100 helicopters requested from Mr. Baker, which was to include -

(a) the effects of rapid reduction of collective control during operation at or near Vne:

(b) the effects of moderate or extreme turbulence:

(c) the recommended Hiller procedure for turbulence penetration under unexpected conditions.

Your co-operation in providing this and any other information which you may have would be of great assistance in our investigation to determine the cause of this accident.

Yours truly,

"T. M. Young"

C. Leyland,
for Regional Superintendent,
Accident Investigation

ENCL

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APPENDIX 19

ADMA, OTTAWA
No. 3 Temporary Bldg.
ATTN: CAIE

5002-715 (AAV)

RDAS, VANCOUVER

July 18, 1968

ACCIDENT - Hiller FH-1100, CF-WMO
March 14, 1968.

1. As requested in our telephone conversation of July 12, 1968, we are sending you the meteorological data obtained from the Vancouver Weather Office.

2. We have also approached Mr. K. F. Harry, Regional Superintendent, General Weather Services, on the feasibility of having weather conditions recorded at the accident scene simultaneous with recordings at Vancouver and Abbotsford. His feelings are that more accurate and useful information could be obtained and conditions duplicated in wind tunnel tests. However, once we receive your letter outlining the information you require we will discuss this with Mr. Harry and be able to give you a more definite answer on the subject.

"T. M. Young"

for Regional Director, Air Services

ENCL

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APPENDIX 21.

and 22.

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Department of Transport,
Accident Investigation Division,
Engineering Laboratory,
Building U 62,
NRC Uplands Ottawa
ATTENTION J. Melson

5002-715 (AAV)

Dec.13,1968

RDAS, PACIFIC

ACCIDENT - Hiller FH-1100, CF-WMO

1. The following information has been obtained in answer to your questions regarding the above aircraft:

(a) We have not received the data covering the flight tests which were conducted for Fairchild Hiller Corporation on FH-1100 helicopters. This information will be forwarded when we receive same.

(b) Helicopter CF-WMO had the extended horizontal stabilizer installed at the time of the accident.

(c) Attached is a copy of Service Bulletin FH-1100 - 62 - 1 Removal of Stabilizer Extensions and a telex message from Fairchild Hiller to Okanagan Helicopters.

(d) Attached is a copy of Service Bulletin FH-1100 - 51 - 3 Inspection and Rework of Teetering Stops. Prior to the original issue of this SB, there was no requirement to check the teetering angles.

2. Operators have informed us that FH-1100 helicopters were operated on skid gear with the extended stabilizer because they would fly faster with less power due to the fuselage remaining in a more horizontal attitude in cruise.

3. We have a reported case of a pilot flying in cruise condition at about 120 MPH, and as he wanted to make a fast letdown into a mountain valley he lowered the collective control quite rapidly to go into autorotation. The helicopter immediately pitched nose down about 20-30° with a rapid buildup of speed. His recovery was effected by leaving the cyclic control in the position it had been and pulling on collective pitch. The helicopter recovered from the dive and the pilot then made a slow descent.

4. We will forward any other pertinent information as we receive it. If you have any other questions or require further information on the above please advise us.

D. M. Young
for Regional Director, Air Services

EM/Claim

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CF-WMO

M
CN TELS VCR TL⊙
ROTORS VCR

CNT NO CK
P DCTL FA HAGERSTOWN MD APRIL 12/68 445P EST
OKANAGAN HELICOPTERS, ATTN R G ASKIN
VANCOUVER BC
A CONCENTRATED ANALYTICAL AND FLIGHT TEST PROGRAM ON THE FH-1100 IS UNDERWAY TO DETERMINE IF A COMBINATION OF ENVIRONMENTAL DISTRUBANCE OVERSPEED AND CONTROL TECHNIQUE CAN CAUSE A SAFETY OF FLIGHT SITUATION PENDING RESULTS OF THIS PROGRAM OPERATORS ARE ADVISED TO 1. TEMPORARILY OBSERVE AN AIRSPEED LIMITATION OF NO MORE THAN 110 MPH AT ALL TIMES 2. AVOID ANY ABRUPT CONTROL MOVEMENTS WHEN FLYING IN TURBULENCE
FIARCHILD HILLER J E BURKE

FH-1100 1. 110 2.
220P PST

CN TELS VCR TL⊙
ROTORS VCR

Telecon Planned St. Rosemarie 14:00 hrs 16/4/68 re The above

Okanagan

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Fairchild Hiller

Fred — RJ
Dave — Dave
Frank — FR
Keith — K.R.
Stu — SKS

O
ROTORS VCR

FAIRHILL HAG B

TLX PD HAGERSTOWN MD 5/29/68
MR GLEN MCPHERSON
OKANAGAN HELICOPTERS
VANCOUVER BC

CONCERNING THR STATUS OF THE COMPANY SPONSORED FH-1100 ACCIDENT INVESTIGATION THE FOLLOWING MAY BE REPORTED

1. OVER THE PAST MONTH FAIRCHILD HILLER CORP HAS CONDUCTED AND IS CONTINUING EXTENSIVE FLIGHT TESTING AND ANALYTICAL INVESTIGATION INTO POSSIBLE COMBINATIONS OF FLIGHT MODES AND ENVIRONMENTAL CONDITIONS WHICH COULD LEAD TO A FLIGHT SAFETY SITUATION IN THE FH-1100
2. THESE TESTS AND STUDIES ARE NOT YET COMPLETE BUT SO FAR RESULTS INDICATE THE MOST CRITICAL FLIGHT CONDITION IN THE FH-1100 IS THE TRANSIENT MODE BETWEEN FORWARD FLIGHT AND AUTOROTATION IN TURBULENT ENVIRONMENTAL CONDITIONS.
3. TO IMPROVE THE MARGIN OF SAFETY IN THIS FLIGHT MDE TWO FILED SERVICE BULLETINS PLUS A FLIGHT MANUAL REVISION WILL BE ISSUED DURING THE NEXT THIRTY DAYS. BULLETIN NO. 51-3 WILL CALL FOR EACH OPERATOR TO INSPECT AND INSURE THAT MAIN ROTOR TEETER STOPS ARE PER FH-1100 SPEC. BULLETIN NO,Z. 62-1 WILL CALL FOR A MODIFICATION TO THE HORIZONTAL STABILIZER.
4. COMPLIANCE WITH THE TWO SERVICE BULLETINS PLUS FAA APPROVAL OF THE FLIGHT MANUAL REVISION SHOULD RESULT IN EVENTUAL REMOVAL OF THE SELF-IMPOSED SPEED RESTRICTION.
5. IN THE INTERIM OPERATORS ARE URGED TO A.OBSERVE THE EXISTING VNE RESTRICTION B. AVOID ABRUPT CONTROL MOVEMENTS AND C. APPORACH THE TRANSIENT MODE BETWEEN FORWARD FLIGHT AND AUTOROTATION WITH CAUTION

FAIRCHILD HILLER
B S DAVIS
DIRECTOR OF SERVICE

O
ROTORS VCR

FAIRHILL HAG B

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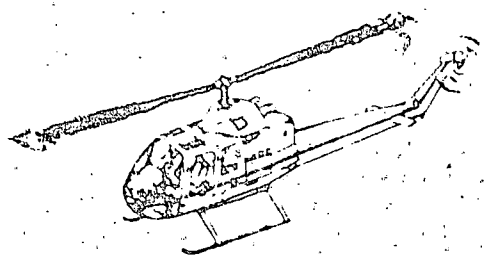

FH-1100

Service Bulletin

MAIN ROTOR ASSEMBLY

INSPECTION AND REWORK OF TEETERING STOPS P/N 24-51423-1 & -13, & P/N 24-51441-21, -23 & -25

1. PLANNING INFORMATION.

A. Effectivity.

Model	Manufacturer's Serial Numbers
FH-1100	10, 12 through 14, 16 through 24, 26 through 29, 31 through 52, 54 through 72, 74 through 84, 86 through 97, 101, 108, 111, 112, 114 through 116, 118 and 120.

Aircraft MSN 9, 11, 15, 25, 30, 53, 73, 85, 98 through 100, 102 through 107, 109, 110, 113, 117, 119, 121 and subsequent will have this modification incorporated prior to delivery.

B. Reason. To inspect and insure the proper manufacturer's specification of the teeter angular dimension.

C. Description. The contents of this bulletin describe the inspection and rework, if necessary, to the teetering stops to assure that the main rotor head has the specified angular movement.

D. Compliance. Within the next 25 hours of flight or two weeks whichever occurs first and concurrently with any replacement of main rotor hub and/or teeter stops on FH-1100 helicopters.

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E. Approval.

Engineering C. Newell

Airworthiness H. Hockett

Service J. E. Burke

F. Manpower. Approximately five (5) man-hours required for inspection and rework.
(a) Inspection - 1 man-hour
(b) Rework - 4 man-hours

G. Material Cost and Availability. No kits involved. Material to be furnished by operator.

H. Tooling. None.

I. Weight and Balance. The weight and balance change resulting from this modification is negligible.

J. Reference. FH-1100 Service Manual
FH-1100 Parts Catalog

2. ACCOMPLISHMENT INSTRUCTIONS.

NOTE: The following instructions are Fairchild Hiller recommended procedures for accomplishing the inspection and rework contained in this bulletin. Deviations from this procedure are permissible, provided the full intent of the bulletin is accomplished.

A. Inspection.

(1) Ascertain that the teetering stops (24-51423-1 or -13 or 24-51441-21, -23 or -25) are properly installed by insuring that the stops are against the inside radius of the hub. (Figure 1) If a gap exists between the stop and hub, loosen bolts and push stop outboard. Retighten bolts.

(2) Pull the tip of one blade downward until contact is made between the stop and the rotor mast. Hold blade in this position.

(3) Measure the angle of the rotor mast with a propeller protractor. Measure the angle of the lower surface of the rotor hub. The difference between the two readings should allow a teetering angle of 10° (+30' -0').

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(4) Repeat steps (2) and (3) for the opposite blade.

(5) If the inspection performed does not allow a teetering angle to fall within the prescribed limits: If under remove the teetering stops (24-51423-1 or -13 or 24-51441-21, -23 or -25) from the rotor hub and rework per Part B. If over, replace stop(s) and proceed in accordance with paragraph 2.A.

CAUTION: Blade ends should be supported when teetering stops are removed.

B. Rework.

(1) Position teetering stop in a vise. Using a three-inch diameter drum sander installed in a hand drill or drill press, sand the area of the stop that contacts the rotor shaft. Remove as little material as necessary to increase the angle of teeter. Maintain same profile on stop surface being reworked. See Figure 1. Exercise caution not to remove material in excess of tolerance.

(2) Install teetering stop and repeat step (2) and (3) of Section A.

(3) Repeat steps (1) and (2) of Section B as often as necessary to produce the required teetering angle for both stops.

(4) When all rework is completed, remove all sharp edges in rework area by maintaining a .06-.07 radius. Penetrant inspect per MIL-I-25135.

(5) Anodic coat per MIL-C-5541A, Grade B, Type I (brush application) rework area of stops.

(6) Zinc Chromate two coats (MIL-P-8585).

(7) Finish with two coats of silver lacquer (TT-L-32).

(8) Color match mark hub and teeter stop using same code as for balancing, i.e., paint blue and/or yellow stripes 1/4" wide on hub and stops to match blade markings. (See Figure 1.)

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C. Re-installation.

