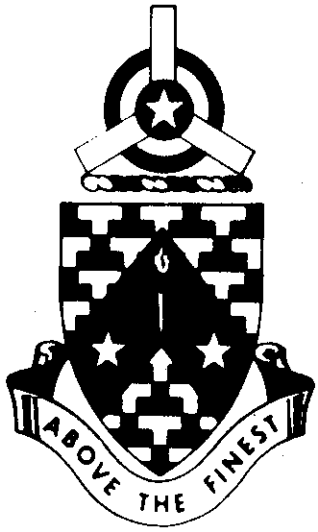
PROGRAMED TEXT

MAIN ROTOR AND TAIL ROTOR SYSTEMS
TH-55

AM 11-55



OCTOBER 1968

UNITED STATES ARMY
PRIMARY HELICOPTER SCHOOL
FORT WOLTERS, TEXAS

PROGRAMED TEXT

PROGRAM TEXT

FILE NO: AM 11-55

PROGRAM TITLE

Main Rotor and Tail Rotor Systems
TH-55

POI SCOPE: Nomenclature, function and preflight inspection checks of the main rotor and tail rotor assemblies.

INSTRUCTOR REFERENCES:

269A/A-1/TH-55A-HMI
Sections IV-V

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DATE: November 1968

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Main Rotor and Tail Rotor Systems TH-55

PREFACE

Knowledge of your aircraft will not only distinguish you during "hangar flying" sessions, but may very well save your life. Familiarity with the main rotor and tail rotor systems will enable you to perform the preflight inspection, thoroughly and rapidly.

Start with frame 1 and work each frame in succession. Each frame will usually ask you a question. The correct answer is printed on the top of the next frame. If you were incorrect, turn back and restudy the information before continuing on to the next frame. When you have finished the text, complete the self evaluation exercise. Now begin by studying the performance objectives on page iv.

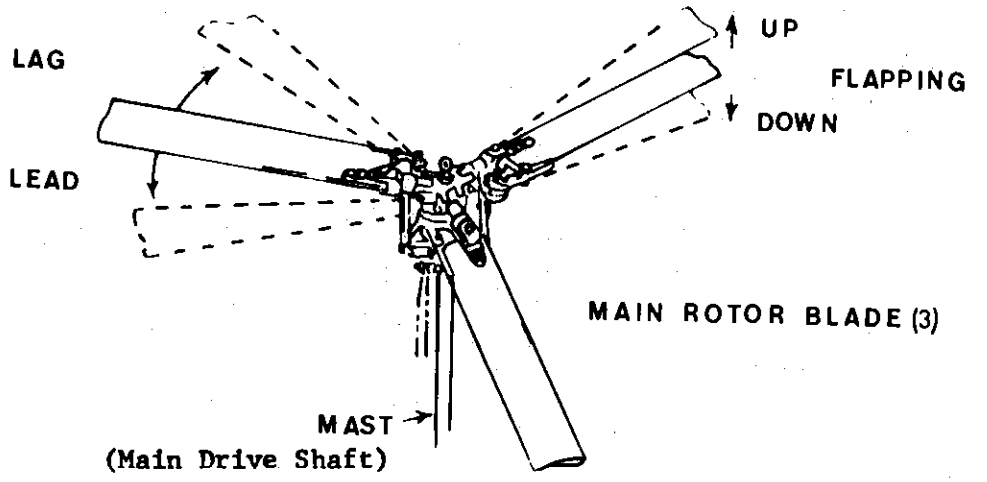
PERFORMANCE OBJECTIVES

Upon completion of this programed text and with the aid of photographs or sketches of the TH-55 helicopter, you will be able to locate or identify various components or parts of the main rotor and tail rotor systems using proper nomenclature, and determine if those systems are serviceable.

FRAME 1 MAIN ROTOR SYSTEM

TH-55 main rotor system is a fully articulated system.

This means that each blade can go up and down (flap) and fore and aft (lead and lag) and feather independently of the other blades.



The main rotor system of the TH-55 is:

a. rigid

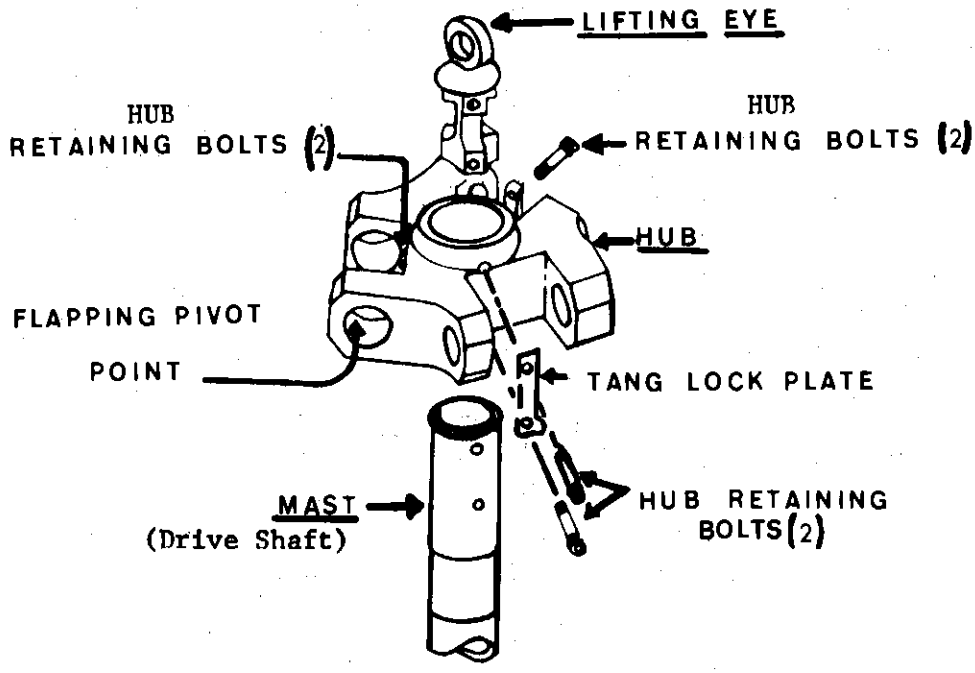
b. semi-rigid

(c) fully articulated

TURN TO PAGE 3 FOR FRAME 2

FRAME 6

HUB ASSEMBLY



The above picture is of the hub, lifting eye, and top part of the mast. The hub is bolted to the mast with 6 bolts. The bolts extend through the hub and through the mast and screw into the lifting eye. This means that the hub turns at the same speed as the mast. The pitch bearing assembly (not shown) bolts to the hub with one bolt, and this bolt is the flapping hinge for one main rotor blade.

