

AERONAUTICAL ENGINEERS AUSTRALIA

AVIATION SPECIALISTS

AIRCRAFT WEIGHT CONTROL AUTHORITY

PRINCIPAL:

G. S. SWANNELL

B.E., M.ENG.Sc., M.I.E. AUST., A.M.R.Ae.S.

REGISTERED OFFICE:

15 UPLAND GDNS.,
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P.O. BOX 238,
WILLETTON, W.A. 6155

JANDAKOT AIRPORT

Tel. 09 417 9057

OUR REFERENCE: **AV-404**

6th December, 1983.

Department of Aviation,
Jandakot Airport,
JANDAKOT, W.A. 6164

Dear Sir,

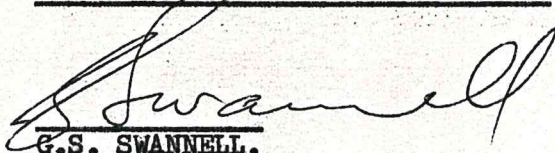
With reference to the design advice DA-404-01 reply, V131.22.12 (8).
The following data is provided for certification of the Forests
Department Piper Cub fleet.

1. Flight test Report AV-404/FT-1, issue 2 which contains flight test results.
2. EO-404/1 issue 2.
3. Record of weight alterations for each aircraft.
4. Draft Supplemental Type Certificate data sheet.
5. Flight manual amendment. N.B. The propeller approved for the O-320-B2B engine is to be a Sensenich 74DM6-0-56.

Bearing in mind the unfortunate history of this project, we request immediate approval of Forests Department Piper Cub fleet.

Yours sincerely,

AERONAUTICAL ENGINEERS AUSTRALIA


G.S. SWANNELL.

AERONAUTICAL ENGINEERS AUSTRALIA

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ENGINEERING ORDER

Number : EO-392/1 Aircraft: Piper
 Issue : 1 Model : PA-18-150 Super Cub.
 Approved by: D. KLEINIG Regn.No.: VH-FPF, FPG, FPH, FPI, FPJ, FPK,
 Date : 14th November, 1983. FPM, FPN, TSY.

Distribution: BERNIES AVIATION

REASON FOR E.O.: Removal of internal heat exchanger/baffling cones from
 engine muffler.

DETAILS:

Sheet No. 1 of 2

1. Remove muffler from engine. Clean and prepare for welding.
(Muffler P/N 12433-14).
2. Remove, by cutting and grinding, one of the muffler caps off either
end of the muffler. Remove as little material as possible so that
cap may be re-welded onto the muffler. (see sketch on sheet 2)
3. Remove the internal heat exchanger/baffling cones from each end of
the muffler.
4. Replace end cap and fully weld back onto muffler as per original.
5. Reinstall muffler to aircraft.
6. All work, including welding and installation, to be carried out by
a suitable, Department of Aviation approved organisation using normal
aircraft practices.
7. Welding filler rod to be High Test grade complying with: AS 1588-1974,
A2; BS 1453-1972, A2; AWS A5.2-RG60 or equivalent.
8. No weight and balance data amendments are necessary with this
modification.

AERONAUTICAL ENGINEERS
 AUSTRALIA

D OF A. CERTIFICATE No 5082

APPROVED

PURSUANT TO REGULATION 40
 OF THE AIR NAVIGATION REGULATIONS

[Signature]
 AUTHORISED PERSON. 7.12.87

AERONAUTICAL ENGINEERS AUSTRALIA

AVIATION SPECIALISTS

AIRCRAFT WEIGHT CONTROL AUTHORITY

ENGINEERING ORDER

Number : EO-392/1 Aircraft: PIPER
Issue : 1 Model : PA-18-150 Super Cub
Approved by: D. KLEINIG Regn.No.: VH-FPF, FPG, FPH, FPI, FPJ,
Date : 14th November, 1983. FPK, FPM, FPN, TSY.

