TECHNICAL MANUAL

AVIATION UNIT MAINTENANCE (AVUM) AND AVIATION INTERMEDIATE MAINTENANCE (AVIM) MANUAL

NONDESTRUCTIVE INSPECTION PROCEDURES

FOR

CH/MH-47 HELICOPTER SERIES

**HEADQUARTERS, DEPARTMENT OF THE ARMY
30 NOVEMBER 1996**

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TM 1-1520-253-23
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CHANGE

NO. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 17 JANUARY 2003

Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) Manual

NON-DESTRUCTIVE INSPECTION PROCEDURES FOR CH/MH-47 HELICOPTER SERIES

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A/B blank	A/B blank
iii and iv	iii and iv
2-31/(2-32 blank)	2-31 and 2-32
--------	2-33 and 2-34

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By Order of the Secretary of the Army:

ERIC K. SHINSEKI
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CHANGE

NO. 1

**U.S ARMY AVIATION
AND MISSILE COMMAND
REDSTONE ARSENAL, AL 35898-5230
25 MAY 2001**

Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) Manual

NON-DESTRUCTIVE INSPECTION PROCEDURES FOR CH/MH-47 HELICOPTER SERIES

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Remove pages	**Insert pages**
a through d	a through d
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i and ii	i and ii
1-1 through 1-4	1-1 through 1-4
1-21 and 1-22	1-21 and 1-22
1-37 and 1-38	1-37 and 1-38
1-39/(1-40 blank)	1-39/(1-40 blank
3-15 through 3-20	3-15 and 3-20
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6-19 and 6-12	6-19 and 6-20
B-1 and B-2	B-1 and B-2

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C1

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WARNING SUMMARY

Personnel performing inspections involving operations, procedures, and practices which are included or implied in this technical manual shall observe the following warnings.

WARNING

Highlights an operation, procedure, practice, condition, statement, etc., if not strictly observed, could result in injury to, or death of, personnel.

CAUTION

Highlights an operation, procedure, practice, condition, statement, etc., if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operation, procedure, condition, or statement.

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of nondestructive inspections.

GENERAL

Assurance compliance with safety requirements in Technical Manual, Nondestructive Inspection Methods, TM 55-1500-335-23.

Assure compliance with the safety and precautionary measures addressed in the applicable technical manuals listed in Table 1-1. Refer to these manuals for detailed information relating to safety considerations for the specific area or system on which the nondestructive inspection procedure is to be performed.

WARNING

Aircraft Grounding

All aircraft shall be grounded in accordance with FM 55-41 at all times.

WARNING

ACETONE

Acetone (Table 1-8) is flammable and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well-ventilated areas (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames, sparks, or other sources of ignition.

WARNING

ISOPROPYL ALCOHOL, TT-I-735

Isopropyl Alcohol (Table 1-8) is flammable and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated prolonged contact. Use only in well ventilated areas (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames, sparks, or other sources of ignition.

WARNING

DS-108

Use DS-108 (Table 1-8) is combustible, reactive with strong oxidizers, and toxic to eyes, skin and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well ventilated areas (or use approved respirator as determined by local safety/industrial hygiene personnel). Keep away from open flames, sparks, or other sources of ignition. Do not mix or cross-apply with other cleaners or chemicals.

WARNING

ELECTRON

Electron (Table 1-8) is combustible and toxic to eyes, skin and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well ventilated areas. Use approved organic vapor respirator, with dust and mist filter, if exposed to vapor mist. Keep away from open flames, sparks or other sources of ignition.

WARNING

POSITRON

Positron (Table 1-8) is combustible and toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in well-ventilated areas. Use approved organic vapor respirator, with dust and mist filter, if exposed to vapor mist. Keep away from open flames, sparks, or other sources of ignition.

WARNING

n-PROPYL BROMIDE

n-Propyl Bromide (Table 1-8) is toxic to eyes, skin, and respiratory tract. Wear protective gloves and goggles/face shield. Avoid repeated or prolonged contact. Use only in areas with adequate mechanical or local exhaust ventilation (or use approved respirator as determined by local safety/industrial hygiene personnel).

WARNING

Electrical Hazard

Assure that all safety precautions for using electrical equipment near aircraft fuel cells, oxygen systems, and stores have been met.

WARNING

Solvents

Most solvents are flammable. Keep away from heat and open flame. Vapors may be harmful. Use with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Avoid contact with skin and eyes. Do not take internally. Comply with pollution control rules concerning photochemically reactive solvents.

WARNING

Keep Away From Live Circuits

Inspection personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside equipment with a high voltage supply turned on. Under certain conditions, dangerous potentials may exist even when the power control is in the off position, due to charges retained by capacitors. To avoid injuries, always remove power. Discharge and ground a circuit before touching it. Make sure that equipment is grounded to same earth ground as aircraft.

WARNING

Electrical and Electronic Equipment

Do not wear rings, watches, or metal jewelry when working around electrical equipment.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation. Such information may be obtained from the Office of Bioenvironment Health or is listed in FM 21-11.

WARNING

Cleaning Solvents

- Those areas where skin and clothing come in contact with cleaning solvents should be washed thoroughtly and immediately after contact.
- Saturated clothing should be removed immediately.
- Areas where cleaning solvents are used should be adequately ventilated to keep vapors to a minimum.
- In case of contact with eyes, nose, or ears, flush them with generous quantities of water and then seek medical attention immediately.

WARNING

Foreign Object Damage

- Make sure area is clear of foreign objects before closing access doors, panels, and fairings.
- If area is not clear, damage to components or systems could result in personal injury or death.

WARNING

Lifting Components With Hoist

- Lifting or hoisting of components shall be done only by designated personnel.
- Before lifting, alert personal in immediate areas.
- Before lifting, balance the load.
- Do not stand under load while it is being moved from one area to another on a hoist.
- Do not stand under load to do inspection work.

WARNING

Compressed Air

- Do not use more than 30 PSIG compressed air for cleaning purposes.
- Use eye protection to prevent injury to personnel.

The following are warnings and cautions related to specific procedures that appear elsewhere in this publication. These are precautions that personnel must understand and apply during nondestructive inspections.

WARNING

To prevent injury to personnel and damage to helicopter, stand only on designated surfaces. These areas are reinforced to withstand frequent use and are treaded to prevent slipping. All other surfaces are NO STEP areas.

WARNING

Maintenance Platforms/Workstands

Use only appropriate platforms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopters in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

WARNING

Cleaning solvents P-D-680, Type II and MIL-C-38736 are flammable. Avoid eye and skin contact or breathing of vapors. Protective equipment consisting of goggles, gloves, and respiratory protection is required.

WARNING

Electrical equipment shall not be operated in areas where combustible gases or vapors may be present, unless the equipment is explosion-proof.

WARNING

- Black lights generate considerable heat during use. Extreme care must be exercised to prevent contacting the housing with any part of the body.
- To prevent injury to eyes, do not look directly into black light.
- Prolonged direct exposure of hands to the filtered black light's main beam may be harmful. Suitable gloves shall be worn when exposing hands to the main beam.

WARNING

Prolonged or repeated inhalation of vapors or powders may result in irritation of mucous membrane areas of the nose.

WARNING

Continual exposure to penetrant inspection material may cause skin irritation.

WARNING

Temperatures in excess of 49°C (120°F) may cause bursting of pressurized cans and injury to personnel.

WARNING

Volatile fumes may occur, creating both a fire and health hazard.

WARNING

Prolonged breathing of vapor from organic solvents, degreasers, or paint thinners is dangerous. Use respirators in confined areas per Occupational and Environmental Health Respiratory Protection Program (TB MED 502 (DLAM 1000. 2)). Have adequate ventilation. Avoid prolonged skin contact. Wear rubber gloves and goggles.

WARNING

Radiation Hazard

Assure compliance with all applicable safety precautions set forth in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) listed in Table 1-1. A hazard associated with exposure to ionizing radiation is that serious injury can be inflicted without pain, burning, or other sense of discomfort during the exposure period.

Radiation protection shall be utilized in accordance with AR40-14/DLAR 1000. 28.

CAUTION

Do not use cleaning solvent MIL-C-38736 on acrylic lacquer, as it may soften finish.

CAUTION

Penetrant-Emulsifier/Remover Combinations (lipophillic/hydrophilic) from one manufacturer may not be mixed or used in conjunction with materials from a different manufacturer.

CAUTION

Do not operate magnetic particle equipment within 36 inches of aircraft instruments.

CAUTION

Misinterpretation of indications can result in rejectable parts being accepted and acceptable parts being rejected. Only NDI personnel trained and qualified in accordance with applicable military standards and technical manuals shall perform and interpret nondestructive inspections.

LIST OF EFFECTIVE PAGES

Insert latest changed pages; dispose of superseded pages in accordance with regulations.

N0TE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original	30 November 1996
Change 1	25 May 2001
Change 2	17 January 2003

Page No.	*Change No.
Cover	0
a through c	1
d through f	0
A	2
B blank Added	1
i	1
ii	0
iii	2
iv through ix	0
x blank	0
1-1	0
1-2 and 1-3	1
1-4 through 1-20	0
1-21	1
1-22 through 1-37	0
1-38 and 1-39	1
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2-1 through 2-30	0
2-31 and 2-32	2
2-33 and 2-34 Added	2
3-1 through 3-15	0
3-16 through 3-20	1
3-21 through 3-38	0
3-39	1
3-40 and 3-41	0
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4-1 through 4-55	0
4-56 blank	0
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5-18	1
5-19	0
5-20	1
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6-22 blank	0
A-1 through A-5	0
A-6 blank	0
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C-1 and C-2	0
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*Zero in this column indicates an original page.

TECHNICAL MANUAL
No. 1-1520-253-23

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D.C. 30 November 1996

Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) Manual
Nondestructive Inspection Procedures
for
CH/MH47 Helicopter Series

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, U. S. Army Aviation and Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Boulevard, St.
Louis, MO 63120-1798. A reply will be furnished to you.

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SECTION I

INTRODUCTION

1. INTRODUCTION.

a. This manual contains instructions for accomplishing Nondestructive Inspection (NDI) of the CH/MH-47 helicopters at the AVUM and AVIM levels. The procedures described in this manual are intended to provide instructions for the NDI of locations where service defects would prevent items from performing their designated functions, and of components for serviceability. These procedures were developed through review of CH/MH-47 Technical Manual inspection requirements. The goal is to upgrade these requirements wherever possible using NDI methodology to improve inspection quality, decrease inspection time, and increase systems operational readiness. Other factors involved were maintenance engineering analysis, experience, and comparison with similar installations. Procedures shall be reviewed and changes and additions made during the service life of the equipment by continually evaluating the following: performance of the equipment, results of scheduled inspections, and thorough study of failure data. Local conditions, such as special utilization or climatic environment, may dictate more detailed inspections. Commanders and their maintenance officers are expected to exercise their prerogative to increase the frequency and scope of any inspection as required.

b. This manual may pertain to part, or all types and series, of a model, and may, therefore, contain requirements applicable to specific equipment that is not installed on an individual model.

When this situation is encountered, those requirements that are not applicable should be disregarded.

c. This manual does not contain inspection level or frequency, acceptance and rejection limitations, or instructions for correcting defective conditions. Inspection levels and frequency are provided in the inspection requirements manuals. Detailed acceptance and rejection criteria and instructions for correcting defective conditions are provided in appropriate maintenance manuals and are, therefore, not contained in this manual. Decisions regarding the serviceability of components properly belong with maintenance technicians trained, skilled, and experienced in their particular specialty, such as airframe, hydraulic, or propulsion. Also, it would duplicate existing information and make the task of incorporating the numerous changes to inspection frequency and repair instructions impractical.

d. The inspection requirements are stated in such a manner as to address the following: (1) What part or area is to be inspected? (2) What conditions are to be sought? (3) What NDI method is to be used? (4) How is the method to be performed? In scope, the inspection procedures are designed to direct attention of maintenance personnel to components and areas where service defects can occur. The procedures also provide detailed instructions on the application of NDI in an effort to ensure the serviceability of these areas.

e. Nondestructive inspection methods require application by trained, experienced, and proficient technicians. This manual provides detailed procedures for the application of nondestructive methods to inspect specific areas or locations. However, it must be emphasized that the reliability of the inspection depends upon the proper evaluation of the results obtained from the inspection equipment.

f. While using this manual, such adjectives as left and right, upper and lower, front and rear, forward and aft, and clockwise and counterclockwise refer to the helicopter as viewed from the rear (aft), looking forward.

g. Changes and supplements to this manual will be published when necessary to add, delete, or change the scope of requirements. Such changes will be based on factual data accumulated as a result of maintenance experience with the equipment. Suggested new or revised field developed inspection procedures or changes to this manual are encouraged and should be made by submitting a DA Form 2028. Mail to: U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL. 35898-5230.

h. These NDI procedures are directive in nature and deviation without prior approval is limited to compensation for differences in equipment output. Equipment settings, when given, are reference points only, due to the widely varying outputs from different inspection equipment. The condition that must be satisfied for accurate inspection is that the inspection equipment be adjusted to obtain the specified response from the setup or defect standard or the specified density reading on radiographic film. Trained NDI technicians are qualified to make these adjustments.

1.1 GENERAL INFORMATION.

CAUTION

Misinterpretation of indications can result in rejectable parts being accepted and acceptable parts being rejected. Only NDI personnel trained and qualified in accordance with applicable military standards and technical manuals shall perform and interpret nondestructive inspections.

a. This manual provides necessary information to enable qualified personnel to perform NDI on CH/MH-47 helicopter series. The selection of components in this manual is based on a review of applicable technical manuals listed in Table 1-1. All existing NDI callouts were updated. New NDI procedures were developed for those parts that required check, inspect, or any other NDI related actions. Section I of this manual contains a list of special terms, abbreviations, acronyms, information on how to use the manual, use of NDI symbols, and a list of publications. Section I also contains general information on the CH/MH-47 helicopter series, including descriptive data, access panels, major assemblies, stops, handholds, walkways, various NDI method descriptions, and rules of safety to be observed during nondestructive inspections.

b. Additional information on inspection methods can be found in the Technical Manual, Nondestructive Inspection Methods, TM 55-1500-335-23. Detailed inspection procedures for each main aircraft group are given in Sections II through VI of this manual.

Table 1-1. Supporting Technical Documentation

Document	Description
AR40-14/DLAR 1000.28	Medical Services, Control, and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials
ASTM 1417	Inspection, Liquid Penetrant
ASTM-E1444	Standard Practice for Magnetic Particle Inspection
DA PAM 738-751	Functional Users Manual for the Army Maintenance Management System – Aviation (TAMMS-A)
DOD 6050.5 (HMIS)	Hazardous Materials Information System (HMIS)
FM 21-11	First Aid for Soldiers
MIL-STD-410	Nondestructive Testing, Personnel Qualification, and Certification
MIL-STD-453	Inspection, Radiographic
MIL-STD-2154	Inspection, Ultrasonic, Wrought Metals, Process for
TB MED 502 (DLAM 1000.2)	Occupational and Environmental Health Respiratory Protection Program
TB MED 251	Surgeon General's Hearing Conservation Criteria
TM 55-1500-335-23	Nondestructive Inspection Methods
TM 1-1500-344-23	Aircraft Weapons Systems Cleaning and Corrosion Control
TM 55-1520-240-23 (Series)	Aviation Unit and Aviation Intermediate Maintenance Manual for CH/MH-47 Helicopters
Volume I Chapter 1	 Introduction and Helicopter General
Volume II Chapter 2	 Airframe
Volume III Chapter 3 Chapter 4	 Alighting Gear Power Plant
Volume IV Chapter 5	 Rotor System

Table 1-1. Supporting Technical Documentation - Continued

Document	Description
Volume V Chapter 6	 Drive System
Volume VI Chapter 7	 Hydraulic Systems
Volume IX Chapter 11	 Flight Control System
TM 55-2840-254-23 (series)	Aviation Unit and Aviation Intermediate Maintenance Manual Engine, Gas Turbine, Model T55 Engines

1.1.1 Special Terms. Abbreviations. and Acronyms.

AC	Alternating Current
ADF	Automatic Direction Finder
APU	Auxiliary Power Unit
AVIM	Aviation Intermediate Maintenance
AVUM	Aviation Unit Maintenance
BL	Butt Line
BT	Bond Testing Method
C	Celsius
CL	Center Line
CRT	Cathode Ray Tube
DAC	Distance Amplitude Correction
DC	Direct Current
EDM	Electrically Discharged Machined
ET	Eddy Current Method
F	Fahrenheit
FS	Fuselage Station
FSH	Full Screen Height
FWD	Forward
HdB	Horizontal Decibels (Gain)
H Pos	Horizontal Position
HPF	High Pass Filter
ILCA	Integrated Lower Control Actuator
KHz	Kilohertz
LPF	Low Pass Filter

MHz	Megahertz
MIA	Mechanical Impedance Analysis
MT	Magnetic Particle Method
NDI	Nondestructive Inspection
P/N	Part Number
PE	Pulse Echo
PSI	Pounds Per Square Inch
PSIG	Pounds Per Square Inch Gauged
PT	Fluorescent Penetrant Method
ROT	Rotation
RT	Radiographic Method
STA	Station
SYNC	Synchronization
TM	Technical Manual
UT	Ultrasonic Method
VdB	Vertical Decibels (Gain)
VEL	Velocity
V Pos	Vertical Position
WL	Water Line

1.1.2 How to Use This Manual. This manual is divided into six sections as follows:

I Introduction
II Rotor Group
III Transmission/Drivetrain Group
IV Airframe and Landing Gear Group
V Engine Group
VI Flight Control Group

Section I contains the introduction and general information pertaining to the helicopter and Nondestructive Inspections. Sections II through VI contain detailed inspection procedures for specific items located within each group. In general, inspection items are grouped with respect to part location and function. To use the manual, it is necessary to know the group, the model CH/MH-47, and name of the inspection item.

When the group and part name are known:

a. Turn to the appropriate section of the manual covering that group. Refer to the group inspection index table at the beginning of the section. If the item is listed, the corresponding paragraph and figure number will be referenced in the table.

b. Turn to referenced inspection paragraph and figure for detailed inspection information.

1.1.3 Inspection item Code. When inspection items, due to their proximity, are grouped in. one illustration, the figure will be indexed using the inspection item code. This code consists of digits separated by dashes.

In the text, the inspection item is identified as follows:

a. The first digit refers to the section of the manual in which the item appears. Example: Paragraph 2.5 is found in Section II.

b. The second digit refers to the item number or order that the part procedure occurs in the manual section. Example: Paragraph 2. 5 refers to item or procedure 5.

1.1.4 Use of NDI Symbols. Nondestructive Inspection symbols and their application to detail inspection figures are shown in Figure 1-1. In the main figures of each section, NDI symbols representing the type of inspection associated with a part will appear next to the item number on the figure.

1.1.5 Use of Reference Publications. This manual is applicable to the CH/MH-47 helicopter series.

The technician shall be responsible for using the applicable referenced TM for the helicopter being inspected.

1.1.6 Related Publications. Supporting TMs and reference materials are listed in Table 1-1.

1.1.7 Description. The CH/MH-47 is a tandem rotor helicopter. It is powered by two T55 engines in nacelles on the aft fuselage and pylon section of the helicopter. Torque from the engines is transmitted to the rotary-wing blades through a series of mechanical transmissions. These transmissions are interconnected by a system of synchronizing driveshafts. Each rotor system consists of a rotary-wing head and three rotary-wing blades. Rotor systems are controllable from the cockpit by both pilot and copilot through dual, hydraulic-boosted control systems. The helicopter is equipped with four landing < gear, with dual wheels on each forward landing gear, and a single wheel on each aft landing gear.

Each aft gear can swivel 360 degrees. Power steering is connected to the right aft gear. A hydraulically operated cargo ramp and door is incorporated in the aft end of the fuselage. A hydraulically operated rescue and cargo handling winch is located in the forward cabin area.

1.1.8 Configuration. The general configuration of the CH/MH-47 helicopter series is shown in Figure 1-2.

1.1.9 Stations. Water Lines. and Butt Lines (Figure 1-3). Stations, water lines, and butt lines provide an accurate method of locating or installing parts and/or equipment in the airframe.

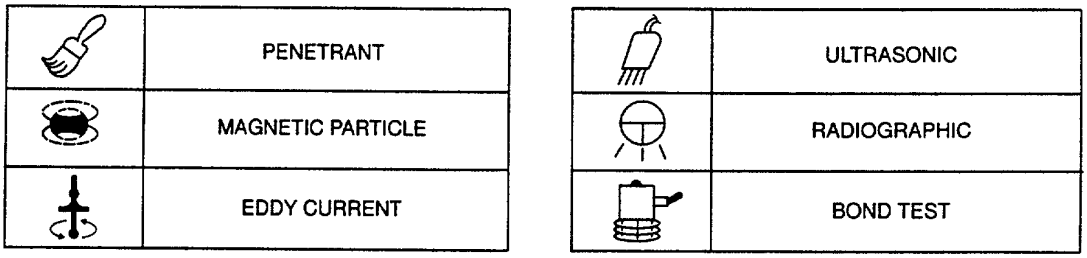
a. CH/MH-47 helicopter length is divided into stations (STA) 1 inch apart along the longitudinal plane of the helicopter. They begin with station 21. 50 at the most forward part of the nose section, and end at station 630. 50 at the aft end of the fuselage.

b. Helicopter height is divided into water lines (WL) 1 inch apart along the vertical plane of the helicopter. Water line 0.0 is marked at each side of the cabin along a beam below the windows.

c. Helicopter butt lines (BL) are 1 inch apart starting at the helicopter center line (CL) and extending outward, left and right, to the extreme outsides of the fuel tanks.

METHOD OF INSPECTION

USED IN ILLUSTRATIONS TO IDENTIFY THE TYPE
OF INSPECTION METHODS BEING ILLUSTRATED



SUPPLEMENTAL SYMBOLS

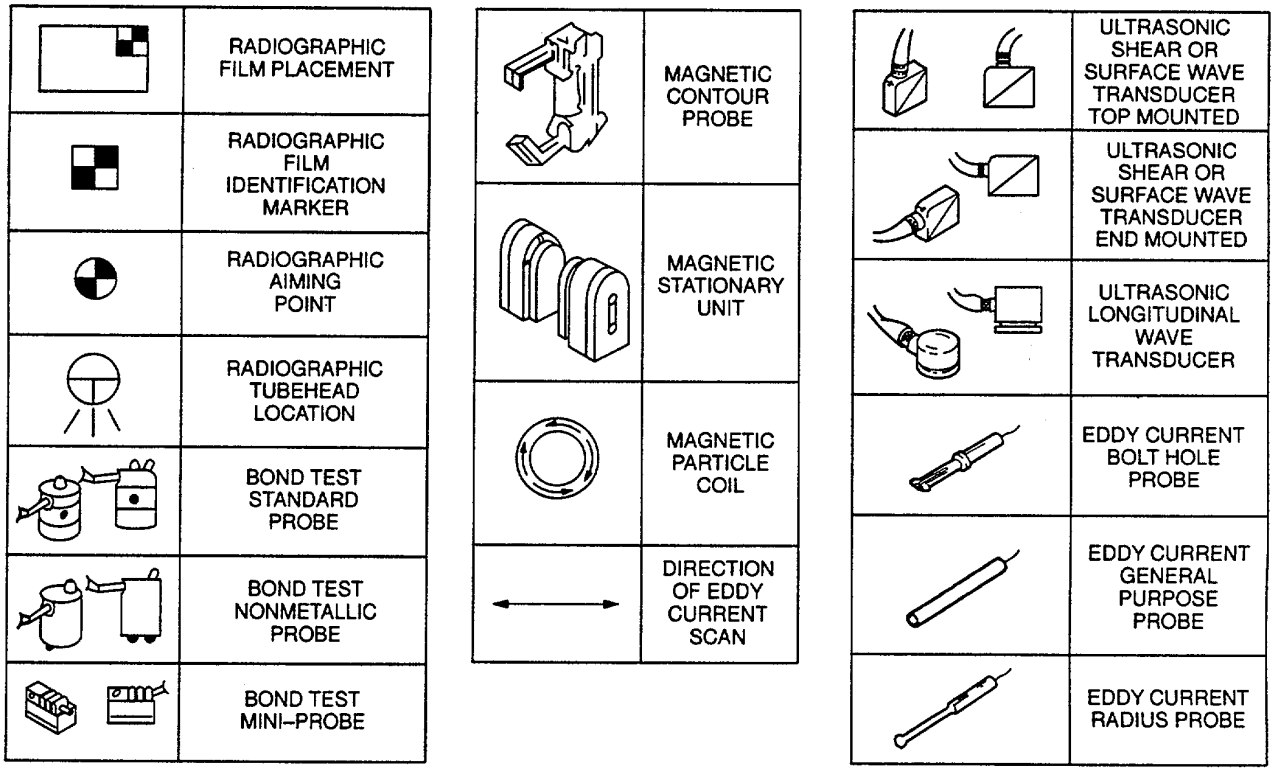


Figure 1-1. Nondestructive Inspection Symbols

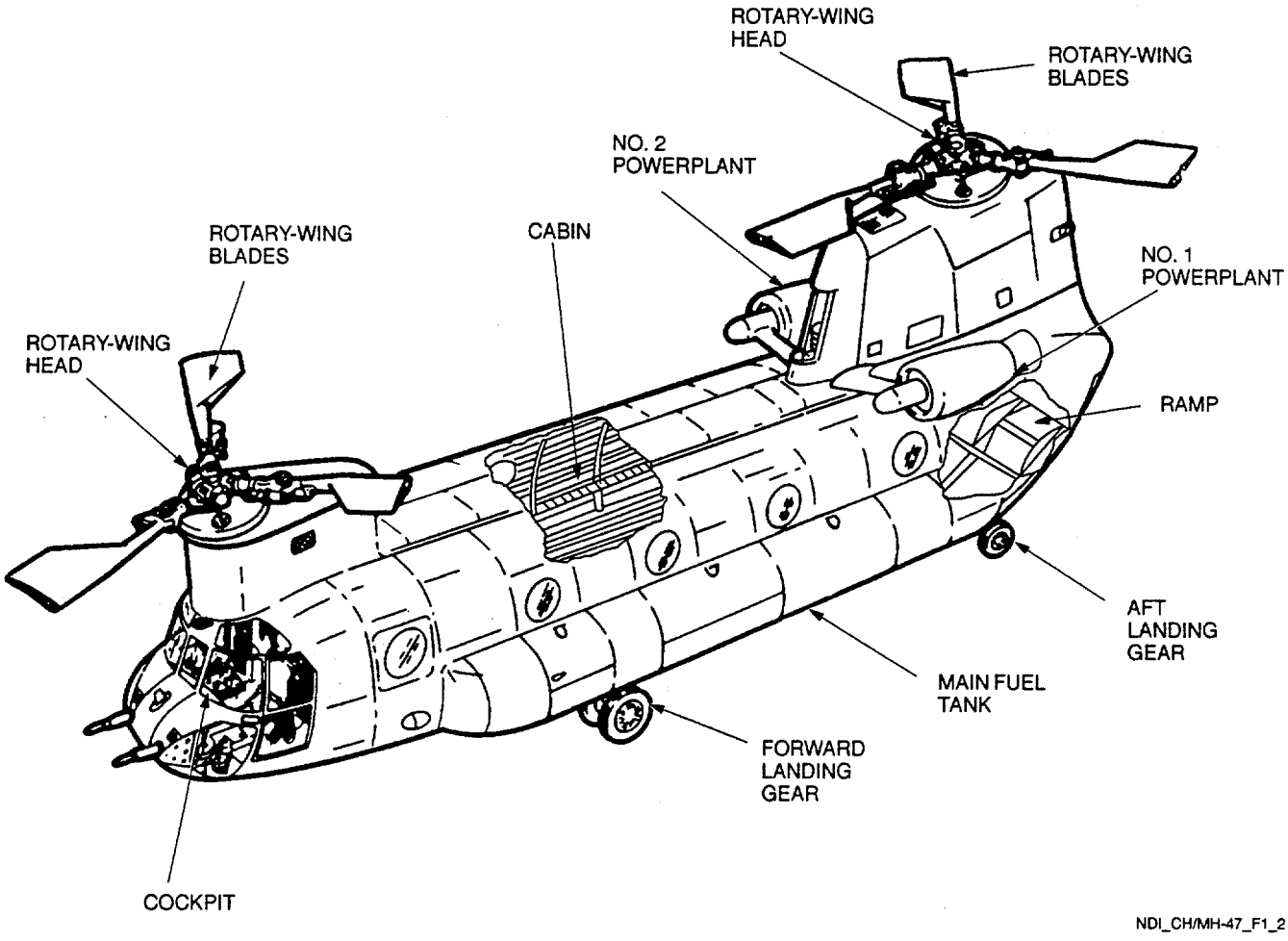


Figure 1-2. General Configuration of CH/MH-47 Helicopter

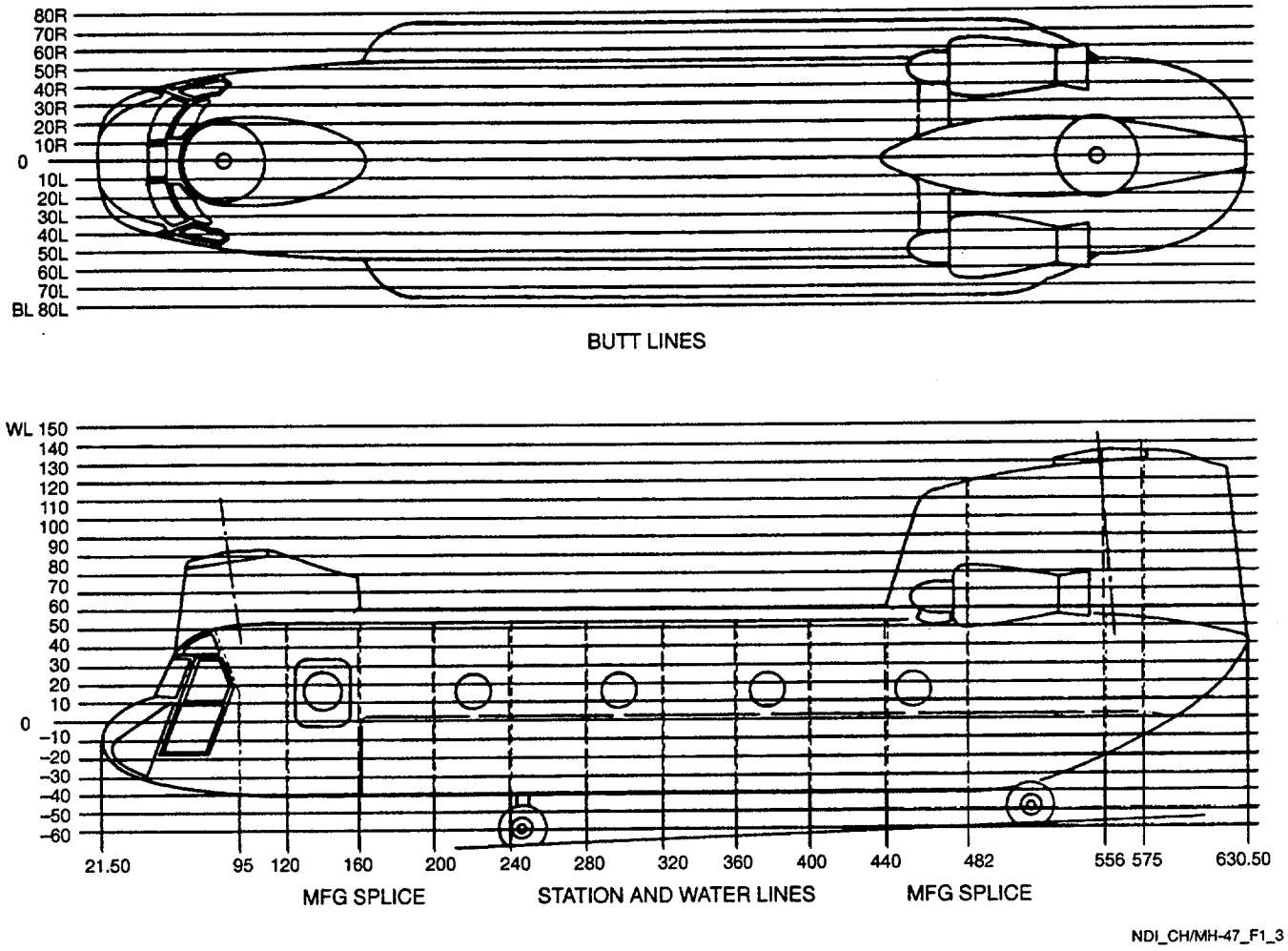


Figure 1-3. Stations, Water Lines, and Butt Lines

1.2 TYPE OF CONSTRUCTION.

NOTE

The following paragraphs describe the type of construction and materials used in the manufacture of the major CH/MH-47 helicopter components.

1.2.1 Rotor Group. The rotary-wing heads transmit torque from the forward and aft transmission rotor shafts to the rotary-wing blades. Each rotary-wing head and controls consist of a rotor hub, three pitch-varying housings, three pitch-varying shafts with droop stops, three shock absorbers, two swashplates, three pitch links, a drive collar and drive arms, and a weather protective cover. The rotary-wing controls transmit cockpit control movements to the blades.

Three rotary-wing blades are attached to the forward and aft rotary-wing heads. The aft blades turn clockwise and the forward blades turn counterclockwise, when viewed from above. The rotary-wing blades are composite structures. The spar is constructed from torsion straps consisting of continuous fiberglass elements that begin at the blade tip, wrap around the vertical pin bore, and return to the tip. The straps are formed in a D-shape and wrapped with several layers of cross-ply fiberglass. The leading edge of the spar is formed around a permanent balance weight with tubes at the tip of the spar for tracking weights. The titanium leading edge nose cap is bonded to the spar with a nickel erosion cap bonded over the outboard 54 inches. The blade body is Nomex honeycomb core covered by laminated cross-ply fiberglass skins. The skins and core are bonded to the trailing edge of the spar and a wedge of fiberglass closes out the entire trailing edge. Wire mesh is installed on the surface of the skin for lightning protection, reaching to the trailing edge of the blade at the trim tab and at the tip. Kevlar filament windings secure the shock absorber bracket to the spar. Replaceable composite sleeves line the vertical pin bores of the blade.

1.2.2 Transmission/Drivetrain Group. Five transmissions make up the transmission group. An engine transmission is mounted on the front of each of the two engines. A splined quill shaft transmits torque from the engines to the engine transmissions. Output torque from each engine transmission is delivered through an engine driveshaft to the combining transmission which, in turn, transmits it through driveshafts to the forward and aft transmissions. The forward and aft transmissions drive vertical rotor shafts that are splined to the rotary-wing heads to drive the rotor blades.

1.2.3 Airframe and Landing Gear Group. Made up of sections and assemblies as follows:

a. The cockpit section contains the pilot and copilot seats and controls. Three dynamic absorbers are mounted in the cockpit; one in the nose and two below the floor under the seats. The absorbers automatically adjust to lower vibrations in the helicopter. A jettisonable door is next to each pilot's seat with a main personnel door at the aft right side of the cockpit section.

b. The cabin fuselage section can be fitted to carry troops, litters, cargo, or any combination of the three. The cabin floor consists of 12 removable panels made of riveted sections of magnesium alloy. These panels are set between five tie-down beams and tie-down rings installed on each tie-down beam. A rescue hatch door of sandwich honeycomb construction is in the center of the floor. A tunnel along the top of the cabin houses the driveshafting and flight controls. The tunnel consists of six honeycomb covers that hinge open for access to the housed components. A walkway at the right of the tunnel runs the length of the cabin. External pods on either side of the fuselage section contain fuel tanks. The forward end of each pod houses components of both the electronic and electrical systems. A hinged panel in each pod provides access to the forward landing gear.

c. The aft fuselage and pylon sections together contain the aft transmission and the auxiliary power unit. The engines are mounted inside nacelles at the base of the pylon on each side of the / fuselage. A hydraulically operated cargo ramp is at the aft end of the fuselage section. A jettisonable door hatch is in the center of the cargo door. The pylon houses the aft transmission, rotor shaft, and the combining transmission. The leading edge of the pylon is hinged on each side. It opens at the center line for access to the combining transmission.

d. The landing gear consists of four assemblies: two forward and two aft. The two forward assemblies have dual wheels. Each aft assembly has a full-swivel single wheel. The aft wheels can be locked in the trailing position. A power steering unit is installed on the aft right landing gear assembly.

1.2.4 Engine Group. There are two gas turbine, model T55 engines, one mounted externally on each side of the pylon. They supply torque to power the drive and rotor systems. Fuel, hydraulic, and electrical connections to the powerplant have quick-disconnect couplings at the fuselage for ease in changing powerplants. The powerplant is started by a hydraulically powered starter. The starter provides power to motor the seven-stage compressor section. Air is inducted at the front of the engine, compressed, mixed with fuel, and ignited in the combustion chamber. Combustion gases drive four rotors. The first two rotors drive the seven-stage compressor turbine after the engine is started. The last two rotors drive the power turbine output shaft with the final power output taken off the front of the engine by the engine transmission.

1.2.5 Flight Control Group. The flight control system is electrohydraulically operated and powered by two independent hydraulic boost systems. Control inputs from the cockpit are transmitted through mechanical linkage to the Integrated Lower Control Actuator (ILCA). The ILCA then transmits individual control motions to the first and second stage mixing units. The mixed outputs are then transmitted through a series of push-pull tubes to the upper dual-boost actuators attached to the forward and aft swashplates. The flight control system is divided into seven main sections:

- Cockpit controls
- Closet controls between stations 95 and 120
- First and second stage mixing controls
- Forward upper controls
- Tunnel controls
- Aft fuselage controls
- Aft upper controls

1.2.6 Access Panels. Doors. and Fairings. Access panels, doors, and fairings consist of panels, doors, fairings, covers, baffles, and work platforms. Inspection of the helicopter and its components can be done through principal access panels. Principal access and inspection openings are shown in Figure 1-4 and listed in Table 1-2.