During your preflight inspection, you must inspect the hub for cracks, dents, corrosion, deep scratches, and insure that the tang lock plates are bent tight against the bolts holding the hub to the mast.

The hub is

(a.) held rigidly to the mast

b. free to rotate around the mast.

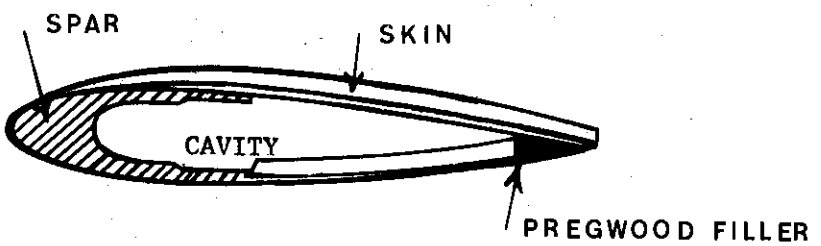
c. free to teeter on the mast.

TURN TO PAGE 4 FOR FRAME 7.

ANSWER: c. fully articulated.

FRAME 2

The main rotor blade assembly is constructed of an aluminum alloy spar. The skin of the rotor blade is a wraparound aluminum alloy sheet bonded to the spar. At the trailing edge the aluminum sheet is bonded and riveted to a pregwood filler. There are vents and drain holes in the tips of the main rotor blades. These holes are there to allow condensation to drain out and to equalize air pressure in the blades. Check these on preflight to see that they are not clogged.



The main rotor blade is

a. filled with aluminum.

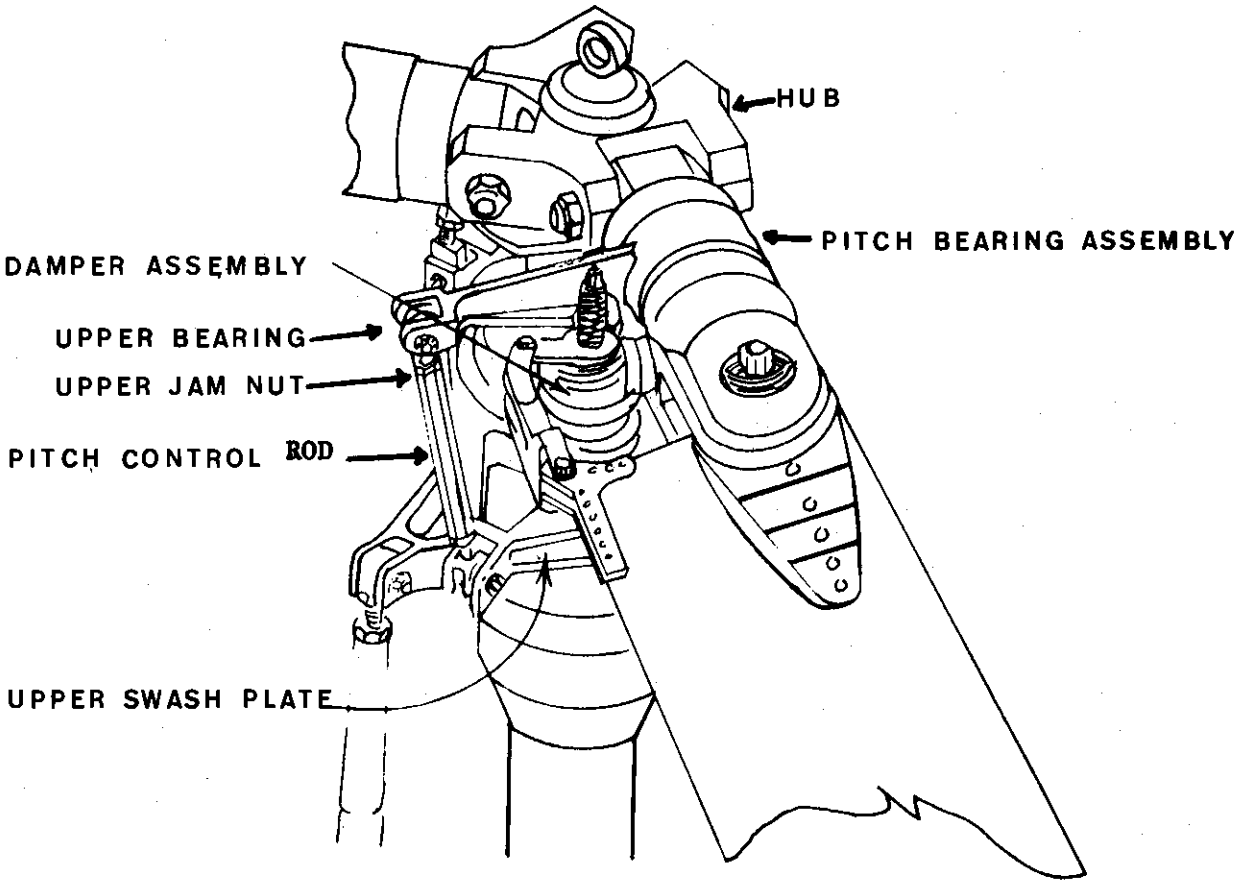
(b) hollow.

c. filled with wood.

ANSWER: a. The hub is held rigidly to the mast by 6 bolts.

