

Control Column U-Joint Wear

Note: You must have the assistance of a licensed AMT (A&P mechanic) to complete this procedure. A logbook entry is required.

Description: It has come to our attention that the universal joint (u-joint) at the forward end of the control column may have excessive play or wear that must be addressed. The following procedure will help identify the problem.

With the top glareshield covers removed, grab the aileron pulley on the forward end of the control column (This is the large pulley controlling the aileron cables). At the same time, turn the pilot's control wheel back and forth slightly, holding the pulley from moving, and note any play in the u-joint. If there is any play, conditions may exist that will cause a catastrophic failure of the aileron control system. Note: The elevator control may not be affected.



U-Joint on the forward end of control column

Procedure: If the wear, or "play", is excessive, the u-joint may need to be replaced. Get your mechanic to determine if the wear is out of limits. The original u-joint had no play at all when new and movement was smooth and precise so a replacement u-joint may be in your future. Finding a replacement may be a bit of a challenge as the original part number was UJ-388 from the Apex Machine and Tool Company in Dayton, Ohio. Below is the original Republic drawing:



17F31063 C

REVISIONS

REV.	DATE	CHG.	APP.	QWR.
B				

B REDRAWN & REDESIGNED

DRAWN	CHECKED	STRUCT.	GR. ENG.	STDS.	PROJ.	WEIGHTS	COST.
10-14-46	11/17/46	11-24-46	10-20-46	10-20-46	11/17/46	17.07	

13/16 DIM. WAS 23/8 REMOVED 2.062 ± .005
C BEAM 1/4 (.250) ± .0015, ADD NOTE #1.

DRILL 19/32 (.5937) DIA. BOTH ENDS

.748 ± .003 DIA BOTH ENDS

4 5/8

1 3/16

1

1 19/32

©NOTE:
1. MIN. STATIC TORQUE - 2200 IN.-LBS.
SIMILAR TO UJ-388 APEX
MACHINE & TOOL CO.

NO. REQD. PER UNIT	PART NO.	ZONE	NAME	DIA.	THICK	WIDTH	LENGTH	MATERIAL	MATERIAL SPEC.	T. & 1000 PLS.	CALC. WT. (LBS.)	ADJ. WT.
	17F31063-1		UNIVERSAL					APEX MACH. & TOOL CO. DAYTON, O.	OR EQUIV.		125 MIN.	20

UNLESS OTHERWISE NOTED

TOLERANCES:

FRACTIONAL	DECIMAL	ANGULAR
± 1/32	NOTED	

RADI: BEND CORNER
BEND RELIEF

MACHINE FINISH DESIGNATIONS

③ SMOOTH MACHINE	⑩ SMOOTH GRIND
④ ROUGH MACHINE	① ALL OVER

HEAT TREAT:

FINISH: R.F.F. 12

REPUBLIC AVIATION CORPORATION
FARMINGDALE, L. I., NEW YORK

UNAUTHORIZED USE, MANUFACTURE OR REPRODUCTION
IN WHOLE OR IN PART IS PROHIBITED

UNIVERSAL
AILERON CONTROL

SCALE (UNLESS NOTED)
FULL SIZE

17F31063

FORM 8-1-58 REFERENCE NO. 107H

Original Republic drawing of Column U-Joint

A search on the Internet will list a myriad of suppliers. They may be a little pricey but it's a small price to pay.

Procedure:

In order to replace the u-joint the inner control torque rod must be removed from the outer control column push-pull tube:

COLUMN REMOVAL

- ☐ Remove the copilot's control wheel assembly.
- ☐ Remove the dust cover fairing on pilot's control wheel yoke.
- ☐ Unsafety and disconnect the chain on the pilot's side of control yoke and clear the sprocket on the torque shaft assembly.
- ☐ Remove three (3) AN502-416-8 Fillister head screws that secure yoke to push-pull tube.
- ☐ Remove yoke and pilot's control wheel assembly.
- ☐ Remove two (2) 1/4" clevis head bolts (AN24) at forward end of push-pull tube.

- ☐ Remove bolt through aileron pulley and discard the hardware (throw them away!)
- ☐ Remove pulley from torque tube. The aileron cables can remain connected.
- ☐ Pull the push-pull tube aft, toward the tail, to disconnect it from the aileron bearing.
- ☐ Remove push-pull tube assembly by pulling it forward through instrument panel.



Control Arm cover removed showing turnbuckle and chain.
Safety wire removed.



Turnbuckle and chain safety wire installed.
THIS IS REQUIRED!