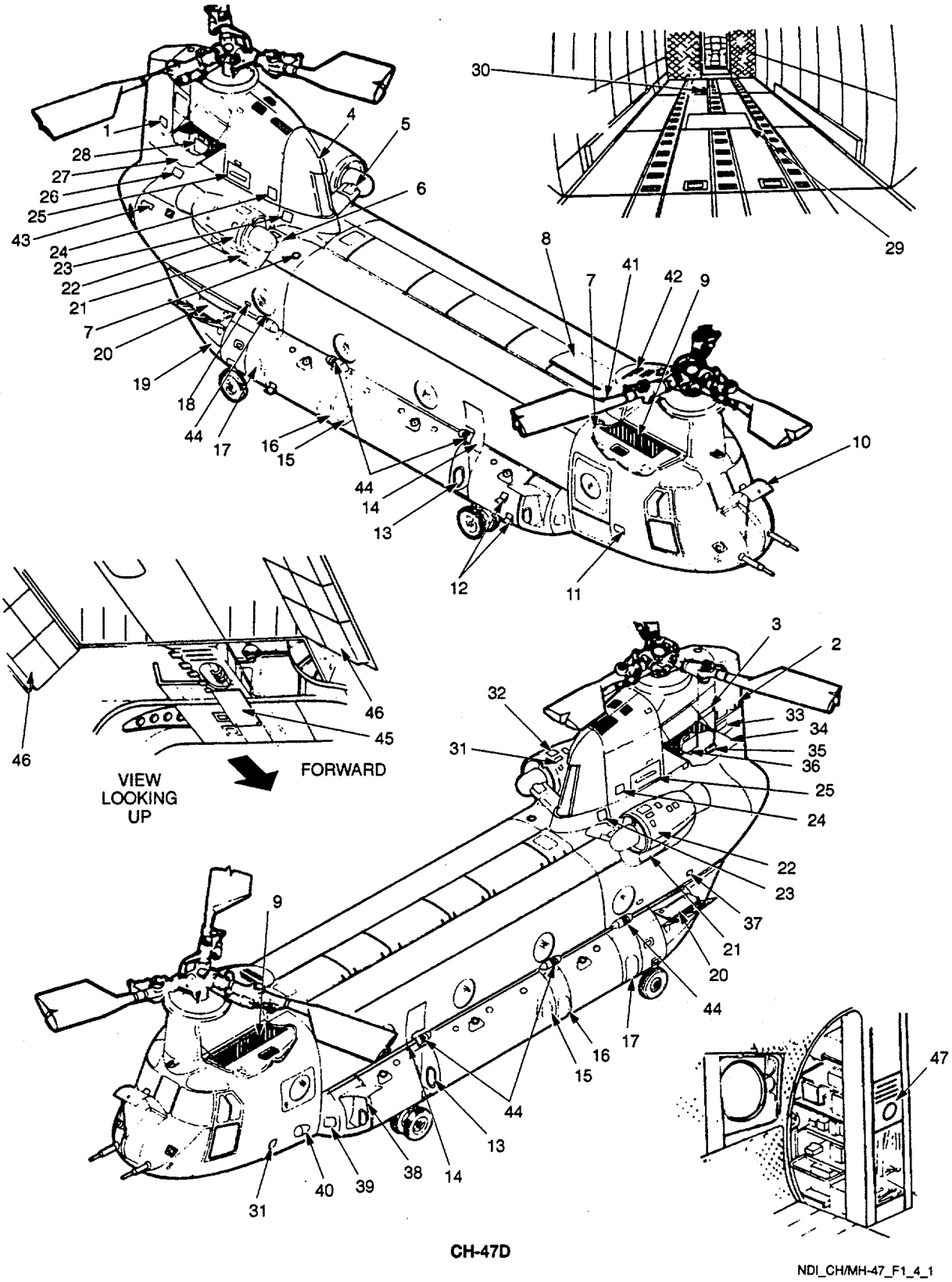


Figure 1-4. Access Panels, Doors, and Fairings (Sheet 1 of 2)

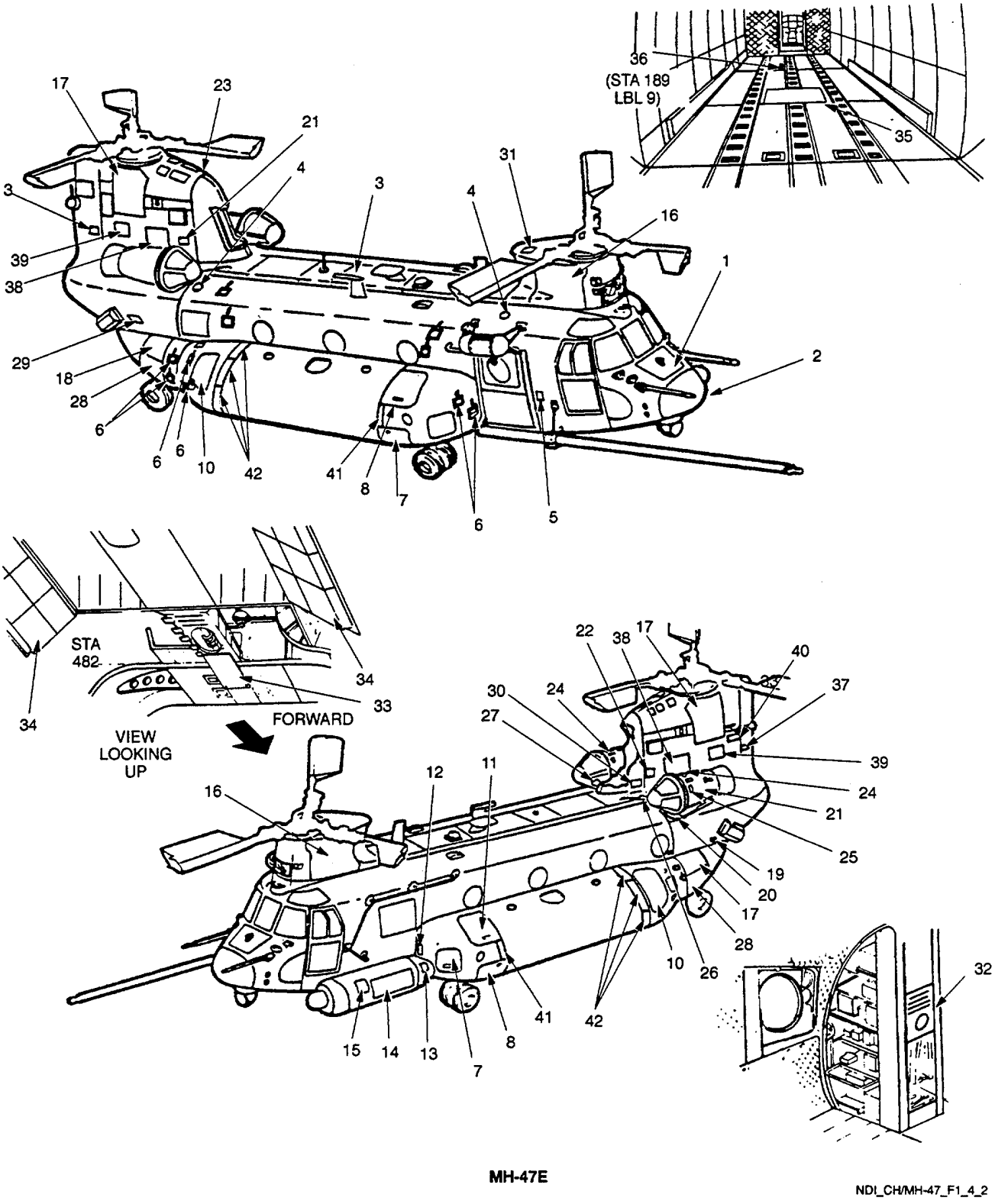


Figure 1-4. Access Panels, Doors, and Fairings (Sheet 2 of 2)

Table 1-2. Access Panels, Doors, and Fairings

Item No.	Item	Access To
	CH-47D	
1	Panel	Pylon mounting bolts
2	Door	Radar warning antenna
3	Panel	Radar warning receiver
4	Hinged Fairing	Pylon combiner transmission
5	Hinged Panel	Engine driveshaft
6	Hinged Panel	Engine driveshaft
7	Panels	Hoisting unit installation
8	Covers	Cabin crown tunnel
9	Work Platform	Forward transmission
10	Door	Nose compartment
11	Door	Forward transmission
12	Foldout Steps	Fuselage
13	Panel	Forward fuel boost pump
14	Panel	Forward landing gear
15	Panel	Aft fuel boost pump
16	Panel	Center pod
17	Panel	Aft pod
18	Door	Aft interphone jack and ramp control
19	Panel	Aft landing gear
20	Work Platforms	Engine (powerplant)
21	Lower Door	Engine
22	Upper Cover	Engine
23	Door	Combiner transmission
24	Door	Hydraulic module inspection
25	Cover	Reservoir cooler
26	Door	Generator
27	Work Platform	Pylon, aft transmission, right side
28	Cover	Aft transmission
29	Door	Rescue hatch (cabin floor)
30	Panel	ADF antenna amplifier
31	Door	Engine oil quantity indicator
32	Door	Engine oil filter
33	Panel	Pylon mounting bolts
34	Work Platform	Pylon, aft transmission, left side
35	Panel	Utility hydraulic pump
36	Cover	Aft transmission
37	Panel	APU emergency fluid shutoff
38	Door	Electrical compartment

Table 1-2. Access Panels, Doors, and Fairings - Continued

Item No.	Item	Access To
39	Door	External power receptacles
40	Cover	Hydraulic ground test
41	Cover	Forward transmission hydraulic module
42	Door	Forward transmission hydraulic module
43	Panel	Aft ground test connection
44	Panel	Fuel tank vent
45	Baffle	Aft driveshafting
46	Baffle	Aft transmission
47	Panel	Flight controls closet
	MH-47E	
1	Door	Nose absorber
2	Radome	Nose compartment
3	Covers	Cabin crown tunnel
4	Panels	Hosting unit installation
5	Door	Forward interphone jack
6	Steps	Fuselage
7	Door	Electrical compartment
8	Panel	Forward landing gear fuel lines, forward pod TFIS
9	Panel	Pressure refueling system control
10	Panel	Aft pod fairing access Aft pod IFIS
11	Panel	Avionics compartment
12	Door	External power receptacle
13	Door	Access hyd.ground test
14	Door	Access AN/APQ 174, CN-165/ASN
15	Door	Access emergency jettison
16	Work Platform	Forward transmission
17	Work Platform	Pylon, aft transmission
18	Work Platform	Engine (powerplant)
19	Panel	APU emergency fluid shut-off
20	Lower Door	Engine
21	Upper Door	Engine
22	Door	Hyd.module inspection
23	Hinged Fairing	Pylon combiner transmission
24	Door	Engine oil filter
25	Door	Engine oil qty.ind.
26	Hinged Panel	Engine driveshaft
27	Hinged Panel	Engine driveshaft

Table 1-2. Access Panels, Doors, and Fairings - Continued

Item No.	Item	Access To
28	Panel	Aft landing gear
29	Panel	Aft ground test connections
30	Door	Combiner transmission
31	Door	Forward transmission hyd.module
32	Panel	Flight controls closet
33	Cover	Aft driveshafting
34	Baffle	Aft transmission
35	Door	Rescue hatch
36	Panel	ADF antenna amplifier
37	Door	Aft pylon mounting bolts
38	Door	Hyd bay access
39	Door	Aft transmission and blower
40	Door	Radar warning receiver
41	Cover	Area between forward pod fairing and fuel pod
42	Covers	Area between fuel pod and aft pod fairing

WARNING

To prevent injury to personnel and damage to helicopter, stand only on designated surfaces. These areas are reinforced to withstand frequent use and are treaded to prevent slipping. All other surfaces are NO STEP areas.

1.2.7 Steps. Handholds and Walkways Steps, handholds, and walkways aid in performing maintenance, inspections, and servicing on helicopters.

1.3. MARKING AND/OR RECORDING OF INSPECTION RESULTS.

NOTE

Only approved marking pencils are to be used for temporary marking of indications found during an NDI inspection. The color of the marking shall contrast with the color of the part.

a. Wipe the area to be marked with low-lint cleaning cloth, MIL-C-85043.

b. Mark surface with appropriate color aircraft marking pencil, MIL-P-83953, using a light touch.

c. Remove markings as soon as there is no further need for them with a low-lint cloth, MIL-C-85043, dampened with tap water. It is allowable for a shadow of the marking to remain on the surfaces after removal.

WARNING

Cleaning solvents P-D-680, Type II and MIL-C-38736 are flammable. Avoid eye and skin contact or breathing of vapors. Protective equipment consisting of goggles, gloves, and respiratory protection is required.

CAUTION

Do not use cleaning solvent MIL-C-38736 on acrylic lacquer, as it may soften finish.

d. Dry-cleaning solvent, P-D-680, Type II shall be used for removal of markings on acrylic lacquer surfaces.

e. Record inspection results as required by the applicable technical manuals listed in Table 1-1.

1.4 NONDESTRUCTIVE INSPECTION METHODS.

1.4.1 Purpose of Nondestructive Inspection (NDI). Methods used in NDI are those that may be applied to inspect a structure or component to determine its ability to perform its intended function without damaging or causing any change in the characteristics of the structure or component. During manufacture, aircraft components are given in-process and final inspections. The most commonly used methods are magnetic particle and liquid penetrant because these two methods are bulk processes that provide 100 percent inspection coverage and they are highly effective. It is unusual, but possible, for NDI personnel to locate defects that are inherent (associated with the production of the material) or related to the manufacturing operations. It follows that nearly all maintenance nondestructive inspection requirements are to locate defects that have developed during service (i.e., corrosion and corrosion induced cracking, fatigue cracks, and defects resulting from mechanical damage, improper maintenance, or inappropriate use). It is important that NDI personnel shall be able to distinguish between inherent or in-service defects. A general knowledge of typical sites for in-service defect occurrence and specific knowledge of the mode and location of previous cracking problems for a particular part is relevant. This knowledge will assure that the crack prone areas are identified for inspection and time will not be wasted inspecting areas not subject to in-service cracking.

This manual summarizes the steps necessary to perform satisfactory inspections. It includes the preparation of the helicopter, the inspection area for NDI, safety rules to be observed, highlights of each inspection method, and specific safety precautions for each of these methods. For a detailed description of each method and its application, refer to the Technical Manual, Nondestructive Inspection Methods, TM 55-1500-335-23. Specific procedures peculiar to each part being inspected will be included in the discussion of that inspection item as it is covered in this manual.

1.4.2 Selecting the NDI Method. Factors governing the selection of an inspection method are: accessibility, portability of equipment, type of suspected damage, material composition of part to be inspected, surface condition, and degree of sensitivity required for the inspection. In many cases the method selected will depend primarily on accessibility and practicality. For example, a threaded item that may qualify for eddy current inspection may instead require the substitution of an ultrasonic inspection due to accessibility constraints. However, the ultrasonic inspection must be capable of providing equivalent sensitivity. Also, the type of inspection desired may adversely affect adjacent j, parts. Inspection methods in this manual were selected in order to provide maximum detection sensitivity while requiring a minimum of removal or disassembly, and at the same time, protect adjacent areas from damage. Radiographic inspection is used only to examine areas partly or totally hidden, or where the suspected damage is internal to the part. Where one method of inspection (primary) reveals an indication of a crack, another method (backup) should be used to verify if a crack is actually present. Quite often backup procedures are limited to disassembly and a good visual inspection. Certain cases may arise when another NDI method could be used to prevent needless or complicated disassembly. For example, a crack in a spar cap may not appear clearly on radiographic film due to cloudiness caused by sealant or substructure clutter. A backup eddy current or ultrasonic method could be used for verification and if no indications were observed, disassembly would not be necessary. Whenever a backup method is used, it shall be specified in every case where the initial
damage indication may not be positive proof that a reject condition exists.

1.4.3 Preparation of Helicopter for NDI. Prior to NDI, the helicopter shall be prepared for safe ground maintenance in accordance with applicable technical manuals listed in Table 1-1.

1.4.4 Preparation of Part or Area for NDI.

WARNING

Prolonged breathing of vapor from organic solvents, degreasers, or paint thinners is dangerous. Use respirators in confined areas per Occupational and Environmental Health Respiratory Protection Program (TB MED 502 (DLAM 1000.2)). Have adequate ventilation. Avoid prolonged skin contact. Wear rubber gloves and goggles.

All NDI methods require proper cleanliness of the part or area being inspected. Refer to Table 1-1 for the applicable cleaning and corrosion control manual. The cleaning technique to be used will be determined by the type of foreign matter present, NDI method to be performed, and if the part is plated, painted, or has a protective coating. Scale and corrosion shall be removed completely before inspection. If removal of protective coatings, such as paint, phosphate coatings, black oxide, etc., is required, do not use removal methods that mechanically abrade the surface of the part to be inspected since this may cause damage or mask over potential surface cracks on the part. Some inspection methods, by their particular nature, will require that small openings and/or oil holes leading to obscure passages or cavities be plugged, such as in the case of engine parts. A suitable nonabrasive material should be used that is soluble in oil and can be readily removed. Effective masking shall be used to protect those components, such as bearings and certain nonmetallics, that may be damaged by contact with the inspection solution or medium.

1.4.5 NDI General Safety Precautions.

WARNING

Electrical equipment shall not be operated in areas where combustible gases or vapors may be present, unless the equipment is explosion-proof.

Prior to conducting an NDI inspection, survey the general area in advance. Eliminate possible hazards created by loose structures, protruding workstands, and support equipment. Secure loose electric cords and remove toxic fluids or fumes. If AC power is supplied to equipment, be sure that equipment is well grounded to prevent electrical hazards. Specific safety instructions for each NDI method used in this manual are contained in the paragraph immediately following the discussion of that method.

1.4.6 Bond Testing (BT) Method.

NOTE

Inspection of bonded structures shall be performed in accordance with the general applications and techniques in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) and the specific requirements of this technical manual.

A number of different methods of NDI can be applied to the many configurations and types of bonded structures that are in use. Variables such as skin material and thickness, adhesive type and thickness, underlying structure, and accessibility are all factors in the development of specific inspection procedures. Because of the many inspection methods and structural configurations, each application must be considered and reference standards representative of the structure must be evaluated to verify proposed techniques.

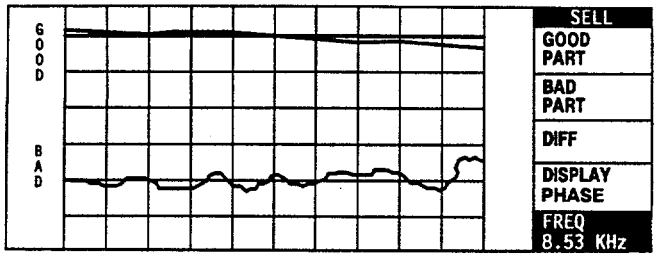
1.4.6.1 Bond Testing Equipment. The bond testing equipment, Bondmaster, used in the procedures in this manual operates by generating a mechanical vibration into the material being tested. This equipment is designed to detect flaws in bonded metallic and composite structures. The instrument is capable of determining bad bonds, delaminations, unbonds, and crushed honeycomb core defects. The Bondmaster has the following features:

a. Resonance. Detects unbonds and delaminations by changes in phase and amplitude at probe resonance. Couplant is required.

b. Pitch Catch Swept. Measures amplitude and phase changes using a swept frequency method to detect unbonds and deeper defects. Requires no couplant.

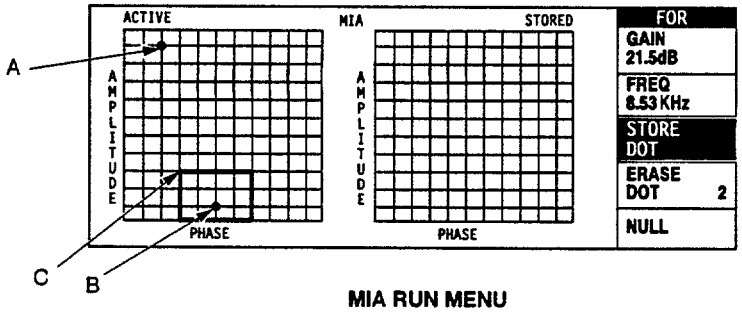
c. Pitch Catch Impulse. Measures amplitude and phase changes using a short burst of energy to detect unbonds. Requires no couplant.

d. Mechanical Impedance Analysis (MIA). Measures the effect of generated sound waves and the effect of loading as drive frequency is swept in the range of 2.5 KHz to 10 KHz. This method can be used on unbonds, crushed core, and defects on the inside of composites. Requires no couplant. See Figure 1-5, Bond Testing Reference Block Displays.



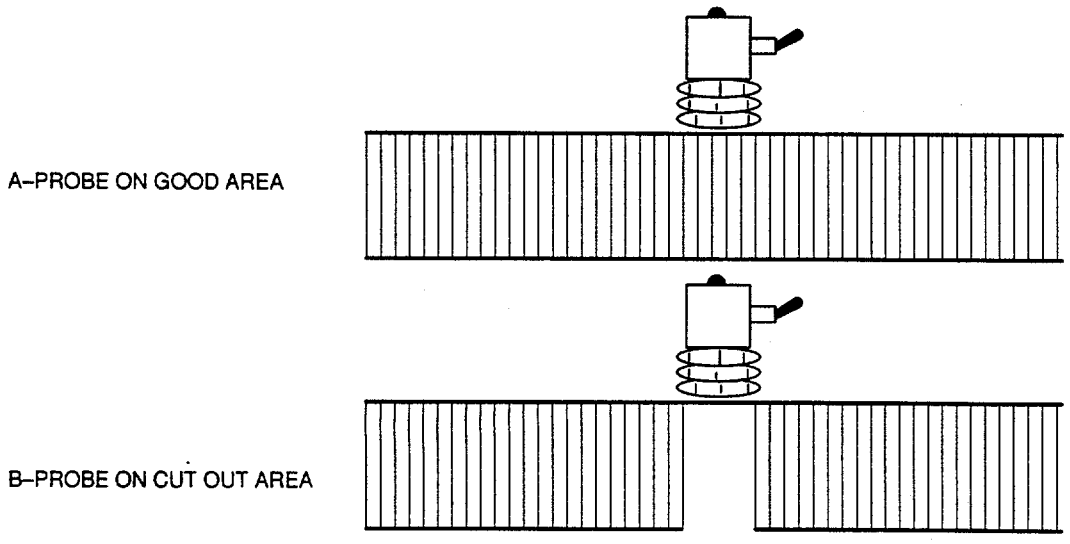
MIA SET MENU

(DISPLAYS DIFFERENCE BETWEEN GOOD AND
BAD AREAS AT A PARTICULAR OPERATING FREQUENCY)



MIA RUN MENU

(A) RESPONSE OF FLYING SPOT ON GOOD AREA
(B) RESPONSE OF FLYING SPOT ON BAD AREA
(C) ALARM GATE



NDI_CH/MH-47_F1_5

Figure 1-5. Bond Testing Reference Block Displays

Mechanical vibration energy generated by resonance test equipment can be measured, analyzed by the tester, then displayed on a screen. There are several ways this energy can be applied to material and then be analyzed. Because bonded metallic and composite material properties differ substantially, no one test method will detect flaws n all types of material. For this reason, current bond testing equipment incorporates at least one or more of the aforementioned features.

1.4.6.2 Safety precautions During Bond Testing. Follow safety precautions and instructions contained in this manual and the Nondestructive Inspection Methods manual listed in Table 1-1.

WARNING

Electrical equipment shall not be operated in areas where combustible gases or vapors may be present, unless the equipment is explosion-proof.

a. If instrument is operated using AC power, use a grounded power cord.

b. Turn power OFF before connecting or disconnecting probe cable or power cable.

1.4.7 Fluorescent Penetrant (PT) Method.

NOTE

Fluorescent penetrant inspections shall be performed in accordance with the general applications and techniques in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) and the specific requirements of this technical manual.

The basic purpose of fluorescent penetrant inspection is to increase the visible contrast between a discontinuity and its background. This method is performed by applying a fluorescent penetrant solution to the inspection area which enters the surface opening of the discontinuity. The area is then wiped or rinsed and a developer is added to draw the fluorescent material from the discontinuity. A flaw or crack in the part will then become visible under the influence of ultraviolet light (black light). This method is effective for detecting surface flaws in forgings, castings, extrusions, formed sections, webs, and skins of materials. The penetrant method of inspection requires that the surface of the inspection area be thoroughly cleaned. Paint on the part must be removed before inspection.

CAUTION

Penetrant-Emulsifier/Remover Combinations (lipophilic/hydrophilic) from one manufacturer may not be mixed or used in conjunction with materials from a different manufacturer.

Four penetrant procedures are given in Tables 1-3, 1-4, 1-5, and 1-6. All four inspections shall be conducted using fluorescent penetrant, AMS 2644, Type I, Method A, B, C, or D, sensitivity level 3 or 4. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-propyl bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8), Electron (Table 1-8), Positron (Table 1-8). DS-108, Electron, and Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts. Refer to the Nondestructive Inspection Methods manual listed in Table 1-1 for more detailed instructions. Table 1-5 describes the procedure for using Type I, Method C, Level 3 or 4 on a removed part or parts attached either to a component or to the helicopter. This procedure supports the accomplishment of fluorescent penetrant inspection at the AVUM and AVIM levels regardless of geographic location. Therefore, the procedure in Table 1-5 will be one of the most frequently referred to in this manual. Table 1-7 lists the equipment and Table 1-8 lists the fluorescent penetrant materials to be used.

Table 1-3. Penetrant Procedure (Type I, Method A)

Task	Description
a. Preparation of Part:	Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.
b. Precleaning Procedure:	Refer to TM 1-1500-344-23.
c. Penetrant Application:	The penetrant may be applied by brushing, spraying, or dipping.
d. Penetrant Dwell:	Allow a minimum of 30 minutes dwell time to a maximum of 240 minutes. Extended dwell time may require rewetting of parts.
e. Penetrant Removal/Rinse:	Rinse the part by waterwash using a low-pressure spray (pressure not to exceed 20 PSI) and a temperature of 16°C to 38°C (60° to 100°F). DO NOT OVERRINSE.
f. Drying Operation:	The parts should be dried in a circulating air dryer with a temperature range from 38°C to 60°C (100° to 140°F). The time in the dryer should not exceed the time necessary to completely dry the surface of the parts.
g. Developer Application:	The dry developer is sprayed or dusted lightly over the part to be inspected. Shake or blow off with low oil-free air to remove excess developer.
h. Inspect:	Perform inspection under black light.
i. Materials:	Type I, Method A, Level 3 or 4 (water-washable) Penetrant.

Table 1-4. Penetrant Procedure (Type I, Method B)

Task	Description
a. Preparation of Part:	Refer to Preparation of Part of Area for NDI, paragraph 1.4.4.
b. Precleaning Procedure:	Refer to TM 1-1500-344-23.
c. Penetrant Application:	The penetrant may be applied by brushing, spraying, or dipping.
d. Penetrant Dwell:	Allow a minimum of 30 minutes dwell time to a maximum of 240 minutes. Extended dwell time may require rewetting of parts.
e. Emulsifier Application:	The emulsifier may be applied by dipping or spraying. The preferred method of application is by dipping the part in the emulsifier. Do not permit emulsifier to remain on the part over 3 minutes.
f. Rinse:	Rinse the part by waterwash using a low-pressure spray (pressure not to exceed 40 PSIG) and a temperature of 16°C to 38°C (60°F to 100°F).
g. Drying/Developer Operation:	If a dry nonaqueous developer is to be used, first dry the part in a drying oven at a temperature not to exceed 60°C (140° F) until dry. Then apply the developer. If an aqueous developer is to be used, then submerge the part in the developer solution immediately after washing. Follow by drying the part in a drying oven as mentioned above. In either case, parts shall be removed from the drying oven as soon as they are dry.
h. Inspect:	Perform inspection under black light.
i. Materials:	Type I, Method B, Level 3 or 4 (post emulsifiable-lypophilic) Penetrant (see Table 1-8).

Table 1-5. Penetrant Procedure-Portable or Field Application (Type I, Method C)

Task	Description
a. Preparation of Part:	Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.
b. Precleaning Procedure:	Refer to TM 1-1500-344-23.
c. Penetrant Application:	Apply penetrant either by brushing or spraying. In a confined area, apply with brush to prevent overspray.
d. Penetrant Dwell:	Allow a minimum of 30 minutes penetrant dwell time. In temperature below 16°C (60°F), refer to Nondestructive Inspection Methods manual listed in Table 1-1 for dwell time compensations.
e. Penetrant Removal:	Wipe dry with a dry, lint-free cloth. Wipe down with a solvent-moistening cloth. Check area to be inspected with black light to be sure all surface penetrant has been removed before applying developer. Do not spray cleaner directly onto part.
f. Developer Application:	Spray a light film of developer over area to be inspected.
g. Inspect:	Perform inspection under black light. Observe any obvious bleed-out as developer dries. Complete inspection after developer dwell time is complete.
h. Materials:	Type I, Method C, Level 3 or 4, Solvent - Removable Fluorescent Dye Penetrant (see Table 1-8).

Table 1-6. Penetrant Procedure (Type I, Method D)

Task	Description
a. Preparation of Part:	Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.
b. Precleaning Procedure:	Refer to TM 1-1500-344-23.
c. Penetrant Application:	The penetrant may be applied by brushing, spraying, or dipping.
d. Penetrant Dwell:	Allow a minimum of 30 minutes dwell time to a maximum of 240 minutes. Extended dwell times may require rewetting of parts.
e. Penetrant Prerinse	Prerinse part with a water spray at a temperature of 16°C to 38°C (60°F to 100°F) and a spray pressure of 40 PSIG maximum. Do not overrinse.
f. Remover Application:	Apply a solution as recommended by manufacturer of the specific hydrophilic remover in water to surface of the part. Dwell time shall be kept to an absolute minimum consistent with complete removal of excess penetrant.
g. Postrinse Operation:	Postrinse part with a water spray at a temperature of 16°C to 38°C (60°F to 100°F) and a spray pressure of 40 PSIG maximum. Do not overrinse. Rinse effectiveness should be checked with a black light to ensure complete removal of penetrant remover.
h. Drying/Developer Operation:	If a dry nonaqueous developer is to be used, first dry the part in a drying oven at a temperature not to exceed 60°C (140°F) until dry. Then apply the developer. If an aqueous developer is to be used, then submerge the part in the developer solution immediately after washing. Follow by drying the part in a drying oven as mentioned above. In either case, parts shall be removed from the drying oven as soon as they are dry.
i. Inspect:	Perform inspection under black light.
j. Materials:	Type I, Method D, Level 3 or 4 (hydrophilic remover) Penetrant (see Table 1-8).

1.4.7.1 Safety Precautions During Fluorescent Penetrant Inspections. Follow safety precautions and instructions contained in this manual and the Nondestructive Inspection Methods manual listed in Table 1-1.

WARNING

- **Black lights generate considerable heat during use. Extreme care must be exercised to prevent contacting the housing with any part of the body.**
- **To prevent injury to eyes, do not look directly into black light.**
- **Prolonged direct exposure of hands to the filtered black light's main beam may be harmful. Suitable gloves' should be worn when exposing hands to the main beam.**

a. Follow manufacturer's instructions when using black lights and filter.
b. Do not wear sunglasses or glasses with light-sensitive lenses during fluorescent penetrant inspections. They can contribute to improper interpretation of defects.

WARNING

Prolonged or repeated inhalation of vapors or powders may result in irritation of mucous membrane areas of the nose.

c. Provide adequate ventilation when handling cleaner, emulsifier, penetrants, or developers.

WARNING

Continual exposure to penetrant inspection material may cause skin irritation.

d. Observe the following when handling cleaners, emulsifiers, penetrants, or developers.

(1) Avoid contact with penetrant inspection materials by wearing neoprene gloves.

(2) Wash inside and outside of gloves.

(3) Wash exposed areas of body with soap and water.

(4) Check for traces of fluorescent penetrant materials on skin, clothing, and gloves using a black light source.

WARNING

Temperatures in excess of 49°C (120°F) may cause bursting of pressurized cans and injury to personnel.

e. Store all pressurized spray cans in a cool, dry area protected from direct sunlight. Avoid exposure of pressurized spray cans to open flames.

WARNING

Volatile fumes may occur, creating both a fire and health hazard.

f. Exercise extreme caution when handling penetrants that have been heated to a point where some lighter constituents are driven off.

1.4.7.2 Controlling Excess Fluorescent Penetrant. After fluorescent penetrant inspection, the part shall be thoroughly cleaned to ensure all penetrant is removed from the part. This shall include removing the penetrant from cracks as much as possible before disposition of the part. This can be easily accomplished by performing cleaning operations under a black light.

1.4.8 Magnetic Particle (MT) Method.

NOTE

Magnetic particle inspections shall be performed in accordance with the general application and techniques in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) and the specific requirements of this technical manual.

NOTE

During magnetic particle inspections performed with portable equipment, the operator shall keep the can of magnetic particle media constantly agitated by continuously shaking the can prior to application.

Magnetic particle is a method of detecting cracks or other flaws on the surface or near surface of materials that are ferromagnetic. This method will produce good indications of discontinuities provided the part is free from grease, oil, loose scale, or other surface contaminants. The inspection is accomplished on either assembled or disassembled parts. As specified in the procedure, the inspection is accomplished by inducing a magnetic field in the part and applying a liquid suspension of iron oxide particles to the surface to be inspected. By controlling the direction of the magnetic flux, the lines of magnetic force shall be positioned perpendicular to the suspected crack or flaw. All magnetic particle inspections in this manual shall be of the wet continuous method using fluorescent magnetic particles.

1.4.8.1 Magnetic Particle Inspection Equipment. Considerations involved in the selection of magnetic particle inspection equipment include the type of magnetizing current and the location and nature of the inspection. The purpose of this manual is to support the accomplishment of NDI at the AVUM and AVIM levels. This dictates equipment that can be used on or off the helicopter at remote sites. Therefore, magnetic particle procedures in this manual use the electromagnetic yokes or probes and hand-held coils as shown in Figure 1-6. This equipment is common and readily available to AVUM and AVIM levels. Stationary magnetic particle equipment can be used if facilities, required shop equipment, and qualified NDI technicians are available. Refer to TM 55-1500-335-23 (Nondestructive Inspection Methods manual) for stationary magnetic particle inspection techniques.

1.4.8.1.1 Magnetic Yokes and Probes. Portable induced field inspection equipment is generally referred to as either a probe or a yoke. These terms are synonymous and differ due to manufacturer's nomenclature. They are small, portable, easy to use, and can be used on or off the helicopter. They induce a strong magnetic field into that portion of a part that lies between the poles or legs. This limits the magnetization to longitudinal; however, by turning the probe 90 degrees on the part for the second position, cracks, either perpendicular or parallel to the axis of the part, can be detected. Some yokes and probes have both AC and DC capabilities while others have AC only. All procedures in this manual use AC. AC provides a very desirable and useful field. The vibratory action of AC adds significantly to the magnetic particle mobility enhancing the formation and build-up of larger and sharper indications at discontinuities. An AC magnetic field is also used when it is necessary to reveal only surface cracks, common to in-service parts, due to fatigue and stress cracking. Yokes and probes utilizing AC for magnetization also have the additional advantage that they can be used for demagnetization.

1.4.8.1.2 Hand-held Coil. For longitudinal magnetization of bolts, shafts, spindles, axles, and similar small parts, the hand-held coil offers a simple, convenient method of inspecting for transverse cracks. It allows for equipment maintenance inspections wherever a coil can be applied around the part. Parts are magnetized and demagnetized with the same coil.

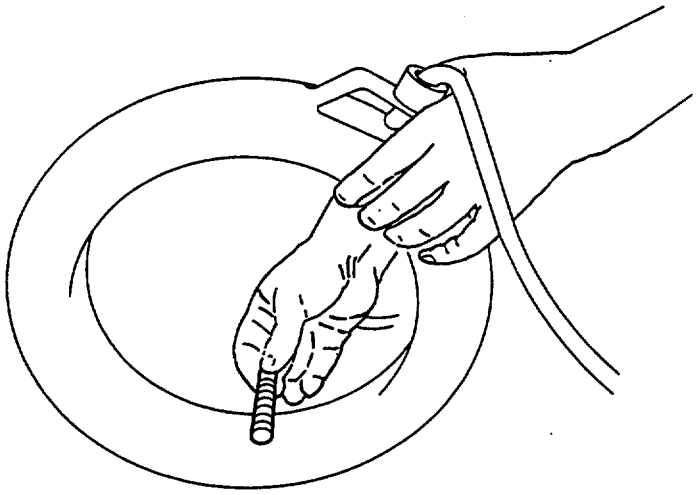
1.4.8.2 Safety Precautions During Magnetic Particle Inspections. Follow safety precautions and instructions contained in this manual and the Nondestructive Inspection Methods manual listed in Table 1-1.

WARNING

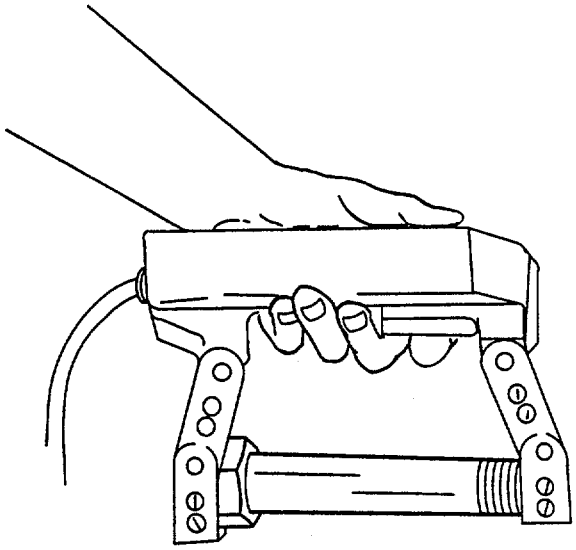
- **Black lights generate considerable heat during use. Extreme care must be exercised to prevent contacting the housing with any part of the body.**
- **To prevent injury to eyes, do not look directly into black light.**
- **Prolonged direct exposure of hands to the filtered black light's main beam may be harmful. Suitable gloves should be worn when exposing hands to the main beam.**

a. Follow manufacturer's instructions when using black lights and filter.

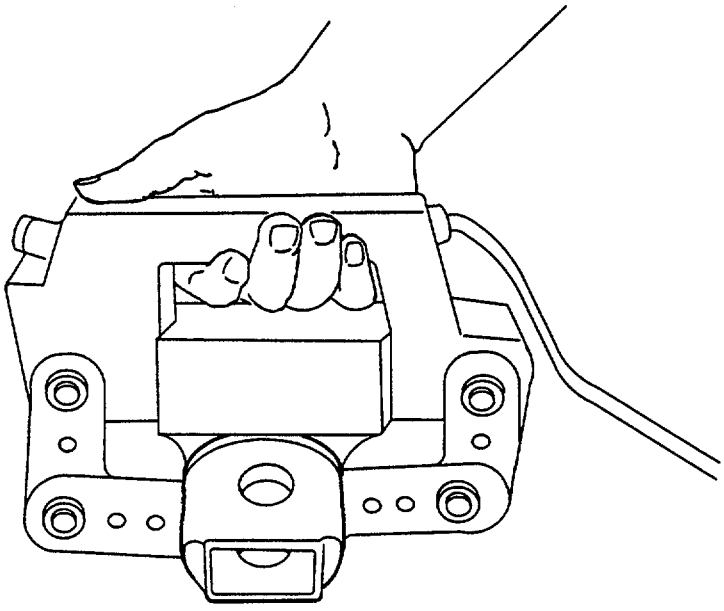
b. Do not wear sunglasses or glasses with light-sensitive lenses during fluorescent magnetic particle inspections. They can contribute to improper interpretation of defects.



HAND–HELD COIL



ARTICULATED OR MOVEABLE YOKE



CONTOUR PROBE

NDI_CH/MH-47_F1_6

Figure 1-6. Portable Magnetic Particle Inspection Equipment

CAUTION

Do not operate magnetic particle equipment within 36 inches of aircraft instruments.

1.4.9 Demagnetization of Inspection Parts. Following magnetic particle inspection of a part, the residual magnetic field in the part shall be reduced to the lowest possible level. This must be done · prior to returning the part to service or rejecting it as a defective part. Unless this is done properly, the residual magnetism may cause adverse influence on instruments, unnecessary wear on parts, or attract ferrous metal chips and dust into bearing surfaces. After demagnetization a magnetic field strength meter shall be used to measure residual fields. Readings in excess of 3 units are not acceptable.

1.4.9.1 Demagnetization Using AC. If AC demagnetization is selected, hold the part about 12 inches in front of the coil. Move it slowly and steadily through the coil to at least 36 inches beyond end of coil while current is still flowing. Repeat process as necessary. Rotate and tumble parts of complex configuration while passing through the coil field. All parts can be demagnetized using a contour probe in the AC mode. Place the probe against the magnetized part with the switch in AC position. Turn probe on and withdraw it from the part, or the part from the probe, about 24 inches before turning the probe off.

1.4.9.2 Demagnetization Using DC. If DC demagnetization is selected, the initial demagnetizing field shall be higher than, and in nearly the same direction as, the field reached during inspection. The field shall then be reversed and decreased in magnitude, and the process repeated (cycled) until an acceptable low value of residual field is reached. Whenever possible, parts that have been circularly magnetized shall be magnetized in the longitudinal direction before being demagnetized. This procedure is limited to stationary equipment.

1.4.10 Radiographic (RT) Method.

NOTE

Radiographic inspection shall be performed in accordance with the general application and techniques in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) and the specific requirements of this technical manual.

Radiographic inspection is used to detect internal and external structural details of all types of parts and material. This method is used for the inspection of airframe structure for damage, detection of moisture entrapment, structure alignment, and foreign object intrusion. It can sometimes be used in areas otherwise inaccessible to other nondestructive inspections and to verify indications observed by other methods.

Radiographic inspections are accomplished by passing the X-ray beam through the part or assembly to expose a radiographic film emulsion or other sensitized medium. The processed film shows the structural details of the part by variations in film density. Requirements for film density, image quality indicator, identification, and other factors are specified in MIL-STD-453. Film processing is a series of operations such as developing, fixing, and washing associated with the conversion of the latent image into a stable visible image, and will be provided by automatic or manual film processing.

1.4.10.1 Safety Precautions During Radiographic Inspections. Follow safety precautions and instructions contained in this manual and the Nondestructive Inspection Methods manual listed in Table 1-1.

WARNING

Radiation Hazard

Assure compliance with all applicable precautions set forth in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) listed in Table 1-1. A hazard associated with exposure to ionizing radiation is that serious injury can be inflicted without pain, burning, or other sense of discomfort during the exposure period. Radiation protection shall be utilized in accordance with AR40-14/DLAR 1000.28.

1.4.10.2 Mixing of Radiographic Film Processing Chemicals. Exercise extreme care when working with film processing chemicals. Fixer solution is highly acidic and developer is highly caustic. Avoid contact with the skin. Flush any skin contact with water.

1.4.11 Eddy Current (ET) Method. The eddy current method is used for the detection of discontinuities in electrically conductive materials. The method is effective when inspecting for discontinuities originating: (1) at the radii of mounting lugs, flanges, or crevices; (2) at pressed-in (interference fit) grease fittings, guide pins, etc.; and (3) from fastener holes and bushing/bearing bores. Eddy current method will locate surface cracking on any conductive material, but probes and techniques for inspection of magnetic materials may differ considerably from those used on nonmagnetic materials. Eddy current has great value for inspecting areas where paint stripping is not desirable and/or impossible. The method also has wide application in confirming surface indications found by other methods.

The capability and reliability of the eddy current method has been greatly enhanced by the use of modern phase analysis (impedance plane display) instruments used in conjunction with shielded probes. These instruments display a representation of the impedance plane which illustrates both the magnitude and direction of impedance changes. Impedance variables (conductivity, probe lift-off, permeability variations, etc.) can be separated by their characteristic video response and are readily recognized by the trained operator. The interaction of the probe coils and the part is represented by a "'flying spot"' (or dot) in the video display.

Equipment is standardized on a test block (reference block) which is constructed of a known material that contains known good areas, and either simulated or actual defects of known size. The response of the equipment (eddy current machine and probe) to the good material is set as the starting point by nulling the equipment on the sound area of the block. By this action, all subsequent readings represent deviations from the null point and have both magnitude and direction. Careful manipulation of the controls allows the operator to separate the response (deviation from the null point) for lift-off and flaw (geometric) effects.