FRAME 7

The three pitch control rods link the pitch bearing assemblies to the upper swash plate.



On preflight check to insure that the upper and lower jam nuts are safetied to the main body of the pitch control rod. Also check to see that the upper and lower bearings are free to move within their limits.

The pitch bearing assembly is linked to the swashplate by

a. the damper control arm.

b. the drag brace.

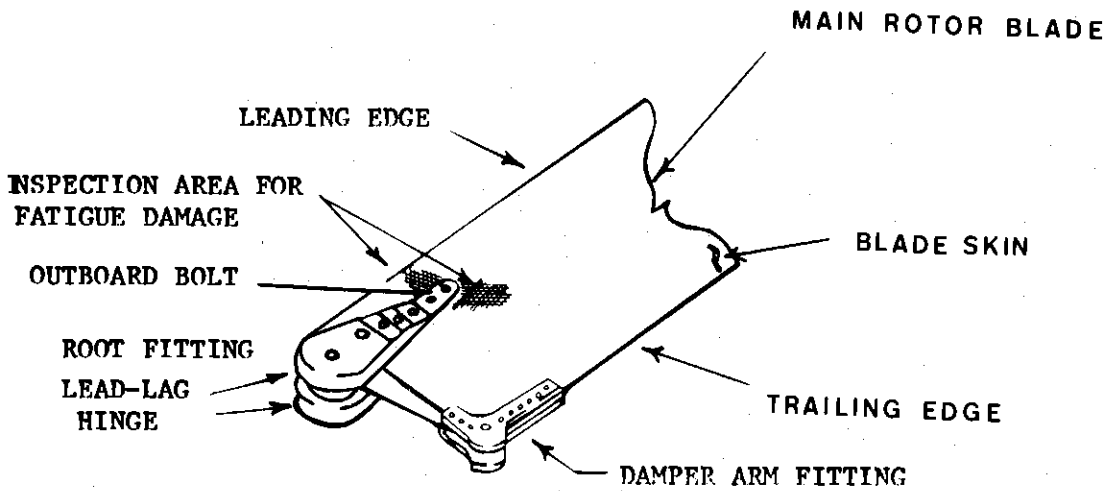
c. swash plate control arm.

(d.) pitch control rods.

ANSWER: b. hollow. - This helps cut down the overall weight of the aircraft, so it will be able to carry a heavier pay load.

FRAME 3

The root fitting is attached near the leading edge of the blade by 6 bolts. On preflight inspections be sure to check the outboard area of the root fitting for fatigue damage (cracks and wrinkles in the skin of the blade) and the attaching bolts for security. If any discrepancies are found, report them to a tech inspector.



MAIN ROTOR ROOT AND ATTACHED FITTINGS

Cracks in the main rotor blade will generally form around the

a. leading edge

b. trailing edge.

c. outboard edge of the root fitting.

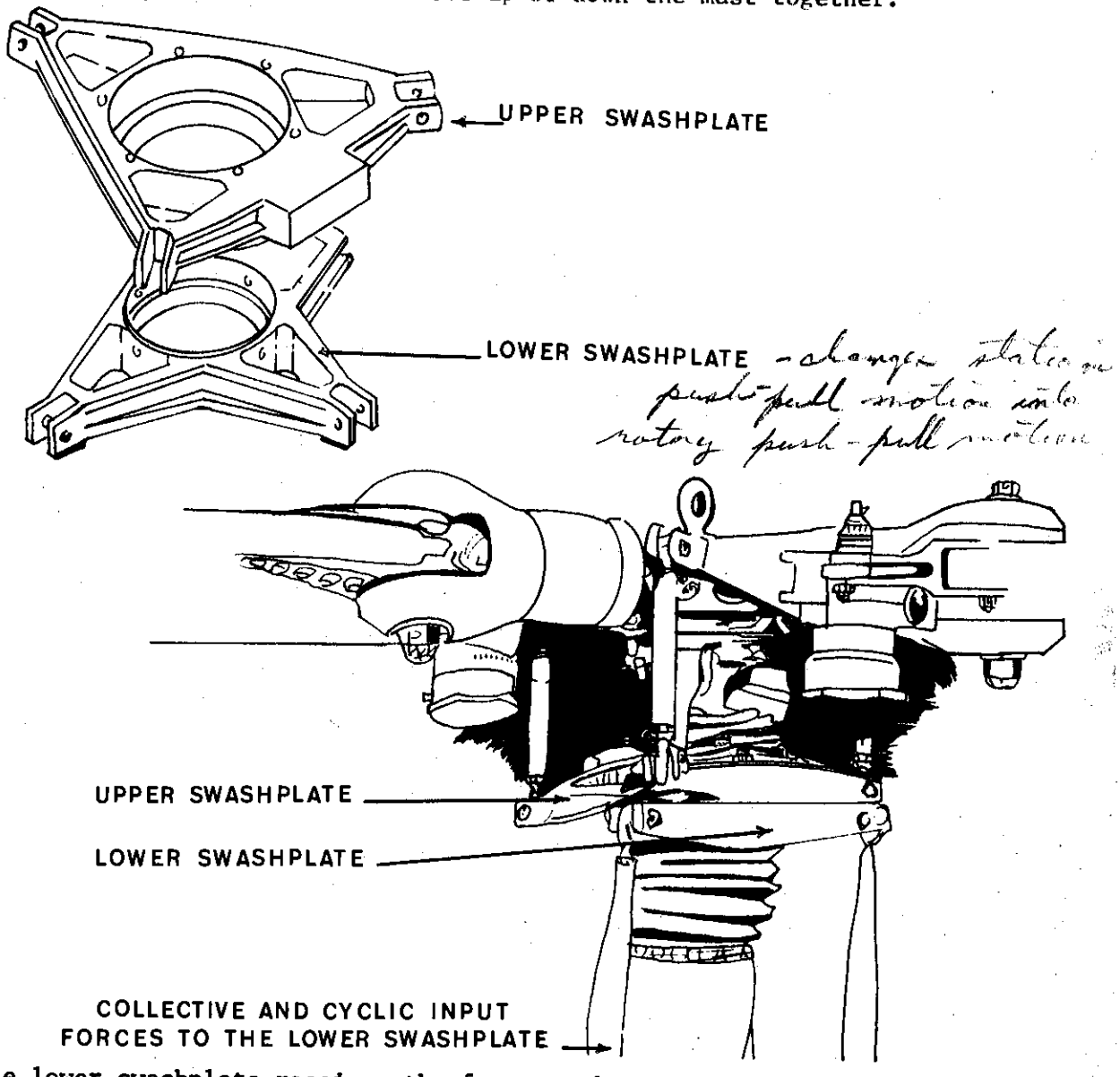
d. outboard edge of the blade.