Distribution: BERNIE'S AVIATION

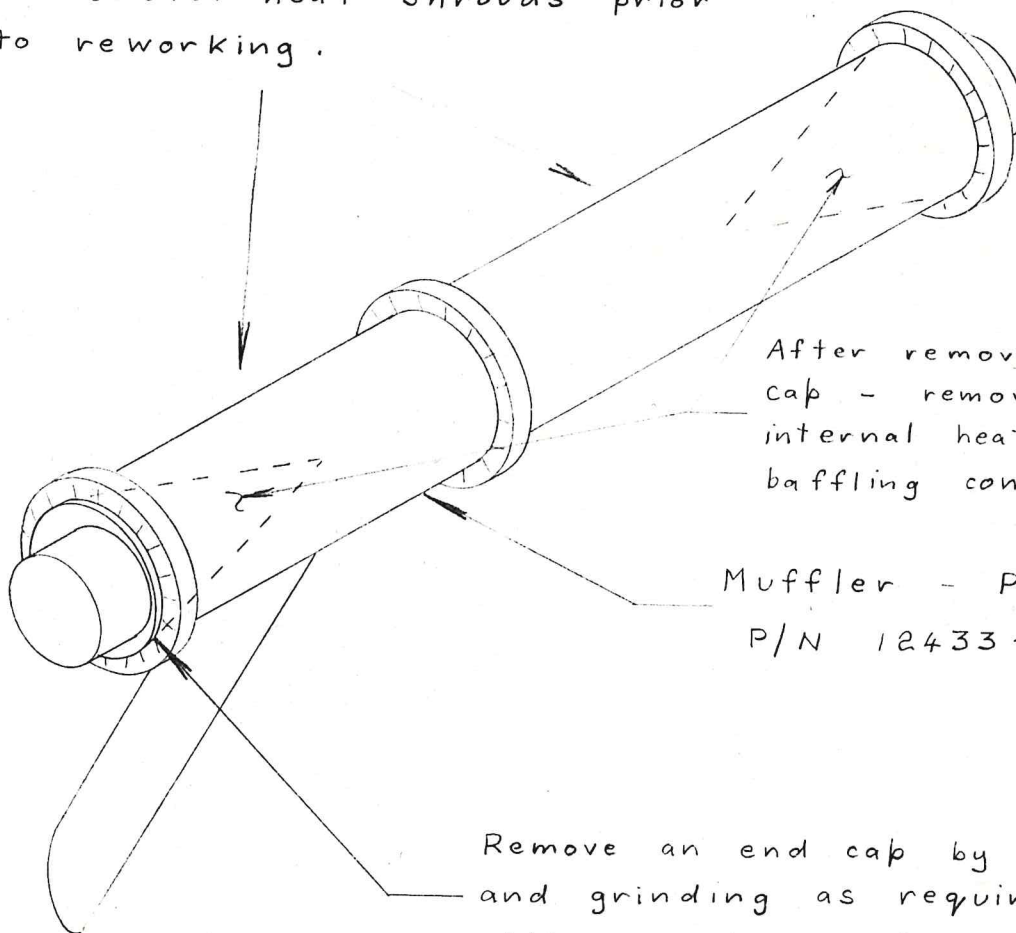
REASON FOR E.O.:

Removal of internal heat exchanger / baffling
cones from engine muffler.

DETAILS:

Sheet No. 2 of 2

Remove cabin air heating and
carburetor heat shrouds prior
to reworking.



After removal of an end
cap - remove 2 @
internal heat exchanger/
baffling cones.

Muffler - Piper
P/N 12433-14

Remove an end cap by cutting
and grinding as required -
either end may be removed.

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JANDAKOT AIRPORT

Tel. 09 417 9057

OUR REFERENCE: AV-392

Report No. : AV-392/FT-1.

FLIGHT TEST SCHEDULE

Removal of internal heat exchanger/baffling
cones from engine muffler.