Shielded probes have a cylinder of material which encircles the coil of the probe. This serves to constrict the probe's field and, therefore, limits the spread of eddy currents from much beyond the probe's diameter. This concentrated electrical field is most useful for scanning around fasteners, near edges, and into specific small areas. Other types of probes are used for wide area scans, alloy sorting, conductivity comparisons, coating thickness comparisons, skin thickness comparisons, etc.

1.4.11.1 Safety Precautions During Eddy Current Inspection. Follow safety precautions and instructions contained in this manual and the Nondestructive Inspection Methods manual listed in Table 1-1.

WARNING

Electrical equipment shall not be operated in areas where combustible gases or vapors may be present, unless the equipment is explosion-proof.

1.4.11.2 Eddy Current Scanning Techniques. Eddy current inspection is performed by moving the probe over and as close as possible to the surface of the area of interest. If the coil(s) pass over a defect like a crack, the impedance of the coil will change and be represented as a movement of the "flying spot. " Before beginning the inspection, the operator will have separated the response from lift-off and from a flaw by using the test block and manipulating the controls. Therefore, the crack response will be essentially similar to the response from the known defect and different from the response from lift-off. Microprocessor controlled instruments have the ability to store responses in memory. Such stored responses are an invaluable teaching aid.

1.4.11.2.1 Scanning Around Fasteners, Inserts, and Edges of Parts. Shielded probes are recommended any time that the pattern of the eddy current field is likely to extend out such that it comes in contact with a feature which would mask the response from a defect. Such features may include edges, fasteners, dissimilar materials attached to the test piece, etc. An unshielded probe can be used around such features, but the effect of those features must be made constant by keeping the distance between the probe and the feature constant. Non-conductive mechanical guides (straight edges, plugs, spacers, etc.) can be used to maintain a constant distance. In fact, the use of non-conductive mechanical guides is useful for shielded and unshielded probes alike. As operators gain experience, they become quite innovative in making guides that maintain constant lift-off, angles, and distance from features which may mask flaw indication. Common materials for mechanical guides are plastics (polyethylene, acrylic, and polycarbonate), wood, phenolic impregnated material, and resins for casting into shapes (epoxy, polyester, or hot glue). Careful selection of probes and construction of suitable mechanical guides will make possible inspection of problem areas such as sharp edges, tight radii, small openings, and areas near potentially masking features.

1.4.11.2.2 Bolthole Inspection. Manual bolthole inspection probes usually consist of a split 90 degree probe with the exposed shaft inserted in an adjustable collar. The shaft is marked in increments, and the collar secured at the desired increment by means of a setscrew through the collar. The probe is then rotated 360 degrees around the hole at each setting until the entire surface of the bore has been inspected. These probes are available in federal or commercial catalogs.

1.4.11.2.3 Scanning Fillets and Radii. Using appropriate radius probe, scan fillets and radii several times in each direction.

1.4.11.3 Eddy Current Instrument Standardization. Eddy current inspection equipment and standards required by the procedures in this manual are listed in Table 1-7. Reference blocks, instrument settings, and standardization instructions for the eddy current instrument are included in each eddy current procedure. Instrument settings, as they are given in this manual, should be considered typical and present a test block display shown in Figure 1-7. Additional nulling will be required to reestablish the position of the "flying spot" with the probe on the part/area to be inspected. (Use Teflon tape (listed in Table 1-8) on the probe to save wear. Instrument settings shall be made with Teflon tape on the probe, if used.)

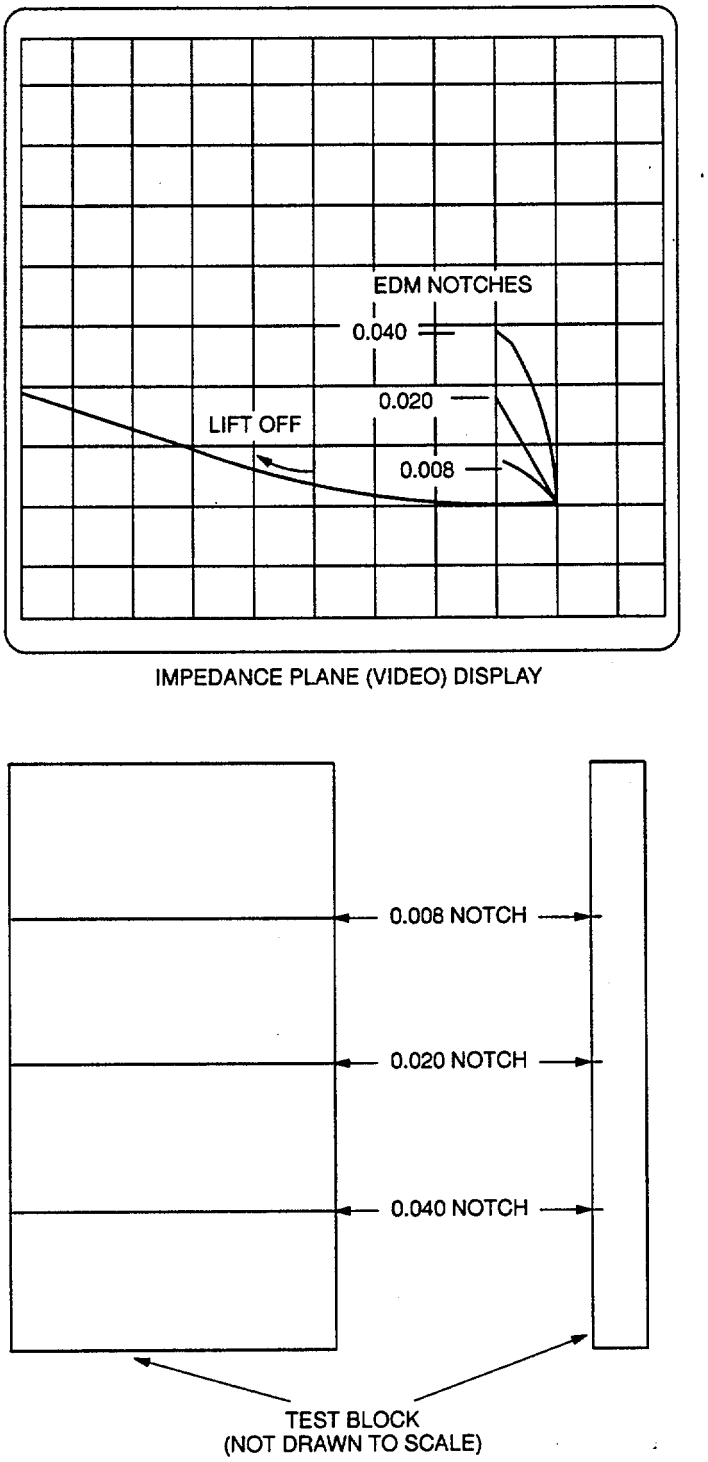


Figure 1-7. Signatures of EDM Notches in Test Block

1.4.11.4 Sorting Metal Using Eddy Current. In addition to the more common usage for crack detection, eddy current equipment may be used for metal sorting. Electrical conductivity and magnetic permeability are the material characteristics evaluated during this type of inspection. The sorting technique cannot directly identify alloy or even the type of metal. But, when there are limited possibilities, conductivity and/or permeability information may permit proper classification (see Figure 1-8). Typically, the need for alloy sorting occurs when changes to parts are made to improve performance. For example, a magnesium part that is experiencing severe corrosion is replaced by one made from aluminum. Another example is the replacement of one aluminum part with another, also of aluminum, but made from an alloy having improved strength or corrosion resistance. In both these examples, there may be a need to verify that replacement has been made, and the electrical conductivity of the alloys involved may be sufficiently different to permit verification by a sorting inspection. Another situation is the requirement to NDI a part to confirm a visual indication where the material is not known and cannot be easily determined. Eddy current sorting will quickly determine if the part is ferromagnetic and should be inspected using the magnetic particle method. Also, if the part is nonferromagnetic, which test block (standard) most closely matches the conductivity of the part, and therefore, should be used to adjust the eddy current equipment for crack inspection/verification.

1.4.12 Ultrasonic (UT) Method.

NOTE

Ultrasonic inspection shall be performed in accordance with the general application and techniques in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) and the specific requirements of this technical manual.

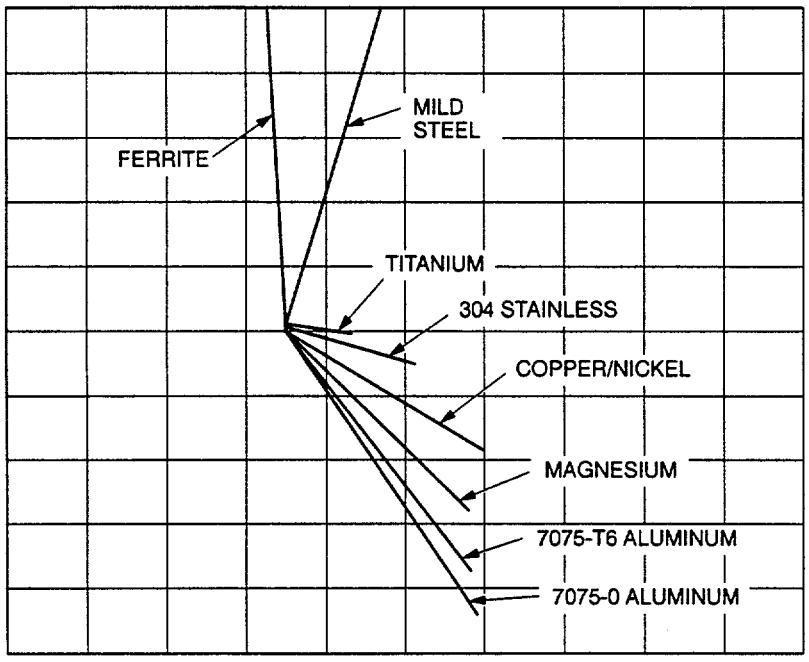


Figure 1-8. Typical Metal Sorting Display

Ultrasonic inspection uses high frequency sound waves as a probing medium to provide-information as to the state of various materials. This method is effective for the inspection of most metals for surface and subsurface damage. The method requires that at least one surface of the part be accessible for transducer contact in the vicinity of the area to be examined. The inspection is accomplished by inducing the ultrasound into the part by coupling the transducer to the part and picking up reflections of this sound from within the part. Any marked changes in acoustic properties, defect, interface, or back surface, will reflect sound back to the transducer. The detected ultrasonic reflections are electronically displayed on a Cathode Ray Tube (CRT) and interpreted for indications of defects. Accessory wedges can be used to provide adequate transducer mating to curved surfaces or to change the angle of the sound beam.

1.4.12.1 Safety Precautions During Ultrasonic Inspection. Follow safety precautions and instructions contained in this manual and the Nondestructive Inspection Methods manual listed in Table 1-1.

WARNING

Electrical equipment shall not be operated in areas where combustible gases or vapors may be present, unless the equipment is explosion-proof.

a. If instrument is operated using AC power, use a grounded power cord.

b. Turn power OFF before connecting or disconnecting transducer cable or power cable.

1.4.12.2 Ultrasonic Instrument Standardization. The ultrasonic equipment used in ultrasonic v inspection procedures described throughout this manual is listed in Appendix B. Reference blocks, instrument settings, and standardization instructions for the ultrasonic instrument are included in the individual ultrasonic inspection procedures. Because of varied circumstances under which the inspections may be performed, instrument settings, as they are given in this manual, should be considered typical. Slight adjustment to the settings may be necessary to achieve the desired CRT presentation. Illustrations representing typical CRT presentation will, in most cases, include reference signals representing initial pulse, transducer, and/or wedge echoes that have been moved off the scope to make room for relevant indications. An effective ultrasonic inspection will depend largely upon the proper handling of the transducer; therefore, the following steps are recommended:

a. Clean ultrasonic transducer with a low-lint cloth, MIL-C-85043 or equivalent. Clean all contact surfaces when using a wedge or delay block. Apply couplant to these contact surfaces and carefully tighten the assembly prior to test.

NOTE

Scratches or similar surface blemishes remaining on the transducer or wedge may give false indications.

b. Use prescribed or equivalent couplant and in sufficient quantity to achieve proper coupling. The use of lubricants containing graphite, silicones, and glycerines is prohibited.

c. Apply adequate pressure to keep transducer in contact with part.

d. Use moderate speed for transducer search pattern. If transducer movement is too fast, a flaw could be passed over without a proper indication.

1.4.13 Acceptance/Rejection Criteria.

CAUTION

Misinterpretation of indications can result in rejectable parts being accepted and acceptable parts being rejected. Only NDI personnel trained and qualified in accordance with applicable military standards and technical manuals shall perform and interpret Nondestructive Inspections. Nondestructive inspection procedures in this manual have been selected to enhance the safety of the aircraft and personnel. Inspection procedures (including primary and backup) have been outlined to enable NDI personnel to perform a reliable inspection of parts with respect to their design, composition, and accessibility. In the event that a final interpretation of an indication cannot be made, assistance from the next higher maintenance level shall be requested.

1.4.14 Equipment Used for NDI. See Table 1-7 for a summary of equipment used for NDI in this manual. Equivalent equipment may be used unless specified otherwise in the inspection procedures.

1.4.15 Materials Used for NDI. See Table 1-8 for a summary of materials used for NDI in this manual. Common commercial grade materials (cheesecloth, paper, etc.) are not listed. Equivalent materials may be used unless specified otherwise in inspection procedures.

1.4.16 Post Cleaning and Restoration of Part or Area After NDI. Upon completion of the NDI test and prior to restoration of protective finishes, it is necessary to clean off residual inspection materials from the part. This cleaning will vary based upon test method, contaminant, and subsequent processing of the part. In many instances, methods used for precleaning are acceptable for post cleaning. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

WARNING

Prolonged breathing of vapor from organic solvents, degreasers, or paint thinners is dangerous. Use respirators in confined areas per Occupational and Environmental Health Respiratory Protection Program (TB MED 502 (DLAM 1000. 2)). Have adequate ventilation. Avoid prolonged skin contact. Wear rubber gloves and goggles.

a. Following all magnetic particle inspections, clean part by dipping or spraying with dry-cleaning solvent, P-D-680, Type II or equivalent. Wipe dry with a clean, low-lint cloth, MIL-C-85043, or equivalent.

b. After post cleaning has been performed, the original protective finish or approved alternate must be restored to the part or area by appropriate personnel. Refer to applicable technical manuals listed in Table 1-1.

Table 1-7. Equipment Used for NDI

Fluorescent Penetrant Method	Fluorescent Penetrant Inspection Kit Black Light UV Kit Black Light Meter Black Light Bulbs Filter UV
Magnetic Particle Method	Yoke and Coil Kit Black Light Magnetic Particle Inspection Probe Magnetometer
Eddy Current Method	Eddy Current Inspection Unit Cable, Coaxial 6-feet long (1 required) Reference Block Aluminum (0.008, 0.020, and 0.040 EDM notches) Reference Block Titanium (0.008, 0.020, and 0.040 EDM notches) Reference Block Magnesium (0.008, 0.020, and 0.040 EDM notches) Reference Block - Block of Six Conductivity Samples Probe, right angle, shielded surface 100 KHz-500 KHz 90° 1/2 inch drop Probe, straight, shielded surface 100 KHz-500 KHz
Ultrasonic Method	Ultrasonic Inspection Unit Cable, assembly, BNC to microdot Transducer, contact 1.0 MHz 1/2 inch (two required)
Bond Testing Method	Bond Test Inspection Unit Cable Probe, Mechanical Impedance Analysis Probe Holder, spring loaded Test Block, Composite Defect Standard #1 Test Block, Composite Defect Standard #3 Test Block, Aluminum Honeycomb with 0.020 inch thick aluminum/fiberglass skin (refer to Appendix C) Test Block, Aluminum Honeycomb with 0.040 inch thick aluminum skin (refer to Appendix C) Test Block, Aluminum Honeycomb with 0.063 inch thick aluminum skin (refer to Appendix C)
Radiographic Method	Tripod X-Ray Tubehead Stand Signal Appliance Lamp Assembly X-Ray Unit (LPX-160 Water Cooled Digital)

Note: Refer to Appendix B for equipment part number, National Stock Number and manufacturer.

Table 1-8. Materials Used for NDI

Nomenclature	P/N or Specification	Manufacturer	National Stock Number
Fluorescent Penetrant Method			
Type I, Method C	AMS 2644 Level 3 or Higher	General Services Administration (GSA)	6850-01-703-7406
Magnetic Particle Method			
Fluorescent Magnetic Inspection Compound	14AM	Magnaflux Div. of Illinois Tool Works Inc. 1301 W. Ainsle St. Chicago, IL 60656	6850-00-841-1347
Eddy Current Method			
Tape, Teflon	MIL-I-23594	General Service Administration (GSA)	5970-00-812-7387
Ultrasonic Method			
Couplant, Ultrasonic	Ultragel II	Sonotech, Inc. 1413 Frasier St. Suite 2, Bldg. H P.O. Box 2189 Bellingham, WA 98226	6850-01-157-4348
Bond Test Method			
Tape, Teflon	MIL-I-23594	General Service Administration (GSA)	5970-00-812-7387
Radiographic Method			
M-2 Film, Ready Pack 8 inch x 10 inch	145 7837	Eastman Kodak Co. 343 State St. Rochester, NY 14650	6635-00-412-2071
AA-2 Film, Ready Pack 8 inch x 10 inch	827 8137	Eastman Kodak Co. 343 State St. Rochester, NY 14650	6635-00-850-3326

Table 1-8. Materials Used for NDI - Continued

Nomenclature	P/N or Specification	Manufacturer	National Stock Number
Miscellaneous Materials			
Gloves, Protective	ZZ-G-381	General Services Administration (GSA)	8415-00-823-7456
Gloves, Surgeon	E-008	Defense Services Administration (GSA)	1615-01-149-8843
Apron, General Purpose	A-A-55063	General Services Administration (GSA)	8415-00-082-6108
Face Shield	A-A-1770	General Services Administration (GSA)	4240-00-542-2048
Cloth, Low-Lint Cleaning	MIL-C-85043	General Services Administration (GSA)	7920-00-044-9281
Dry-Cleaning Solvent	P-D-680, Type II	General Services Administration (GSA)	6850-00-274-5421
Cleaning Solvent	MIL-C-38736	General Services Administration (GSA)	6850-00-538-0929
Scotch-Brite, Type A	L-P-0050	General Services Administration (GSA)	7920-00-659-9175
Temporary Marking Materials			
Aircraft Marking Pencils (China Marker)	MIL-P-83953 Yellow	General Services Administration (GSA)	7510-00-537-6930
Acetone	O-A-51	General Services Administration (GSA)	6810-00-184-4796
Isopropyl Alcohol	TT-I-735	General Services Administration (GSA)	6810-00-286-5435
Cleaning, Solvent, General Purpose	DS-108	Dynamold Inc 2905 Shamrock Ave Fort Worth, TX 76107	7930-01-367-0996
Dielectric Solvent	Electron	Sentry Chemical Co. Inc 1481 Rock Mountain Blvd P.O. Box 748 Stone Mountain, GA 30083-1505	6850-01-375-5553
Dielectric Solvent	Positron	Ecolink Inc 1481 Rock Mountain Blvd Stone Mountain, GA 30083-1505	6850-01-412-0026
n-Propyl Bromide	0338-06	Ecolink Inc 1481 Rock Mountain Blvd Stone Mountain, GA 30083-1505	6850-01-450-6162

SECTION II

ROTOR GROUP

2. GENERAL.

2.1 CONTENTS. The rotor group inspection items covered in this section are those critical items of the CH/MH-47 helicopter rotor blades, rotor head, and components listed in the Rotor Group Inspection Index (Table 2-1). Corresponding inspection figures and applicable text paragraphs are listed opposite each inspection item. The index number for each item may be used to locate it in Figure 2-1.

Table 2-1. Rotor Group Inspection Items

Index: Number	Nomenclature	Inspection Method	Paragraph Number	Figure Number
*2	Rotary-Wing Head:	MT:	2.2	2-2
3	Hub Oil Tank:	ET:	2.3	2-3
*4	Pitch Varying Shaft:	MT:	2.4	2-4
*5	Rotor Hub:	MT:	2.5	2-5
6	Vertical Hinge Pin Flanges:	MT:	2.6	2-6
7	Pitch Varying Shaft Bore Liner:	MT:	2.7	2-7
*8	Horizontal Hinge Pin:	MT:	2.8	2-8
*9	Centrifugal Droop Stop Lugs:	ET:	2.9	2-9
*10	Centrifugal Droop Stop Bolts:	MT:	2.10	2-10
*11	Rotary-Wing Blade:	BT:	2.11	2-11
*12	Pitch Link:	MT:	2.12	2-12
*13	Ball Spherical Bearing:	ET:	2.13	2-13
14	Weather Protective Cover:	BT:	2.14	2-14

NOTE: *Indicates Flight Safety Part.

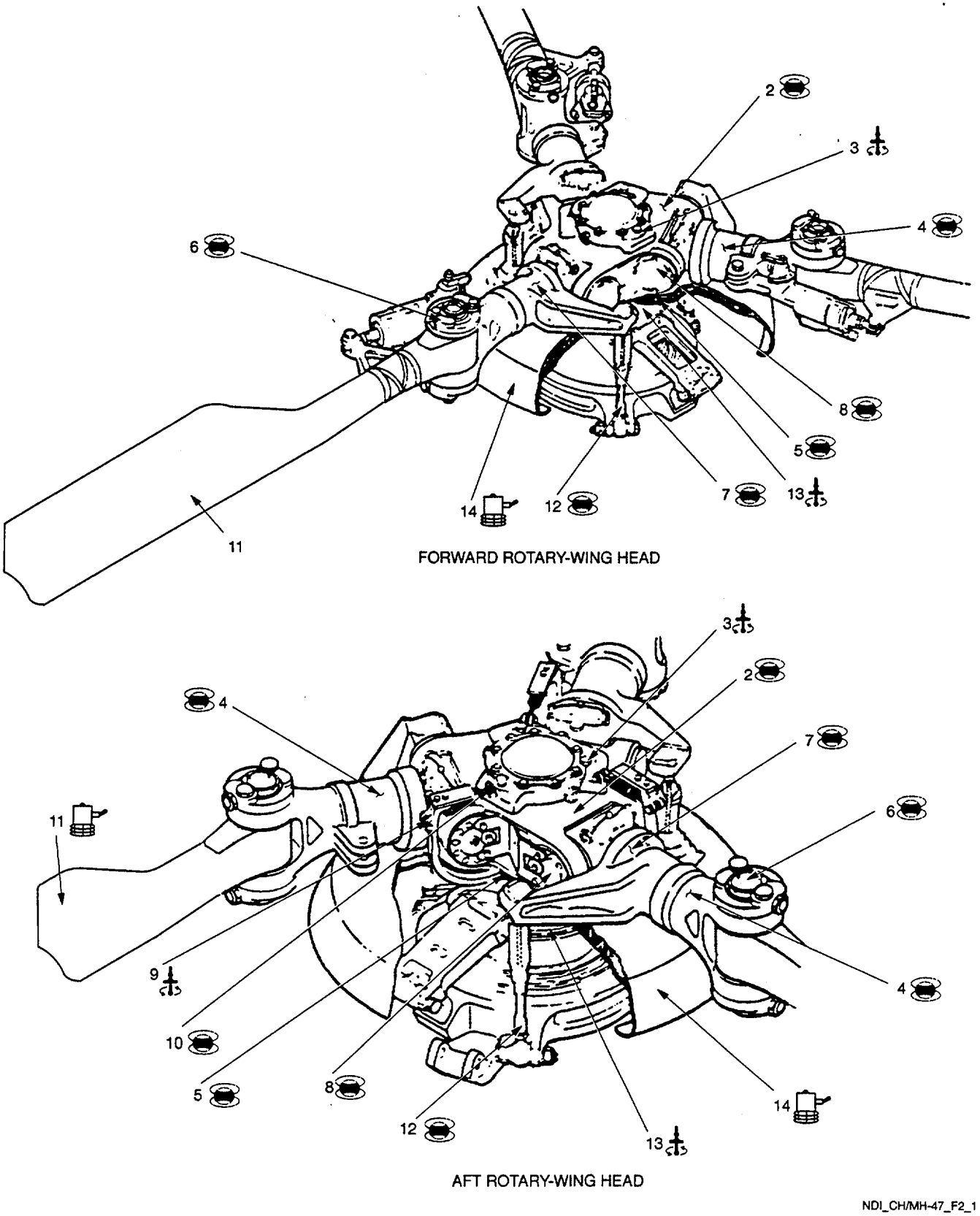


Figure 2-1. Rotor Group

2.2 ROTARY-WING HEAD (MT).

2.2.1 Description (Figure 2-1. Index No.2). This inspection is applicable to all surfaces of the webs, lugs, and holes of the rotary-wing head to verify indications found visually.

2.2.2 Defects. Defects may occur anywhere on the surface of the part. No cracks are allowed.

2.2.3 Primary Method. Magnetic Particle.

2.2.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

2.2.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the rotary-wing head shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.2.3.3 Access. Access is from the forward and aft transmission work platforms. See Figure 1-4 CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.2.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.2.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.2.3. 6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position for this inspection is illustrated in Figure 2-2.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part as shown in relation to suspect crack.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

2.2.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1. 3.

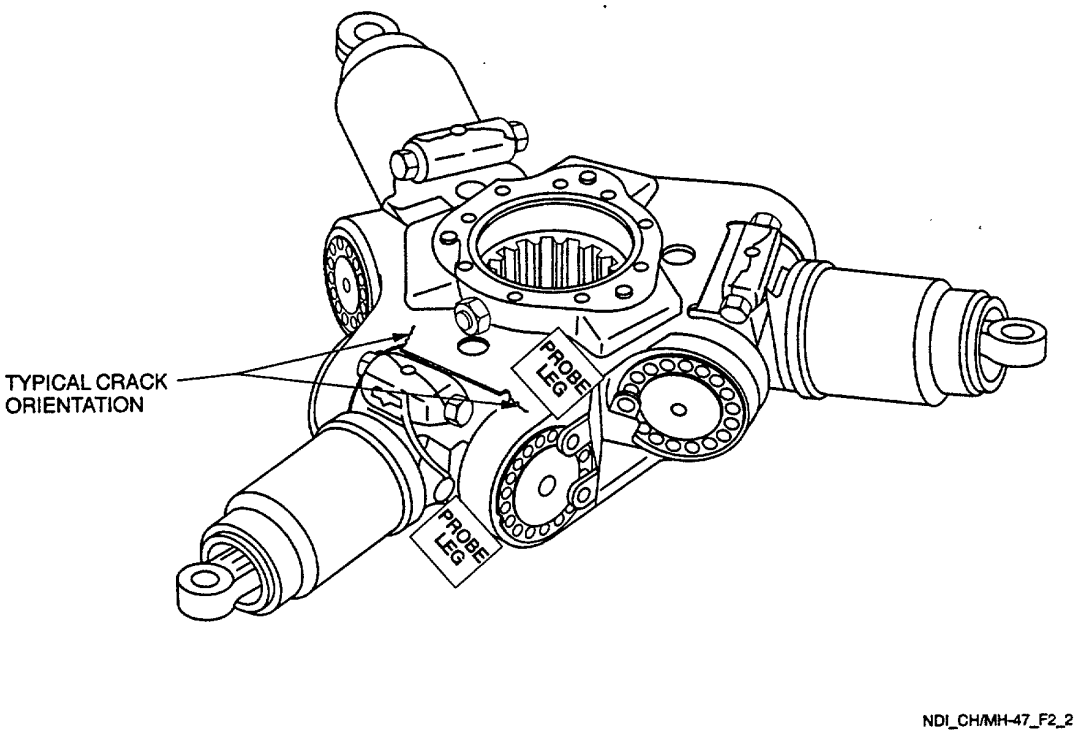


Figure 2-2. Rotary-Wing Head

2.2.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.2.4 Backup Method. None required.

2.2.5 System Securing. Clean the identified component(s) thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. Secure the forward and aft transmission work platforms.

2.3 HUB OIL TANK (ET).

2.3.1 Description (Figure 2-1. Index No.3). The hub oil tank assemblies are located on the upper side of both forward and aft rotary-wing head assemblies, which supply lubrication to the horizontal pin bearing. The hub assemblies are made from either magnesium or aluminum alloy.

2.3.2 Defects. Defects may occur anywhere on the surface of the hub oil tank. Any defects must be inspected both before and after rework. No cracks are allowed.

2.3.3 Primary Method. Eddy Current.

2.3.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Reference Block, three-notched magnesium (0.008, 0.020, and 0.040 EDM notches)

g. Teflon Tape, refer to Table 1-8

h. Aircraft Marking Pencil, refer to Table 1-8

2.3.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the hub oil tank shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.3.3.3 Access. Access is from the forward and aft transmission work platforms. See Figure 1-4 CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.3.3.4 Preparation of Part. The hub oil tank outside surface shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.3.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 560		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block (Refer to standard instrument display shown in Figure 1-7).

2.3.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 2-3.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 2.3.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 2.3.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

2.3.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

2.3.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.3.5 System Securing. If removed, install the hub oil tank as required in accordance with the applicable technical manual listed in Table 1-1. Secure the forward and aft transmission work platform.

2.4 PITCH VARYING SHAFT (MT).

2.4.1 Description (Figure 2-1, Index No. 4). The pitch varying shaft is the inner component of the pitch varying assembly of the rotary using head assembly. It is the bearing surface for the horizontal pin and the attach point for the tie bar assembly.

2.4.2 Defects. Defects may occur anywhere on the surface of the pitch varying shaft. Particular attention shall be given to the horizontal hinge pin barrel around both sides of shaft from oil tank to droop stop mounting bosses. No cracks are allowed.

2.4.3 Primary Method. Magnetic Particle.

2.4.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

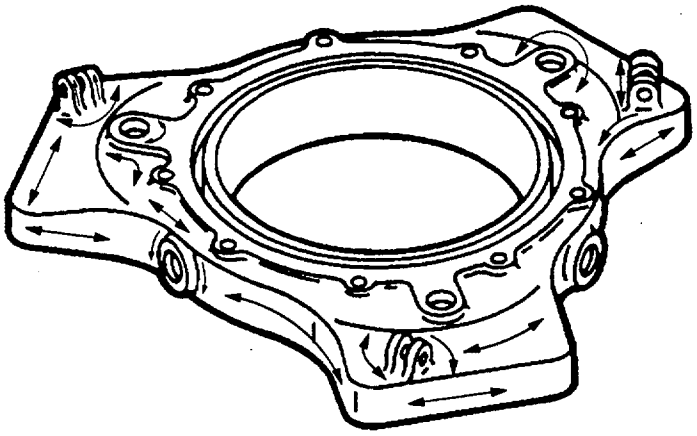
b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

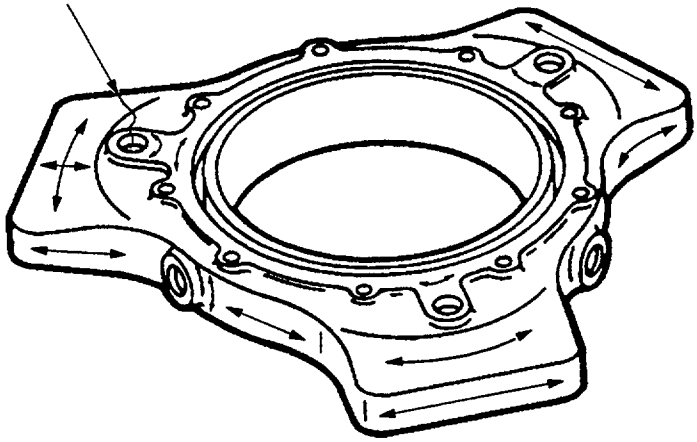
e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8



AFT HUB OIL TANK

TYPICAL CRACK ORIENTATION



FORWARD HUB OIL TANK

ARROWS INDICATE SCAN PATHS

NDI_CH/MH-47_F2_3

Figure 2-3. Hub Oil tank

2.4.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the pitch varying shaft shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.4.3.3 Access. Access is from forward and aft transmission work platforms. See Figure 1-4 -CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.4.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.4.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.4.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 2-4.

a. Select AC on the AC/DC power switch.
b. Place probe/yoke on part in Position 1 as shown.
c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.
d. Inspect for cracks using the black light.
e. Demagnetize before moving to the next position. Refer to paragraph 2.4.3.8.
f. Rotate the probe legs 90 degrees and repeat steps a. through e. for Position 2.
g. Place probe/yoke on part in Position 3 as shown.
h. Repeat steps a. through e. for Position 3.
i. Rotate the probe legs 90 degrees and repeat steps a. through e. for Position 4.

2.4.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

2.4.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.4.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.4.5 System Securing. Clean the pitch varying shaft thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, the pitch varying housing requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the forward and aft transmission work platforms.

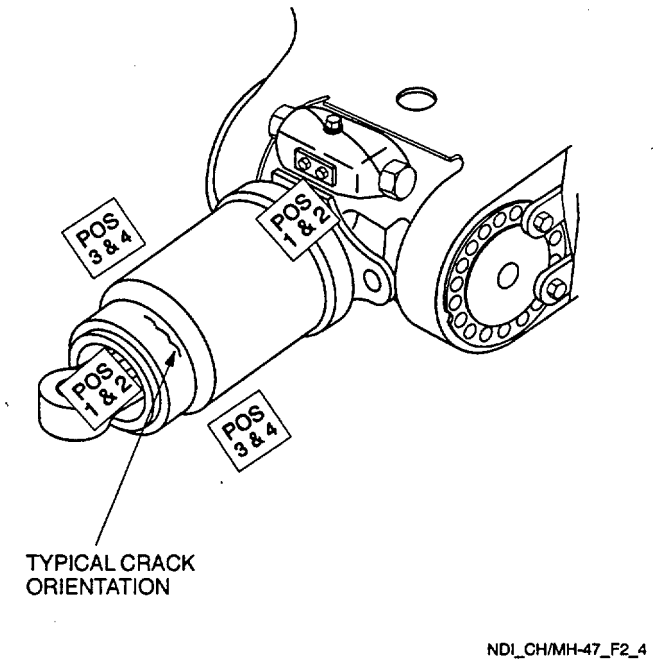


Figure 2-4. Pitch Varying Shaft

2.5 ROTOR HUB (MT).

2.5.1 Description (Figure 2-1. Index No. 5). The rotor hub contains splines that mate with the splines on the transmission rotor shaft. Pitch shafts are connected to the hub through the three horizontal pins. These pins ride in bearings supported by the hub lugs. Caps retaining the pins and bearings are secured by locking beams. The beams connect the leading cap of one pin with the trailing cap of the next pin.

2.5.2 Defects. Defects may occur anywhere on the rotor hub surface. Particular attention shall be given to a one inch area around underside splined area of the rotor hub. No cracks are allowed.

2.5.3 Primary Method. Magnetic Particle.

2.5.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

2.5.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the rotor hub removed in accordance with the applicable technical manuals listed in Table 1-1.

2.5.3.3 Access. Not applicable.

2.5.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.5.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.5.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 2-5.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part in Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 2.5.3.8.

f. Repeat steps a. through e. for Position 2.

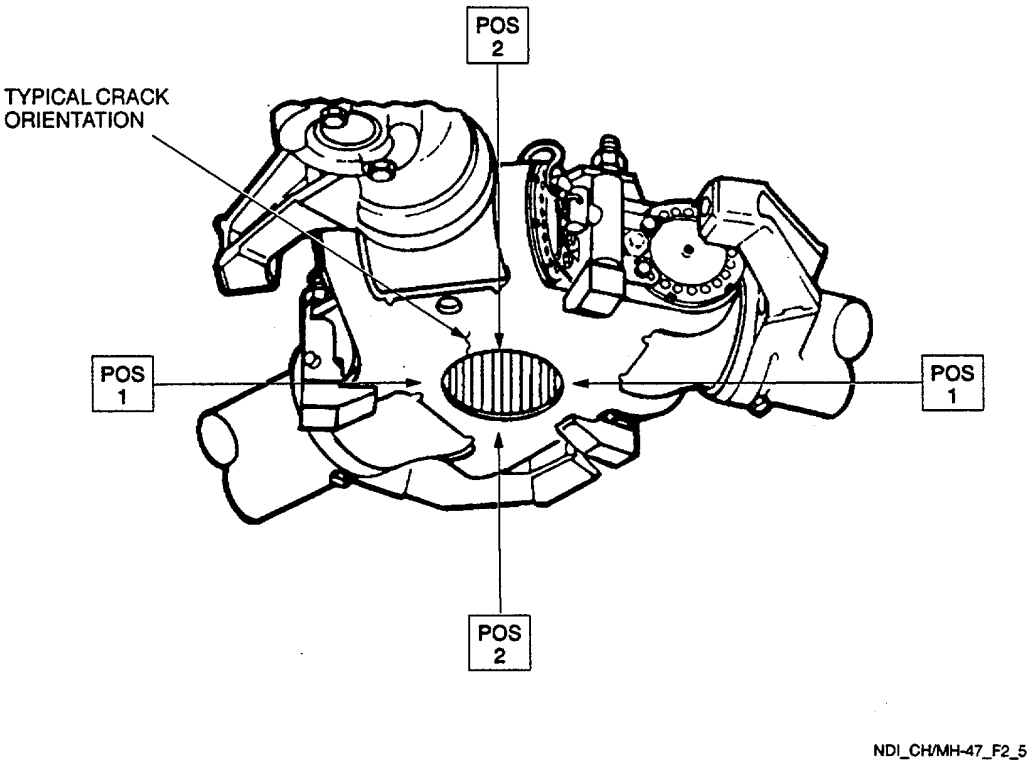


Figure 2-5. Rotor Hub

2.5.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

2.5.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.5.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.5.5 System Securing. Clean the rotor hub thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The rotor hub requires installation in accordance with the applicable technical manuals listed in Table 1-1.

2.6 VERTICAL HINGE PIN FLANGES (MT).

2.6.1 Description (Figure 2-1. Index No. 6). The vertical hinge pin flanges retain the upper and lower bearings within the varying pitch housing lugs. This inspection is to verify any cracks found visually.

2.6.2 Defects. Defects may occur anywhere on the surface of the flanges. No cracks are allowed.

2.6.3 Primary Method. Magnetic Particle.

2.6.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

2.6.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the vertical hinge pin flanges shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.6.3.3 Access. Access is from the forward and aft transmission work platforms. See Figure 1-4 -CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.6.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.6.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.6.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the Am orientation of possible cracks. Position required for this inspection is illustrated in Figure 2-6.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

2.6.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

2.6.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.6.4 Backup Method. None required.

2.6.5 System Securing. Clean the vertical hinge pin flanges thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, the vertical hinge pin flanges require installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the forward and aft transmission work platforms.

2.7 PITCH VARYING SHAFT BORE LINER (MT).

2.7.1 Description (Figure 2-1. Index No. 7). The pitch varying shaft bore liner is the bearing surface for the horizontal pin and the attach point for the tie bar assembly.