ANSWER: d. Pitch control rods.

FRAME 8

The swashplate is made up of two triangular castings.

The function of the swashplate is to transmit cyclic and collective movements to the pitch bearing assembly to change pitch in the blades. The upper swashplate rotates with the mast. The lower swashplate does not rotate, they are both free to move up or down the mast together.



The lower swashplate receives the forces and transmitts the movement to the upper, rotating swashplate.

(a) True b. False

ANSWER: c. The outboard edge of the root fitting absorbs most of the stress placed on the blade.

FRAME 4

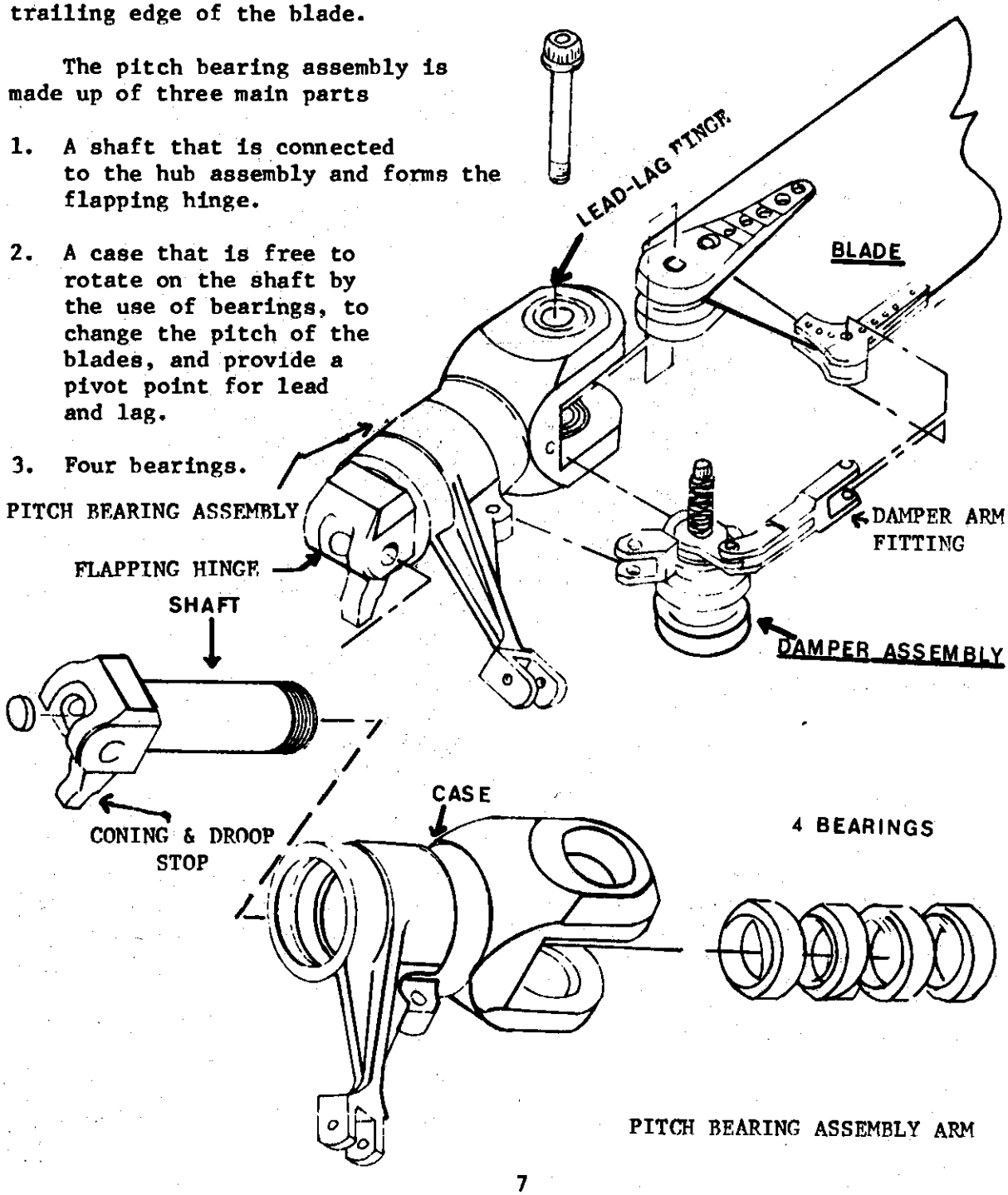
The blade is attached to the pitch bearing assembly by the blade root fitting and to the damper arm fitting on the trailing edge of the blade.

The pitch bearing assembly is made up of three main parts

1. A shaft that is connected to the hub assembly and forms the flapping hinge.

2. A case that is free to rotate on the shaft by the use of bearings, to change the pitch of the blades, and provide a pivot point for lead and lag.

