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FILE NO. 5002 - 715 VOLUME NO. 2

DEPARTMENT OF TRANSPORT

FROM JUNE 1, 1969
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SUBJECT AIRCRAFT
SUB-SUBJECT ACCIDENTS - GENERAL
FILE TITLE CF-WMO FAIRCHILD HILLER FH-1100 PAR F.R. FLETCHER APPROX. 3 MI. N. OF THE FREEWAY NEAR JACKMAN RD. ALDERGROVE

5002 - 715

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APR 30 1970	B.F. APR 30 1970	CA WJ	~~15-5-70~~	

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CANADA

DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

YOUR FILE
VOTRE RÉF.

IN REPLY QUOTE
RÉF. À RAPPELER:

5008-WMO (ARV)
5002-715 ✓

739 West Hastings Street,
Vancouver 1, B.C.,
October 29, 1968.

REGISTERED

Okanagan Helicopters Limited,
VANCOUVER AIRPORT, B.C.

Dear Sir,

Enclosed please find:

Aircraft Journey Logbook	☐
Aircraft Technical Logbook	☐
Propeller Logbook	☐
United States Aircraft Logbook	☒
United States Engine Logbook	☒
Weight and Balance Report	☐
Certificate of Registration Number	
Certificate of Airworthiness Number	
Radio Licence Number.....	

for Hiller FH-1100 aircraft CF- WMO which was involved in a reportable accident on...March 14, 1968....

As these documents have now served the purpose for which they were submitted to this office, they are herewith returned for your future retention, in accordance with Section 824 of the Air Regulations.

Yours truly,

W. R. Lavery,
Regional Superintendent, Air Regulations

/mng

Enc.
ARV-2-20

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NNNN [redacted]

DEC 29 AM11 46

ZCZC VRA068 1925 262

JJ CYVRRO

291850 CYHQ

PCAI VANCOUVER

CAIE 57 RE CF-WMO. PLEASE ADVISE NUMBER OF COPIES OF LABORATORY REPORT 24/68 RECEIVED. (YOUR REF 5002-715PCAI)

CAIE OTTAWA

CA1

5002-715

Answered on Jan 5/70
DMy.

000702

OCT
SEP 31 AM 8 39

CAI

5002-715

5008-WMO

NNNNZCZC VRA097 1536 222

JJ CYVRRO

011459 CYHQ

PCAI VANCOUVER

CAIE43 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

CAIE OTTAWA

Information to be obtained at Miller Plant and given direct to Ottawa by J. Young on Nov. 10/69

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C.A.I., OTTAWA

5002-715 (PCAI)

P.C.A.I., VANCOUVER

July 11, 1969

ACCIDENT - Hiller FH-1100, CF-WMO
approximately 5 miles east of
Fort Langley, B.C., March 14, 1968.

1. Attached are 2 copies of the subject aircraft accident report. The pilot was killed. There were no passengers. The aircraft was destroyed.

2. The Engineering Laboratory Report #24/68 should be attached as Appendix 20.

C. Leyland.

C. Leyland,
Regional Superintendent,
Accident Investigation

mim

ENCL

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DEPARTMENT OF TRANSPORT

CIVIL AVIATION BRANCH

COPY NO. 2

FILE NO. 5002-3796(CAIE)

LABORATORY REPORT

PAGES 20

FIG.(S) 10

AIRCRAFT ACCIDENT INVESTIGATION DIVISION

REPORT NO. 24/68

BREAK-UP ANALYSIS

AND

WRECKAGE EXAMINATION

Hiller FH-1100, CF-WMO

WORK BY: C.A.I.E. / Eng./ Met.

DATE COMPLETED: July 17, 1968

SUBMITTED BY: R.M. Logan

T.W. Heaslip

PREPARED BY: A.J.W. Melson

S.A. Bergen-Henengouwen

APPROVED: ENGINEERING SUPERINTENDENT
A.N. Le Cheminant

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I N D E X

BREAK-UP ANALYSIS

AND

EXAMINATION OF WRECKAGE

HILLER FH-1100 CF-WMO

BREAK-UP ANALYSIS

Appendix I - INSTRUMENT EXAMINATION

Appendix II - METALLURGICAL EXAMINATION

Appendix III - FIN FAILURE ANALYSIS

Appendix IV - MAIN ROTOR MAST FAILURE ANALYSIS

Appendix V - ADDENDUM TO REPORT 24/68

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1. INTRODUCTION

1.1 The break-up of Hiller FH-1100 helicopter, CF-WMO, appeared to have initiated at an altitude of less than 1,000 feet above ground level while it was travelling in an easterly direction at about 110 mph. (Initial velocity of 160 ft. per sec. is used in calculations). The main wreckage scatter covered an area of about 10 acres with some papers from the cabin almost 1½ miles away. The ground level at the main wreckage was about 250 feet above sea level and this is used as the reference for calculations of heights above ground.

1.2 At the time of the accident the wind was from a southerly direction with paper scatter on a bearing of about 350° true from the main wreckage. Pilot's reports indicate there was severe gusting in the area at the time of the accident with winds about 20 mph to 25 mph. (An average wind velocity of 35 feet per second is used in calculations).

1.3 Physical evidence showed that prior to ground impact the main rotor had flapped severely and the mast broke off adjacent to the static stops. The main rotor struck and shattered the forward fuselage plexiglass and dislodged a number of other forward fuselage items prior to being thrown clear of the helicopter. The tail rotor blades, prior to ground impact, cut into the vertical fin and broke a number of pieces from the leading edge - throwing the outer 19.5 inches of both blades.

1.4 An accurate scatter plot and catalog of the 265 recovered items were prepared and these, plus wind and flight information, were used to analyze the probable break-up sequence. Particular emphasis was placed on attempting to determine whether initial failure was associated with main rotor flap or tail rotor fin strike.

2. ANALYSIS

2.1 Terminal velocities were calculated for 94 of the wreckage items, using basic formulae from NRC Aeronautical Report LR-310. Past experience in such calculations and in timed drops of wreckage items from helicopters shows that for all practical purposes reasonable accuracy can be obtained by examining each item, postulating the manner in which it will fall, and thus deciding upon the most likely effective area to apply.

2.2 Tables were compiled showing wind drift and throw for the selected items for heights, in increments of 100 feet, up to 1,000 feet above ground level. Throw values were obtained by reference to a series of as yet unpublished trajectory tables which have been programmed on an NRC computer. Interpolation from these tables was necessary in most cases. Six of the selected items came from the rotor blades, main and tail, and these items could have been thrown in any direction with initial velocity varying greatly, depending on direction of throw. For this reason these items were assigned drift and throw values intended to represent a mean between minimum and maximum. See Paragraph 2.5.2.

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2.3 Wind drifts of items with low terminal velocity (therefore little throw) were plotted in plan view to show the probable position of each as it passed through 100 foot increments of height above ground level. Similar plots were made for wind directions ranging from 100° True to 165° True. Companion plots were made in elevation, showing wind drift paths with different winds. Grouping of items at different levels on these plots indicated the most likely average wind direction at the site to have been about 155° True and the most likely height of the helicopter at original break-up to have been between 400 and 600 feet above ground level.

2.3.1 In order to check the accuracy of terminal velocity calculations, a number of the wreckage items were dropped from a hovering helicopter, The drop times of 18 items were recorded and from these times the terminal velocities were established.

2.4 A new plan view plot was prepared showing ground positions of items and wind drift positions at 400 and 600 feet. Throw circles were drawn around the wind drift position of each item - the radius of each circle being equal to the total throw of that item from the height under consideration. Different wind positions for items were tried by moving them up-wind or down-wind (consistent with a higher or lower height at separation). In this manner it was decided that the most likely height for initial break-up appeared to be about 420 feet above ground, i.e. 670 feet above sea level.

2.5 As already mentioned in paragraph 2.3, all items scattered down-wind had relatively low terminal velocities. The position of these items was chiefly the result of wind drift. 68% of all items numbered higher than "98" consisted of pieces of plexiglass from the forward fuselage. These pieces had apparently been thrown clear by the main rotor strike or strikes. Evidence showed that one main rotor strike had occurred on the right side of the battery box and had caused the quick disconnect to be broken into 15 pieces (recovered). Evidence also showed that the tail rotor strike on the fin had broken off 10 pieces (recovered) of the fin fibreglass leading edge as well as 3 pieces of the tail rotor blades.

2.5.1 It was considered reasonable to assume, under the circumstances, that main mast fracture had occurred at almost the same instant as plexiglass fracture and battery disconnect fracture. Similarly, tail rotor fracture would have occurred at almost the same instant as fin leading edge fracture.

2.5.2 After examination of the ground positions and wind drift paths of tail rotor and fin items and consideration of the assumptions of paragraph 2.5.1, it was decided that tail rotor blade fracture would most likely have resulted in portions of the blades being thrown aft, i.e. in a westerly direction. The basis for this assumption is that a tail rotor fin strike would cause severe imbalance with subsequent rapid blade failure. Since item "97" (with relatively high terminal velocity) was found farther west than both items "125" and "201", the implication is that either the times of item separation were widely separated (at least 240 revolutions of the tail rotor) with throw in an easterly

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direction or closely spaced with items thrown in a westerly direction. A trajectory curve was plotted for item "97" (one rotor blade tip) using an initial velocity of 750 feet per second (tip speed less assumed forward speed of 35 feet per second in area of fin leading edge separation) and at an angle of 45° above the horizon. This was considered to represent maximum throw and indicated that from a height of 340 feet (this height estimated from fuselage trajectory) the throw would have been 244 feet with a throw time of 10.5 seconds and a drift of 367 feet. A similar trajectory curve was plotted for item "201" (a portion of the same rotor blade). The indication was that this item would have been thrown 100 feet with a throw time of 16.6 seconds and a drift of 580 feet.

2.5.3 It was also considered reasonable to assume that of the large number of plexiglass items, there must have been many combinations of two or more items thrown together. Similarly, most of the battery disconnect items must have been thrown at almost the same instant as some plexiglass items. By the same line of reasoning it is considered reasonable to assume that at least half of the fin leading edge items must have been thrown at almost the same instant as the tail rotor strike.

2.6 With the above points in mind, a number of formulae were derived to show spatial orientation and direction of throw of any two items, if they separate together. All possible combinations of plexiglass separation (two items at a time) were considered. The resultant calculations showed that many combinations could not have been items which separated together and a few had to be disregarded because they indicated a gross error in height, i.e. 8,000 feet. However, 42 out of 136 possible combinations were remarkably consistent and gave an average height at separation of 455 feet above ground level with average direction of item separation being 127° True. In the same manner, 6 out of 15 possible combinations of battery disconnect items gave an average height at separation of 557 feet above ground level with an average direction of item separation being 125° True. The overall average for all plexiglass and battery disconnect items gave an average height at separation of 475 feet above ground level with average direction of separation being 127° True.

2.6.1 Similar calculations involving 15 possible combinations for fin leading edge pieces separating two at a time gave six indications of height and direction which averaged out to give a height at separation of 340 feet above ground level with the average direction of item separation being 138° True.

2.7 The most likely direction of item separation, given in paragraph 2.6, is considered to be the resultant of the aircraft speed and the rotor speed. If the main rotor was turning at 368 rpm with a diameter of 35.417 feet, the tip speed would be 682 feet per second. With this lateral component of velocity and a forward component of 160 feet per second, the resultant aircraft direction would be about 80° True. Major rotor contact would be closer to mid-span where angular velocity would be nearer 340 feet per second. Using this component of lateral velocity, the resultant aircraft direction would be about 68° True. Interference of cabin structure and loss of rotor rpm during the strike(s) would give more weight to the latter direction. If weights of 2 and 1 are assigned

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to the above values, the weighted average direction of flight at separation of the first items (plexiglass and battery disconnect) becomes 72° True.

3. SOURCES OF ERROR

3.1 Many errors are introduced into calculations because it is necessary to use so many arbitrary values. Calculations and the values obtained thereby can not be accepted as definitive, but it is believed the final results give an acceptable indication as to the general break-up pattern. It must also be remembered that calculations of throw and drift are idealistic and may not represent the actual behavior of an item during its fall. The most important sources of error are outlined below.

3.1.1 Errors in location of items on the wreckage plot. The plot used in this analysis is considered to be accurate except for the fact that height of item is not shown. Wreckage plots should be three-dimensional.

3.1.2 The wind velocity used is arbitrary and no allowance has been made for turbulence although there was reported to have been considerable gusting at the time of the accident.

3.1.3 On the basis of previous experience it is considered that terminal velocity calculations will average out correctly with the probability that five or six are grossly in error and the remainder within ± 8 feet per second of the correct value. It is noted that the 18 experimental drops produced terminal velocities averaging 34.6 while calculated values for the same items averaged 34.2. The range of errors between experimental and calculated terminal velocities for these 18 items average out to + 3.0 feet per second and -4.3 feet per second with one error of -8 feet per second.

3.1.4 In an accident such as this, initial aircraft velocity can never be known exactly, however, the value of about 110 mph is considered to be reasonably close. If actual speed was higher, then item throws would have been greater and vice versa. Actual throw variations for initial aircraft velocities of 110 mph plus or minus 15 mph would average out to about 60 feet for the 9 items with terminal velocities over 100 feet per second and less than 29 feet for the remaining items. Further, with reference to paragraph 2.6, these formulae make use of throw difference and actual throw is not important, therefore, initial velocity need be only approximate.

3.1.5 Initial altitude was quite low in this accident. This fact increases the probability of error since past experience in this type of analysis shows that when items fall from high altitude, other factors being similar, many errors tend to cancel each other out as the analysis progresses. In addition, currently available tabular information favours solution of break-up at higher altitudes. In this particular accident

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the presence of trees rising to about 100 feet above ground in some cases made it impossible to tell whether or not some items had been diverted before reaching the ground.

3.1.6 The formulae referred to in paragraph 2.6 and the subsequent calculations represent a new approach to the analysis of this type of breakup - and while the results look promising in this analysis, there is no background of experience against which the reliability can be gaged.

3.1.7 All calculations related to throw and drift distances are based on the assumption that items were thrown in a horizontal plane. Since the helicopter was presumably in level flight, a horizontal plane represents the best approximation - although some items would be thrown above and some below this plane. Exceptions to the above throw plane were made with respect to tail rotor pieces.

3.1.8 The accuracy of calculated wind drift positions at different heights varies inversely as drift distance. It can thus be seen that where large drift is involved (low terminal velocity), minor errors in terminal velocity and wind velocity will produce large errors in wind drift position. For this reason it is best to consider only the wind drift channel for items with low terminal velocity.

4. CONCLUSIONS

4.1 Results and conclusions are presented as indicative of the breakup picture and are not definitive.

4.2 Initial breakup involved main rotor strikes on the forward fuselage while the aircraft was flying in level flight in a direction of about 72° True and at a height of about 475 feet about ground (725 feet above sea level) at a speed of about 110 mph. With reference to drawing No. 5002-3796-1, initial strike apparently occurred overhead of the shaded area near the bottom of the page with remaining items separating along the shaded path to the point of main wreckage impact.

4.3 The main rotor-mast separation apparently occurred about .3 second later (about 50 feet or 2 revolutions). Successive fuselage breakup occurred for the next 4.7 seconds until the helicopter reached a height of about 340 feet (about 130 feet south of the scatter plot location of item "20").

4.4 In this general area the tail rotor, still operating and swinging the tail to the right struck the fin leading edge - breaking off portions of the leading edge and the blades.

4.5 The helicopter fuselage struck the ground about 1.7 seconds after the tail rotor strike. Total time from first main rotor strike to fuselage ground impact was, therefore, about 6.7 seconds.

4.6 A number of separation points, heights and throw directions are shown on the attached drawing. Most points fall in a fairly confined area, where breakup apparently occurred. Other widely scattered points are explained in Section 3 of this report.

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"D" – DISTANCE

"L" – DISTANCE IN FEET

1600 1500 1400 1300 1200 1100 1000 900 800

450 400 350 300 250 200 150 100 50 0

245 244 F250 F249 246 248 F F247 254 F203 255 256 257 252 253 258 202 240 241 229 230 231 232 200 TR201 219 220 237 234 235 236 238 239 F 217 218 209 206 F 207 210 211 212 213 205 204 208 216 214, 215 259 260 198 193 194 195 196 197 221 224 225 222 223 226 227 233 228 199 189 156 192 139 155 113 117 149 118 150 119 151 116 114 115 148 161 162 163 152 112 107 106 105 108 109 110 111 138 134 133 104 168 164 165 166 167 169 153 154 170 MR 171 172 173 135 136 MR 137 101 100 131 132 98 99 174 175 188 191 190 179 180 181 182 183 120 121 122 123 124 TR 125 126 127 128 129 130 TRO 184 185 186 187 176 177 178

"D" – DISTANCE

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"D" – DISTANCE IN FEET

900 800 700 600 500 400 300 200 100

MAIN WRECKAGE 146,147, 265

140 141 142 143 144 145 19

157 158 80 14 15 42 42 77 81 29 27 20 78 264 16 113 117 118 119 149 150 151 116 114 115 148 28 159 21 76A 79 76A 217 82 160 76B 97 125 29 F 35 201 34 48 22 203 28 239 35 26 25 234 206 148 202 30 89 32 33 90 91 92 51 31 93 61 47 83 156 134 84 108 161 214 46 106 35A 80 15 109 160 34 78 21 139 107 152 112 106 105 138 134 108 109 110 111 133 104 73 103 71 72 65 66 67 69 70 68 39 75 74 40 62 MR 36 37 94 38 59 58 63 64 60 49 86 23 24 53 50 87 43 85 45 104 51 47 61 22 153 170 66 62 74 68 73 90 59 49 70 38 96 79 69 31 23 83 44 88 54 52 263 262 242 243 56 57 95 41 55 261 262 185 164 165 166 167 153 154 135 136 MR 137 101 102 131 132 100 98 99 126 127 128 129 130 TR 125 TR 97 120 121 122 123 124 176 177 178 25 26 187 184 129 20 46 44 7 24 92 41 43 261 53 82 57 89 81

PLEXIGLASS DRIFT CHANNEL

FIN DRIFT CHANNEL

MAIN ROTOR DRIFT CHANNEL

900 800 700 600 500 400 300 200 100

"D" – DISTANCE IN FEET ← WIND DIRECTION ← 155° True

Items 53* & 82* should be approx. 50' southwesterly of the positions shown.

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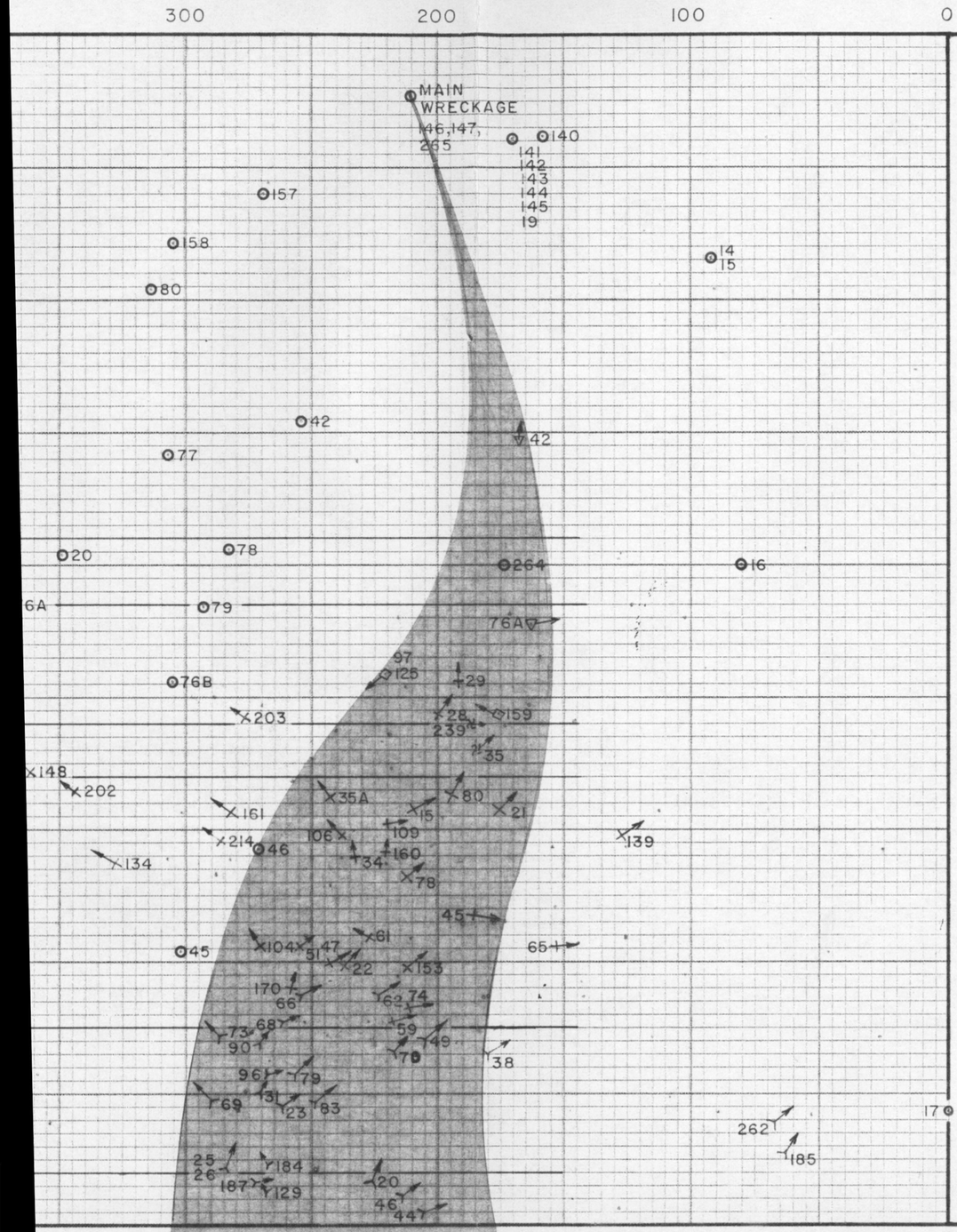

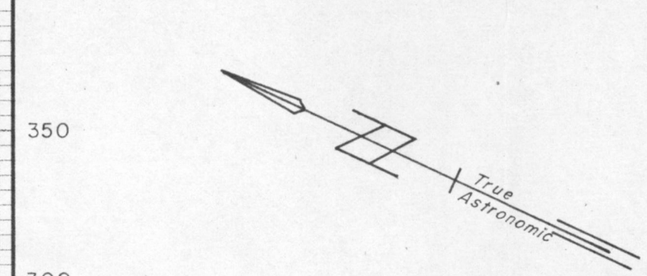

LEGEND

Location of items on ground ..... o
Calculated locations of items at time of separation
Height 475' ..... Y
Height 420' X
Height 400' ..... ⊠
Height 300' ..... □
Height 200' ..... ▽
Direction of throw ..... →
Fin Items ..... F
Tail Rotor Items ..... TR
Main Rotor Items ..... MR

Nº	REVISIONS	DATE	CHK'D

CANADA
DEPARTMENT OF TRANSPORT - AIR SERVICES
CONSTRUCTION ENGINEERING AND ARCHITECTURAL BRANCH

ACCIDENT INVESTIGATION
BREAK-UP ANALYSIS
HILLER FH-1100 HELICOPTER
CF-WMO
LANGLEY. B.C. 14 MARCH, 1968
SCALE 1" = 50'

Drawn by V.A. Radzius
Checked by R.M. Logan
Dated, Ottawa 4 Sept. 1968

for Chief, Accident Investigation
Date 11 Sept 68.

PREPARED FOR
ACCIDENT INVESTIGATION DIVISION

Dwg. Nº 5002-3796-1

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INSTRUMENT EXAMINATION

APPENDIX I TO PROJECT 24/68

Hiller FH-1100, CF-WMO

1.0 SUMMARY

1.1 Portions of six indentifiable instruments were recovered from the wreckage of CF-WMO and forwarded for laboratory examination. (See Figure 1)

2.0 EXAMINATION

2.1 Examination of the volt-ammeter under ultra-violet light gave negative results. Microscopic examination showed a large gash on the face pointing to 100, but glass was imbedded in the gash. A small remnant of the hand indicated a reading of 25.

2.2 Examination of the oil temperature gauge, serial number 143, under ultra-violet light gave negative results. Microscopic examination showed marks on the hairspring gear made by the sector gear while the hand was pointing about 110° clockwise from the zero position.

2.3 Examination of the exhaust temperature gauge under ultra-violet light showed three spots on the face between the hub of the hand and 800°C/900°C. Microscopic examination showed possible hand marks from 860°C to 890°C. A mark at the central hole of the face was indicative of the hand reading 500°C and moving towards zero. Other possible hand markings were visible near 60°C.

2.4 The altimeter setting was 29.84. Examination of the face under ultra-violet light revealed scattered spots of no apparent significance. Paint was missing from the letter "U" of "Altitude". This would correspond with the hand indicating 400' to 500'. Microscopic examination of the hand hub indicated the hand was pointing to about 340' when impact occurred.

2.5 Examination of the Gas Generator (N_1) Tachometer, serial number 1438, under ultra-violet light gave negative results. Microscopic examination of the face revealed nothing significant. Internal examination revealed a bent stop indicating the hand had over-travelled beyond 100%. No other significant marks were noted.

2.6 Microscopic examination of the Dual Tachometer (the face was missing) revealed the following:

2.6.1 Both hairsprings were distorted but intact.

2.6.2 All gears and shafting were free to turn.

2.6.3 The centre concentric hand attachment shafts were bent.

....2

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2.6.4 The outer portion of the turbine gear was bent upwards between tooth number 10 and 49 (reading clockwise from the gear tooth mechanical stop). Impact marks were apparent between teeth 9-10, 10-11, and 11-12. Three corresponding teeth on the matching gear were marked. This would be consistent with engine (N_2) RPM above 100%.

2.6.5 The rotor gears were slightly misaligned (not meshing) and were free to turn independent of each other. The only significant mark was a heavy smear adjacent to the first two teeth clockwise of the gear tooth mechanical stop. This would be consistent with maximum indication of rotor speed (N_R) when the gear teeth became unmeshed.

3.0 CONCLUSIONS

3.1 The Volt-Ammeter was reading 25 amp. when impacted.

3.2 The oil temperature gauge was reading about 110° clockwise from the zero position when impacted.

3.3 The exhaust temperature gauge was reading between 890°C and 500°C when impacted.

3.4 The Altimeter was reading between 340' and 500' when impacted.

3.5 The Gas Generator Tachometer exceeded 100% at some time.

3.6 The Dual Tachometer indicated both N_2 and N_R readings in excess of 100% when the instrument was impacted.

Prepared by: R.M. Logan

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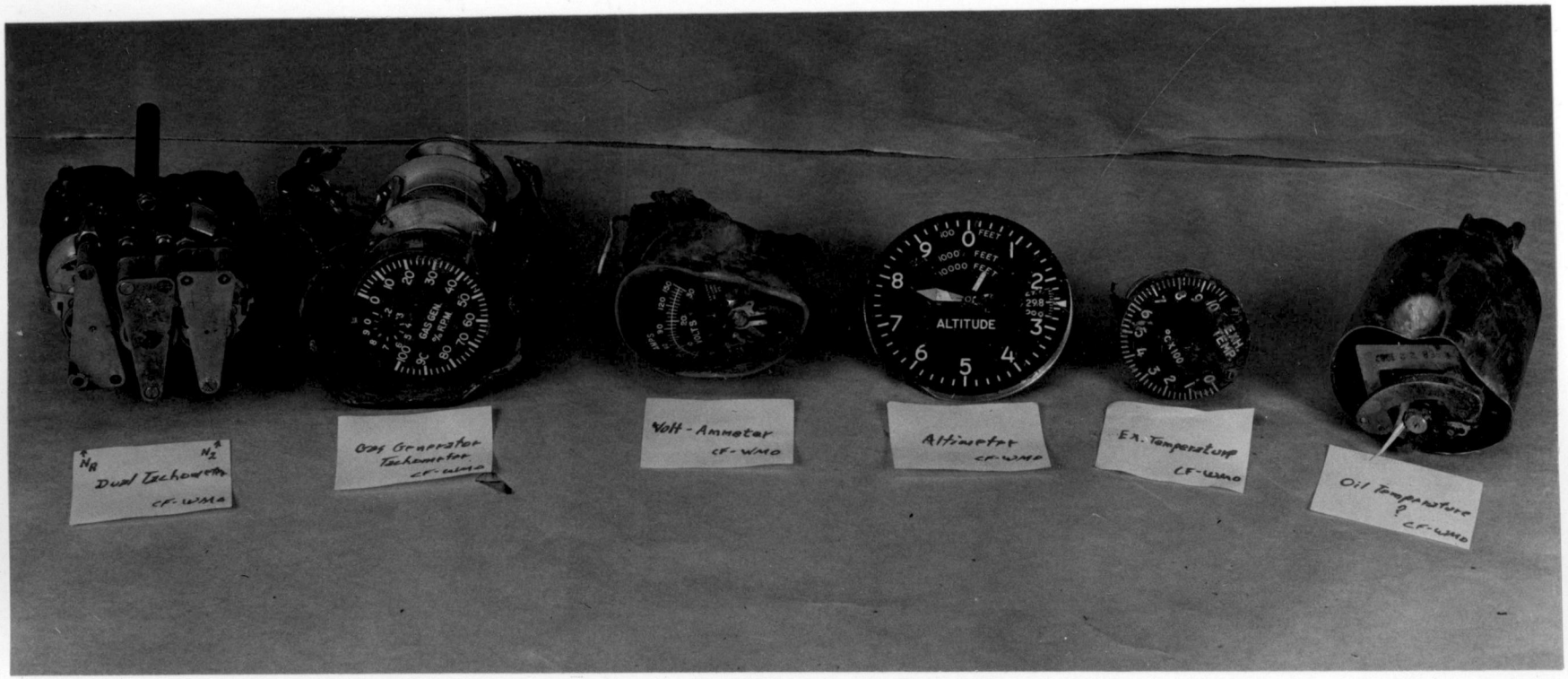

FIG. 1 - GENERAL VIEW OF INSTRUMENTS

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METALLURGICAL APPENDIX II TO PROJECT 24/68

Hiller FH1100, CF-WMO

1.0 INTRODUCTION

1.1 The purpose of this investigation was to determine:

(a) the mechanism of failure of the main rotor shaft

(b) whether the main rotor was in autorotation or under engine power when failure occurred

(c) the possibility of any metallurgical defects

2.0 METALLURGICAL EXAMINATION AND DISCUSSION

2.1 The submitted shaft did not exhibit any corrosive attack to the painted inner and cadmium plated outer surfaces. No signs of previous abnormal surface defects were detected on the shaft and the fracture faces disclosed no evidence of progressive failure such as fatigue.

2.2 Metallographic examination revealed a microstructure typical of tempered martensite. No metallurgical defects were evident. The hardness of the shaft ranged from 383/409VPN (39/42 Rc) which corresponds to a converted equivalent tensile strength of approximately 180/197 KSI.

2.3 Examination of the failed rotor shaft revealed a typical overstress failure. It was apparent from the topography of the fracture faces as well as the presence of stop mark imprints on the shaft that the failure occured in two stages. PHOTO 1 shows the fracture faces fitted together in the manner in which they mated during the second stage of failure. It is evident from the photo that during the first stage of the failure sequence 2/3 of the shaft cross-section failed as a result of the first excessive flap. When the upper shaft had been displaced to the position shown in PHOTO 1, only 1/3 of the cross-section remained unruptured. This section subsequently failed during the second excessive flap. The initial heavy static stop imprint, made during the failure of the 2/3 cross-section, is shown in PHOTO 2. A less forceful static stop imprint on the other side of the shaft, opposite the final 1/3 cross-section that failed, is shown in PHOTO 3. A bending overload in the double flap sequence resulted in complete failure.

2.4 The relative displacement of the fracture faces during the second flap as shown in PHOTOS 1 & 4 reveals that the lower half of the shaft was advancing ahead of the upper half (in rotation) as the shaft ruptured. This indicates that the main rotor shaft was under engine power during failure. Shearing and tearing of the upper fracture face in a clockwise direction of rotation is shown in PHOTO 4 (which is consistent with the main rotor resisting applied torque). The tears were produced as a result of improper mating of the fracture faces caused by their relative rotational displacement. These marks again indicate that the bottom shaft section was driving the top section which corresponds to an engine power on condition.

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3.0 CONCLUSIONS

3.1 The main rotor shaft was subjected to a bending overload coupled with a torsional load.

3.2 No metallurgical defects, in the submitted shaft sections, were found.

3.3 Approximate tensile strength of the shaft was 180/197 KSI.

3.4 All the evidence including the fracture surface topography indicates that the shaft was driving the main rotor at the time of failure.