2.7.2 Defects. Defects may occur anywhere on the surface of the pitch varying shaft bore liner. No cracks are allowed.

2.7.3 Primary Method. Magnetic Particle.

2.7.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

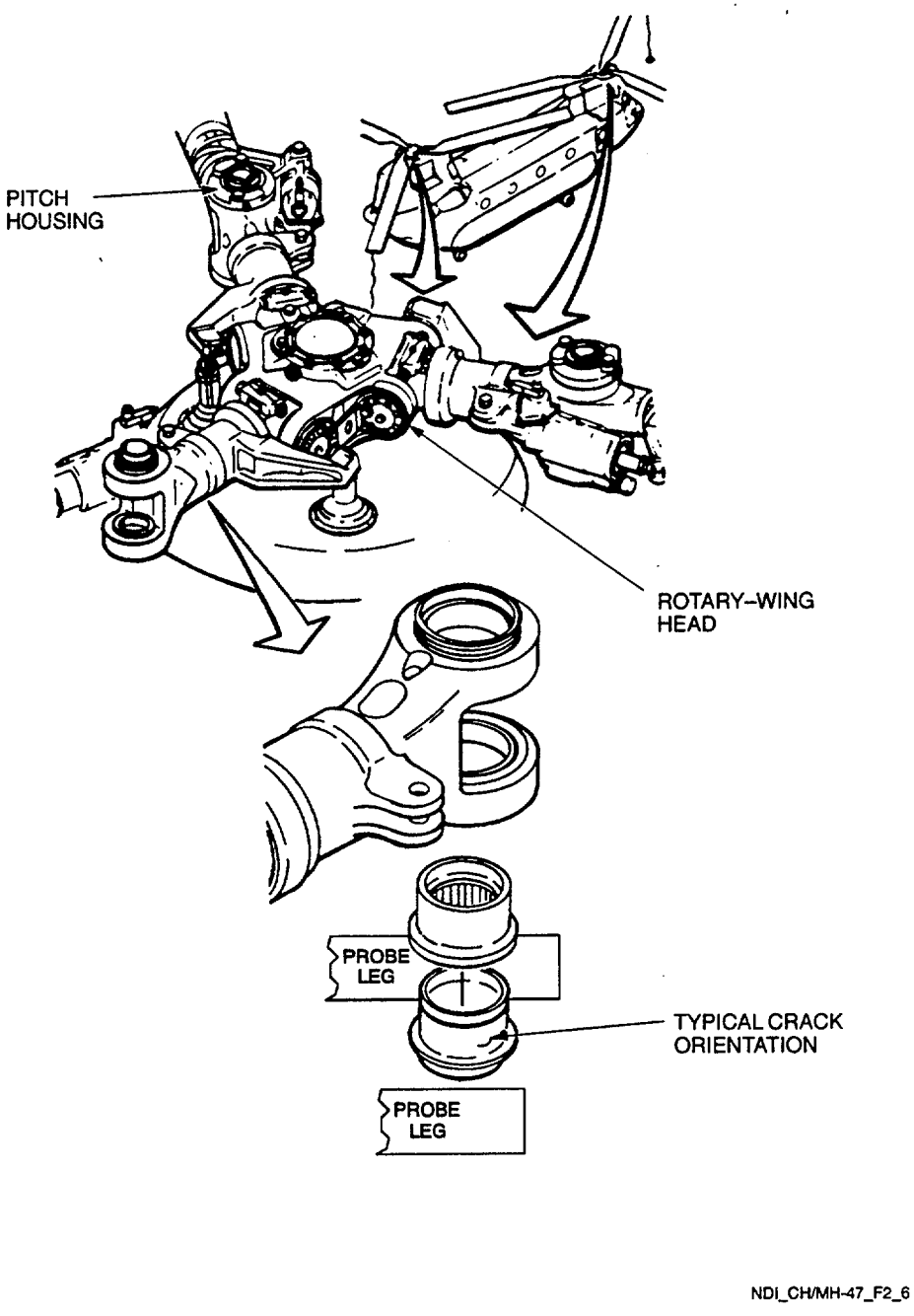


Figure 2-6. Vertical Hinge Pin Flanges

2.7.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. if required, the pitch varying shaft bore liner shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.7.3.3 Access. Not applicable.

WARNING

Maintenance Platforms/ Workstands

Use only appropriate platforms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopters in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

2.7.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.7.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.7.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 2-7.

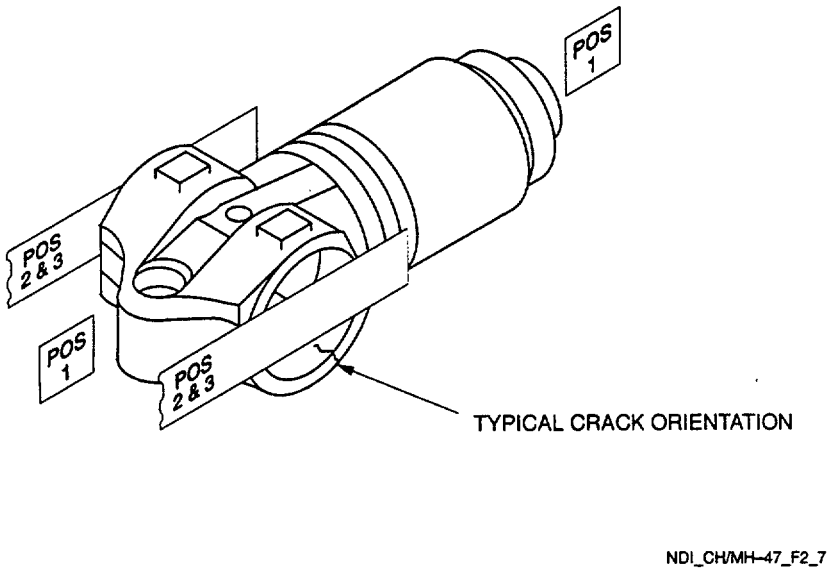


Figure 2-7. Pitch Varying Shaft Bore Liner

a. Select AC on the AC/DC power switch.
b. Place probe/yoke on part in Position 1 as shown.
c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.
d. Inspect for cracks using the black light.
e. Demagnetize before moving to the next position. Refer to paragraph 2.7.3.8.
f. Repeat steps a. through e. for Position 2.
g. Rotate the probe legs 90 degrees and repeat steps a. through e. for Position 3.

2.7.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

2.7.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.7.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.7.5 System Securing. Clean the bore liner thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The pitch varying shaft requires installation in accordance with the applicable technical manuals listed in Table 1-1.

2.8 HORIZONTAL HINGE PIN (MT).

2.8.1 Description (Figure 2-1, Index No. 8). The horizontal hinge pin is a hollow steel pin which connects the pitch varying shaft assembly to the rotary-wing hub assembly.

2.8.2 Defects. Defects may occur anywhere on the surface of the pin. No cracks are allowed.

2.8.3 Primary Method. Magnetic Particle.

2.8.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

NOTE
Hand-held coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6

2.8.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the horizontal hinge pin removed in accordance with the applicable technical manuals listed in Table 1-1.

2.8.3.3 Access. Not applicable.

2.8.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.8.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.8.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position required for this inspection is illustrated in Figure 2-8.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke legs on part as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

2.8.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

2.8.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

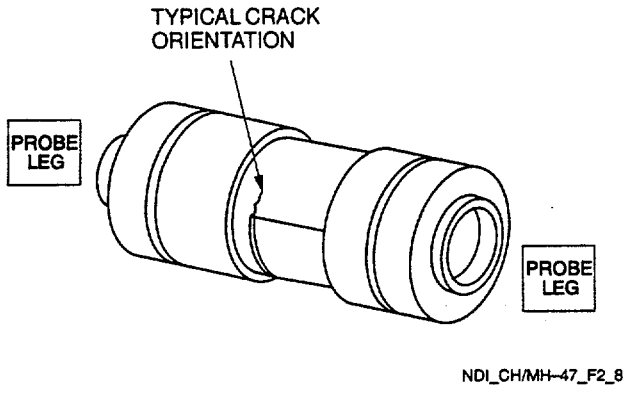


Figure 2-8. Horizontal Hinge Pin

2.8.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.8.5 System Securing. Clean the horizontal hinge pin thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The horizontal hinge pin requires installation in accordance with the applicable technical manuals listed in Table 1-1.

2.9 CENTRIFUGAL DROOP STOP LUGS (ET).

2.9.1 Description (Figure 2-1. Index No. 9). The centrifugal droop stop assembly is mounted in a splined plate under the aft rotor head. The droop stop contains three balancing arms. These are connected by springs to lugs on the hub oil tank. This inspection is to verify any cracks found visually.

2.9.2 Defects. Defects may occur anywhere on the surface of the centrifugal droop stop lugs. No cracks are allowed.

2.9.3 Primary Method. Eddy Current.

2.9.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

2.9.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the droop stop balancing arms shall be removed as required in accordance with the applicable technical manuals listed in Table 1-1.

2.9.3.3 Access. Access is from the aft transmission work platform. See Figure 1-4 - CH-47: 27 and/or 34; MH-47: 17.

2.9.3.4 Preparation of Part. The centrifugal droop stop lugs shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.9.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:
(1) Null probe on test block.
(2) Adjust phase as required to obtain horizontal lift-off.
(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

2.9.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 2-9.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

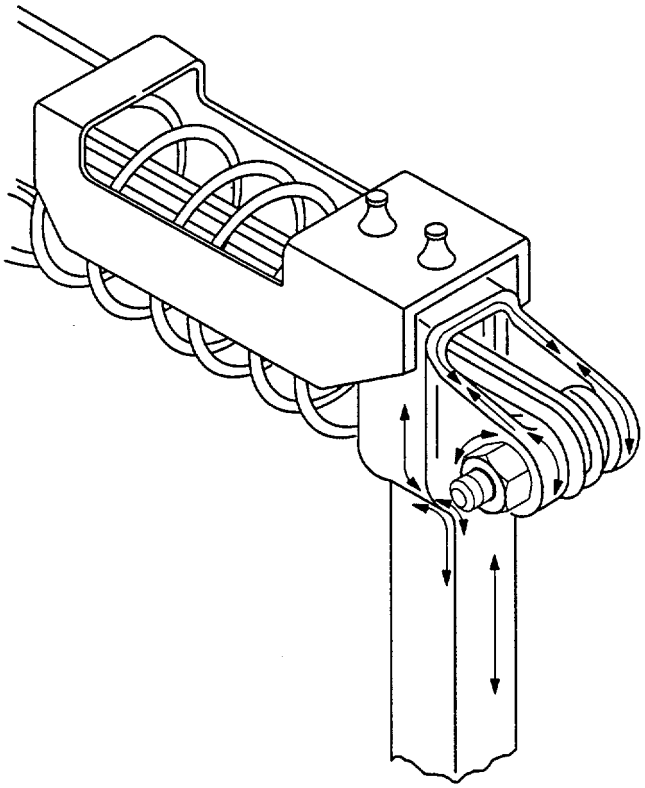
NOTE

Either probe identified in paragraph 2.9.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 2.9.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

2.9.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

2.9.4 Backup Method. None required.

2.9.5 System Securing. The centrifugal droop stop lugs, if removed, require installation in accordance with the applicable technical manual listed in Table 1-1. Secure the aft transmission work platform.



ARROWS INDICATE SCAN PATHS

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Figure 2-9. Centrifugal Droop Stop Lugs

2.10 CENTRIFUGAL DROOP STOP BOLTS (MT).

2.10.1 Description (Figure 2-1. Index No. 10). The centrifugal droop stop bolts connect the balancing arms to the lugs in the hub oil tank. This inspection is to verify any cracks found visually.

2.10.2 Defects. Defects may occur anywhere on the surface of the bolt. No cracks are allowed.

2.10.3 Primary Method. Magnetic Particle.

2.10.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

2.10.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the centrifugal droop stop bolts removed in accordance with the applicable technical manuals listed in Table 1-1.

2.10.3.3 Access. Not applicable.

2.10.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.10.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.10.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position required for this inspection is illustrated in Figure 2-10.

a. Select AC on the AC/DC power switch.
b. Place probe/yoke legs on part as shown.
c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.
d. Inspect for cracks using the black light.

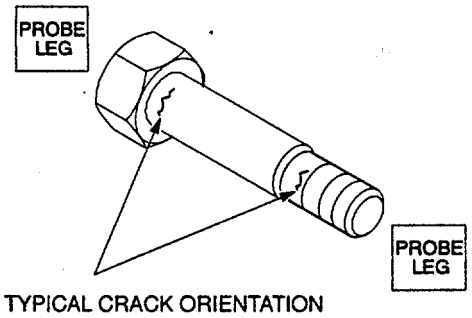


Figure 2-10. Centrifugal Droop Stop Bolts

2.10.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

2.10.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.10.4 Backup Method. None required.

2.10.5 System Securing. Clean the centrifugal droop stop bolts thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The centrifugal droop stop bolts require installation in accordance with the applicable technical manuals listed in Table 1-1.

2.11 ROTARY-WING BLADE (BT).

2.11.1 Description (Figure 2-1. Index No. 11). The rotary-wing blades are composite structures that consist of a D-shaped fiberglass spar, titanium leading edge, nickel erosion cap, and a fairing having fiberglass skins over nomex honeycomb bonded to the spar. This inspection is to verify any void indications found visually.

2.11.2 Defects. Void damage may occur anywhere on both sides of the blade.

NOTE

A void is defined as an unbonded area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term ("void").

2.11.3 Primary Method. Bond Testing.

2.11.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Bond Test Unit

b. Probe, Mechanical Impedance Analysis

c. Probe Holder

d. Cable Assembly

e. Test Block, Composite Defect Standard #1

f. Test Block, Composite Defect Standard #3

g. Teflon Tape, refer to Table 1-8

h. Aircraft Marking Pencil, refer to Table 1-8

2.11.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance in accordance with applicable technical manuals listed in Table 1-1.

2.11.3.3 Access. Access is from the forward and aft transmission work platforms and the fore and aft walkway. See Figure 1-4 - CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.11.3.4 Preparation of Part. The rotary-wing blades shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.11.3.5 NDI Equipment Settings. Refer to Bond Testing Equipment, paragraph 1.4.6.1.

a. Attach cable and probe to Bondmaster. Protect probe with Teflon tape and install in probe holder.

b. Turn on Bondmaster, press SPCL, and make the following adjustments:

H Pos	-40%
V Pos	- 80%
PHASE REF	- 0
DRIVE	- MID

c. Press SET and select DISPLAY - PHASE.

d. Place probe on the good area of test block #1 and press GOOD PART. Do this several times while moving the probe to different spots in the good area of the test block. Note the video signature for each. Select and enter a representative good area by pressing GOOD PART one last time.

e. Place probe on void area of test block #1 and press BAD PART. Do this several times while moving the probe slightly to different positions within the void area. Select and enter a position that gives a strong difference between good and void areas. (See Figure 1-5.) Use DIFF soft key to observe difference between good and bad areas of test block.

NOTE

If during setup the flying spot deflects upward or to the side when the probe passes over the bad part, instead of the desired down deflection toward the alarm box, press SPCL and toggle to a different phase setting (90,180, or 270), and repeat d. and e. Continue to try phase setting until the flying spot moves in the desired down direction.

f. Place probe on good area of test block and press RUN. Flying spot should be near the top-center of the ACTIVE screen. If not, press NULL. Slide probe from good to void area and note response from flying spot. This response should provide both amplitude (vertical) and phase (horizontal) movement. The default gate/alarm setting may be incorrect for this setup. Turn off or reset gate/alarm as desired.

g. The Bondmaster is programmed to automatically set test parameters to a start-up or initial bond test. By following the steps outlined above, adjustments to the FREQ, GAIN, and ALARM can help to refine the selectivity in locating defects among differing bonded metallic and composite materials.

2.11.3.6 Inspection Procedure. Refer to Bond Test Method, paragraph 1.4.6 and inspection areas shown in Figure 2-11.

a. Skin-to-Honeycomb Voids. Place probe on main rotor blade in location where test for skin-to-honeycomb bond separation is desired and press NULL. Move probe from good to suspect area and note response. A strong amplitude change with phase shift similar to the test block is indicative of a void. This setup is very sensitive to thin skin-to-core bonding. Move the probe slowly over the skin and note the slight amplitude change (bounce) as the probe senses alternately the honeycomb cell nodes and cell walls.

NOTE

The basic setup provided also selects a frequency unit provided a satisfactory inspection for voids associated with skin-to-spar, skin-to-trailing edge, doubler-to-doubler and doubler-to-skin, and trim tab bonding. For the inspection of bonding voids to the spar, setup on Test Block Composite Defect Standard #3 may provide some advantage.

b. Use the NULL and GAIN adjustments to reset the ACTIVE screen for the areas to be inspected (do not go back to SET mode). Also, compare similar areas. For example, to check for spar-to-skin voids, check front and back of blade in the same area, or check another blade in the same area. Observe that, when moving the probe chordwise from the spar to the trailing edge, the transitions at the spar-to-honeycomb and the honeycomb-to-trailing edge strip are easily detected. When inspecting these areas, adjust the NULL and GAIN and move the probe carefully along the transition using a straight edge or other guide. A localized phase and amplitude shift similar to the test block indicates a void.

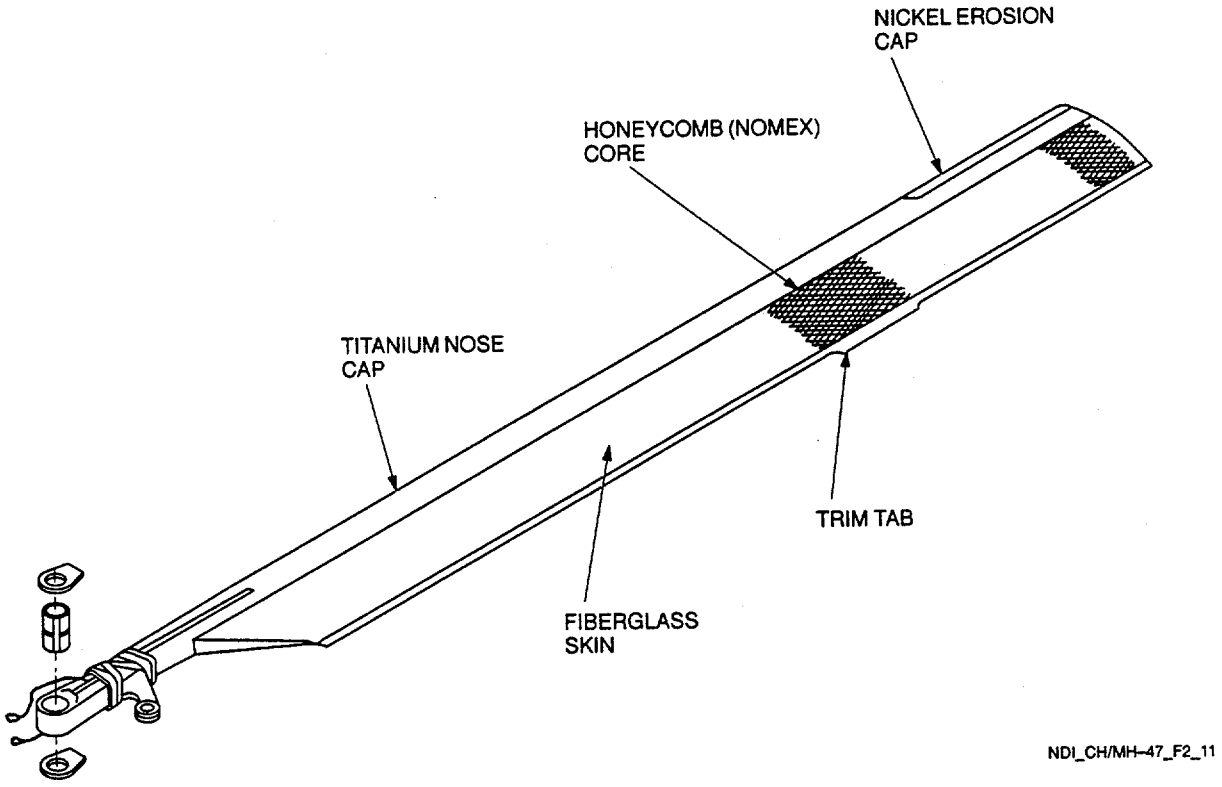


Figure 2-11. Rotary-Wing Blade

2.11.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

NOTE

Attention shall be directed to accurately mark the boundaries of all voids on both sides of the blade. These markings will be needed to determine acceptance or rejection criteria in accordance with applicable technical manuals.

2.11.4 Backup Method. None required.

2.11.5 System Securing. Secure the forward and aft transmission work platforms.

2.12 PITCH LINK (MT).

2.12.1 Description (Figure 2-1. Index No.12).The pitch links are between the swashplates and pitch varying housings. Tilting a swashplate up or down moves the pitch link and pitch arm in the same direction. This increases or decreases the blade pitch angle.

2.12.2 Defects. Defects may occur anywhere on the surface of the pitch link. No cracks are allowed.

2.12.3 Primary Method. Magnetic Particle.

2.12.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held coil may be used in lieu of Position 1 only provided the link is detached from one end or removed from helicopter. Refer to Paragraph 1.4.8.1.2 and Figure 1-6.

2.12.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the pitch links shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.12.3.3 Access. Access is from the forward and aft transmission work platforms. See Figure 1-4 -CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.12.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.12.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

2.12.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to-the orientation of possible cracks. Positions required for this inspection are illustrated in Figure 2-12.

a. Select AC on the AC/DC power switch.
b. Place probe/yoke on part at Position 1 as shown.
c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.
d. Inspect for cracks using the black light.
e. Premagnetize before moving to the next position. Refer to paragraph 2.13.3.8.
f. Repeat steps a. through e. for Positions 2 and 3.

2.12.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

2.12.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

2.12.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.12.5 System Securing. Clean the pitch link thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, the pitch link requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the forward and aft transmission work platform.

2.13 BALL SPHERICAL BEARING (ET).

2.13.1 Description (Figure 2-1. Index No. 13). The ball spherical bearing is a bearing surface for the sleeve bearings of the stationary swashplate ring assemblies, both forward and aft.

2.13.2 Defects. Defects may occur anywhere on the surface of the spherical bearing. No cracks are allowed.

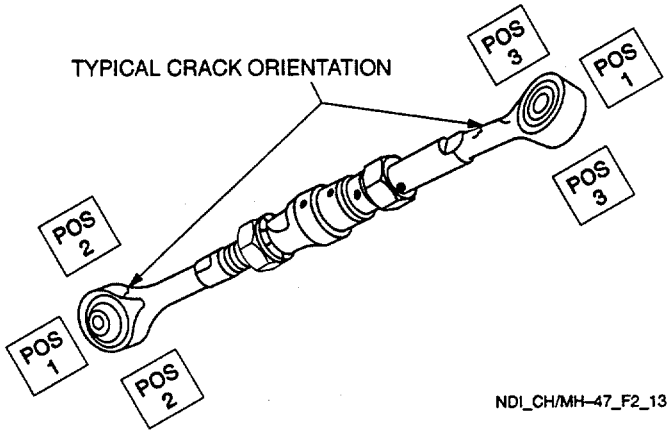


Figure 2-12. Pitch Link

2.13.3 Primary Method. Eddy Current.

2.13.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

2.13.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the ball spherical bearing shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

2.13.3.3 Access. Not applicable.

2.13.3.4 Preparation of Part. The ball spherical bearing shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.13.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-1 9e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	-0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.
(2) Adjust phase as required to obtain horizontal lift-off.
(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

2.13.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 2-13.

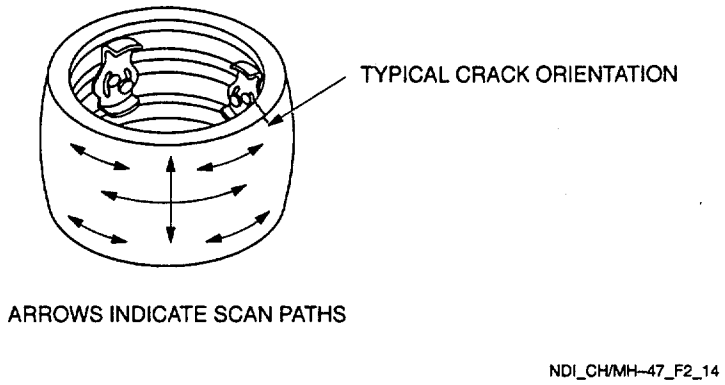


Figure 2-13. Ball Spherical Bearing

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 2.14.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 2.14.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

2.13.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

2.13.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

2.13.5 System Securing. The ball spherical bearing requires installation as required in accordance with the applicable technical manual listed in Table 1-1.

2.14 WEATHER PROTECTIVE COVER (BT).

2.14.1 Description (Figure 2-1. Index No. 14). The weather protective cover is bolted to the drive collar flanges and turns with the collar and shaft. The cover provides weather protection for the upper controls.

2.14.2 Defects. Void damage may occur on any area of the structure.

NOTE

A void is defined as an unbonded area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term ("void").

2.14.3 Primary Method. Bond Testing.

2.14.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Bond Test Unit
b. Probe, Mechanical Impedance Analysis
c. Probe Holder
d. Cable Assembly
e. Test block, metal honeycomb with skin thickness closest to that of the panel to be inspected.
f. Test Block, Composite Defect Standard #1
g. Teflon Tape, refer to Table 1-8
h. Aircraft Marking Pencil, refer to Table 1-8

2.14.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the weather protective cover shall be removed in accordance with applicable technical manuals listed in Table 1 -1.

2.14.3.3 Access. Access is from the forward and aft transmission work platforms. See Figure 1-4 - CH-47: 9, 27, and/or 34; MH-47: 16 and 17.

2.14.3.4 Preparation of Part. The components shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

2.14.3.5 NDI Equipment Settings. Refer to Bond Test Equipment, paragraph 1.4.6.1.

a. Attach cable and probe to Bondmaster. Protect probe with Teflon tape and install in probe holder.

b. Turn on Bondmaster, press SPCL, and make the following adjustments:

H Pos	-40%
V Pos	- 80%
PHASE REF	- 0
DRIVE	- MID

c. Press SET and select DISPLAY - PHASE.
d. Place probe on the good area of test block #1 and press GOOD PART. Do this several times while moving the probe to different spots in the good area of the test block. Note the video signature for each. Select and enter a representative good area by pressing GOOD PART one last time.
e. Place probe on void area of test block #1 and press BAD PART. Do this several times while moving the probe slightly to different positions within the void area. Select and enter a position that gives a strong difference between good and void areas. (See Figure 1-5.) Use DIFF soft key to observe difference between good and bad areas of test block.

NOTE

If, during setup, the flying spot deflects upward or to the side when the probe passes over the bad part, instead of the desired down deflection toward the alarm box, press SPCL and toggle to a different phase setting (90, 180, or 270), and repeat steps d. and e. Continue to try phase setting until the flying spot moves in the desired down direction.

f. Place probe on good area of test block and press RUN. Flying spot should be near the top-center of the ACTIVE screen. If not, press NULL. Slide probe from good to void area and note response from flying spot. This response should provide both amplitude (vertical) and phase (horizontal) movement. The default gate/alarm setting may be incorrect for this setup. Turn off or reset gate/alarm as desired.

g. The Bondmaster is programmed to automatically set test parameters to a start-up or initial bond test. By following the steps outlined above, adjustments to the FREQ, GAIN, and ALARM can help to refine the selectivity in locating defects among differing composite materials.

2.14.3.6 Inspection Procedure. Refer to Bond Test Method, paragraph 1.4.6 and inspection areas shown in Figure 2-14. Place probe on cover in location where test for void is desired and press NULL. Move probe from good to suspect area and note response. A strong amplitude change and phase shift similar to the standard is indicative of a void.

2.14.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

NOTE

Attention shall be directed to accurately mark the boundaries of all voids. These markings will be needed to determine acceptance or rejection criteria in accordance with applicable technical manuals.

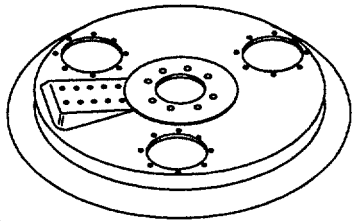


Figure 2-14. Weather Protective Cover

2.14.4 Backup Method. None required.

2.14.5 System Securing. If removed, the weather protection cover shall be installed in accordance with applicable technical manuals listed in Table 1-1. Secure the forward and aft transmission work platforms.

2.15 ROTOR HUB LIGHTENING HOLES (ET)

2.15.1 Description. The CH-47 main rotor hub lightening holes are located in the vertical web area inside the hub. This procedure is applicable only to the following parts:

a. Forward Rotor Hub - P/N 114R2050-19, 114R2050-21, 114R2050-39, 114R2050-41

b. Aft Rotor Hub - P/N 114R2050-20, 114R2050-22, 114R2050-40, 114R2050-42

2.15.2 Defects. This inspection is to detect cracks extending from the lightening holes in the vertical web area. No cracks are allowed.

2.15.3 Primary Method. Eddy Current.

2.15.3.1 NDI Equipment and Materials.

a. Eddy Current inspection unit, 19eII or equivalent.

b. Probe Kit, P/N SPCK - 135, consisting of:

(1) Pencil Probe Unshielded - P/N PAUB90602

(2) Pencil Probe Unshielded - P/N PAUB30602

(3) Cable - P/N EC-N19-TL-6

(4) Reference Block - Three notch 4340 steel (0.008, 0.020 and 0.040 EDM notches)

c. Teflon Tape, refer to Table 1-8, TM 1-1520-253-23

d. Aircraft Marking Pencil, refer to Table 1-8, TM 1-1520-253-23

2.15.3.2 Preparation of helicopter. This is an on aircraft task. The helicopter shall be prepared for safe ground maintenance. The locking beams shall be removed in accordance with Task 5-40, TM 1-1520-240-23 or Task 5-41, TM 1-1520-252-23 for access to the outside surface of the lightening holes. Perform a thorough visual inspection of the lightening holes for signs of mechanical damage, corrosion, cracking, etc. This inspection may also be performed off aircraft if hub is removed for other maintenance.

2.15.3.3 Access. Access is from the forward and aft transmission work platforms. See Figure 1-4-CH-47D: 9 and 27, and/or 34; MH-47E: 16 and 17.

2.15.3.4 Preparation of part. The rotor hub web area shall be free of grease, oil, loose scale or other contamination that could interfere with accurate interpretation of indications. Light sanding of the inspection area with crocus cloth to smooth the painted surface is permissible. Wipe the inspection area clean after sanding.

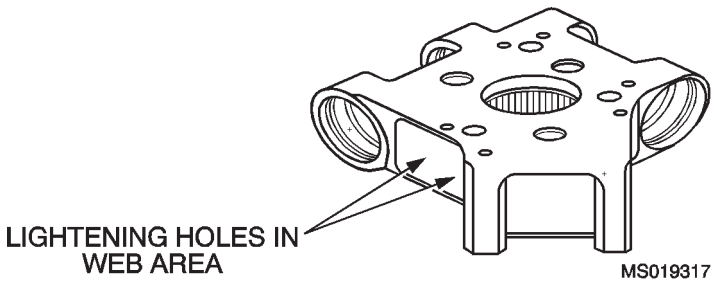


Figure 2.15A Main rotor hub

2.15.3.5 Reference Standard. The reference standard used for calibration has one half of its working surface cadmium plated. This provides the user an opportunity to identify conductivity changes related to cadmium plating variations. The reference standard has been covered with a layer of teflon tape to (1) protect the cadmium plating and (2) provide a facsimile of the lift off encountered from the main rotor hubs painted surface.

2.15.3.6 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19eII.

Frequency F1-	100 KHz	F2	-off
HdB-	76.0		
VdB-	82.0		
Rot-	260°		
Probe Drive-	Low		
LPF-	100		
HPF-	0		
H Pos-	80%		
V Pos-	30%		

Refer to Eddy Current Method, paragraph 1.4.11, TM 1-1520-253-23

b. Set up on the reference standard as follows:

(1) Place a piece of teflon tape across the probe tip. Replace as necessary.

(2) Null the probe on the test block.

(3) Adjust phase as required to obtain horizontal lift-off.

(4) Slide the probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over the 0.040 inch notch. Refer to the standard instrument display shown in Figure 1-7, TM 1-1520-253-23.

(5) Note the differing conductivity locations of the flying dot with the probe placed on the non-cadmium plated portion of the reference standard versus the probe located on the cadmium plated portion. Reference Figure 2.15B below.

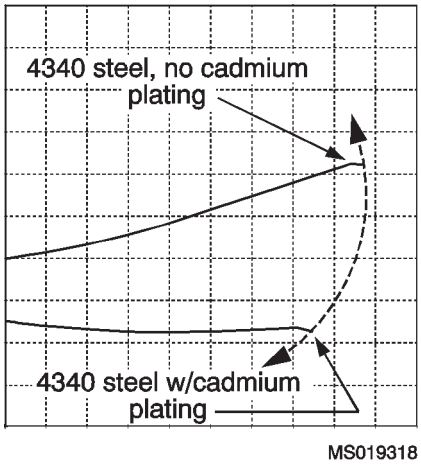


Figure 2.15B

Figure 2.15B displays the conductivity variation between cad and non-cad areas on the calibration standard. Cadmium variations will raise or lower the flying dot along the dotted line representing the conductivity curve as conductivity values change.

2.15.3.7 Inspection procedure. Refer to Eddy Current Method, paragraph 1.4.11, TM 1-1520-253-23.

NOTE

A nonmetallic insert (a short piece of PVC pipe, Styrofoam etc.) may be inserted snugly into the hole to aid as a probe guide to prevent edge effect signals.

a. Place the probe on a good area of the web under inspection and null. Adjust the phase angle as required to obtain horizontal lift-off.

b. Recognize the possible lift off variation associated with the hubs paint thickness in comparison to the the layer of tape on the calibration standard. Lift off variations will be evident by horizontal movement of the flying dot across the CRT display. Reference Figure 2.15C.

c. Adjust the vertical positioning of the flying dot to maintain the hub null point on the CRT display if its conductivity is greater than the reference standard.

d. Scan around the perimeter of the lightening holes as close as possible without achieving edge effect. Continue scanning the area surrounding the lightening holes to sufficiently cover an area of one half inch from the edge of the hole.

e. Any signal similar to the notches in the test block is cause for rejection.

CAUTION

Excessive probe wear will be encountered if the teflon tape on the probe tip is allowed to deteriorate. Light sanding of the inspection area with crocus cloth to smooth the painted surface is permissible. Wipe the inspection area clean after sanding.

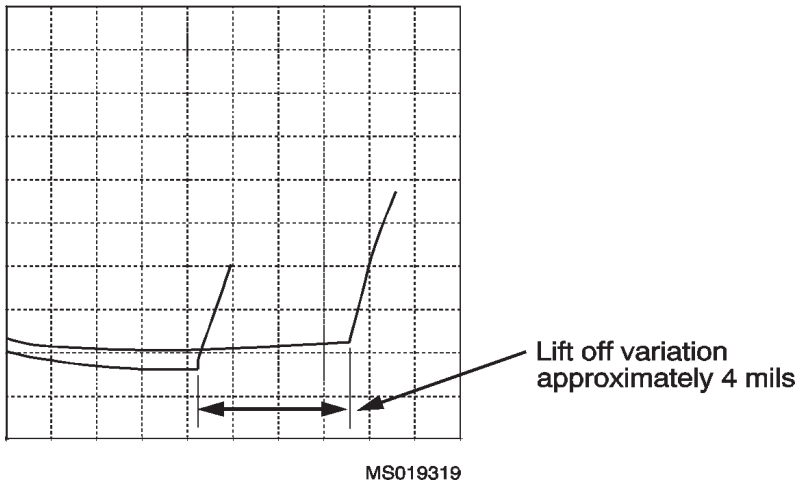


Figure 2.15C Lift off variation due to nonconductive coating

NOTE

Either probe in the probe kit identified in paragraph 2.15.3.1 can be used depending on the ease of accessibility and user friendliness. If the probes are changed, repeat paragraph 2.15.3.6 steps 1, 2, 3, and 4. The probe contact surface should be kept as flat as possible on the test surface. The probe shafts are made of thin copper tubing allowing the probe shaft to be carefully modified as necessary to optimize the probe contact angle.

2.15.3.8 CRT Display Interpretation. Eddy current interpretation requires an understanding of the material properties and subsequent manufacturing processes that can effect inspection results. Figures 2.15D, 2.15E, and 2.15F & G below display hub variations that can be detected while inspecting the main rotor hub.

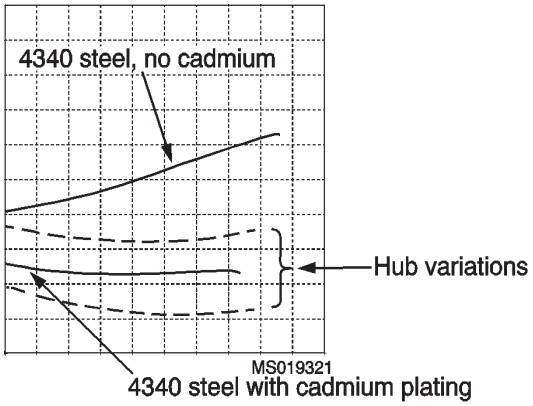


Figure 2.15D

Figure 2.15D again display the conductivity variation between cad and non-cad areas on the calibration standard. Main rotor hub null locations can vary either side of the null point of the calibration standard depending on cadmium plating thickness.

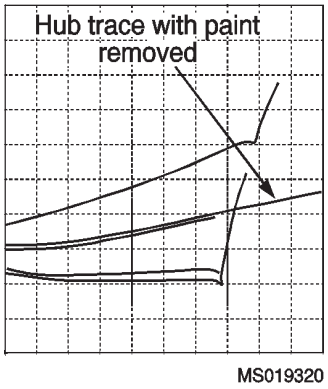


Figure 2.15E

Figure 2.15E displays the cad plated and non-cad plated surfaces when passing over the .040 in. EDM notch. Impedance values change with cadmium or paint thickness variations. The center trace is from a section of the main rotor hub with the paint removed. The flying dot is off screen to the right due to the change in lift off. Calibration on the reference standard with the tape removed will bring these null points closer together.

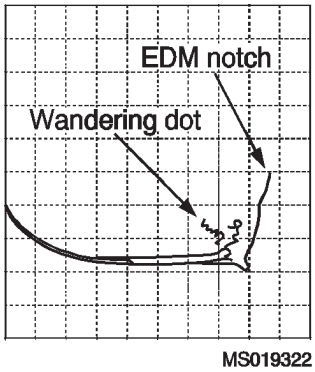


Figure 2.15F

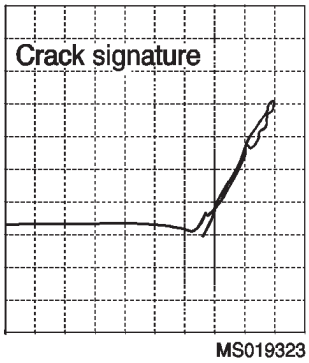


Figure 2.15G

Figure 2.15F compares the slow wandering dot movement associated with conductivity/permeability changes in contrast to the quick rise and fall signature of the EDM notch.

Figure 2.15G is an actual crack that seldom will be as cleanly defined as the calibration notches. True cracks can be readily identified by the rapid rise and fall time of their eddy current signature.

2.15.4 Marking and Recording of Inspection Results. Mark and record inspection results as required by paragraph 1.3.

2.15.5 If any cracks are found the rotor hub is unserviceable.

2.15.6 Replace the locking beams in accordance with Task 5-40, TM 1-1520-240-23 or Task 5-41, TM 1-1520-252-23.

SECTION III

TRANSMISSION/DRIVETRAIN GROUP

3. GENERAL.

3.1 CONTENTS. The transmission/drivetrain group inspection items covered in this section are those items of the CH/MH-47 helicopter transmission, gear boxes, driveshafts, and components listed in the Transmission/Drivetrain Group Inspection Index (Table 3-1). Corresponding inspection figures and applicable text paragraphs are listed opposite each inspection item. The item number for each item may be used to locate it in Figure 3-1.

Table 3-1. Transmission/Drivetrain Group Inspection Index

Index Number	Nomenclature	Inspection Method	Paragraph Number	Figure Number
*2	Driveshaft Adapters (Aluminum)	ET	3.2	3-2
*3	Driveshaft Adapters (Steel)	MT	3.3	3-3
*4	Forward Driveshafting Tubes	ET	3.4	3-4
*5	Aft Driveshafting Tubes	ET	3.5	3-5
*6	Engine Driveshaft (Two Piece)	ET	3.6	3-6
*7	Engine Driveshaft (One Piece)	ET	3.7	3-7
8	Driveshaft Adapter Plate	PT	3.8	3-8
*9	Engine Transmission Adapter	MT	3.9	3-9
*10	Combining Transmission Adapter	MT	3.10	3-10
*11	Forward Transmission Slider Shaft	MT	3.11	3-11
*12	Forward Transmission Outside Surface	ET	3.12	3-12
13	Aft Slider Shaft	MT	3.13	3-13
*14	Aft Rotor Shaft	MT	3.14	3-14
*15	Aft Rotor Shaft Support	ET	3.15	3-15
*16	Combining Transmission Outside Surface	ET	3.16	3-16
*17	Aft Transmission Outside Surface	ET	3.17	3-17
*18	Engine Transmission Quill Shaft	MT	3.18	3-18
*19	Engine Transmission Outside Surface	ET	3.19	3-19
20	Transmission Oil Cooler Assemblies	PT	3.20	3-20

NOTE: *Indicates Flight Safety Part.