Aircraft : Piper PA-18-150 Super Cub

VH- FPM

Configuration : Modify the standard aircraft
in accordance with EO-392/1,
issue 1.

Date : 25th November, 1983.

Issue

: ~~1.~~
Two 7th Dec. 1983.

PREPARED: D. KLEINIG	AERONAUTICAL ENGINEERS	PAGE No. 1 OF 6
CHECKED:	AUSTRALIA	REP. No.: AV-392/FT-1.
TITLE: Flight Test Schedule - Muffler mod.		DATE: 25th Nov. 1983

CONTENTS.

- 1.0 Introduction.
- 2.0 Configuration.
- 3.0 Build Standard.
- 4.0 Test Requirements.
- 5.0 Measurements Required.
- 6.0 Instrumentation
- 7.0 Limitations.

1.0

INTRODUCTION.

There is a tendency for the internal heat exchanger / baffling cones within the engine muffler to deteriorate in service, crumble and present the possibility of blocking (either totally or partially) the exhaust outlet. EO-392/1 describes the permanent removal of these baffling cones; but prior to approval of this modification, it is required to demonstrate compliance with FAR 23.1093 (a) (1), with the muffler modified as previously described. It is the purpose of this flight test schedule to describe a test that will accumulate the required information.

2.0

CONFIGURATION.

Weight - any.

C.G. - any

Flaps - up.

Mixture setting - as used
for normal ops.

PREPARED: D. KLEINIG	AERONAUTICAL ENGINEERS AUSTRALIA	PAGE No. 3 OF 6
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3.0

BUILD STANDARD.

Standard Piper PA-18-150 aircraft in 'as is' condition, modified in accordance with EO-392/1, issue 2. In addition, a temperature probe is required to be introduced such that the carburetor heat rise temperature may be measured in flight. The actual details of this location will be finalised prior to flight, and the installation of this probe is to be in accordance with EO-392/2 and satisfactory to a representative from Aeronautical Engineers Aust.

4.0

TEST REQUIREMENTS.

All flight testing to be carried out in air free of visible moisture.

Conduct a pair of level flight runs at approx 500 ft, 2500 r.p.m. Allow temperature to stabilise. Apply full carburetor heat. Continue level flight at 500 ft, 2500 r.p.m until temperature has again stabilised.

Repeat the above procedure, except this time conduct a pair of

level flight runs at approx. 5000 ft,
2500 r.p.m.

5.0 MEASUREMENTS REQUIRED.

altitude .

R. P. M.

O. A. T.

Temperature prior to carb heat.

Temperature after carb heat.

6.0 INSTRUMENTATION.

Standard aircraft instruments
and Simpson 389 "Therm-o-meter".
(Supplied by D. O. A. VIC/TAS)

7.0 LIMITATIONS.

Normal flight manual
limitations apply. Any special limitations
nominated in the associated permit to
fly.

PREPARED: GSWANNELL	AERONAUTICAL ENGINEERS	PAGE No. 5 OF 6
CHECKED:	AUSTRALIA	REP. No.: AV-392/FT-1
TITLE: PA-18 MUFFLER MOD		DATE: 7-12-83

FLIGHT TESTS WERE CONDUCTED ON
7TH DECEMBER 1983 @ 1400 HOURS.

PILOT : MAX FOLKS

OBSERVER: G. SWANNELL

APPARATUS: R.K.C. DIGITAL THERMOMETER
MODEL DP-100.

GROUND TEST:

22° AMBIENT

80° C @ 1800 RPM WITH HEAT

∴ 58° C RISE

FLIGHT TEST:

500' 28° C → 110° C → 28° C.

RISE = 82° C.

OAT = 25° C.

2500' 23° C → 117° C → 22° C

RISE = 94° C

OAT = 20° C.

5000' 16° C → 108° C → 17°

17° C → 102° C → 16°

RISE = 85° C.

