May 25, 1995

IN REPLY REFER TO: L171-51-95-107

Cessna

Ms. Margaret Napolitan
National Transportation Safety Board
Northeast Field Office (NEF-A)
490 L'Enfant Plaza East, S.W.
Washington, DC 20594

REF: 1975 CESSNA 172M, S/N: 17263846, REG: N20819
D/A: 4/7/95, LOCATION: Eldersburg, Maryland

Dear Margaret,

In accordance with our telephone conversation yesterday, I have calculated the approximate loss of climb performance which would be expected with the subject airplane with the carburetor heat applied in the climb condition. As shown on the attached page, the rate of climb would be reduced about 143 feet per minute. Portions of the relevant reports and manuals from which the calculations were derived are also enclosed.

The loss of performance due to carburetor heat is in addition to the approximate 60 fpm loss due to the high pitch propeller, which was referred to in my letter to you of 4/19/95. I have discussed the question of the FAA approved propeller with our FAA Delegation Option office here at Cessna. Our interpretation is that the FAA Type Certificate Data Sheet 3A12, which calls for the McCauley 1C160/CTM or 1C160/DTM propeller along with static RPM limits, is not the complete definition of the propeller. The static limits are tolerances which do not in themselves define the propeller pitch. Therefore, unless the 7557 version of the 1C160/DTM has an STC approval, it is not approved for use on the Cessna 172M.

We hope the above may be of help with this investigation. Please call if you have any questions regarding the above.

Sincerely,

[redacted]

Joseph A. Hutterer
Air Safety Investigator/Analyst

Enclosures
cc: Dan Fletcher, TEXTRON Lycoming

RATE OF CLIMB CHANGE WITH APPLICATION OF CARBURETOR HEAT

Joseph A. Hutterer, Air Safety Investigator/Analyst

May 25, 1995

Reference: 1975 CESSNA 172M, S/N: 17263846, REG: N20819
D/A: 4/7/95, LOCATION: Eldersburg, Maryland

Static RPM = 2320, Maximum = 2700 (Reference FAA Spec 3A12), use the average 2500 RPM engine speed for the climb condition. At 2500 RPM, sea level, power available = 142 HP. At 2500 RPM, 600 feet pressure altitude, 71°F, temperature, 1500 feet density altitude, power available = 137 HP Reference Lycoming Curves 9540-B and 9541-C, O-320-A and E engines.

Power available therefore = 137/150 = 91%. At 91% power and outside temperature of 71°F, carburetor heat rise = 90°F. Reference Cessna reports DM 172I-O, page 77 and DM 177-O, page 77A (172J), Cessna 1754001 muffler.

Power at induction air temperature = $HP_{ind}(Temp_{std} / Temp_{act})^{1/2}$ in °Rankin
(reference Lycoming curve 9541-C)

Rate-of-Climb loss due to carburetor heat =

$$\Delta R/C = (\Delta HP)\eta_{prop}(33{,}000) / Weight_{Aircraft}$$ (FAA Flight Test Guide)

Where:

$$\Delta HP = 137HP - [137][(460° + 59°)/(460° + 71° + 90°)]^{1/2} = 11.75 HP$$

Propeller efficiency, η_{prop} = .79 (McCauley estimate)

$Weight_{Aircraft}$ = 2149 pounds (NTSB / writer estimate)

Therefore:

$\Delta R/C$ = (11.75)(.79)(33,000) / 2149 = **143 feet per minute loss from standard climb performance.**

DELEGATION OPTION MANUFACTURER FLIGHT TEST REPORT

Cessna.