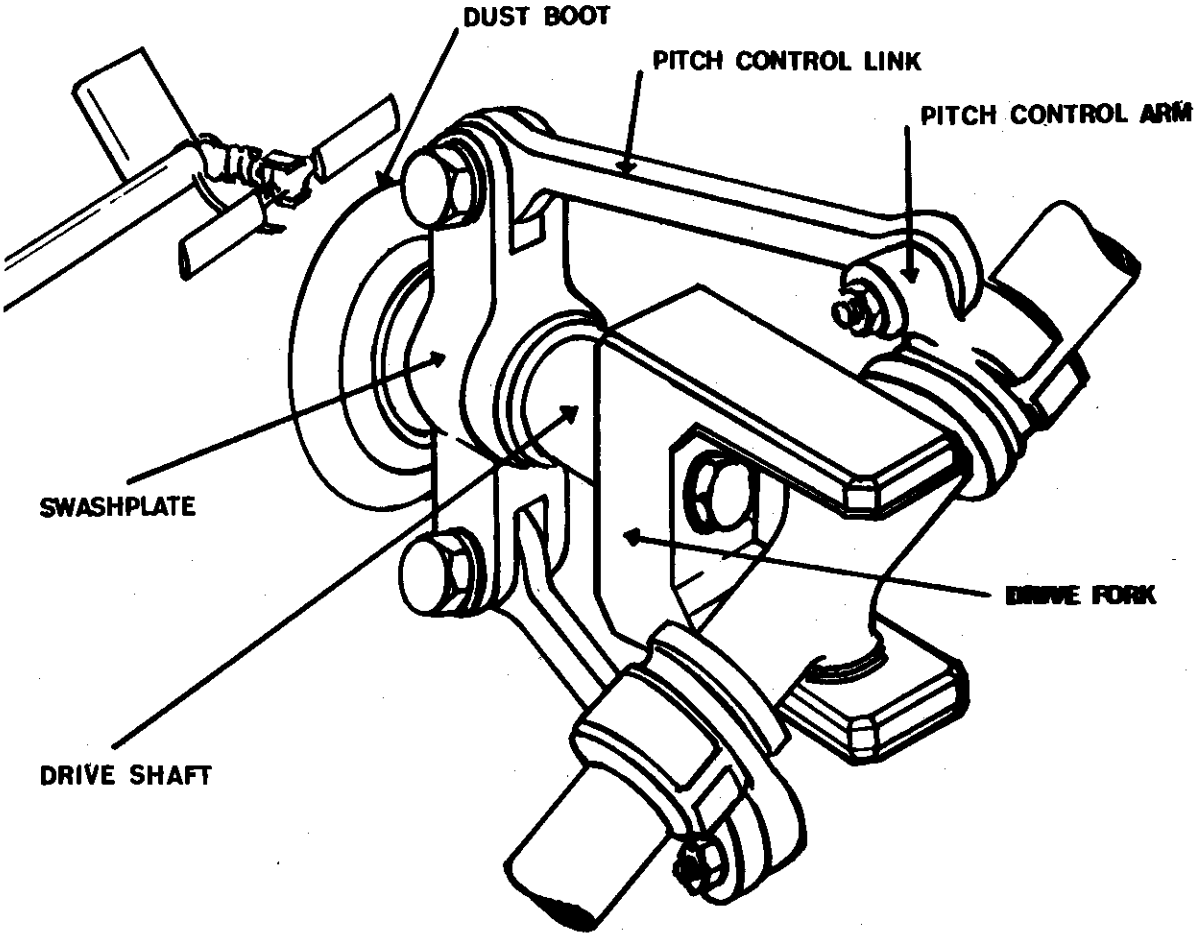
3. Four bearings.



ANSWER: a. True

FRAME 9 TAIL ROTOR ASSEMBLY

The tail rotor assembly consists of a drive shaft, a swashplate, a drive fork assembly, two pitch control links, two pitch control arms, and two tail rotor blades.



As the drive shaft turns, it turns the drive fork and the swashplate. When the tail rotor pedals are pushed in the cockpit, it will cause the swashplate to move back and forth on the drive shaft. As the swashplate moves back and forth, it transmits its motion through the pitch control links and causes a pitch change in the blades.

FRAME 4 (Continued)

The pitch bearing assembly attaches

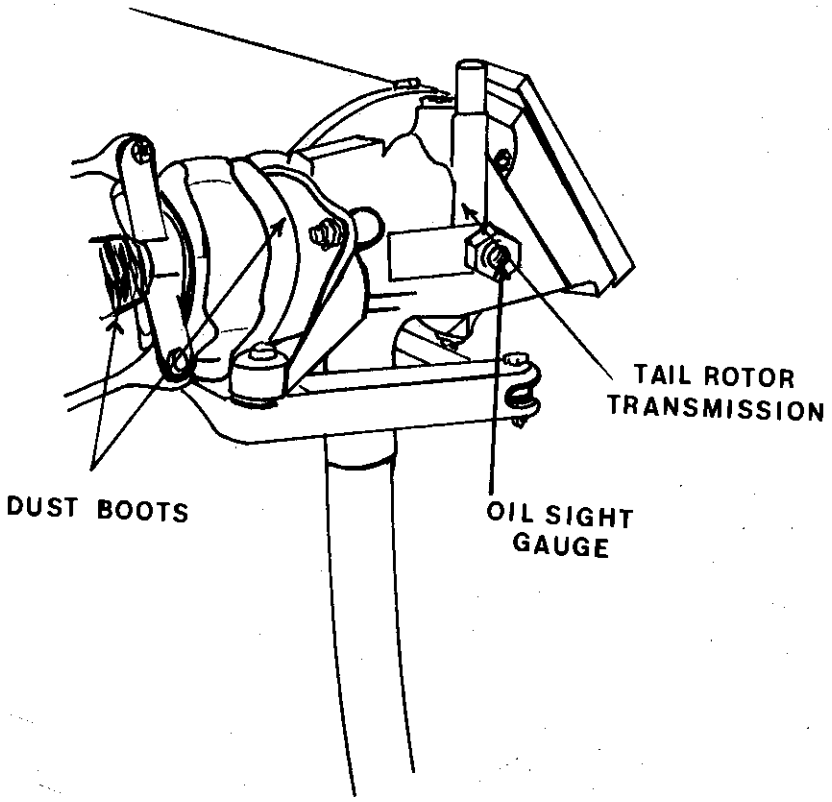
a. to the trailing edge of the blade and helps dampen lead and lag.

b. to the leading edge of the blade root and permits pitch changes of the blades, and provides a hingepoint for lead and lag.

c. to the leading edge of the blade and helps to hold it rigidly in place.