(1) Install teeter stops against the lower side of the rotor hub assembly with four (4) bolts (AN6-11A), four (4) washers (AN960-PD416) and four (4) nuts (MS20365-624A).

(2) Ascertain that the back of the stop is against the inside radius of rotor hub. (Figure 1.)

(3) Torque bolts to 160-190 pound-inches.

(4) Repeat angular dimension inspection in accordance with paragraph 2.A.

(5) After compliance, make entry in aircraft log, and fill out the attached sheet and forward to Service Manager, Fairchild Hiller Corporation, Aircraft Division, Hagerstown, Maryland 21740.

(6) Note at bottom of page 51-3 of FH-1100 Service Manual - "Refer to S.B. FH-1100-51-3 for Main Rotor Hub and/or Teeter Stop Replacement."

3. MATERIAL INFORMATION.

*MIL-P-8585	A/R	Zinc Chromate
*TT-L-32	A/R	Silver Lacquer
*MIL-C-5541A	A/R	Brush-On Anodize

*Operator furnished.

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FAIRCHILD HILLER
FH-1100
SERVICE BULLETIN

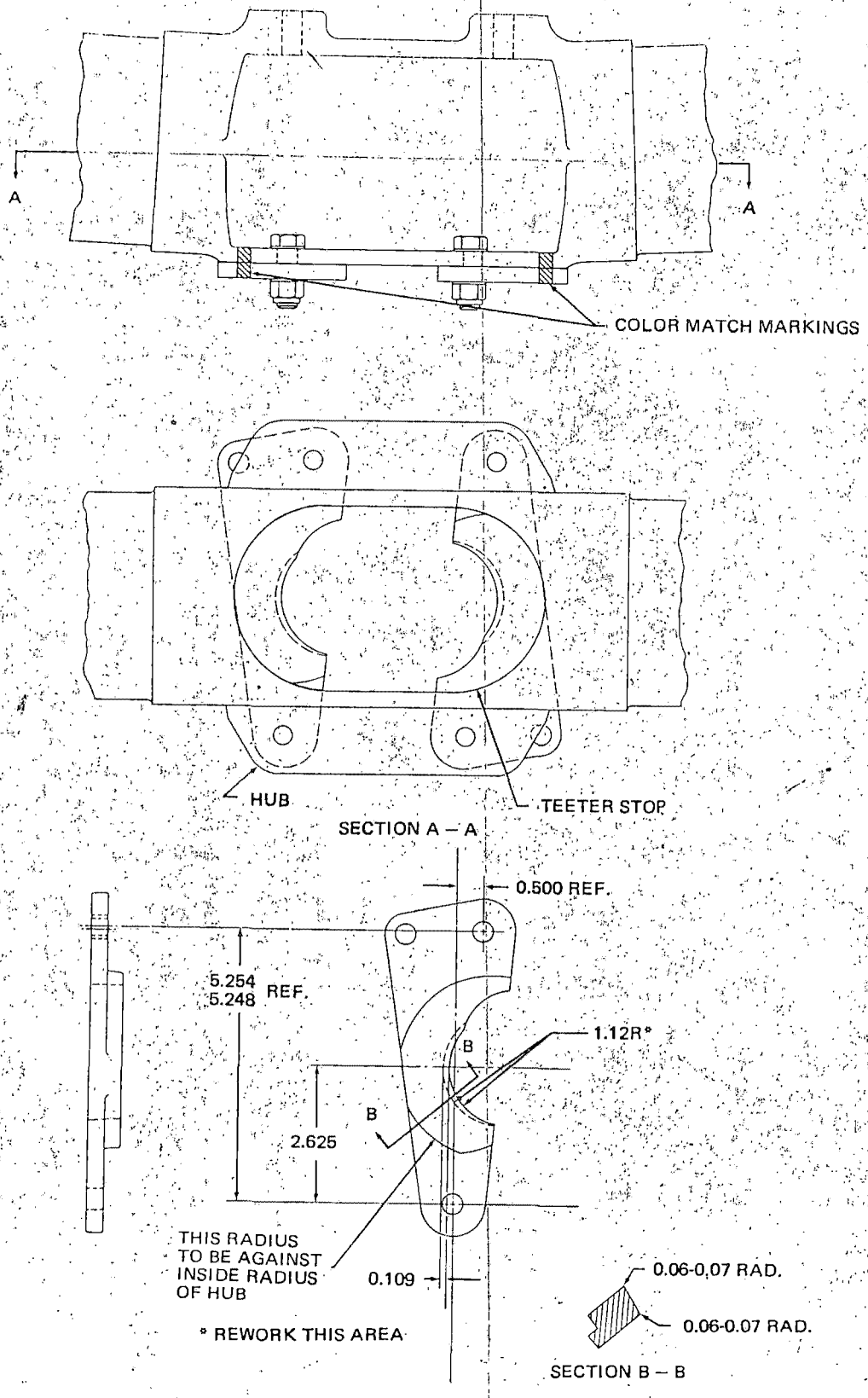

Figure 1

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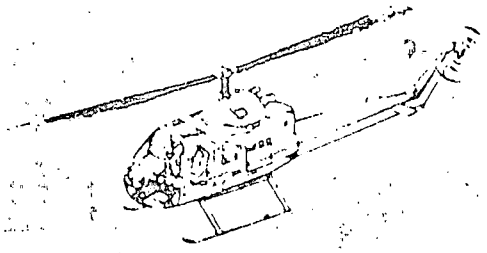

FH-1100

Service Bulletin

TAIL BOOM

REMOVAL OF STABILIZER EXTENSIONS

1. PLANNING INFORMATION.

A. Effectivity.

Model	Manufacturer's Serial Numbers
FH-1100	All aircraft which have extended stabilizers installed and which are operating without inflatable floats.

Aircraft MSN 25, 30, 48, 55, 73, 98 through 106, 109, 110, 117, 121, 122, 124 through 129, 131, 135 and 137 and subsequent will have this modification incorporated prior to delivery if inflatable floats are not specified per Sales Order.

B. Reason. To improve body stability of non-float equipped FH-1100 Helicopters when entering autorotation.

C. Description. The presently installed extended stabilizer is to be reworked to remove the right and left extensions, to install modified fairings, and to stow the position light wiring.

D. Compliance. Within 25 flight hours or two weeks from receipt of kits, whichever occurs first.

E. Approval.

Engineering A. Bonnell

Airworthiness H. Hoelett

Service J. Burke

F. Manpower. Approximately 5.0 man-hours per aircraft.

Document disclosed under the Freedom of Information Act

G. Material Cost and Availability. Kit, P/N SBK-FH1100-62-1A, -62-1C, -62-1B containing the necessary parts to accomplish this modification will be shipped to operators free of charge.

H. Tooling. None.

I. Weight and Balance.

Weight Change	-3.5 pounds
Horizontal Arm	+279.5 inches
Horizontal Moment	-978 pound-inches

J. Reference. FH-1100 Service Manual
FH-1100 Parts Catalog
FH-1100 Flight Manual

2. ACCOMPLISHMENT INSTRUCTIONS.

NOTE: The following instructions are Fairchild Hiller recommended procedures for accomplishing the changes contained in this bulletin. Deviations from the procedures herein contained are permissible, provided the full intent of the modification is accomplished.

PART A. REWORK INSTRUCTIONS.

A. Remove right and left horizontal stabilizer tips. Remove the 12 clips (SL201-5AA11) used as attachment hardware of the tip to stabilizer and retain.

B. Disconnect wires from position lights on stabilizer.

C. Remove screws and washers attaching stabilizer extensions to stabilizer and remove extensions.

NOTE: Pull the wiring through the extension trailing edge only and bundle for re-attachment at the stabilizer trailing edge.

D. Install the 12 clips (SL201-5AA11) removed in Step A. in their original position on the horizontal stabilizer. Right and left sides. Reference Figure No. 1.

E. Remove screws, blocks and nuts securing the fairings and gaskets. Remove fairings and gaskets, right and left side.

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F. Install new horizontal stabilizer fairings with gaskets on tail boom. Bond gaskets to fairings with Pliobond adhesive or equivalent.

NOTE: Fairings, P/N 24-62000-915 and -916, must be drilled in accordance with instructions in Figure No. 2 and 3.

G. Bond two wedge shaped blocks (24-62000-195) to each stabilizer fairing at the aft fairing-to-stabilizer attach bolt location (one block on top side of fairing and one on bottom side). Use Pliobond adhesive or equivalent.

H. Drill .190 - .196 inch diameter holes through fairings and blocks to match four existing holes in horizontal stabilizer. Spotface blocks to 9/16 inch diameter.

I. Secure horizontal stabilizer to fairings.

J. Position stabilizer tips to horizontal stabilizer.

K. Position the two wire leads, (from stabilizer trailing edge) to the tip position light, and tape and stow excess wire.

NOTE: The excess amount of lead, approximately one foot, to be retained to allow for reinstallation of extended stabilizer in event a float installation is desired.

L. Install stabilizer tips utilizing same hardware from removal.

M. Install screws (AN5158R4), 24 places, in shur-loc nuts left open by extension removal. Notch tip assembly as necessary to clear above screw heads.

N. With power on aircraft, check operation of position lights.

O. After compliance, make appropriate entry in aircraft log and fill out the attached sheet and forward to Service Manager, Fairchild Hiller Corporation, Aircraft Division, Hagerstown, Maryland 21740.

Document disclosed under the Access to Information Act

3. MATERIAL INFORMATION.

The following parts and materials are required to accomplish this modification and can be obtained as a kit:

New Part No.	Qty.	Key Word	Old Part No.	Disposition
24-62000-229, -230 Kit A.	2	Fairings (A/C 60 and sub.)	-310, -309	Retain for use in float installation.
24-62000-315, -316 Kit B.	2	Fairings (A/C 60 and sub.)	-313, -314	Retain for use in float installation.
	2	Stabilizer Extension	24-62037-1	
24-62000-915, -916 Kit C.	2	Fairings (A/C 9 thru 59)	-313, -314	Retain for use in float installation.
	24	Washer	AN960-8	Operator's Option
**Pliobond or Equivalent	A/R	Adhesive		
24-62000-85	2	Gasket		
24-62000-195	4	Block		
MIL-L-23053A	A/R	Tubing, Vinyl Heat Shrinkable 1/4" I.D.		
*24-83051	2	Gasket		
*24-83084-3	2	Support Assembly		
*AN507-440R8	4	Screw		
*AN515-4R8	2	Screw		
*AN525-10R7	18	Screw		
*AN525-10R16	2	Screw		
*AN960PD4L	6	Washer		
*AN960-8L	12	Washer		
*AN960-PD10L	2	Washer		
*MS27039-0805	12	Screw		
*NAS623-3-31	2	Screw		
*MS21042L04	6	Nut		
**AN5158R4	24	Screw	MS27039-0804	Operator's Option

*Existing parts to be reused.