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T.W. Heaslip

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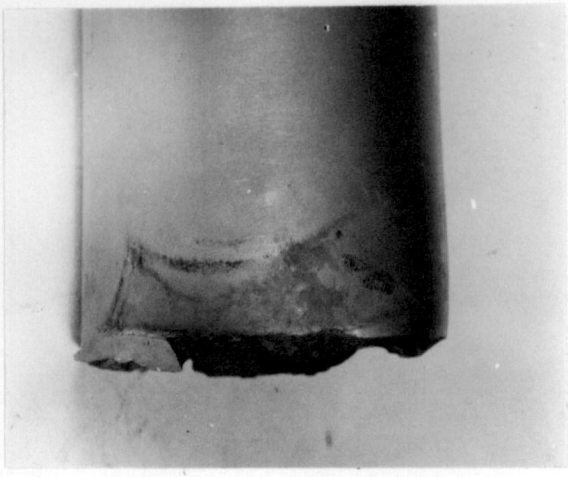
APPROXIMATELY 1/2 X

PHOTO 1 - ILLUSTRATES MATING GEOMETRY AFTER FIRST FLAP AND FAILURE OF 2/3 OF THE CROSS-SECTION UPON IMPACT WITH SHAFT STOP (IMPRINT EVIDENT ABOVE FRACTURE). APPROXIMATELY 1/3 OF CROSS-SECTION IS MATING. ARROW SHOWS DIRECTION OF ROTATION OF BOTTOM SECTION RELATIVE TO TOP SECTION.



APPROXIMATELY FULL SCALE

PHOTO 2 - TOP SECTION OF SHAFT SHOWING CLOSE-UP OF SHAFT STOP IMPRINT AND FRACTURE FACE. NOTE 45 DEGREE ANGLE OF FRACTURE FACE.

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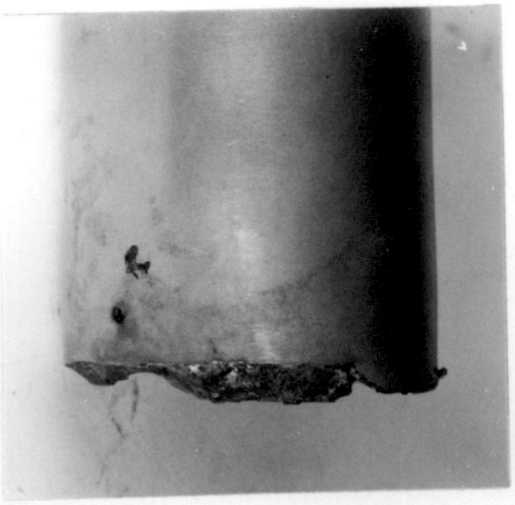
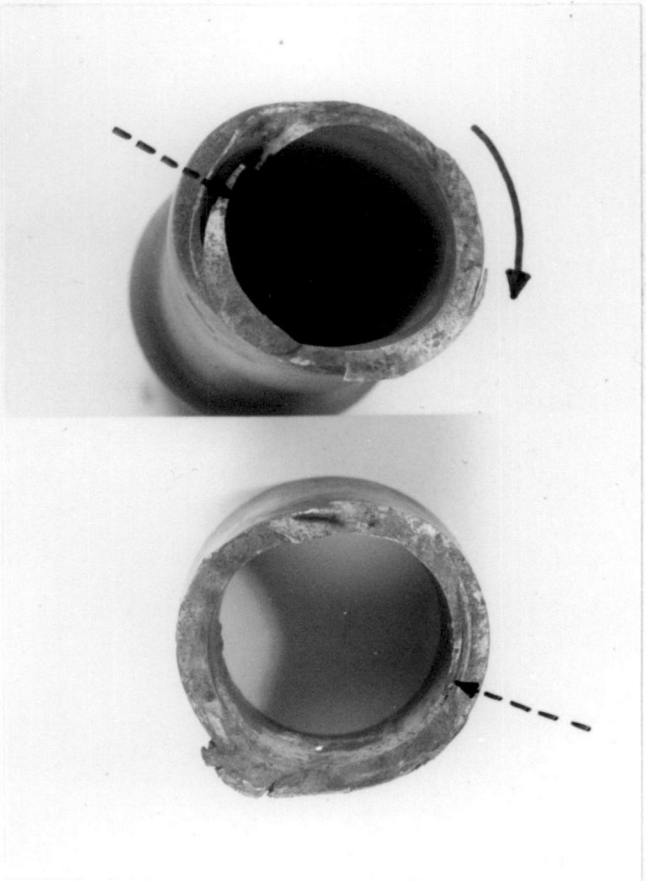


APPROXIMATELY FULL SCALE

PHOTO 3 - TOP SECTION OF SHAFT SHOWING CLOSE-UP OF SHAFT STOP IMPRINT ON OTHER SIDE OF SHAFT. NOTE 45 DEGREE ANGLE OF FRACTURE FACE.



APPROXIMATELY 3/4 X

PHOTO 4 - VIEW OF MATING SHAFT FRACTURE SURFACES. ARROW INDICATES DIRECTION OF ROTATION OF BOTTOM PORTION RELATIVE TO TOP PORTION REQUIRED TO PRODUCE TEARS (DASHED ARROWS). TOP & BOTTOM PHOTOS ARE TOP AND BOTTOM OF ROTOR SHAFT RESPECTIVELY.

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APPENDIX III TO PROJECT 24/68

FIN FAILURE ANALYSIS - PART I

Hiller FH1100, CF-WMO

INTRODUCTION

Examination of the fin and the tail rotor wreckage reveals that the tail rotor hit the leading edge of the fin causing each to break up. The photographs show the parts which contacted each other.

The tail rotor is on the left side of the fin and turns counter-clockwise when viewed from the left hand side.

DISCUSSION

There are several factors which reduce the clearance between the leading edge of the fin and the tail rotor tip.

1. For anti-torque the tail rotor load is acting from left to right. Therefore, the lift force on a blade is acting to the right and bending it toward the fin. Equilibrium between lift and centrifugal force results in a coning of the tail rotor toward the fin, with the usual flapping superimposed.

2. When the main rotor mast separated, the torque applied to the helicopter by the main rotor was removed. The anti-torque force of the tail rotor which is still being applied to the right at the top of the fin causes yawing to the left and rolling to the right. The rolling acceleration is greater than the yawing acceleration because the effect of the shorter rolling moment arm is more than offset by the much smaller rolling moment of inertia of the helicopter without the main rotor.

   The gyro couple on the tail rotor, due to rolling velocity to the right, acts in the sense to move the rotor blade tips closer to the fin, i.e., the tail rotor disc yaws to the right. The gyro couple on the tail rotor, due to aircraft yawing velocity to the left, acts in the sense to move the rotor blade tips away from the fin, i.e., the tail rotor disc rolls to the right. Since the roll velocity will increase much faster than the yaw velocity, the net effect will be to move the tail rotor blade tips closer to the fin leading edge. The possibility of over speeding of the tail rotor would aggravate this condition. Twisting of the fin tip, from the large gyro couple in a right yaw sense, will also move the tail rotor blade tips closer to the fin.

(See sketch on Page 2.)

CONCLUSION

It is concluded that the tail rotor tips were caused to contact the leading edge of the fin by a combination of the above loads.

A.J.W. Melson Sept. 18, 1968.

Prepared by A.J.W. Melson

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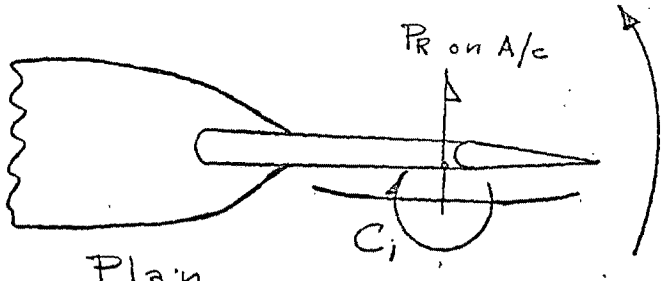
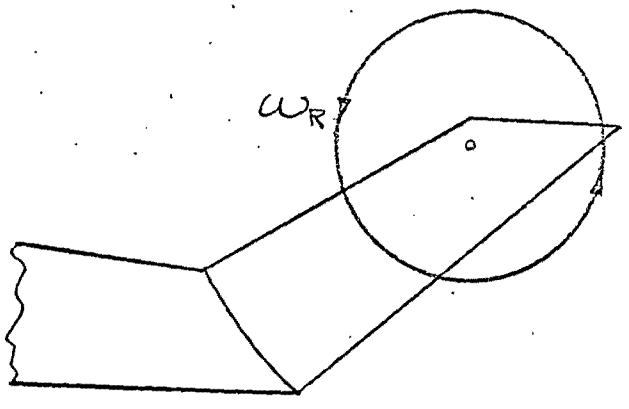
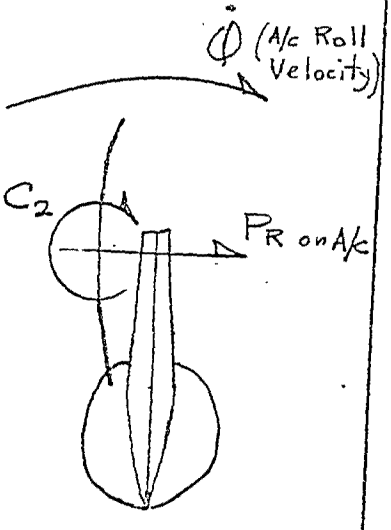
Sketch Showing Direction of Tail Rotor Load and Sense of Gyro Couples



Plan



Elevation



Rear View

$\dot{\psi}$ = yaw velocity, rad./sec.
$\dot{\phi}$ = roll " " " "
C_1 = gyro couple due to $\dot{\phi}$, in. lb.
C_2 = " " " " $\dot{\psi}$, in. lb.

$$\dot{\phi} > \dot{\psi}$$
$$\therefore \quad C_1 > C_2$$

Tail rotor tips bent toward fin due to rotor load P_R.

	INITIALS	DATE
CALC.	A.J.W.M.	Sept/68
CHECK		
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SUBJECT
Appendix III
Fin Failure Analysis - Part I

HQ FILE: 5002-3796
JOB No.: 24/68
PAGE No.: 000725

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PHOTO I - VIEW FROM R.H. SIDE OF FIN SHOWING THE APPROXIMATE POSITION OF THE TAIL ROTOR BLADE AS IT STRUCK THE LEADING EDGE SPAR AND BROKE ITS TIP OFF.



PHOTO II - CLOSE-UP VIEW FROM R.H. SIDE OF FIN SHOWING WHERE TIP OF THE SAME BLADE STRUCK THE CHANNEL (ARROW "A"). NOTE THREAD IMPRINT FROM BROKEN SCREW "B" ON ROTOR TIP (ARROW "C") AND ON CHANNEL (ARROW "D").

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PHOTO III - VIEW FROM R.H. SIDE OF FIN SHOWING THE POSITION OF THE OTHER TAIL ROTOR BLADE AS IT STRUCK THE TAIL ROTOR DRIVE SHAFT.



PHOTO IV - VIEW FROM R.H. SIDE OF FIN SHOWING THE FIBERGLASS LEADING EDGE AND THE TORQUE TUBE STRUCK BY THE TAIL ROTOR.

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Appendix III Part II

Project 24/68
Hiller FH 1100, CF-WMO

Strength of Fin

From Hiller Stress Report No. 63-40, Page 2.19,
Margin of Safety = +.79
for maximum tail rotor load of 420 lb. (limit)
which occurs for the design yawing case.
∴ Fin strength is more than adequate to take the bending moments due to the maximum rotor load.

Air Load on Fin

The only load on the fin dealt with in the Hiller reports appears to be the tail rotor load of 420 lb.

The air load on the fin will be found for the helicopter in the yawed condition.

The fin bending moment due to air load will then be discussed.

Fin air load = $C_L \cdot q \cdot S$ (at speed Vne)

where $q = \frac{1}{2} V^2 = .00256 \times 127^2 = 41.4$ psf.

$C_L \doteq 1.0$ (assumed max. lift coefficient in yaw condition)

$S \doteq 7.0$ ft.^{2} (measured from Hiller drawing 24-62002)

∴ Air load = $1.0 \times 41.4 \times 7 =$ 290 lb. (limit)

For a yawing manouever, the air load will act in the opposite sense to the rotor load, and therefore it reduces the bending on fin.

	INITIALS	DATE	SUBJECT	HQ FILE: 5002-3796
CALC.	A.J.W.M.	Sept. 68	Appendix III	
CHECK			Fin Failure Analysis – Part II	JOB No.: 24/68
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For a lateral gust case, it could act in the same sense. However, it would be added to a small anti-torque load instead of the large (420 lb. limit) rotor load which occurs for the design yawing case.

Because the rotor is situated at the top of the fin, the bending moment due to the rotor load is much higher than that due to the max. airload which effectively acts at a station or water line less than half way from the base of the fin.

The cause of the buckling failures observed in the fin near the rotor can not be attributed to fin airloads. They are believed to be the result of violent load reversals from a severely out of balance rotor, subsequent to the loss of the rotor blade tip when the rotor struck the fin.

	INITIALS	DATE	SUBJECT	HQ FILE: 5002-3796
CALC.	A.J.W.M	Sept. 68	Appendix III Fin Failure Analysis - Part II	JOB No.: 24/68
CHECK				
REVISED				PAGE No.: 000729

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Appendix IV to Project 24/68

Main Rotor Mast Failure Analysis

Hiller FH 1100, CF-WMO

Strength of Rotor Mast

Section Properties

Diameter D = 2.122 in. (measured)
Thickness t = .191 in. (")

Moment of inertia I about a diameter
$= \frac{\pi}{4}(r_o^4 - r_i^4)$

where r_o = outside radius = 1.061 in.
" r_i = inside " = .870 in.

$\therefore I = \frac{\pi}{4}(1.061^4 - .870^4) = .289 \text{ in.}^4$

Material = steel of F_{tu} = 180 - 197 ksi.
- ref. Appendix II

$\therefore F_B$ = 248000 - 270,000 psi. (say 260,000)
for $\frac{D}{t} = \frac{2.122}{.191} = 11.1$ ref. MIL-HDBK-5 Fig. 2.10.1.1

$F_B = \frac{M \cdot y}{I}$ ——— (1) where $y = D/2 = 1.061$ in.
$I = .289$ in.^{4}
M = bending moment at failed section.
$= P \cdot d$
where P = force applied by stop
d = dist. from trunnion to ". $\doteq 6.5$ in.

	INITIALS	DATE
CALC.	A.J.W.M.	Sept. 68
CHECK		
REVISED		

SUBJECT: Appendix IV
Main Rotor Mast Failure Analysis

HQ FILE: 5002-3796
JOB No.: 24/68

D.O.T. AIRCRAFT ACCIDENT INVESTIGATION DIVISION
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$\therefore M = 6.5 P$

Sub. in ① $P = \frac{F_B \cdot I}{6.5\ 4} = \frac{260{,}000 \times .289}{6.5 \times 1.061}$

$= \underline{10900 \text{ lb.}}$

$\therefore M = 6.5 \times 10900 = \underline{70900 \text{ in. lb.}}$ which is the moment applied to the mast causing it to fail.

Discussion of Main Rotor Mast Failure

The evidence indicates excessive main rotor flapping which caused the stops to contact the mast with such force that failure of the mast occurred.

The reason for the excessive flapping is not known with certainty but the following possibilities are considered:

1. Low Main Rotor RPM

This condition is ruled out because there is evidence to show that the main rotor was under power and that the engine had high rpm at the time of the accident.

2. Flapping due to Gusts

The effect of a head on horizontal gust is to increase the lift on the advancing blade and decrease it on the retreating one. This results, 90° later, in the advancing blade rising in front of the helicopter, and

	INITIALS	DATE
CALC.	A.J.W.M.	Sept. 68.
CHECK		
REVISED		

SUBJECT: Appendix IV
Main Rotor Mast Failure Analysis

HQ FILE: 5002-3796
JOB No.: 24/68
PAGE No.: 000731

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the retreating blade lowering closer to the boom. If the helicopter speed is near $V_{N.E.}$ there is danger of retreating blade stall. The major warnings of approaching retreating blade stall in the order in which they will generally be experienced are: (ref. F.A.A., Basic Helicopter Handbook)

1. Abnormal 2 per revolution vibration in two-bladed rotors.
2. Pitchup of the nose.
3. Tendency for the helicopter to roll in the direction of the stalled (left) side.

At the onset of blade stall vibration, the pilot should take the following corrective measures:

1. Reduce collective pitch.
2. Increase rotor RPM.
3. Reduce forward airspeed.

It should be noted that the immediate reaction of the pilot is to push the stick forward when the nose pitches up, as it would when the helicopter meets an upward vertical gust, in order to smooth out the ride. If the problem is the onset of retreating blade stall, the pilot will realize this and subsequently take the corrective action of easing back on the cyclic control to reduce airspeed.

"When operating under flight conditions likely to produce blade stall, a helicopter may quickly advance into severe blade stall by a steep turn; pullup, or other abrupt manoeuver. The stall reaction will be rapid and violent. The vibrations, pitchup, and roll tendencies of the helicopter will present a serious threat to helicopter control and structural limitations." ref. Basic Helicopter Handbook F.A.A.

	INITIALS	DATE
CALC.	A.J.W.M.	Sept. 68
CHECK		
REVISED		

SUBJECT

Appendix IV
Main Rotor Mast Failure Analysis

HQ FILE: 5002-3796

JOB No.: 24/68

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The effect of flying into a forward moving horizontal gust is to lower the advancing blade and raise the retreating blade. At a speed near $V_{N.E.}$ there is the danger of flapping the blade against the stop because, in this flight condition, the rotor disc is already tilted forward (cyclic stick forward). Pilot corrective action would be to pull back on the cyclic to pull the nose back up.

The effect of an upward vertical gust is to increase the angle of attack of the advancing blade and of the retreating blade. Since the increase in lift on the advancing blade is greater than that on the retreating blade, the rotor will flap up at the front. This flapping is similar to the above "head-on" gust condition. The pilot can not distinguish this gust from the "head-on" gust and his corrective action is the same, ie., forward on cyclic control to smooth out the ride.

It should be noted here that, unlike fixed wing aircraft which are statically stable in both angle of attack and speed, the helicopter is statically stable with regard to speed only and is statically unstable in angle of attack. This means that when the attitude of a helicopter is changed by a gust or a forward or aft movement of the cyclic control which pitches the helicopter downward or upward, the pilot must apply cyclic control in a direction to arrest the pitching motion which was started. Therefore, he is continually trimming for angle of attack change.

The effect of a downward vertical gust is to flap the advancing blade downward and the

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retreating blade upward. In high speed flight when the rotor disc is tilted forward and the cyclic control is forward, the effect of this gust could be severe because the blade flapping angle could be increased. If a downward gust was preceded by an upward gust for which corrective action was taken, the effect of the downward gust could well be to cause a severe flap against the stop resulting in failure of the mast. Overcorrection would aggravate the condition.

The evidence shows that the main rotor blade struck the forward fuselage at the time it separated from the helicopter. It was also reported that at the time of the accident the wind in the area was strong and gusty and that other aircraft in the area had experienced very turbulent conditions. The turbulence could have been caused, to a large extent, by the irregular terrain above which the wind was blowing. The flight path was to the east and the wind was from the right about 65° from the flight path. To the south the terrain is flat with a rapid drop of about 300 feet to the Frazer River level just north of the flight path. There is a deep valley in this plain which extends back into the hill along the river in a southerly direction. Several smaller valleys run off at right angles to it on the east side. At the time of the accident, the wind was blowing in the direction of this valley.

Conclusions

The helicopter probably flew into gust

	INITIALS	DATE	SUBJECT	HQ FILE: 5002-3796
CALC.	A.J.W.M.	Sept. 68	Appendix IV Main Rotor Mast Failure Analysis	JOB No.: 24/68
CHECK				
REVISED				

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conditions at too high a speed with the result that the main rotor flapped hard against the stop causing failure of the rotor mast.

Note

After this accident, the manufacturer restricted the helicopter to a maximum speed of 110 mph. Previously, the maximum speed was 127 mph. On June 12, 1968, this speed restriction was lifted and a maximum speed of 127 mph. was restored by the manufacturer.

- ref. Hiller Flight Manual Revision 6 and 7.

	INITIALS	DATE
CALC.	A.J.W.M.	Sept. 68
CHECK		
REVISED		

SUBJECT

Appendix IV
Main Rotor Mast Failure Analysis

HQ FILE: 5002-3796
JOB No.: 24/68

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ADDENDUM TO REPORT 24/68

Preliminary Discussion

At the time of the accident (March 14, 1968), the sea level never exceed speed (Vne) was 127 mph. I.A.S., ref. FH-1100 Flight Manual Section 1. At this time two horizontal stabilizers were available: a 52 inch and a 72 inch. The accident aircraft had a 72 inch (extended) stabilizer. On page 62-3 of the Service Manual dated November 15/67 it says: "A longer horizontal stabilizer with 0° pitch angle is required when the inflatable float kit is installed on the helicopter. A fiberglass extension assembly is attached to the existing horizontal stabilizer and a new stabilizer fairing is installed."

The accident aircraft did not have the inflatable float kit installed, but there was no apparent restriction on the use of the extended stabilizer at this time.

On April 25, 1968, revision 6 of the Flight Manual was issued. The operating limitations were changed to give a new sea level never exceed speed (Vne) of 110 mph. I.A.S. with either the 52 inch or the 72 inch horizontal stabilizer.

Two Service Bulletins were issued by the manufacturer about two months later. On 27 May, 1968, Service Bulletin FH1100-51-3 was issued. The reason for this bulletin was: "To inspect and insure the proper manufacturer's specification of the teeter angular dimension." The bulletin describes the "inspection and rework, if necessary, to the teetering stops to assure that the main rotor head has the specified angular movement."

The Second Service Bulletin FH1100-62-1 was issued on 17 June 1968. The reason for this bulletin was: "To improve body stability of non-float equipped FH-1100 Helicopters when entering autorotation". The bulletin says: "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."

About the time the above bulletins were issued, the FH1100 Flight Manual operation limitations were revised to restore the original sea level never exceed speed (Vne) of 127 mph. I.A.S. at revision 7 approved by FAA on June 12, 1968.

Since the original Vne was restored at the time the service bulletins were issued, it appears that there may be some connection between the restoration of the original Vne and the two service bulletins. Helicopter specialists at the National Aeronautical Establishment of the National Research Council were consulted about the flight characteristics of helicopters with regard to stability, the cyclic stick position, and the main rotor flapping angles for different horizontal stabilizers. These characteristics were discussed in relation to autorotations, level flight in still air, and flight in turbulent air. The pertinent information obtained as a result of these consultations is as follows:

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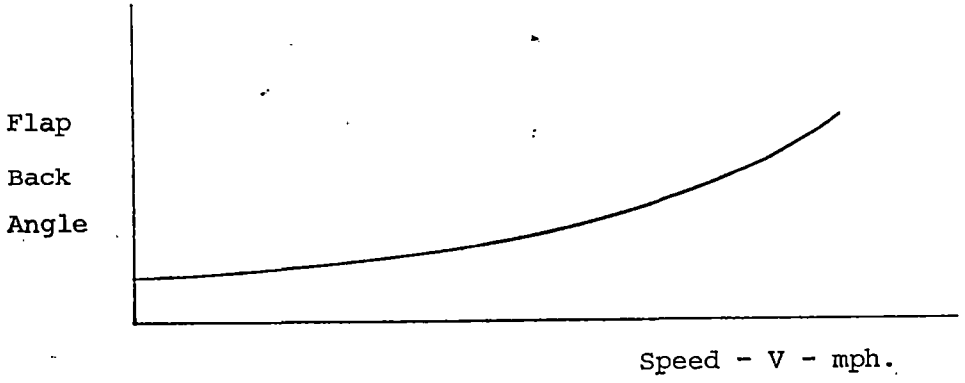
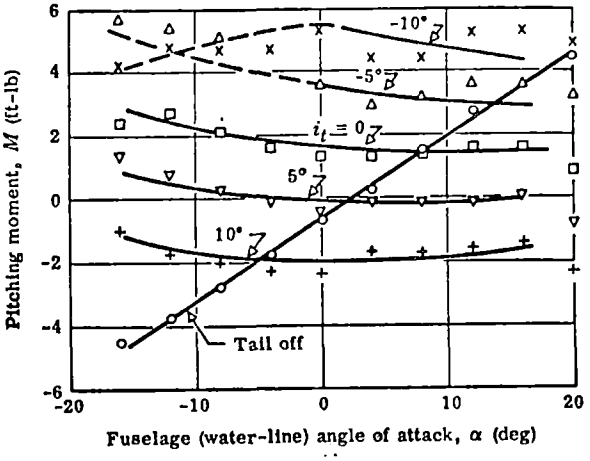
1. General

In a hover, very little flapping of the main rotor blades occurs. As the cyclic control is pushed forward, the swash plate causes the rotor disc to tilt forward; i.e., the rotor blades flap down as they move forward.

At zero speed, the angle of tilt is about the same as the swash plate angle. With forward speed there is a flap back of the rotor blades which reduces the flapping angle.



Characteristic fuselage and tail pitching moments are shown in the graph below. The curve shows that, with no horizontal tail, the helicopter will have a pitching moment which varies directly with the angle of attack. With a stabilizer added at various angles of attack, the pitching moment may be reduced to a nearly constant value for a wide range of fuselage angles of attack including high negative values.



Fuselage and Tail Pitching Moments

Ref.: E. Seckel, Stability and Control of Aircraft and Helicopters.

As the angle of attack of the stabilizer becomes more negative, the pitching moment of the helicopter moves from nose down to nose up. Therefore, if one stabilizer, which is set at a given angle of attack to reduce the pitching moment, is repaced by a larger stabilizer, the angle of attack of the larger stabilizer should be set at an angle of attack which is more positive than that of the smaller one.

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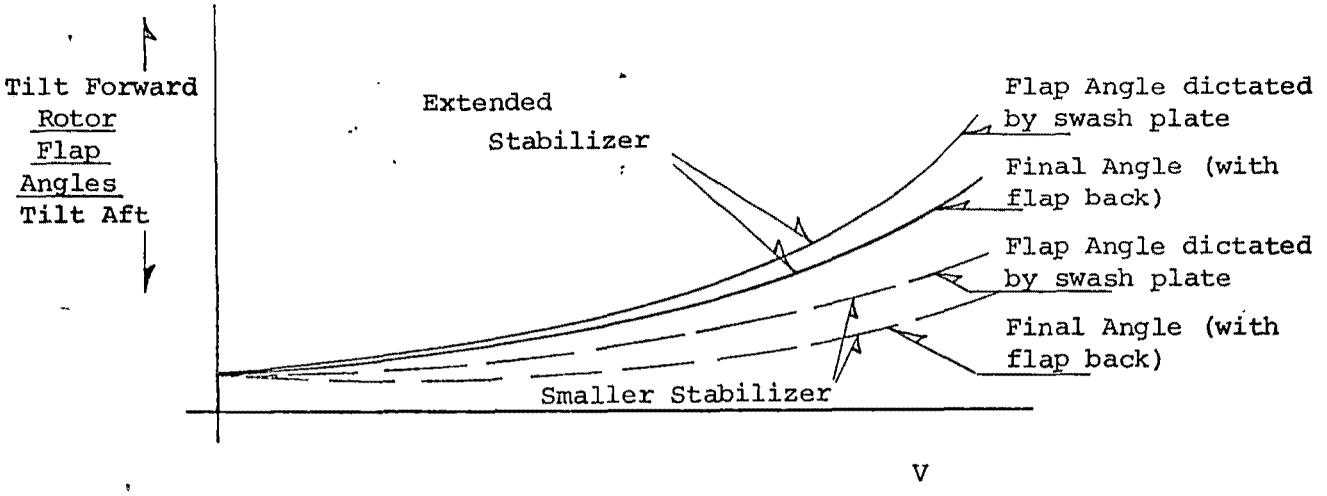
The cyclic stick is moved forward with speed. If both stabilizers are set at the same angle of attack, the larger stabilizer will cause the cyclic stick to be farther forward. Since the downward flapping angle is proportional to the forward displacment of the cyclic control, larger blade flapping angles will be obtained when the larger stabilizer is used.

The curve below shows the relation of the flapping angles with speed for two stabilizers at the same angle of attack.



There is a reduction in the rotor flap angle at any given speed due to flap back for both stabilizers, but the flapping angle is higher for the larger stabilizer.

Specific Flight Conditions

1. Autorotations

The Pacific Region reported a case of an FH-1100 pilot in cruise condition at about 120 mph., who lowered the collective control quite rapidly to go in to autorotation because he wanted to make a fast let down into a mountain valley. The helicopter immediately pitched nose down about 20-30 degrees with a rapid buildup of speed. He recovered by leaving the cyclic control in the position it had been in and pulling up on the collective control. The helicopter recovered from the dive and the pilot then made a slow descent. This helicopter had the extended stabilizer & skid gear.

In the transition from cruising flight to autorotation, the flow of air through the rotor disc changes from downward to upward. The downwash in cruise flight which causes the stabilizer to have an effective negative angle of attack and hence a downward acting load, changes to upwash in autorotation causing an upward load on the stabilizer. This upward load, in the case of the extended stabilizer was apparently too large and caused a nose down pitching moment that was higher than desired.

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The Service Bulletin FH1100-62-1 of June 17, 1968, which was issued "to improve body stability of non-float equipped FH1100 helicopters when entering autorotation", specifies removal of the extensions to the horizontal stabilizer.

2. Level Flight in Still Air

An FH-1100 operator reported that the helicopter on skids flew faster with less power with the extended stabilizer. The reason given was that the fuselage remained in a more horizontal attitude at cruise (less nose down).

This is explained by the fact that a larger stabilizer would produce a larger down load at a given fuselage angle of attack. Therefore, equilibrium would be obtained at a smaller fuselage angle of attack.

The forward tilt of the rotor disc would be greater with the extended stabilizer, and therefore, the cyclic control displacment would be more forward. Thus the blade flapping angles at cruise would be larger with the extended stabilizer than they would be with the regular stabilizer.

3. Flight in Turbulent Air

When gusts are encountered in a helicopter blade, flapping takes place according to an equation of the form:

$$\phi = \frac{Lv \times Vg \times Ixx}{W \times h}$$

Where ϕ = flap angle - degrees

Lv = rolling or pitching moment coefficient due to side or forward velocity.

Vg = gust velocity - ft./sec.

Ixx = aircraft moment of inertia - slug $ft.^2$

W = aircraft weight - lb.

h = height of rotor hub above helicopter centre of gravity.

Therefore, the rotor blade will have additional flapping superimposed on the normal flapping due to cyclic control displacement. The direction of the flapping due to gusts would be as follows:

For upward vertical gust -- advancing blade rises
For downward vertical gust -- advancing blade lowers
For rearward horizontal gust -- advancing blade rises
For forward horizontal gust -- advancing blade lowers

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One effect of increasing the size of the horizontal stabilizer is that the helicopter becomes more sensitive in pitch, both with respect to control movements (cyclic) and to gusts which affect the pitch attitude.

Additional Data

The main rotor head angular movement available for CF-WMO was not known exactly at the time of the accident. For other FH-1100 helicopters of the same fleet, the angular movement was measured after receipt of Service Bulletin FH-1100-51-3. The total measured angle varied from 20° to 15° and the average was 18°3. A check done by investigators using a serviceable rotor mast in the damaged rotor hub of CF-WMO gave readings of 9°5 for blue blade and 9°0 for yellow blade, for a total angular movement of 18°5. Since the stops were deformed and may have been moved outboard when they impacted the mast, this angle would have been less than 18°5 before the accident.

The aft C.G. position reported for this helicopter was within the approved limits.

The angle of incidence of the 52 inch (standard) horizontal stabilizer is -2° ± .5°. (Ref. Type Certificate H2 - WE, Revision 1, November 30, 1966).

The angle of incidence of the 72 inch (extended) horizontal stabilizer on CF-WMO was +1°. (Ref. Fairchild Hiller Engineering Orders 60946 & 61253)

Discussion

Two flight characteristics of the helicopter that were peculiar to the extended horizontal stabilizer installation on the otherwise standard configuration have been noted. The first one reported was the nose down pitching and the rapid speed increase experienced after entering an autorotation at about 120 mph. The second characteristic reported was that the helicopter on skids flew faster with less power with the extended horizontal stabilizer.

Both of these characteristics can be directly related to the influence of the extended horizontal stabilizer by comparing the effect of the extended stabilizer at +1° incidence with that of the standard stabilizer at -2° incidence.

For the autorotation case, the upward acting load on the extended stabilizer was probably too large and caused a nose down pitching moment that was higher than desired. Reverting to the smaller stabilizer at -2° incidence, as required by the Service Bulletin FH1100-62-1, would reduce the nose down pitching moment for this case.

For the other case, for which it was reported that the helicopter flew in a less nose down attitude at high speed, the extended stabilizer must have been capable of producing a larger down load (or balancing load) than the standard stabilizer for a given fuselage angle of attack. Therefore, equilibrium was obtained at a smaller fuselage angle of attack.

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Apparently, the effect of a more positive angle of incidence of the extended stabilizer was more than offset by the increase in area. As stated before, the forward tilt of the rotor disc would be greater with the extended stabilizer, and therefore, the cyclic control displacement would be more forward. Therefore, the blade flapping angles at cruise would be larger with the extended stabilizer than they would be with the standard stabilizer.