NB TESTS CARRIED OUT @ 2500 RPM
+ 65 KIAS.

ADDITIONAL TESTS @ 2500 RPM

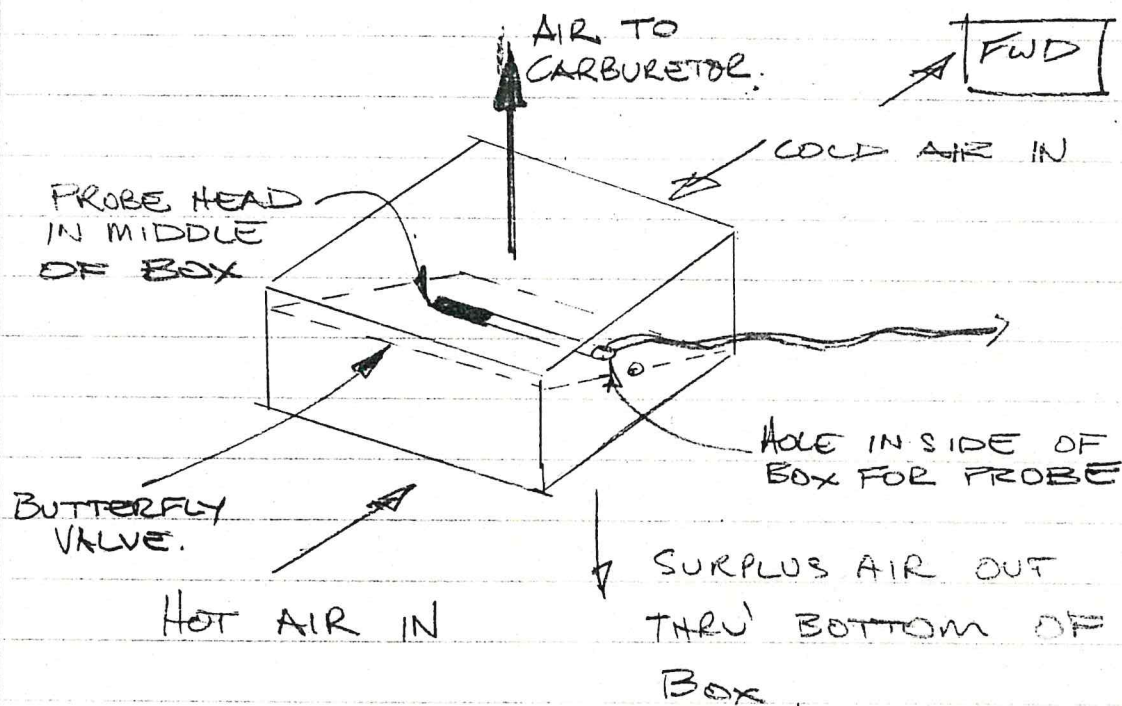
AND 100 KIAS GAVE

APPROXIMATELY 70° C RISE.

∴ CARBURETOR HEAT SYSTEM MEETS
REQUIREMENTS

PREPARED: <u>G. SWANWELL</u>	AERONAUTICAL ENGINEERS AUSTRALIA	PAGE No. <u>6</u> OF <u>6</u>
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TITLE:		DATE: <u>7-12-83</u>

LOCATION OF PROBE



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ENGINEERING ORDER

Number : EO-404/1 Aircraft: Piper
 Issue : 2 Model : PA-18-150
 Approved by: D. KLEINIG Regn.No.: VH-FPF, FPG, FPH, FPI, FPJ, FPK,
 Date : 25th November, 1983. FPM, FPN, TSY.