MODEL: 177 REPORT NO: DM 177-0

ORIGINAL CERTIFICATION

REPORT DATE: February 8, 1967

FLIGHT INSPECTION CONDUCTED BY: W. M. Robinson

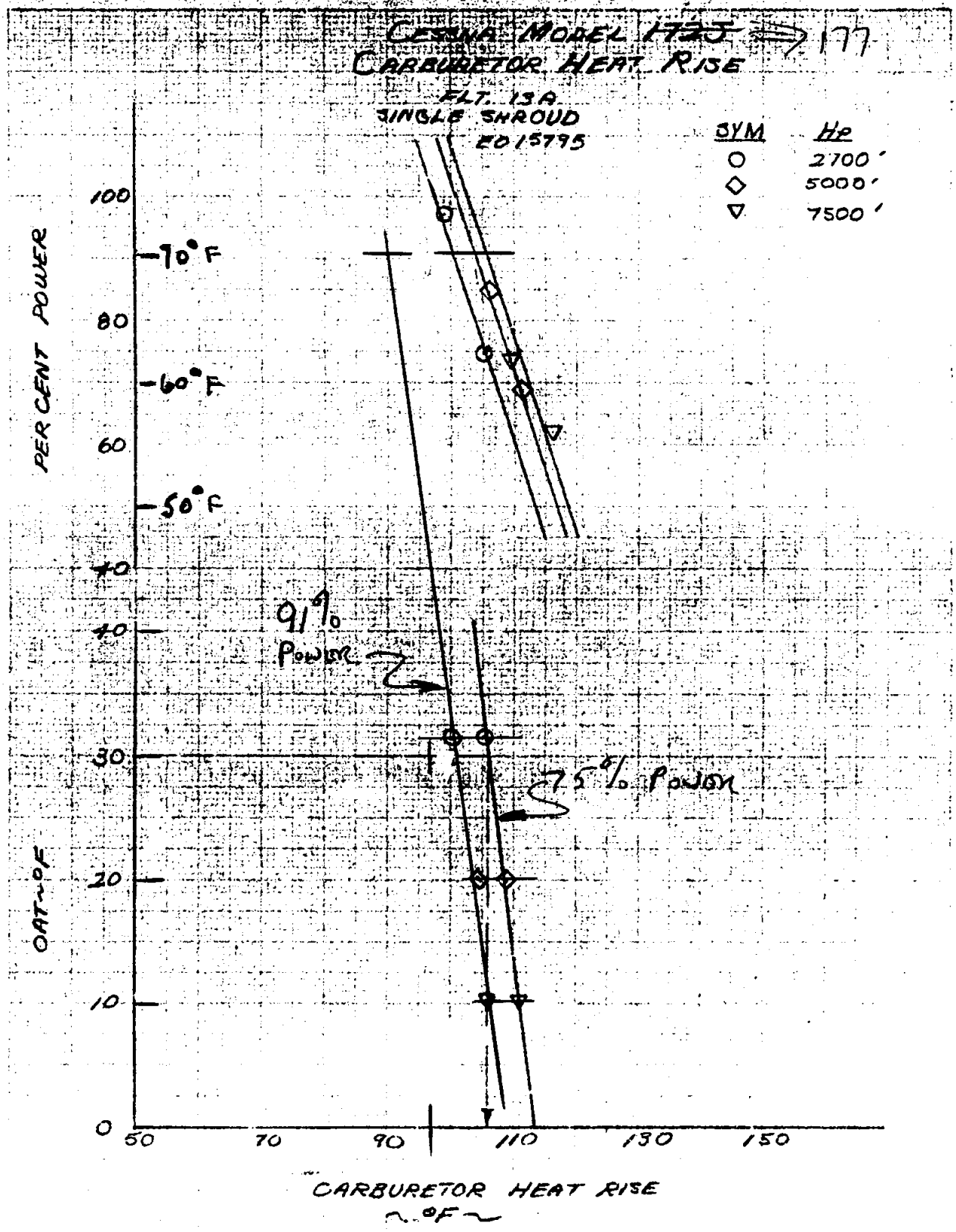
REPORT PREPARED BY: G. M. Baker

REPORT REVIEWED BY: W. D. Thompson

APPROVED BY: [signature]