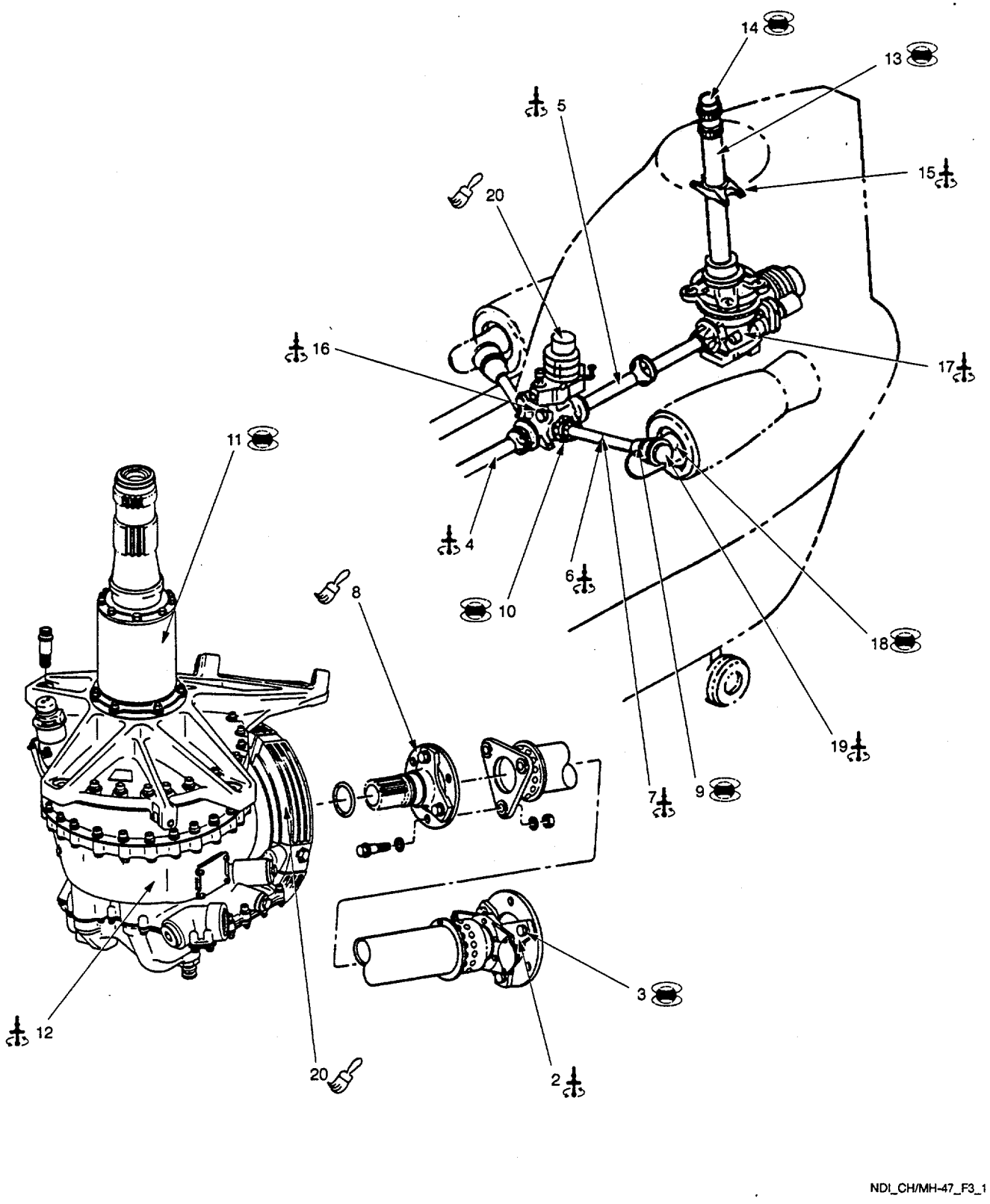


Figure 3-1. Transmission / Drivetrain Group

3.2 DRIVESHAFT ADAPTERS (ALUMINUM) (ET).

3.2.1 Description (Figure 3-1. Index No. 2). This inspection is applicable to the aluminum adapters on the forward driveshaft ends of shafts 1 through 6, both ends of shaft number 7, the forward end of aft shaft number 8, both ends of aft shaft number 9, and the engine driveshaft adapters.

3.2.2 Defects. Defects may occur anywhere on the surface of the aluminum driveshaft adapter assemblies. Particular attention shall be given to areas around bolts. No cracks are allowed.

3.2.3 Primary Method. Eddy Current.

3.2.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

3.2.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the components shall be removed in accordance with the applicable technical manuals listed in Table 1 -1.

3.2.3.3 Access. Access is through the cabin crown tunnel covers. See Figure 1-4 - CH-47: 8; MH-47:3.

3.2.3.4 Preparation of Part. The aluminum driveshaft adapters shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.2.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-1 9e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

3.2.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-2.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part. (Rotation of blades may be necessary.)

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.2.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.2.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.2.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.2.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.2.5 System Securing. If removed, install the adapters in accordance with the applicable technical manual listed in Table 1-1. Secure the cabin crown tunnel covers.

3.3 DRIVESHAFT ADAPTERS (STEEL) (MT).

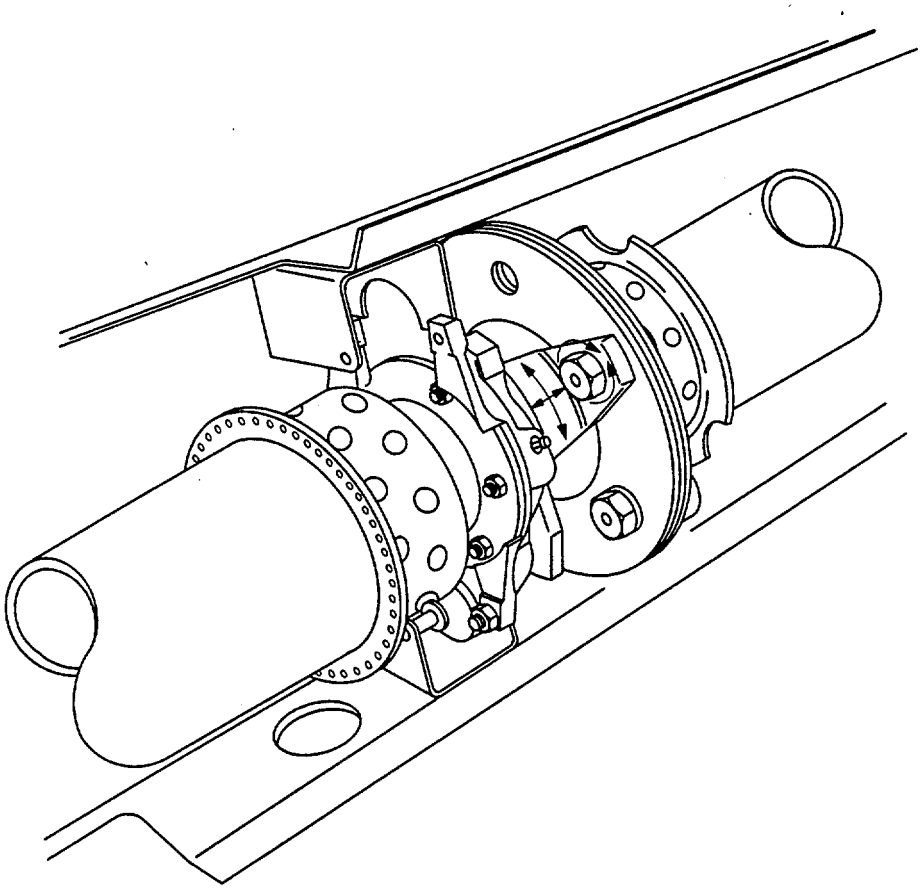
3.3.1 Description (Figure 3-1. Index No. 3). This inspection is applicable to the steel adapters contained within the forward and aft driveshafting. The adapters are on the aft ends of the forward shafts 1 through 6 and aft shaft number 8.

3.3.2 Defects. Defects may occur anywhere on the surface of the adapters. Particular attention shall be given to areas around bolts. No cracks are allowed.

3.3.3 Primary Method. Magnetic Particle.

3.3.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8



ARROWS INDICATE SCAN PATHS

NDI_CH/MH-47_F3_2

Figure 3-2. Driveshaft Adapters (Aluminum)

3.3.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the, components shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.3.3.3 Access. Access is through the cabin crown tunnel covers. See Figure 1-4- CH-47: 8; MH-47: 3.

3.3.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.3.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

3.3.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 3-3.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part in Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 3.3.3.8.

f. Rotate the adapter and place either probe leg on the third adapter ear.

g. Repeat steps a. through e. for Position 2.

3.3.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

3.3.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

3.3.4 Backup Method. None required.

3.3.5 System Securing. Clean the driveshaft adapter thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, install the adapters in accordance with the applicable technical manuals listed in Table 1-1. Secure the cabin crown tunnel covers.

3.4 FORWARD DRIVESHAFTING TUBES (ET).

3.4.1 Description (Figure 3-1, Index No. 4). The forward driveshafting transmits torque from the combining transmission to the forward transmission. It consists of seven shafts coupled by six adapter / assemblies. The shafts are numbered 1 through 7 beginning with the forward shaft.

3.4.2 Defects. Defects may occur anywhere on the surface of the tubes. All dents, scratches, nicks, or gouges shall be inspected to ensure they do not conceal cracks. No cracks are allowed.

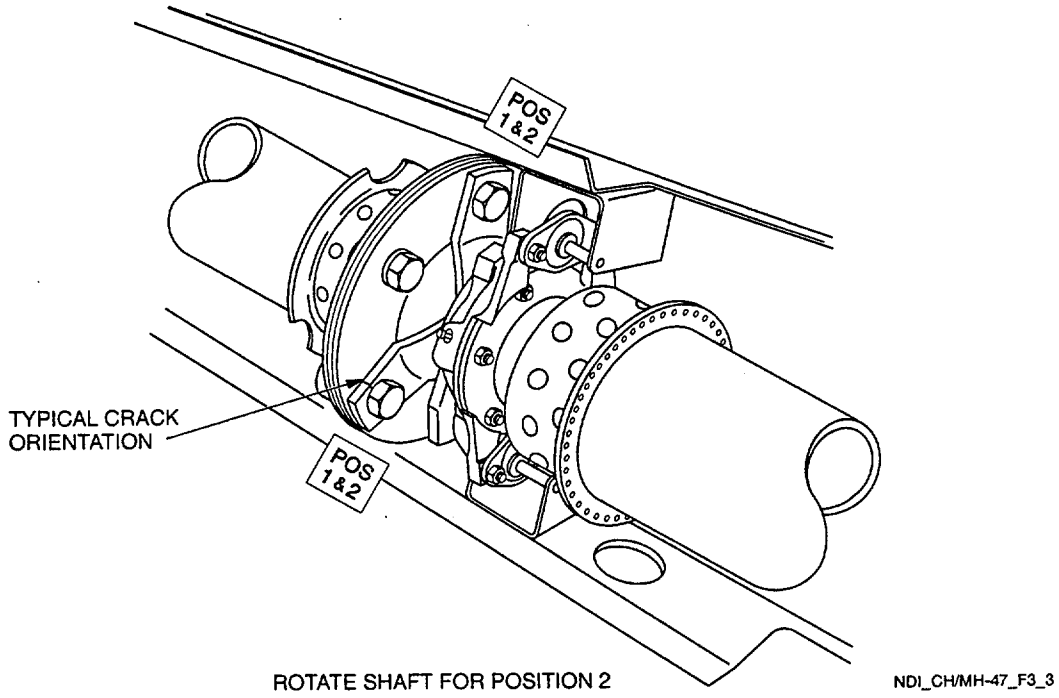


Figure 3-3. Driveshaft Adapters (Steel)

3.4.3 Primary Method. Eddy Current.

3.4.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.4.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the forward driveshafting tubes shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.4.3.3 Access. Access is through the cabin crown tunnel covers. See Figure 1-4 - CH-47: 8; MH-47:3.

3.4.3.4 Preparation of Part. The forward driveshafting tubes shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.4.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block (Refer to standard instrument display shown in Figure 1-7).

3.4.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-4.

a. Place probe on part in the required inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.4.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.4.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.4.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.4.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.4.5 System Securing. If removed, install the driveshafts in accordance with the applicable technical manual listed in Table 1-1. Secure the cabin crown tunnel covers.

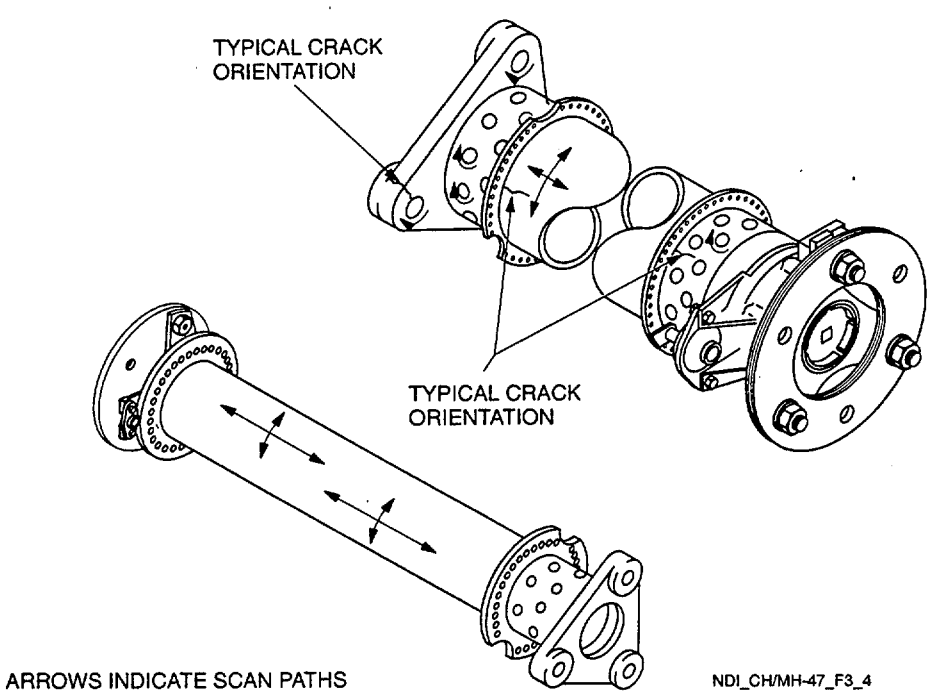


Figure 3-4. Forward Driveshafting Tubes

3.5 AFT DRIVESHAFTING TUBES (ET).

3.5.1 Description (Figure 3-1. Index No. 5). The aft driveshafting transmits torque from the combining transmission to the aft transmission. It consists of two individual shafts coupled by an adapter assembly. The two shafts are numbered 8 and 9 to continue the numbering of the forward driveshafting.

3.5.2 Defects. Defects may occur anywhere on the surface of the tubes. All dents, scratches, nicks, or gouges shall be inspected to ensure they do not conceal cracks. No cracks are allowed.

3.5.3 Primary Method. Eddy Current.

3.5.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.5.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the aft driveshafting tubes shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.5.3.3 Access. Access is through the aft driveshafting baffle. See Figure 1-4 - CH-47: 45; MH-47: 33.

WARNING

Maintenance Platforms/Workstands

Use only appropriate platforrms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopters in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

3.5.3.4 Preparation of Part. The aft driveshafting tubes shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.5.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block (Refer to standard instrument display shown in Figure 1-7).

3.5.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-5.

a. Place probe on part in the required inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

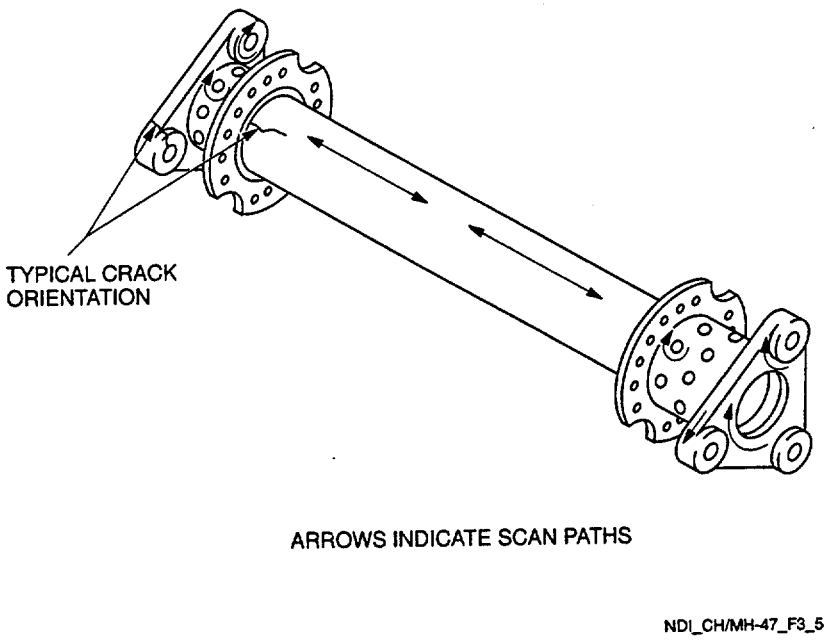


Figure 3-5. Aft Driveshafting Tubes

NOTE

Either probe identified in paragraph 3.5.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.5.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.5.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.5.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.5.5 System Securing. If removed, install the aft driveshafting in accordance with the applicable technical manual listed in Table 1-1. Secure the aft driveshafting baffle.

3.6 ENGINE DRIVESHAFT (TWO PIECE) (ET).

3.6.1 Description (Figure 3-1. Index No. 6). The two piece engine driveshaft is an aluminum tube with a three-cornered aluminum adapter riveted to each end.

3.6.2 Defects. Defects may occur anywhere on the surface of the driveshaft. All dents, scratches, nicks, or gouges shall be inspected to ensure they do not conceal cracks. No cracks are allowed.

3.6.3 Primary Method. Eddy Current.

3.6.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.6.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the engine driveshaft shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.6.3.3 Access. Access is through the engine driveshaft hinged panels. See Figure 1-4 - CH-47: 5 and 6; MH-47: 26 and 27.

3.6.3.4 Preparation of Part. The engine driveshaft outside surface shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.6.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	-0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block (Refer to standard instrument display shown in Figure 1-7).

3.6.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-6.

a. Place probe on part in the required inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.6.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.6.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.6.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.6.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.6.5 System Securing. If removed, install the driveshafting tubes in accordance with the applicable technical manual listed in Table 1-1. Secure the engine driveshaft hinged panels.

3.7 ENGINE DRIVESHAFT (ONE PIECE) (ET).

3.7.1 Description (Figure 3-1. Index No. 7). The one piece engine driveshaft is an aluminum shaft with flanged ends.

3.7.2 Defects. Defects may occur anywhere on the surface of the driveshaft. All dents, scratches, nicks, or gouges shall be inspected to ensure they do not conceal cracks. No cracks are allowed.

3.7.3 Primary Method. Eddy Current.

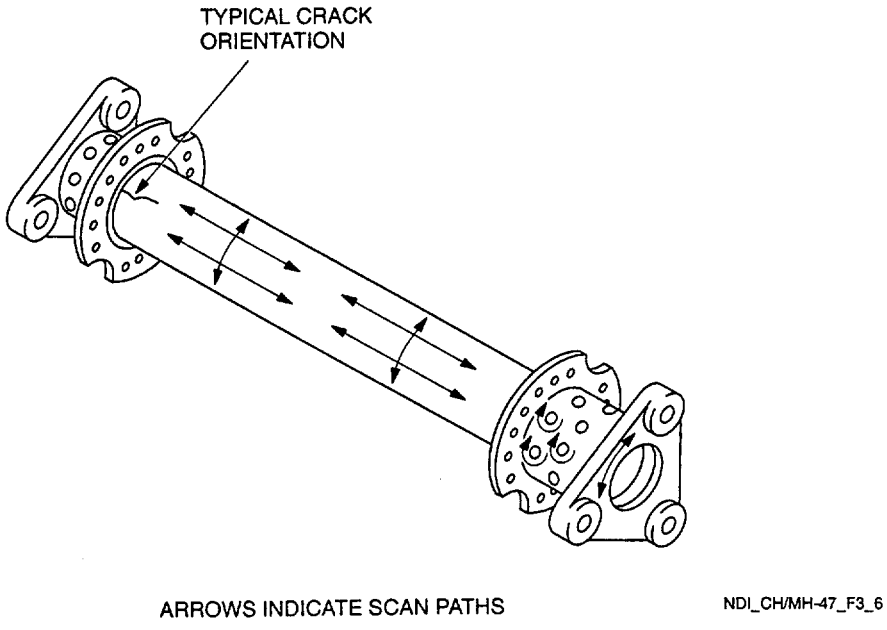


Figure 3-6. Engine Driveshaft (Two Piece)

3.7.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.7.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the engine driveshaft shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.7.3.3 Access. Access is through the engine driveshaft hinged panels. See Figure 1-4 - CH-47: 5 and 6; MH-47: 26 and 27.

3.7.3.4 Preparation of Part. The engine driveshaft shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.7.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block (Refer to standard instrument display shown in Figure 1-7).

3.7.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-7.

a. Place probe on part in the required inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.7.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.7.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.7.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.7.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.7.5 System Securing. If removed, install the engine driveshaft in accordance with the applicable technical manual listed in Table 1-1. Secure the engine driveshaft hinged panels.

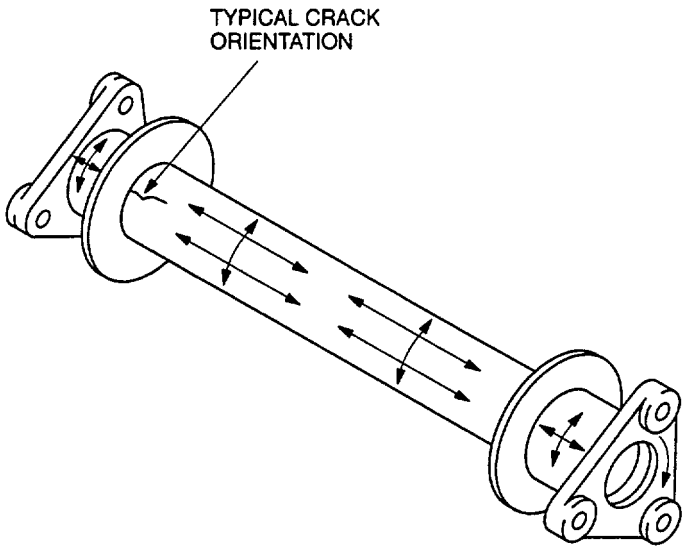


Figure 3-7. Engine Driveshaft (One Piece)

3.8 DRIVESHAFT ADAPTER PLATE (PT).

3.8.1 Description (Figure 3-1), Index No. 8). The driveshaft adapter plates are flexible steel plates bolted to adapter assemblies which provide for attachment of the driveshafts.

3.8.2 Defects. Defects may occur anywhere on the surface of the plates. No cracks are allowed.

3.8.3 Primary Method. Fluorescent penetrant.

3.8.3.1 NDI Equipment and Materials. (Refer to Appendix B.) AMS-2644, level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8), DS-108. Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

3.8.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the driveshaft adapter plates shall be removed and disassembled in accordance with the applicable technical manuals listed in Table 1-1.

3.8.3.3 Access. Access is through the cabin crown tunnel covers. See Figure 1-4 - CH-47: 8; MH-47: 3.

3.8.3.4 Penetration of Part. Protective coating shall be removed and the part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.8.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-5. Inspect the part. See Figure 3-8.

3.8.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.8.4 Backup Method. None required.

3.8.5 System Securing. Clean the part or area to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI paragraph 1.4.16. Protective coating shall be reapplied as required. Reinstall or assemble parts or components in accordance with the applicable technical manuals listed in Table 1-1.

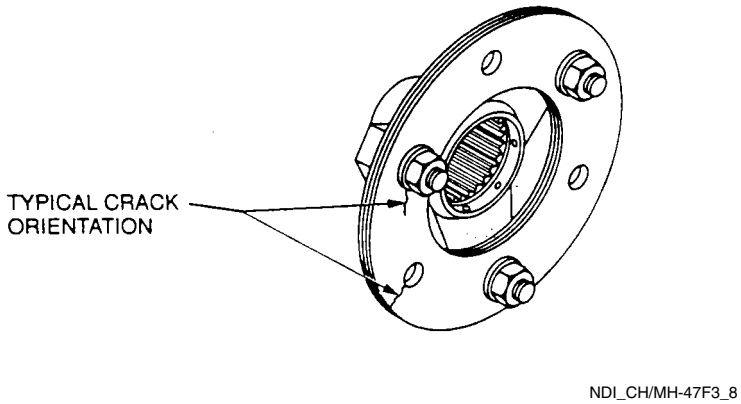


Figure 3-8. Driveshaft Adapter Plate

3.9 ENGINE TRANSMISSION ADAPTER (MT).

3.9.1 Description (Figure 3-1, Index No. 9). The engine transmission adapter is externally splined and connects the engine to the engine driveshaft.

3.9.2 Defects. Defects may occur anywhere on the surface of the adapter. Particular attention shall be given to areas around bolt holes. No cracks are allowed.

3.9.3 Primary Method. Fluorescent Penetrant.

3.9.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Fluorescent Penetrant

b. Black Light

c. Consumable Materials, refer to Table 1-8

3.9.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the engine transmission adapter shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.9.3.3 Access. Access is through the engine driveshaft hinged panels. See Figure 1-4 - CH-47: 5 and 6; MH-47: 26 and 27.

3.9.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.9.3.5 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

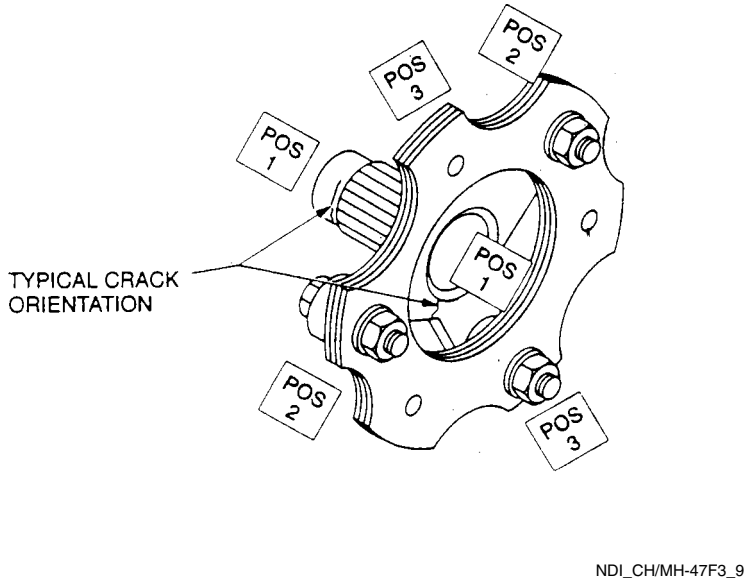


Figure 3-9. Engine Transmission Adapter

3.9.4 System Securing. Clean the engine transmission adapter thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, the engine transmission adapter requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine driveshaft hinged panel.

3.10 COMBINING TRANSMISSION ADAPTER (MT).

3.10.1 Description (Figure 3-1, Index No. 10). The combining transmission adapter is internally splined, which connects the engine driveshaft to the combining transmission.

3.10.2 Defects. Defects may occur anywhere on the surface of the combining transmission adapter. Particular attention shall be given to areas around bolt holes. No cracks are allowed.

3.10.3 Primary Method. Fluorescent Penetrant.

3.10.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Fluorescent Penetrant

b. Black Light

c. Consumable Materials, refer to Table 1-8

d. Aircraft Marking Pencil, refer to Table 1-8

3.10.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the combining transmission adapter shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.10.3.3 Access. Access is through combiner transmission door. See Figure 1-4 - CH-47: 23; MH-47: 30.

3.10.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

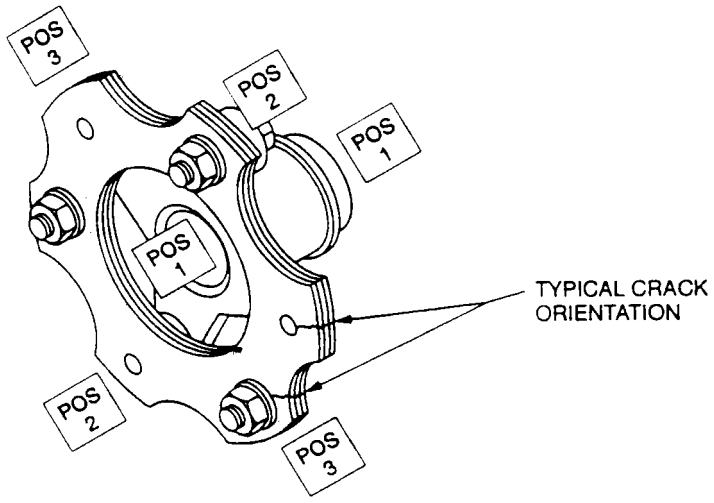


Figure 3-10. Combining Transmission Adapter

3.10.3.5 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

3.10.4 System Securing. Clean the combining transmission adapter thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, the combining transmission adapter requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the combiner transmission door.

3.11 FORWARD TRANSMISSION SLIDER SHAFT (MT).

3.11.1 Description (Figure 3-11, Index No. 11). The slider shaft is mounted around the integral shaft and bolted to the top of the transmission. It provides the bearing surfaces for the swashplate motion.

3.11.2 Defects. Defects may occur anywhere on the surface of the forward transmission slider shaft. Any damaged areas shall be inspected both before and after repair to ensure there are no cracks. No cracks are allowed.

3.11.3 Primary Method. Magnetic Particle.

3.11.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

3.11.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the slider shaft removed in accordance with the applicable technical manuals listed in Table 1-1.

3.11.3.3 Access. Not applicable.

3.11.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.11.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

3.11.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 3-11.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part in Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 3.11.3.8.

f. Repeat steps a. through e. for Positions 2 and 3.

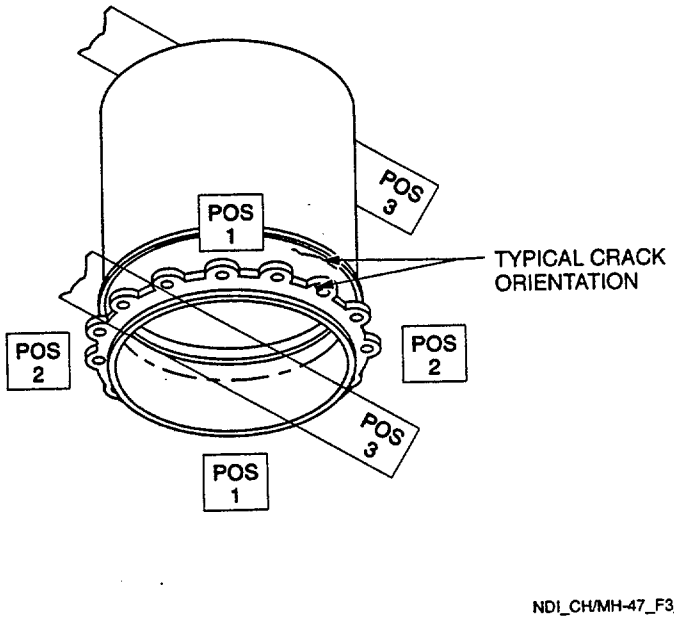


Figure 3-11. Forward Transmission Slider Shaft

3.11.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

3.11.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

3.11 4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.11.5 System Securing. Clean the forward transmission slider shaft thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The forward transmission slider shaft requires installation in accordance with the applicable technical manuals listed in Table 1-1.

3.12 FORWARD TRANSMISSION OUTSIDE SURFACE (ET).

3.12.1 Description (Figure 3-1. Index No. 12). The forward transmission receives input torque from the combining transmission through its forward driveshafting. It then transmits the torque directly to the forward rotary-wing head and rotor blades through an integral shaft.

3.12.2 Defects. Defects may occur anywhere on the surface of the forward transmission. Any damaged areas shall be inspected both before and after repair to ensure there are no cracks. No cracks are allowed.

3.12.3 Primary Method. Eddy Current.

3.12.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0. 020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.12.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the forward transmission shall be removed in accordance with the. applicable technical manuals listed in Table 1-1.

3.12.3.3 Access. Access is from the forward transmission work platform. See Figure 1-4-CH-47: 9; MH-47: 16.

3.12.3.4 Preparation of Part. The forward transmission outside surface shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.12.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block (Refer to standard instrument display shown in Figure 1-7).

3.12.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-12.

a. Place probe on part in the required inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

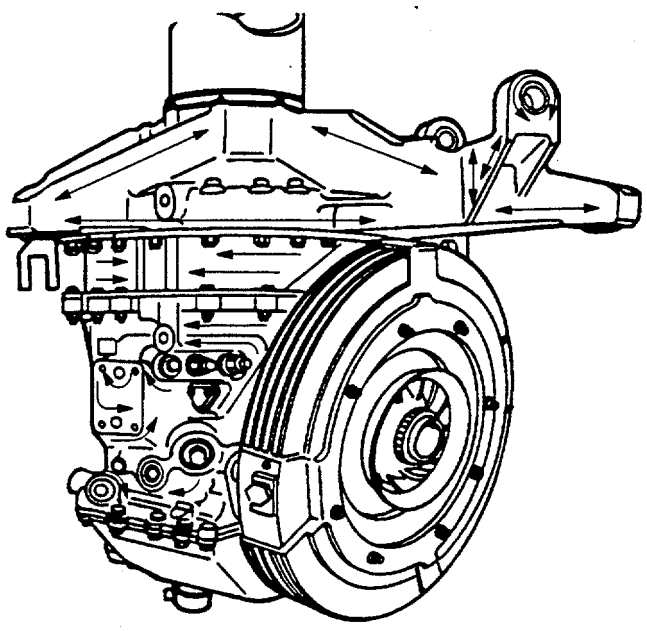
NOTE

Either probe identified in paragraph 3.12.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.12.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.12.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.12.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.12.5 System Securing. If removed, the forward transmission requires installation in accordance with the applicable technical manual listed in Table 1-1. Secure the forward transmission work platform.



ARROWS INDICATE SCAN PATHS

NDI_CH/MH-47_F3_12

Figure 3-12. Forward Transmission Outside Surface

3.13 AFT SLIDER SHAFT (MT).

3.13.1 Description (Figure 3-1. Index No. 13). The aft slider shaft is mounted on the rotor shaft and bolted to the rotor shaft support. It provides the bearing surface for aft swashplate motion.

3.13.2 Defects. Defects may occur anywhere on the slider shaft. Any damaged areas shall be inspected both before and after repair to ensure there are no cracks. No cracks are allowed.

3.13.3 Primary Method. Magnetic Particle.

3.13.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

3.13.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the aft slider shaft removed in accordance with the applicable technical manuals listed in Table 1-1.

3.13.3.3 Access. Not applicable.

3.13.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.13.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

3.13.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 3-13.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part in Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 3.13.3.8.

f. Rotate part-to-probe contact 90 degrees for each position and repeat steps a. through e. for Positions 2, 3, and 4.

3.13.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

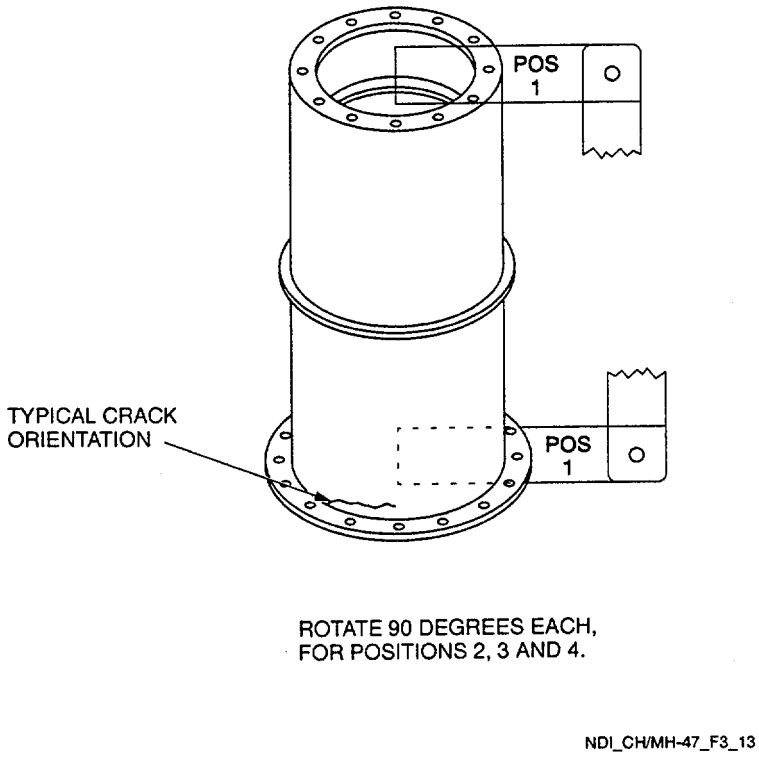


Figure 3-13. Aft Slider Shaft

3.13.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

3.13.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.13.5 System Securing. Clean the aft slider shaft thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The aft slider shaft requires installation in accordance with the applicable technical manuals listed in Table 1-1.

3.14 AFT ROTOR SHAFT (MT).

3.14.1 Description (Figure 3-1. Index No. 14). The aft rotor shaft is splined to the top of the aft transmission. It transmits input torque from the transmission to the aft rotary-wing head and rotor blades.

3.14.2 Defects. Defects may occur anywhere on the surface of the aft rotor shaft. No cracks are allowed.

3.14.3 Primary Method. Magnetic Particle.

3.14.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

3.14.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the aft rotor shaft shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.14.3.3 Access. Access is from the aft transmission work platform. See Figure 1-4 - CH-47: 27 and/or 34; MH-47: 17.

3.14.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.14.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

3.14.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions required for this inspection are illustrated in Figure 3-14.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part at Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 3.14.3.8.

f. Repeat steps a. through e. for Positions 2, 3, and 4.

g. Rotate shaft 90 degrees and repeat steps a. through e. for Positions 1 and 2.

h. Rotate shaft 90 degrees and repeat steps a. through e. for Positions 3 and 4.

3.14.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

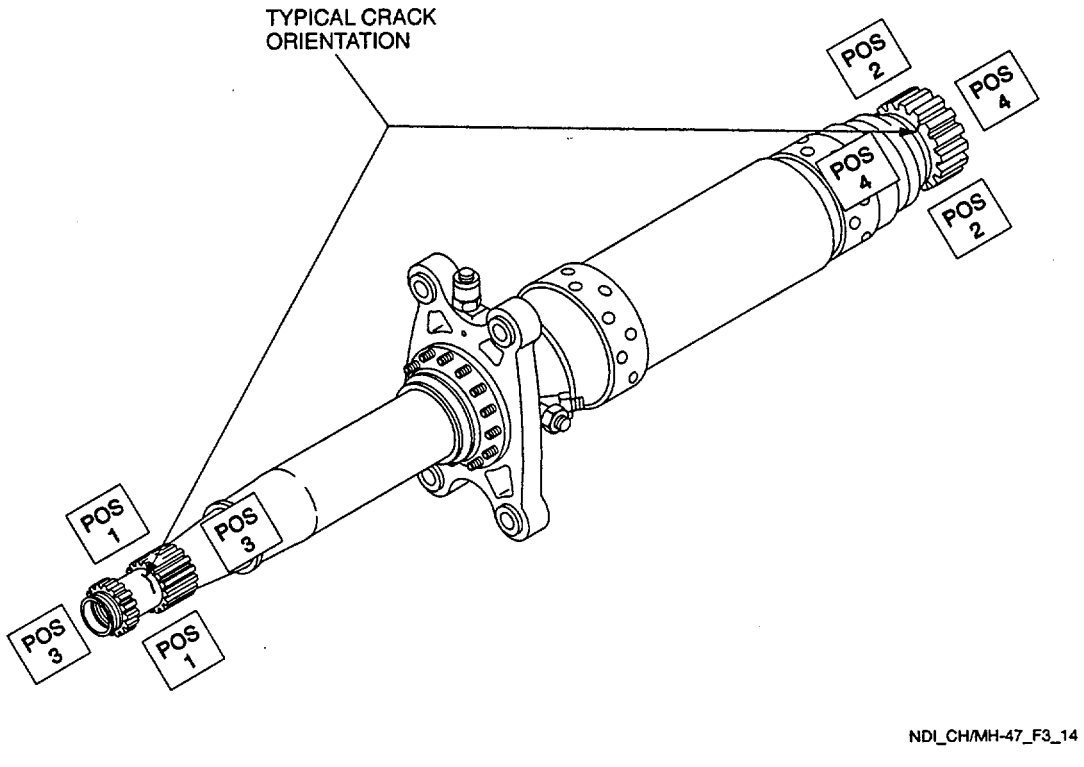


Figure 3-14. Aft Rotor Shaft

3.14.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

3.14.4 Backup Method. None required.

3.14.5 System Securing. Clean the aft rotor shaft thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The aft rotor shaft requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the aft transmission work platform.

3.15 AFT ROTOR SHAFT SUPPORT (ET).

3.15.1 Description (Figure 3-1. Index No. 15). The aft rotor shaft support is an aluminum part that provides the thrust bearing support for the aft rotor shaft assembly.

3.15.2 Defects. Defects may occur anywhere on the surface of the support. Any damaged area shall be inspected both before and after rework. No cracks are allowed.

3.15.3 Primary Method. Eddy Current.

3.15.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.15.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the aft rotor shaft support shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.15.3.3 Access. Access is from the aft transmission work platform. See Figure 1-4 - CH-47: 27 and/or 34; MH-47: 17.

3.15.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.15.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

3.15.3.6 Inspection Procedure. Refer to Eddy Current method paragraph 1.4.11 and Figure 3-15.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.15.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.15.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.15.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.15.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.15.5 System Securing. The aft rotor shaft support, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the aft transmission work platform.