In addition, a larger stabilizer has the effect of increasing the sensitivity in pitch of the helicopter with respect to control movements (cyclic) and to gusts which affect the pitch attitude.

From the above, it is apparent that downward flapping of the advancing blades would be greater for the non-float equipped helicopter when the horizontal stabilizer extensions are installed and the aircraft is in forward powered flight.

The aft C.G. position is the most adverse one with respect to the magnitude of the downward flapping angles of the advancing main rotor blades because, as the C.G. is moved to the rear, a forward displacement of the cyclic control is required to correct the resulting unbalance.

Additional flapping takes place in turbulence. A downward vertical gust would flap the advancing blade downward toward the cockpit. Service Bulletin FH1100-51-3 of May 27, 1968, was issued to ensure that 10° angular movement on each side was available. The accident aircraft had a main rotor head angular movement less than the amount specified in the above Service Bulletin, i.e., less than 18.5^{o} instead of 20°.

Flapping of the advancing blade in a downward direction towards the cabin area is in agreement with the conclusion reached in the main body of the report which states that initial breakup involved a main rotor strike on the forward fuselage.

Conclusions

The main rotor blades flapped downward 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 blade.

2. This flapping of the rotor blade in forward flight was of a higher amplitude with the extended horizontal stabilizer which was installed than it would have been with the small stabilizer.

3. The teetering stops on this helicopter did not provide the specified angular movement of the rotor blade of 20°. The maximum angular movement from stop to stop was less than 18.5^{o} for the accident helicopter.

Submitted by: A.J.W. Melson

Approved by: A.N. Le Chemin

000741

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CANADA

DEPARTMENT OF TRANSPORT

AIRCRAFT ACCIDENT INVESTIGATION DIVISION

AIRCRAFT TYPE AND REGISTRATION
HILLER FH-1100 CF-MMO
LOCATION OF ACCIDENT
Approximately 5 miles east of FORT LANGLEY, B.C.
DATE OF ACCIDENT
March 14, 1968

REPORT OF THE INQUIRY INTO THE ACCIDENT OF A CIVIL AIRCRAFT

23-0003
10-63

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CONTENTS

		PAGE
PART 1	INTRODUCTION	
	ACCIDENT DETAILS	4
PART 2	FACTS ASCERTAINED BY INVESTIGATION	
	AIRCRAFT	4
	ENGINE AND PROPELLER	4
	WRECKAGE	5
	WRECKAGE – TECHNICAL EXAMINATION – INVESTIGATION & TESTS	6
	CREW	7
	WEATHER	7 & 7A
	NAVIGATION AIDS	8
	AIR TRAFFIC CONTROL AND COMMUNICATIONS	8
	FIRE FIGHTING EQUIPMENT	8 & 9
	WATER OPERATIONS	9
	ACCIDENT AREA	9
PART 3	EXAMINATION OF EVIDENCE	
	RECONSTRUCTION OF FLIGHT AND SUMMARY OF EVENTS	10
	DISCUSSION OF EVIDENCE	11
	SUMMATION	11
PART 4	CONCLUSION	
	PROBABLE CAUSE(S)	12
	RECOMMENDATIONS	12
	NOTIFICATION	12

000743

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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.

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5. PHOTOGRAPHS.

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

(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 AIMA, Ottawa
20. Leboratory 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

 the main wreckage. The tail rotor blades were severed just outboard from the root

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onds. 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 #14. 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".

000749

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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 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 ☑ CONTROL TOWER ☐ TERMINAL CONTROL ☐ CENTRE CONTROL ☐ COMPANY ONLY ☐

TYPE OF CLEARANCE

NONE ☑ 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 ☑ 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 ☑ 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.

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 Mr. Roy Hepworth, 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.

. . . Page 11(A)

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.

. . . Page 11(B)

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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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PART 4 CONCLUSION

PROBABLE CAUSE(S)

PRIMARY

6.4.4. Helicopter main rotor mast failure.

6.8.9. Turbulence in flight.

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.

NOTIFICATION

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

24 June 1969 — DATE — INVESTIGATOR

June 25, 1969 — DATE — INVESTIGATOR

DATE — INVESTIGATOR

Reviewed and Recommended for Approval:

25 June 69 — DATE — REGIONAL SUPERINTENDENT ACCIDENT INVESTIGATION

Approved:

July 11/69 — DATE — 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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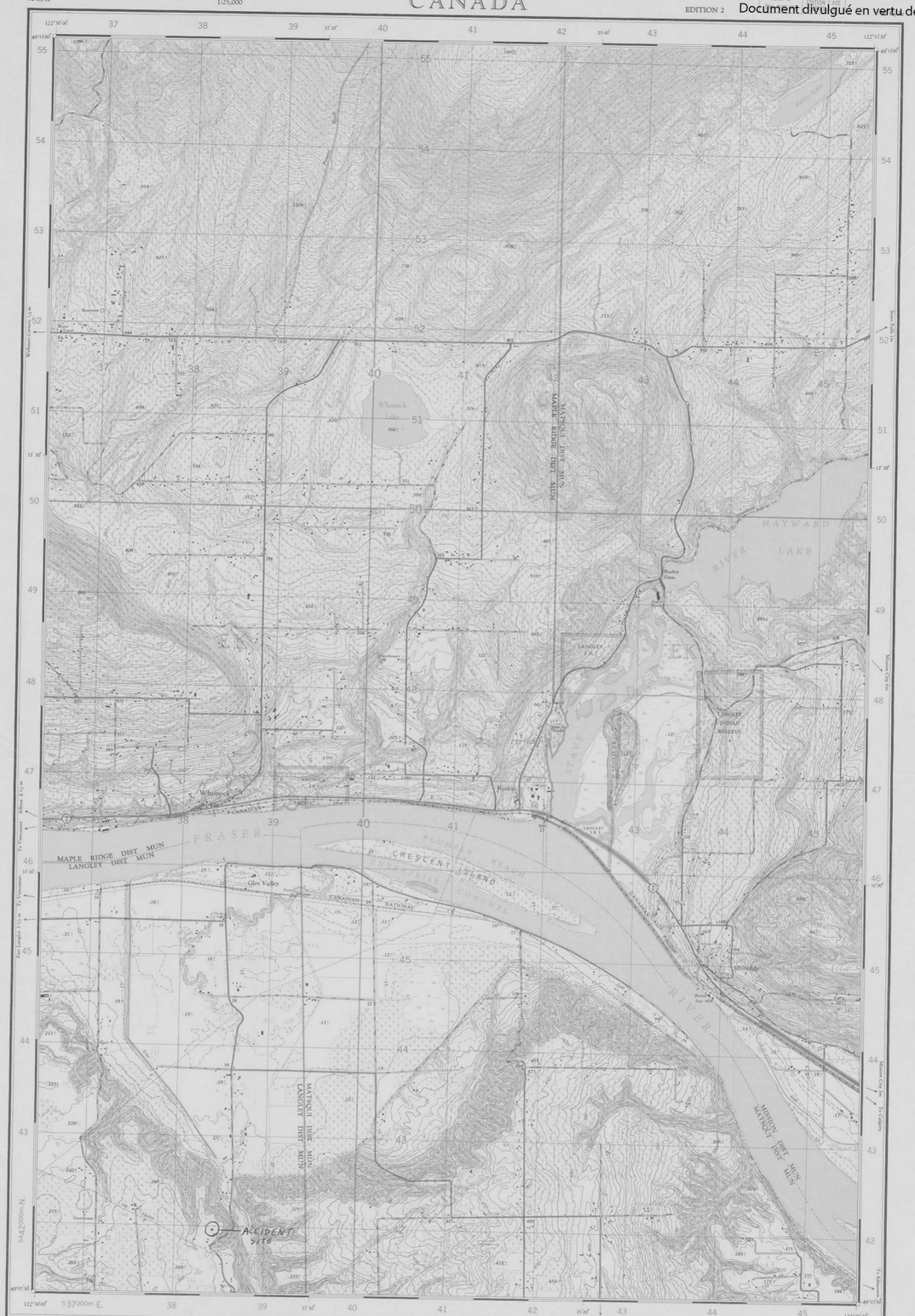

WHONOCK

NEW WESTMINSTER DISTRICT

BRITISH COLUMBIA

SCALE 1:25,000

2.50 Inches to 1 Mile approximately

1961

CONTOUR INTERVAL 10 FEET
AUXILIARY CONTOUR INTERVAL 5 FEET
Elevations in Feet above Mean Sea Level

Transverse Mercator Projection
North American Datum 1927

GRID ZONE DESIGNATION 10U
100,000 M. SQUARE IDENTIFICATION E. K.

TO GIVE A REFERENCE TO NEAREST 100 METRES
EXAMPLE WATER TOWER

EASTING. Read number on grid line immediately to left of point. Estimate tenths of a square from this line eastward to point. 42
10
NORTHING. Read number on grid line immediately below point. Estimate tenths of a square from this line northward to point. 420
46
9
469

MILITARY GRID REFERENCE 420469

Nearest similar grid reference 100,000 metres (about 63 miles)

ONE THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 10

Roads:
hard surface, all weather
hard surface, all weather
loose surface, all weather
loose surface, all weather
dry weather
cart track, trail, or cut line
Railways:
normal gauge, multiple track
normal gauge, single track
abandoned or under construction
underpass, overpass
Tunnel; Drawbridge
Power line; Telephone line

Boundaries:
international, with monument
provincial
county or district
township or parish
township or parish, unsurveyed
city or town
park, reserve, etc.
Horizontal control point, with elevation
Bench mark, with elevation
Spot elevation; precise, approximate
Historical site; Cemetery
Mine or open cut; Quarry
Sand or gravel pit

House; Building
School
Church; Church with spire
Post Office
Radio Station
Tower; Chimney
Well; Tank
Cutting
Embankment
Cliff
Contours:
elevation
depression
auxiliary

Foreshore flats
Lighthouse
Wharf or pier; Breakwater
Levee or dyke
Rocky reef
Swamp or marsh
Inundated land, seasonal
Intermittent lake, stream
Indefinite shoreline, stream
Rapids, large, small; Bridge
Ditch or flume
Woods; deciduous, coniferous
Woods; mixed, scrub
Vineyard; Orchard

INDEX TO ADJOINING SHEETS



WHONOCK
92 G/1e
EDITION 2

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Appendix H(A)

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Appendix 4 (B)

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DEPARTMENT OF TRANSPORT
MINISTÈRE DES TRANSPORTS

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

739 West Hastings St.

OFFICE AT Vancouver 1, B. C.
BUREAU DE

02-0038

ON HER MAJESTY'S SERVICE
SERVICE DE SA MAJESTÉ

CANADA
POSTAGE PAID
PORT PAYÉ

000765

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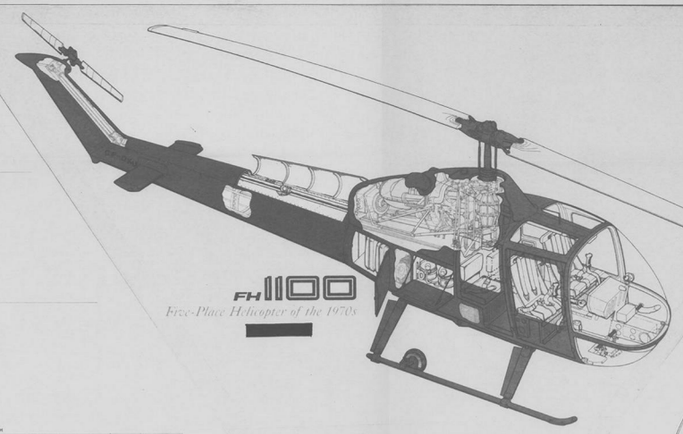

NO.	DESCRIPTION	SIZE
1	Main wreckage	
2	Deck of engine, transmission	
3	Right front cabin section	36"x4'
4	Front air box	4'- 6" x 3'- 0"
5	T/R gear box and fin top	35"- 10"- 13"
6	Broken right front skid	
7	L/H front strut	13"- 6"- 3"
8	Main area of helicopter	
9	25' on camera and 12" tape	1'- 6"
10	Tail section	11'6"x 6'6"
11	Tail fin spar plate	11"x 38"
12	Baggage compartment door	20"- 10"- 1"
13a	Tail boom skid	14"- 1"
13b	Intake air vent	8"- 1"
14	Battery	7'9"- 24"- 8½"
15	Battery cover	7"- 5"- 1"
16	Shaftcone bag and clothing	35"- 18"
17	Front T/R drive shaft	35"- 1"
17a	T/R drive shaft (around from front)	35"- 1"
17b	T/R drive shaft (fin)	77½"- 1"
18	Cabin air vent	10"- 1"
20	Barrel hooks and ring	2½"
21	Right R/C pulley pedal	6½"- 4"- 1"
22	Pilot's headset and mike	
23	Seatbelt boots	
24	C- 5000 mfd. condensers	1"- 1" each
25	Left mid and rear pan	
26	Left mid forward section	1'6"- 33"
27	C- 5000 mfd. condensers	1" each
28	Rear seat cushion	24"- 11"- 3"
29	Front seat cushion	24"- 11"- 3"
30	Connector panel, front	6"- 3"- 4"
31	Left R/C pulley pedal	
32	Black plastic moulding	1"x 4"
33	Place of S/T radio	10"- 1"- 4"
34	Front seat back cushion	26"- 11"- 3"
35	Fibre glass fin fairing	1'6"- 48"
36	Pwr.recvr1,contractor and rule	6"x 1'6"
37	L/H corner instrument panel	4"- 3"- 4"
38	Upper right control shielding	1'6"- 4"
39	Log book, 1965 year book	6"- 5"- 1"
40	Package of needles	
41	Front air box	6"- 4"- 1"
42	R/H ach. corner of instrument panel	4"- 3"- 4"
43	Single S/T radio and transformer	9"- 5"- 3"
44	Battery disconnect	
45	R rudder pedal shaft and tubing	10"- 1"
46	Single S/T trans. power supply	3"- 2"
47	Aluminium radio pan	3"- 2"- 1"
48	Chicago radio plate	3"- 2"- 1"
49	Ash tray	3"- 2"- 1"
50	Radio component	3"- 2"- 1"
51	Instrument ring, dial	
52	Cable tie mount	4"- 1"
53	Cable tie mount	
54	Loop mesh S T/T radio	8"- 5"- 1"
55	Aluminium deck frame	1"- 1"
56	Windshield frame horizontal	1"- 1"
57	Aluminium strip	1"- 1"
58	Small metal piece and wires in spaghetti	1"- 1"
59	Battery vent tube	1"- 1"
60	Aluminium radio can	1"- 1"
61	Belly innovation cover	1"- 1"
62	Main rotor fragment	1"- 1"
63	Radio tube furnace	1"- 1"
64	Inside portion battery disconnect	1"- 1"
65	Fibre glass fairing	1"- 1"
66	Battery vent tube	1"- 1"
67	Small metal piece, rubber, small piece of metal	1"- 1"
68	Clear plexi glass	1"- 1"
69	Tuberaflo inspection plate	1"- 1"
70	Battery quick connect	1"- 1"
71	Bubble plexi glass and orange fibre glass	1"- 1"
72	Satellite instrument container	1"- 1"
73	Glass metal strip	1"- 1"
74	Curved aluminium strip-75"up on track; mb	1"- 1"
75	Metal strip and two brass screws	1"- 1"
75a	Pair of sideacre	
75b	Pieces of watch strap	
76	Cash plastic connectors	
77	Flashlight and two batteries	8"- 2"
78	Pair of shades and ring	8"- 2"
79	Seat belt,shoulder and tension sling	6"- 2"
80	Radio speaker	18"- 1"- 2"
81	Electrical radio terminal	1"- 1"
82	Warning horn	1"- 1"
83	Radio unit	1"- 1"
84	Radio unit	1"- 1"
85	Painted metal bar	11"- 1"- 1"
86	Piece of aluminium strip	1"- 1"
87	Super mesh from S T/T radio	11"- 1"
88	Fibre glass pulley assembly	1"- 1"
89	Plate from landing gear torque tube	10"- 1"- 1"
90	Nylon belt head - door window	1"- 1"
91	Piece of roll / scooter face	22"- 1"
92	Flattened radio tube	11"- 1"
93	Aluminium rod - instrument	1"- 1"
94	Battery quick connect	1"- 1"
95	Battery bullet glass edge	1"- 1"
96	Tail rotor blade tip	1"- 1"
97	Honey comb section (aslaby top skin, none from fitch)	7"- 6"- 1"
98	Bubble plexi glass (orange)	75"- 30"
99	Clear plexi glass and washer	
100	" " "	
101	Piece of metal	2"- 1"- 1"
102	Battery quick connect	1"- 1"
103	Bubble plexi glass (orange)	1"- 1"
104	Clear plexi glass	1"- 1"
104a	Overhead plexiglass (grey)	10"- 1"
105	Nylon liner strip	1"- 1"
106	Sequence plain hook	3"- 1"- 1"
107	Battery quick connect	1"- 1"
108	Radio component	1"- 1"
109	Bubble plexi glass (orange)	1"- 1"
110	Overhead plexi glass (grey)	1"- 1"
111	Bubble plexi glass (orange)	1"- 1"
112	" " "	1"- 1"
113	" " "	1"- 1"
114	" " "	1"- 1"
115	" " "	1"- 1"
116	Overhead plexi glass	1"- 1"
117	Overhead plexi glass	1"- 1"
118	Piece of altimeter (S/A 727)	32"- 1"
119	Overhead plexi glass	1"- 1"
120	" " "	1"- 1"
121	Battery quick connect	1"- 1"
122	Overhead plexi glass	1"- 1"
123	Tail rotor blade and tip	1"- 1"
124	Overhead plexi glass	1"- 1"
125	Clear plexi glass	1"- 1"
126	Bubble plexi glass (orange)	1"- 1"
127	Battery quick connect	1"- 1"
128	Clear plexi glass	1"- 1"
129	Instrument plexi	1" each side
130	Bubble plexi glass	1"- 1"
131	Clear plexi glass	1"- 1"
132	Main rotor skin and honey comb	11"- 1"
133	Black and red plexi glass	1"- 1"
134	Small aluminium strip	1"- 1"
135	Pilot's sport jacket	1"- 1"
136	Small plastic piece	1"- 1"
137	Bubble plexi glass	1"- 1"
138	Instrument glass	1"- 1"
139	Door plexi glass	1"- 1"
140	" " "	1"- 1"
141	" " "	1"- 1"
142	Pitot / scooter	11"- 1"
143	Pilot static line and connections	1"- 1"
144	Door plexi glass	1"- 1"
145	FWD left L/C skid	11'- 1"- 4"
146	Aluminium strip	1"- 1"
147	Green chip (battery disconnector)	1"- 1"
148	Piece of seatbelt	1"- 1"
149	Cabin angle piece (SL-41060-37)	1"- 1"
150	Battery quick connect	1"- 1"
151	Red and black plexi glass	1"- 1"
152	Overhead plexi glass	1"- 1"
153	R/T cable	6"- 1"
154	Aluminium strip and insulation	1"- 1"
155	Bubble plexi glass	1"- 1"
156	Altimeter knob and portion of ring	11"- 1"
157	Aluminium angle strip and insulation	1"- 1"
158	Overhead plexi glass	1"- 1"
159	Bubble plexi glass	1"- 1"
160	" " "	1"- 1"
161	" " "	1"- 1"
162	" " "	1"- 1"
163	" " "	1"- 1"
164	" " "	1"- 1"
165	Flight report book	10"- 1"
166	Overhead plexi glass	1"- 1"
167	Main rotor skin and honey comb	11"- 1"
168	Bubble plexi glass	1"- 1"
169	" " "	1"- 1"
170	" " "	1"- 1"
171	" " "	1"- 1"
172	Fibre glass strip white	1"- 1"
173	Bubble plexi glass (orange)	1"- 1"
174	Clear plexi glass	1"- 1"
175	Bubble plexi glass (orange)	1"- 1"
176	" " "	1"- 1"
176A	" " "	1"- 1"
176B	" " "	1"- 1"
176C	" " "	1"- 1"
176D	" " "	1"- 1"
176E	" " "	1"- 1"
176F	" " "	1"- 1"
176G	" " "	1"- 1"
177	" " "	1"- 1"
178	" " "	1"- 1"
179	" " "	1"- 1"
180	" " "	1"- 1"
181	" " "	1"- 1"
182	Door plexi glass	1"- 1"
183	Bubble plexi glass (orange)	1"- 1"
184	" " "	1"- 1"
185	Green plastic battery quick connect	1"- 1"
186	Bubble plexi glass	1"- 1"
186a	" " "	1"- 1"
187	" " "	1"- 1"
188	" " "	1"- 1"
189	Tail rotor blade	1"- 1"
190	Bubble plexi glass	1"- 1"
191	Fibre glass fin (orange)	1"- 1"
192	Yellow casing - 20'-15'	1"- 1"
193	Red coiling - NO 15	1"- 1"
194	Fibre glass fairing fin (orange)	1"- 1"
195	Yellow plastic	1"- 1"
196	Bubble plexi glass (orange)	1"- 1"
197	" " "	1"- 1"
198	" " "	1"- 1"
199	" " "	1"- 1"
200	" " "	1"- 1"
201	Clear plexi glass	1"- 1"
202	Overhead plexi glass (partially grey)	1"- 1"
203	Bubble plexi glass	1"- 1"
204	" " "	1"- 1"
205	Overhead plexi glass (grey)	1"- 1"
206	" " "	1"- 1"
207	Small piece of foil	1"- 1"
207a	Bubble plexi glass	1"- 1"
208	" " "	1"- 1"
209	" " "	1"- 1"
210	" " "	1"- 1"
211	" " "	1"- 1"
212	Piece from front corner of overhead elec. panel	10"- 1"
213	Bubble plexi glass	1"- 1"

NO.	DESCRIPTION	SIZE
226	Bubble plexi glass	1"- 1"
227	Red and black plexi glass	1"- 1"
228	Pilot side cable floor extension plate	32"- 1"
229	Clear plexi glass	1"- 1"
230	Bubble plexi glass	1"- 1"
231	" " "	1"- 1"
232	" " "	1"- 1"
233	" " "	1"- 1"
234	" " "	1"- 1"
235	" " "	1"- 1"
236	" " "	1"- 1"
237	" " "	1"- 1"
238	" " "	1"- 1"
239	Fibre glass fin (partially orange)	1"- 1"
240	Bubble plexi glass	1"- 1"
241	Overhead plexi glass	1"- 1"
242	Radio component	1"- 1"
243	Front plate gyro pitch and roll actuator	1"- 1"
244	Black note book	1"- 1"
245	Trip log book	1"- 1"
246	Facsaline	1"- 1"
247	Fibre glass fin (orange)	11"- 1"
248	" " "	1"- 1"
249	Fibre glass fairing fin (orange)	1"- 1"
250	" " "	1"- 1"
251	Facsaline	1"- 1"
252	Bubble plexi glass	1"- 1"
253	" " "	1"- 1"
254	" " "	1"- 1"
255	Radio dial face	1"- 1"
256	Fibre glass strip	1"- 1"
257	Bubble plexi glass	1"- 1"
258	Fibre glass strip	1"- 1"
259	Clear plexi glass	1"- 1"
260	" " "	1"- 1"
261	Battery notch connect	1"- 1"
262	Battery vent tube	1"- 1"
263	Radio component	1"- 1"
264	Main rotor blade and fittings	1"- 1"
265	Upper aft skid support and torsion tube	

INDEX OF WRECKAGE

DEPARTMENT OF TRANSPORT
VANCOUVER INTERNATIONAL AIRPORT
CRASH INVESTIGATION
FH-1100 HELICOPTER MARCH 14 1968
AS SHOWN
DRAWN K.DORUYTER
DATE MARCH 25 1968
000766

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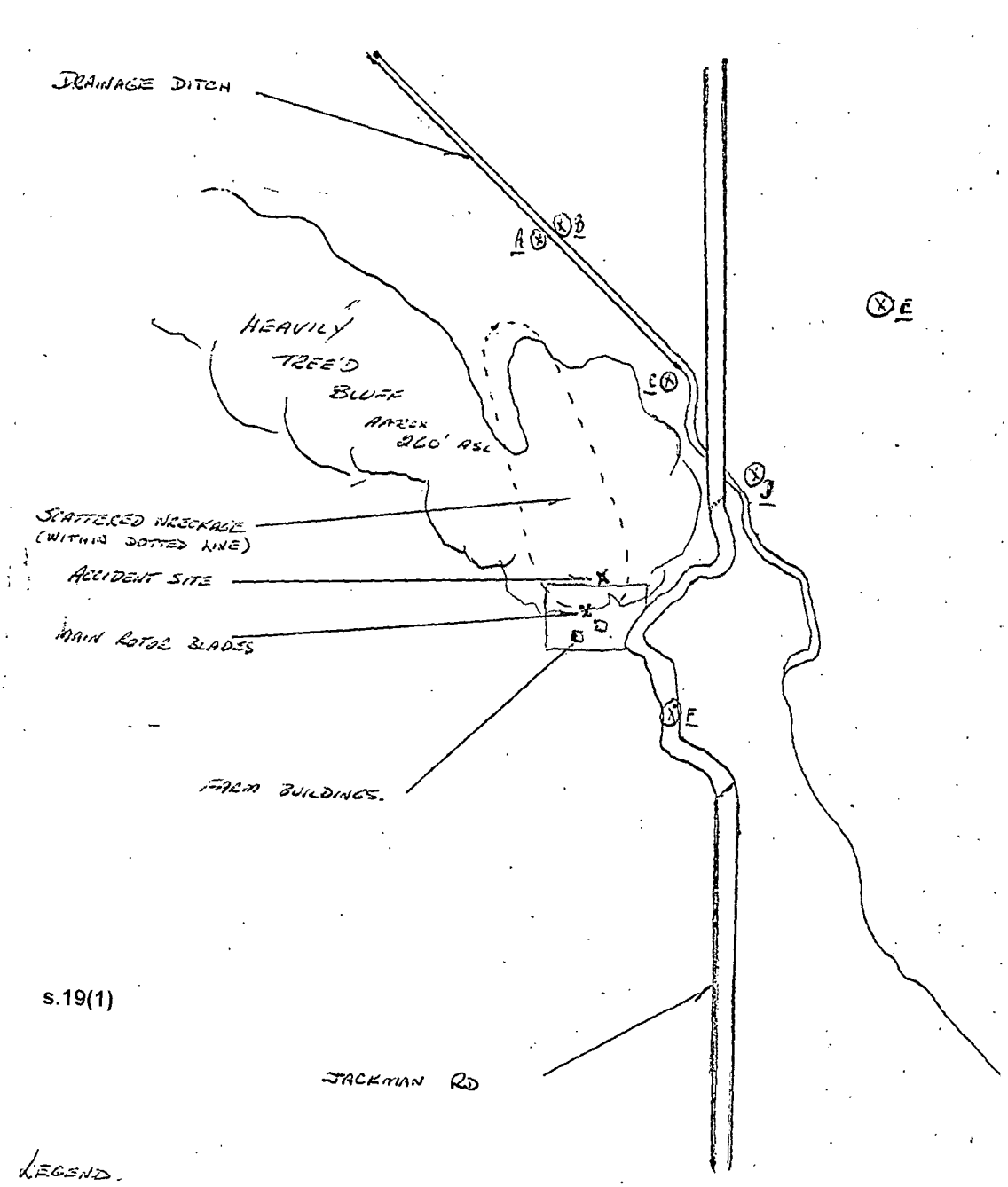
APPENDIX 4 (C)



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LEGEND.

⊗ = LOCATION OF WITNESSES

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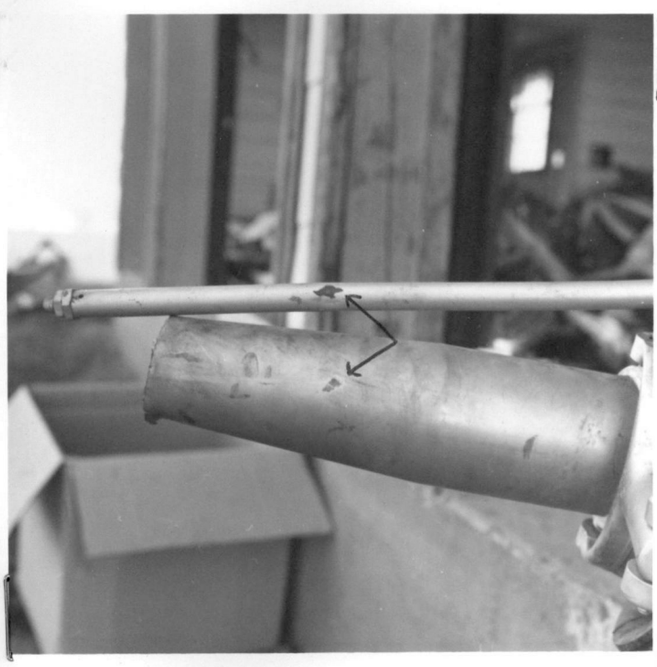
22. View of rotor mast and twisting of the incidence pushrods around mast.
Arrow (1) indicates pushrod shown in photo 23.
Arrow (2) indicates pushrod shown in photo 25 and corresponding mark on photo 24.



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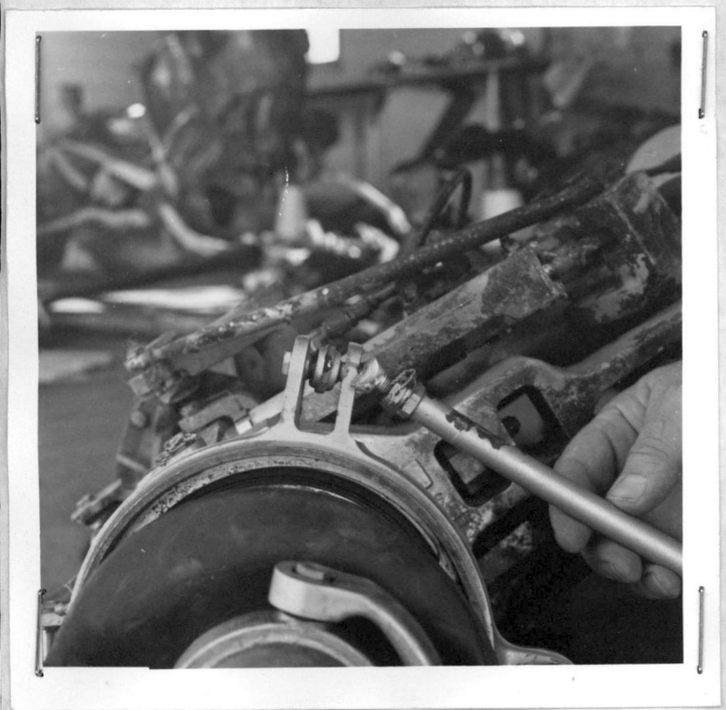
28. View of swashplate incidence pushrod attachment opposite to one in photo 27.



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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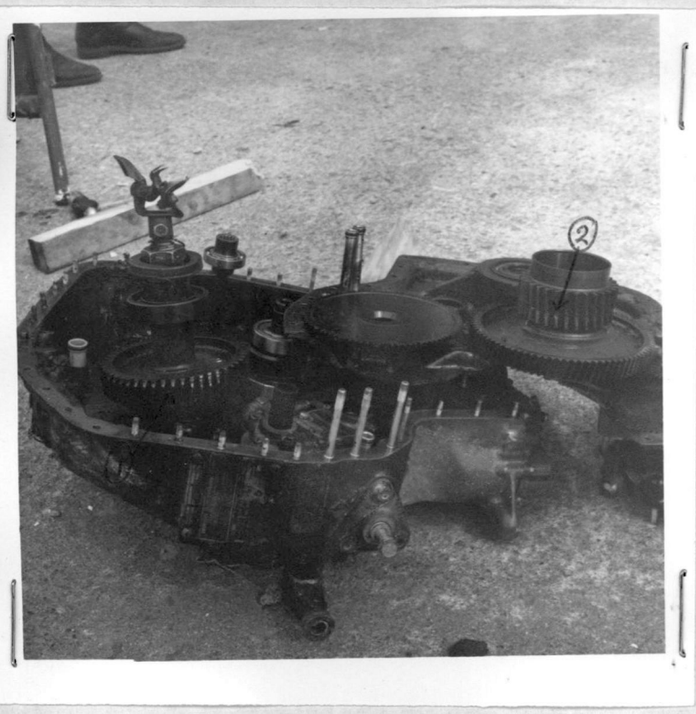

34. View of accessory drive gearbox.
Arrow (1) indicates damaged power output gear.
Arrow (2) indicates damaged torquemeter gear.