The tail rotor assembly and transmission should be checked on preflight to insure that all bolts are safetied, no oil leaks, sight guage for oil level, dust boots for condition, and blades for dents or cracks. If any discrepancies are found, check with a tech inspector.

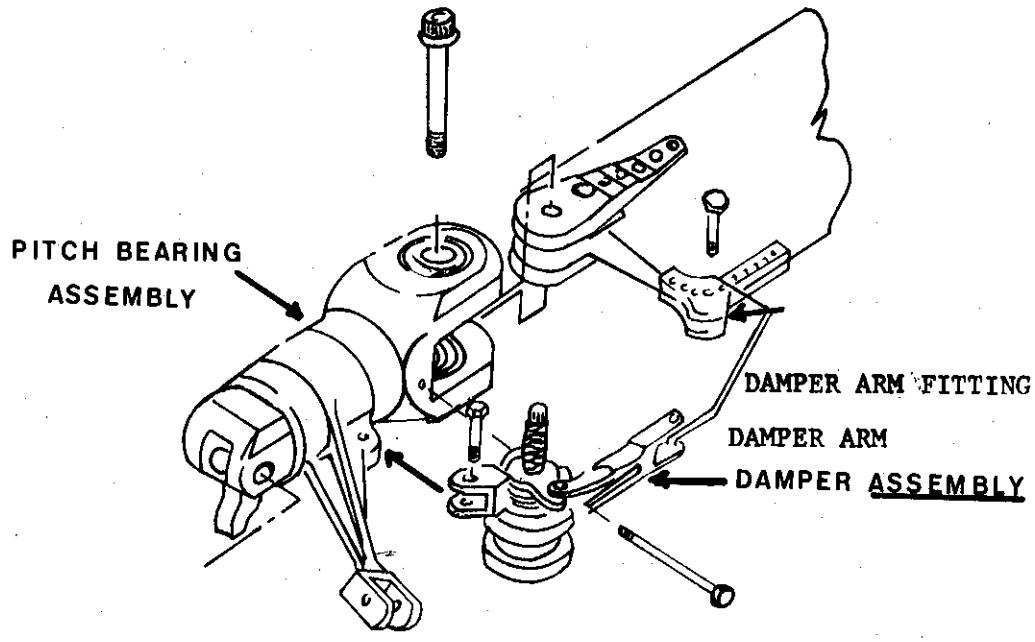
Some TH-55A tail rotors have tape on the leading edge of both blades. This tape helps to balance and to protect the blades from erosion and rain damage. If this tape is frayed, do not try to trim it yourself. Ask the maintenance personnel to replace it for you. Tape must be equal on both blades.



CONTINUE TO SELF EVALUATION EXERCISE

ANSWER: b. to the leading edge of the blade root and permits pitch changes of the blades, and provides a hinge point for lead and lag.

frame # 5



The damper is bolted to the pitch bearing case as shown in the photo above. The damper arm connects the damper to the damper arm fitting on the blade root trailing edge. The main rotor dampers control the lead and lag action of the main rotor blades. They act to restrict blade movement in its lead or lag action.

The dampers should be checked on every preflight for oil levels, oil leaks, safeties, sticky, jerky, or uneven operation that could cause vibration in the control system. Also, insure that the blades are aligned between the 4 1/2 and 5 alignment position on the dampers.

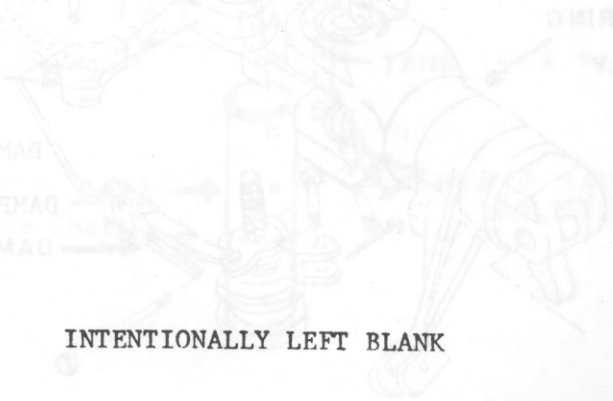
The aircraft should not be flown if

a. the blades are aligned between 3 1/2 and 5 1/2.

b. the oil level is extremely low.

c. the damper has sticky or jerky operation.

d. all of the above.