CHIEF, FLIGHT TEST SECTION

APPROVED
Cessna Aircraft Co. Commercial Div.
Delegation Option Manufacturer, CE-1
[signature] Examiner Engineer
Date 8-11-67


CESSNA MODEL 172S ⇒ 177
CARBURETOR HEAT RISE
FLT. 13A
SINGLE SHROUD
E0 15795
SYM
He
2700'
5000'
7500'
PER CENT POWER
100
80
60
40
30
20
10
0
70°F
60°F
50°F
91% Power
75% Power
OAT-°F
50
70
90
110
130
150
CARBURETOR HEAT RISE
~°F~

DELEGATION OPTION MANUFACTURER FLIGHT TEST REPORT

Cessna.

MODEL: 172I REPORT NO: DM 172I-0

BASIC CERTIFICATION OF THE MODEL 172I

WITH LYCOMING O-320-E2D ENGINE

REPORT DATE: October 5, 1967

FLIGHT INSPECTION CONDUCTED BY: P. R. Leckman

REPORT PREPARED BY: P. R. Leckman

REPORT REVIEWED BY: R. A. Hummel

APPROVED BY: [redacted]

CHIEF, FLIGHT TEST SECTION

APPROVED
Cessna Aircraft Co. Commercial Div.
Delegation Option Manufacturer, CE-2
[redacted] Executive Engineer
Date 11/3/67

CESSNA AIRCRAFT COMPANY, COMMERCIAL AIRCRAFT DIVISION, WICHITA, KANSAS

CARBURETOR HEAT RISE

Since the carburetor heat installation is identical to that which is installed on the Model 177 (Reference 2, Page 77), carburetor heat rise is judged satisfactory.

172S

Cessna
A Textron Company

April 19, 1995

IN REPLY REFER TO: L171-51-95-073

Ms. Margaret Napolitan
National Transportation Safety Board
Northeast Field Office (NEF-A)
490 L'Enfant Plaza East, S.W.
Washington, DC 20594

REF: 1975 CESSNA 172M, S/N: 17263846, REG: N20819
D/A: 4/7/95, LOCATION: Eldersburg, Maryland

Dear Margaret,

The following items are enclosed related to the subject mishap:

- Cessna photographs 1-AIAN-0 through 5-AIAN-29
- Photograph log
- Delivery documents
- Page 312 of Cessna 172 Parts Catalog

Regarding the 7557 propeller used on this airplane instead of the proper 7553:

Our previous engineering flight test data and estimates from McCauley Propeller indicate that the 7557 blade would reduce takeoff and climb engine speed about 120 RPM. This would result in a loss of about 60 feet per minute rate of climb. Page 312 of the 172 parts catalog shows the proper part numbers for the 172 model airplanes.

Enjoyed meeting and working with you Margaret. Let us know if we can be of further assistance.