** Operator furnished.

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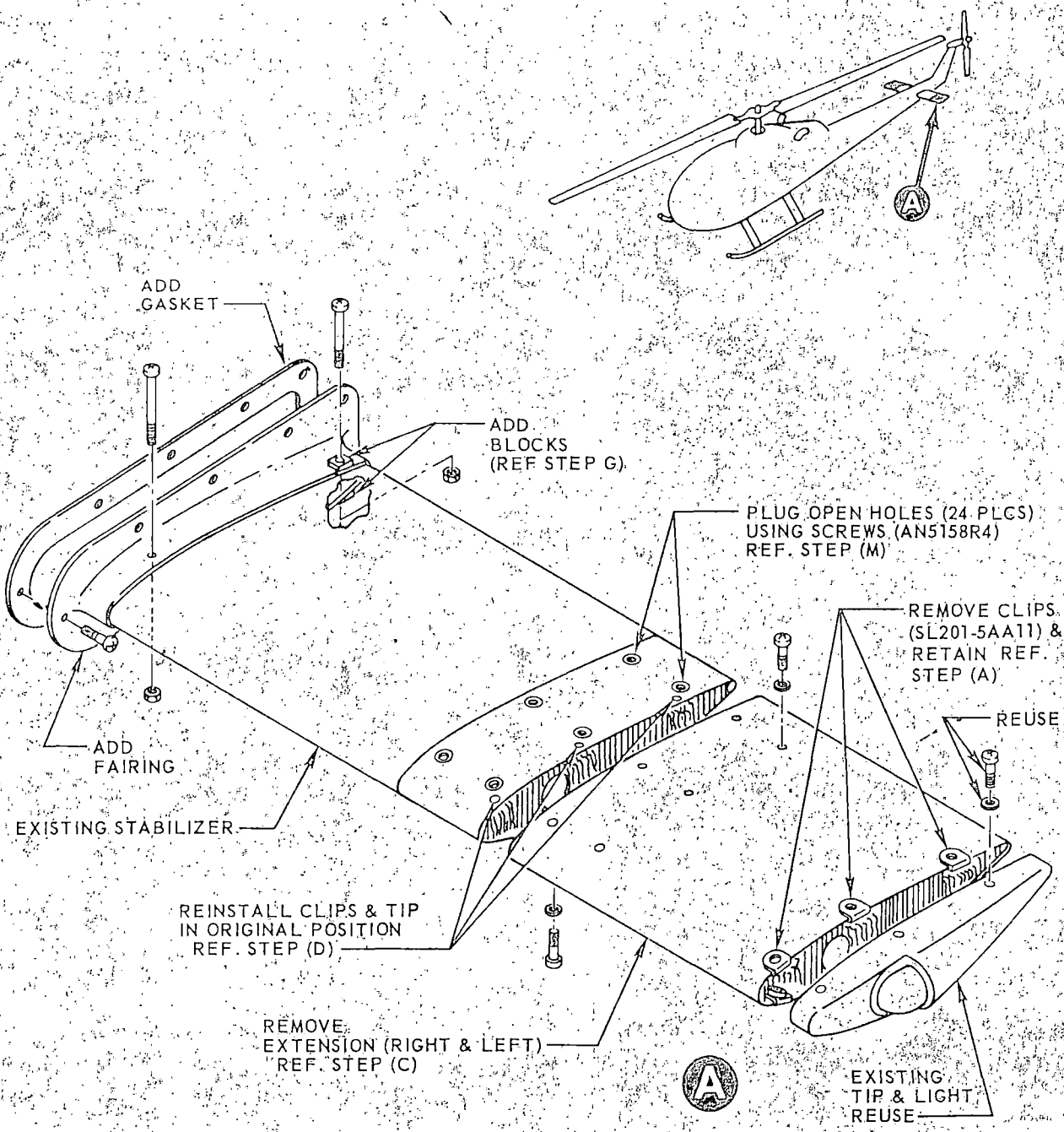

Figure 1

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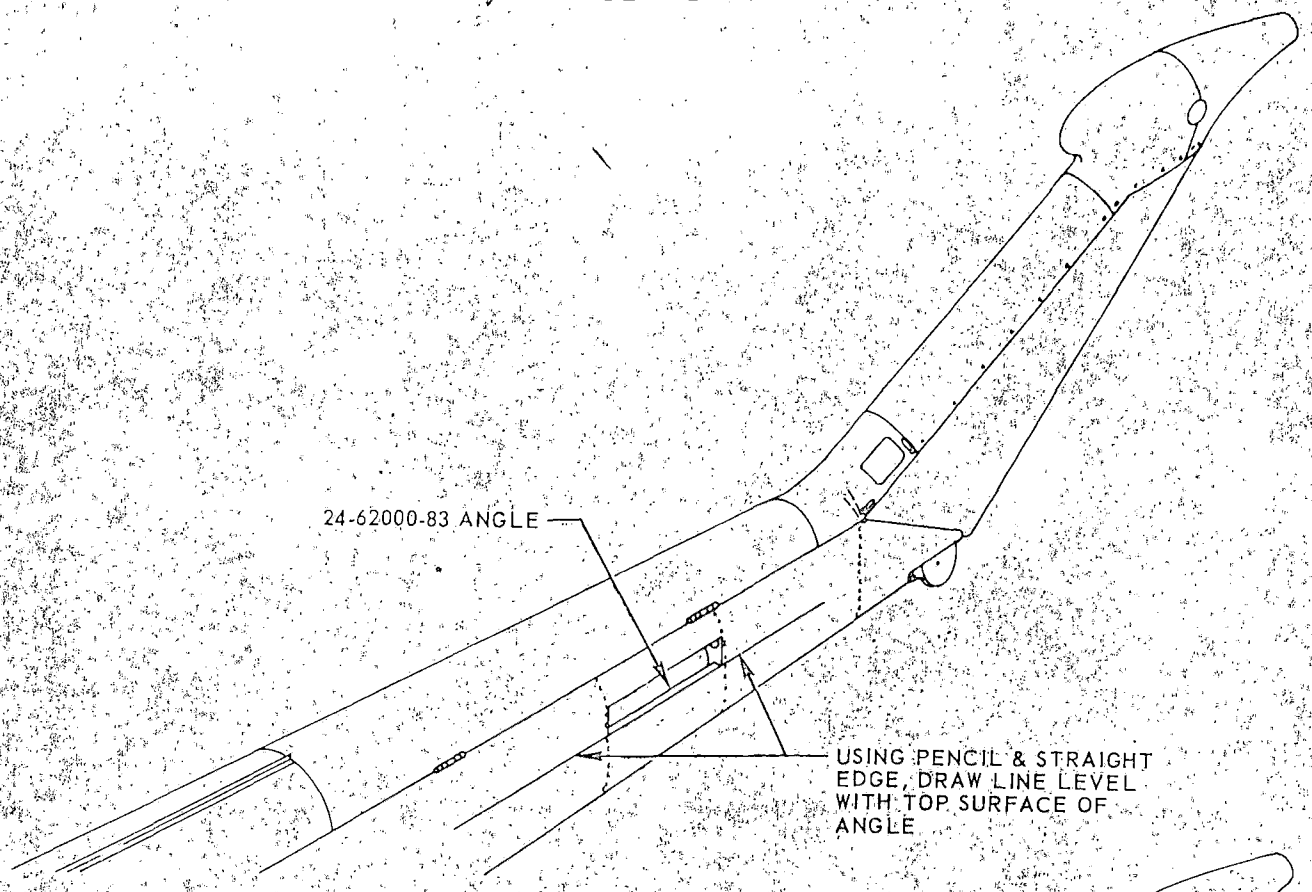

Figure 2

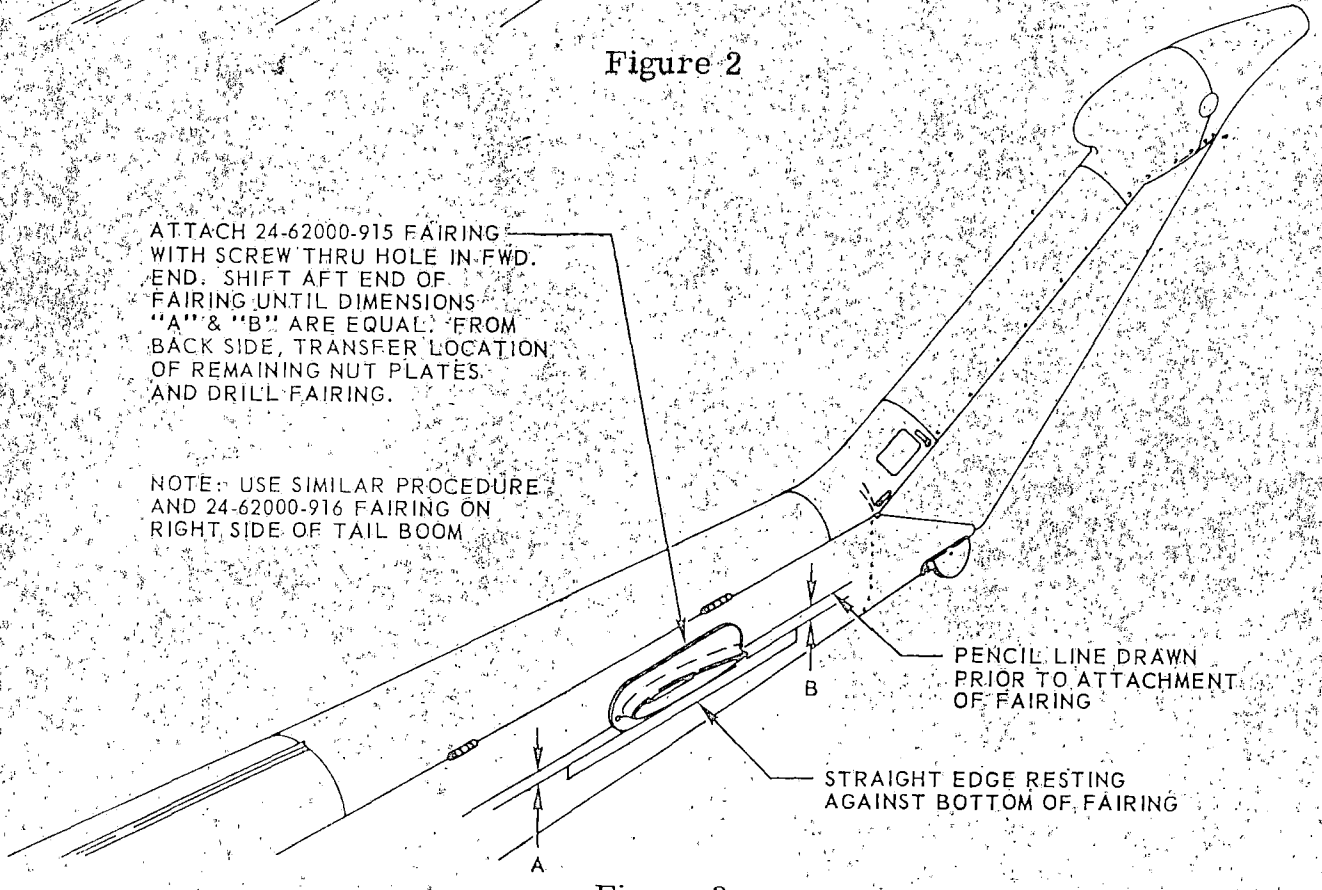

Figure 3

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APPENDIX 22

Registration	Purchased	OKH Bulletin #43	OKH Bulletin #54	OKH Bulletin #70
OKR	Jan. 6/68	June 6/68 605:30 hours 10° each blade	June 6/68 605:30 hours	July 20/68 859:45 hours
WMF	Jan. 15/68	May 27/68 133:00 hours 18 1/2°	June 15/68 195:20 hours	July 25/68 325:05 hours
WMG	Jan. 15/68	May 16/68 185:15 hours 19° stop to stop	June 6/68 220:55 hours	July 15/68 313:00 hours
WMH	Jan. 15/68	Jan. 7/69 177:40 hours	June 7/68 220:55 hours	Jan. 7/69 177:40 hours
WMJ	Jan. 15/68	May 18/68 114:15 hours 20°	June 7/68 161:00 hours	Aug. 7/68 242:35 hours
WMK	Jan. 15/68	May 17/68 63:05 hours 17.8°	June 23/68 125:35 hours	Aug. 7/68 168:45 hours
WML	Jan. 15/68	May 20/68 107:50 hours 18°	June 17/68 152:15 hours	July 23/68 247:15 hours
WMM	Jan. 15/68	June 2/68 123:20 hours 18°	June 8/68 135:00 hours	Oct. 31/68 560:00 hours
WMN	Jan. 15/68	May 18/68 207:25 hours 15°	June 21/68 307:25 hours	July 12/68 374:10 hours
WMO	Jan. 15/68			

NOTE: The original S.B. FH1100-62-1 was issued June 17/68 and received in this office June 25/68 and was sent out the same day.