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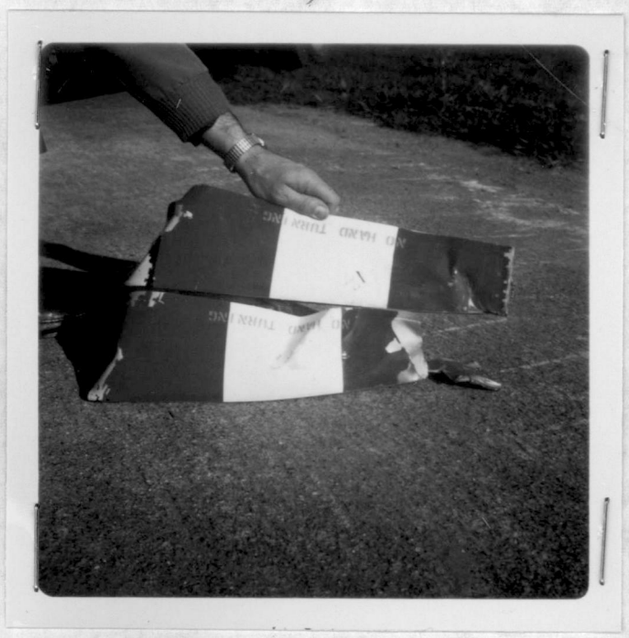
43. View of tail rotor, gearbox and severed pylon.



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.



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

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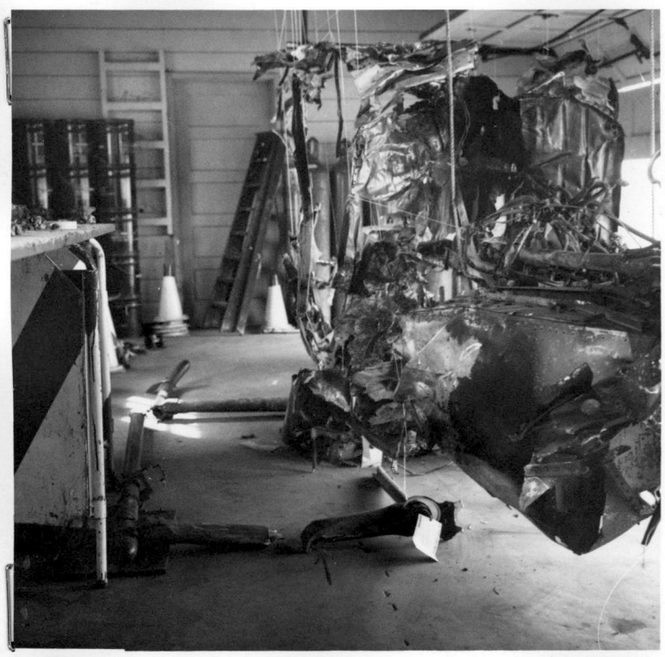
52. View of right side of cabin area.



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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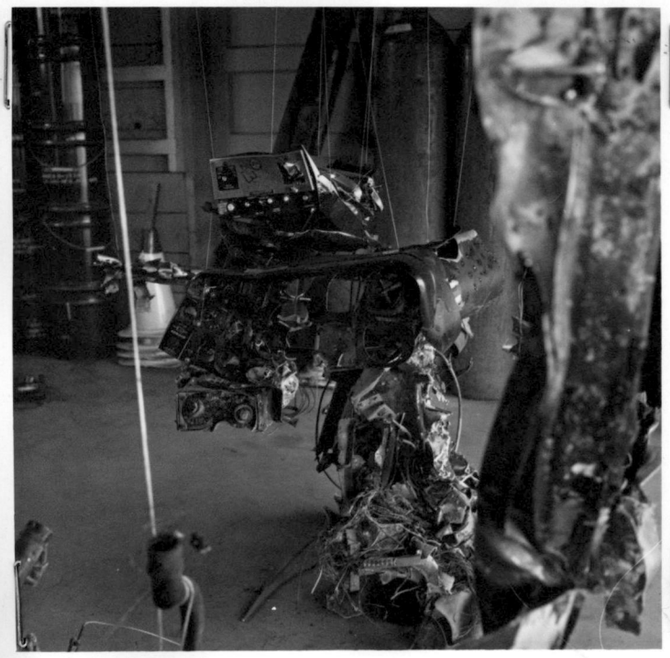
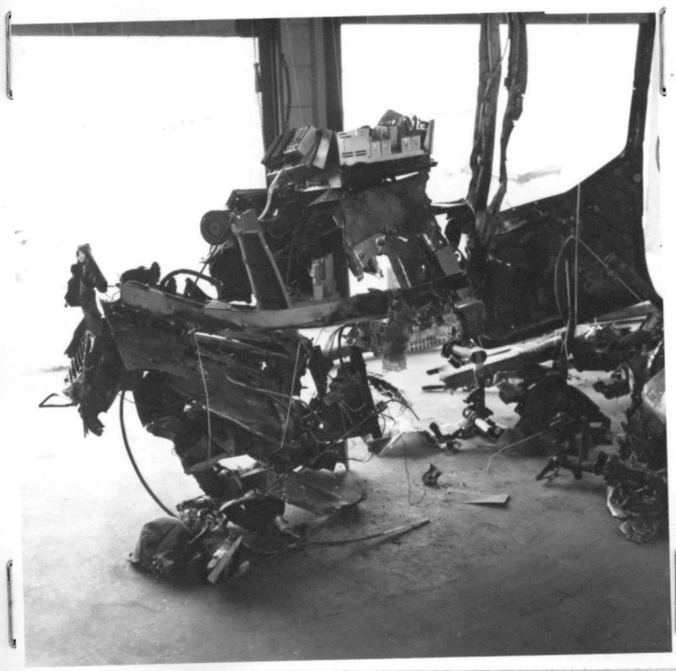
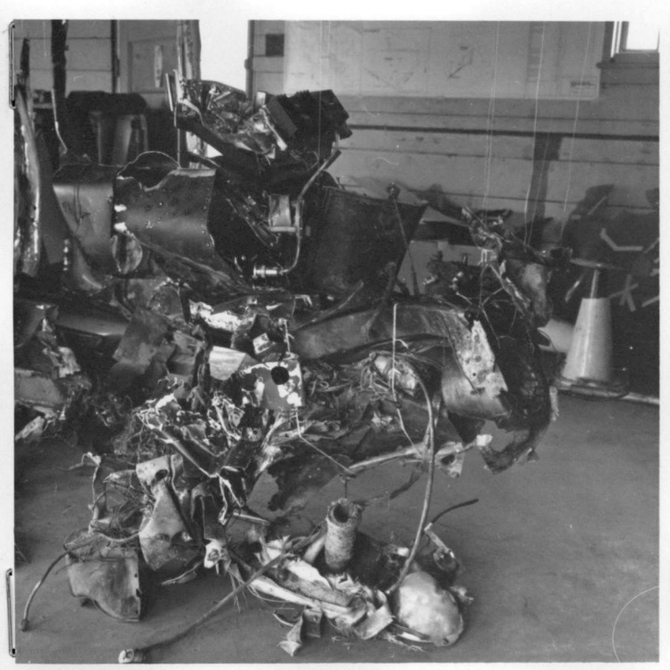


58. View of instrument console and radio equipment.



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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s.19(1)

APPENDIX 6 (A)

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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s.19(1)

APPENDIX 6 (B)

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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APPENDIX 6 (E)

STATEMENT of [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.

s.19(1)

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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APPENDIX 6 (F)

s.19(1)

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]

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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]

(Holder of Commercial Pilot Licence [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]

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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.

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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 5002-715

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

Encls.

000800

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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
VANCOUVER
JUL 15 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. Straker.

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 20ØM26Ø4 ØØ9ØØ20 082/47/42/1414/976/CF2SC5SC1AC2
XX S E2ØØ4ØØ20RW-- 088/47/39/1714/978/CU+8SC1 QAGOM RNWY 06
TIL 2000Z

142000Z
VR 17ØM21Ø3ØØ9ØØ20 089/46/40/ 1613/978/ CF1SC2SC1AC1
XX 15ØE2ØØ4ØØ15RW-- 095/46/37/1918/980/CF2CU+5SC3 40Ø OCNLY
Ø HJ CLD ABV LW SF E QAGOM RNWY 06 TIL 2100Z

VR S 142040Z 17Ø2ØØM26Ø7ØØ12RW- 1608 CF1CU4SC4AS1

XX S142040Z 15ØE2ØØ4ØØ1ØRW- 1825 CF4CU+4SC2

142100Z
VR 16Ø26ØM35Ø7ØØ1ØRW- 096/46/41/1613/980/ CF1SC3SC5AS1 120
XX 15ØE2ØØ4ØØ1ØRW- 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. 10Ø20 20-30ØSCCU+60-120 90Ø120 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 20ØC4ØØ9ØØ OCNLY 15ØC3ØØ RW- 0915. 0400Z C4ØØ1ØØØ
END

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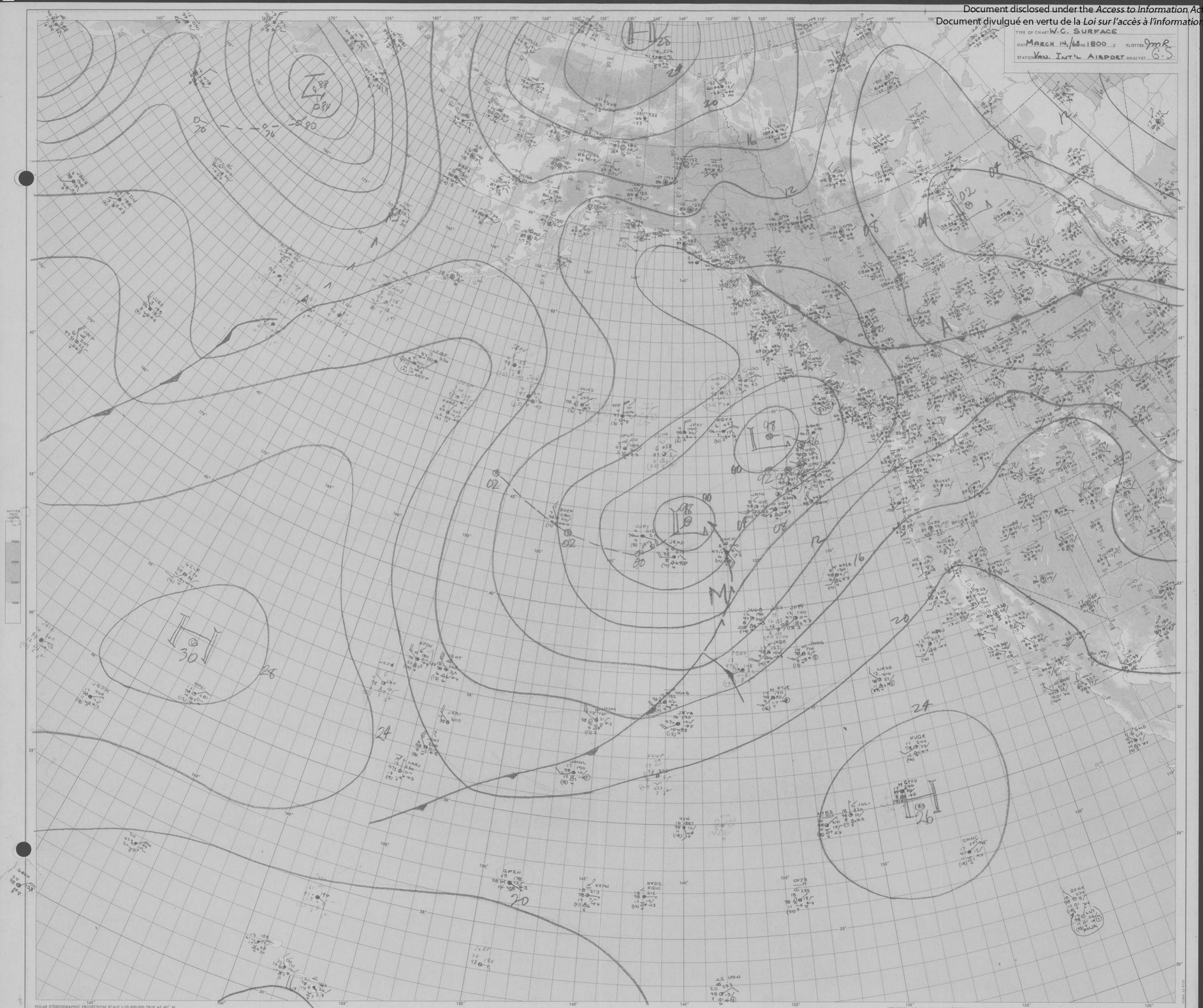
Document divulgué en vertu de la *Loi sur l'accès à l'information*

TYPE OF CHART W.C. SURFACE
DATE MARCH 14/68 HR 1800 Z PLOTTER DMR
STATION VAN. INT'L AIRPORT ANALYST G.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 - TORONTO, ONT.

000804

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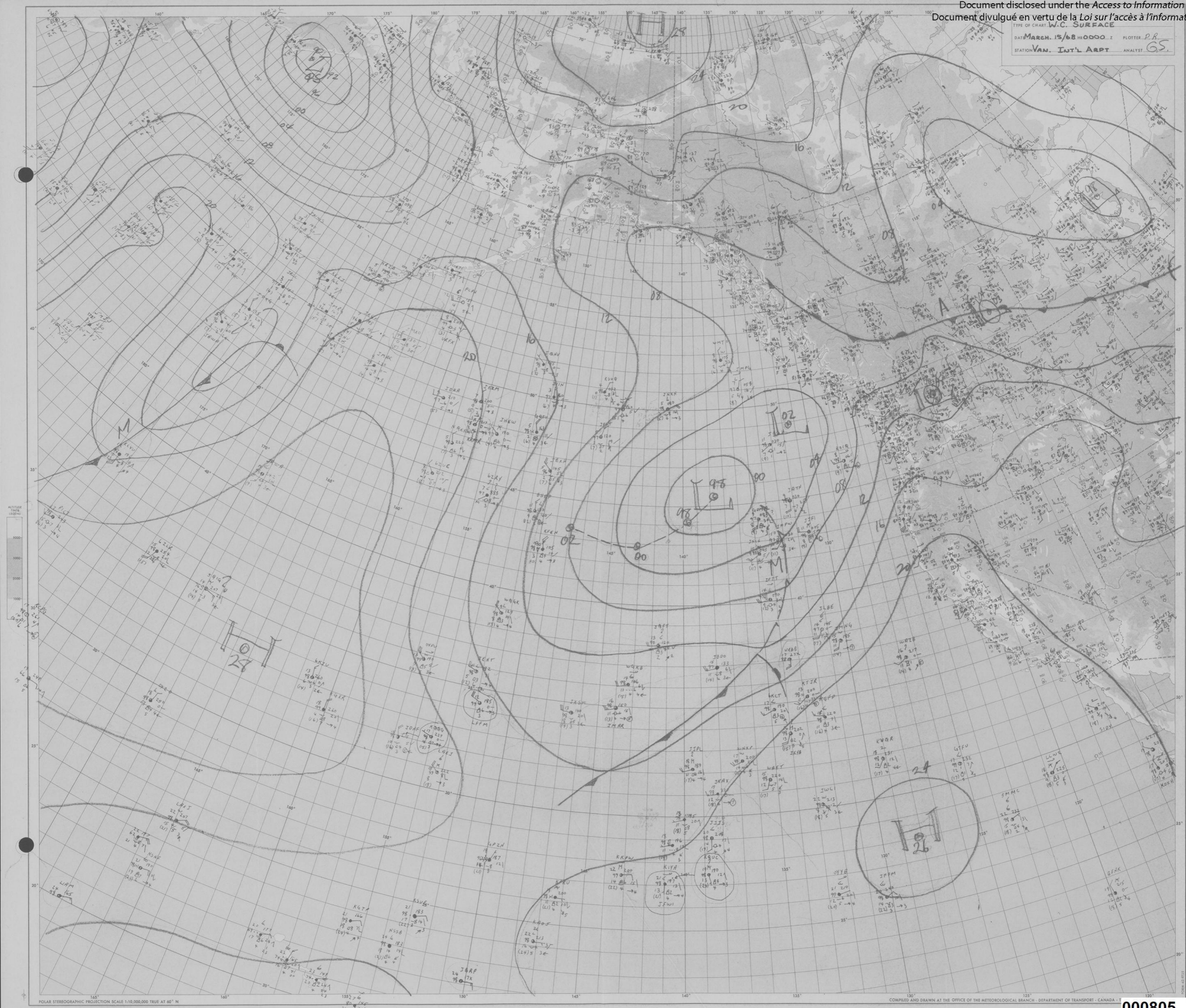
TYPE OF CHART W.C. SURFACE
DAY MARCH. 15/68 HR 0000 Z PLOTTER P.R.
STATION VAN. INT'L ARPT ANALYST GS



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 - T

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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 Comoressor 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-20374.

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 comoressor 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.

——— // ———

OTHER SERIAL NUMBERS FOUND

Fuel Pump (Engine)	1116	Rear Diffuser	DEO 1988
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 811B
Exhaust Output Turbine Support	A 589	GP Fuel Control	199575
		Tail Fin (Vertical)	181

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A P P E N D I X 11

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-WMO.
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 8 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
s.19(1) [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:

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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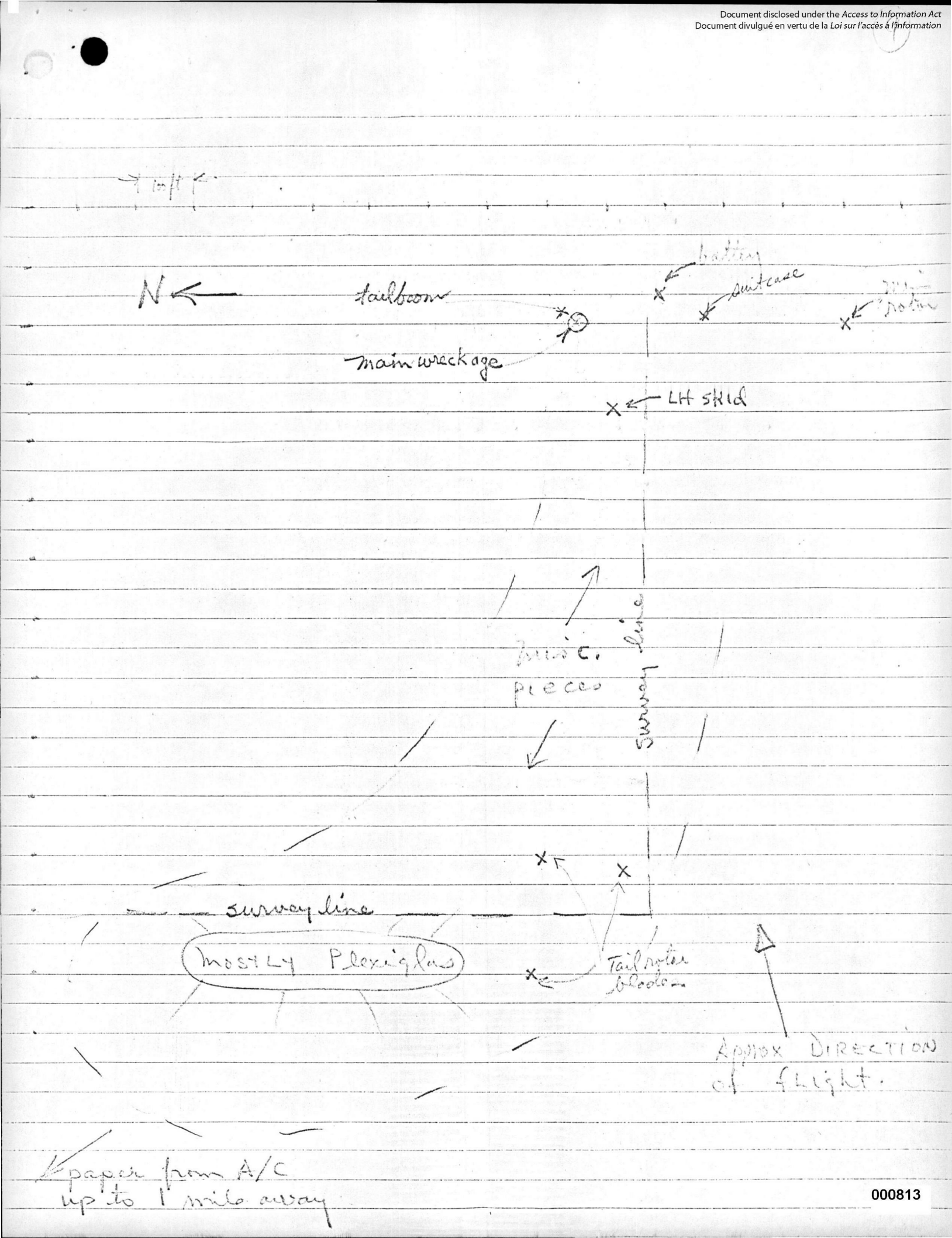

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Document divulgué en vertu de la *Loi sur l'accès à l'information*

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 ccw 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 [illegible]
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

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

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

FAIRCHILD HILLER
AIRCRAFT DIVISION

INTER-OFFICE COMMUNICATION

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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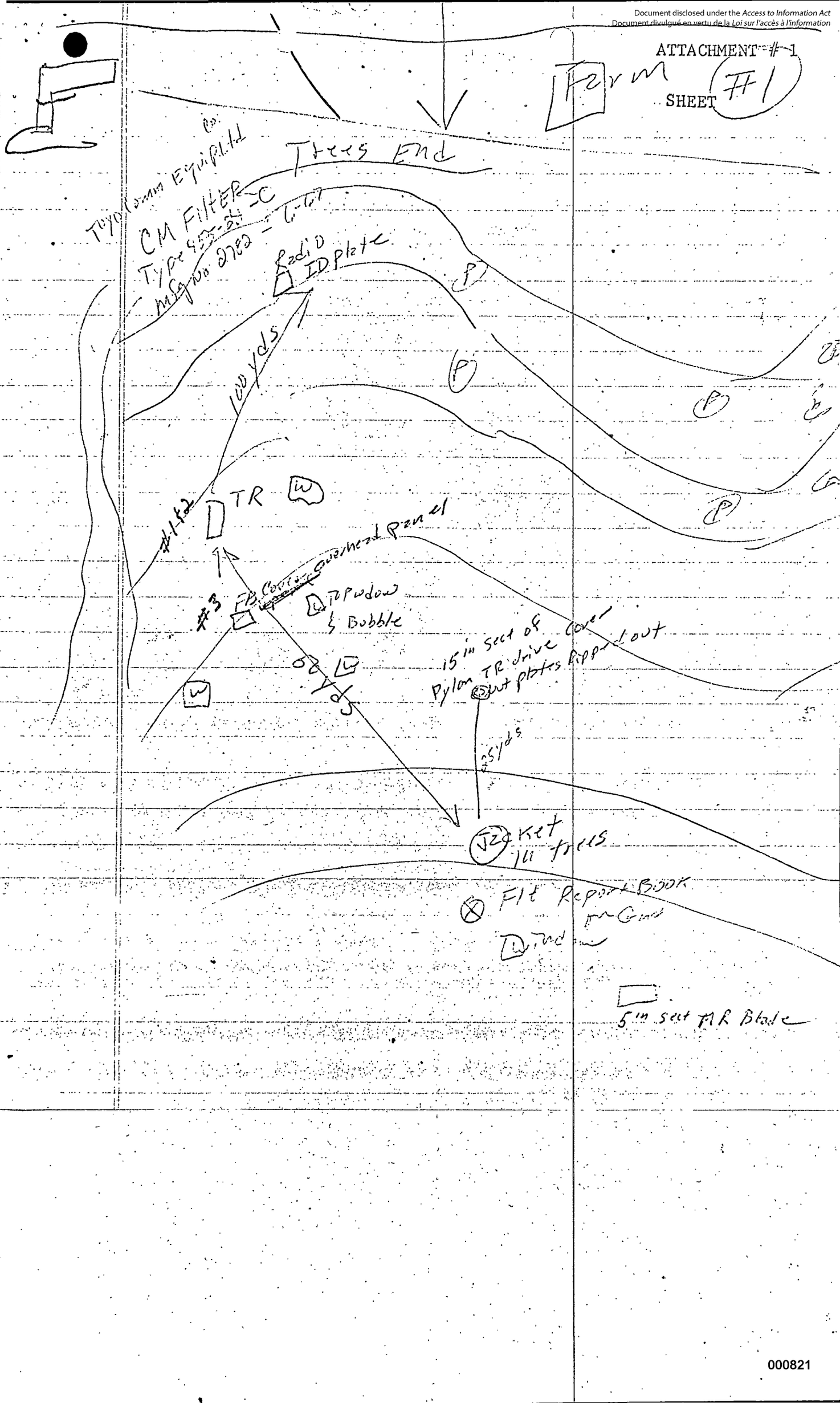
ATTACHMENT # 1

Form

SHEET FF1



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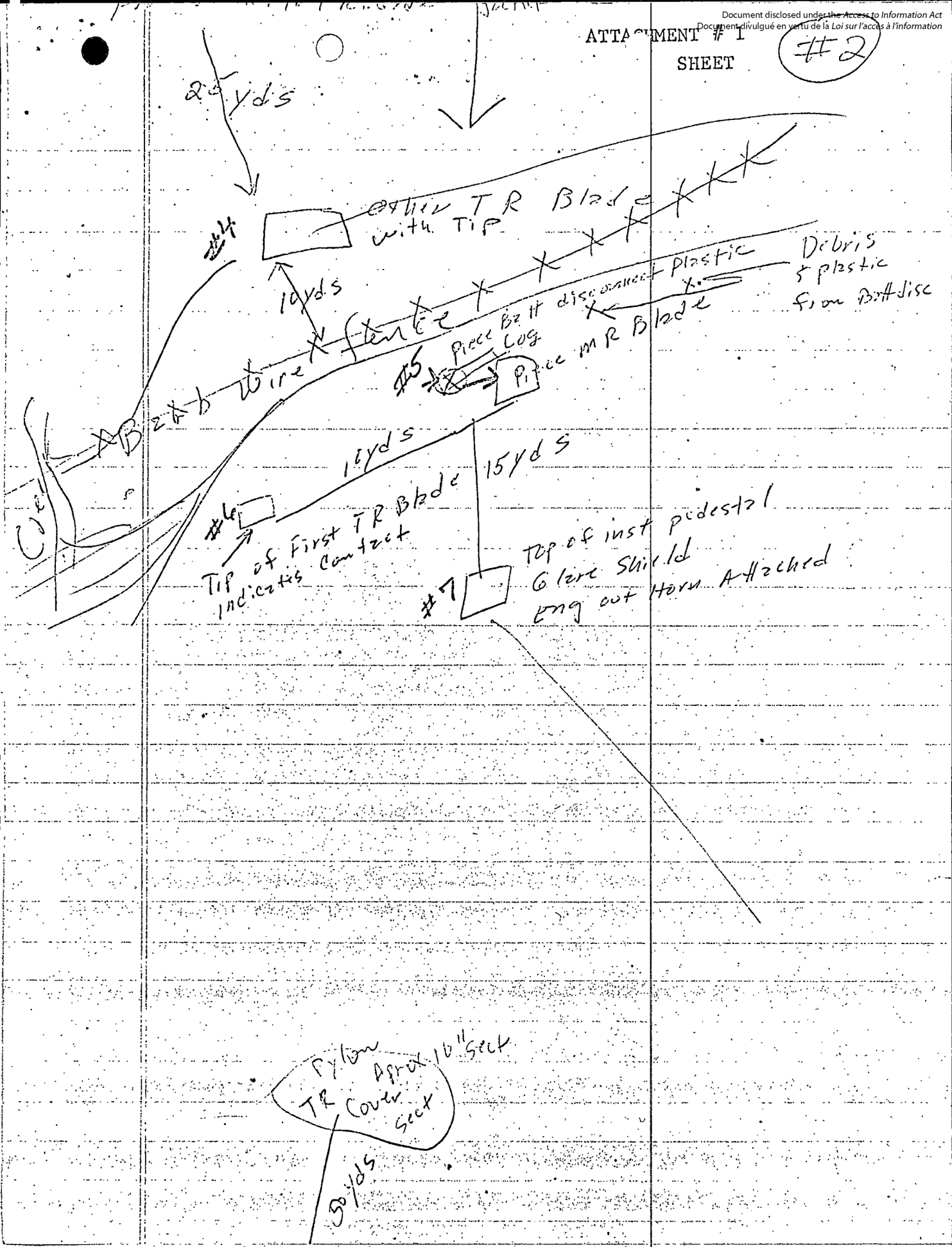
ATTACHMENT # 1
SHEET

#2



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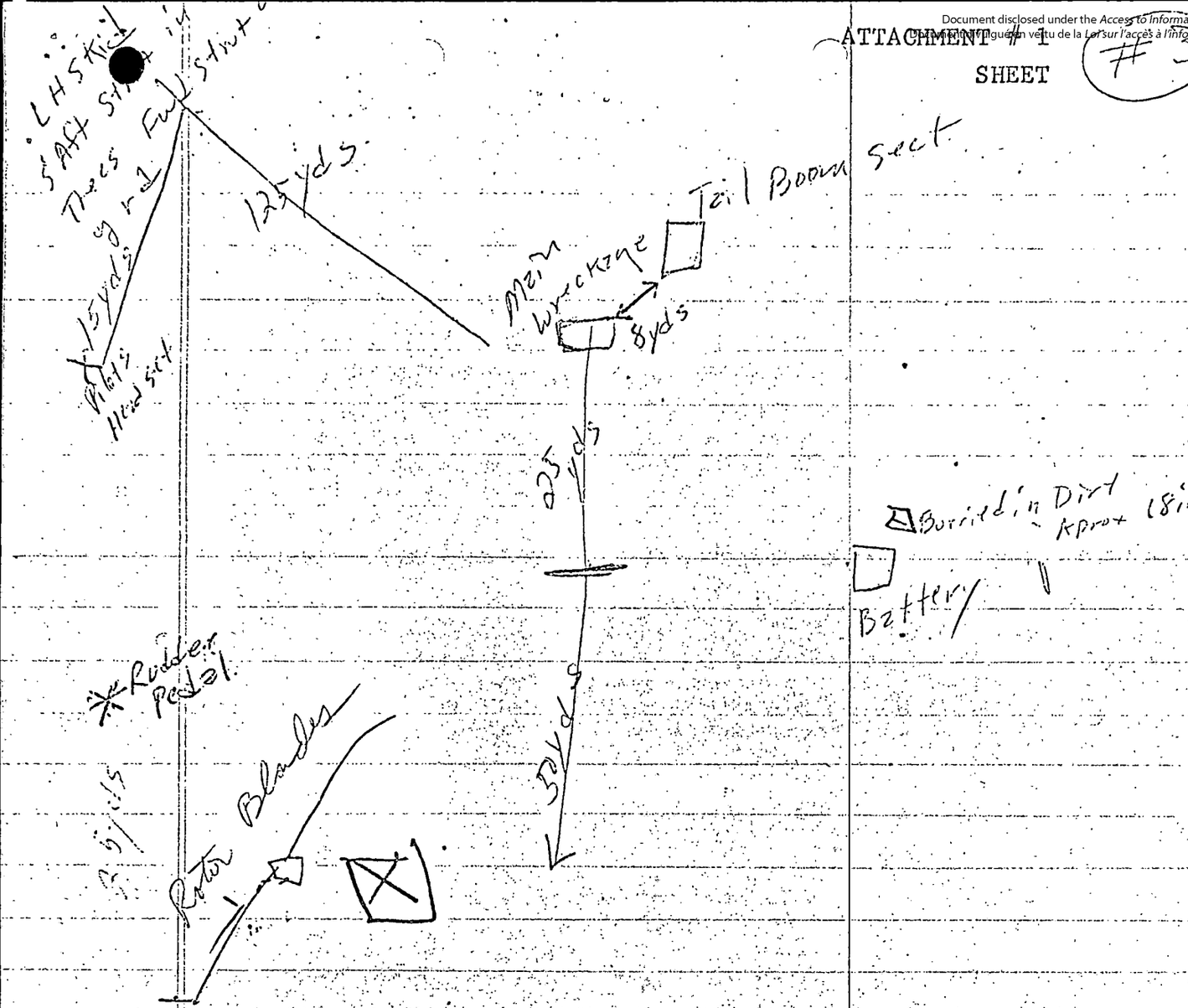
ATTACHMENT # 1
SHEET
#3



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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 5802-715

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	3 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

THIS REPORT OR ANY RELATED PHOTOGRAPHIC OR OTHER MATERIAL MAY NOT BE PUBLISHED, IN WHOLE OR IN PART, WITHOUT THE WRITTEN CONSENT OF THE COMMISSIONER OF THE ROYAL CANADIAN MOUNTED POLICE.

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" N°	LAB. FILE NO. – DOSSIER DU LAB. N°	DATE
	392-968	10 April 1968
YOUR REF. NO. – VOTRE RÉF. N°	ENCLOSURES – PIÈCES JOINTES	PLACE – LIEU
		Vancouver, B.C.
	LABORATORY REPORT NO. / RAPPORT DU LABORATOIRE N° 1	
SECTION: CHEMISTRY	CLASSIFICATION: 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.

.....4

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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-WMO - 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.

Document disclosed under the Access to Information Act
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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.

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

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	CLASSIFICATION	
SEROLOGY	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.

000833

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APPENDIX 15

PATHOLOGICAL REPORT — ROYAL COLUMBIAN HOSPITAL
March 18/68 — Tissue No. 68-NS-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 recognized. 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 adjacent 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 N°

OUR No. 68E-500-453
NOTRE N°

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

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.)