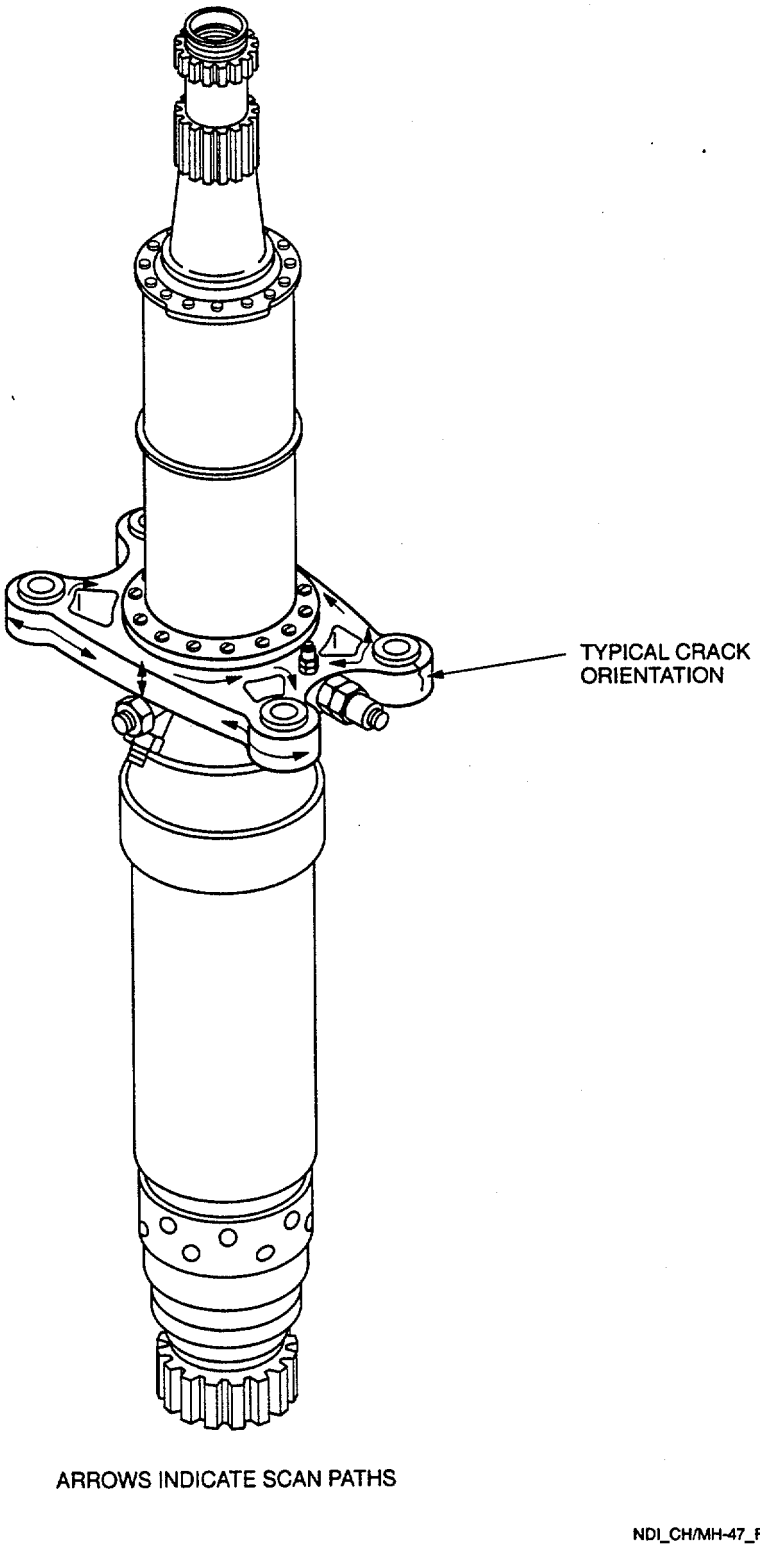


Figure 3-15. Aft Rotor Shaft Support

3.16 COMBINING TRANSMISSION OUTSIDE SURFACE (ET).

3.16.1 Description (Figure 3-1. Index No. 16). The combining transmission receives input torque from the two engine transmissions through the engine driveshafts. It combines the torque and transmits it to the forward and aft driveshafting through output shafts.

3.16.2 Defects. Defects may occur anywhere on the surface of the combining transmission outside surface. Any damaged area shall be inspected both before and after rework. No cracks are allowed.

3.16.3 Primary Method. Eddy Current.

3.16.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.16.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the combining transmission shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.16.3.3 Access. Access is through the combiner transmission door. See Figure 1-4 - CH-47: 23; MH-47: 30.

3.16.3.4 Preparation of Part. The area to be inspected shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.16.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	-0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

3.16.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-16.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.16.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.16.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.16.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.16.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.16.5 System Securing. If removed, the combining transmission requires installation as required in accordance with the applicable technical manuals listed in Table 1-1. Secure the combiner transmission door.

3.17 AFT TRANSMISSION OUTSIDE SURFACE (ET).

3.17.1 Description (Figure 3-1. Index No. 17). The aft transmission receives input torque from the combining transmission through the aft driveshafting. It transmits torque to the aft rotor shafting through a splined connection.

3.17.2 Defects. Defects may occur anywhere on the surface of the aft transmission outside surface. Any damaged area shall be inspected both before and after rework. No cracks are allowed.

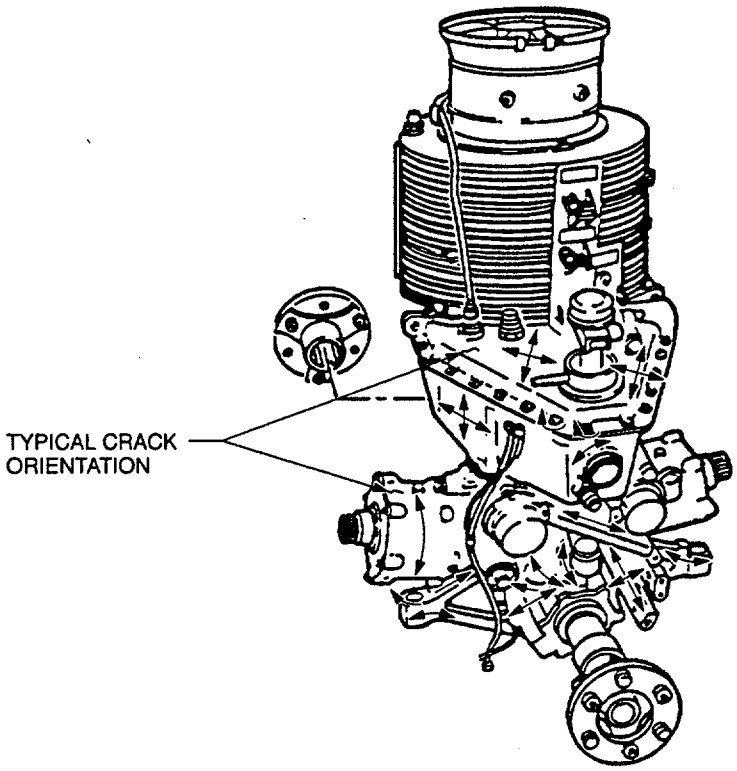


Figure 3-16. Combining Transmission Outside Surface

3.17.3 Primary Method. Eddy Current.

3.17.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.17.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the aft transmission shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.17.3.3 Access. Access is from the aft transmission work platform. See Figure 1-4 - CH-47: 27 and/or 34; MH-47: 17.

3.17.3.4 Preparation of Part. The aft transmission outside surface shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.17.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

3.17.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-17.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.17.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.17.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

3.17.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.17.4 Backup Method. None required.

3.17.5 System Securing. If removed, the aft transmission requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the aft transmission work platform.

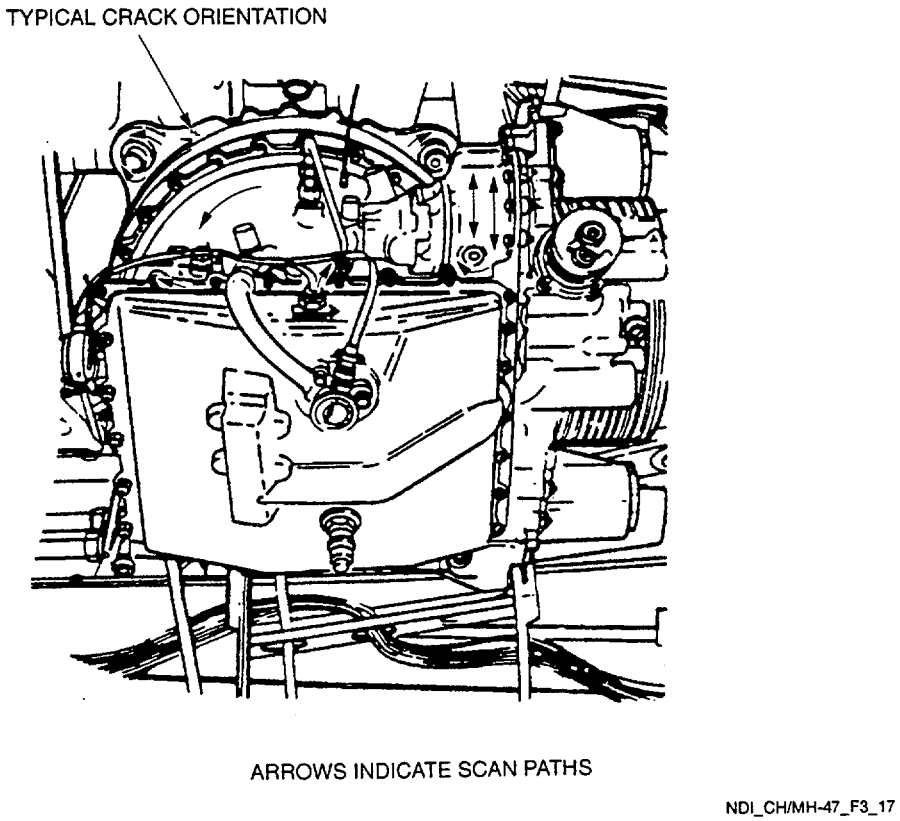


Figure 3-17. Aft Transmission Outside Surface

3.18 ENGINE TRANSMISSION QUILL SHAFT (MT).

3.18.1 Description (Figure 3-1. Index No. 18). The engine transmission quill shaft is a splined shaft that transmits power from the engine to the engine transmission.

3.18.2 Defects. Defects may occur anywhere on the surface of the quill shaft. No cracks are allowed.

3.18.3 Primary Method. Magnetic Particle.

3.18.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held magnetic coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

3.18.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the engine transmission quill shaft removed in accordance with the applicable technical manuals listed in Table 1-1.

3.18.3.3 Access. Not applicable.

3.18.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.18.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

3.18.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position required for this inspection is illustrated in Figure 3-18.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part at Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

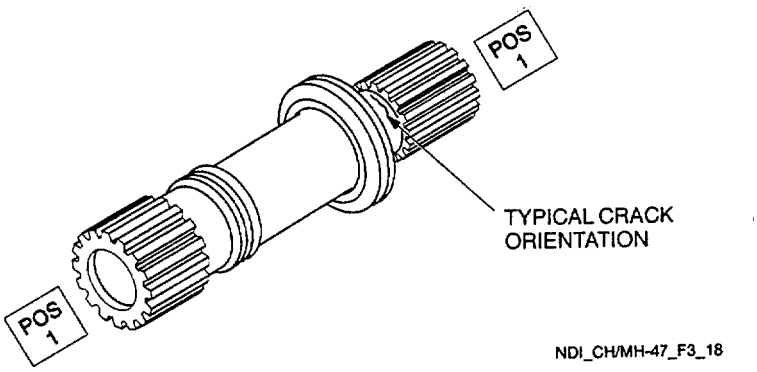


Figure 3-18. Engine Transmission Quill Shaft

3.18.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

3.18.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

3.18.4 Backup Method. None required.

3.18.5 System Securing. Clean the engine transmission thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The engine transmission quill shaft requires installation in accordance with the applicable technical manuals listed in Table 1-1.

3.19 ENGINE TRANSMISSION OUTSIDE SURFACE (ET).

3.19.1 Description (Figure 3-1. Index No.19). The engine transmissions turn the direction of engine torque 90 degrees to direct it toward the combining transmission.

3.19.2 Defects. Defects may occur anywhere on the surface of the engine transmission. Any damaged area should be inspected both before and after rework. No cracks are allowed.

3.19.3 Primary Method. Eddy Current.

3.19.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

3.19.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the engine transmission shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

3.19.3.3 Access. Access is from the aft transmission work platform. See Figure 1-4 - CH-47: 27 and/or 34; MH-47: 17.

3.19.3.4 Preparation of Part. The engine transmission shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.19.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

3.19.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 3-19.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 3.19.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 3.19.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

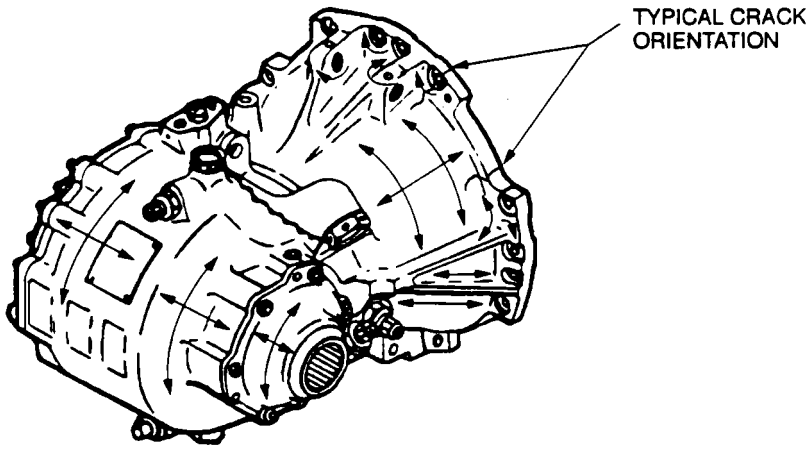


Figure 3-19. Engine Transmission Outside Surface

3.19.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.19.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

3.19.5 System Securing. If removed, install the engine transmission as required in accordance with the applicable technical manuals listed in Table 1-1. Secure the aft transmission work platform.

3.20 TRANSMISSION OIL COOLER ASSEMBLIES (PT).

3.20.1 Description (Figure 3-1, Index No. 20). This inspection is applicable to the forward, aft, combining and engine transmission oil cooler assemblies to verify all indications found visually.

3.20.2 Defects. Defects may occur anywhere on the surface of the oil cooler. Any damaged area shall be inspected both before and after rework. No cracks are allowed.

3.20.3 Primary Method. Fluorescent Penetrant.

3.20.3.1 NDI Equipment and Materials. (Refer to Appendix B). Inspection is listed in Table 1-7. AMS-2644, level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8). DS-108 (Table 1-8), DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

3.20.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the oil cooler shall be removed and disassembled in accordance with the applicable technical manuals listed in Table 1-1.

3.20.3.3 Access. Access is through the forward and aft transmission work platform and combiner transmission doors. See Figure 1-4 - CH-47: 9, 23, 27, and/or 34; MH-47: 16, 17, and 30.

3.20.3.4 Preparation of Part. Protective coating shall be removed only from the area of interest and the part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

3.20.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-5. Inspect area of concern. See Figure 3-20.

3.20.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

3.20.4 Backup Method. None required.

3.20.5 System Securing. Clean the part or area to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI paragraph 1.4.16. Protective coating shall be reapplied as required. Reinstall or assemble parts or components in accordance with the applicable technical manuals listed in Table 1-1. Secure the transmission work platforms, combiner transmission, and doors that were used.

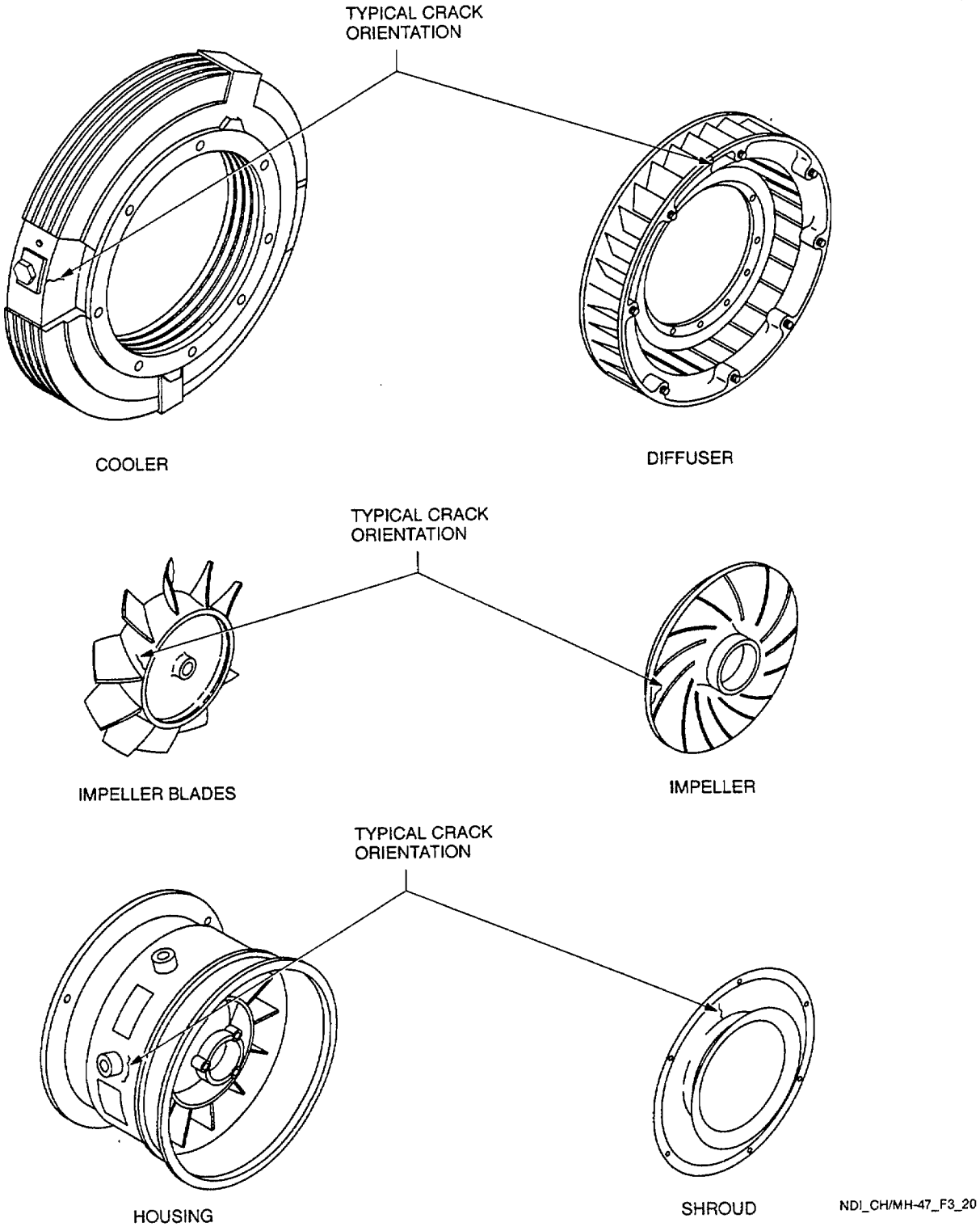


Figure 3-20. Transmission Oil Cooler Assemblies

SECTION IV

AIRFRAME AND LANDING GEAR GROUP

4. GENERAL.

4.1 CONTENTS. The airframe and landing gear group inspection items covered in this section are those critical items of the CH/MH-47 helicopter listed in the Airframe and Landing Gear Group Inspection Index (Table 4-1). Corresponding inspection figures and applicable text paragraphs are listed opposite each inspection item. The index number for each item may be used to locate it in Figure 4-1.

Table 4-1. Airframe and Landing Gear Group Inspection Index

Index Number	Nomenclature	Inspection Method	Paragraph Number	Figure Number
2	Honeycomb Cores and Panels (Voids)	BT	4.2	4-2
3	Airframe Structures	ET	4.3	4-3
*4	Forward Transmission Support Structures	ET	4.4	4-4
5	Dynamic Absorber Support Structure	ET	4.5	4-5
6	Cabin Equipment Support Structure	ET	4.6	4-6
7	Pods	BT	4.7	4-7
8	Pods	RT	4.8	4-8
9	Rescue Hatch Lower Door Gearbox Assembly	MT	4.9	4-9
10	Rescue Hatch Lower Door Gearbox Housing and Cover	ET	4.10	4-10
11	Cargo Ramp	BT	4.11	4-11
*12	Combining Transmission Support Fittings and Longitudinal Beams	ET	4.12	4-12
13	Composite Pylon Hinged Fairings (Work Platform)	BT	4.13	4-13
14	Forward Landing Gear Support Structure	ET	4.14	4-14
15	Landing Gear Wheel	ET	4.15	4-15
16	Landing Gear Axle	MT	4.16	4-16
17	Forward Landing Gear Strut Piston Tube	MT	4.17	4-17
18	Aft Landing Gear Structure	ET	4.18	4-18
19	Forward Landing Gear Torque Arm	ET	4.19	4-19
20	Lower Drag Link Assembly Hardware	MT	4.20	4-20
21	Lower Drag Link	ET	4.21	4-21
22	Center Cargo Hook	MT	4.22	4-22
23	Aft Pylon Equipment Support Structure	ET	4.23	4-23

NOTE: *Indicates Flight Safety Part.

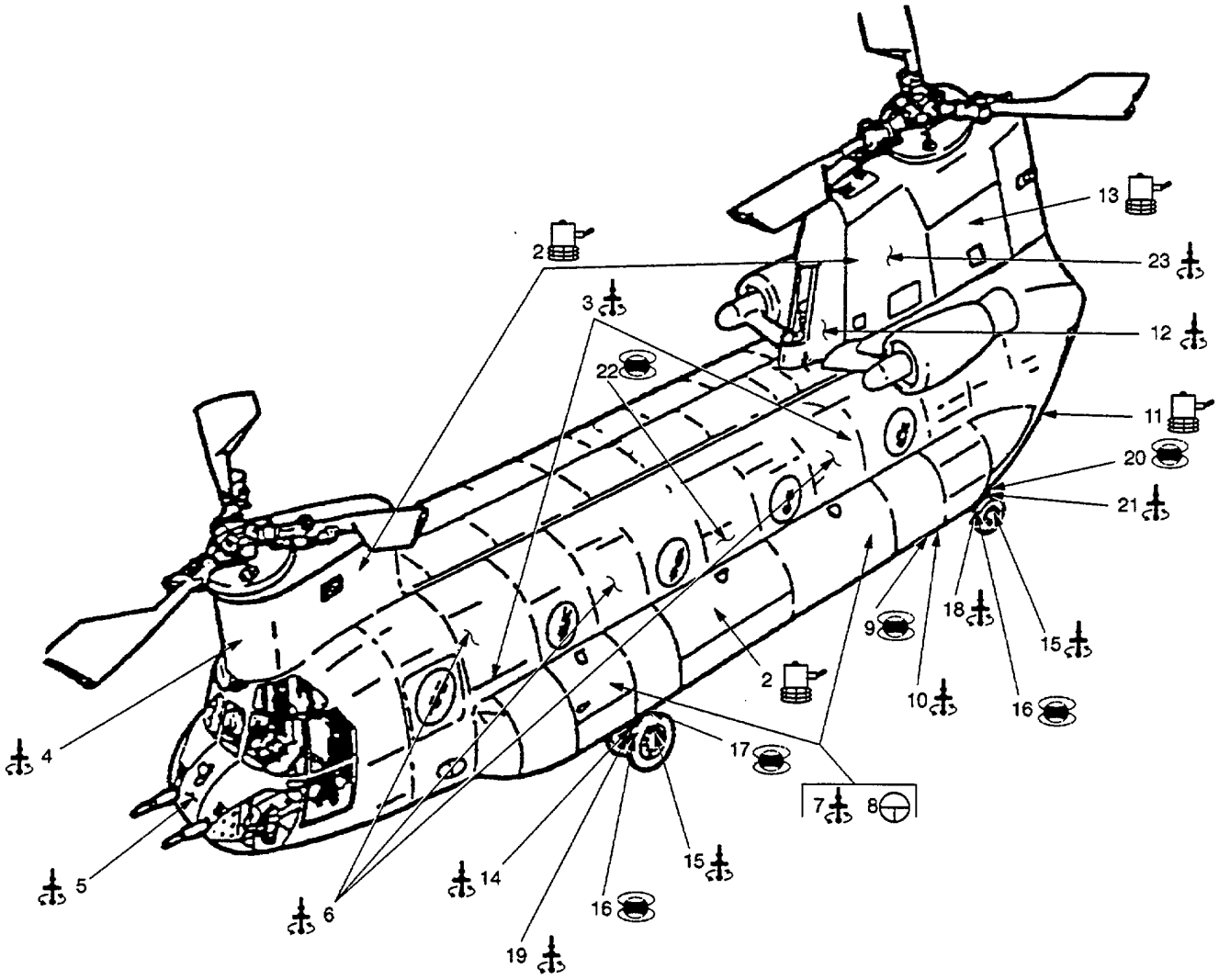


Figure 4-1. Airframe and Landing Gear Group

4.2 HONEYCOMB CORES AND PANELS (VOIDS) (BT).

4.2.1 Description (Figure 4-1. Index No. 2). This inspection is applicable to parts or components made of metallic/nonmetallic skins bonded to metallic/nonmetallic cores and laminations of facings of metal or fiberglass panels. The structural assembly components identified for inspection are: fuselage honeycomb panels, decking honeycomb panels, and pylons.

4.2.2 Defects. Perform the NDI method contained herein on the assembly components listed above for the primary purpose of verification of void indications identified by visual inspection.

NOTE

A void is defined as an unbonded area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term ("void").

4.2.3 Primary Method. Bond Testing.

4.2.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Bond Test Unit

b. Probe, Mechanical Impedance Analysis

c. Probe Holder

d. Cable Assembly

e. Test Block, metal honeycomb with skin thickness closest to that of the panel to be inspected

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.2.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and in accordance with applicable technical manuals listed in Table 1-1.

4.2.3.3 Access. Refer to paragraph 1.1.9, Figure 1-4, and Table 1-2 to locate applicable access panels and fairings.

WARNING

Maintenance Platforms/Workstands

Use only appropriate platforms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopters in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

4.2.3.4 Preparation of Part. The components shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.2.3.5 NDI Equipment Settings. Refer to Bond Test Equipment, paragraph 1.4.6.1.

a. Attach cable and probe to Bondmaster. Protect probe with Teflon tape and install in probe holder.

b. Turn on Bondmaster, press SPCL, and make the following adjustments:

H Pos	- 40%
V Pos	- 80%
PHASE REF	- 0
DRIVE	- MID

c. Press SET and select DISPLAY - PHASE.

d. Place probe on the good area of test block and press GOOD PART. Do this several times while moving the probe to different spots in the good area of the test block. Note the video signature for each. Select and enter a representative good area by pressing GOOD PART one last time.

e. Place probe on void area of test block and press BAD PART. Do this several times while moving the probe slightly to different positions within the void area. Select and enter a position that gives a strong difference between good and void areas. (See Figure 1-5.) Use DIFF soft key to observe difference between good and bad areas of test block.

NOTE

If, during setup, the flying spot deflects upward or to the side when the probe passes over the bad part, instead of the desired down deflection toward the alarm box, press SPCL and toggle to a different phase setting (90,180, or 270), and repeat steps d. and

e. Continue to try phase setting until the flying spot moves in the desired down direction.

f. Place probe on good area of test block and press RUN. Flying spot should be near the top-center of the ACTIVE screen. If not, press NULL. Slide probe from good to void area and note response from flying spot. This response should provide both amplitude (vertical) and phase (horizontal) movement. The default gate/alarm setting may be incorrect for this setup. Turn off or reset gate/alarm as desired.

g. The Bondmaster is programmed to automatically set test parameters to a start-up or initial bond test. By following the steps outlined above, adjustments to the FREQ, GAIN, and ALARM can help to refine the selectivity in locating defects among differing composite materials.

4.2.3.6 Inspection Procedure. Refer to Bond Test Method, paragraph 1.4.6 and Figure 4-2. Place probe on panel in location where test for void is desired and press NULL. Move probe from good to suspect area and note response. A strong amplitude change and phase shift similar to the test block is indicative of a void.

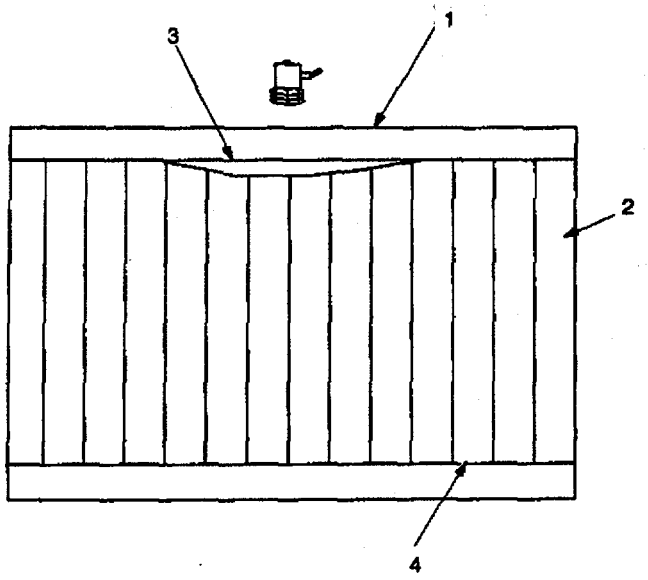


Figure 4-2. Honeycomb Cores and Panels (Voids)

NOTE

This setup is very sensitive to thin skin-to-core bonding. If the panel skin is 0.020 inch thick or less, move the probe slowly over the skin and note the slight amplitude change (bounce) as the probe senses alternately the honeycomb cell nodes and cell walls. Be sure of panel configuration. Panel edges and attachment points may not be bonded structure and do not normally contain honeycomb. These areas will respond similarly to voids with the Bondmaster. Panels having rigidized skins are more easily scanned using wide Teflon tape on the probe holder.

4.2.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

NOTE

Attention shall be directed to accurately mark the boundaries of all voids. These markings will be needed to determine acceptance or rejection criteria in accordance with applicable technical manuals.

4.2.4 Backup Method. None required.

4.2.5 System Securing. If removed, install any components and secure all access panels as required in accordance with the applicable technical manuals listed in Table 1-1.

4.3 AIRFRAME STRUCTURES (ET).

4.3.1 Description (Figure 4-1. Index No, 3). This inspection is applicable to all decking, panel and door skins, bulkheads, formers, stringers, supports, beams, and longerons constructed with nonferrous material.

4.3.2 Defects. Defects may occur anywhere on the surface of the airframe structures listed above. The primary purpose of this inspection is for: (1) confirmation of crack indications identified by usual inspection; (2) verification that dents, scratches, or gouges do not conceal cracks; and (3) locating the ends of confirmed cracks so that stop drilling may be performed. No cracks are allowed.

4.3.3 Primary Method. Eddy Current.

4.3.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.3.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the removable airframe structures shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.3.3.3 Access. Refer to paragraph 1.1.9, Figure 1-4, and Table 1-2 to locate applicable access panels and fairings.

WARNING

Maintenance Platforms/Workstands

Use only appropriate platforms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopters in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

4.3.3.4 Preparation of Part. The area of interest shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDl, paragraph 1.4.4.

4.3.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.3.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-3.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.3.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.3.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.3.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.3.4 Backup Method. None required.

4.3.5 System Securing. If removed, install airframe structures and secure access panels, doors, etc. as required in accordance with the applicable technical manuals listed in Table 1-1.

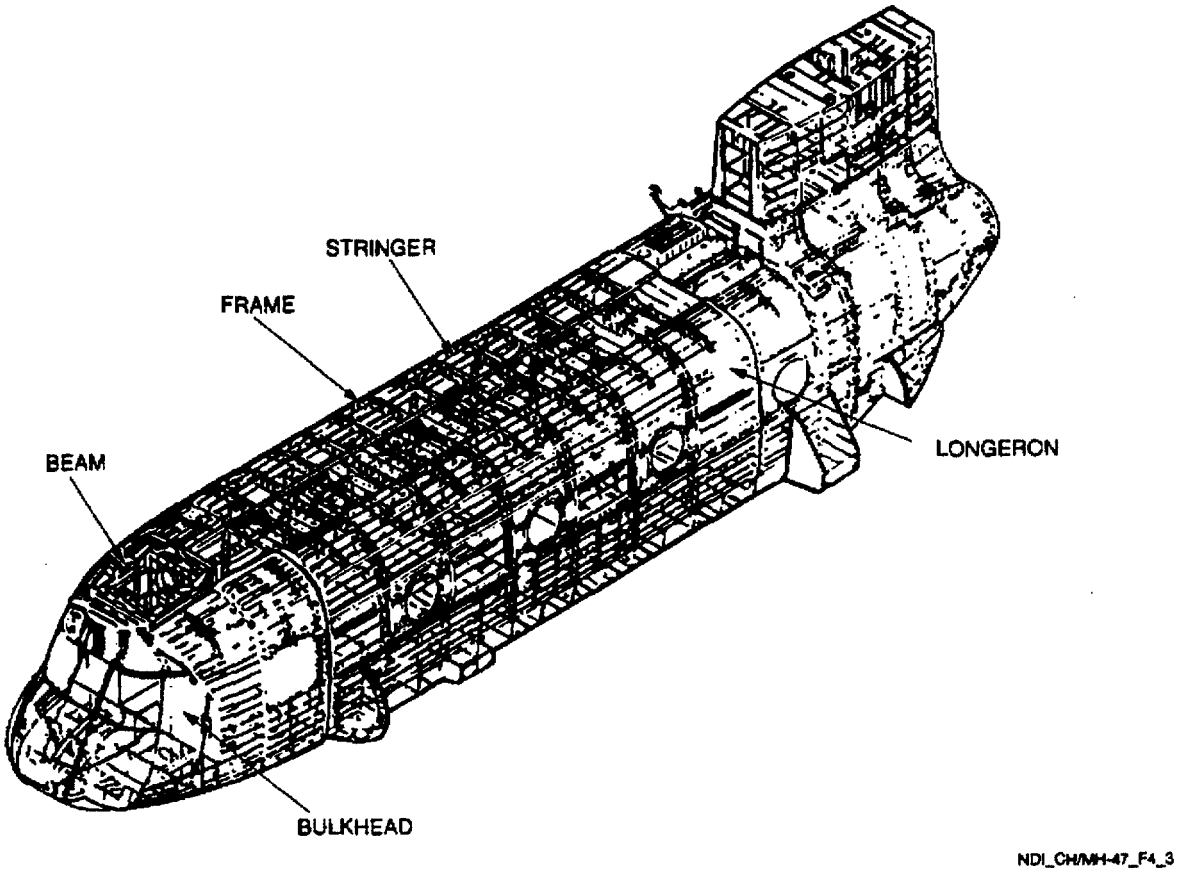


Figure 4-3. Airframe Structures

4.4 FORWARD TRANSMISSION SUPPORT STRUCTURES (ET).

4.4.1 Description (Figure 4-1. Index No. 4). The forward transmission support structure is in the cockpit fuselage structure assembly. The forward transmission support structure is made up of machined fittings spliced to sheet aluminum webs and reinforced by formed and extruded parts.

4.4.2 Defects. Defects may occur anywhere on the surface of the structures. The primary purpose of this inspection is to verify crack indications found visually. No cracks are allowed.

4.4.3 Primary Method. Eddy Current.

4.4.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.4.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the transmission shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.4.3.3 Access. Access is from the forward transmission work platform. See Figure 1-4 - CH-47: 9; MH-47: 16.

4.4.3.4 Preparation of Part. The forward transmission support structure shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.4.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.4.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-4.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.4.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.4.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

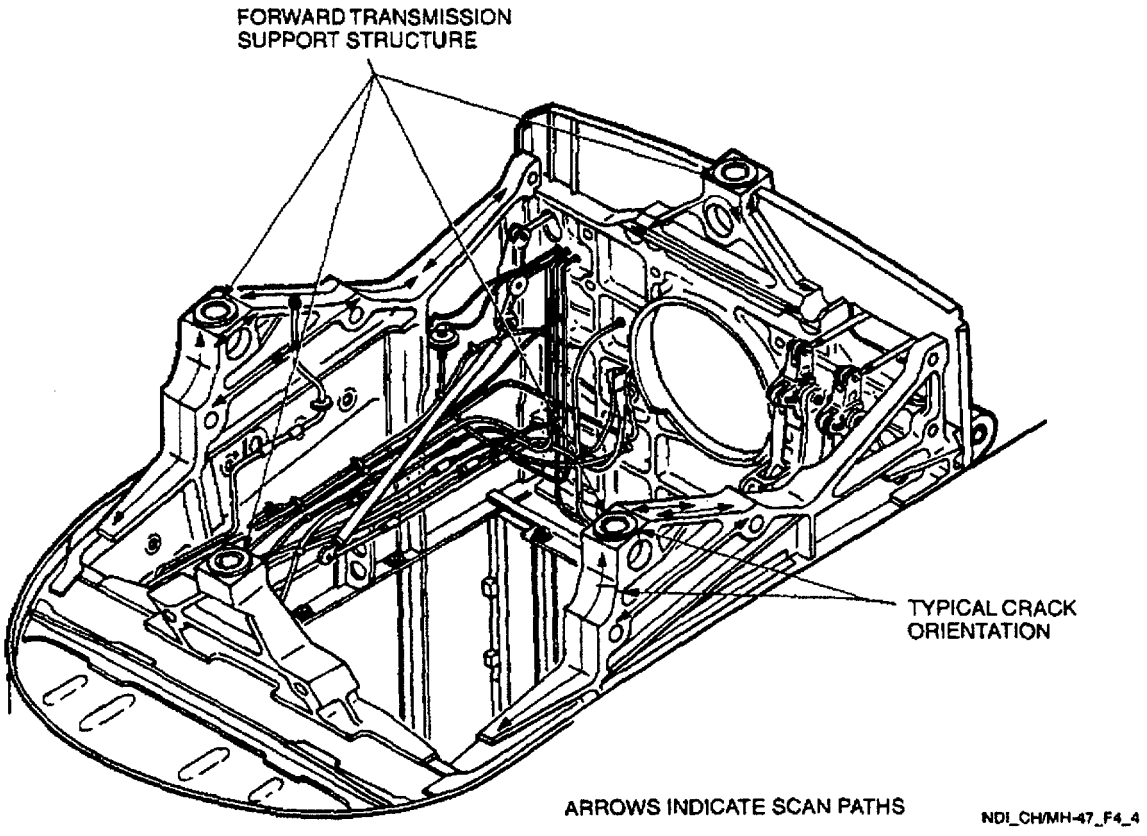


Figure 4-4. Forward Transmission Support Structures

4.4.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.4.4 Backup Method, None required.

4.4.5 System Securing. If removed, the forward transmission requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the forward transmission work platform.

4.5 DYNAMIC ABSORBER SUPPORT STRUCTURE (ET).

4.5.1 Description (Figure 4-1. Index No. 5). The forward dynamic absorber support structure is located in the nose of the cockpit section. The dynamic absorber lowers vibration in the helicopter throughout its operating range.

4.5.2 Defects. Defects may occur anywhere on the surface of the dynamic absorber support structure. The primary purpose of this inspection is to verify crack indications found visually. No cracks are allowed.

4.5.3 Primary Method. Eddy Current.

4.5.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.5.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the dynamic absorber shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.5.3.3 Access. Access is through the nose compartment door. See Figure 1-4 - CH-47: 10; MH-47:1.

4.5.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.5.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.5.3.6 Inspection Procedure. Refer to Eddy Current method, paragraph 1.4.11 and Figure 4-5.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.5.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.5.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.5.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.5.4 Backup Method. None required.

4.5.5 System Securing. If removed, the dynamic absorber requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the nose compartment door.

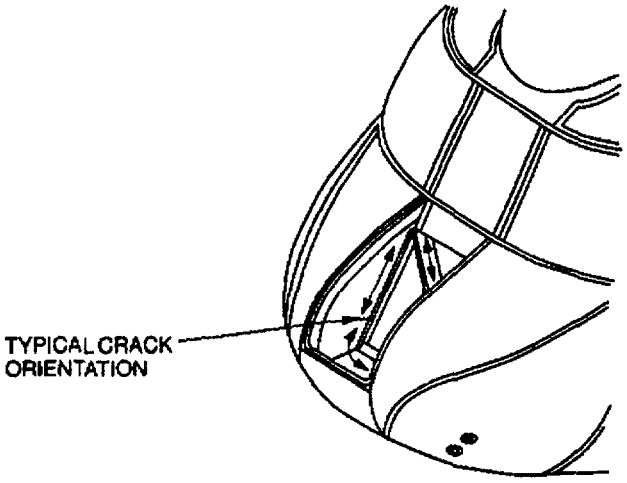


Figure 4-5. Dynamic Absorber Support Structure

4.6 CABIN EQUIPMENT SUPPORT STRUCTURE (ET).

4.6.1 Description (Figure 4-1, Index No. 6). This inspection is applicable to the driveshaft supports, cargo hook supports, litter strap supports, combining transmission longitudinal support beams, and the ramp actuator support structure contained within the cabin equipment support structure.

4.6.2 Defects. Defects may occur anywhere on the surface of the part. The primary purpose of this inspection is to verify crack indications found visually. No cracks are allowed.

4.6.3 Primary Method. Eddy Current.

4.6.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.6.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, removable, cabin equipment support structures shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.6.3.3 Access. Refer to Figure 1 -4 and Table 1-2 for applicable access panels, doors, and fairings.