Okanagan Bulletin #54 is the same as S.B. FH1100-51-3

Okanagan Bulletin #70 is the same as S.B. FH1100-62-1

Document divulgué en vertu de la [illegible]

5005-3796

OTTAWA
AFRADIO

MAR 17 '70 12 52 CAIE

ZCZC OHA045

JJ CYHQYY

170024 CYVRRO

CAIE OTTAWA

PCAI 210. REF HELICOPTER ACCIDENT HILLER FH 1100 CHARLIE FOXTROT DASH WHISKEY MIKE OSCAR AND OUR TELECON REGARDING HYDRAULIC ACTUATORS. LATERAL CYCLIC POWER CYLINDER S/N T-601. LONGITUDINAL CYCLIC POWER CYLINDER S/N T-525. COLLECTIVE POWER CYLINDER S/N X-159. TEST REPORT WITH NUMBERS WAS ALSO ATTACHED TO ACCIDENT REPORT AS APPENDIX 13.

PCAI VANCOUVER

CONFIRMATION COPY
Phoned to MD ..... by JL

NNNN

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WH-89

5002-3796 (CAIO)

Ottawa, Ontario,
26 February, 1970.

AIR MAIL

Mr. W. Harms,
Airworthiness Coordinator,
Fairchild Hiller,
Helicopter Development Center,
Farmingdale, Long Island,
New York 11735,
U.S.A.

Dear Sir:

This refers to your letter of February 18, 1970, asking for a copy of the final report of the accident to FH-1100, CF-WMO.

Please be advised the report of this accident has not yet been completed. We will be pleased to forward you a copy as soon as the report has been approved.

Yours truly,

H.A. Fawcett,
for Chief, Accident Investigation,
Civil Aviation Branch.

HAF/SG

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5002-3796

FAIRCHILD HILLER
HELICOPTER DEVELOPMENT CENTER

34925

February 18, 1970

Ref: WH-89

CA1

Mr. R. L. Bolduc
C.A.I.E.
Civil Aviation Branch
Department of Transport
No. 3 Temporary Building
Ottawa, 4, Ontario,
CANADA

Dear Mr. Bolduc:

Fairchild Hiller Corporation desires to obtain information on the findings of your investigation into the accident of FH-1100 helicopter, CF-WMO in British Columbia, March 14, 1968. Specifically, we are interested in obtaining your conclusions on this accident and a copy of your final report, when it is released.

Please advise the writer of the expected availability of the report and any billing which you will require.

Very truly yours,

W. HARMS
Airworthiness Coordinator

WH:beg

FARMINGDALE, LONG ISLAND, NEW YORK 11735

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P.C.A.
VANCOUVER

5002-715
5008-WMO (PCA)

5002-3796 (CAIO)

C.A.I.
OTTAWA

12 February, 1970.

Accident - Hiller FH-1100, CF-WMO
- 14 March, 1968

1. Reference your memorandum of January 30, 1970, concerning the status of the report of the subject accident.

2. It appears that all the information required is now available and the report is being prepared. I hesitate to predict a precise date, but we will likely provide a copy to Mr. Kennedy by the end of March.

H.A. Fawcett

H.A. Fawcett,
for Chief, Accident Investigation.

HAF/SG

000663

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MEMORANDUM

CLASSIFICATION

TO
A

CAI, OTTAWA

YOUR FILE No.
Votre dossier
5002-396
33045

OUR FILE No.
Notre dossier
5002-715(PCA)
5008-WMO

FROM
De

PCA, VANCOUVER

DATE January 30,1970

FOLD

SUBJECT
Sujet

Accident Hiller FH 1100 CF-WMO - March 14, 1968

CAIO

1. Mr. Ian Kennedy of Okanagan Helicopters has been in touch with this office in respect of the subject accident.

2. They have a number of outstanding matters arising from this accident and are most interested in learning when the accident report will be available. It would be appreciated if you could advise the anticipated date when the report will be completed.

W. M. Johnson,
Regional Controller, Civil Aviation

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CAI
20
11

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NATIONAL TRANSPORTATION SAFETY BOARD
DEPARTMENT OF TRANSPORTATION
WASHINGTON, D.C. 20591

5004-4-1

January 21, 1970

CA10

32144

Mr. W. M. Johnson
Civil Aviation Branch
Department of Transport
Ottawa, Ontario, Canada

Re: your file: 5002-3796 (CAIO)
5002-3822
5002-3786

Reference: Aircraft accident - Goliad, Texas
April 3, 1968

We are enclosing a copy of the factual report(s) of investigation concerning the referenced aircraft accident about which you inquired.

We will send a copy of the Board's determination of probable cause when it is issued.

Administrative Operations Division
Accident Inquiry

Enclosure(s)

Document disclosed under the *Access to Information Act*
Document divulgué en vertu de la *Loi sur l'accès à l'information*

CATO 4/11

Document disclosed under the *Access to Information Act*
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NE-513

NATIONAL TRANSPORTATION SAFETY BOARD
Bureau of Aviation Safety
Washington, D. C.

August 1, 1968

TECHNICAL SERVICES SPECIALIST'S FACTUAL REPORT 69-1

A. ACCIDENT

Location: Goliad, Texas
Date: April 3, 1968
Aircraft: Fairchild Hiller FH-1100, N512FH

B. INVESTIGATOR

Frank E. Schretter, NTSB, FTW

C. SUMMARY

Microscopic examination of the fractured surfaces and detailed chemical analysis and laboratory testing failed to disclose any malfunction. A partial overload fracture existed in the main rotor drive shaft and a separation occurred in the input gear shaft assembly. The planetary spur gears in both the 2nd and 3rd stage planetary assemblies were damaged by intermeshment of foreign material.

D. DETAILS OF INVESTIGATION

The following listed components and parts were recieved for detail examination:

Oil samples from main rotor trunion bearing block and inside of aft cabin door.
Two segments of Main Rotor Blade; P/N24-53100-2
Fractured Incident Arm; P/N24-51406
Input Incident Arm Rod Assembly; P/N24-30206-47
Three Sections of Center Housing Assembly; P/N23024-5
Spur Ring Gear; P/N24-23050-7
Upper Flight Controls and Rotor Installation; P/N24-30001-3
Input Gear Shaft Assembly with 456992 and ESJ7234-90 Bearings; P/N24-23072-5
Planetary 2nd Stage Gear Assembly; P/N24-23005-11
Planetary 3rd Stage Gear Assembly; P/N24-23006-11
Upper Housing and Shaft Assembly; P/N24-23001-11
Collective Power Cylinder; P/N9710, S/NS-153
Cyclic Power Cylinder (Tandem); P/N9720, S/N&-106
Cyclic Power Cylinder (Tandem); P/N9720, S/NT-111
Irreversible Hydraulic Valve; P/N8810, S/N132
Relief Valve; P/N8720, S/N32

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D. DETAILS OF INVESTIGATION (cont)

The oil samples were submitted to the Materials Laboratory, U. S. Naval Air Rework Facility for identification. The infrared spectra and chemical tests, etc., revealed the oils were predominately MIL-L-23699. However, a small percentage (approximately 10 percent) was MIL-L-7808. To ascertain the origin of the blood stains, as to whether fowl or human, the main rotor blade segments were submitted to the FBI Laboratory. Blood of human origin was identified. The fracture surfaces that existed in the above listed components and parts were examined in the Metallurgical Laboratory which disclosed the failures occurred from either tension or torsion overload with the exception of the input gear shaft assembly. This shaft separated approximately $5\frac{1}{2}$ inches above the lower female splined end that accepts the upper end of the tail rotor output pinion shaft (P/N24-23183-1). Microscopic examination of the separated surface disclosed the failure occurred as a result of internal abrasion and overload. The immediate area at and below the fracture was bellmouthed and numerous circular abrasive cuts existed in the internal surface extending downward to approximately $\frac{1}{4}$ inch below the four oil/ lightening holes. Although the shaft and both bearings (P/N456992 and ESJ7234-90) were subjected to an intense fire, no fracturing of the rollers or ball bearings occurred, all bearings remained intact in their respective raceways. As an overload partial fracture existed in the main rotor drive shaft (P/N24-23070-7), in the area adjacent to one of the main rotor teetering stops (P/N24-51423-1), a 3/4 inch section of the drive shaft was cut and removed approximately $1\frac{1}{2}$ inches below the fracture for hardness testing. The hardness measurements obtained on this specimen averaged Rockwell "C" 38. The manufacturers hardness specification requirement for this shaft is Rickwell "C" 36-40. No damage or distortion occurred to the planetary drive teeth.

Examination of the 2nd stage planetary gear assembly disclosed an overload separation fracture, approximately $2\frac{1}{2}$ inches, occurred in the circumference of the outer raceway of the 8294 bearing. The four planetary spur gears and bearing assemblies remained intact in the 24-23081-7 carrier although small half circular impressions existed in the apexes of three teeth on one of the spur gears. The 24-23195-1 planetary gear retainer ring for the intact sun gear (24-23194-1) of this assembly was missing and the lower coupling teeth of the sun gear remained lodged in the drive splines of the carrier. The circumference for the 3rd stage planetary gear drive of the sun gear was distorted and many of the apexes of the drive teeth sustained half circular impressions. Although no complete apex-to-root separation occurred to any of the 43 teeth, partial overload fracturing, or deformation, existed in 36 teeth.

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D. DETAILS OF INVESTIGATION (cont)

Examination of the 3rd stage planetary gear assembly revealed that one planetary gear and bearing (24-23048 and 24-23089-1) and 6 of the 7 AN501A105 screws for the 24-23085 baffle were missing. The locking edge of the seven 24-23099 bearing retainer lockwashers for the spur gear pin bearing retainer nuts had been flattened horizontally and although all six planetary spur gears sustained some half circular impressions in the apexes of their teeth, no complete separation of any of the teeth occurred in the assembly. No damage or distortion existed in the female main rotor drive shaft splines of the 24-23067-7 carrier.

Functional testing of the flight control power cylinders and hydraulic valves at the Manufacturer's Facilities (Conair, Inc.) disclosed no failure or malfunction occurred prior to impact.