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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] rn, gave evidence as contained in his statement.
(e) [redacted] Sworn, gave evidence as contained in his statement.
(f) [redacted], gave evidence as contained in his statement.
(g) Mr. Hellmuth MILASTER,Sworn, 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.
s.19(1)
(h) [redacted] Sworn, gave evidence as contained in his statement.
(i) [redacted] Sworn, 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

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

AIR SERVICES REGISTRY
VANCOUVER
APR 1 1968
File 5002-715

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

CMP 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.

s.19(1) (a) [redacted] Appendix 'A'.

(Cont'd 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]

(f) [redacted]

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

s.19(1) (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 - 7025 Jackman Road, Aldergrove, B.C.

(Cont'd Page three

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RCMP 6881

CONTINUATION - 2

REV. 1-4-65

RE: Par Frederick Raymond FLETCHER - Sudden Death

PAGE three

(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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s.19(1)

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 - [redacted] - 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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Par Frederick Raymond FLETCHER - Sudden Death

(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
Joseph Hartwell YOUNG -
Dennis Gerald HORGAN -

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

16. Further to the statement of JOINSON (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

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

for (W.I.M.) Sgt., 40c.
i/c Det.
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

APPENDIX 'A'

s.19(1)

1:45 P.m., 15 MAR 68

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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s.19(1)

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: (Signed)

Cpl. W.J. Stacey [redacted]

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s.19(1)

RE:
OBJET.

Par FLETCHER - Sudden Death

APPENDIX 'C'

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.

Witness:

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

(Signed) [redacted]

PROPERTY OF R.C.M.P. — THIS POLICE RECORD IS SUPPLIED TO YOU BY THE R.C.M. POLICE FOR INFORMATION OF YOUR DEPARTMENT ONLY. IT IS NOT TO BE MADE KNOWN TO ANY OTHER AGENCY OR PERSON WITHOUT THE WRITTEN PERMISSION OF THE R.C.M.P.

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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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RE: OBJET.
Par FLETCHER - Sudden Death

PAGE

APPENDIX 'E'

s.19(1)

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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s.19(1)

10:45 A.M. 15 MAR 68

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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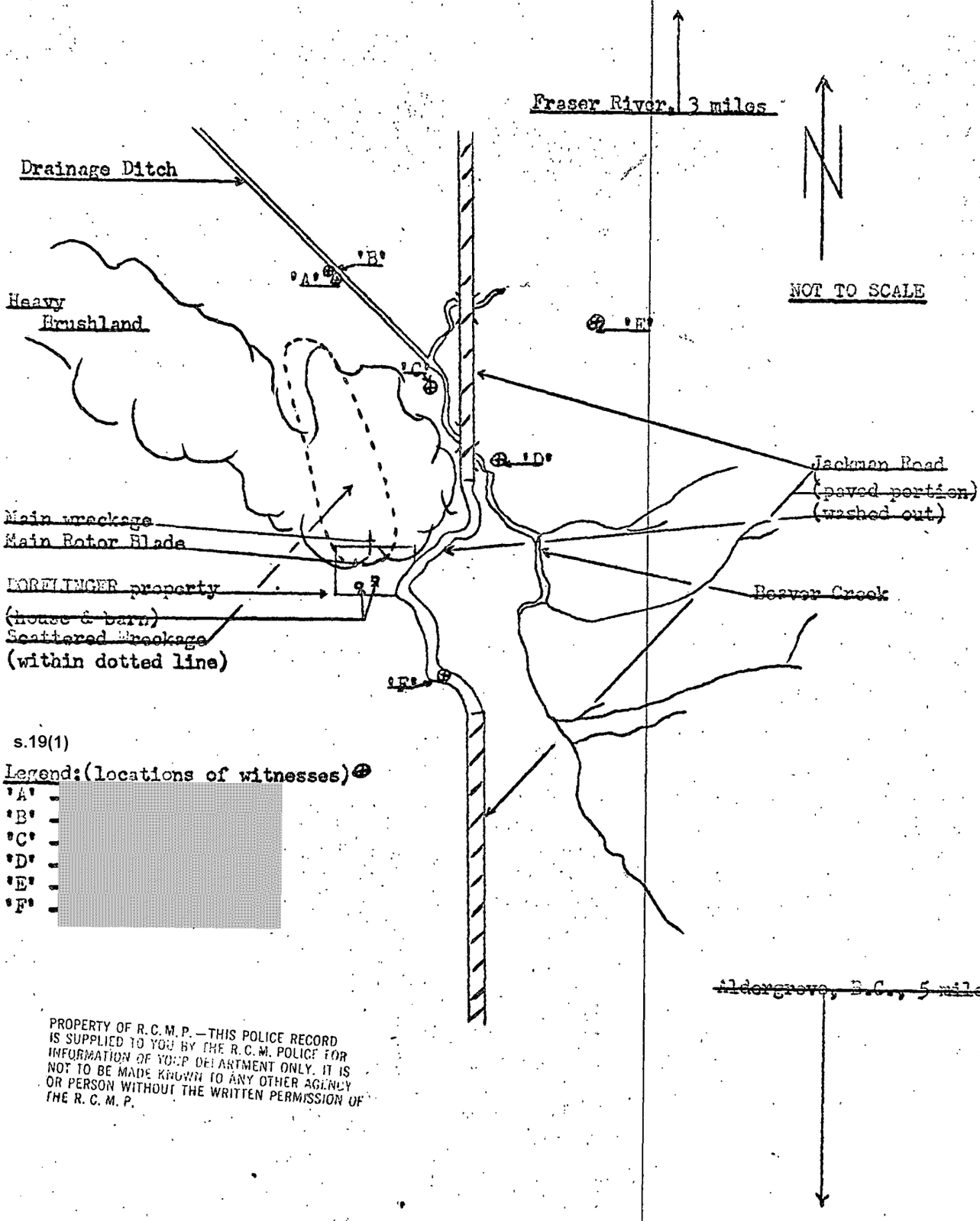
RE:
OBJET.

Par FLETCHER - Sudden Death

PAGE

APPENDIX 'C'



s.19(1)

Legend:(locations of witnesses)

'A' -
'B' -
'C' -
'D' -
'E' -
'F' -

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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-WMO, 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

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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-WMO
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. Nelson

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.

J. M. Young
for Regional Director, Air Services

EM/Cain

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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

Telex Phoned St. Q. St. Rosemarine, 14:00 hrs 16/4/68 re the above

Okanagan Helicopters

000856

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Fairchild Hiller

Fred — RJS
Dave — Dave
Frank — FB
Keith — K.R.
Stu — SKS

FH

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

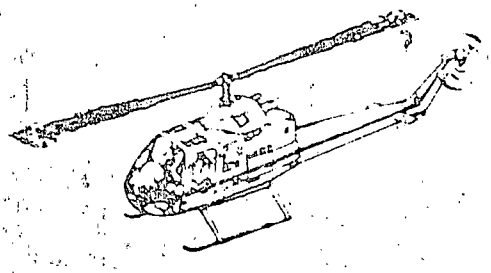
1. OVER THE PAST MONTH FAIRCHILD HILLER CORP HAS CONDUCTED AND IS CONTINUING EXTENSIVE FLIGHT TESTING AND ANALYTICAL INVESTIGATION INTO POSSIBLE COMBINATIONS OF FLIGHT MODES AND ENVIRONMENTAL CONDITIONS WHICH COULD LEAD TO A FLIGHT SAFETY SITUATION IN THE FH-1100
2. THESE TESTS AND STUDIES ARE NOT YET 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

Document produced by Hughes Tool Co. Aircraft Division
Technical Publications Department



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 Dennett

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').

(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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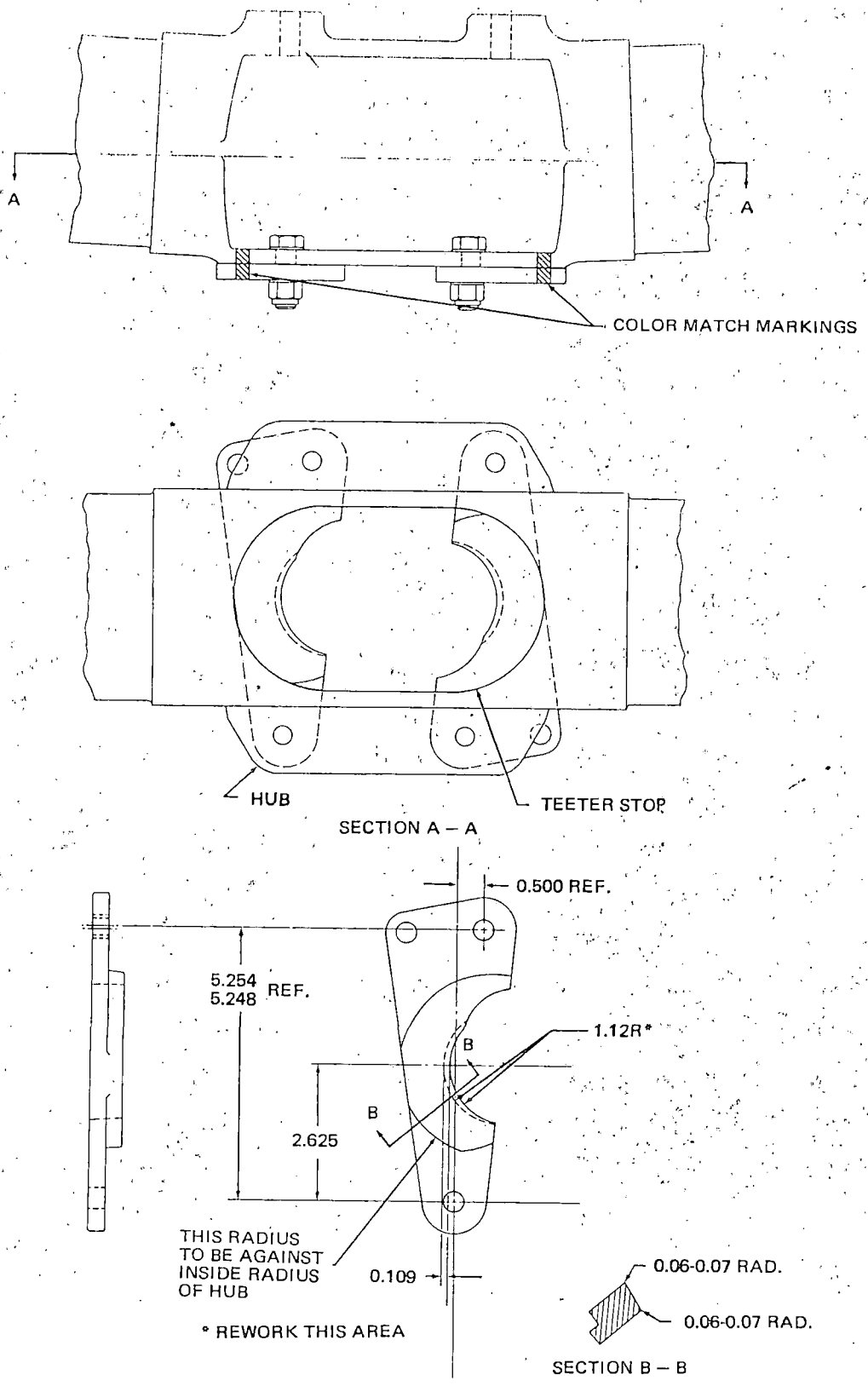

Figure 1

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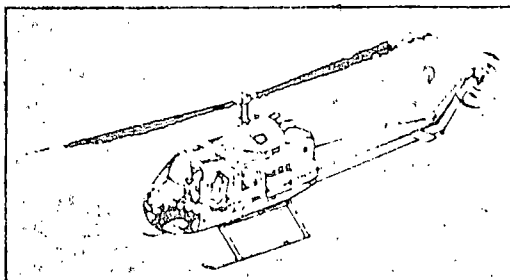

FH-1100

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 G Bonnell

Airworthiness H Hoelett

Service E Burke

F. Manpower. Approximately 5.0 man-hours per aircraft.

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 material 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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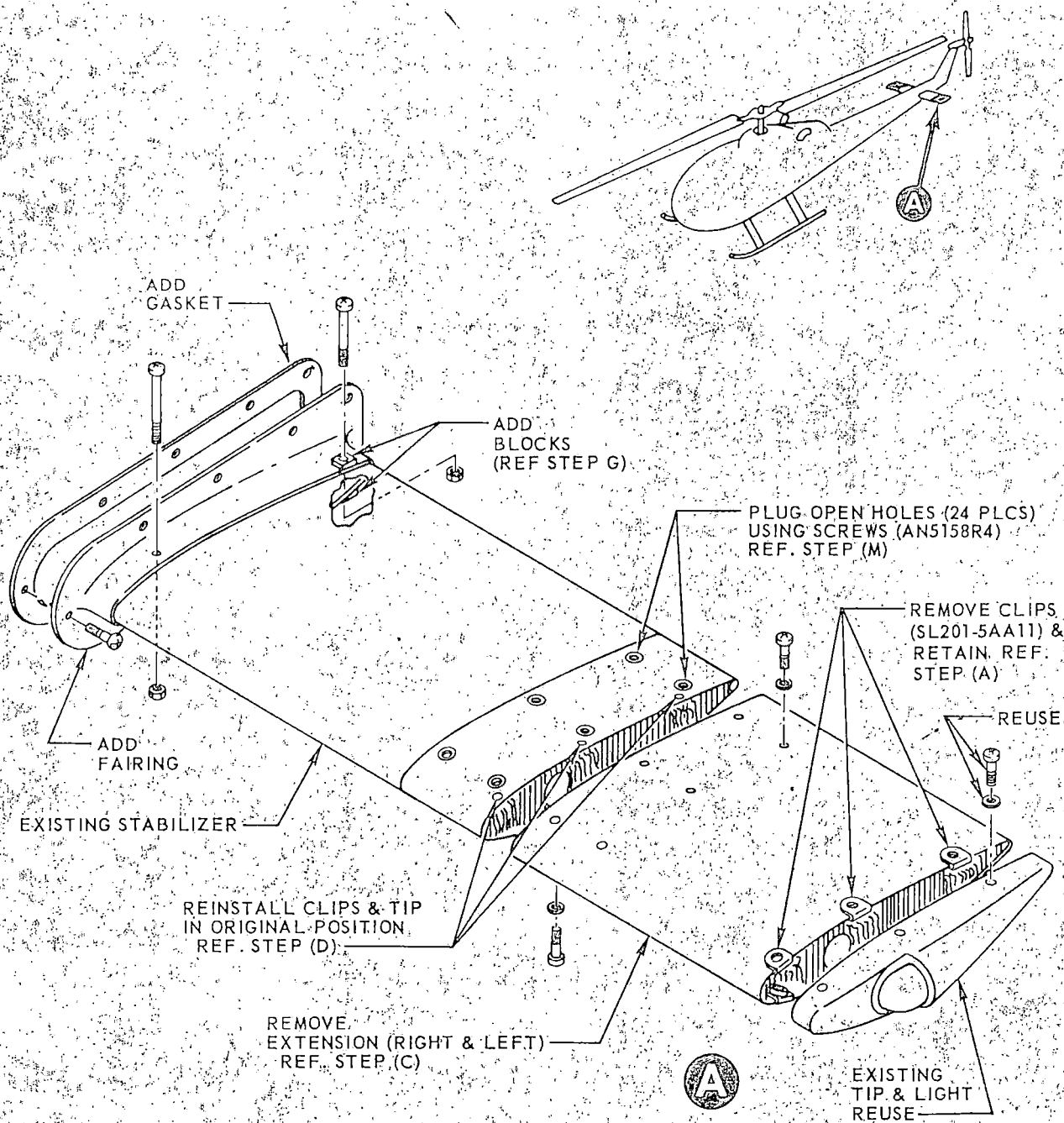

Figure 1

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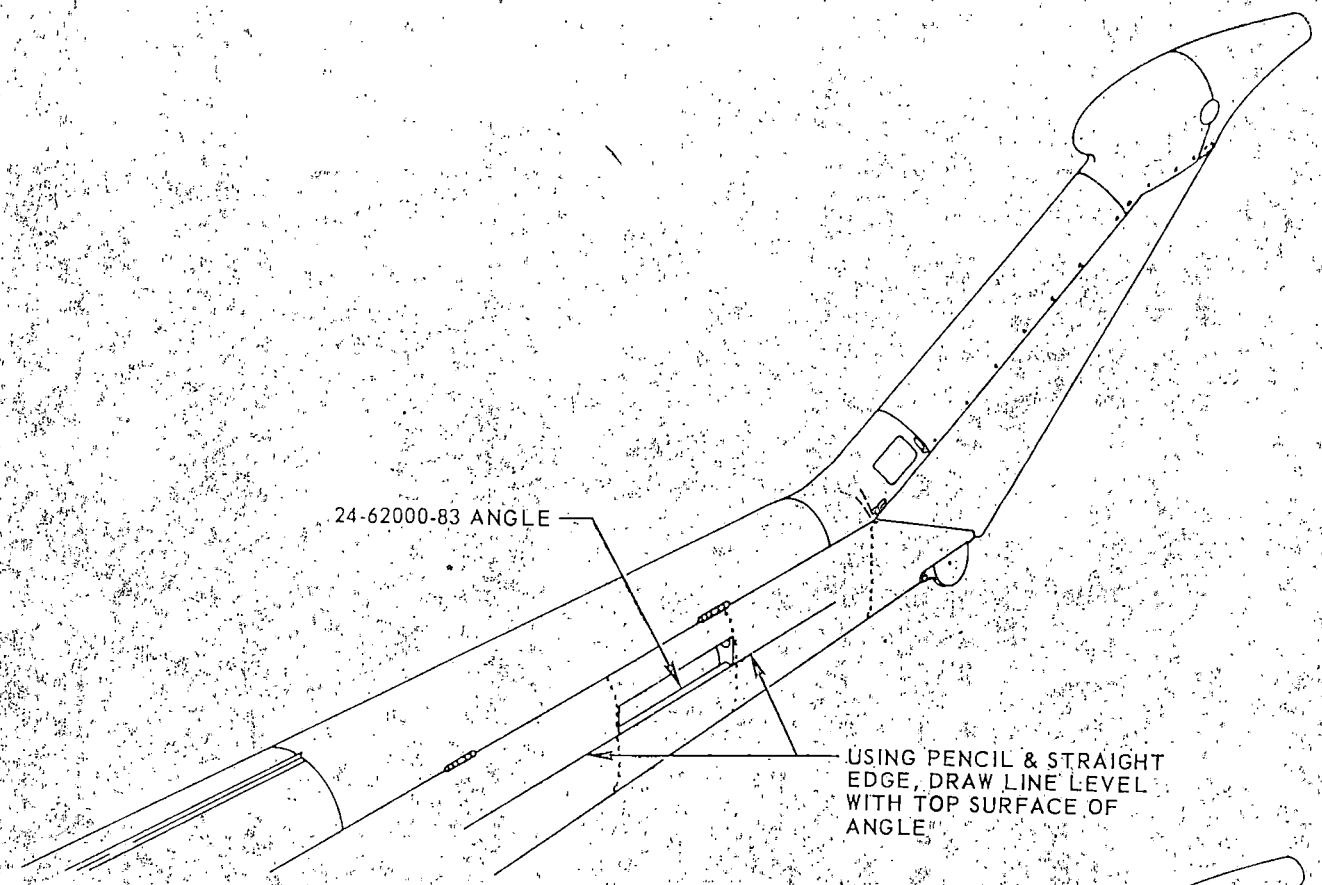

Figure 2

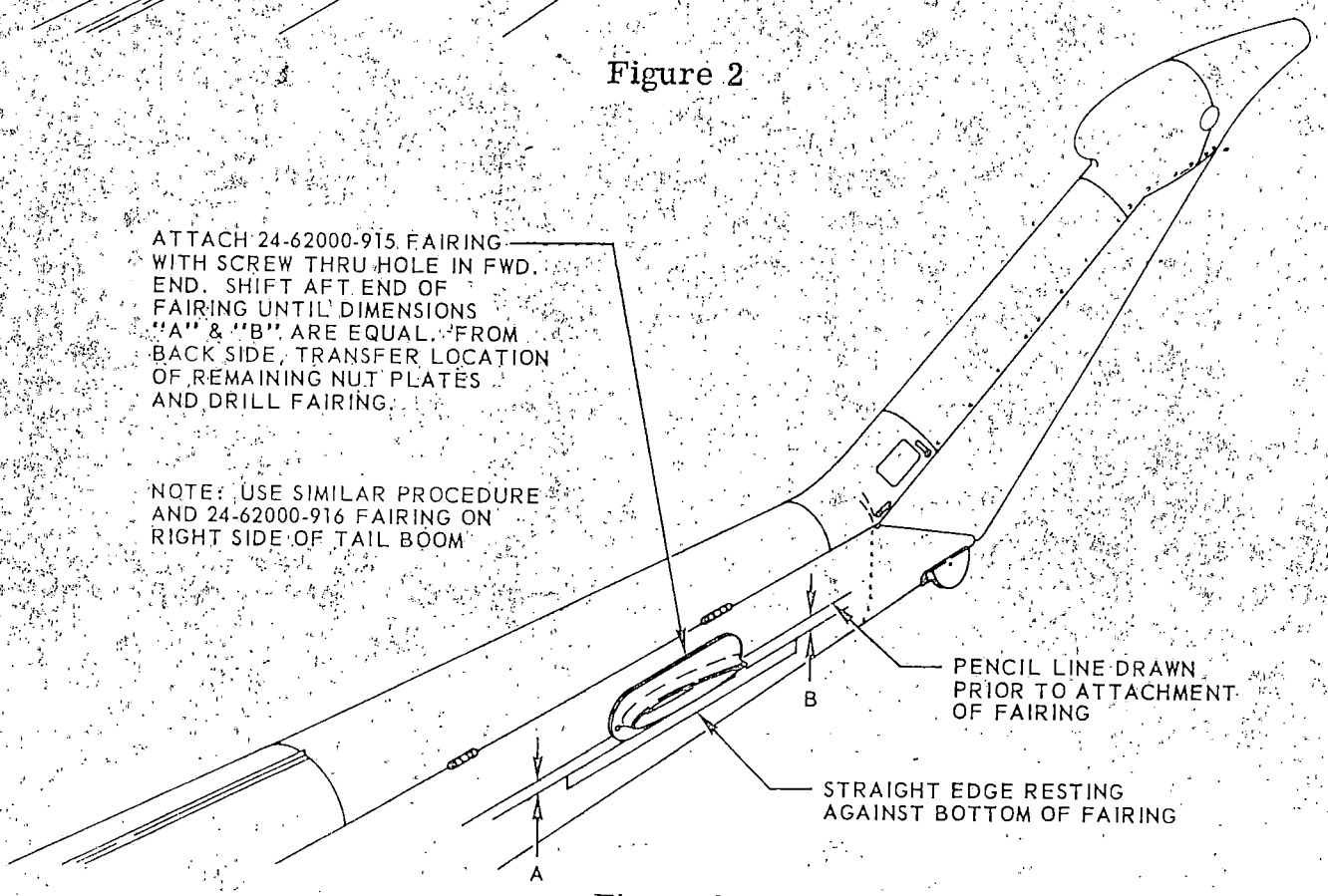

Figure 3

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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

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LAB. REPORT

24/68

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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

000871

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Pilot History

Par Fletcher

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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.

02-0043

ON HER MAJESTY'S SERVICE
SERVICE DE SA MAJESTÉ

CANADA
POSTAGE PAID
PORT PAYÉ

Pilot History

Par Fletcher

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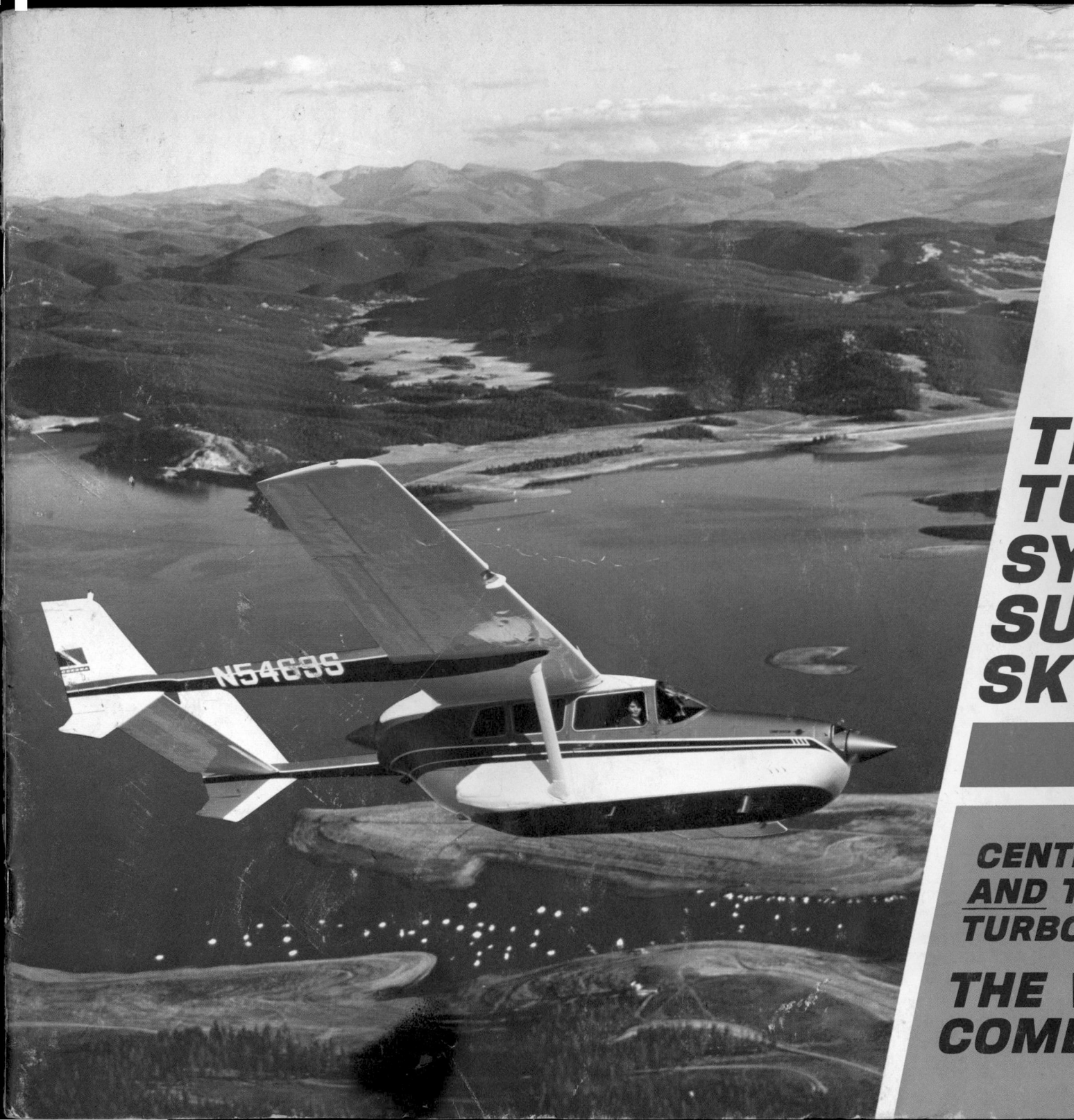

THE TURBO-SYSTEM SUPER SKYMASTER

CENTER-LINE THRUST... AND TWIN TURBO-SYSTEM POWER

THE WINNING COMBINATION!

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THE WINNING COMBINATION MAKES EVERY DAY A BETTER FLYING DAY!



The combination of Turbo-System power and Center-Line Thrust brings a total new capability to the Super Skymaster and to twin-engine flying. Singly, these two Cessna features represent the two most significant advancements in contemporary multiengine aircraft design. Together, they represent a winning combination; two great features that allow the new Turbo-System Super Skymaster to provide the greatest combination of flexibility and total twin performance available today.

Turbo-System power provides full sea level manifold pressures and maximum horsepower up to 12,000 feet, 99% horsepower to 15,000 feet and 93% horsepower to 20,000 feet. Beyond, the Turbo-System helps the engines breathe more easily, efficiently and effectively, giving more usable power to work with. Thus, the new Turbo-System Super Skymaster provides speeds up to 232 mph and a single-engine service ceiling above 20,000 feet. It gets off at full gross weight in 845 feet and lands in only 590 feet.

It comes close to making a standard day out of a hot, calm operating situation and assuring maximum power at all altitudes.

When density altitude on a nonstandard day adds several thousand feet to an operating airfield, the Turbo-System Super Skymaster's twin engines provide sea level manifold pressure and maximum horsepower for full performance capacity.

And exclusive Cessna Super Skymaster Center-Line Thrust is the perfect partner for Turbo-System power. It lines up the power straight down the center for maximum thrust and control. While Turbo-System gets the most out of the power plants, the Center-Line Thrust principle puts it to the most productive use. Nothing's wasted. Everything's used to fly straight ahead, true to the mark. And the exclusive Center-Line Thrust of the Turbo-System Super Skymaster imposes no single-engine control speed restrictions under any flying conditions.

With the new Turbo-System Super Skymaster you get the plus power of Turbo-System and the positive control of Center-Line Thrust . . . an unbeatable twin-engine combination.

The new Turbo-System Super Skymaster is also remarkable for the ease of entrance and exit, for quick conversion from passenger service to air cargo carrier and for its smooth and natural responsiveness.

It has more usable space, better visibility and superior short-field capabilities over more expensive aircraft. It can be professionally equipped for IFR operations and provides the exclusive advantages of high-stability wing, Para-Lift flaps and fully retracting Land-O-Matic gear.

Any way you figure it, this winning combination improves every flying day . . . in ways no other twin-engine airplane can.

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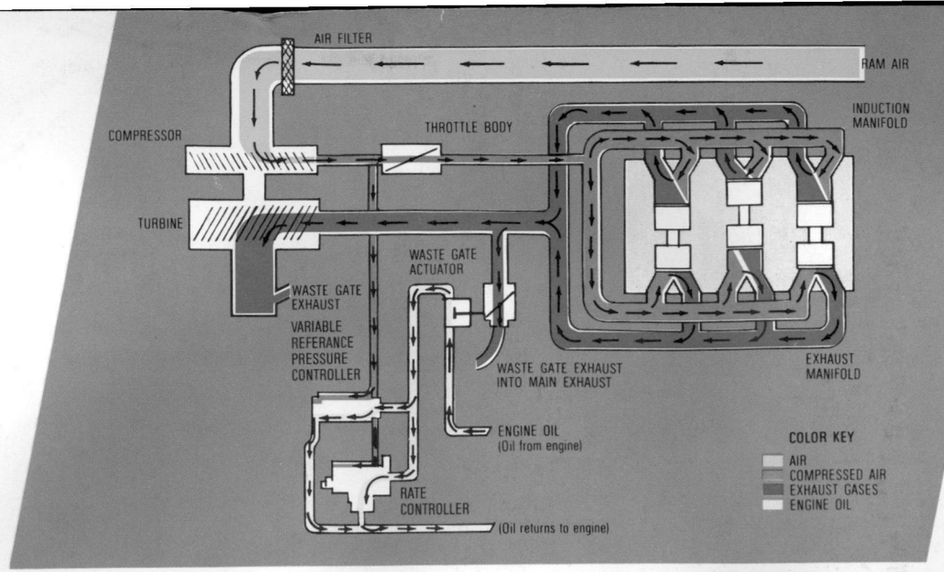

TURBO-SYSTEM OPERATION Automatic controls of the Super Skymaster's Turbo-System give accurate, reliable power plant management. Ram air enters system through forward-ported ducting, passes through air filter, and into turbine-driven compressor. Compressor pressurizes induction air and sends it through the throttle body which is controlled by the pilot and allows selection of the desired manifold pressure. Turbocharged air enters cylinder through induction manifold. Exhaust gases leave cylinder through exhaust manifold and are routed to turbine before being ducted overboard. Automatic waste gate valve, which is controlled by waste gate actuator, permits controlled amounts of exhaust gases to escape prior to entering turbine, thereby stabilizing turbine speed and assuring selected manifold pressure. Maximum manifold pressure is limited by a Variable Referance Pressure Controller which senses the compressor pressure, opening the waste gate to reduce turbine speed to assure the desired manifold pressure regardless of ambient pressure. The Rate Controller assures smoothly accelerating power during rapid throttle advance.

On a standard day, at sea level, you can count on most twins to perform up to maximum capability. However, when the altitude is higher or the day is hot and calm, the arithmetic begins: Subtract power; add to the amount of takeoff run needed; reduce the rate of climb; diminish the capability of the airplane. And if the field is high and the load is heavy, the mathematics of the hot, calm day takes even more away from the performance of the ordinary twin.

With an engine out, under such conditions, the arithmetic becomes even more significant. Now the Turbo-System Super Skymaster brings a new kind of arithmetic and confidence to twin-engine flying . . . based on the full capability of Cessna Turbo-System power and the control of Center-Line Thrust . . . now available together for the first time.

The winning combination of Center-Line Thrust and Turbo-System power can best be seen by examination of the total performance of the Turbo-System Super Skymaster . . . a superior total performance that sets it apart from all other twins.