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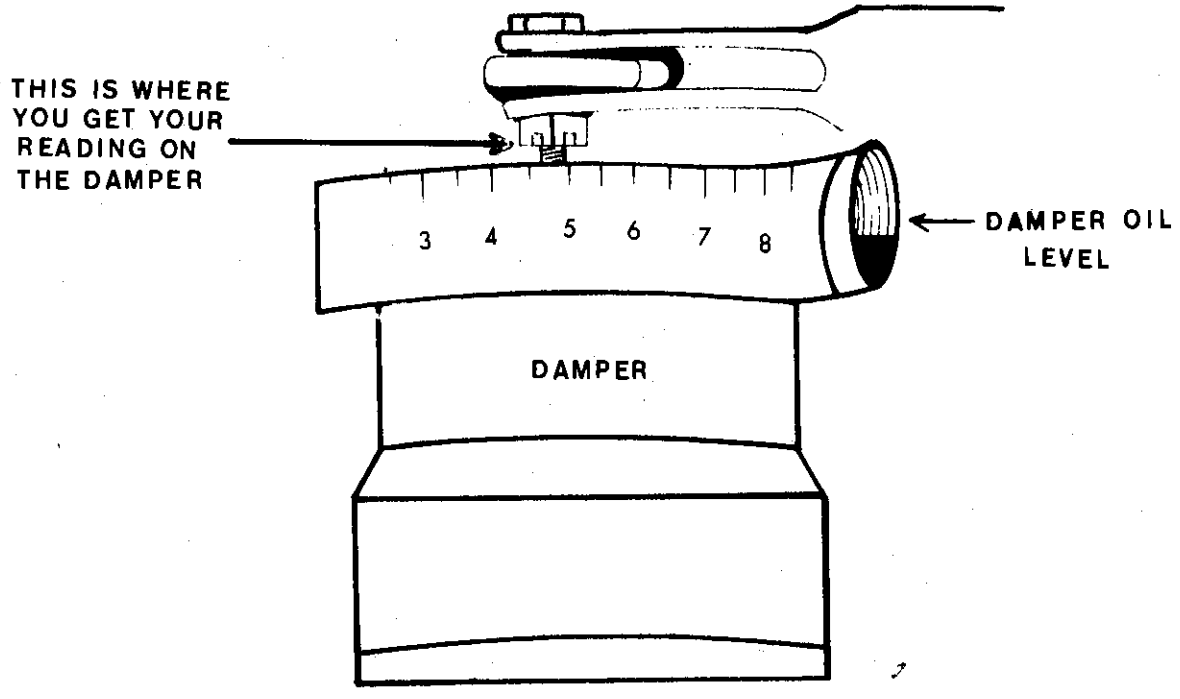
ANSWER: d. All of the above.

FRAME 5A 5A

Procedure for aligning blades

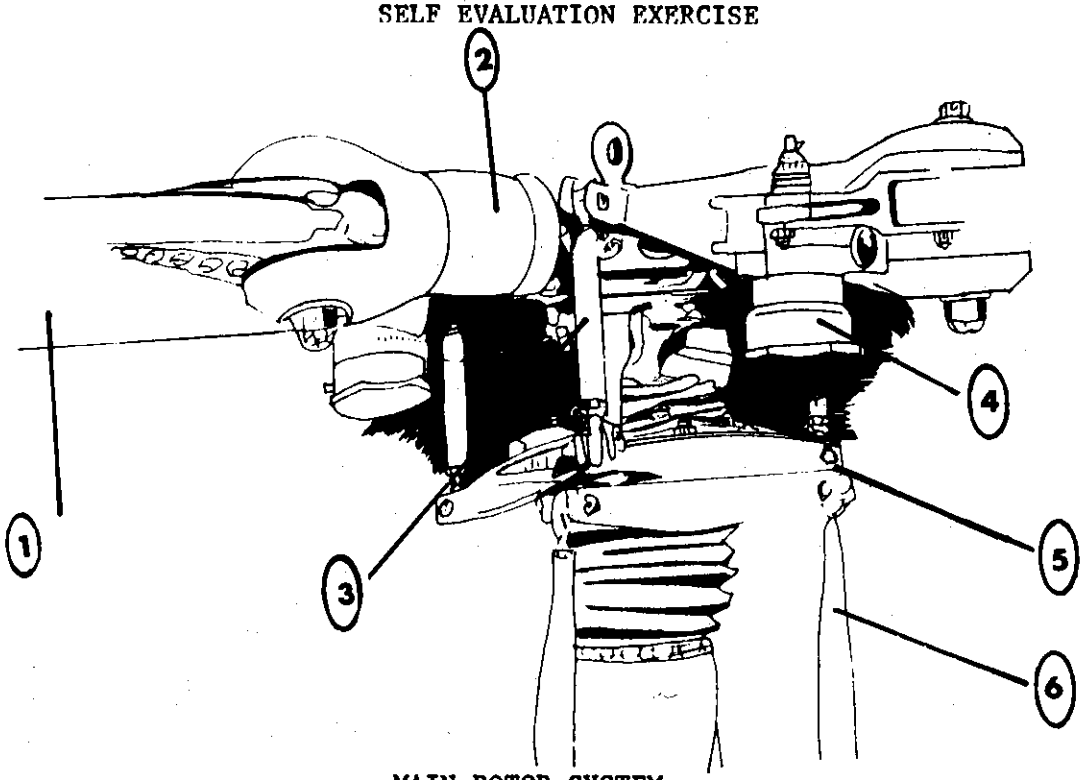
1. Hold tail rotor firmly.
2. Move the first main rotor blade to be adjusted in the opposite direction of rotation until it reaches its stop.
3. Continue holding the tail rotor and move the blade back in the direction of rotation until it reaches its stops.



4. Inspect to insure the center of the damper arm attachment bolt is between 4 1/2 and 5 position.
5. Repeat the same procedure for the other two blades.
6. If the blades will not align correctly, check with a tech inspector.

STOP. TURN TO PAGE 3 FOR FRAME 6

MAIN ROTOR AND TAIL ROTOR SYSTEMS
TH-55A
SELF EVALUATION EXERCISE



MAIN ROTOR SYSTEM

1. On preflight inspection of all three damper assemblies, you would look for
   a. safeties, torque on bolts, cracks.
   b. fluid levels, safeties, torque on bolts, cracks.
   c. blade alignment at 4 1/2 to 5, oil level, oil leaks, safeties, and any visual damage.
   d. visual damage, blade alignment at 3 1/2 to 5 torque on bolts, and safeties.

2. During preflight of your TH-55A, you find that one blade <u>will not</u> align properly. You would
   a. fly the helicopter, 2 out of 3 is enough.
   b. fly the aircraft, but don't practice autorotations.
   c. check with a tech inspector.
   d. record it in the log book, and maintenance personnel will repair it on your return.

3. In the picture on page ~~15~~ 14, locate the pitch control rod.

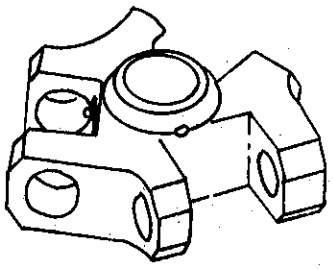
   a. 5

   b. 4

   c. 6

   (d) 3

4. This is a sketch of a



   (a.) hub assembly.

   b. swashplate

   c. pitch bearing assembly.

   d. control rod arm.