Harry H. Black
Air Safety Investigator

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DEP. OF TRANSPORTATION
NATIONAL TRANSPORTATION SAFETY BOARD

FACTUAL AIRCRAFT ACCIDENT REPORT – GENERAL AVIATION

– Shaded areas to be used by FAA –

NTSB ACCIDENT IDENT. NO.: FTW 68-A-85
REGION AND DISTRICT OFFICE NO.:

A. STATEMENT OF ACCIDENT

LOCATION	NEAREST POST OFFICE: Goliad	COUNTY: Goliad	STATE: Texas	NAME OF NEAREST AIRPORT: Rooke
WHEN OCCURRED	DATE: Apr. 3, 1968	TIME (Local): 0852	ZONE: CST	APPROX. DIST.: 15 mi. / COMPASS HDG.: 190°

Highest Degree of Injury				Highest Degree of Aircraft Damage				Aircraft	
								MAKE AND MODEL	REGISTRATION MARK
X	FATAL		MINOR	X	DESTROYED		MINOR	Fairchild Hiller 1100	N 512 FH
	SERIOUS		NONE		SUBSTANTIAL		NONE		

	NAME	ADDRESS	JURISDICTION OF FAA DISTRICT OFFICE NO.
REGISTERED OWNER	L. A. Nordan	711 Nat'l Bank of Commerce San Antonio, Texas	
OPERATOR	same		

CREW	PILOT'S NAME	AGE	OCCUPATION
	1. Forrest Lester Hall	41	Commercial Pilot
	2.		

B. INVESTIGATION

1. TYPE OF FLIGHT		2. PURPOSE OF FLIGHT							
	LOCAL		PLEASURE		CORP. EXECUTIVE		INSTRUCTIONAL		PRACTICE
		X	BUSINESS		AIR TAXI		☐ DUAL		OTHER (Specify)
X	CROSS COUNTRY		INDUSTRIAL		AERIAL APPLICATION		☐ SOLO		

3. FLIGHT PLAN FILED (Attach copies of all clearances issued)													
	X	NONE		IFR		VFR		FVFR		DVFR		CONTROLLED VFR	

4. FLIGHT DATA	DEPARTURE POINT	DATE	TIME	INTENDED DESTINATION	ETA (If any)
	San Antonio, Tex.	4/3/68	0745C	Refugio, Tex.	0900

5. PLANNED INTERMEDIATE POINTS OF LANDING

LOCATION	ACTUAL TIME ARR.	ACTUAL TIME DEP.	LOCATION	ACTUAL TIME ARR.	ACTUAL TIME DEP.
None					

SERVICE, IF ANY, AT LAST POINT OF DEPARTURE: N/O

6. PERSONNEL

(List all persons aboard; also persons on ground receiving injuries)

NAME	ADDRESS	PILOT	OTHER CREW	PASSENGER	NON-OCCUPANT	DEGREE OF INJURY: FATAL	SERIOUS	MINOR	NONE
Forrest Lester Hall	806 Cobble Dr. San Antonio, Tex.	X				X			
Doyle R. Avant	302 Lamont Ave. San Antonio, Tex.			X		X			
If additional space is required, attach a supplemental sheet. Identify the data by item number.	*NUMBER OF PERSONS ABOARD AIRCRAFT* → 2	TOTAL →	1		1		2			

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NTSB Form 6120.4 PAGE 1

NOTE: N/A = NOT APPLICABLE. N/O = NOT OBTAINED.

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7. ACCIDENT SITE

	ON AIRPORT	TERRAIN FEATURES (Check more than one if necessary)	X	LEVEL		WOODED		PLOWED FIELD		LAKE
X	OFF AIRPORT			ROLLING		BRUSH	X	CROPS		CITY AREA
ELEVATION 100 ft. MSL				HILLY		SWAMP		OPEN WATER	OTHER (Specify)	
				MOUNTAINOUS		DESERT		RIVER		
GRADE OF TERRAIN AT IMPACT		GENERAL CONDITION AT TIME AND PLACE OF ACCIDENT		DAWN	X	DAYLIGHT		NIGHT-BRIGHT MOON		
				TWILIGHT		NIGHT-DARK				

8. WEATHER AT TIME AND PLACE OF ACCIDENT (If possible factor, furnish weather documents)

OFFICIALLY REPORTED		CLEAR SKY	FOG	CEILING brkn.	VISIBILITY
Victoria FSS	X	CLOUDY	THUNDERSTORM CONDITIONS	1800 ft.	
ESTIMATED BY WITNESS		RAIN	OTHER (Specify)	WIND DIRECTION AND VELOCITY	
		SNOW		180° 18 kts26 X GUSTY	

TEMPERATURE	DEW POINT	ALTIMETER SETTING	DENSITY ALT.	RESTRICTIONS TO VISIBILITY
74°F	66°F	29.69		None

9. FLIGHT BRIEFED ON WEATHER	PRIOR TO TAKEOFF				AFTER TAKEOFF			
		YES	BY	METHOD		YES	BY	METHOD
	X	NO			X	NO		

10. GROSS WEIGHT	WITHIN MAX. AUTH.	OVER MAX. AUTH.	UNKNOWN	11. C.G. CONDITION WITHIN LIMITS		12. FUEL LAST TAKEOFF			13. Obstacle Struck Before Principal Impact			
				X	YES	AMT. ON BOARD	JET			WIRES		BRUSH
AT TAKEOFF	X				NO	N/O	N/O	A		TREES		BUILDING
AT OCCURRANCE	X				UNKNOWN	OCTANE RATING		B	OTHER (Specify)			
								MIXED	N/A			

14. AIRCRAFT COMPONENT INVOLVED WITH OBSTACLE														LANDING GEAR
	N/A	PROPELLER		RIGHT WING		FUSELAGE		MAIN ROTOR		☐ RT. ☐ LEFT
		NOSE		LEFT WING		EMPENNAGE		TAIL ROTOR		

15. MOVED AFTER PRINCIPAL IMPACT			15a. CONDITION OF GROUND			OTHER (Specify)	15b. FIRE		
X	NO			SOFT				X	ON GROUND
	YES (Give dist.)		X	HARD					IN FLIGHT
				ROCKY					NONE

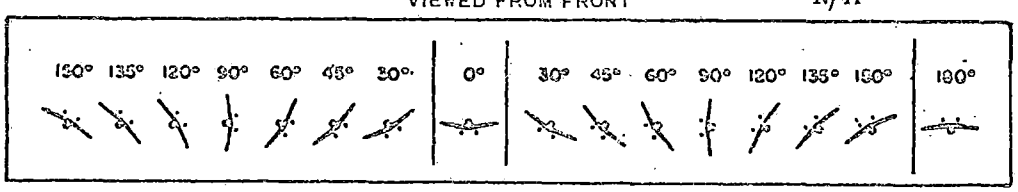
16. SKETCH OF IMPACT POINTS (Sketch gouge marks with dimension and magnetic heading; include initial and final impact points

N/A

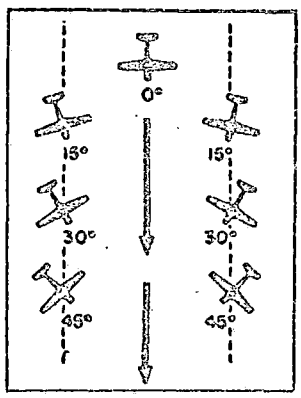
17. APPROXIMATE ATTITUDE AT IMPACT IN RELATION TO HORIZON

USE ONLY WHEN SUPPORTED BY DOCUMENTED EVIDENCE. CIRCLE AIRPLANES IN THREE VIEWS TO INDICATE APPROXIMATE ATTITUDE AT TIME OF IMPACT WITH OBJECTS PRIOR TO HITTING GROUND. DRAW SQUARES AROUND AIRPLANES TO INDICATE APPROXIMATE ATTITUDE AT TIME OF IMPACT WITH GROUND.

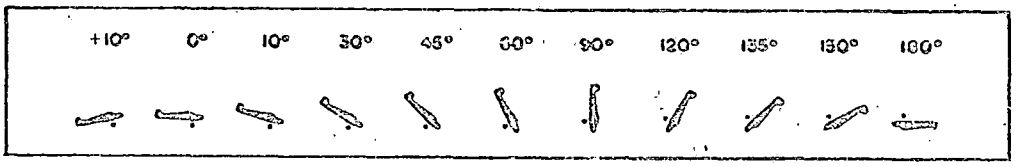
VIEWED FROM FRONT N/A



VIEWED FROM ABOVE



VIEWED FROM SIDE



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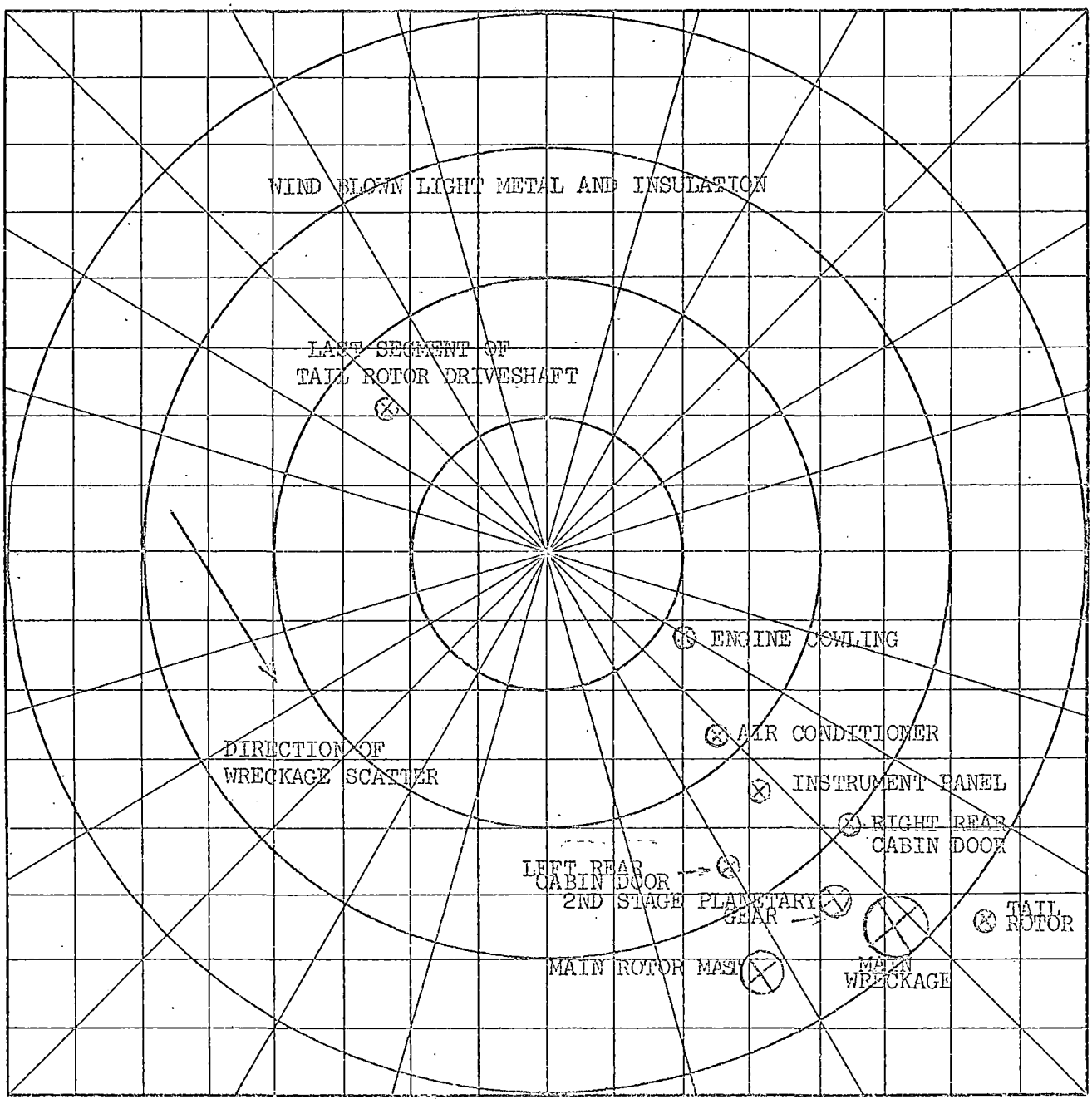
18. SKETCH