The chart on the opposite page clearly shows the effects of temperature, gross weight and altitude on the new Turbo-System Super Skymaster and clearly depicts its ability to maintain enroute altitudes under varying conditions. A comparison of your present twin under similar circumstances is the best example of what the new kind of arithmetic . . . brought to twin-engine flying by the new Turbo-System Super Skymaster . . . can mean to you.

In every meaningful way, the Turbo-System Super Skymaster represents a winning combination of the most useful, most wanted, most exclusive features found in twin-engine flying. It's the twin you would have designed for yourself.



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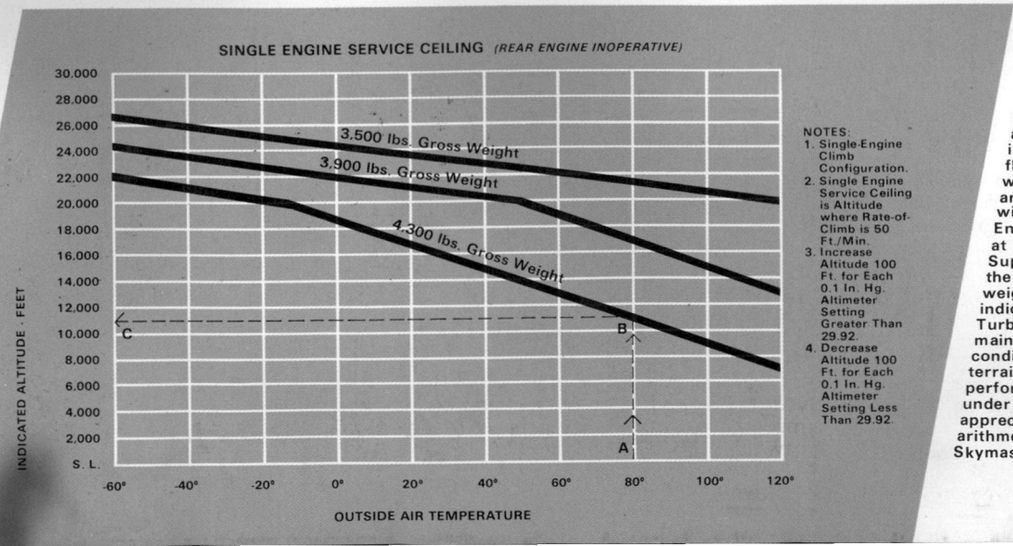
THE WINNING COMBINATION A NEW KIND OF TWIN-ENGINE ARITHMETIC!



On a nonstandard day, density altitude and gross weight become important considerations. If you are flying at 8,000 feet, at full gross weight, with an outside air temperature of 80° and an engine becomes inoperative, what will density altitude do to your Single Engine Service Ceiling? The chart at left shows what the Turbo-System Super Skymaster will maintain. Run up the 80° temperature line (A) to your gross weight (B) and then across to your indicated altitude (C). You find that the Turbo-System Super Skymaster could maintain 11,000 feet under these conditions--well above your enroute terrain clearance. Compare the performance of your present airplane under similiar conditions and fully appreciate the new kind of twin-engine arithmetic the Turbo-System Super Skymaster has brought to flying.

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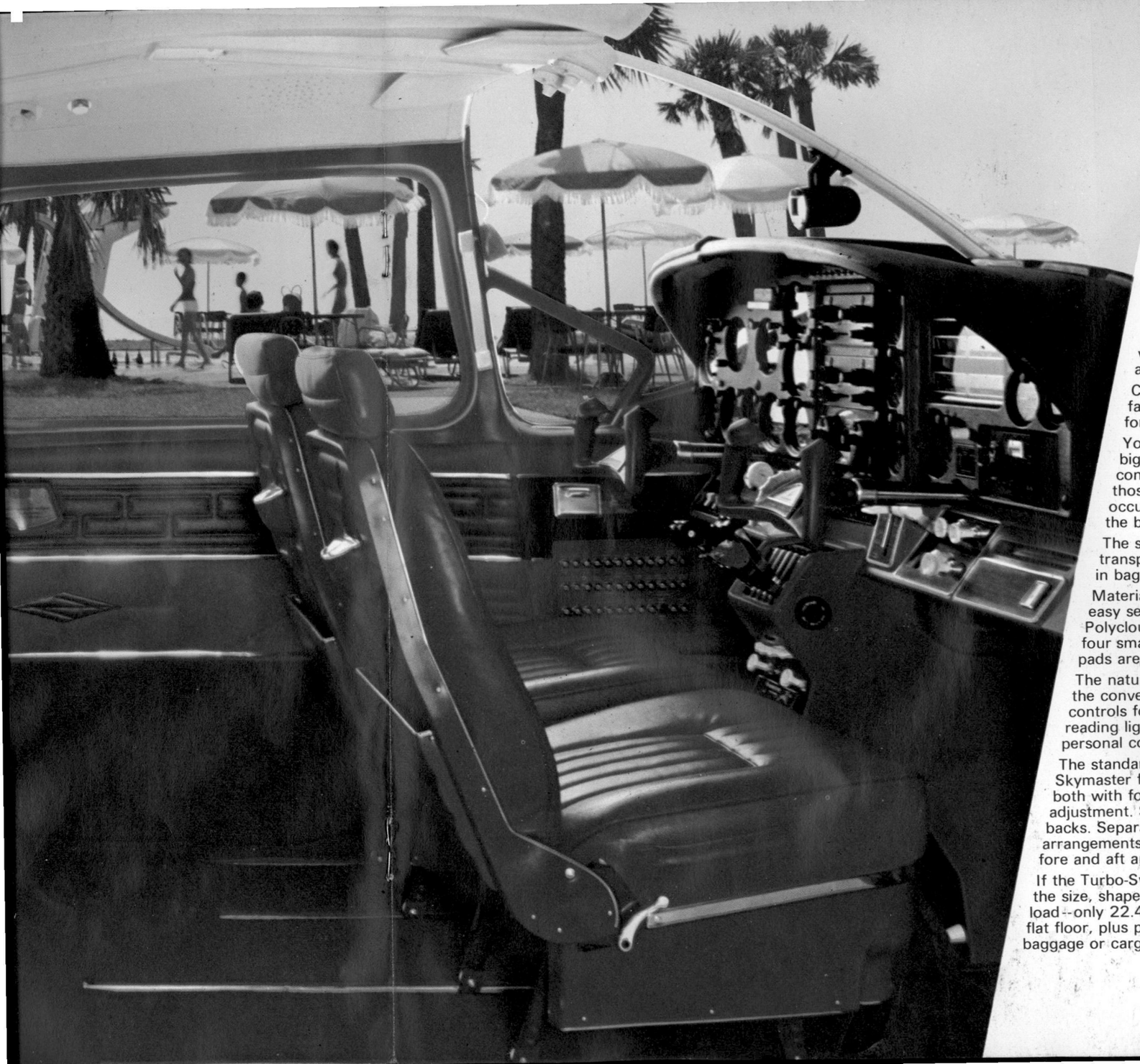

THE WINNING COMBINATION...

LUXURIOUS COMFORT / PRACTICAL CONVENIENCE!

If you were planning the perfect aircraft cabin, you'd design one that was easy to enter and to exit from; one that would let you move about freely; one where luxury abounds; and one in which total conveniences for passengers and pilot are close at hand.

Cessna has used this ideal concept of an interior as a model . . . and from it fashioned a winning combination of luxurious comfort and practical convenience for the new Turbo-System Super Skymaster.

You enter under a large, sheltering wing to a completely flat floor. The sill of the big 45-inch door is only 22.4 inches from ground level. The cabin itself has the consistent corner-to-corner, floor-to-ceiling dimensions of a room rather than those of an ordinary tapered cabin, providing spacious comfort for every occupant. Luggage may be loaded through the passenger door or directly into the baggage compartment through a large luggage door.

The size is no illusion. The Turbo-System Super Skymaster is perfectly suited to transport four adults in "big twin" style and comfort . . . or with a reduction in baggage or fuel, a spacious cabin for six people.

Materials for the cabin are selected for beauty and luxury, plus long wear and easy serviceability. Seats are padded and contoured from layers of soft Polycloud. Seats and optional matching headrests are covered in a choice of four smart nylon fabrics and vinyls or four leathers. Special color-matching scuff pads are provided in the rudder pedal area to prevent carpet wear.

The natural comfort of the new Turbo-System Super Skymaster is enhanced by the conversational quiet of a sound-sealed and padded cabin; convenient controls for a pleasant interior environment; handy storage pockets; optional reading lights for each passenger; ash trays; sun visors . . . plus many other personal conveniences.

The standard four-place seating arrangement of the new Turbo-System Super Skymaster features a reclining pilot's seat and a fully reclining copilot's seat, both with fore and aft adjustments and optional electrical or mechanical vertical adjustment. Standard aft seats employ a common seat with individually reclining backs. Separate individual seats are available in four-, five- and six-seat arrangements. In these optional arrangements, the center pair of seats adjust fore and aft and recline to a full-prone position.

If the Turbo-System Super Skymaster is hauling cargo instead of passengers, the size, shape and reinforced toughness of the cabin is ideal. And it's easy to load--only 22.4 inches from ground level into 19.5 square feet of completely flat floor, plus pilot seat. Seats may be quickly removed to facilitate baggage or cargo airlift.

THE WINNING COMBINATION
PROFESSIONAL COMPLETENESS/ ADVANCED PERFORMANCE!

The professional completeness of the Turbo-System Super Skymaster panel offers the expert pilot unequalled opportunities to utilize his advanced skills. Yet the basic simplicity of Center-Line Thrust and self-managing Turbo-System power permits the new twin-engine pilot to quickly assume proficient command of this big, powerful, high-performance airplane. The result is precise control and flexible performance above that of any other twin-engine airplane in its class.

Typical of many refinements is optional post lighting featuring instrument white light. This latest development in panel lighting systems is being adopted by many major airlines and by the United States Air Force because it reduces eye fatigue. White light more fully utilizes all of the cones of the eye, enabling the pilot to monitor instruments at night more efficiently at any desired light intensity.

The arrangement of the Turbo-System Super Skymaster panel is planned for the pilot's convenience. Flight instruments are directly in front of the pilot. Radios and electronics are center-panel mounted. Engine instruments are on the right, with primary gauges slant mounted for easier, more accurate monitoring by the pilot. The wood-grained lower panel is tilted upward for easier reference. On it are engine, panel lighting and navigation light switches; cabin comfort controls; gear and flap selector handles; elevator trim control and cowl flap controls; and glove box. The control pedestal at the lower center of the panel provides efficient pilot management of the airplane. Grouped here are the throttles, propeller and mixture controls, rudder trim wheel and engine primers. Also provided is space for installation of a choice of Nav-O-Matic autopilots. The Nav-O-Matic 300 Series autopilot features command turns, heading lock, and omni-intercept and tracking capability. The Nav-O-Matic 400 Series autopilot performs command turns, heading lock, omni-intercept and tracking, altitude hold, and command climb and descent.

New nontumbling gyros are optional. A spring-return selector on the new directional gyro prevents its being inadvertently caged. The new concept attitude gyro is positive indicating, directly translating the attitude of the airplane. When the airplane rolls to the right, the dial pointer moves to the right--directly indicating a right bank.

Ample center mounting space is provided on the panel for a full complement of communication and navigation equipment. Both the Cessna-Crafted 300 and 500 Series radios are offered to complete an IFR package consisting of dual communications, dual omni, ADF, glide slope, marker beacon, DME, 800 transponder and a high-frequency transceiver.

A pilot's all-weather window is standard; and provisions are optional for a wing deice system and propeller anti-ice system for the front to permit operations in a wide range of weather conditions. Right, installed with the deice systems, is available.



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THE WINNING COMBINATION OF VALUE FEATURES!

POWER flows smoothly at all altitudes from two fuel-injected 210 hp engines especially built for turbo-charging--with sixteen integral parts and assemblies "extra" stressed over and above a regular aspirated engine to insure long, dependable service. Each engine is equipped with a new Cessna-Crafted 38-amp alternator, transistorized solid-state voltage regulator, and shielded all-weather ignition harness. Automatic cut-off is provided for all unneeded electronic equipment during engine starting, offering maximum starting power and protection from transient voltage damage. An automatic propeller synchronizer is available.

COOLING is controlled for the front engine by electrically operated cowl flaps which regulate the flow of air from its exit at the cowling. An intake above the rear engine admits cooling air which is controlled by electrically operated cowl exit flaps.

FUEL capacity with standard tanks is 93 gallons, permitting a full gross, 75% power cruising range of more than 750 miles. Optional auxiliary tanks can increase the fuel capacity to 131 gallons and extend the cruising range to more than 1,000 miles.

GEAR is the long-proved Cessna spring steel Land-O-Matic system, designed for full retraction with hydraulic power. The nose gear retracts up and forward; the main gear retracts aft. The main wheel well doors are fully closed when the gear is extended, sealing against mud, water, snow and ice. The gear is extended and retracted by a hydraulic pump powered by the front engine or by a manual control. An optional dual hydraulic pump on the rear engine is available. The nose wheel is steerable 15° in either direction and swivels for tight turns within less than a 9-foot diameter around the inboard wheel.

PARA-LIFT FLAPS of broad span provide exceptional short-field capability. Electrically powered, they quickly respond to the panel-mounted flap control and are monitored by a panel-mounted position indicator. Para-lift flaps expand the wing area to provide shorter, slower, more stable approaches.

WING location above the center of gravity affords optimum stability. Large wing area provides high lift capabilities.

BRAKES with organic linings and strong steel band disks assure precise, powerful braking and long service life.

SOUNDPROOFING is thorough and includes multilayered thick sound cushioning throughout the cabin area, plus double-paned side windows.

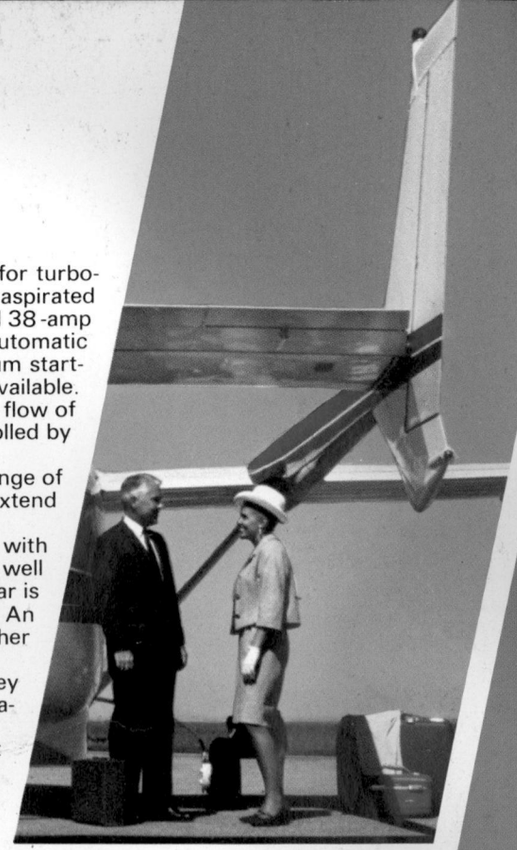
OMNI-FLASH BEACON of new, lightweight design, mounted on the restyled fin tip, is smaller to reduce drag, and longer lasting. Solid-state flasher unit has no moving parts.

ELECTRIC ELEVATOR TRIM is an optional feature that provides precise electrical control of the pitch system from a switch on the left-hand side of the pilot's control wheel. It is backed up by the manual trim system, designed to override the electrical control if desired. The manual trim control is located on the lower center panel.

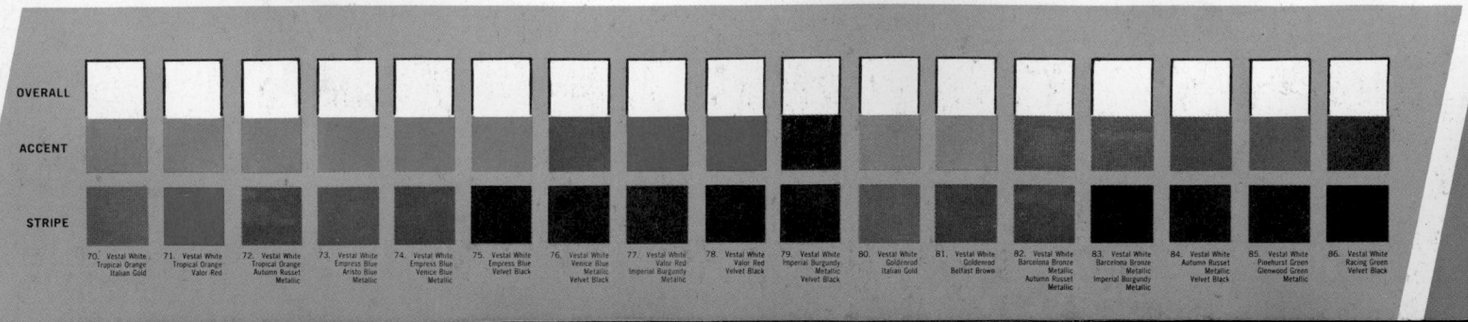
TRUE AIRSPEED INDICATOR is optionally available and incorporates a built-in computer for quick, accurate computation of true airspeed.

FIBER GLASS CARGO-PACK allows the Turbo-System Super Skymaster to adapt easily to air-taxi operations or other special missions requiring five or six passengers, plus baggage. The simply attached Cargo-Pack, beneath the fuselage, is on the center of gravity and has a carrying capacity of 300 pounds. An access door located on one side of the Cargo-Pack facilitates easy loading.

GASOLINE HEATER provides 25,000 BTUs for adequate cabin heat at all elevations.







Choose your Turbo-System Super Skymaster exterior colors from the selector at left or see the Cessna Styling Selector for complete interior and exterior details.

PERFORMANCE

Gross Weight:	**4300 lbs.**
Speed:	
Top Speed at 20,000 Ft.	232 mph
Cruise, 75% Power at 24,000 Ft.	225 mph
Cruise, 75% Power at 10,000 Ft.	195 mph
Range:	
Normal Lean Mixture	
Cruise, 75% Power at.	860 mi.
24,000 Ft. - 92 Gal.	3.9 hr.
No Reserve	223 mph
Cruise, 75% Power at.	750 mi.
10,000 Ft. - 92 Gal.	3.9 hr.
No Reserve	194 mph
Cruise, 75% Power at.	1200 mi.
24,000 Ft. - 128 Gal.	5.4 hr.
No Reserve	223 mph
Cruise, 75% Power at.	1045 mi.
10,000 Ft. - 128 Gal.	5.4 hr.
No Reserve	194 mph
Optimum Range at	1150 mi.
24,000 Ft. - 92 Gal.	6.8 hr.
No Reserve	169 mph
Optimum Range at	1005 mi.
10,000 Ft. - 92 Gal.	7.2 hr.
No Reserve	140 mph
Optimum Range at	1590 mi.
24,000 Ft. - 128 Gal.	9.4 hr.
No Reserve	169 mph
Optimum Range at	1400 mi.
10,000 Ft. - 128 Gal.	10.0 hr.
No Reserve	140 mph
Rate of Climb at Sea Level:	
Twin Engine.	1250 fpm
Front Engine Only.	390 fpm
Rear Engine Only.	480 fpm
Service Ceiling:	
Twin Engine.	31,000 ft
Front Engine Only.	20,000 ft
Rear Engine Only.	21,000 ft
Takeoff Performance:	
Ground Run	845 ft.
Total Distance Over 50-Ft. Obstacle	1490 ft.
Landing:	
Ground Roll.	590 ft.
Total Distance Over 50-Ft. Obstacle	1500 ft.
Stall Speed:	
Flaps Down, Power Off.	66 mph
Empty Weight: (Approximate)	2785 lbs
Baggage Allowable:	365 lbs.
Wing Loading:	21.4 lbs
Power Loading:	10.2 lbs
Fuel Capacity: Total	
(Standard)	93 gals.
(Optional)	131 gal
Oil Capacity: (Total)	5 gals.
Power:	Two Six 2800 R
Propellers:	Constar
Wing Span:	38 ft.
Wing Area:	201 ft
Length:	29 ft. 1
Height:	
With Depressed Nose Strut	9 ft. 4 i

**Subject to Change Without Notice.*

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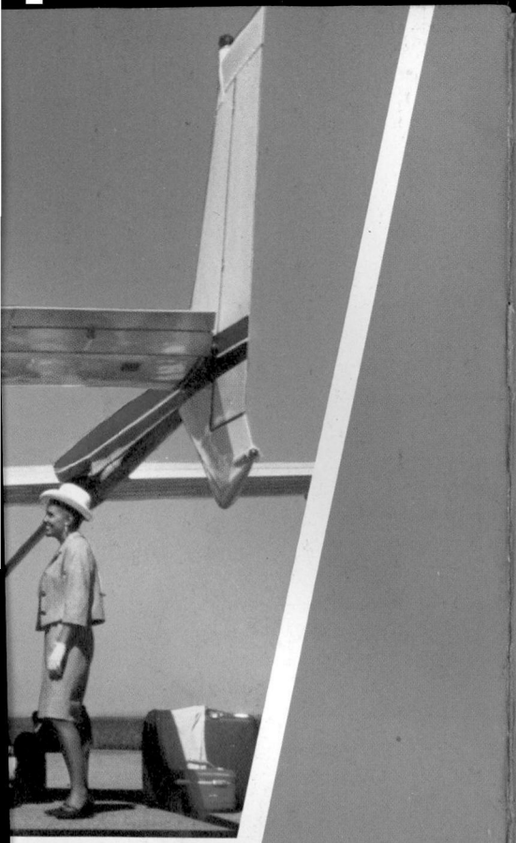



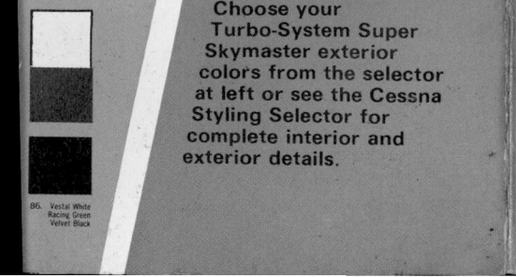

Choose your Turbo-System Super Skymaster exterior colors from the selector at left or see the Cessna Styling Selector for complete interior and exterior details.

86. Vestal White
Racing Green
Velvet Black

PERFORMANCE & SPECIFICATIONS*

Gross Weight:	**4300 lbs.**	**1950 kg**	**3900 lbs.**	**1769 kg**
Speed:				
Top Speed at 20,000 Ft.	232 mph	373 km/h	233 mph	375 km/h
Cruise, 75% Power at 24,000 Ft.	225 mph	362 km/h	226 mph	364 km/h
Cruise, 75% Power at 10,000 Ft.	195 mph	314 km/h	196 mph	315 km/h
Range:				
Normal Lean Mixture				
Cruise, 75% Power at.	860 mi.	1384 km	865 mi.	1392 km
24,000 Ft. - 92 Gal.	3.9 hr.		3.9 hr.	
No Reserve	223 mph	359 km/h	224 mph	360 km/h
Cruise, 75% Power at.	750 mi.	1207 km	755 mi.	1215 km
10,000 Ft. - 92 Gal.	3.9 hr.		3.9 hr.	
No Reserve	194 mph	312 km/h	195 mph	314 km/h
Cruise, 75% Power at.	1200 mi.	1931 km	1205 mi.	1939 km
24,000 Ft. - 128 Gal.	5.4 hr.		5.4 hr.	
No Reserve	223 mph	359 km/h	224 mph	360 km/h
Cruise, 75% Power at.	1045 mi.	1682 km	1050 mi.	1690 km
10,000 Ft. - 128 Gal.	5.4 hr.		5.4 hr.	
No Reserve	194 mph	312 km/h	195 mph	314 km/h
Optimum Range at	1150 mi.	1850 km	1185 mi.	1907 km
24,000 Ft. - 92 Gal.	6.8 hr.		7.1 hr.	
No Reserve	169 mph	272 km/h	167 mph	269 km/h
Optimum Range at	1005 mi.	1617 km	1040 mi.	1674 km
10,000 Ft. - 92 Gal.	7.2 hr.		7.5 hr.	
No Reserve	140 mph	225 km/h	138 mph	222 km/h
Optimum Range at	1590 mi.	2560 km	1640 mi.	2640 km
24,000 Ft. - 128 Gal.	9.4 hr.		9.8 hr.	
No Reserve	169 mph	272 km/h	167 mph	269 km/h
Optimum Range at	1400 mi.	2253 km	1450 mi.	2333 km
10,000 Ft. - 128 Gal.	10.0 hr.		10.5 hr.	
No Reserve	140 mph	225 km/h	138 mph	222 km/h
Rate of Climb at Sea Level:				
Twin Engine	1250 fpm	381 m/m	1460 fpm	445 m/m
Front Engine Only	390 fpm	119 m/m	520 fpm	158 m/m
Rear Engine Only	480 fpm	146 m/m	620 fpm	189 m/m
Service Ceiling:				
Twin Engine	31,000 ft.	9448 m	33,000 ft.	10,058 m
Front Engine Only	20,000 ft.	6096 m	23,000 ft.	7010 m
Rear Engine Only	21,000 ft.	6400 m	24,000 ft.	7315 m
Takeoff Performance:				
Ground Run	845 ft.	258 m	680 ft.	207 m
Total Distance Over 50-Ft. Obstacle	1490 ft.	454 m	1290 ft.	393 m
Landing:				
Ground Roll	590 ft.	180 m	590 ft.	180 m
Total Distance Over 50-Ft. Obstacle	1500 ft.	457 m	1500 ft.	457 m
Stall Speed:				
Flaps Down, Power Off	66 mph	106 km/h	63 mph	101 km/h
Empty Weight: (Approximate)	2785 lbs.	1263 kg	2785 lbs.	1263 kg
Baggage Allowable:	365 lbs.	166 kg	365 lbs.	166 kg
Wing Loading:	21.4 lbs/ft^2	104 kg/m^2	19.4 lbs/ft^2	94.7 kg/m^2
Power Loading:	10.2 lbs/hp	4.64 kg/hp	9.3 lbs/hp	4.21 kg/hp
Fuel Capacity: Total				
(Standard)	93 gals.	352 liters	93 gals.	352 liters
(Optional)	131 gals.	496 liters	131 gals.	496 liters
Oil Capacity: (Total)	5 gals.	18.9 liters	5 gals.	18.9 liters
Power:	Two Six-Cylinder Fuel-Injection Engines, 210 Rated HP at 2800 RPM and 32" MP.			
Propellers:	Constant-Speed, Full-Feathering, Diameter 76 in. (1.93 m)			
Wing Span:	38 ft.	11.58 m	38 ft.	11.58 m
Wing Area:	201 ft^2	18.67 m^2	201 ft^2	18.67 m^2
Length:	29 ft. 10 in.	9.09 m	29 ft. 10 in.	9.09 m
Height:				
With Depressed Nose Strut	9 ft. 4 in.	2.84 m	9 ft. 4 in.	2.84 m

**Subject to Change Without Notice.*

STANDARD EQUIPMENT*

Altimeter, Sensitive
Alternators, Self-Rectifying, 38-Amp, 28-Volt (Two)
Armrests (Four)
Ashtrays (Four)
Attachment Provisions (Cargo Rings, Shoulder Harness)
Battery, 24-Volt
Beacon, Omni-Flash
Brake, Parking
Brakes, Hydraulic Toe-Operated
Bus Bar, Split
Carpet
Checklist, Pilot's
Circuit Breakers, Electrical
Clock, Electric
Compass, Magnetic
Controls, Cowl Flap (Electric) (Two)
Controls, Fuel Strainer Drain Remote (Two)
Controls, Mixture (Two)
Controls, Propeller (Two)
Controls, Throttle (Two)
Cup, Fuel Sampling
Cushions, Polycloud Seat
Defroster, Windshield
Detectors, Navigation Light
Door, Baggage Compartment (Outside)
Engines, Fuel-Injection (Two)
Fairings, Wing Strut
Filters, Engine Induction Air (Two)
Flaps, Cowl (Four)
Flaps, Para-Lift Wing (Electric)
Fuel System, Injection Type
Fuel Valves, Four-Position Selector (Two)
Gauge, Fuel Flow, Dual (Left-Right)
Gauge, Manifold Pressure, Dual
Gauge, Outside Air Temperature
Gauge Unit, Engine (Includes Oil Pressure (Two), Oil Temperature (Two), Cylinder Head Temperature (Two), Ammeter, Volt-Meter, and Two Electric Fuel Gauges)
Heating System, Gasoline Heater
Hook, Clothes Hanger
Ignition Switches (Two)
Ignition Systems, Dual Magneto (Two)
Indicator, Airspeed
Indicator, Rate-of-Climb
Indicator, Stall Warning (Audible)
Indicator, Engine Synchronization
Indicator, Turn and Bank
Indicator, Wing Flap Position
Instrument Panel, Shock-Mounted
Jack, Microphone
Jacks, Headphone (Two)
Jack Pads
Landing Gear, Land-O-Matic, Retractable (Hydraulic)
Light, Landing and Taxi (Dual Beam)
Light, Map
Lighter, Cigarette
Lights, Dome (Two)
Lights, Instrument Panel Red and White Flood (Variable Intensity)
Lights, Navigation
Lock, Baggage Door
Lock, Cabin Door
Lock, Elevator and Aileron Controls
Map Compartment
Nose Gear, Steerable
Oil Coolers (Two)
Oil Filters, Engine (Two)
Oxygen Mask
Oxygen System
Paint Scheme, All Over
Pedestal, Control
Pockets, Map and Storage (Two)
Primer System, Engine
Propellers, Constant-Speed (Full-Feathering)
Pump, Engine-Driven, Hydraulic (Front Only)
Pumps, Electric Auxiliary Fuel (Two)
Pumps, Engine-Driven Fuel (Two)
Regulators, Voltage (28-Volt, Solid State) (Two)
Rings, Airplane Tie-Down
Scoop, Rear Engine Air
Seats, Rear (Individually Adjustable Backs)
Seats, Individual Front (Fore and Aft Adjusting with Reclining Backs)
Shelf, Storage (Fold-Away)
Shielding, Engine Ignition (All-Weather)
Soundproofing, Super
Spinners, Propeller (Two)
Starters, Engine (Electric) (Two)
Static Source, Alternate
Step, Entrance
Strainers, Fuel (With Quick-Drain) (Two)
Straps, Assist (Four)
Sun Visors (Two)
Tachometer, Dual
Tires, Nylon (Tube Type)
Tow Bar, Airplane
Trim System, Elevator and Rudders
Turbocharger Controllers, Variable Referance Pressure (Two)
Turbocharger Controllers, Rate (Two)
Turbocharger Waste Gates and Actuators (Two)
Turbochargers, High-Capacity, Lightweight (Two)
Valves, Quick-Drain Fuel Tank (Two)
Ventilation System, Cabin
Ventilators, Individual (Adjustable Cabin Air) (Four)
Window, Hinged (Right Side)
Window, All-Weather
Windshield and Double Windows (Tinted)
Wiring Provisions (VHF Communications and Omni Antenna Cables, Nav-O-Matic Wiring Harness for Pitch and Roll Actuators)

**Subject to Change Without Notice*

000884

THE BEAUTY OF A CESSNA IS MORE THAN SKIN DEEP...

What happens AFTER you buy an airplane is equally important as an intelligent purchase. The fact that year after year more airplane owners buy Cessnas (almost as many as all other makes combined) is testimony to the continuing concern which Cessna shows for its customers... the service which comes after the sale.

Cessna purchasers recognize that the Cessna warranty, covering the airplane and all factory-installed equipment for a full six months from the purchase date, is the best offered in the airplane industry. Cessna-Crafted electronics are now covered under a new and separate Service Policy which provides the purchaser with parts replacement and repair labor for one year from date of purchase at no charge.

And Cessna owners value the other continuing customer services which Cessna dealers furnish. Items like free new-airplane and initial 100-hour inspections, continuing owner notification services, and battery pro rata service beyond the warranty--all offered at more dealer service outlets throughout the world than on any other airplane. CESSNA SERVICE almost everywhere you need it. There's a world of Cessna service awaiting you wherever you fly. This is one of the very important Cessna "tangibles" which benefit the purchaser of a Turbo-System Super Skymaster... or any other Cessna.

Make your next stop and all the stops thereafter at the sign of the red and blue pennants--your Cessna Dealer--the helpful headquarters for Cessna-Crafted accessories, finance and lease plans and other answers to your flying needs.

Cessna

CRAFT COMPANY, WICHITA, KANSAS



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A BRIEF SUMMARY

OF THE

FLYING, EDUCATIONAL AND BUSINESS

BACKGROUND

OF

PAR F.R. FLETCHER

000886

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

PAR F.R. FLETCHER

- Born in Moose Jaw, Saskatchewan, Canada, April 30, 1926.

- Canadian - English Extraction, Anglican.

- Height 5 ft. 11 inches
  Weight - 175 lbs.