Note: This is a great time to inspect the chain for wear. Clean the chain thoroughly with mineral spirits. The chain should not have any movement in the individual links when pulled lengthwise. Check for excessive wear on the links where the sprockets mate with the chain. If all is well, lubricate the chain by soaking it in oil. If replacement is necessary, the chain and links are available from a number of suppliers. (i.e.: McMaster-Carr.com)

Once the control column is removed, take it to the workbench to remove the U-joint. The inner torque tube must be removed:

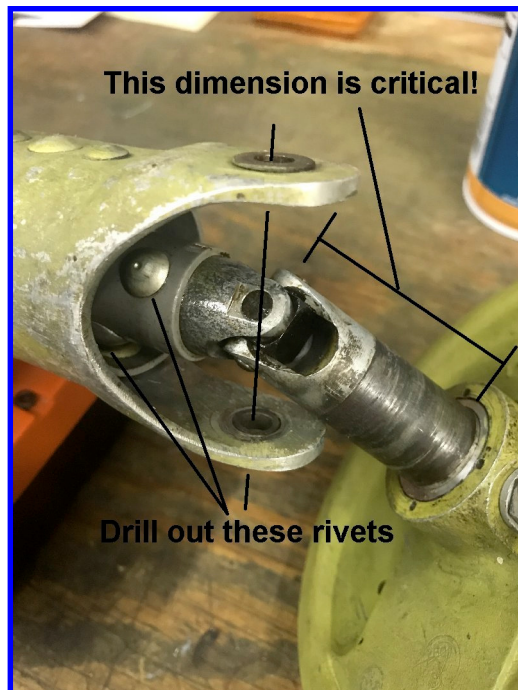
Torque Tube Removal:

- ☐ Mark the sprocket and square drive with a Sharpie to aid in installation later

- ☐ Remove the 1/16" roll pin (music wire) that is installed diagonally through the square drive. A pair of vise grips and/or a 1/16 punch may be necessary.
- ☐ Remove the inner torque tube from the outer push-pull tube.
- ☐ Drill out rivets holding the U-joint in place.
- ☐ Remove the U-joint

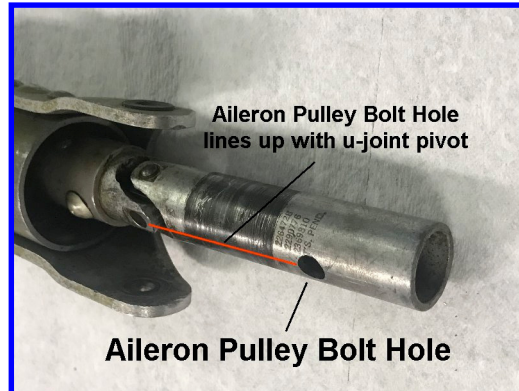


Torque tube end with sprocket. Note 1/16" roll pin.



Rivets to be removed. Use AD rivets!
Note alignment of u-joint with pivot bolt holes

Install the new U-joint and drill torque tube end for the new rivets. Be sure the new u-joint pivot pins are in line with the bolt holes on the forward end of the push-pull tube. The aileron pulley end must also be drilled for the AN4-16A bolt. Make sure the pulley orientation and dimensions on the U-joint is the same as when it was removed! It appears that the aileron pulley bolt is in line with the u-joint pivot.



Orientation of aileron pulley bolt hole

Warning: Make sure the pivot point of the U-joint (where the U-joint block pins are) is inline with the two boltholes on the forward end of the outer push-pull tube! If not, there will be premature wear of the U-joint. Also make sure the aileron pulley is in the same location as when it was removed. The old U-joint can be used as a pattern.

Side note: This may be a good time to replace the phenolic Control Wheel Tube Bearing (RPN 1163) that supports the Tube. There is Teflon replacement bearings available that make the Control Tube slide effortlessly through the instrument panel. No lubrication is needed nor wanted. You should also polish the push-pull tube to a mirror finish that will reduce the effort required to pull the controls aft plus, it really looks good when you are done.

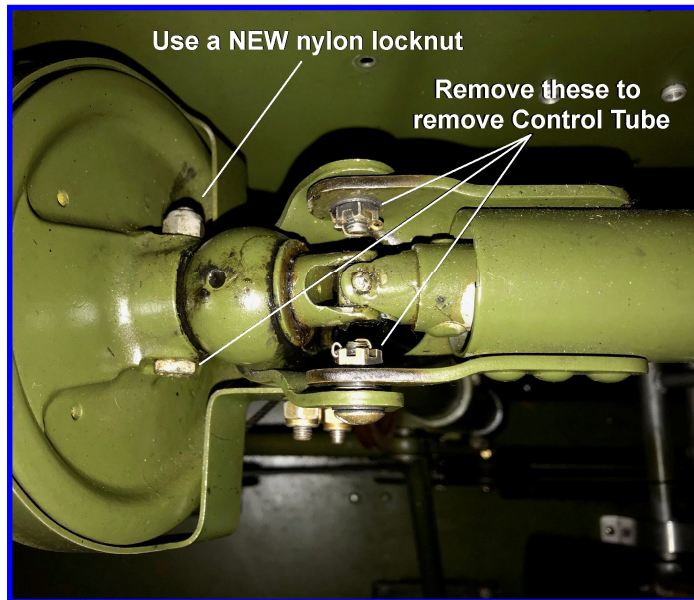


Teflon Control Tube Bearing

FORM 160-37 DEFANCE NO. 167H

4/21/2024

Below is a photo of the completed installation. Notice how the two bolts are in alignment with the U-joint pivot pins.



Control Tube shown in place. Three bolts will allow removal of Control Tube.
USE A NEW NYLON LOCKNUT ON THE AILERON PULLEY!

Conclusion:

Hopefully you will find your U-joint in good shape. If not, this procedure will save your day. Just remember what a well-respected mechanic once said, " You can never have too much lubrication." Lubricate everything liberally prior to installation. Grease can be used on the inside of the aileron pulley and the U-joint part that slides into the pulley. Oil on everything else.