5. Main rotor blades are connected to the
   a. damper assembly and the hub.

   (b.) pitch bearing assembly and the damper assembly.

   c. control rod assembly and the swashplate.

   d. pitch bearing assembly and the swashplate.

6. In the picture on page ~~15~~ 14, #5 is the

   a. balance plate assembly.

   b. pitch change mixing plate.

   c. control rod arm.

   (d.) swashplate assembly.

7. In the picture on page ~~15~~ 14, #4 in the

   a. gust bumper assembly.

   b. pitch bearing assembly.

   (c.) damper assembly.

   d. hub oil reservoir.

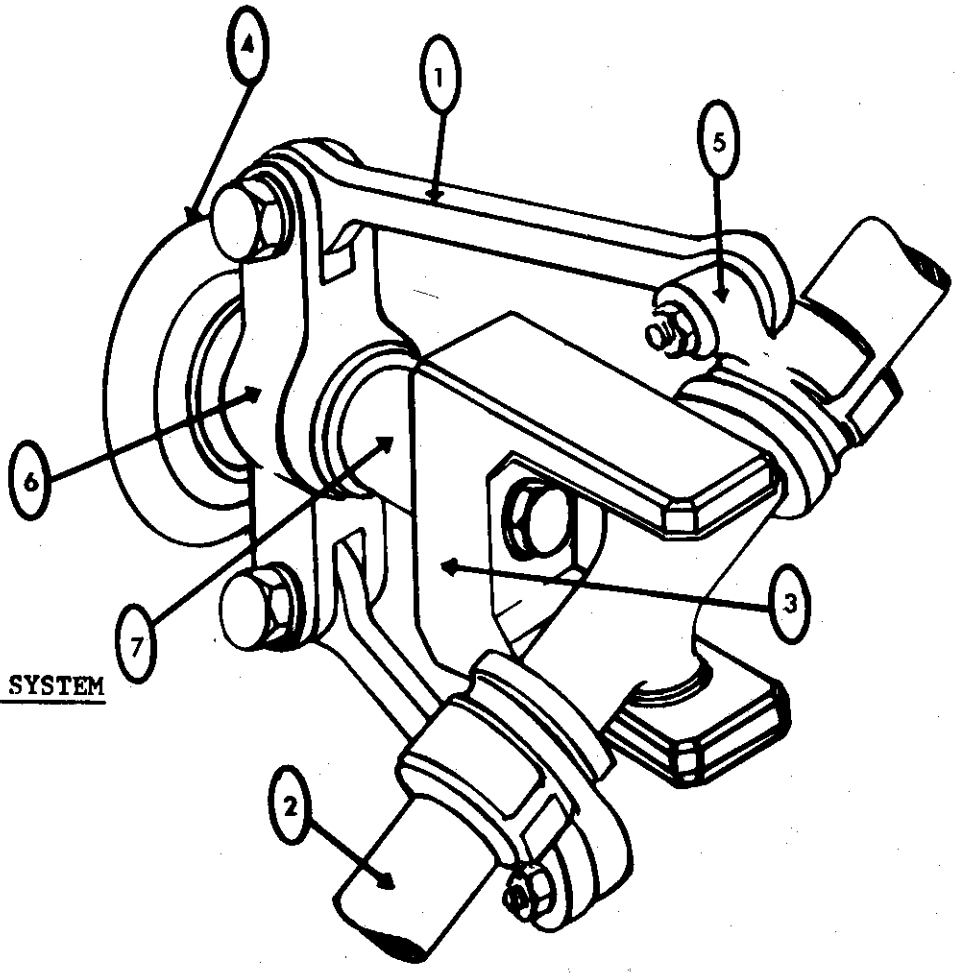
8. The pitch bearing assembly is number (Refer to picture, page ~~15.~~ 14)

a. 4

b. 3

c. 5

d. (2)



TAIL ROTOR SYSTEM

9. In the picture above, locate the tail rotor swashplate.

a. 1

b. (6)

c. 3

d. 5

10. What is number 1?

a. Swashplate

b. Damper control arm

c. Pitch control arm

(d) Pitch control link

11. What is number 5?

a. Boot

b. Pitch control arm

c. Blade control arm

d. Damper control arm

12. You would check the tail rotor and tail rotor transmission for

a. oil leaks, cracks, and dents.

b. oil levels, safeties, and cracks.

c. safeties, visual damage, oil level, and leaks.

d. visual damage, oil level, and oil leaks.

13. Locate the fork in the picture on page 14.

a. 7

b. 6

c. 3

d. 5

14. On preflight inspection of your TH-55A you find that one tail rotor blade has tape on the leading edge, and the other blade has none. You would

a. remove the tape.

b. have maintenance put tape on the blade that doesn't have any on it.

c. fly the aircraft but write it up in the -13.

d. fly the aircraft, you don't need tape on both blades.

15. When you align the blades on the TH-55A, you first move the blade

a. opposite the direction of rotation.

b. in the direction of rotation.

c. up and down.

d. you don't align the blades on this aircraft, maintenance does it.

MAIN ROTOR AND TAIL ROTOR SYSTEMS
TH-55A
KEY TO SELF EVALUATION EXERCISE

1. c blade alignment at 4 1/2 to 5, oil level, oil leaks, safeties, and visual damage

2. c check with a Tech inspector

3. d 3

4. a hub assembly

5. b pitch bearing assembly and the damper assembly

6. d swashplate assembly

7. c damper assembly

8. d. 2

9. b 6

10. d pitch control link

11. b pitch control arm

12. c safeties, visual damage, oil level, and leaks

13. c 3

14. b have maintenance put tape on the blade that doesn't have any on it.

15. a opposite the direction of rotation.

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