- Single

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S U M M A R Y

EDUCATION

PUBLIC SCHOOL - Davin Public School, Regina, Sask.
1933 - 1941

SECONDARY SCHOOL - Balfour Technical School, Regina, Sask.
1941 - 1945

UNIVERSITY - University of Saskatchewan, Regina
1952 - 1953 Arts
1953 - 1955 Engineering (no Degree)

- University of Alberta, Calgary
1963 - 1964 Education (incomplete)
because course wasn't compatable with my goals

CORRESPONDENCE COURSE - International Correspondence Schools
1960 - 1963 Canadian Business Management

EXTRA-CURRICULAR ACTIVITIES - Professional Golf Teacher, Badminton, Skiing, Skating, Curling, Bowling.

- Masonic Lodge (N.W.M.P. No. 11 - Regina)

000888

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

6376 Collingwood Street,
Vancouver 13, B.C.,

March 12, 1968.

Mr. Harvey D. Wylie,
President,
Pipe Line Technologists (Alberta) Ltd.,
4th Floor, Confederation Building,
12th Avenue S.W.,
Calgary, Alberta.

Dear Harvey:

Enclosed for your perusal please find an addition to my resume on qualifications and experience as a pilot - a further break-down of flying hours on fixed wing aircraft and other information concerned with my flying background.

Also enclosed is an article on "Carbon Monoxide in the Cockpit." You mentioned the possibility that Jim Cox's accident was due to 'Carbon Monoxide' - this technical article discusses the subject. Engine management along with the technical know-how would seem to be a deterrent.

Now that you joined the flying fraternity re solo flight, you may wish to label this information for future reference.

Harvey, here is to the possibility of working with you and flying the beautiful proposed Turbo System Super Skymaster!

Best regards,

Yours sincerely,

Encl.

Par Fletcher

000889

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ADDITION TO RESUME ON QUALIFICATIONS & EXPERIENCE AS PILOT

FURTHER BREAK-DOWN OF HOURS INTO TYPES OF AIRCRAFT FLOWN & TIMES

MULTI ENGINE		
Piper Apache, Twin Commanche, Aztec C	67:40	13:10
D.H. Dove	1:40	
Aero Commander 500	7:05	
Beech 18	1:20	
Lockheed 18, Loadstar	60:20	15:50
	138:05	29:00
SINGLE ENGINE - 300 H.P. & Over		
D.H. Beaver & Otter	21:20	9:35
SINGLE ENGINE - Under 300 H.P.		
Fleet 80	43:25	
Luscombe	8:20	
Fairchild Cornell	82:45	6:25
Piper Colt	13:55	3:05
" Clipper & Tri-pacer	18:40	
" J-3, Super Cub 150	48:20	3:50
" Super Cruiser	30:50	5:30
" Cherokee 140, 160, 180	53:35	3:25
" Commanche 180, 250, 400	100:45	2:50
Beech Bonanza	13:50	
Aeronca Champ, Champion	512:30	2:10
Stinson Voyager	5:40	
Tiger Moth	20:10	
Ercoupe, Taylorcraft	4:55	
Cessna 120, 140, 150	993:30	33:45
" 170, 172, 175	177:50	22:35
" 180, 182	79:05	19:35
" 206, 210	5:05	3:50
	2243:30	107:00

- I was employed as Co-pilot (Part-time) for Mannix Construction Co., Calgary, Alberta - May 1963 - September 1963 on their Lockheed Loadstar. Pilot - John Gleishman.
- Total Instructional Hours - 1662:00
- I have valid Glider Pilot's Licence No. VRG-168.
- I have U.S.A. Commercial Pilot's Licence (Restricted for Ferry only - at present time.)
- I possess a Class I Medical Profile.
- I have been a member of the AOPA (Aircraft Owners & Pilots Association-U.S.A.) for nine years. Membership No. 181747

000890

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QUALIFICATIONS & EXPERIENCE AS PILOT

Flying Licenses Held - AIRLINE TRANSPORT PILOT'S LICENCE NO. 1078

Licence valid for - all aeroplanes, single and multi-engine land and sea. Up to 12,500 lbs. gross allowable weight.
Plus Helicopters: Bell 47, Bell 206 (Jet Ranger)
Hiller UH-12, FH 1100

VALID FOR VFR & IFR FLIGHT

FIXED WING AIRCRAFT EXPERIENCE

No. of hrs. flown	Total	Day	Nite	Instrument	Floats	Wheels	Skis
Single Engine up to 300 H.P.	2350:10	2243:10	107:00	113:40	16:30	2108:15	225:20
Single Engine over 300 H.P.	30:55	21:20	9:35	11:20		19:10	11:45
Multi Engine	167:05	138:05	29:00	69:20		167:05	
TOTAL	2548:10	2402:35	145:35	194:20	16:30	2294:30	237:05

Link Training Hours - 88:10

INSTRUMENT RATING - CLASS I - Issued 22 January 1968

INSTRUCTOR'S RATING - CLASS III - 1954 - 1962 (Lapsed)

ROTARY WING AIRCRAFT EXPERIENCE

Helicopter Time Total - 1744:45 hours

Total Flying Experience -	Fixed Wing	2548:10
	- Rotary Wing	1744:45
	Total	4292:55

000891

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W O R K E X P E R I E N C E

1965 - 1968 — Okanagan Helicopters Limited, Vancouver, B.C.
- employed as pilot.

1964 - 1965 - Simons (International) Limited, Vancouver, B.C.
- Engineering Draftsman

- Par '3' & Driving Range, Calgary, Alberta.
- Professional Golf Teacher

1963 - 1964 — Piper Aircraft Distributor,
Trans Aircraft Company Limited, Calgary, Alberta.
- Sales Staff and Charter Flying

1962 - 1963 - Premier Cycle & Sports, Calgary, Alberta.
- Sporting Goods Salesman

- Earl Grey Golf Club, Calgary, Alberta.
- Teaching and Playing Golf Professional

1960 - 1962 — Wild Horse Golf Range & Par '3' Golf Course,
Calgary, Alberta.
- Pro-Manager - Teaching & Playing Golf Professional

1958 - 1960 — Department of Mineral Resources,
Government of Saskatchewan
at Regina, Estevan, Swift Current & Kindersley Offices.
- Field Technician

1956 - 1958 — Imperial Oil Limited, Regina, Saskatchewan.
- Engineering Draftsman, Oilfield Engineering Inventory Clerk, Oilfield Engineering Construction Inspector, Pipeline Construction Inspector, Roughneck - Drilling Rig.

1951 - 1960 — Smith Airways Limited, Swift Current, Saskatchewan.
Estevan Flying Club, Estevan, Saskatchewan.
Regina Flying Club, Regina, Saskatchewan.
- Part & Full time Flying Instructor & Charter Pilot.

000892

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PERSONAL CHARACTER REFERENCES

s.19(1)



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A BRIEF SUMMARY

OF THE

EDUCATIONAL AND BUSINESS

BACKGROUND

OF

PAR F. R. FLETCHER

000894

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



PAR F. R. FLETCHER

- Born in Moose Jaw, Saskatchewan, Canada,
  April 30, 1926

- Canadian - English Extraction
  Anglican

- Height 5ft. 11 ins. Weight - ~~165~~ 175 lbs.
  Single

000895

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

S U M M A R Y

EDUCATION

PUBLIC SCHOOL - Davin Public School, Regina, Sask.
1933 - 1941

SECONDARY SCHOOL - Balfour Technical School, Regina, Sask.
1941 - 1945

UNIVERSITY - University of Saskatchewan, Regina
1952 - 1953 - Arts
1953 - 1955 - Engineering — NO DEGREE.
University of Alberta, Calgary
1963 to ~~present date~~ 1964 - Education — INCOMPLETE

CORRESPONDENCE COURSE - International Correspondence Schools
1960 to ~~present date~~ 1963 - Canadian Business Management

ATHLETICS

EXTRA-CURRICULAR ACTIVITIES

- Golf, Badminton, Skiing, Skating, CURLING, BOWLING
1941 - won the Saskatchewan Juvenile Golf Championship
1949 - runner-up City of Regina open Badminton Championship

~~SOCIAL~~

- Masonic Lodge (N.W.M.P. #11 - Regina)
- ~~Commercial Pilot~~ - Instructor's License

Professional teacher

000896

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BUSINESS EXPERIENCE

1939 - 1945 - Assistant Professional to Father
Wascana Golf & Country Club, Regina.

1946 - 1955 - Teaching-Playing & Head Professional, Class A
C. P. G. A. Member - Wascana Golf & Country Club,
Regina, Sask.

1950 - 1951 - Assistant Teaching Pro to Pat Fletcher
Winter Golf School - Saskatoon

1956 - 1958 - Engineering Construction Inspector
Imperial Oil Limited - Saskatchewan

1958 - 1960 - Field Technician - Dept. of Mineral Resources
Government of Saskatchewan

1960 - 1962 - Pro-Manager - Teaching and Playing
Class A Golf Pro - Wild Horse Golf Range and
Par 3 Golf Course, Calgary

1962 - 1963 - Téaching and Playing Golf Professional
Class A Member
Earl Grey Golf Club, Calgary

1962 - 1964 - SPORTING GOODS SALESMAN - PART TIME PRESTIGE CYCLE & SPORT

1963 - Private teaching - Class A Member
Sales Staff - Trans Aircraft Company Ltd.
Calgary

PLAYING EXPERIENCE

1948 & 1949 - P. G. A. Gold Trail - U. S. A. - 5 tournaments

- Played in Canadian Open Eight Times

- Played in Western Provinces - open tournaments
through 1940

1962 - Placed 13th in C. P. G. A. Tournament - Toronto

1963 - Placed 20th in C. P. G. A. Tournament - Edmonton

000897

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PERSONAL CHARACTER REFERENCES ??

[redacted]

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

6376 COLLINGWOOD ST
VANCOUVER 13, B.C
MARCH 12/1968

MR HARVEY D. WYLIE, Pres.
PIPE LINE TECHNOLOGISTS (ALBERTA) LTD.
4th Floor, Confederation Bldg. 12th AVE. S.W.
CALGARY, ALBERTA

DEAR HARVEY.

...pon Perusal ...on qualifications + experience as a pilot.

...SE FIND AN ADDITION TO MY RESUME — A

FURTH... ...F FLYING HOURS ON FIXED WING AIRCRAFT. &

...ERN WITH MY FLYING BACKGROUND. FOR ~~YOUR~~ PERUSAL.

...S AN ARTICLE ON "CARBON MONOXIDE IN THE

...E POSSIBLITY ~~THAT~~ JIM COX'S ACCIDENT

... — THIS TECHNICAL ARTICLE

... MANAGEMENT ALONG WITH

... TO BE A DETERRANT.

... THE FLYING FATERNITY - RE SOLO FLIGHT

...UATION FOR ~~YOUR~~ ~~FLYING~~ FUTURE REFERENCE.

...GETTING YOU AGAIN ~~HARVEY~~. I DO

...BLIEVE THE ACCIDENT "RED TAPE",

...BILITY OF WORKING WITH YOU. & ~~YOUR~~ MY FLYING

...ER SKYMASTER. ~~BEAGLEY~~.

REGARDS

DJ

000899

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LODSTAR

* WAS EMPLOYED AS CO-PILOT (PART TIME) FOR
~~FLEW FOR~~ MANNIX CONSTRUCTION COMPANY MAY/1963 To ~~Dec~~ 11/1963
~~AS CO PILOT~~ ON THEIR LOCKHEED LOADSTAR
PILOT - JOHN ~~GEELSHAAN~~

* TOTAL INSTRUCTIONAL HOURS 1662:00

* HAVE VALID GLIDER PILOT LICENCE URG - 168

* ~~I~~ USA COMMERICAL PILOTS LICENCE
(RESTRICTED FOR FERRY ONLY) ~~—~~ AT PRESENT TIME)

* 1 MEDICAL PROFILE.

AOPA (AIRCRAFT OWNERS & PILOT ASSOCIATION - USA)
MEMBERSHIP No. 181747

000900

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ADDITION TO RESUMÉ ON QUALIFICATIONS & EXPERIENCE AS PILOT

FURTHER BREAK-DOWN OF HOURS INTO TYPES OF AIRCRAFT FLOWN & TIMES

Multi-engine

PIPER APACHE, TWIN COMMANCHE, AZTEC C	67:40	13:10
D.H. DOVE	1:40	
AERO COMMANDER 500	7:05	
BEECH 18	1:20	
LOCKHEED 18	60:20	15:50
	138:05	29:00

Single Engine

D.H. BEAVER, OTTER	21:20	9:35
	43:25	
	8:20	
	62:45	6:25
	13:55	3:05
	18:40	
	48:20	3:50
	80:50	5:30
	3:35	3:25
	0:45	2:50
	13:50	
	444:25	
	993:30	33:46
	177:50	22:35
	79:05	19:35
	5:05	3:50
	1255:30	
CHAMPION	512:30	10 7:00
	5:40	2:10
	20:10	
	4:55	
	543:15	

000901

ADDITION TO
FURTHER BREAK-DO

MULTI ENGINE

Piper Apache, Twin Commanche, Aztec C	67:40	
D.H. Dove	1:40	
Aero Commander 500	7:05	
Beech 18	1:20	
Lockheed 18, Loadstar	60:20	15:50
	138:05	29:00

SINGLE ENGINE - 300 H.P. & Over

D.H. Beaver & Otter	21:20	9:35

SINGLE ENGINE - ~~300 H.P.~~ & Under 300 H.P.

000902

ADDITION TO
FURTHER BREAK-D

MULTI ENGINE

Piper Apache, Twin Commanche, Aztec 6	67:4	
D.H. Dove	1:4	
Aero Commander 500	7:05	
Beech 18	1:20	
Lockheed 18, Loadstar	60:20	15:50
	138:05	29:00

SINGLE ENGINE - 300 H.P. & Over

D.H. Beaver & Otter	21:20	9:35

SINGLE ENGINE - 300 H.P. & Under

000903

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CLASS III INSTRUCTOR TIME — LOG BOOK #1 —

		PAGE TOTAL	ACCUMULATIVE TOTAL
JULY 4/55	PAGE 35	10:45	
	LOG BOOK #1.		
	PAGE 36	11:45	22:30
	37	6:55	29:25
	38	6:20	35:45
	39	8:55	44:40
	40	9:35	54:15
	41	8:10	62:25
	42	5:30	67:55
	43	7:10	75:05
	44	13:20	88:25
	45	16:30	104:55
	46	9:40	114:35
/56	47	2:45	117:20
	48	14:55	132:15
	49	13:00	145:15
	50	9:05	154:20
	51	11:10	165:30
	52	13:15	178:45
	53	15:00	193:45
	54	13:55	207:40
	55	12:30	220:10
	56	11:55	232:05
	57	12:25	244:30
	58	12:45	257:15
	59	10:50	268:05
	60	12:45	280:50
	61	13:35	294:25
	62	9:00	303:25
	63	9:10	312:35
	64	9:40	322:15
	65	9:55	332:10
	66	9:45	341:55
	67	10:45	352:40
/57	68	12:45	365:25

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CLASS III INSTRUCTOR TIME

LOG BOOK # 2.

		PAGE TOTAL	ACCUMULATIOE TOTAL	
			365:25	LOG BOOK #1.
JAN/57	PAGE 1	11:20	376:45	
	2	18:45	395:30	
	3	23:20	418:50	
	4	21:10	440:00	
	5	21:40	461:40	
	6	24:35	486:15	
	7	21:20	507:35	
	8	26:15	533:50	
	9	16:40	550:30	
/58	10	2:40	553:10	
	11	4:00	557:10	
/59	12	20:15	577:25	MARCH 23/59 CAT TEST
	13	19:15	596:40	
	14	16:45	613:25	
	15	17:50	631:15	
	16	20:45	652:00	
	17	26:35	678:35	
	18	25:00	703:35	
	19	13:10	716:45	
	20	20:55	737:40	
	21	15:00	752:40	
	22	17:30	770:10	
	23	9:45	779:55	
	24	3:00	782:55	
	25	1:30	784:25	
	26	20:05	804:30	
	27	17:05	831:35	
JAN/60	28	16:50	848:25	FEB 16/60 274:00 HRS
	29	22:10	870:35	KARL MORAN
	30	16:40	887:15	
	31	20:15	907:30	
	32	13:55	921:25	
	33	14:15	935:40	
	34	22:25	958:05	
	35	27:10	985:15	
	36	20:55	1005:10	
	37	29:05	1034:15	
	38	18:15	1052:30	
	39	12:50	1064:20	
JAN/61	40	15:40	1080:00	
	41	25:25	1105:25	
	42	15:15	1120:40	
	43	14:45	1135:25	
	44	14:50	1150:15	
	45	16:15	1166:30	
	46	13:00	1179:30	FEB 9/60 CARL MORAN 333:05
	47	21:50	1201:20	
	48	18:15	1219:35	
		846.10		

848:25
577:25
271:00
3
274:00

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CLASS III INSTRUCTOR TIME

LOG BOOK #2

	PAGE	PAGE TOTAL	ACCUMULATIVE TOTAL	
			1219:35	
19/61	49	18:10	1237:45	Feb/61
	50	19:05	1256:50	
	51	22:10	1289:00	
	52	16:05	1305:05	
	53	19:45	1324:50	
	54	10:05	1334:55	
	55	16:35	1351:30	
	56	22:35	1374:05	AI
	57	15:55	1390:00	APRIL
	58	18:40	1408:40	
	59	19:50	1428:30	
	60	19:35	1448:05	
	61	16:50	1464:55	
	62	19:45	1484:40	
	63	1:25	1486:05	March 25/61
		256.30		

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TransAir
The Airline in your Future

May 11, 1967.

Mr. P. Fletcher,
Okanagan Helicopters,
c/o Lamb Airways,
Churchill, Manitoba.

Dear Sir:

With reference to our telephone conversation of this date regarding employment with our Company.

Please find enclosed an application form which we would ask you to complete and return to the undersigned.

Yours truly,

TRANSAIR LIMITED,

E. L. Quirk.

E. L. Quirk,
Assistant General Manager,
Flight Operations.

ELQ:gtp
Encl: 1

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Form P-2

TRANSAIR LIMITED
APPLICATION FOR EMPLOYMENT

Position applied for.....

Print name in full.....
(Surname) (Christian Names)

Address..... Telephone.....
(Street and Number) (City)

Age..... Date of birth..... Unemployment Insurance No. .....

Single, Married, Widowed, Divorced..... Particulars of Dependents.....

What is the present condition of your health?..... Any physical disability?.....

Height..... Weight..... Any defects in speech?..... Hearing?..... Eyesight?.....

Name of Next of Kin..... Relationship..... Address .....

EDUCATION	No. of years attended	Did you graduate?
Public School		
High School		
University		
Business College		
Technical School		
Course or Degrees Taken		

Military, Naval or Air Service in Canada.....

Any other country or theatre of war.....

Date discharged..... Reason.....

PARTICULARS OF BUSINESS EXPERIENCE DURING LAST FIVE YEARS

Name of Employer	Occupation	Time Employed From	Time Employed To	Final Rate of Pay	Reason for Leaving

CHARACTER REFERENCES

Name	Address	Occupation

Are you now employed?..... Name of Company..... Date ready to report.....

Date..... 19.....

(PLEASE TURN OVER)

..... Signature of Applicant

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APPLICANTS HAVING EXPERIENCE UNDER THE FOLLOWING HEADINGS SHOULD COMPLETE SUCH INFORMATION REGARDLESS OF POSITION APPLIED FOR

PILOT

Flying licenses held..... Date learned to fly..... Where trained.....

Type	Number	Date	Type of aircraft for which valid

What training have you had in (1) Meteorology?.....

(2) Navigation?.....

Number of hours flown:	Total	Day	Night	Instrument	Floats	Wheels	Skis
Single engine up to 300 H.P.....							
Single engine over 300 H.P.....							
Multi engine.....							
Total.....							

Number of hours as:

Link trainer hours.....(1) Pilot.....(2) Co-Pilot.....Date of last medical.....

Accident record, with dates.....

.....

AIRCRAFT MAINTENANCE

Do you hold an Air Engineers License?.....Number.....Issued.....Expires.....

Types of aircraft endorsed for:	Types of engines endorsed for;
A.....	C.....
.....	.....
.....	.....
B.....	D.....
.....	.....
.....	.....

RADIO OPERATOR OR TECHNICIAN

Do you hold an Operator's License?.....Class.....Issued.....Expires.....

Number of Words handled per minute?.....

For Office use only— REMARKS.....

.....

.....Employed (Date).....

Position.....

Rate.....

Interviewed by.....

Approved.....

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HELICOPTERS 1966 March 762:30

48:35
8:45
57:20

402.20
298.20
700.40

2864.30
762:30
2102

Page 89

FIXED WING

180:30
57:20
113:10

DAY

	Dual	Pilot in Command	Co-Pilot	Dual	Pilot in Command	Co-Pilot
TOTAL SEAPLANE	6:30 ✓					
TOTAL SINGLE ENGINE	113:10	2102:00		7:35	97:25	
TOTAL MULTI ENGINE	28:25	17:50	47:15			15:50

Single Engine
1:20
1:30
3:10 after Page 2
4:05
50
10:55

1:05
5:20
2:15
1:30
:50
1:00
1:25
2:10 Page 4
+ 3:40
20:05
23:30
43:35

TWIN 1:20
1:00
10:50

Page 99
1099:20

1:00
28:25
29:25

SINGLE 2:00

TWIN 13:10

43:35
47:15
17:50
29:25
138:05
13:10
15:50
167:05

2102:00
113:10
2215:10
105.
2320

97:25
7:35
105:00
167.05
29
38.05

104.
105
23 50

2498.
762.
3260

30:55
19:10

-000910

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BUSINESS EXPERIENCE

1967 To 1968 FLYING HELICOPTERS FOR OKANAGAN HELICOPTERS LTD, VANC B.C
HILLER
~~AN~~ TURBINE HELICOPTER (FH 1100) ON CONTRACT WITH CANADIAN AIRBORNE
CONTROL SURVEYS & A BELL JET RANGER ON ANOTHER CONSTRUCTION CONTRACT

1966 To 1967 FLYING6 HELICOPTERS FOR OKANAGAN HELICOPTERS LTD. VANC., B.C
A HILLER 12E-L ON CONTRACT WITH C.A.B.C. SURVEYS. PLUS
A VARIETY OF OTHER CONTRACT.

1965 To 1966 FLYING6

1964 To 1965 Pinions (International)

LAST 3 YEARS 1800 hours on H/C

000911

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PROFESSIONAL RECORD AND PERSONAL SUMMARY

1. PERSONAL SUMMARY

DATE: 14th May 1964

Name of candidate in full:

Age:

Date of birth:

Nationality of applicant: British

Applicant's place of birth:

Nationality and profession of father

Nationality of mother:

s.19(1)

Present address

Permanent address

Marital status:

References for competence and character

2. EDUCATION

School:

Dates:

Dates:

University:

Dates:

Degree:

Primary subject:

Secondary subjects:

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3. PROFESSIONAL RECORD

s.19(1)

Date	Particulars
[redacted]	

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CF-WMO
Serial No 96

Document disclosed under the *Access to Information Act*
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CF-WMO

Serial # 96

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Controls inspected for correct action and safety of testing devices.

Date March 1/68

John Taylor

D. G. T. Approval

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FORM 80-9A

OKANAGAN HELICOPTERS LTD.

WEEKLY REPORT

HELICOPTER CF- WNIO (H)

TOTAL FLYING 39:10 HRS. FOR WEEK-ENDING —

A/C TOTAL TIME SINCE NEW 39:10

COMPONENT REMOVED

COMPONENT	PART No.	SERIAL	TSN	TSO	A/C TIME ON REMOVAL
Main Rotor Head	24-51400-11	806	39:10		39:10
Main Rotor Blades	24-53100-02	249 238	39:10		39:10

COMPONENT INSTALLED

COMPONENT	PART No.	SERIAL	TSN	TSO	A/C TIME INSTALLATION

GENERAL RUNNING CONDITION, INSPECTIONS, SNAGS, REMARKS: Removed for Shipment to Resolute Bay and subsequent installation on CF-OKR

LAST PERIODIC INSPECTION _____ DONE AT _____ A.F. TIME _____

PLEASE LIST ALL COMPONENT, ACCESSORIES & INSTRUMENT CHANGES.
MAKING APPROPRIATE LOG BOOK ENTRY.

MT1

SIGNED J Robbins

DATE 21 Feb 68

FORM NO. 101-3/67

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CANADIAN HELICOPTER OVERHAULS LIMITED

Vancouver International Airport, B.C., Canada • Tel: 278-5506 • Telex: 04-5283

WMO

CF - WMO, S/N 96, W/O H1360
A/F Time 39:10, March 13, 1968

LOG BOOK ENTRY

The following work was carried out: 50 hour inspection as per form FH1100; Southwind heater S/N 291 installed as per drawing #OHH-61; bear paws installed as per drawing #OHH-66; single side band radio installed; fire extinguisher installed; stainless steel identification plate installed;cargo hook installed; cargo box installed; baggage compartment door stops installed; compass swung and new compass card made up; fuel sender unit sealed with silastic; S.B. 81-1, S.L. #1 - #7 checked and complied with; S.B. FH1100-32-1 carried out; Allison 250CSL-11 complied with; Allison S.B. 24 carried out.

The following serviceable components were installed:

Part #	Description	S/N	T.S.N.	
24-51400-9	Main Rotor Head	65	324:55	removed from OKR
-53100-02	Main Rotor Blades	316,317	00:00	
-34100	Swashplate	190	39:10	repaired - time left on gimbal-710 hrs.
-2500-7	Tail Rotor Gear Box	299	37:45	repaired
9710	Power Cylinder	159	39:10	repaired
22-279-02B	Tachometer	1438	00:00	
32005-005	Tach Generator	42946	00:00	
FLOX-F20338H	Voltameter	FH-1V	33:45	tested
24-834-03-3	Compass	---	39:10	tested
A13A	Clock	621	00:00	
940-F24	S/W Heater	291	00:00	
24-55132	Tail Rotor Ass'y	58	37:45	off WMF

Controls inspected for correct action and safety or locking devices.	Controls inspected for correct action and safety or locking devices.
Date March 13/68	Date March 13/68
D. O. T. Approval 9/58	D. O. T. Approval 9/58

CANADIAN HELICOPTER OVERHAULS LTD.
VANCOUVER AIRPORT, B.C.
HELICOPTER OVERHAUL – MODIFICATION
REPAIR – CERTIFICATION
D. O. T. APPROVAL No. 9/58
CHIEF INSPECTOR R J Fraser
DATE Mar 13 19 68

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ENGINEERING RELEASE NOTE

This is to certify that aircraft CF-- WMO has been flown for a period of 1.00 hours, following work completed as shown on W.O.# 41360 dated 13 MARCH 1968. This aircraft is now considered airworthy and is hereby released to Operations.

Signed Roy A Webster pilot

Signed R. J. Evans Engineering

Received by Operations----------Signature [signature]

Date March 14/68 Time 0829.30

The following people have been notified of the above:

Accounting Signed [signature]

Don McPherson Signed [signature]

S-55---five hours minimum
Bell and Hiller---three hours minimum

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OKANAGAN HELICOPTERS LTD

Form SB-3
Rev. Feb. 28, 1966

Sikorsky - Bell - Hiller

REQ. NO: _____

WORK SHEET

W/O No. H 136.0

A/C Registration 1MO

Date Jan 29/68

ITEM	DETAILS OF WORK TO BE CARRIED OUT	EST. LABOUR HOURS	INITIAL
	Carry out mods - prepare a/c for Ops.	70	
	Closed March 14/68 RJT		

Inspector's Signature _____
Company Licence 9/58

Date March 14/68

W.O. 2

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Sheet # 1

Sikorsky - Bell - Hiller

CANADIAN HELICOPTER OVERHAULS LTD.

Form SB-3A
March 1, 1968

WORK SHEET

W/O # H1360 A/C Registration WOO Airframe Time 39:10 Date Jan. 29, 1968

NOTE: EACH ITEM IN SECTION "A" MUST BE RECTIFIED BY AN ITEM IN SECTION "B".

SECTION "A"			SECTION "B"			
ITEM	DETAILS OF WORK REQUIRED	ENTERED BY	ITEM	RECTIFICATION	PERSON DOING WORK	INSPECTOR
1	Install heater		1.	HEATER INSTALLED.	WMT.	
2	Install single side band.		2.	S.S.B. INSTALLED.	J.W.B.	
3	Install bear paws.		3.	BEAR PAWS INSTALLED	WMT.	
4	Install cargo box		4.	CARGO BOX INSTALLED	WMT.	
5	Install fire extinguisher		5.	FIRE EXT. INSTALLED	WMT.	
6	Install baggage comp. door stop.		6.	BAGGAGE COMP. DOOR STOPS INSTALLED.	WMT.	
7	Install Ident. plate (S.S.)		7.	S.S. IDENT. PLATE INSTALLED.	WMT.	
8	Install document holder.		8.	DOCUMENT HOLDER INSTALLED	WMT.	
9	CHECK ON S.B. 1001		9.	S.B. 1001 C/W.	WMT.	
10	CHECK ON S.L. # 1 - 2 - 2A - 3 - 4 - 5 - 6 - 6A - 7.		10.	ALL S.B. # 1 THRU 7 CHECKED & COMPLIED WITH.	— WMT.	
11	Install CARGO HOOK.		11.	CARGO HOOK INSTALLED.	WMT.	

NOTE: ITEMS NOT COMPLETED ON THIS SHEET TO BE ENTERED ON THE NEXT SHEET.

Inspector's Signature [signature]
Company Licence #9/58

Date [signature] March 13/68

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000921

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Sikorsky - Bell - Hiller

CANADIAN HELICOPTER OVERHAULS LTD.

Form SB-3A
March 1, 1968

WORK SHEET

W/O # H 1360 A/C Registration WMO Airframe Time 39:10 Date Jan. 29/68

NOTE: EACH ITEM IN SECTION "A" MUST BE RECTIFIED BY AN ITEM IN SECTION "B".

SECTION "A"			SECTION "B"			
ITEM	DETAILS OF WORK REQUIRED	ENTERED BY	ITEM	RECTIFICATION	PERSON DOING WORK	INSPECTOR
12	CHECK HORN RELAY WIRING.		12.	Wiring checked OK	JP	
13.	COMPLY WITH ALLISON 250 CSL # 11		13.	ALLISON 250 CSL # 11 COMPLIED WITH.	DMT.	
14.	FIT APU START SWITCH.		14.	Fitted	JR	
15	TOP UP HYDRO PACK		15.	SECONDARY HYDRO PACK FILLED UP.	DMT.	
16	RE-POSITION ALTIMETER		16.	ALTIMETER RE-POSITIONED.	DMT.	
17	INSTALL REPAIRED CLOCK		17.	NEW CLOCK INSTALLED.	DMT.	
18	CHECK VOLTMETER.		18.	VOLTMETER CHANGED S/N FH-14	DMT.	
19	SWING COMPASS		19.	COMPASS SWUNG 3/13/68	DMT.	
20	SET R.P.M. TRIM.		20	RPM. TRIM APPEARS OK.	DMT.	
21	CHECK BEARING COLLECTIVE SERVO		21.	REPAIRED SERVO INSTALLED	DMT.	
22	SILASTIC TOP OF FUEL SENDER UNIT.		22.	FUEL SENDER UNIT SEALED WITH SILASTIC	DMT.	
23	CARRY OUT SB FH-1100-32-1		23	SB FH-1100-32-1 CARRIED OUT	DMT.	

NOTE: ITEMS NOT COMPLETED ON THIS SHEET TO BE ENTERED ON THE NEXT SHEET.

Inspector's Signature R Shaw
Company Licence #9/58

Date March 13/68

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Sikorsky - Bell - Hiller

CANADIAN HELICOPTER OVERHAULS LTD.

Form SB-3A
March 1, 1968

WORK SHEET

W/O # H 1360 A/C Registration WMO Airframe Time 39.10 Date Jan. 29/68.

NOTE: EACH ITEM IN SECTION "A" MUST BE RECTIFIED BY AN ITEM IN SECTION "B".

SECTION "A"			SECTION "B"			
ITEM	DETAILS OF WORK REQUIRED	ENTERED BY	ITEM	RECTIFICATION	PERSON DOING WORK	INSPECTOR
24.	CARRY OUT 50 HR. INSPECTION.		24.	50 HR. CARRIED OUT.	WMT.	
25.	RE-INSTALL T/R. GEAR BOX.		25.	T/R. GEAR BOX INSTALLED	B.B.	
26.	CHECK EXCESS SWASHPLATE PLAY.		26	SWASHPLATE UNIBALL RE-SHIMMED	WMT.	
27.	R.P.M. NEEDLES SLOW & DON'T MATCH.		27.	NEEDLES ACCEPTABLE TO 1% DIFFERENCE	WMT.	
28.	ROTOR TACH. INTERMITTENT.		28.	NEW TACH. INSTALLED.	WMT.	
29.	VERTICAL BOUNCE AT 100 KPH.		29.	M/R. HEAD & BLADES RE-ALIGNED & BALANCED.	WMT.	
30.	COMPLY WITH ALLISON ENGINE BULLETIN #24		30.	ALLISON ENGINE BULLETIN COMPLIED WITH.	WMT.	
31.	REPLACE FRONT DOOR SAFETY STOP.		31.			
32.	INSTALL TACH.-GEN.		32.	TACH. GEN. INSTALLED.		
33	Eng Start S/W knob missing		33.	NEW START SWITCH KNOB MADE & FITTED	WMT.	
34	Cabin roof leaking					
35	allison SB #24 to be done		35	allison S.B #24 carried out	RJ	

NOTE: ITEMS NOT COMPLETED ON THIS SHEET TO BE ENTERED ON THE NEXT SHEET.