DESCRIPTION OF SKETCH					SCALE
X	WRECKAGE DISTRIBUTION		PROBABLE FLIGHT PATH	OTHER *(Describe)*	1 INCH = 100 FEET
	WITNESS LOCATION		RUNWAY DATA *(With wind component)*		

LEGEND



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19. EXAMINATION OF WRECKAGE

WRECKAGE REMOVED PRIOR TO EXAMINATION: [X] NO [ ] YES (Provide details)

	NO. INSTALLED	NO. USED	NO. FAILED	DESCRIPTION OF FAILURE
SEAT BELTS	5	N/O	N/O	
SHOULDER HARNESS				

DAMAGE (Complete applicable column) I-IMPACT F-FIRE

AIRCRAFT COMPONENT	DES-TROYED	SUB-STANT.	MINOR	NONE
PROPELLER NO. 1				
PROPELLER NO. 2				
ENGINE NO. 1				
ENGINE NO. 2				
FUSELAGE				
FLIGHT CONTROL SYSTEM				
ENGINE CONTROLS				
LANDING GEAR				
HORIZONTAL STABILIZER				
ELEVATORS				
VERTICAL FIN				
RUDDER				
TRIMTABS RUDDER				
TRIMTABS ELEVATOR				
TRIMTABS AILERON				
LEFT WING				
LEFT FLAP				
LEFT AILERON				
LEFT WING STRUTS				
RIGHT WING				
RIGHT FLAP				
RIGHT AILERON				
RIGHT WING STRUTS				
SEATS FRONT				
SEATS REAR				
SYSTEMS FUEL				
SYSTEMS OIL				
SYSTEMS ELECTRICAL				
SYSTEMS HYDRAULIC				
SYSTEMS ANTI-ICE				
SYSTEMS VACUUM				
CABIN HEATER				
OTHER (Specify)				

	INSTALLED	USED	ANY BEARING ON CASE
OXYGEN			
PRESSURIZATION			

ROTORCRAFT COMPONENT	Destroyed 1	Destroyed 2	Substan. 1	Substan. 2	MINOR 1	MINOR 2	NONE 1	NONE 2
POWERPLANTS								
ACCESSORIES	IF							
CONTROL SYSTEMS	IF							
LUBRICATION SYSTEMS	IF							
FUEL SYSTEM	IF							
MOUNTS	IF							
1/	F-L	A-R	F-L	A-R	F-L	A-R	F-L	A-R
MAIN ROTORS								
BLADES	I	I						
HUBS	I	I						
MASTS	I	I						
CONTROL SYSTEM	I							
TRANSMISSIONS	I							
ACCESSORIES	IF							
DRIVE(S) SYSTEM(S)	IF							
LUBRICATION SYSTEM	IF							
AIRFRAME								
COCKPIT	IF							
CABIN	IF							
TAIL BOOM/CONE/PYLON	I							
LANDING GEAR	IF							
TAIL ROTOR GUARD	I							
STABILIZERS	I							
TAIL ROTOR								
BLADES	I							
HUB	I							
DRIVE SYSTEM	I							
CONTROL SYSTEM	IF							
LUBRICATION SYSTEM	I							
SYSTEMS ELECTRICAL	IF							
SYSTEMS VACUUM	IF							
SYSTEMS HYDRAULIC	IF							
SEATS FRONT	IF							
SEATS REAR	IF							
CABIN HEATER	IF							
OTHER (Specify)								

IF A KNOWN FAILURE OR MALFUNCTION OF ANY COMPONENT IS INDICATED, SUBMIT A DETAILED DESCRIPTION

	YES	NO
FIXED PITCH PROPELLER(S) INSTALLED		
VARIABLE PITCH PROPELLER(S) INSTALLED		

BLADE ANGLES (If known): NO. 1. NO. 2.

EXTERNAL LOAD: [ ] LITTER [ ] SLING [ ] HOIST [ ] DUST HOPPER [ ] SPRAY TANK [ ] OTHER (Specify) None

TRIM N/O: LONGITUDINAL [ ] FORE [ ] AFT; LATERAL [ ] RIGHT [ ] LEFT

FRICTION	ON FULL	PARTIAL	OFF
COLLECTIVE	N/O		
CYCLIC	N/O		
FORE AND AFT	N/O		

1/ LEGEND: F - FORWARD L - LEFT A - AFT R - RIGHT

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LANDING GEAR INSTALLED

X	FIXED		TRICYCLE		WHEELS		AMPHIBIOUS	OTHER *(Identify)*
	RETRACTABLE		CONVENTIONAL		FLOATS	X	SKIDS	

POSITION AND READINGS

RETRACTABLE GEAR AT IMPACT	UP	DOWN	LOCKED	UNLOCKED
LEFT				
RIGHT				
NOSE OR TAIL				

POSITION OF WING FLAPS	WING FLAP POS. INDICATOR	WING FLAP CONTROL
UP		
DOWN *(Give amount)*		

DUAL CONTROLS — INSTALLED ☐YES ☐NO — OPERATIVE ☐YES ☐NO

TRIM TAB POSITIONS *(Amt. of Deflection)*	NEUTRAL	LEFT	RIGHT	FIXED
RUDDER				
AILERON		UP / DOWN	UP / DOWN	
ELEVATOR	NEUTRAL	UP	DOWN	FIXED
LANDING GEAR CONTROL				
LANDING GEAR INDICATOR				

TRIM TAB INDICATOR SETTINGS
RUDDER
AILERON
ELEVATOR
VACUUM SELECTOR

FUEL VALVES N/O — MAIN — AUXILIARY — RIGHT — LEFT — CROSS-FEED

RADIO/NAVIGATIONAL AID FREQUENCY SETTINGS

COMPONENT	ENGINE NO. 1 READ./POS.	ENGINE NO. 1 UNK.	ENGINE NO. 2 READ./POS.	ENGINE NO. 2 UNK.	COMPONENT	POSITION OFF	POSITION ON
THROTTLE	N/O				BATTERY MASTER SWITCH	N/O	
~~PROPELLER~~					LANDING LIGHT		
~~MIXTURE~~					NAVIGATIONAL LIGHT		
~~CARBURETOR HEAT~~					INSTRUMENT LIGHT		
~~COWL FLAPS~~					RADIO MASTER SWITCH		
FUEL BOOST PUMPS					ANTI-COLLISION LIGHT		
PRIMER					CIRCUIT BREAKERS		
~~IGNITION SWITCH~~					AUTO PILOT/COUPLER		
GENERATOR SWITCH					CONTROL LOCKS		

INSTRUMENT READINGS

INSTRUMENT		NEEDLE FREE SWINGING	UNKNOWN	REMARKS
ALTIMETER	READING			1820 Ft.
	SETTING			30.08
MAGNETIC COMPASS			X	
AIRSPEED				40 MPH
CLOCK				5:02
DIRECTIONAL GYRO				
RATE OF CLIMB	UP			
	DOWN			

ENGINE	TACHOMETER	RPM	HOURS
	NO. 1	10	
	~~NO. 2~~		

	RIGHT	LEFT		
CYLINDER HEAD TEMPERATURE				
OIL PRESSURE				
OIL TEMPERATURE				
MANIFOLD PRESSURE				
OTHER *(Specify)* torque meter				20%
exhaust gas temp				180°C

REMARKS/OTHER

000675

Document disclosed under the *Access to Information Act*
Document divulgué en vertu de la *Loi sur l'accès à l'information*

20. PILOT HISTORY

A. Pilot-in-Command

NAME AND ADDRESS	DATE OF BIRTH	NATIONALITY	SEAT OCCUPIED	REG. AND D.O. NO. OF RESIDENCE
Forrest Lester Hall 806 Cobble Dr. San Antonio, Tex.	7/6/27	USA	N/O	

FAA PILOT CERTIFICATE HELD

CERTIFICATE NO.	DATE OF ISSUE	INSTRUMENT TRAINING PRIOR TO SOLO		YES	NO	BLUE SEAL		YES	NO
661689	N/O								

		RATINGS AND LIMITATIONS			
	AIRLINE TRANSPORT				
X	COMMERCIAL	X	AIRPLANE		MULTI ENGINE LAND
	FLIGHT INSTRUCTOR	X	ROTORCRAFT		MULTI ENGINE SEA
	PRIVATE		GLIDER	X	SINGLE ENGINE LAND
	STUDENT		INSTRUMENT		SINGLE ENGINE SEA
OTHER (Specify)			OTHER (Specify)		
		TYPE RATINGS			

FAA MEDICAL CERTIFICATE

DATE OF ISSUE: 9/15/67

CLASS: ☐ FIRST ☒ SECOND ☐ THIRD

LIMITATIONS: None

PATHOLOGICAL AND/OR TOXICOLOGICAL EXAMINATION PERFORMED: ☐ NO ☒ YES (Extent) Both

PILOT FLIGHT TIME (To nearest hour) | SOURCE OF INFO. | PILOT'S FLT. LOG | | FAA RECORDS | | OPERATOR'S ESTIMATE | OTHER (Specify)

TYPE	LAST 24 HOURS		LAST 90 DAYS			TO DATE		
	DUAL	SOLO	DUAL	SOLO	TOTAL	DUAL	SOLO	TOTAL
(1) THIS MAKE AND MODEL		1.2			49			59
(2) NIGHT								N/O
(3) DAY								N/O
(4) INSTRUMENT ACTUAL								N/O
(4) INSTRUMENT SIMULATED								N/O
(5) SINGLE ENGINE								N/O
(6) MULTI ENGINE								N/O
(7) ROTORCRAFT								N/O
(8) GLIDER								N/O
TOTAL (5, 6, 7, 8)								2388

B. Second Pilot

NAME AND ADDRESS	DATE OF BIRTH	NATIONALITY	SEAT OCCUPIED	REG. AND D.O. NO. OF RESIDENCE

FAA PILOT CERTIFICATE HELD

CERTIFICATE NO.	DATE OF ISSUE	INSTRUMENT TRAINING PRIOR TO SOLO		YES	NO	BLUE SEAL		YES	NO

		RATINGS AND LIMITATIONS			
	AIRLINE TRANSPORT				
	COMMERCIAL		AIRPLANE		MULTI ENGINE LAND
	FLIGHT INSTRUCTOR		ROTORCRAFT		MULTI ENGINE SEA
	PRIVATE		GLIDER		SINGLE ENGINE LAND
	STUDENT		INSTRUMENT		SINGLE-ENGINE SEA
OTHER (Specify)			OTHER (Specify)		
		TYPE RATINGS			

FAA MEDICAL CERTIFICATE

DATE OF ISSUE:

CLASS: ☐ FIRST ☐ SECOND ☐ THIRD

LIMITATIONS:

PATHOLOGICAL AND/OR TOXICOLOGICAL EXAMINATION PERFORMED: ☐ NO ☐ YES (Extent)