Distribution: BERNIES AVIATION/DEPT. OF AVIATION

REASON FOR E.O.: Re-engine with Lycoming O-320-B2B

DETAILS:

Sheet No. 1 of 1

1. Remove original engine O-320-A2B and install new engine O-320-B2B.
 NOTE: Starter motor P/N 76210 and corresponding starter ring gear assembly P/N 68867 may be installed to engine.
2. Install Sensenich 74DM6-O-56 propeller according to manufacturer's specifications.
3. Note that all engine controls, fuel and oil plumbing, engine instrument probes, air induction system, exhaust system, engine baffles, engine mount rubbers and cowling are identical to previous engine installation.
4. Carry out compass calibration to ANO 108.6.
5. Placard adjacent to each fuel tank filler to read:
 "FUEL 100/130 OCTANE MIN."
6. A record of weight alteration is to be raised.
7. Flight manual changes to be approved by the Department of Aviation.
8. Initially restricted to one aircraft subject to a Permit to Fly.
9. Flight tests to be carried out in accordance with AV-404/FT-1, issue 1.



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JANDAKOT AIRPORT

Tel. 09 417 9057

OUR REFERENCE: AV-404

Report No.: AV-404/FT-1

FLIGHT TEST SCHEDULE

Re-engine of Piper Cub with Lycoming
O-320-B2B.

Aircraft	:	Piper PA-18-150 Super Cub VH-
Configuration	:	Re-engine standard aircraft in accordance with EO-404/1, issue 2.
Date	:	25th November, 1983.
Issue	:	1. Two 6-12-83.

PREPARED: D KLEINIG	AERONAUTICAL ENGINEERS AUSTRALIA	PAGE No. 1 OF 6
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TITLE: Flight Test Schedule - Cub re-engine		DATE: 25th Nov. 1983

CONTENTS

- 1.0 Introduction.
- 2.0 Configuration.
- 3.0 Build Standard.
- 4.0 Test Requirements.
- 5.0 Measurements Required.
- 6.0 Instrumentation.
- 7.0 Limitations.

PREPARED: D. KLEINIG	AERONAUTICAL ENGINEERS AUSTRALIA	PAGE No. 2 OF 6
CHECKED:		REP. No.: AV-404/FT-1
TITLE: Flight Test Schedule - Cub re-engine		DATE: 25th Nov. 1983

1.0 INTRODUCTION.

It is required to demonstrate that the Lycoming O-320-B2B engines may be used in lieu of the original O-320-A2B installed within the Piper PA-18-150 Super Cubs. The O-320-A2B are capable of approx. 150 HP at 2700 r.p.m., whilst the O-320-B2B are capable of approx. 160 HP at 2700 r.p.m.

Flight tests are to be carried out to determine compliance for the re-engined aircraft with FAR 23.1521(b). This is to be demonstrated at V_2 , the take-off safety speed.

(Note that the original propellers as used on the O-320-A2B engines are also to be used on the O-320-B2B engines. These propellers are: Sensenich 74DM6-O-56.)

2.0 CONFIGURATION.

Weight - any.

C.G. - any.

Flaps - 25°

Mixture setting - full rich.

Airspeed - take-off safety
speed determined
from flight manual
at the appropriate
weight. (viz. at 1750 lb
43 KIAS; at 1250 lb
35 KIAS)

3.0 BUILD STANDARD.

Standard Piper PA-18-150
aircraft in "as is" condition, modified
in accordance with EO-404/1, issue 2.

4.0 TEST REQUIREMENTS.

Determine the maximum
static r.p.m. with the aircraft restrained
on the ground. Use full throttle, both
magnetos on and carburetor heat off.

Determine the maximum
r.p.m. with the aircraft at the take-off
safety speed (determined for the appropriate
aircraft weight). Use full throttle, both

magnetos on and carburetor heat off.

Comment on the observed oil temperature and cylinder head temperature relative to the respective maximum temperatures allowable. (Note: max. oil temp. = 245°F , max. cylinder head temp. = 500°F .)

The aircraft is not required to be airborne for any of these tests.

5.0 MEASUREMENTS REQUIRED.

STATIC RPM

= 2500 RPM

NB STROBE UNIT

RECORDED 2430 RPM

$\therefore$ 70 RPM OVER
READING

Gross weight.