4.6.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.6.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.6.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-6.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.6.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.6.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

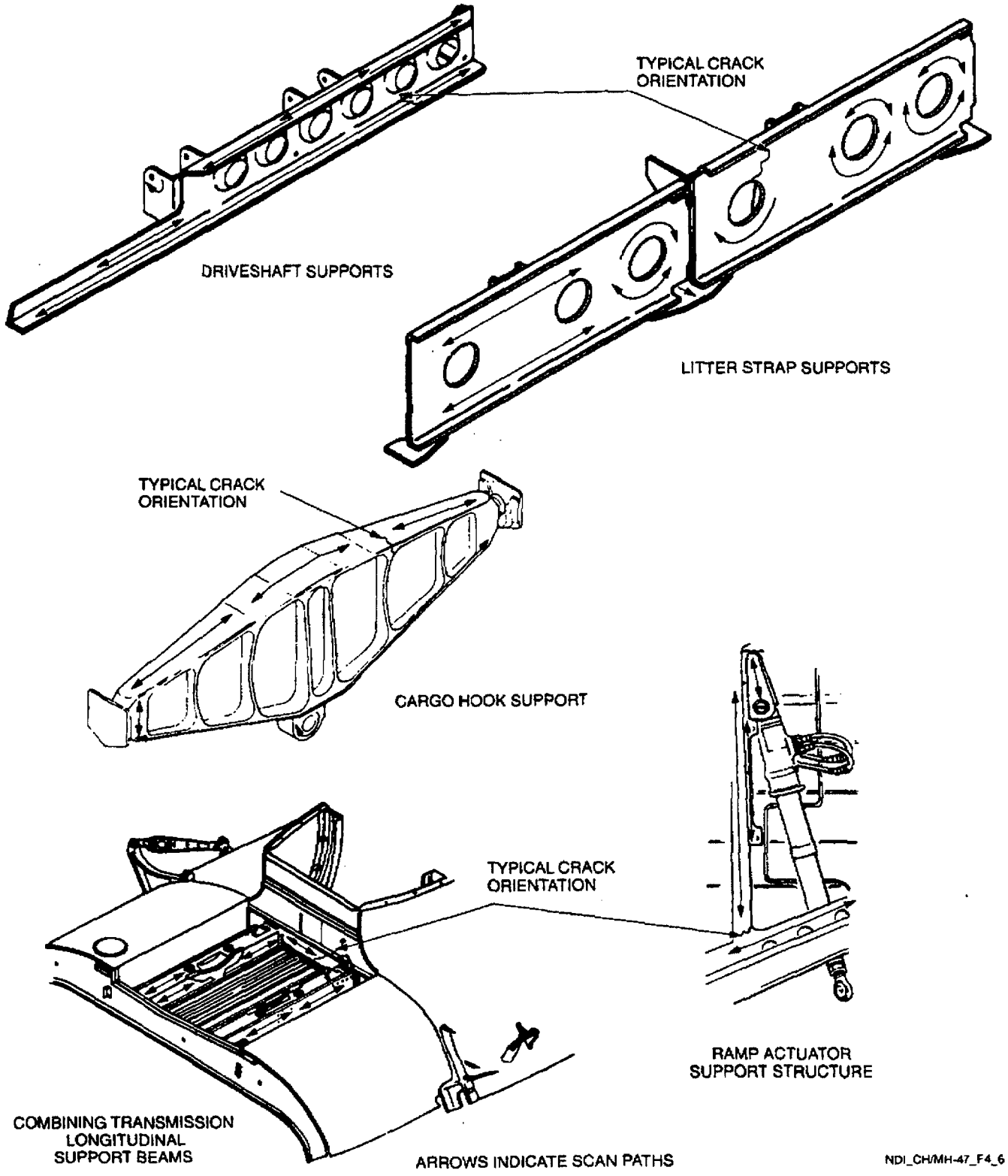


Figure 4-6. Cabin Equipment Support Structure

4.6.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.6.4 Backup Method. None required.

4.6.5 System Securing. If removed, the cabin equipment support structures require installation in accordance with the applicable technical manuals listed in Table 1-1. Secure any access panels that were used.

4.7 PODS (BT).

4.7.1 Description (Figure 4-1, Index No.7). The pods are located on each side of the fuselage system containing the fuel tanks. The forward end of each pod contains components of the electronic and electrical systems. A hinged panel in each pod provides access to the forward landing gear.

4.7.2 Defects. Void damage may occur on any area of the skin/honeycomb structure. The primary purpose of this inspection is to verify void indications found visually.

NOTE

A void is defined as an unbonded area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term (void").

4.7.3 Primary Method. Bond Testing.

4.7.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Bond Test Unit

b. Probe, Mechanical Impedance Analysis

c. Probe Holder

d. Cable Assembly

e. Test Block, metal honeycomb with skin thickness closest to that of the panel to be inspected.

f. Test Block, Composite Defect Standard #1

g. Test Block, Composite Defect Standard #3

h. Teflon Tape, refer to Table 1-8

i. Aircraft Marking Pencil, refer to Table 1-8

4.7.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the pods shall be removed in accordance with applicable technical manuals listed in Table 1-1.

4.7.3.3 Access. Refer to Figure 1-4 and Table 1-2 to locate applicable access panels, doors, and fairings.

4.7.3.4 Preparation of Part. The components shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.7.3.5 NDI Equipment Settings. Refer to Bond Test Equipment, paragraph 1.4.6.1.

a. Attach cable and probe to Bondmaster. Protect probe with Teflon tape and install in probe holder.

b. Turn on Bondmaster, press SPCL, and make the following adjustments:

H Pos	- 40%
V Pos	- 80%
PHASE REF	- 0
DRIVE	- MID

c. Press SET and select DISPLAY - PHASE.

d. Place probe on the good area of test block and press GOOD PART. Do this several times while moving the probe to different spots in the good area of the test block. Note the video signature for each. Select and enter a representative good area by pressing GOOD PART one last time.

e. Place probe on void area of test block and press BAD PART. Do this several times while moving the probe slightly to different positions within the void area. Select and enter a position that gives a strong difference between good and void areas. (See Figure 1-5.) Use DIFF soft key to observe difference between good and bad areas of test block.

NOTE

If, during setup, the flying spot deflects upward or to the side when the probe passes over the bad part, instead of the desired down deflection toward the alarm box, press SPCL and toggle to a different phase setting (90, 180, or 270), and repeat steps d. and e. continue to try phase setting until the flying spot moves in the desired down direction.

f. Place probe on good area of test block and press RUN. Flying spot should be near the top-center of the ACTIVE screen. If not, press NULL. Slide probe from good to void area and note response from flying spot. This response should provide both amplitude (vertical) and phase (horizontal) movement. The default gate/alarm setting may be incorrect for this setup. Turn off or reset gate/alarm as desired.

g. The Bondmaster is programmed to automatically set test parameters to a start-up or initial bond test. By following the steps outlined above, adjustments to the FREQ, GAIN, and ALARM can help to refine the selectivity in locating defects among differing composite materials.

4.7.3.6 Inspection Procedure. Refer to Bond Test Method, paragraph 1.4.6 and Figure 4-7. Place probe on pod in location where test for void is desired and press NULL. Move probe from good to suspect area and note response. A strong amplitude change and phase shift similar to the standard is indicative of a void.

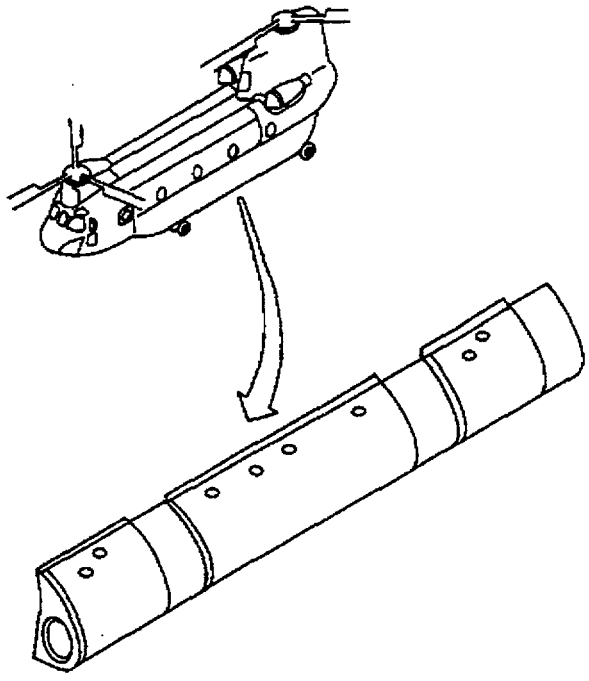
NOTE

This setup is very sensitive to thin skin-to-core bonding. If the panel skin is 0.020 inch thick or less, move the probe slowly over the skin and note the slight amplitude change (bounce) as the probe senses alternately the honeycomb cell nodes and cell walls. Be sure of panel configuration. Panel edges and attachment points may not be bonded structure and do not normally contain honeycomb. These areas will respond similarly to voids with the Bondmaster. Panels having rigidized skins are more easily scanned using wide Teflon tape on the probe holder.

4.7.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

NOTE

Attention shall be directed to accurately mark the boundaries of all voids. These markings will be needed to determine acceptance or rejection criteria in accordance with applicable technical manuals.



NDI_CH/MH-47_F4_7

Figure 4-7. Pods

4.7.4 Backup Method. None required.

4.7.5 System Securing. If removed, pods require installation and secure all access panels opened in accordance with the applicable technical manuals listed in Table 1-1.

4.8 PODS (RT).

4.8.1 Description (Figure 4-1, Index No. 8). The pods are located on each side of the fuselage section containing the fuel tanks. The forward end of each pod contains components of the electronic and electrical systems. A hinged panel in each pod provides access to the forward landing gear.

4.8.2 Defects. Fluid in honeycomb core.

4.8.3 Primary Method. Radiography.

WARNING

Radiation Hazard

Assure compliance with all applicable safety precautions set forth in TM 55-1500-335-23 (Nondestructive Inspection Methods manual) listed in Table 1-1. A hazard associated with exposure to ionizing radiation is that serious injury can be inflicted without pain, burning, or other sense of discomfort during the exposure period. Radiation protection shall be utilized in accordance with AR40-14/DLAR 1000.28.

4.8.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. X-ray Unit

b. LORAD Tripod, X-ray tubehead stand

c. Film Processor

d. Film, Ready Pack 8 inch x 10 inch

e. Marking Material, refer to Table 1-8

4.8.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the pods and/or bladders shall be removed in accordance with applicable technical manuals listed in Table 1-1.

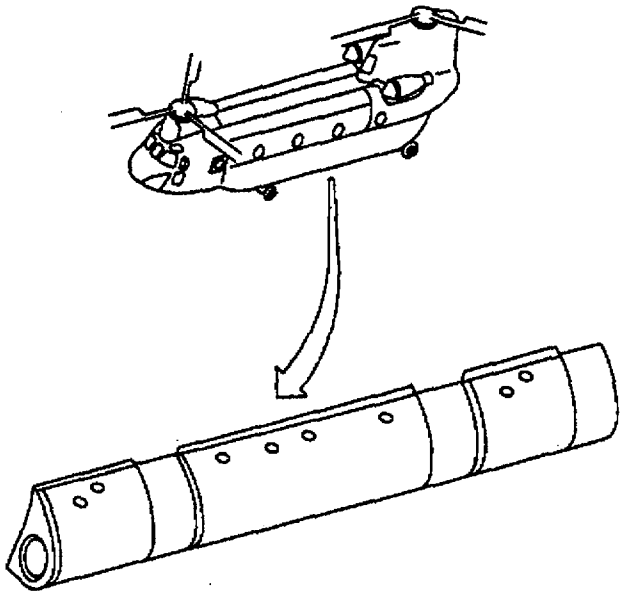
4.8.3.3 Access. Refer to Figure 1-4 and Table 1-2 to locate applicable access panels, doors, and fairings.

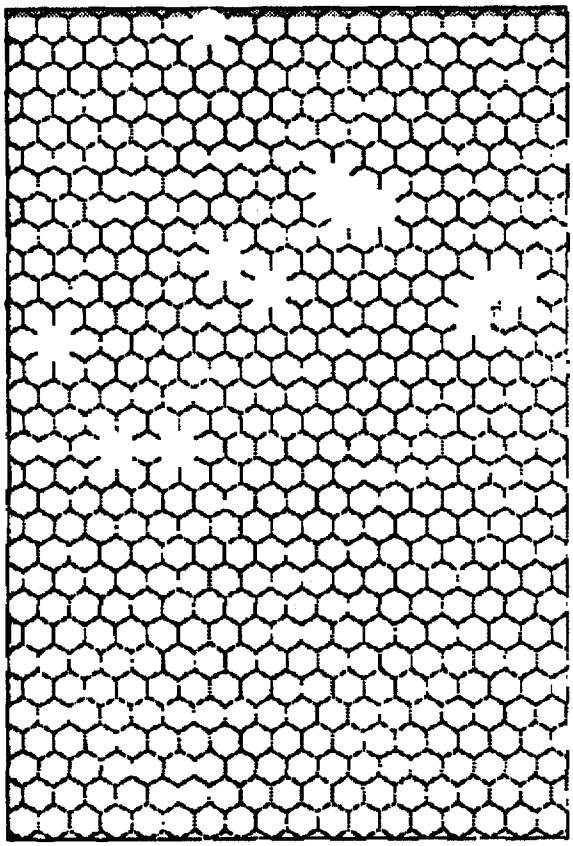
4.8.3.4 Preparation of Part. The pod shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.8.3.5 NDI Equipment Settings.

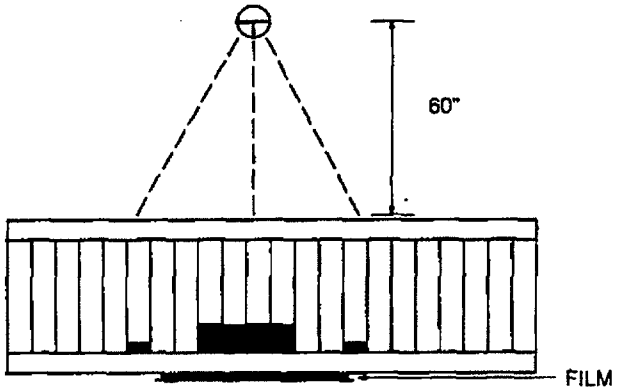
a. Refer to Radiographic Method, paragraph 1.4.10.

b. Equipment settings, inspection data, and arrangement for each exposure are given in Figure 4-8.





TYPICAL WATER ENTRAPMENT



RADIOGRAPHIC INSPECTION DATA						
EXPOSURE NUMBER	KV	MA	FFD (INCHES)	TIME (SEC)	FILM	
					TYPE	SIZE
E1	75	3.5	60	60	AA-2 M-2	8 x 10

REMARKS

1. FILM NUMBER SAME AS EXPOSURE NUMBER.
2. FILM DENSITY FOR EACH EXPOSURE SHALL BE 1.8 TO 2.5 H AND D UNITS IN AREAS OF INTEREST.
3. INSPECTION DATA SHALL BE ADJUSTED AS REQUIRED.

EXPOSURE DATA

NDI_CH/MH-47_F4_8

Figure 4-8. Pods

4.8.3.6 Inspection Procedure.

a. Position film and desired nameplate data for exposure number 1.

b. Position X-ray tubehead for exposure number 1.

c. Set X-ray unit to the values given in the Radiographic Inspection Data chart for exposure number 1.

d. Make exposure number 1.

e. Remove exposed film.

f. Repeat inspection procedure (steps a. through e. above) for each exposure.

g. Process and interpret film for defects as noted in paragraph 4.8.3.2 and as shown in Figure 4-8.

4.8.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as necessary per paragraph 1.3.

4.8.4 Backup Method. None required.

4.8.5 System Securing. The pod shall be cleaned as necessary. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.6.1. The pod and/or bladder, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure all access panels that were used.

4.9 RESCUE HATCH LOWER DOOR GEARBOX ASSEMBLY (MT).

4.9.1 Description (Figure 4-1, Index No.9). This inspection is applicable to the spiroid pinion, spiroid gear, and gear shaft contained in the rescue hatch lower door gearbox assembly.

4.9.2 Defects. Defects may occur anywhere on the surface of the parts listed above. No cracks are allowed.

4.9.3 Primary Method. Magnetic Particle.

4.9.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held magnetic coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

4.9.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the rescue hatch lower door gearbox removed and disassembled in accordance with the applicable technical manuals listed in Table 1-1.

4.9.3.3 Access. Not applicable.

4.9.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.9.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

4.9.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position(s) required for this inspection are illustrated in Figure 4-9.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part in Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

4.9.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

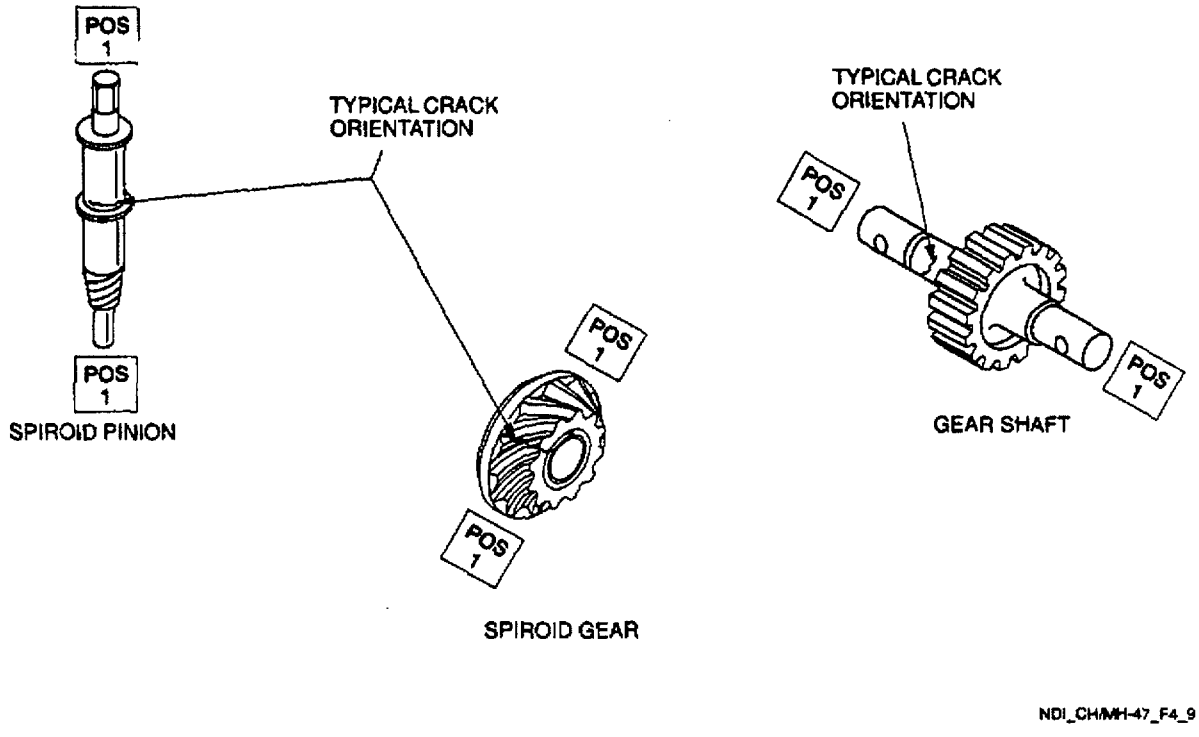


Figure 4-9. Rescue Hatch Lower Door Gearbox Assembly

4.9.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

4.9.4 Backup Method. None required.

4.9.5 System Securing. Clean the identified component(s) thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The rescue hatch lower door gearbox requires assembly and installation in accordance with the applicable technical manuals listed in Table 1-1.

4.10 RESCUE HATCH LOWER DOOR GEARBOX HOUSING AND COVER (ET).

4.10.1 Description (Figure4-1, Index No. 10). This inspection is applicable to the rescue hatch lower door gearbox assembly housing and cover.

4.10.2 Defects. Defects may occur anywhere on the surface of the housing and cover. Particular attention shall be given to the areas of the four mounting holes. No cracks are allowed.

4.10.3 Primary Method. Eddy Current.

4.10.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.10.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the rescue hatch lower door gearbox shall be removed and disassembled in accordance with the applicable technical manuals listed in Table 1-1.

4.10.3.3 Access. Not applicable.

4.10.3.4 Preparation of Part. The housing and cover shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.10.3.5 ND1 Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	-off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.10.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-10.

a. Place probe in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.10.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.10.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.10.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.10.4 Backup Method. None required.

4.10.5 System Securing. If removed, assemble and install the rescue hatch lower door gearbox housing and cover in accordance with the applicable technical manuals listed in Table 1-1.

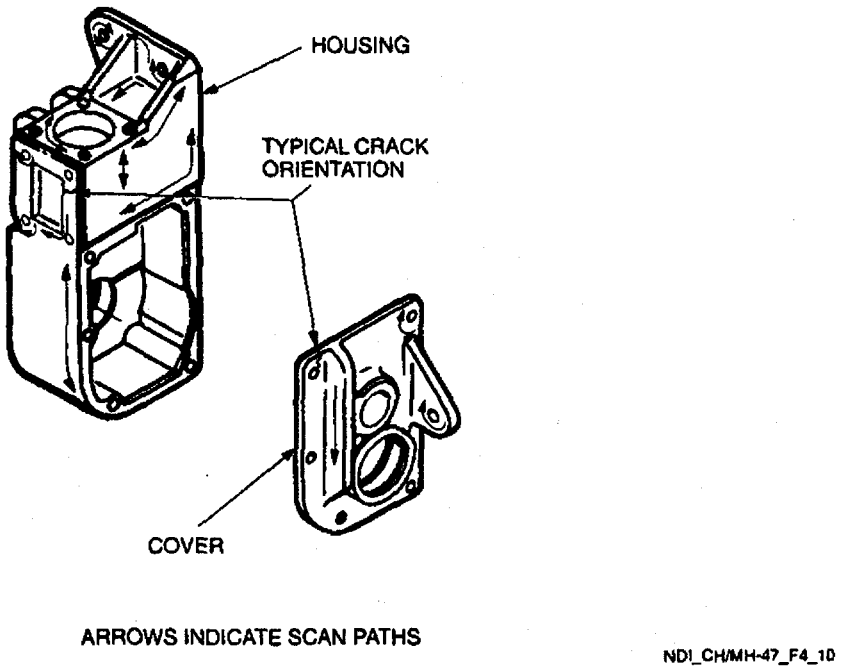


Figure 4-10. Rescue Hatch Lower Door Gearbox Housing and Cover

4.11 CARGO RAMP (BT).

4.11.1 Description (Figure 4-1, Index. No.11). A hydraulically operated cargo loading ramp is at the aft end of the fuselage section.

4.11.2 Defects. Void damage may occur on any area of the skin/honeycomb structure. This inspection is to verify any void indications found visually.

NOTE

A void is defined as an unbonded area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term ("void").

4.11.3 Primary Method. Bond Testing.

4.11.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Bond Test Unit

b. Probe, Mechanical Impedance Analysis

c. Probe Holder

d. Cable Assembly

e. Test Block, Composite Defect Standard #1

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.11.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the cargo ramp shall be removed in accordance with applicable technical manuals listed in Table 1-1.

4.11.3.3 Access. Not applicable.

4.11.3.4 Preparation of Part. The components shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.11.3.5 NDI Equipment Settings. Refer to Bond Test Equipment, paragraph 1.4.6.1.

a. Attach cable and probe to Bondmaster. Protect probe with Teflon tape and install in probe holder.

b. Turn on Bondmaster, press SPCL, and make the following adjustments:

H Pos	- 40%
V Pos	- 80%
PHASE REF	- 0
DRIVE	- MID

c. Press SET and select DISPLAY - PHASE.

d. Place probe on the good area of test block and press GOOD PART. Do this several times while moving the probe to different spots in the good area of the test block. Note the video signature for each. Select and enter a representative good area by pressing GOOD PART one last time.

e. Place probe on void area of test block and press BAD PART. Do this several times while moving the probe slightly to different positions within the void area. Select and enter a position that gives a strong difference between good and void areas. (See Figure 1-5.) Use DIFF soft key to observe difference between good and bad areas of test block.

NOTE

If, during setup, the flying spot deflects upward or to the side when the probe passes over the bad part, instead of the desired down deflection toward the alarm box, press SPCL and toggle to a different phase setting (90, 180, or 270), and repeat steps d. and e. Continue to try phase setting until the flying spot moves in the desired down direction.

f. Place probe on good area of test block and press RUN. Flying spot should be near the top center of the ACTIVE screen. If not, press NULL. Slide probe from good to void area and note response from flying spot. This response should provide both amplitude (vertical) and phase (horizontal) movement. The default gate/alarm setting may be incorrect for this setup. Turn off or reset gate/alarm as desired.

g. The Bondmaster is programmed to automatically set test parameters to a start-up or initial bond test. By following the steps outlined above, adjustments to the FREQ, GAIN, and ALARM can help to refine the selectivity in locating defects among differing composite materials.

4.11.3.6 Inspection Procedure. Refer to Bond Test Method, paragraph 1.4.6 and Figure 4-11. Place probe on cargo ramp in location where test for void is desired and press NULL. Move probe from good to suspect area and note response. A strong amplitude change and phase shift similar to the test block is indicative of a void. This set-up is very sensitive to thin skin-to-core bonding. Move probe slowly over the skin and note the slight amplitude change (bounce) as the probe senses alternately the honeycomb cell nodes and cell walls.

4.11.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

NOTE

Attention shall be directed to accurately mark the boundaries of all voids. These markings will be needed to determine acceptance or rejection criteria in accordance with applicable technical manuals.

4.11.4 Backup Method. None required.

4.11.5 System Securing. If removed, the cargo ramp shall be installed in accordance with applicable technical manuals listed in Table 1-1.

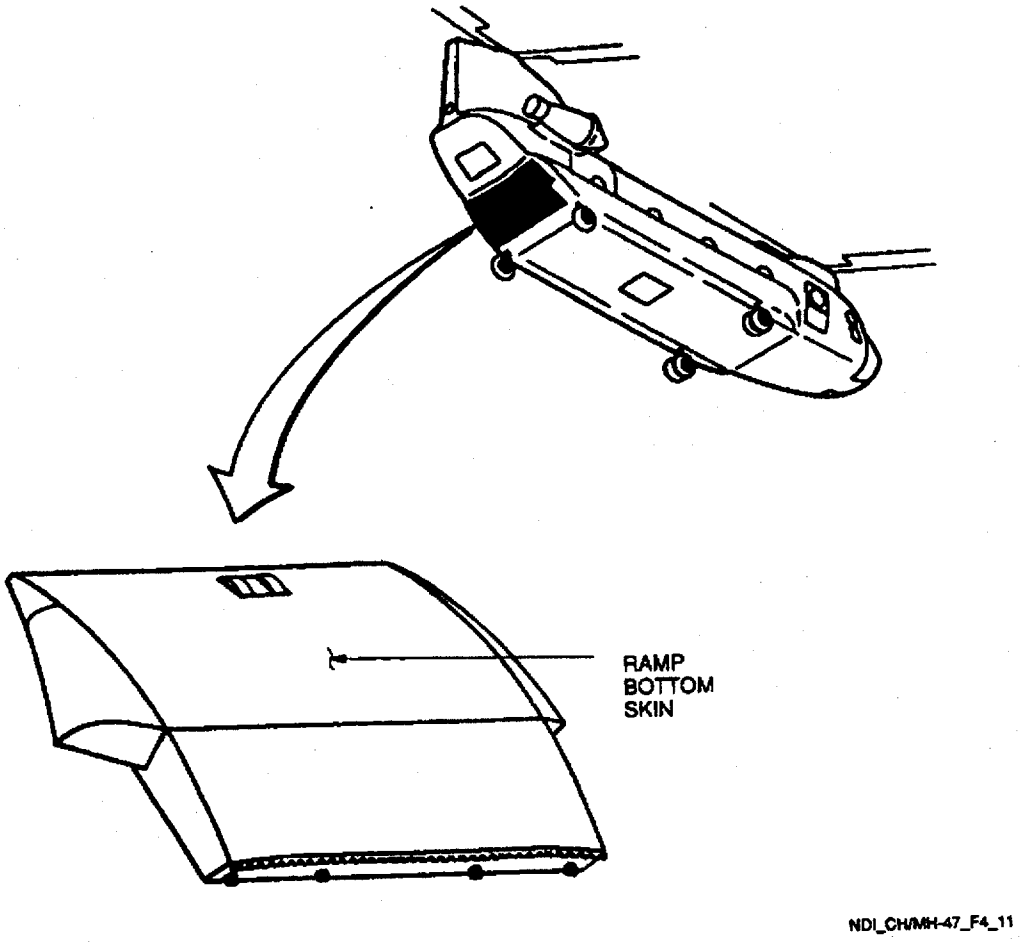


Figure 4-11. Cargo Ramp

4.12 COMBINING TRANSMISSION SUPPORT FITTINGS AND LONGITUDINAL BEAMS (ET).

4.12.1 Description (Figure 4-1, Index No. 12). The combining transmission has four support fittings which are bolted to the longitudinal support beams of the fuselage ceiling. This inspection is applicable to both the interior and exterior.

4.12.2 Defects. Cracks may occur anywhere on the fitting or beams. No cracks are allowed.

4.12.3 Primary Method. Eddy Current.

4.12.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.12.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the components shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.12.3.3 Access. Access is through pylon combiner transmission hinged fairing, doors, or the fuselage ceiling. See Figure 1-4 - CH-47: 4; MH-47: 23.

WARNING.

Maintenance Platforms/Workstands

Use only appropriate platforms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopter in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

4.12.3.4 Preparation of Part. The combining transmission support fittings and longitudinal beams shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.12.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency Fl	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.12.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-12.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.12.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.12.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.12.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.12.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

4.12.5 System Securing. Secure applicable door, fairings, and panels as required in accordance with the applicable technical manuals listed in Table 1-1.

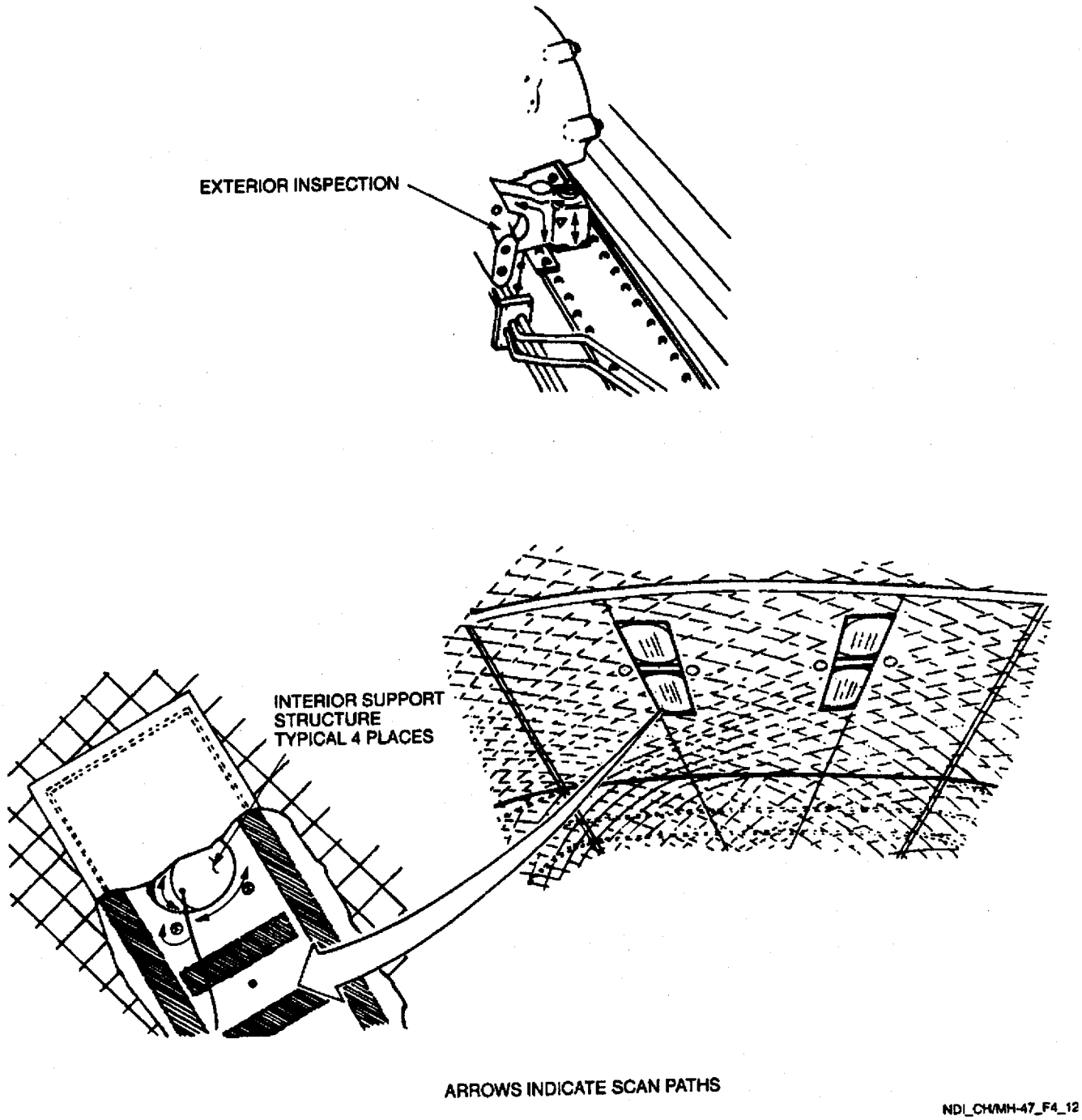


Figure 4-12. Combining Transmission Support Fittings and Longitudinal Beams

4.13 COMPOSITE PYLON HINGED FAIRINGS (WORK PLATFORM) (BT).

4.13.1 Description (Figure 4-1. Index No. 13). The work platforms are located on each side of the pylon which provides access to rotor shaft.

4.13.2 Defects. Void damage may occur on any area of the skin/honeycomb structure.

NOTE

A void is defined as an unbonded area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term ("void").

4.13.3 Primary Method. Bond Testing.

4.13.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Bond Test Unit

b. Probe, Mechanical Impedance Analysis

c. Probe Holder

d. Cable Assembly (compatible with Bond Testing Unit)

e. Test Block, metal honeycomb with skin thickness closest to that of the panel to be inspected.

f. Test Block, Composite Defect Standard #1

g. Teflon Tape, refer to Table 1-8

h. Aircraft Marking Pencil, refer to Table 1-8

4.13.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the work platforms shall be removed in accordance with applicable technical manuals listed in Table 1-1.

4.13.3.3 Access. Not applicable.

WARNING

Maintenance Platforms/Workstands

Use only appropriate platforms, workstands, or other approved locally procured stands and restraint equipment when working above 10 feet on helicopters in a nontactical environment. Otherwise, personnel injury could result from accidental falls.

4.13.3.4 Preparation of Part. The components shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.13.3.5 NDI Equipment Settings. Refer to Bond Test Equipment, paragraph 1.4.6.1.

a. Attach cable and probe to Bondmaster. Protect probe with Teflon tape and install in probe holder.

b. Turn on Bondmaster, press SPCL, and make the following adjustments:

H Pos	- 40%
V Pos	- 80%
PHASE REF	- 0
DRIVE	- MID

c. Press SET and select DISPLAY - PHASE.

d. Place probe on the good area of test block and press GOOD PART. Do this several times while moving the probe to different spots in the good area of the test block. Note the video signature for each. Select and enter a representative good area by pressing GOOD PART one last time.

e. Place probe on void area of test block and press BAD PART. Do this several times while moving the probe slightly to different positions within the void area. Select and enter a position that gives a strong difference between good and void areas. (See Figure 1-5.) Use DIFF soft key to observe difference between good and bad areas of test block.

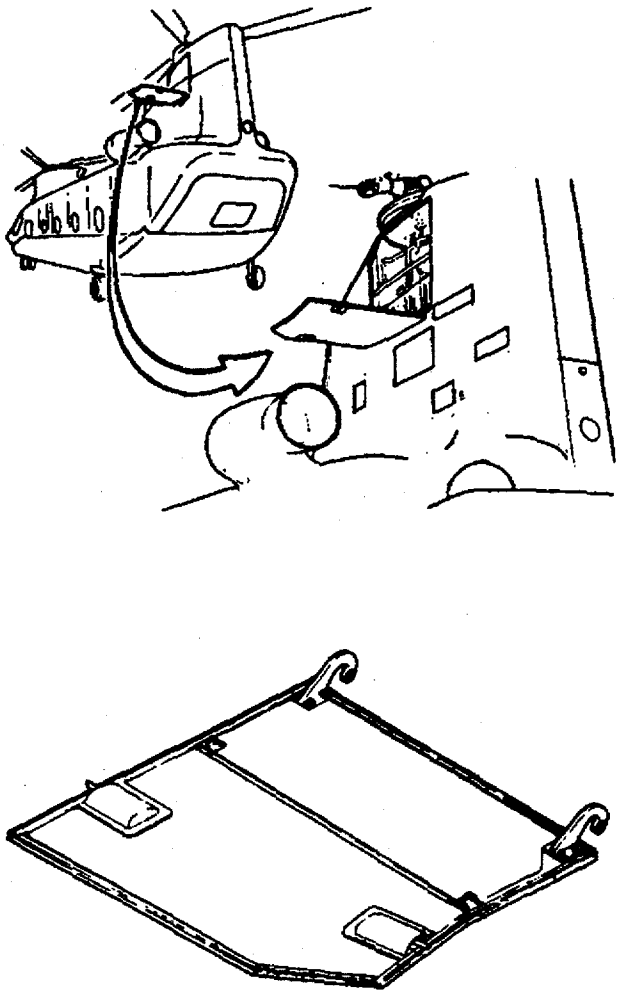
NOTE

If, during setup, the flying spot deflects upward or to the side when the probe passes over the bad part, instead of the desired down deflection toward the alarm box, press SPCL and toggle to a different phase setting (90, 180, or 270), and repeat steps d. and e. Continue to try phase setting until the flying spot moves in the desired down direction.

f. Place probe on good area of test block and press RUN. Flying spot should be near the top center of the ACTIVE screen. If not, press NULL. Slide probe from good to void area and note response from flying spot. This response should provide both amplitude (vertical) and phase (horizontal) movement. The default gate/alarm setting may be incorrect for this setup. Turn off or reset gate/alarm as desired.

g. The Bondmaster is programmed to automatically set test parameters to a start-up or initial bond test. By following the steps outlined above, adjustments to the FREQ, GAIN, and ALARM can help to refine the selectivity in locating defects among differing composite materials.

4.13.3.6 Inspection Procedure. Refer to Bond Test Method, paragraph 1.4.6 and Figure 4-13. Place probe on fairing in location where test for void is desired and press NULL. Move probe from good to suspect area and note response. A strong amplitude change and phase shift similar to the standard is indicative of a void.



NDI_CH/MH-47_F4_13

Figure 4-13. Composite Pylon Hinged Fairings (Work Platform)

NOTE

This setup is very sensitive to thin skin-to-core bonding. Move probe slowly over the skin and note the slight amplitude change (bounce) as the probe senses alternately the honeycomb cell nodes and cell walls. Be sure of panel configuration. Panel edges and attachment points may not be bonded structure and do not normally contain honeycomb. These areas will respond similarly to voids with the Bondmaster. Panels having rigidized skins are more easily scanned using wide Teflon tape on the probe holder.

4.13.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

NOTE

Attention shall be directed to accurately mark the boundaries of all voids. These markings will be needed to determine acceptance or rejection criteria in accordance with applicable technical manuals,

4.13.4 Backup Method. None required.

4.13.5 System Securing. If removed, install the work platforms in accordance with the applicable technical manuals listed in Table 1-1.

4.14 FORWARD LANDING GEAR SUPPORT STRUCTURE (ET).

4.14.1 Description (Figure 4-1. index No. 14). This inspection is applicable to both of the forward landing gear support structures.

4.14.2 Defects. Defects may occur anywhere on the surface of the forward landing gear support structure. No cracks are allowed.

4;14.3 Primary Method. Eddy Current.

4.14.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.14.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the landing gear shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.14.3.3 Access. Not applicable.

4.14.3.4 Preparation of Part. The forward landing gear support structure shall be thoroughly, cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.14.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.14.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-14.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.14.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.14.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

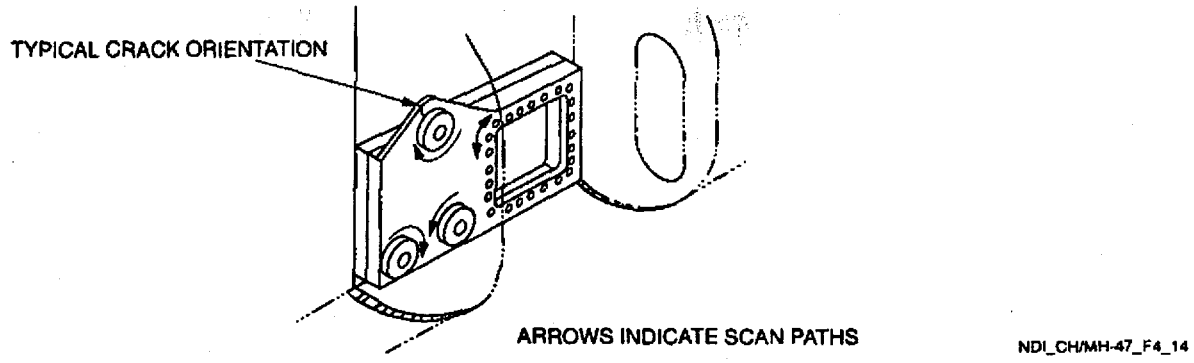


Figure 4-14. Forward Landing Gear Support Structure

4.14.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.14.4 Backup Method. None required.