PILOT FLIGHT TIME (To nearest hour) | SOURCE OF INFO. | PILOT'S FLT. LOG | | FAA RECORDS | | OPERATOR'S ESTIMATE | OTHER (Specify)

TYPE	LAST 24 HOURS		LAST 90 DAYS			TO DATE		
	DUAL	SOLO	DUAL	SOLO	TOTAL	DUAL	SOLO	TOTAL
(1) THIS MAKE AND MODEL								
(2) NIGHT								
(3) DAY								
(4) INSTRUMENT ACTUAL								
(4) INSTRUMENT SIMULATED								
(5) SINGLE ENGINE								
(6) MULTI ENGINE								
(7) ROTORCRAFT								
(8) GLIDER								
TOTAL (5, 6, 7, 8)								

Document disclosed under the Access to Information Act
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21. AIRCRAFT HISTORY

SOURCE OF INFORMATION: Aircraft logs

MAKE	MODEL	SERIAL NO.	REGISTRATION MARK
Fairchild-Hiller	FH 1100	012	N 512 FH

AIRWORTHINESS CERTIFICATE

ISSUANCE DATE	TYPE		NORMAL, UTILITY, ACROBATIC		TRANSPORT		PROVISIONAL		RESTRICTED		LIMITED		EXPERIMENTAL
1/4/67		X											

TOTAL TIME	TIME SINCE OVERHAUL	TYPE OF MAINTENANCE		LAST INSPECTION		
				TYPE	DATE	AIRC. HOURS AT TIME OF INSPECTION
318	New		PROGRESSIVE			
DATE OF LAST PERIODIC INSPECTION: 2/15/68		X	PERIODIC (Give date of last inspection)	2/15/68	2/15/68	287

ENGINES

NO.	MAKE AND MODEL	SERIAL NO.	TIME TOTAL	TIME SINCE OVERHAUL	TIME SINCE LAST INSPECTION	TYPE OF INSPECTION
1	Allison 250-C18	CAE 800,009	318	new	31	100-hr.
2						

PROPELLERS/ROTORS

NO.	MAKE AND MODEL	SERIAL NO.	TIME SINCE NEW OR OVERHAUL
1	Fairchild Hiller (Main)	#44	302
2			

RADIO EQUIPMENT INSTALLED

RECEIVERS									TRANSMITTERS		
X	VOR		ILS	X	ADF/DF		MARKER BEACON	OTHER (Identify)	X	VHF	OTHER (Identify)
X	VHF		DME		LF/MF		RADAR			LF/MF	

FLIGHT INSTRUMENTS INSTALLED	ELECT.	VACUUM
COMPASS		
~~TURN-AND-BANK~~		
ALTIMETER		
AIRSPEED INDICATOR		
ATTITUDE INDICATOR		X
~~DIRECTIONAL GYRO~~		
~~RATE OF CLIMB~~		
CLOCK		
~~INTEGRATED FLIGHT SYSTEM~~		
AUTOPILOT		
~~APPROACH COUPLER~~		
ALTITUDE CONTROL		
FLIGHT RECORDER		
~~STALL WARNING INDICATOR~~		
SAFE FLIGHT INDICATOR		
OTHER (Identify)		

DEICER EQUIPMENT INSTALLED		
X	NONE	TYPE
	PROPELLER DEICERS	
	WING DEICERS	
	EMPENNAGE DEICERS	
	WINDSHIELD DEICERS	
	WINDSHIELD WIPERS	
	PITOT HEATER	
	FUEL TANK VENT HEATER	

MISCELLANEOUS EQUIPMENT INSTALLED		
X	NAVIGATION LIGHTS	
X	LANDING LIGHTS	
X	ANTI-COLLISION LIGHTS	
X	INSTRUMENT LIGHTS	
	FLARES	
	FLASHLIGHT	
	LANDING GEAR INDICATOR	

22. COLLISION ACCIDENTS

(For mid-air collisions, a separate NTSB Form 6120.4 is required for each aircraft involved, and a NTSB Form 6120.4A.)

OTHER AIRCRAFT INVOLVED

MAKE AND MODEL	NAME AND ADDRESS OF OWNER
REGISTRATION MARK: N	

23. NARRATIVE STATEMENT OF FACTS, CONDITIONS, AND CIRCUMSTANCES SURROUNDING ACCIDENT

(Give a concise, chronological sequence of events and detail the environmental conditions at the time of occurrence)

The flight departed San Antonio International Airport, where the aircraft was hangared, for a cross-country flight to Refugio, Texas, a distance of 125 miles. According to Pilot Hall's watch, which was found stopped at 8:52, the accident occurred one hour and seven minutes after takeoff in a sparsely populated area along the proposed flight path 25 miles from the destination. No witnesses could

(cont'd next page)

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be found who may have seen the aircraft just prior to impact and the wreckage was discovered seven hours after occurrence at 1500C.

Wreckage scatter was on a 150° magnetic heading beginning with small pieces of wind blown skin and insulation. The first identifiable part found along the flight path was the last segment of the tail rotor driveshaft normally positioned between the two gear boxes.

The next aircraft parts toward the main wreckage were fragments of the plexiglass canopy, followed by the engine cowling, cabin air conditioner, instrument panel, left and right rear doors, and the main wreckage which came to rest 20 feet from the ground impact point. The main wreckage consisted of the cabin area, engine and accessories, lower half of the main transmission, mechanical flight controls, horizontal stabilizer and tail boom. All components of the main wreckage were subjected to an intense fire that consumed most of the non-ferrous metal. All other components were free of fire damage.

Other aircraft components that were found in the immediate vicinity of ground impact and not burned were the landing gear skids, right front door, vertical fin, tail rotor assembly, tail rotor gear boxes, radio control console, second stage planetary gear assembly and main transmission center housing. The main rotor assembly with blades and mast attached came to rest 100 feet to the right of the main wreckage. The main rotor mast comprised of the hydraulic cyclic and collective actuators, swash plate assembly, upper housing and shaft assembly and third stage planetary gear.

The tail rotor assembly consisting of blades, hub and gear box remained attached to the upper 12 inches of the vertical fin. Both the tail rotor blades were extremely deformed and contained numerous abrasive marks. The separated surface of the upper vertical fin was chordwise and skin was deformed from left to right. The 18 inch mid-segment of the vertical fin had a thin chordwise slash mark and was separated chordwise from the lower fin in a similar manner as the upper segment of the fin. Severe strike was evident on the last segment of the tail rotor drive shaft one-third the distance down from the tail rotor gear box and same area the upper segment of the vertical fin was severed.

The engine cowling was intact and clear of any severe blows or strikes.

The air conditioner console had evidence of a severe strike and black paint smear marks similar to the paint on the bottom of the main rotor blades.

Both the rear cabin doors were coated with a thick film of oil. Samples of this oil and oil from the main rotor trunnion bearings were forwarded to Materials Laboratory, Naval Air Station, Quonset Point, Rhode Island. A report on the findings which is attached as Exhibit No. 3b stated the oil was predominately Mil-L-23699 containing approximately 10% of Mil-L-7808 E or F revision lubricating oil.

The aircraft engine was inspected and disassembled at Southwest Airmotive Facility,

(Cont'd next page)

24. PERSONS PARTICIPATING IN THIS INVESTIGATION

NAMES AND ADDRESSES		AFFILIATION
Mr. H. Olson	SW GADO 10 San Antonio, Texas	Federal Aviation Administration

25. INVESTIGATED BY

DATE	AGENCY	SIGNATURE
4/29/69	Bureau of Aviation Safety, NTSB, Ft Worth	Frank E. Schretter

000678

U. S. GOVERNMENT PRINTING OFFICE : 1967 O - 2

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Dallas, Texas. The turbine and compressor were intact, however the gear box except for the steel gears and bearings was consumed by fire. The governor, fuel control and fuel pump were also consumed by fire. Most surfaces, both external and internal, were heavily coated with a white powder similar to magnesium oxide.

The forward flange and inlet guide vane of the compressor section were extensively deformed. All 1st, 2nd, 5th and 6th stage compressor blades were severely bent opposite to direction of rotation. The first stage was also heavily gouged. All compressor blades of the 3rd and 4th stages were stripped. The first stage stator blades were in place but slightly bent and gouged on both edges. The remainder stator stages were either completely stripped or extremely deformed. No evidence was found of turbine failure or fused metal on turbine blades. The power turbine coupling shaft was twisted.

The main rotor blades remained attached to the main rotor head; however, were extensively distorted. The yellow blade was bowed upward, had numerous scrape and gouge marks on the leading edge and the drag link separated at the blade attach point. The blue blade tip was buried 18 inches in the ground and the trailing tip edge was separated. This separated surface was straight with upper and lower skin folded down. At approximately mid-span of the blue blade there were two 90° bends in opposite direction with the honeycomb structure separated aft the leading edge. This blade area was also spotted with blood and samples were forwarded to Federal Bureau of Investigation to determine origin. The blood was determined to be human blood.

The third stage planetary gear remained attached to the main rotor upper housing and shaft assembly. One of the seven planetary spur gears and related roller bearings were missing although the spur gear pin was in place. The remaining six spur gears had numerous apex segments missing. The transmission center housing was separated in approximately three equal segments. The ring gear of this assembly had a segment of four inner teeth missing approximately 1¼ inches in length. The ring gear was forwarded to the Bureau of Aviation Safety Metallurgical Laboratory for examination. A Metallurgical Report on the ring gear is attached as Exhibit No. 4.

The main rotor head, except for blades, shaft assembly, upper and center housing, 2nd and 3rd stage planetary gear assemblies, hydraulic actuators and other related parts were forwarded to Bureau of Aviation Safety Technical Services Division for inspection and examination. A Technical Services Report is attached as Exhibit No. 3.

The main transmission serial #203 was removed from N512FH at 161 hours and replaced with serial #225. No. 225 had a total of 199 hours at installation and was operated for an additional 157 hours for a total of 356 hours when the accident occurred.

An autopsy was performed on the pilot's body by Paul M. Obert, M.D., P O Box 3784, Victoria, Texas, and toxicological studies by Dr. M. F. Mason, Dallas City-County Hospital System, Dallas, Texas. No evidence was found to indicate pilot incapacitation prior to impact.

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5002-3796(CAIE)

C.A.I.E.,
No. 3 Temp. Bldg.,
Ottawa 4, Ontario,
January 19, 1970.

Manning, Bruce, Macdonald & Macintosh,
Barristers and Solicitors,
85 Richmond Street West,
Toronto 1, Ontario.

Attention: Mr. E.M. Lane

Dear Mr. Lane:

Re: Accident, Hiller FH-1100,
CF-WMO, 14 March 1968.

This acknowledges your letter of January 12, 1970, requesting a copy of the Laboratory Report on the above accident. The Accident Report has not yet been completed. When it is, a copy of the Engineering Laboratory Report will be forwarded to you as soon as it is approved.

Yours truly,

Original Signed by
A. J. W. MELSON

A.J.W. Melson
for Chief, Accident Investigation Division.

AJWM:MD

000680

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P.C.A.I. Vancouver

5002-715(PCAI)

5002-3796(CAIE)

C.A.I.E. Ottawa

January 19, 1970.

Accident - Hiller FH-1100, CF-WMO
Engineering Laboratory Report No. 24/68

1. Enclosed please find a copy of Appendix V to Report 24/68, and an amended Index Page to replace the existing one.

2. Please acknowledge receipt on the attached sheet.

Original Signed by
A. J. W. MELSON

A.N. le Cheminant
C.A.I.E.