1600^{lb}

Airspeed.

43 KIAS

R. P. M. (maximum)

2500 RPM

Oil temp. (maximum)

GREEN

Cylinder head temp. (maximum) GREEN.

6.0 INSTRUMENTATION.

Standard aircraft instruments.

Any suitable 'sight' tachometer for static r.p.m. tests.

PREPARED: D. KLEINIG	AERONAUTICAL ENGINEERS AUSTRALIA	PAGE No. 5 OF 6
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TITLE: Flight Test Schedule - Cub re-engine		DATE: 25th Nov. 1983

7.0

LIMITATIONS.

Normal flight manual
limitations apply. Any special limitations
nominated in the associated Permit to
Fly.

PREPARED: G. SWANNELL

AERONAUTICAL ENGINEERS
AUSTRALIA

PAGE No. 6 OF 6

CHECKED:

REP. No.: AV-404/FT-1

TITLE:

DATE: 6-12-83

TEST FLIGHT CONCLUSIONS

STATIC FULL THROTTLE RPM = 2500 - 70
= 2430 RPM.

∴ ORIGINAL FLIGHT MANUAL
2350 to 2450 CAN STILL APPLY.

RPM AT TAKE-OFF SAFETY SPEED
= 2580 - 70
= 2510 RPM.

NB TEST PROPELLER WAS 74"
DIAMETER

∴ ADD 100 RPM TO RESULTS
TO CATER FOR TRIMMING.

∴ CORRECTED RPM = 2610 RPM.
ie LESS THAN 2700 RPM

CONCLUSION IS THAT THE 56" PITCH
PROPELLER IS SUITABLE WITH THE
160 H.P. INSTALLATION.

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ENGINEERING ORDER

Number : EO 965/1 Aircraft : Piper
 Issue : one Model : PA-18 (150) Cub
 Approved by: G. Swannell Regn.No. : VH-FPK, FPJ, FPN
 Date : 21/10/87

Distribution: CALM/Bernies Aviation

REASON FOR E.O.: Re-installation of rear control stick

DETAILS:

Sheet No. 1 of 1

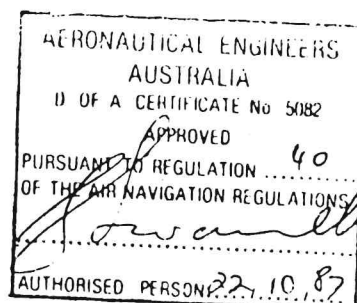
This engineering order approves the re-installation of the rear control stick so that pilot training can take place. The control stick has been modified (as shown below) so that there is adequate clearance to the front and rear seats.

NB Front seat modified in accordance with drawing AV-364-01
 Rear seat and camera installed in accordance with drawings
 AV-465-01 to 07, AV-531-01 and 02