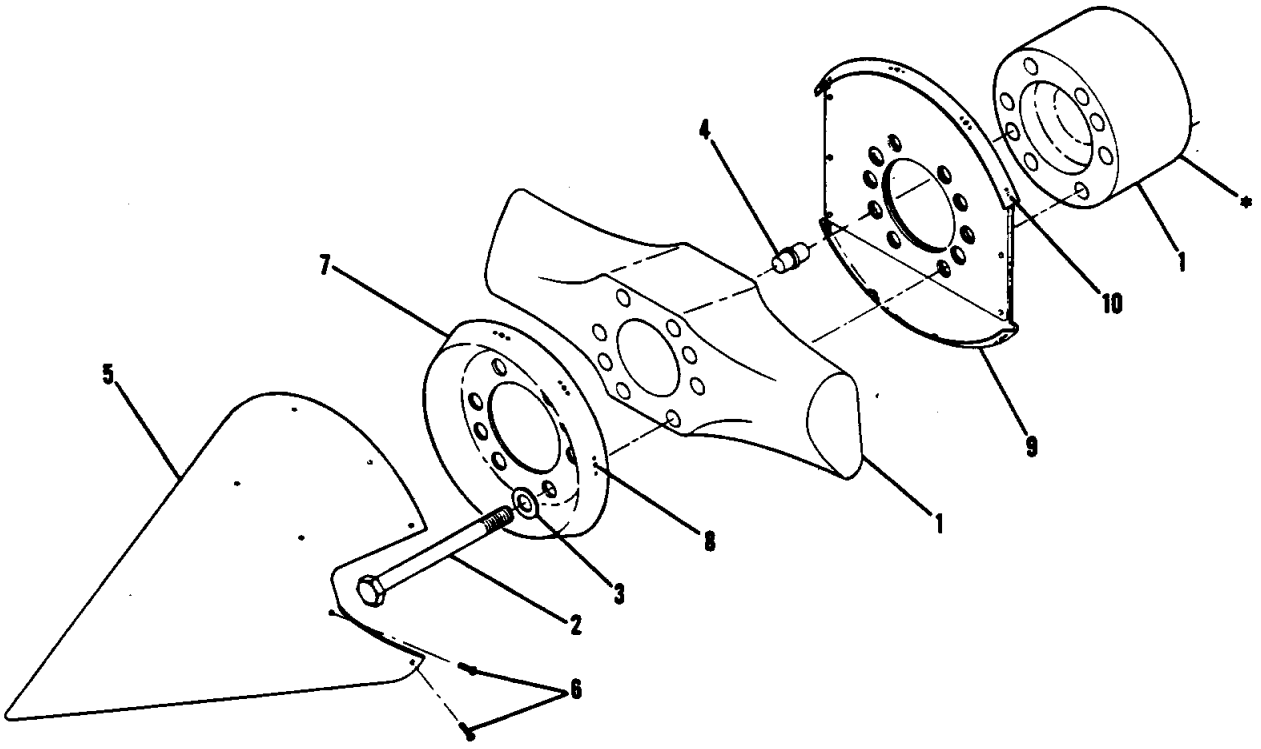
Sincerely,

[redacted]

Joseph A. Hutterer
Air Safety Investigator/Analyst

Enclosures

Propeller



172 SERIAL 17263459 & ON EXCEPT 172Q

Figure 64. Propeller Installation

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
64 -		PROPELLER INSTALLATION	NP	
- 1	C161001-0306	PROPELLER ASSY 1C160/DTM7553 MCCAULEY	1	A
	C161001-0310	PROPELLER ASSY 1C160/DTM7557 MCCAULEY	1	B
	C161001-0309	PROPELLER ASSY ALT FOR C161001-0306 1C160/CTM7553 MCCAULEY	1	A
	C161001-0307	PROPELLER ASSY FLOATPLANE ONLY 1A175/ETM8042 MCCAULEY	1	
	C161001-0308	PROPELLER ASSY FLOATPLANE ONLY ALT FOR C161001-0307 1A175/ATM8042 MCCAULEY	1	
		ATTACHING PARTS		
- 2	A2513-38	BOLT MCL	6	
- 3	A1638-11	WASHER MCL	6	
- 4	A2973-6	DOWEL MCL	2	
		—*—		
- 5	0550236-8	SPINNER	1	
		ATTACHING PARTS		
- 6	AN525-832R7	SCREW	14	
		—*—		
- 7	0550321-4	BULKHEAD ASSY-FWD	1	
- 8	NAS680A08	NUTPLATE	6	
- 9	0550321-10	BULKHEAD ASSY-AFT	1	
-10	MS21044N08	NUTPLATE	8	
		NOTE. *USE ONLY THE SPACER PROVIDED WITH PROPELLER ASSY.		
		A---172 SERIAL 17263459 THRU 17267584 F172 SERIAL F17201235 THRU F17201514		
		B---172 SERIAL 17267585 & ON EXCEPT 172Q F172 SERIAL F17201515 & ON		