Attach.

AJWM:MD

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5002-3796

Manning, Bruce, Macdonald & Macintosh

Barristers & Solicitors

H. E. Manning, Q.C.
Maxwell Bruce, Q.C.
Alastair R. Paterson, Q.C.
Peter H. H. Ridout, Q.C.
Peter Brooke Bell
Eric M. Lane
Ian C. C. Balfour
D. Bruce MacDougall
Robert L. Falby

H. F. Kimber, Q.C.
A. B. Whitelaw, Q.C.
R. D. Poupore, Q.C.
George W. Edmonds, Q.C.
N. W. R. Boyes
H. D. Wilkins
Ivan deB. Thornley-Hall
J. M. Banfill

31031

85 Richmond Street West
Toronto 1, Canada

Telephone (416) 362-6041

Cable Addresses "Mantor"
Telex 02-21375 "Macdon"

January 12th, 1970

Department of Transport,
Accident Investigation Branch,
No.3 Temporary Building,
Ottawa, Ontario.

CA/E

Attention: R.L. Bolduc, Esq.,
Chief, Accident Investigation

Re: Okanagan Helicopters Ltd.
Accident: 14th March, 1968
Aircraft: FH1100, CF-WMO
Location: 10 miles N.E. of
Langley, British Columbia
Your Ref: 5002-3796 (C.A.I.E.)

Dear Sir,

We have been retained on behalf of the insurance underwriters to represent their interests and those of the owner and operator of this aircraft to assess what action, if any, is appropriate in the circumstances based on the cause of the accident.

Accordingly, we would appreciate if it you would at this time record our interest on your accident file and in due course, let us have a copy of the accident report as soon as it is available. If an advance report is prepared in this case, we would appreciate it if we could have one copy of that document as well.

Yours truly,

MANNING, BRUCE, MACDONALD & MACINTOSH,

per: E. M. Lane

EML:hmm

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5002-3796

Manning, Bruce, Macdonald & Macintosh

Barristers & Solicitors

H. E. Manning, Q.C.
Maxwell Bruce, Q.C.
Alastair R. Paterson, Q.C.
Peter H. H. Ridout, Q.C.
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85 Richmond Street West
Toronto 1, Canada

Telephone (416) 362-6041

Cable Addresses "Mantor"
Telex 02-21375 "Macdon"

31030

January 12, 1970

Department of Transport,
Accident Investigation Branch,
No.3 Temporary Building,
Ottawa, Ontario.

CAIE

Attention: A. N. LeCheminant, Esq.

Re: Okanagan Helicopters Ltd.
Accident: 14th March, 1968
Aircraft: FH-1100, CF-WMO
Your Ref: 5002-3796 (C.A.I.E.)

Dear Mr. LeCheminant,

We have not yet received a copy of the laboratory report into the investigation conducted by your organisation concerning the failure of the main rotor mast in CF-WMO. We have gone on record as requesting a copy of the actual accident report with Mr. Bolduc's office, but I would appreciate it if you could let me have a copy of the laboratory report setting out your findings, at your convenience.

Thank you for your co-operation.

Yours truly,

MANNING, BRUCE, MACDONALD & MACINTOSH,

per:

E. M. Lane

EML:hmm

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CAIE 5/9

Document divulgué en vertu de la Loi sur l'accès à l'information

NNNN

CAIE

OTTAWA
AERADIO

JAN 6 13 37 70

ZCZC OHA112

JJ CYHQYY

052303 CYVRRO

CAIE OTTAWA

PCAI 179. REYRTEL CAIE 57. CONCERNING CF-WMO LABORATORY REPORT 24/68. ONE COPY RECEIVED (NO. 2) OCTOBER 28TH 1968. AKNOWLEDGED RECEIPT OCTOBER 29TH, 1968.

PCAI VANCOUVER

Phoned to M.D.
by JS 6/1/70

NNNN

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divulgué en vertu de la Loi sur l'accès à l'informati...

5002-3796(CAIE)

C.A.I.E.,
No. 3 Temporary Bldg.,
Ottawa 4, Ontario,
December 30, 1969.

Fairchild Hiller Aircraft Division,
Hagerstown, Maryland, 21740
U.S.A.

ATTENTION: Mr. Reese I. Joye Jr.

Dear Sir:

Thank you for your letter of April 23, 1969 and the copies of the two flight test reports.

Because of the proprietary nature of the reports, we cannot use them in our investigation of the accident. Therefore, we are returning them to you.

Thank you for your cooperation.

Yours truly,

Original Signed by
A. J. W. MELSON

A.J.W. Melson
for Chief, Accident Investigation Division.

Encl.

AJWM:MD

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TECHNICAL PARAGRAPH

5002-3796(CAIE)

In level cruising flight, the main rotor separated from the helicopter when the rotor mast failed. The forward fuselage was struck by the main rotor blade and the helicopter fell to the ground in a steep nose down attitude.

The technical investigation revealed the following factual evidence:

1. Initial breakup, involving a main rotor strike on the forward fuselage, occurred while the aircraft was in level flight in a direction of about 72° True at a height of about 475 feet above the ground (726 feet above sea level), at a speed that was probably in excess of 110 mph.
2. The rotor mast failed as a result of excessive downward flapping of the advancing main rotor blades. The metallurgical report shows that two teetering stop strikes on the mast (one on each side) caused the failure.
3. There was moderate to severe turbulence reported in the accident area at the time of the accident.
4. The C.G. of the helicopter was within limits at the aft position.
5. The total flapping angle available, which was limited by the main rotor teetering stops, was less than 18.5°, which was less than the amount which the manufacturer has since specified in Service Bulletin FH1100-51-3 of May 27, 1968, i.e., 10° (+30' - 0') for each blade, or a total freedom of movement of 20° (+1° - 0').
6. For this helicopter, with skid gear, the extended horizontal stabilizer (72 inch) which was installed, is no longer permitted by the manufacturer unless it is operating with the inflatable float kit. Service Bulletin FH1100-62-1 of June 17, 1968, says that for non-float equipped FH1100 helicopters, the right and left extensions are to be removed. The horizontal stabilizer then has a span of 52 inches.
7. Revision 6 of the FH1100 Flight Manual, dated April 25, 1968, changes the operating limitations to restrict the sea level never exceed speed (V_{ne}) to 110 mph. I.A.S., with either the 52 inch or the 72 inch horizontal stabilizer. At about the time that the two Service Bulletins were issued, revision 7 of the Flight Manual dated June 12, 1968, revised the operating limitations to restore the original V_{ne} of 127 mph. I.A.S.

NOT FACT

how do you know?

upward flapping prevented by stops?

on the limit

.....2

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DISCUSSION

Since the speed restriction was imposed by the manufacturer shortly after the accident and later removed at the time of the two Service Bulletins, an Engineering Study was undertaken in an attempt to determine if there was any connection between the restoration of the original V_{ne} and the two Service Bulletins. (Refer to Amendment to Engineering Laboratory Report 24/68). The results of this study indicated:

1. The speed restriction was probably a safety measure imposed by the manufacturer pending their investigation of combinations of flight modes and environmental conditions.
2. The two Service Bulletins issued embodied design improvements which were probably necessary before the original V_{ne} could be restored.
3. There were three significant factors which contributed to excessive downward flapping of the advancing rotor blades. These were turbulence, the aft C.G. position, and the extended 72 inch horizontal stabilizer. Also, since the available angular movement of the main rotor was restricted to a value less than is now provided by the Service Bulletin FH1100-51-3, the probability of the stops hitting the mast was increased.

CONCLUSIONS

The main rotor blades flapped downward toward the forward fuselage with sufficient force to fail the mast for the following reasons:

1. The helicopter flew into turbulent conditions at a speed in excess of 110 mph. in an aft C.G. condition which made it less tolerant to excessive downward flapping of the advancing blades.
2. This flapping of the rotor blade in forward flight was of a higher amplitude with the 72 inch extended horizontal stabilizer which was installed than it would have been with the 52 inch stabilizer.
3. The teetering stops on this helicopter did not provide the full angular movement specified.

September 29, 1969

AJWM:MD

17 Dec.

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FAIRCHILD HILLER HORIZONTAL STABILIZER

Fairings 24-62000

P/N (dash No.)	ANGLE OF INCIDENCE	STAB.	FAIRING
-229	2° down	52"	3 Ply drilled
-230	"	"	"
-305	1° up	72"	3 Ply drilled
-306	"	"	"
-307	1° up	72"	3 Ply un-drilled
-308	"	"	"
-309	1° up	72"	5 Ply undrilled
-310	"	"	"
-313	1° up	72"	5 Ply undrilled
-314	"	"	"
-315	2° down	52"	5 Ply undrilled
-316	"	"	"

T.M. Young
(Investigator P.C.A.I.)

November 10, 1969

DEPA

MESSA

COMPLET
COMMER

P.C.A.I. Vancouver

C.A.I.E. 57 RE CF-WMO. PLEASE ADVISE NUMBER OF COPIES OF LABORATORY

24/68 RECEIVED (YOUR REFERENCE 5002-715PCAI)

A.J.W. McLeod

C.A.I.E. OTTAWA

AJWM:MD

Phoned to G. H. at 1:48 p.m.

38-0014
9-63

FILE COPY

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DEPARTMENT OF TRANSPORT

MESSAGE FORM

FILE NO. 5002-3796(CAIE)

DATE October 1, 19 69

COMPLETE THIS SECTION FOR COMMERCIAL MESSAGES ONLY | CHARGE

P.C.A.I. VANCOUVER

CAIE 43 RE CF-WMO, PLEASE ADVISE ANGLE OF INCIDENCE OF THE EXTENDED HORIZONTAL STABILIZER USED. ALSO REQUIRE ANGLE THAT WOULD BE OBTAINED AFTER SERVICE BULLETIN FH1100-62-1 COMPLIED WITH.

A.J.W. Mebs

C.A.I.E. OTTAWA

AJWM:MD

Phoned in at 10:55 a.m. 1AM

38-0014
9-63

FILE COPY

000692

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MEMORANDUM

CLASSIFICATION

TO
A DCA

YOUR FILE No. 5002-3796 (CAIO)
Votre dossier

OUR FILE No. 5002-0 (MBFS)
Notre dossier

FROM
De DMB

DATE 4 September 1969

FOLD

SUBJECT
Sujet ACCIDENT - HILLER FH1100 CF-WMO

19139

CAIO

1. Reference is to your memorandum dated August 22nd.

2. The report of the above accident is attached as requested.

J. R. H. Noble,
Director.

Att:

000693

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5.9
CAIE

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...MENT OF CANADA ... this e...

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...used up. Delivery should always be made to the last address given. **NOT FOR POST**
...ut former address.

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...GSB STANDARD 6 GP 14B C.G.S.S. 7530-21-102-1200

Continue on reverse side.

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...rtu de la *Loi sur l'acc...*

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000696

D.M.B.
TORONTO

D.C.A.
OTTAWA

Accident - Hiller FH 1100, CF-WMO
near Fort Langley, B.C.
14 March, 1968.

1. In accordance with established procedure, attached is a copy of the subject Investigation Report in which weather was a factor.

W. M. Howes,
for Chief, Accident Investigation.

Attach.
WMH/ofg.

NOTE (Kindly return this copy of the report when it has served your purpose)

Noted and recorded.
F.V.
F. CAEI
Aug. 29/69