1. Modify the rear control column as shown on drawing AV 965-01
2. Manufacture the following placard

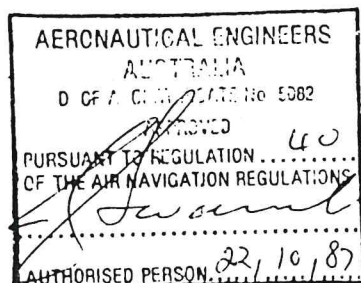
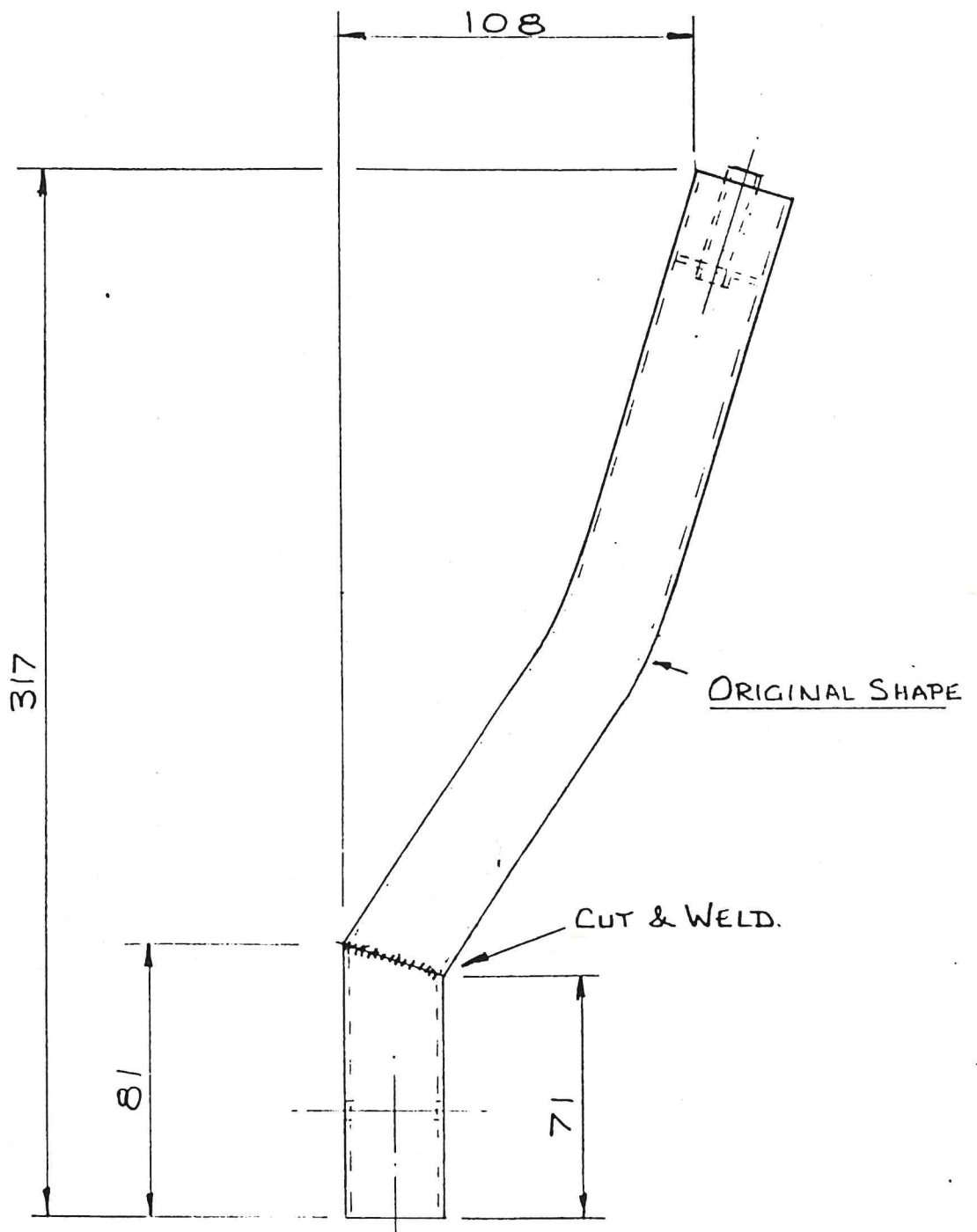
When Pilot seat P/N AV-364-01 is installed and rear seat relocated aft for camera, the rear control stick may only be fitted if it is modified in accordance with drawing AV-965-01. Note that the front seat pocket is to be empty and the rear stick must clear the front seat.

3. Remove the existing placard on the back of the pilot's seat and install the new placard.



*Aircraft Modification
 Approved Drawings
 Draw*

16



DRAWN BY R.W.H.
DATE 21-10-87

C.A.L.M
PIPER CUB REAR
CONTROL STICK MODIFICATION
AV-965-01