Inspector's Signature R. Thom
Company Licence #9/58

Date March 13/68

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Sikorsky - Bell - Hiller

CANADIAN HELICOPTER OVERHAULS LTD.

Form SB-3A
March 1, 1968

WORK SHEET

W/O # H/1360 A/C Registration CF WMO. Airframe Time 39:10 Date 12 MAR 68

NOTE: EACH ITEM IN SECTION "A" MUST BE RECTIFIED BY AN ITEM IN SECTION "B".

SECTION "A"			SECTION "B"			
ITEM	DETAILS OF WORK REQUIRED	ENTERED BY	ITEM	RECTIFICATION	PERSON DOING WORK	INSPECTOR
1	START BUTTON NOT ACCEPTABLE	R.W. Webster	(1)	START BUTTON REPLACED.	G.K.	
2	LATERAL CYCLIC NOT ACCEPTABLE (TOO SLOPPY).	R.W. Webster	(2)	HYDRA CHECK "O" RING REPLACED	O.K.	
3.	RPM NEEDLES 1% DIFFERENCE	R.W. Webster	(3)	1% DIFFERENCE ACCEPTABLE	O.K.	
4.	SAFETY COVER FOR CARGO HOOK ARM SWITCH INCORRECT	R.W. Webster	(4)	GUARD CHECKED & RE-FITTED	G.K.	

NOTE: ITEMS NOT COMPLETED ON THIS SHEET TO BE ENTERED ON THE NEXT SHEET.

Inspector's Signature R.J. Lawson
Company Licence #9/58
Date March 13/68

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CANADIAN HELICOPTER OVERHAULS LTD.

Hiller FH1100 — BLADE ALIGNMENT & BALANCE — Form FH-1
March 5, 1968

W/O # H 1443
Hub S/N 65
T.S.N. 324:55
T.S.O.

Blade S/N 316
T.S.N. 00:00
Blade S/N 317
T.S.N. 00:00
Date March 6/1968

	Done By	Inspector
1. Place hub on erection stand, match mark and then remove teetering stops.	DOTT. R.M.B.	
2. Install blades, no lubricant required on cuff to blade surfaces, lubricate blade retention pins	DOTT. R.M.B.	
3. Align cuff to hub alignment marks using incidence adjustment clamps.	DOTT. R.M.B.	
4. Support blade tips high enough to clear trunnion and stretch a fine nylon cord from the outboard screw center on the tip of one blade to the tip of the other blade using the center of the C/S Phillip screw on the tip of each blade as an alignment mark	DOTT. R.M.B.	
5. Place a mirror on each cuff. Adjust the drag strut so that the alignment wire passes over the index marks within .010". Ensure that blade tips move and blades are not preloaded.	DOTT. R.M.B.	
6. The alignment wire should pass directly over the center of the trunnion	DOTT. R.M.B.	
7. Lock drag nuts. Torque main retention bolts 2800/3000 inch/pounds. Torque drag strut bolts.	DOTT. R.M.B.	
8. Remove head assembly from the stand and install the teetering stop	DOTT. R.M.B.	
9. Place system on balancing stand. Place level on hub support adapter - tolerance of four AN960 washers.	DOTT. R.M.B.	
10. Balance washers if required must be added or removed in pairs on forward and aft tip weight assembly.	Blade — 317 4 washers added R.M.B.	
11. Maximum of three pairs of washers on new blades. Add three pairs or remove three pairs. (no limit on old blades to bring up to new blades).	DOTT. R.M.B.	
12. Chordwise balance. Sweep blade aft only to balance being certain that main rotor retention blade torque is released prior to adjustment. Adjust then retorque	DOTT. R.M.B.	

CAUTION: NO LIQUID WAXES, CLEAN WITH SOAP AND WATER.

Engineer's Signature D.M. Taylor
Date March 7, 1968
Inspector's Signature
Date

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OKANAGAN HELICOPTERS LTD.

HILLER FH1100 — DAILY, 50, 100 & 300 — Rev. Feb. 20/68
Form FH-1100
January 2, 1968.

Registration NMO — Date FEB. 16, 1968.

A/F Total 39:10 (Circle check being done)

Inspection in accordance with appropriate Hiller manual	A/F Time	Cycle	Sig.
Requirements preceded by an asterisk (*) are applicable only when use of the equipment is contemplated. Requirements preceded by a double asterisk (**) will be accomplished prior to each individual flight when more than one flight is made in the same day.			
AIRCRAFT CHECK — DAILY CHECK & 50 HOUR CHECK		DAILY	
1. Main rotor blades and blade tips for damage. NEW BLADES.			DMT.
2. All rotor components, including main rotor hub attaching nut, for condition, security of attachment and proper safetying and for rotational freedom.		"	DMT.
3. Basic body and tail boom for visible damage and security of mounted accessories.		"	DMT.
4. Pitot tube cover removed; pitot tube for correct alignment and port opening for obstructions.		"	DMT.
**5. Skid landing gear ground handling wheels retracted or removed.		"	DMT.
6. Engine and transmission area for fuel, oil and hydraulic oil leaks and visible damage.		"	DMT.
7. Engine controls for full travel and unrestricted movement; "continuous rpm" detent for proper operation.		"	DMT.
8. Exposed flight control linkages for security and freedom of movement.		"	DMT.
9. Tail rotor drive and control system for condition.		"	DMT.
10. Tail and intermediate gear box sight gauges for proper oil level and evidence of leakage.		"	DMT.
**11. Fuel tank for quantity; filler cap for security; sump and strainer drained and checked for leakage or contamination; drain tube for obstruction.		"	DMT.
**12. Oil tanks for quantity; filler caps and drain valves for security; sight gauges for quantity.		"	DMT.
**13. Primary and secondary hydraulic power units for proper fluid quantity and security of attachment.		"	DMT.
14. Windshield, cabin and door windows for cleanliness, visible damage and security.		"	DMT.
*15. Communications equipment for security and proper operation.		"	DMT.
16. Perform engine ground check required in accordance with the applicable section of the FH-1100 Flight Manual.		"	DMT.
*17. Interior and exterior lighting systems for proper operation.		"	DMT.
18. Aft flight controls tunnel area for loose objects or foreign matter.		"	DMT.
19. Engine and transmission chip detectors. (Check for metal particles with continuity tester.)		"	DMT.
20. Inspect transmission oil system in accordance with S.I.L.#1		"	DMT.
AIRFRAME — 100-150-300 HOUR CHECK			
1. Cabin enclosure for visible damage, cleanliness, security and door mechanism for operation.		100	DMT.
2. Seat cushions for general condition; safety belts for fraying.		100	DMT.
3. Basic body and tail boom for cracks, loose and missing rivets, fractures, distortion or buckling; broken spotwelds and paint deterioration.		100	DMT.
4. All stencils, placards, decals and serial numbers for legibility.		100	DMT.
5. Stabilizer for cracks, damaged skin, loose rivets, security of tips and position lights.		100	DMT.
6. Collective control system for freedom of movement and security of attachment.		100	DMT.
7. Cyclic, collective and isolation linkage bellcranks and pushrods for looseness or excessively worn rod end bearings, misaligned rod end bearings, bends, cracks, dents, or insecurity of attaching hardware. Cyclic trim actuators for security, smooth operation and freedom from binding.		100	DMT.
8. Control cables for broken strands, cleanliness, bends, fraying and proper tension; turnbuckle barrels for proper safetying. Cable pulleys for cracks. Cable pulley brackets for condition and security; bearings for condition.		100	DMT.
9. Tail rotor gear box assembly checked for cracks, damage, leaks and security of attachment to tail boom; output shaft for radial or axial play.			

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Form FH1100
January 2,1963.

	A/F TIME	CYCLE	SIG.
10. Tail rotor drive components:			
a. Bearings, bearing supports, universal joints, and slip joints for smooth operation; excessive play, cracks, corrosion; damaged seals and protective boots.		100	DAILY.
b. All drive shafts for twist, bends, dents or cracks.		"	DAILY.
c. Forward drive shaft and end fittings for cracks, scratches or loose balance weights.		"	DAILY.
d. Intermediate gear box for condition and security of mounting.		"	DAILY.
e. Tail rotor gear box for condition and security of mounting.		"	DAILY.
ROTORS			
1. Main rotor trunnion and cuff sight gages for proper oil level, evidence of oil leakage.		"	DAILY.
2. Rotor blades for bonded joint voids or separation, nicks, scratches, cracks, dents, gouges or corrosion. NEW BLADES.		"	DAILY.
FLIGHT CONTROLS			
1. Tail rotor control cables for fraying and security. 2 NEW CABLES INSTALLED.		"	DAILY.
GEAR BOXES			
1. Tail and intermediate gear box for leaks and security of mounting.		"	DAILY.
CABIN HEAT			
1. Cabin heat valve and duct for cracks and security.		"	DAILY.
ROTORS			
1. Main Rotor Assembly:			
a. Rotor head assembly for condition; bearings for free and smooth operation.		"	DAILY.
b. Upper controls system isolation link assembly swivel fitting for binding or axial play; cracks, wear, security and freedom of movement.		"	DAILY.
c. Rotor incidence pushrods for security, bends, misaligned or excessively worn rod end bearings; pushrod assembly lock nuts for safetying; rotor incidence arms for security.		"	DAILY.
d. Rotor blade drag links and retention bolts for security; drag link lock nut torque markings for misalignment; hub teetering stops for security and damage.		"	DAILY.
e. Swashplate uniball bearing for excessive radial or axial play; protective boot for punctures, cuts, cracking and security of attaching cord. RE-SHIMMED.		"	DAILY.
f. Swashplate lower (stationary) link assembly and upper (rotating) yoke and link for security and bearing play.		"	DAILY.
g. Swashplate assembly for cracks, nicks, and scratches; evidence of internal wear.		"	DAILY.
2. Main Rotor Blades:			
a. Blade trim tabs for security, cracks, or excessive angle setting; tip plates for damage, loose or missing attaching screws.		"	DAILY.
b. Complete blades for cleanliness; filler materials and finish for chips and cracks; rivets and screws for security; skin for abrasions, nicks, scratches and gouges.		"	DAILY.
3. Tail Rotor Assembly:			
a. Tail rotor hub and trunnion for security and proper safetying of trunnion retaining nut.		"	DAILY.
b. Tail rotor and pitch change linkage for condition and security.		"	DAILY.
c. Blade tips for excessive erosion, separation of blade bonded joints, skin and internal leading edge doubler (visible at tip and root ends of skin), between skin and tip rib, and between skin and root casting.		"	DAILY.
LANDING GEAR			
1. Landing gear skid runner and/or scuff plates for excessive wear; ground handling wheel tires for proper inflation.		"	DAILY.
2. Landing gear struts for damage, fairing attachment security. Lower fitting for cracks and security to runner.		"	DAILY.
3. Landing gear for deformation; torque tube for damage; security of attachment.		"	DAILY.

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Form FH1100
January 2, 1968.

	A/F TIME	CYCLE	SIG.
POWER PLANT SECTION			
1. Inspect engine for security of assemblies		100	DONE.
2. Inspect compressor case for cracks and dents		"	DONE.
3. Inspect combustion section for cracks, dents or evidence of burning		"	DONE.
4. Inspect exhaust stacks for security, general condition and cracks		"	DONE.
5. Inspect fuel control and governor systems for security of attachments, oil leakage at seals, fuel leakage, plumbing, chafing and security		"	DONE.
5A. Clean - double check valve as per Allison CSL #250-11		"	DONE.
6. Inspect fuel filter for leakage, security and condition		"	DONE.
7. Replace engine fuel filter		300	N/A.
8. Inspect oil system for condition, oil leakage, and plumbing, chafing and security		100	DONE.
9. Clean engine oil filter, ~~drain and change oil~~		150	DONE.
10. Inspect thermocouple leads for chafing and general condition		100	DONE.
11. Inspect engine mount for cracks, dents and security		100	DONE.
12. Inspect firewalls and cowlings for dents, cracks and attachment security		100	DONE.
13. Engine mount assemblies for corrosion, cracks, wear and security of attachments		100	DONE.
14. Engine to transmission flexible drive shaft coupling for visible damage, backlash or axial play, proper safetying, security of attaching bolts, and damaged or missing flexible disc protective coating		100	DONE.
15. Tachometer generators (engine & rotor) for security of attachments		100	DONE.
16. Transmission case and accessory housings for cracks, evidence of overheating corrosion , oil leaks, damage and security of attachment		100	DONE.
17. Engine control assemblies for freedom of operation; proper rig through full travel; security of all components		100	DONE.
18. Replace transmission oil filter element CHECKED.		100	DONE.
FUEL AND OIL SYSTEMS			
1. Fuel cell filler cap, gasket and markings for serviceability		100	DONE.
2. Fuel filter and fuel shutoff valve for security and leakage; valve link for wear, lost motion, security and freedom of operation		100	DONE.
3. Fuel filter element for contamination		100	DONE.
4. Fuel pump for proper operation		100	DONE.
5. Fuel cell sump drain valve for freedom of operation and tight closing		100	DONE.
6. Oil cooler blower drive shaft for bends, damage or loose mounting bolts; shaft and flexible coupling discs for cracks, damage or interference with mating parts; forward drive connection for axial play		100	DONE.
7. Oil cooler forward and aft face for clogged air passages; cooler and support bracket for security, cracks, loose or missing rivets		100	DONE.
8. Oil tanks for condition and security		100	DONE.
HYDRAULIC SYSTEM			
1. Primary and secondary hydraulic power units for security and leakage		100	DONE.
2. Hydraulic system oil filters cleaned		100	DONE.

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Form FH1100
January 2,1968.

	A/F TIME	CYCLE	SIG.
ELECTRICAL SYSTEM			
1. Battery for chemical deposits, electrolyte level, electrical connector corrosion, security of vent line, security of battery support rods, safetying of wing nuts		100	DONT.
2. Starter-generator for security and condition of electrical connections, brushes and commutator		100	DONT.
3. Electrical compartment equiptment panel for security of wiring connections and mounting of voltage regulator, reverse current cutout relay, fuse block, start relay, volt ammeter shunt, current limiters, and circuit breakers		100	DR
4. Wiring harnesses, individual wires, coaxial cables, and shielded cables for chafing, fraying, heat damage deterioration or other visible defects.		100	DR
5. Electrical connectors for corrosion, moisture, dirt, oil and security		100	DR
6. Electrical harness fastening hardware for missing or broken parts, broken nylon clamps, correct position of hardware, and security of attachments		100	DR
7. Cyclic stick trim actuators for proper operation and security		100	DR
8. Check battery leads, terminals and vicinity of battery for corrosion; terminals for tightness; battery and cover for security		100	DR
9. Check generator voltage at voltage regulator with voltmeter		100	DR
INSTRUMENTS			
1. Pitot-static system for moisture; static port openings for dirt or obstruction; pitot tube opening for dirtor obstruction; pitot tube for misalignment		100	DONT.
2. Instrument pointers for indication consistant with existing temperature, pressure, altitude, etc.; cover glasses for cracks, cleanliness; range markings & slippage marks on cover glasses & cases for proper position		100	DONT.
3. Compass for discoloration of liquid, leakage and air bubbles; compass correction card available and current NOT SWUNG AS OF YET.		100	DONT.
4. Disconnect pitot and static system at instrument connections and clear systems with dry compressed air to remove any foreign material or moisture		100	DONT.
5. At any time that equiptment replacement, modification or relocation might cause compass deviation, check compass for correct readings on all cardinal headings; recompensate if necessary, enter on card & make logbook notation			DONT.
6. Swing compass, enter on card and make logbook notation every 6 months		6 mos.	DONT.
RADIO			
1. Wiring and antenna cables for proper routing and security; bonding and shielding for proper installation and condition		100	DAB
2. Radio equipment mountings and fittings for security and condition		100	DAB.

I hereby certify that the above inspection has been carried out and the helicopter is airworthy.

Engineer's Signature D.M. Taylor

Date 3/11/68.

Shop approval #9/58.

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A.I. 99

W. O. No. 17 1417

OKANAGAN GROUP
VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

#1

NOMENCLATURE SWASHPLATE
PART NO. 24-34100
MAKE HILLER MODEL & TYPE FH1100
SERIAL NO. 190
NEW ..... OVERHAULED ..... REPAIRED ✓
PREVIOUS CERTIFICATION WMO

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE FEB 13-22/68 INSPECTOR'S SIGNATURE, STAMP

SERVICEABLE SERVICEABLE SERVICEABLE

A.I. 99

W. O. No. .....

OKANAGAN GROUP
VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

#2

NOMENCLATURE CLOCK
PART NO. A13A
MAKE LAMB MODEL & TYPE 204
SERIAL NO. 621
NEW ✓ OVERHAULED ..... REPAIRED .....
PREVIOUS CERTIFICATION PO 9839 + 3364

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 29 FEB 68 INSPECTOR'S SIGNATURE, STAMP

A.I. 99

W. O. No. W.R.B

OKANAGAN GROUP
VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

#3

NOMENCLATURE TACH. GEN.
PART NO. 32005-005
MAKE HILLER MODEL & TYPE 1100
SERIAL NO. 42946
NEW ✓ OVERHAULED ..... REPAIRED .....
PRN 6297
PREVIOUS CERTIFICATION PO 9693 AABE

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 13/2/68 INSPECTOR'S SIGNATURE, STAMP

A.I. 99

W. O. No. .....

OKANAGAN GROUP
VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

#4

NOMENCLATURE TACHOMETER
PART NO. 22-279-02B.
MAKE GARVIN MODEL & TYPE 1100
SERIAL NO. 1438
NEW ..... OVERHAULED ..... REPAIRED ✓
PREVIOUS CERTIFICATION PO 9913

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 6/2/68 INSPECTOR'S SIGNATURE, STAMP

A.I. 99

10518

MASTER INSTRUMENTS LTD.
PHONE 278-6131 - 278-2223 VANCOUVER AIRPORT, B. C.

#5

D.O.T. APP. No. .....
NOMENCLATURE Power Cyl.
PART No. 9710 ~~MODEL or TYPE~~ 24-229201
MAKE CONAIR
SERIAL No. 159
NEW ..... OVERHAULED ..... REPAIRED ✓ TESTED .....
PREVIOUS CERTIFICATION .....

The material, part or component identified hereon has been inspected and tested, and is certified airworthy.

DATE FEB 23 1968 INSPECTOR'S SIGNATURE, STAMP
FOR CHIEF INSPECTOR

SERVICEABLE

000930

WMO
Feb 22/68
39:10

5

TSN 00:00
TSO 00:00
INSTALLED ON CF- WMO
DATE 3/6/68
A/F TIME ON INSTALLATION 39:10

4

RETURN TO VANCOUVER

TSN New
TSO
INSTALLED ON CF- WMO
DATE 3/11/68
A/F TIME ON INSTALLATION 39:10

2

RETURN TO VANCOUVER

TSN New
TSO
INSTALLED ON CF- WMO
DATE 3/11/68
A/F TIME ON INSTALLATION 39:10

3

RETURN TO VANCOUVER

TSN 39:10
TSO
INSTALLED ON CF- WMO
DATE 22/2/68
A/F TIME ON INSTALLATION 39:10

1

Time left on tower gimbal - 710hrs.
Remove A/F time 750.

RETURN TO VANCOUVER

000931

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A.I. 99

W. O. No. .....

OKANAGAN GROUP

VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

6

NOMENCLATURE HEATER.

PART NO. 940 - F 24.

MAKE S/W. MODEL & TYPE .....

SERIAL NO. 291.

NEW ✓ OVERHAULED ..... REPAIRED .....

PREVIOUS CERTIFICATION V 3827 PO 9879 STD. AERO.

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 16/2/68 J Rollis

INSPECTOR'S SIGNATURE, STAMP

A.I. 99

W. O. No. .....

OKANAGAN GROUP

VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

7

NOMENCLATURE BLADE

PART NO. 24-53100-02.

MAKE HILLER MODEL & TYPE FH 1100

SERIAL NO. 317.

NEW ✓ OVERHAULED ..... REPAIRED .....

PREVIOUS CERTIFICATION PO 99314H2WE

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 27/2/68 J Rollis

INSPECTOR'S SIGNATURE, STAMP

A.I. 99

W. O. No. .....

OKANAGAN GROUP

VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

8

NOMENCLATURE BLADE

PART NO. 24-53100-02.

MAKE HILLER MODEL & TYPE FH 1100

SERIAL NO. 316.

NEW ✓ OVERHAULED ..... REPAIRED .....

PREVIOUS CERTIFICATION PO 99314H2WE

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 27/2/68 J Rollis

INSPECTOR'S SIGNATURE, STAMP

A.I. 99

W. O. No. .....

OKANAGAN GROUP

VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

9

NOMENCLATURE M/R HEAD.

PART NO. 24-57400

MAKE HILLER MODEL & TYPE 1100

SERIAL NO. 65

NEW ..... OVERHAULED OKR REPAIRED .....

PREVIOUS CERTIFICATION REMOVED FROM OK

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE 7 Mar 5/68 [illegible]

INSPECTOR'S SIGNATURE, STAMP

A.I. 99

W. O. No. 1408

OKANAGAN GROUP

VANCOUVER AIRPORT, B.C.

☐ OKANAGAN HELICOPTERS D.O.T. APP. No. 9-58

10

NOMENCLATURE TAIL ROTOR GEAR [illegible]

PART NO. 24-25000-7

MAKE HILLIER MODEL & TYPE 11[illegible]

SERIAL NO. 299

NEW ..... OVERHAULED ..... REPAIRED ✓

PREVIOUS CERTIFICATION HILLIER

THE MATERIAL, PART, OR COMPONENT IDENTIFIED HEREON HAS BEEN INSPECTED AND TESTED, AND IS CERTIFIED AIRWORTHY.

DATE MHR-7/68 SMS

INSPECTOR'S SIGNATURE, STAMP

AIRWORTHY SERVICEABLE SERVICEABLE AIRWORTHY

10

TSN 37.45

TSO

INSTALLED ON CF WHO

DATE 3/7/68

A/F TIME ON INSTALLATION 39.10

RETURN TO VANCOUVER

9

TSN 324:55

TSO ~~3~~

INSTALLED ON CF WHO

DATE 3/7/68

A/F TIME ON INSTALLATION

RETURN TO VANCOUVER

8

TSN 00.00

TSO

INSTALLED ON CF WHO

DATE 3/7/68

A/F TIME ON INSTALLATION 39.10

RETURN TO VANCOUVER

7

TSN NEW

TSO

INSTALLED ON CF WHO

DATE 3/7/68

A/F TIME ON INSTALLATION 39.10

RETURN TO VANCOUVER

6

TSN NEW

TSO

INSTALLED ON CF WHO

DATE Jul 20/68

A/F TIME ON INSTALLATION 39.10

000933

RETURN TO VANCOUVER

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WMG

10437

MASTER INSTRUMENTS LTD.

PHONE 278-6131 - 278-2223 VANCOUVER AIRPORT, B. C.

D.O.T. APP. No.....

NOMENCLATURE VOLTAMMETER

PART No. 1-LDX-F20338H MODEL or TYPE.....

MAKE WACLINE

SERIAL No. FH-1U

NEW.....OVERHAULED.....REPAIRED.....TESTED ✓

PREVIOUS CERTIFICATION.....

The material, part or component identified hereon has been inspected and tested, and is certified airworthy.

DATE 21 Dec 68 INSPECTOR'S SIGNATURE, STAMP

FOR CHIEF INSPECTOR

SERVICEABLE

11

A.I. 99

10456

MASTER INSTRUMENTS LTD.

PHONE 278-6131 - 278-2223 VANCOUVER AIRPORT, B. C.

D.O.T. APP. No.....

NOMENCLATURE Compass

PART No. 24-834-03-8 MODEL or TYPE.....

MAKE AIRPATH

SERIAL No.....

NEW.....OVERHAULED.....REPAIRED.....TESTED ✓

PREVIOUS CERTIFICATION.....

The material, part or component identified hereon has been inspected and tested, and is certified airworthy.

DATE 20 Dec 68 INSPECTOR'S SIGNATURE, STAMP

FOR CHIEF INSPECTOR

SERVICEABLE

12

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~~OLD~~
WMO
26 FEB 68

39:10

12

INSTALLED ON WMO.
MARCH 1968
39:10 A/F. TIME.

11

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Appendix 14.

Index of main rotor (yellow) blade areas designated in RCMP chemical analysis report. All measurements taken from the blade rot attachment bolt hole outwards towards blade tip.

Area "A" 89" on blade leading edge.

" "B" 109" on blade leading edge.

" "C" 147" on blade leading edge and lower surface.

" "D" 60" to 70" on blade leading edge and upper and lower surfaces.

" "E" 154" on blade upper surface mid point between leading and trailing edges.

" F 158" to 162" on blade leading edge upper surface.

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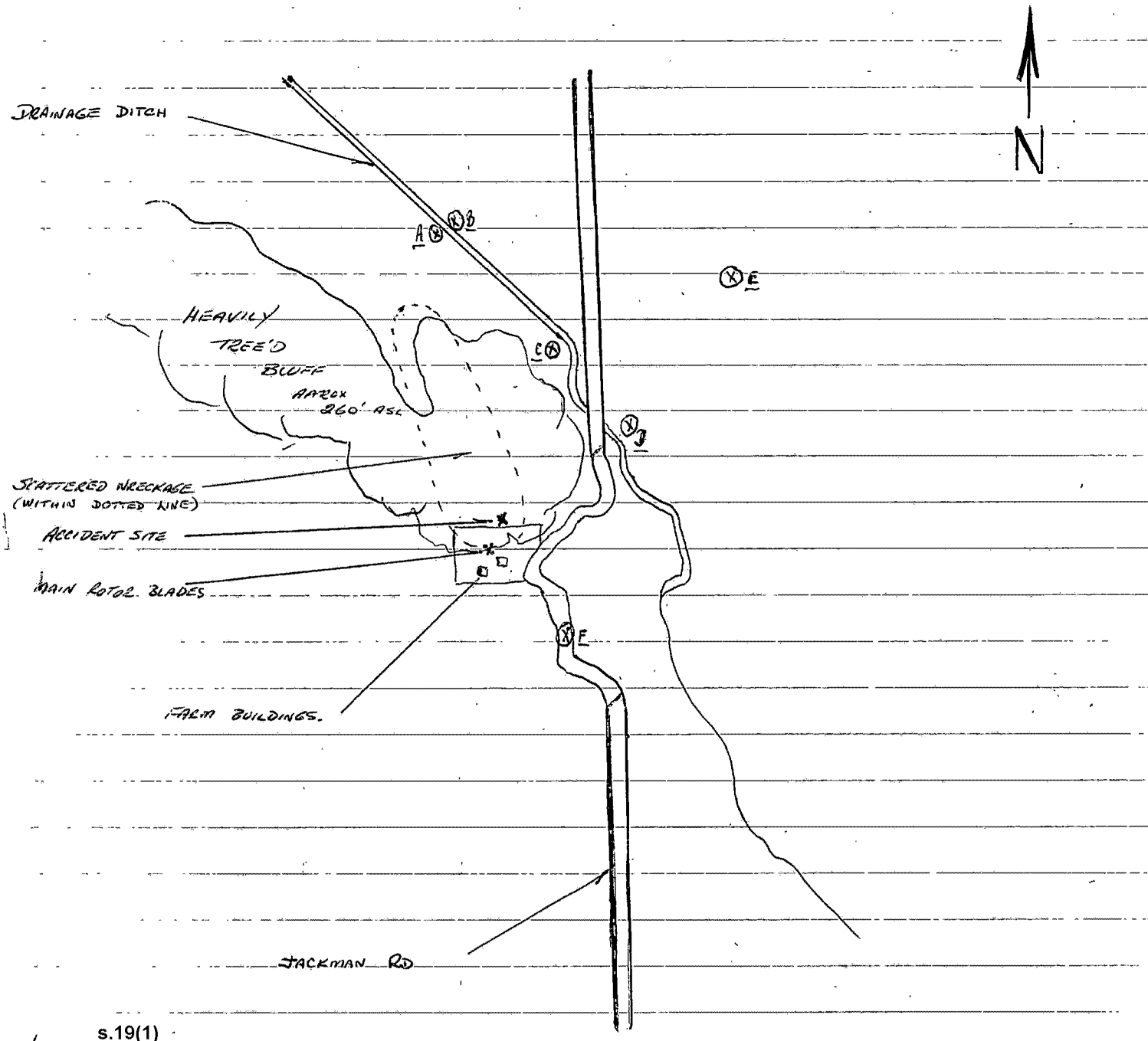
APPENDIX A (C)



s.19(1)

LEGEND

⊗ = LOCATION OF WITNESSES

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

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Pilot History

FAR FREDRICK RAYMOND FLETCHER

① Initial Medical Examination completed 15 April 1948 assessed A1

② Completed training with the Canadian Aircraft Co. and the Regina Flying Club with a total flying time of 13:10 Dual and 12:20 Solo - Aug 1948

③ All examinations completed 3 Aug 1948 - assessed Passed.

④ Issued Private Pilots Certificate No 7400 - 3 Aug 1948 endorsed for 7482 Taylor Cub, & Piper type aircraft.

⑤ Licence endorsed for Fleet 80 & Cessna 120 type aircraft - 9 Dec 1948.

⑥ Involved in an accident, as pilot in command of Aeronca ~~type~~ aircraft CF-FMU on the 5 March 1950 - Pilot received serious injuries, one passenger killed.

⑦ Licence re-instated after successful completion of amateur flight test and written exam on this type. 23 June 1951

⑧ Enrolled with the Regina Flying Club - 18 Aug 1951 - to undertake an approved course of Commercial Pilots training

⑨ Total flying experience 111:15 hrs.

⑩ Private Pilot Certificate endorsed "valid for night flying 8 Sept 1951.

⑪ Completed Commercial Course on the 10 Oct 1951. Total flying hours on course 55:30 hrs.

⑫ Completed Commercial Pilots Flight test 11 Oct 1951 assessed Passed.

⑬ Completed Commercial Examinations with the following results — CP1 - 84% CP5 - 82%
CP2 - 88% CP6 - 86%
CP3 - 69%

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Blue

(13) Issued Commercial Pilot Licence # C5872 - 30 Oct 51 valid for Aeroplanes Single Engine Land.

(14) ~~Unsatisfactory~~ Completed Flying Instructors Category - Flight test, 29 June 1955 - Passed - Awarded Category III

(15) Attempted Senior Commercial Exam SAIA - Failed 58% 19 Feb 1957.

(16) Attempted Instructors written exam FI 1 Part II - Passed - 86% 25 May 1961

(17) Completed a conversion course to Seaplanes - ~~25 July 1962~~ - Licence endorsed. 9 November 1962.

(18) Completed conversion course to Multi-engine aircraft 20 Dec 1962 - Licence endorsed

(19) Completed Helicopter Endorsement Exam HE1 - 7 March 1965 - Passed. - 72%

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

(21) Completed type training on Bell 12E helicopter Licence endorsed for Bell 12E - 6 May 1965.

(22) Involved in an accident as Pilot in Command of Bell 47G3B helicopter CF-OKU on the 15 March 1966 - Pilot seriously injured - Aircraft struck an unmarked power line & crashed into lake.

(23) Completed a practical flight test with DOT inspector following accident - 28 Oct 1966. - Passed.

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(24) Medical examination report dated 5 Aug 1966 assessment withheld pending further review.

(25) Medical report assessed 1-1-1-1 28 Oct 1966.

(26) Attempted written exams for Senior Commercial Licence with the following results

SA1D	— Passed	84%
SA24	— Passed	57.7%
SA3	— Passed	70%
SA4	— "	58%
SA6C	— "	86.4%
SA7C	— "	83.3%

(27) Issued Senior Commercial licence # VRS 663 valid for Aeroplanes Single ~~engine~~ and Multi engine land and sea & Helicopters Bell 47, Hiller UH12 — 23 Jan 1967

(28) Attempted Instrument Rating exam IR-1 — Passed 78% 16 Aug 1967.

(29) Completed training for issuance of Glides licence 10 Sept 1967

(30) Issued Glides Licence # VRG 168 — 18 Sept 1967

(31) Completed Conversion course to Hiller UH1100 — Licence endorsed 3 Feb 1968.

(32) Attempted Instrument flight test — 5 Jan 1968 assessed — Failed.

(33) Re-attempted flight test 22 Jan 1968 — awarded Class I rating.

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Page 26) (4)

(35) Issued Airline Transport Licence # ARA 1078
22 Jan 1968 - Total flying experience 3829:35 hrs.

(38) Completed conversion course to Bell 206 helicopters
- Licence endorsed 7 Feb. 1968.

(36) No further record of any inspections, violations
accidents or incidents on file.

000941