4.14.5 System Securing. If removed, the forward landing gear requires installation in accordance with the applicable technical manuals listed in Table 1-1.

4.15 LANDING GEAR WHEEL (ET).

4.15.1 Description (Figure 4-1, Index No.15). There are four high-flotation landing gear assemblies, two forward and two aft. The two forward assemblies have dual wheels. Each aft assembly has a full- swivel single wheel.

4.15.2 Defects. Defects may occur anywhere on the surface of the wheel. No cracks are allowed.

4.15.3 Primary Method. Eddy Current.

4.15.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.15.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the landing gear wheel removed and disassembled in accordance with the applicable technical manuals listed in Table 1-1.

4.15.3.3 Access. Not applicable.

4.15.3.4 Preparation of Part. The landing gear wheel shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.15.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	-0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 147.)

4.15.3.6 Inspection Procedure. Refer to Eddy current Method, paragraph 1.4.11 and Figure 4-15.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.15.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.15.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.15.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.15.4 Backup Method. None required.

4.15.5 System Securing. The landing gear wheel requires assembly and installation in accordance with the applicable technical manuals listed in Table 1-1.

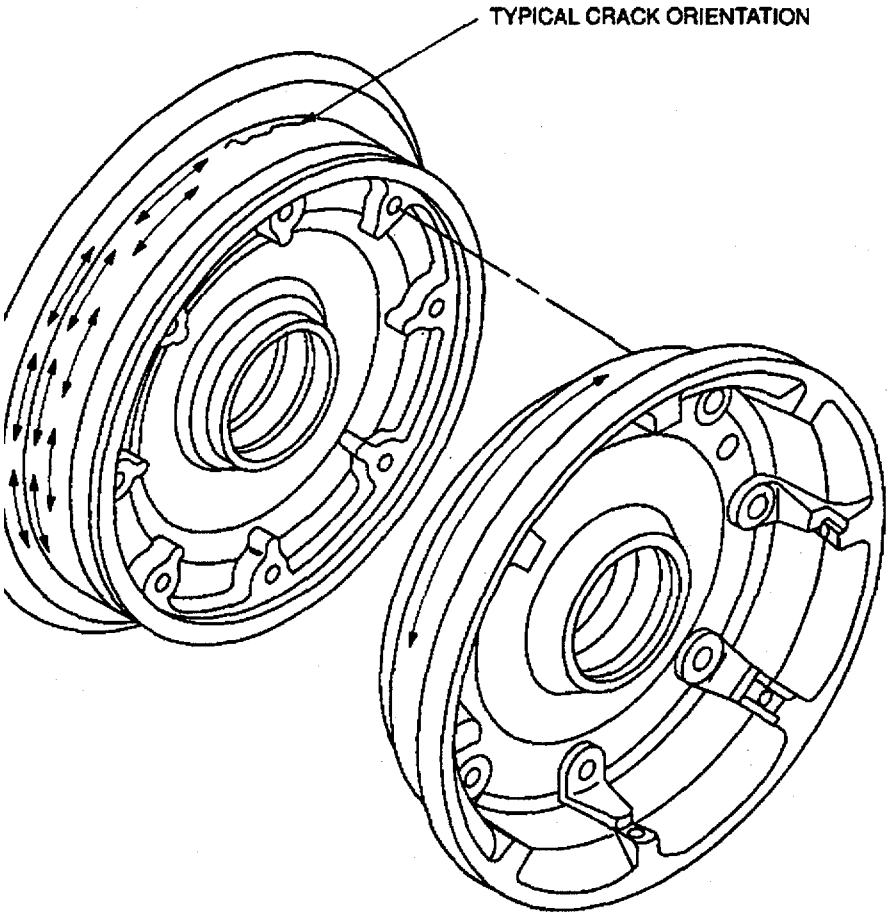


Figure 4-15. Landing Gear Wheel

4.16 LANDING GEAR AXLE (MT).

4.16.1 Description (Figure 4-1. Index No. 16). The landing gear axle is a steel tube which supports the wheels in the landing gear assembly. This inspection is applicable to both inboard and outboard as well as forward and aft axles.

4.16.2 Defects. Defects may occur anywhere on the surface of the landing gear axle. No cracks or bends are allowed.

4.16.3 Primary Method. Magnetic Particle.

4.16.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

NOTE
Hand-held coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

4.16.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the landing gear axle shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.16.3.3 Access. Not applicable.

4.16.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.16.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

4.16.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position required for this inspection is illustrated in Figure 4-16.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part at position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for . no more than five seconds.

d. Inspect for cracks using the black light.

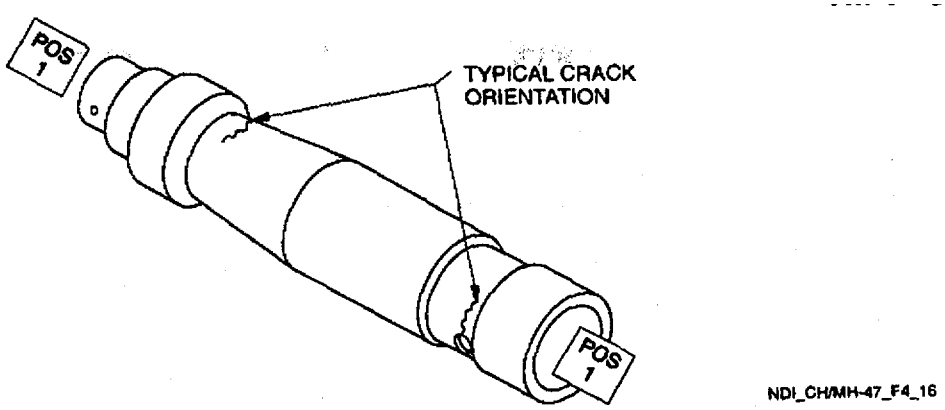


Figure 4-16. Landing Gear Axle

4.16.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

4.16.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

4.16.4 Backup Method. None required.

4.16.5 System Securing. Clean the landing gear axle thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, install the landing gear axle in accordance with the applicable technical manuals listed in Table 1-1.

4.17 FORWARD LANDING GEAR STRUT PISTON TUBE (MT).

4.17.1 Description (Figure 4-1. Index No. 17). The forward landing gear strut piston tube dampens up and down movements during takeoff and landing to reduce structural fatigue.

4.17.2 Defects. Defects may occur anywhere on the surface of the strut piston tube. No cracks are allowed.

4.17.3 Primary Method. Magnetic Particle.

4.17.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

4.17.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the strut piston tube shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.17.3.3 Access. Not applicable.

4.17.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part of Area for NDI, paragraph 1.4.4.

4.17.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

4.17.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions required for this inspection are illustrated in Figure 4-17.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part at Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 4.17.3.8.

f. Rotate the probe leg positions 180 degrees and repeat steps a. through e. for Position 2.

g. Repeat steps a. through e. for Position 3.

4.17.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

4.17.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

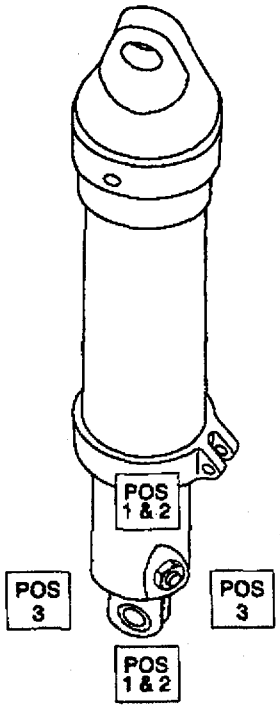
4.17.4 Backup Method. None required.

4.17.5 System Securing. Clean the strut piston tube thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After ND1, paragraph 1.4.17. The strut piston tube, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1.

4.18 AFT LANDING GEAR STRUCTURE (ET).

4.18.1 Description (Figure 4-1, Index No. 18). The aft landing gear are identical left and right. This inspection includes the shock strut attachment fitting and the trunnion.

4.18.2 Defects. Defects may occur anywhere on the structures, shock strut attachment fitting, and the trunnion. No cracks are allowed.



NDI_CH/MH-47-F4_17

Figure 4-17. Forward Landing Gear Strut Piston Tube

4.18.3 Primary Method. Eddy Current.

4.18.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.18.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the aft landing gear shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.18.3.3 Access. Not applicable.

4.18.3.4 Preparation of Part. The areas of interest shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.18.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
V B	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	-0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.18.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-18.

a. Place probe on a good area in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

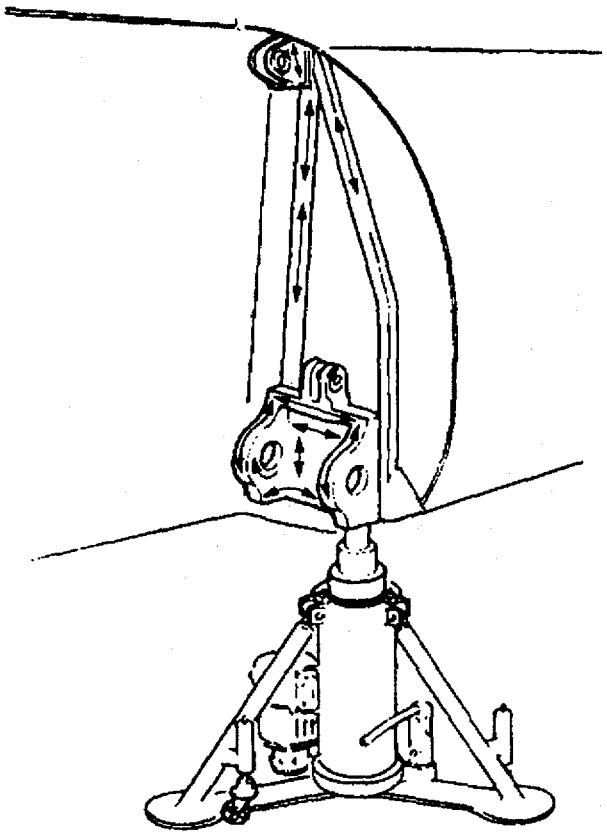
NOTE

Either probe identified in paragraph 4.18.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.18.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.18.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.18.4 Backup Method. None required.

4.18.5 System Securing. The aft landing gear, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1.



ARROWS INDICATE SCAN PATHS

NDI_CH/MH-47_F4_18

Figure 4-18. Aft Landing Gear Structure

4.19 FORWARD LANDING GEAR TORQUE ARM (ET).

4.19.1 Description (Figure 4-1. Index No. 19). The forward landing gear torque arm keeps the forward landing gear aligned.

4.19.2 Defects. Defects can occur anywhere on the surface of the torque arm. No cracks are allowed.

4.19.3 Primary Method. Eddy Current.

4.19.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

4.19.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the forward landing gear torque arm shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.19.3.3 Access. Not applicable.

4.19.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.19.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II} .

Frequency F1 - 200 KHz F2 - off

HdB	- 57.0
VdB	- 69.0
Rot	- 56°
Probe drive	- mid
LPF	- 100
HPF	- 0
H Pos	- 80%
V Pos	-20%

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.
(2) Adjust phase as required to obtain horizontal lift-off.
(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.19.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-19.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.19.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.19.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.19.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.19.4 Backup Method. None required.

4.19.5 System Securing. If removed, the forward landing gear torque arm requires installation in accordance with the applicable technical manuals listed in Table 1-1.

4.20 LOWER DRAG LINK ASSEMBLY HARDWARE (MT).

4.20.1 Description (Figure 4-1. Index No. 20). This inspection is applicable to the fitting, retainer static lock mechanism, fork, all bolts, and pins contained in the lower drag link assembly.

4.20.2 Defects. Defects may occur anywhere on the surface of the parts listed above. No cracks are allowed.

4.20.3 Primary Method. Magnetic Particle.

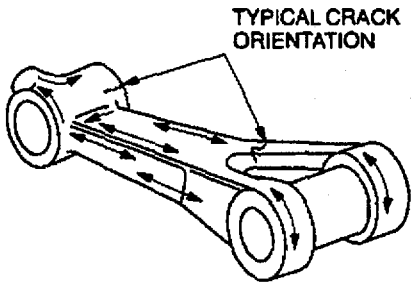


Figure 4-19. Forward Landing Gear Torque Arm

4.20.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

NOTE

Hand-held magnetic coil may be used. Refer to paragraph 1.4.8.1.2 and Figure 1-6.

4.20.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the lower drag link removed and disassembled in accordance with the applicable technical manuals listed in Table 1-1.

4.20.3.3 Access. Not applicable.

4.20.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.20.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

4.20.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Position required for this inspection is illustrated in Figure 4-20.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part at Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

4.20.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

4.20.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

4.20.4 Backup Method. None required.

4.20.5 System Securing. Clean the parts of interest thoroughly to remove all residual magnetic par. tide media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.20. The lower drag link assembly requires reassembly and installation in accordance with the applicable technical manuals listed in Table 1-1.

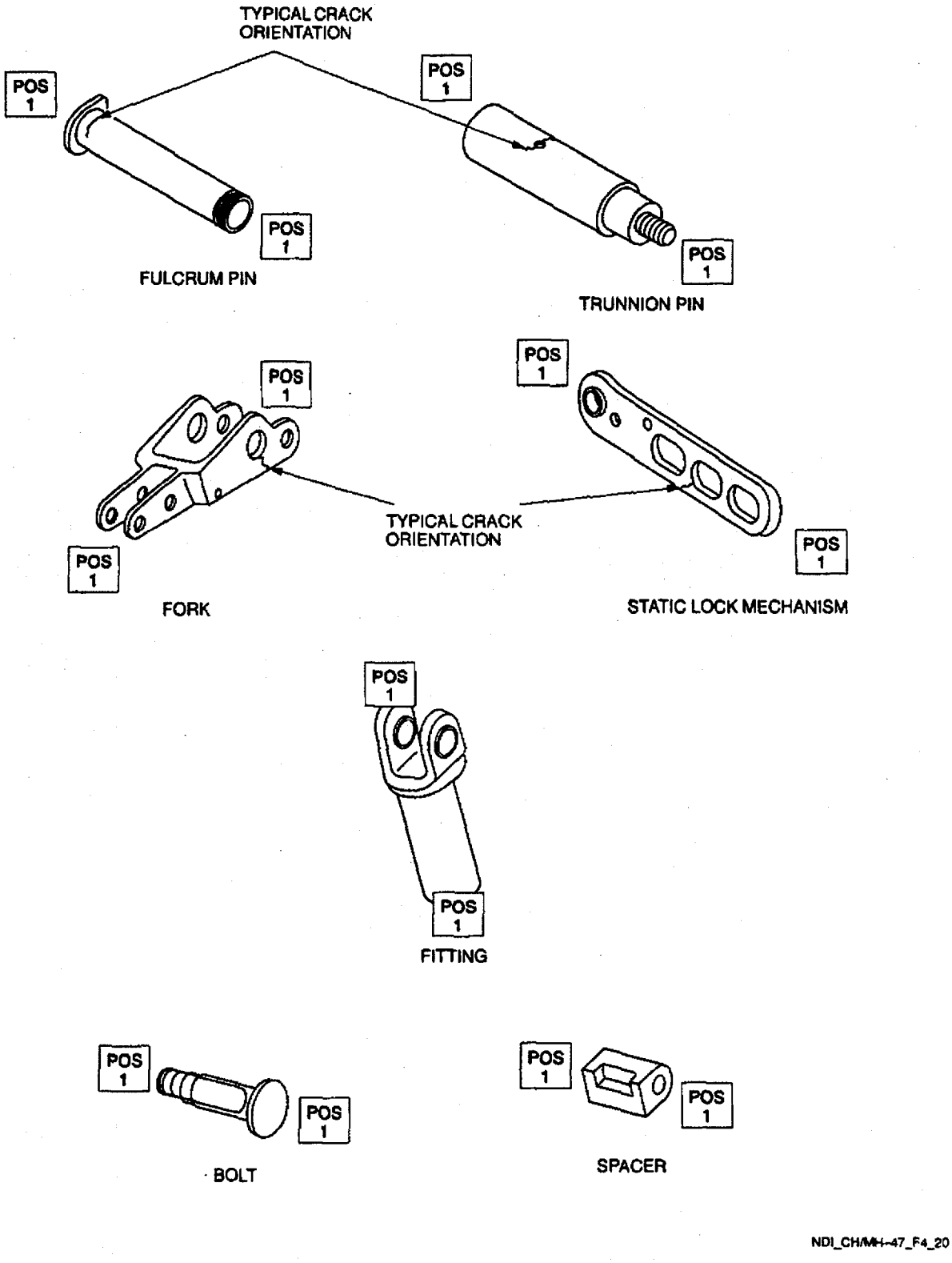


Figure 4-20. Lower Drag Link Assembly Hardware

4.21 LOWER DRAG LINK (ET).

4.21.1 Description (Figure 4-1 . Index No. 21). The lower drag links support the aft landing gear swivel housings and are connected to fuselage fittings.

4.21.2 Defects. Defects may occur anywhere on the surface of the lower link. No cracks are allowed.

4.21.3 Primary Method. Eddy Current.

4.21.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.21.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the lower drag link shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

4.21.3.3 Access. Not applicable.

4.21.3.4 Preparation of Part. The lower drag link shall be thoroughly cleaned. Refer to, Preparation of Part or Area for NDI, paragraph 1.4.4.

4.21.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1 - 200 KHz F2 - off

HdB	- 57.0
VdB	- 69.0
Rot	- 56°
Probe drive	- mid
LPF	- 100
HPF	- 0
H Pos	- 80%
V Pos	-20%

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.21.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-21.

a. Place probe on part in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.21.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.21.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

4.21.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.21.4 Backup Method. None required.

4.21.5 System Securing. If removed, the lower drag link requires installation in accordance with the applicable technical manuals listed in Table 1-1.

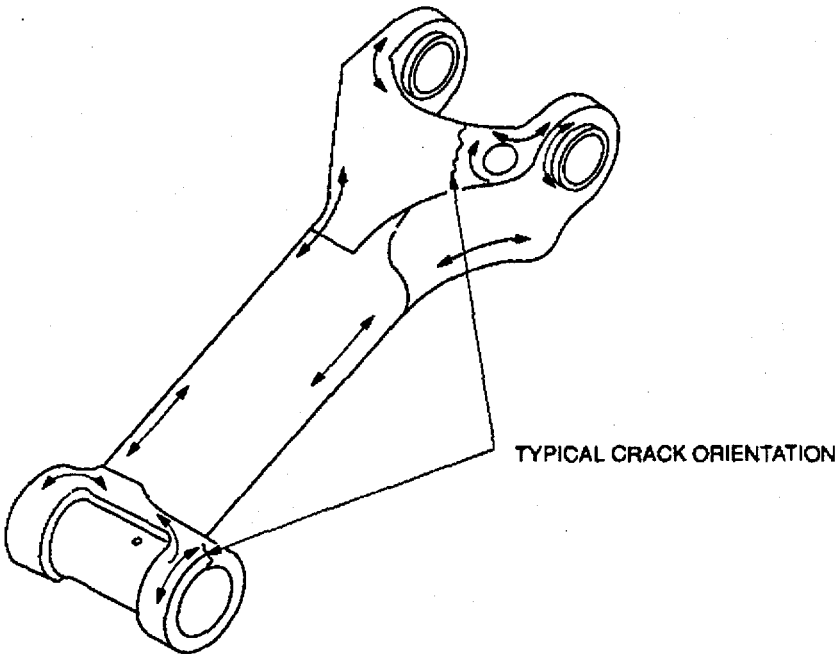


Figure 4-21. Lower Drag Link

4.22 CENTER CARGO HOOK (MT).

4.22.1 Description (Figure 4-1. Index No. 22). The center cargo hook is located in the cabin fuselage at the rescue hatch door.

4.22.2 Defects. Defects may occur anywhere on the surface of the center cargo hook. No cracks are allowed.

4.22.3 Primary Method. Magnetic Particle.

4.22.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

4.22.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the center cargo hook shall be removed in accordance with the technical manuals listed in Table 1-1.

4.22.3.3 Access. Access is through the rescue hatch door. See Figure 1-4 - CH-47: 29; MH-47: 35.\par4.22.3.4 Preparation of Part. The center cargo hook shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4. Do not remove paint.

4.22.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

4.22.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions required for this inspection are illustrated in Figure 4-22.

a. Select AC on the AC/DC power switch.

b. Place probe/yoke on part in Position 1 as shown.

c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.

d. Inspect for cracks using the black light.

e. Demagnetize before moving to the next position. Refer to paragraph 4.22.3.8.

f. Repeat steps a. through e. for Position 2.

4.22.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

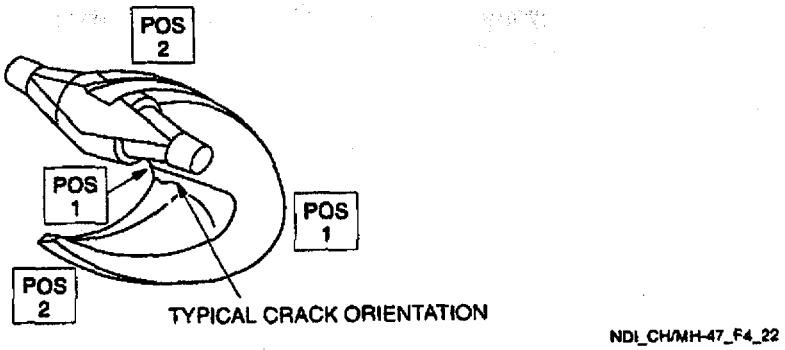


Figure 4-22. Center Cargo Hook

4.22.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

4.22.4 Backup Method. None required.

4.22.5 System Securing. Clean the center cargo hook thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. If removed, installation of cargo hook is required in accordance with the applicable technical manual listed in Table 1-1. Secure the rescue hatch door.

4.23 AFT PYLON EQUIPMENT SUPPORT STRUCTURE (ET).

4.23.1 Description (Figure 4-1. Index No. 23). The aft pylon equipment support structures consist of the aft trunnion actuator forward and aft supports, aft swiveling actuator support, and aft bellcrank left and right support.

4.23.2 Defects. Defects may occur anywhere in the support structure. Inspect all reworked lugs for cracks. Particular attention shall be given to radii at base of lugs and also to the lug bore surfaces and surrounding areas.

4.23.3 Primary Method. Eddy Current.

4.23.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

4.23.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance in accordance with the applicable technical manuals listed in Table 1-1.

4.23.3.3 Access. Not applicable.

4.23.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

4.23.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	-0		
H Pos	-80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

4.23.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 4-23.

a. Place probe on a good area in the inspection location and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 4.23.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 4.23.3.5 b. (1), (2), and (3) shall be repeated each time a change is made. 4.23.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

4.23.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

4.23.5 System Securing. None required.

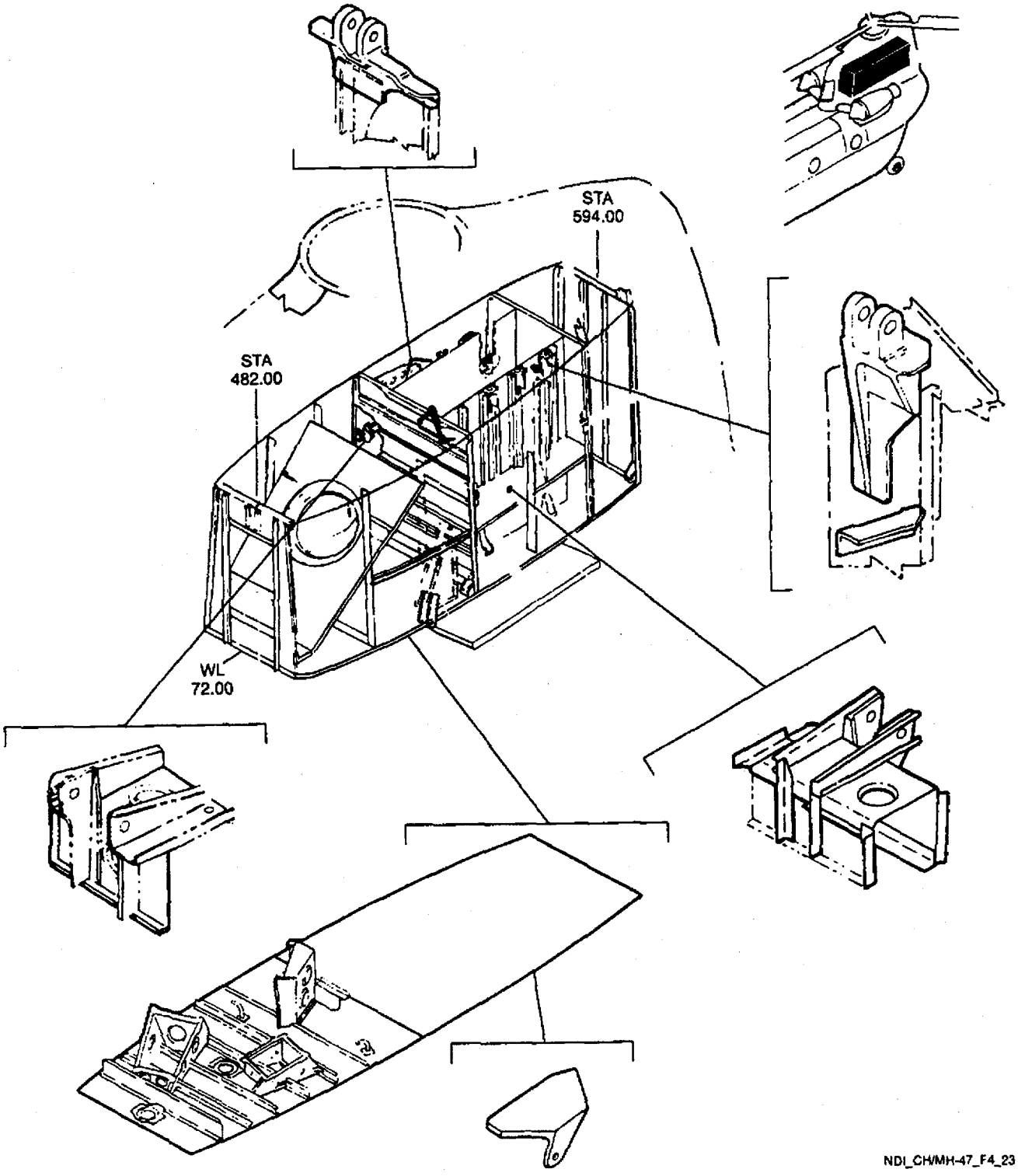


Figure 4-23. Aft Pylon Equipment Support Structure

SECTION V
ENGINE GROUP

5. GENERAL.

5.1 CONTENTS. The engine group inspection items covered in this section are those items of the CH/MH-47 helicopter gas turbine engine, model T55 engines, and components listed in the Engine Group Inspection Index (Table 5-1). Corresponding inspection figures and applicable text paragraphs are listed opposite each item. The index number for each item may be used to locate it in Figure 5-1.

Table 5-1. Engine Group and Inspection Index

Index Number	Nomenclature	Inspection Method	Paragraph Number	Figure Number
2	Engine Oil Pump, Fuel Control, and Accessory Gearbox Flanges	ET	5.2	5-2
3	Engine Mount Caps	ET	5.3	5-3
4	Engine Mount Adapter	ET	5.4	5-4
5	Forward Engine Mount Structure	ET	5.5	5-5
*6	Aft Engine Mount Link	MT	5.6	5-6
*7	Connecting Link	ET	5.7	5-7
8	Aft Engine Mount Adapter	ET	5.8	5.8
9	Exhaust Cone and Stiffener	PT	5.9	5-9
10	Fuel Drain Valve	PT	5.10	5-10
11	Combustion Chamber Housing	PT	5.11	5-11
12	Fireshield Section	PT	5.12	5-12

NOTE: *Indicates Flight Safety Part.

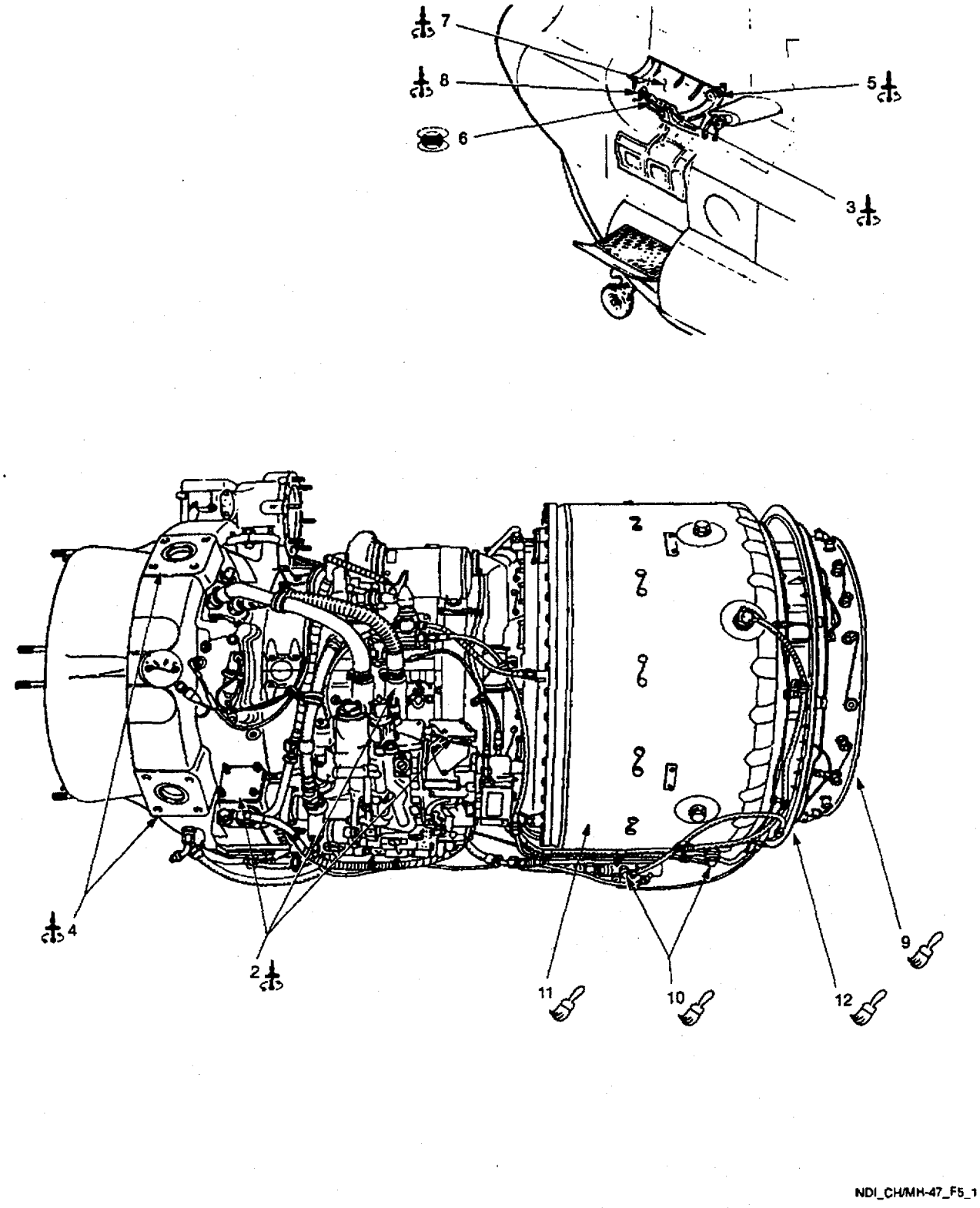


Figure 5-1. Engine Group

5.2 ENGINE OIL PUMP, FUEL CONTROL, AND ACCESSORY GEARBOX FLANGES (ET).

5.2.1 Description (Figure 5-1. Index No. 2). This inspection is to verify cracks found visually during an excessive G-force load inspection. Items to be inspected are: (1) accessory gearbox flanges; (2) oil pump flanges; and (3) fuel control flanges.

5.2.2 Defects. Inspect all above flanges for cracks. No cracks are allowed.

5.2.3 Primary Method. Eddy Current.

5.2.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

5.2.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the components shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.2.3.3 Access. Access is through the engine upper and lower doors from the engine work platform. See Figure 1-4 CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.2.3.4 Preparation of Part. The areas to be inspected shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1. 4. 4.

5.2.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	-200 KHz	F2	- off
HdB	-57.0		
VdB	-69.0		
Rot	-56°		
Probe drive	-mid		
LPF	-100		
HPF	-0		
H Pos	-80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0. 040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

5.2.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 5-2.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 5.2.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 5.2.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

5.2.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.2.4 Backup Method. None required.

5.2.5 System Securing. The components, if removed, require installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

5.3 ENGINE MOUNT CAPS (ET).

5.3.1 Description (Figure 5-1. Index No. 3). The engine mount caps are positioned between the lugs of the forward engine mount to which the engine mount adapters are attached.

5.3.2 Defects. This inspection can be used at any time, but it is primarily used to verify cracks found visually during excess G-force load inspections.

5.3.3 Primary Method. Eddy Current.

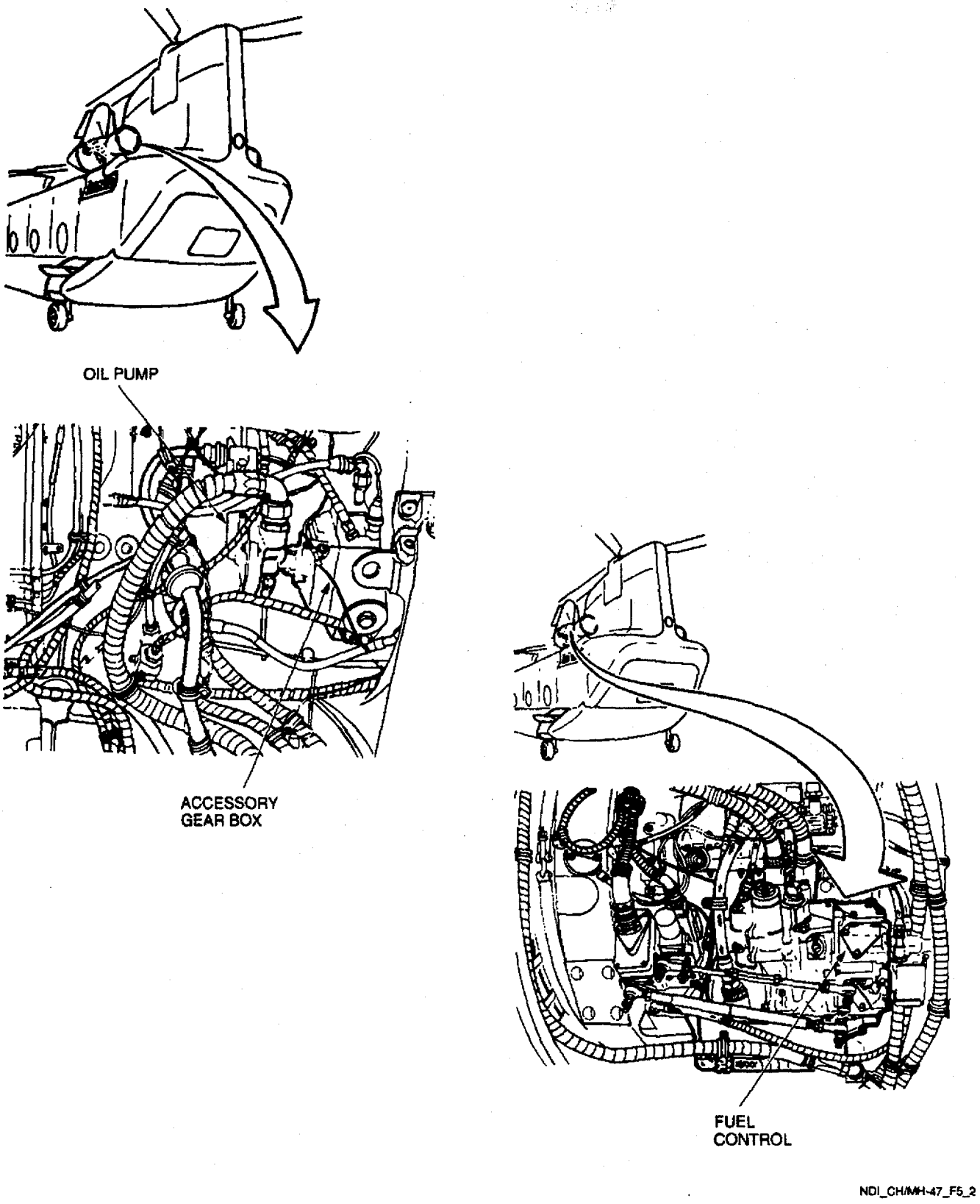


Figure 5-2. Engine Oil Pump, Fuel control, and Accessory Gearbox Flanges

5.3.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

5.3.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the engine mount cap shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.3.3.3 Access. Access is through the engine upper and lower doors from the engine work platform.

See Figure 1-4 - CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.3.3.4 Preparation of Part. The engine mount cap shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.3.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0. 040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

5.3.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 5-3.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 5.3.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 5.3.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

5.3.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.3.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

5.3.5 System Securing. The engine mount cap, if removed, requires installation in accordance with applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

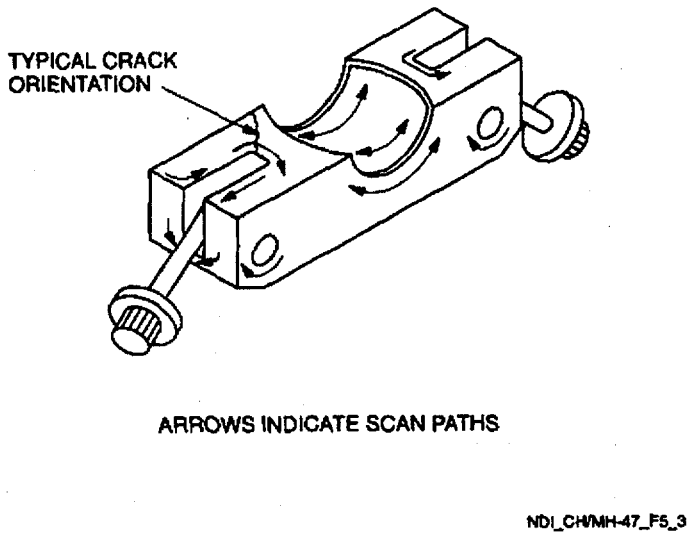


Figure 5-3. Engine Mount Caps

5.4 ENGINE MOUNT ADAPTER (ET).

5.4.1 Description (Figure 5-1 . Index No. 4). The engine mount adapter attaches to the engine allowing an attachment point for the attaching link from the engine mount cap.

5.4.2 Defects. This inspection can be used at any time but it is primarily used to verify cracks found visually during excessive G-force load inspections.

5.4.3 Primary Method. Eddy Current.

5.4.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 112 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

5.4.3. 2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the adapter shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.4.3.3 Access. Access is through the engine upper and lower doors from the engine work platform. See Figure 1-4 CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.4.3.4 Preparation of Part. The engine mount adapter shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.4.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

5.4.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 5-4.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

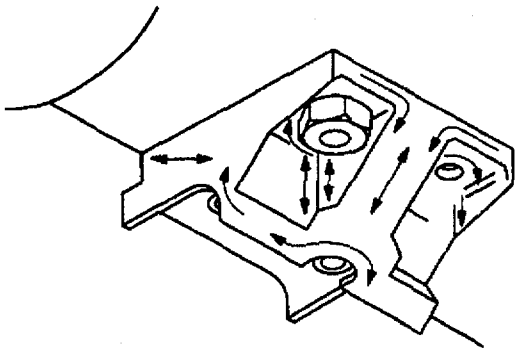
NOTE

Either probe identified in paragraph 5.4.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 5. 4. 3. 5 b. (1), (2), and (3) shall be repeated each time a change is made.

5.4.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.4.4 Backup Method. None required.

5.4.5 System Securing. The engine mount adapter, if removed, requires installation in accordance with applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.



ARROWS INDICATE SCAN PATHS

NDI_CH/MH-47_F5_4

Figure 5-4. Engine Mount Adapter

5.5 FORWARD ENGINE MOUNT STRUCTURE (ET).

5.5.1 Description (Figure 5-1. Index No. 5). The forward engine mount structure is attached to the aircraft and supports the engine.

5.5.2 Defects. This inspection is to verify cracks found visually. No cracks are allowed.

5.5.3 Primary Method. Eddy Current.

5.5.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

5.5.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the forward engine mount structure shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.5.3.3 Access. Access is through the engine upper and lower doors from the engine work platform.

See Figure 1-4 CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.5.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.5.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

5.5.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 5-5.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 5.5.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 5. 5. 3. 5 b. (1), (2), and (3) shall be repeated each time a change is made.

5.5.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

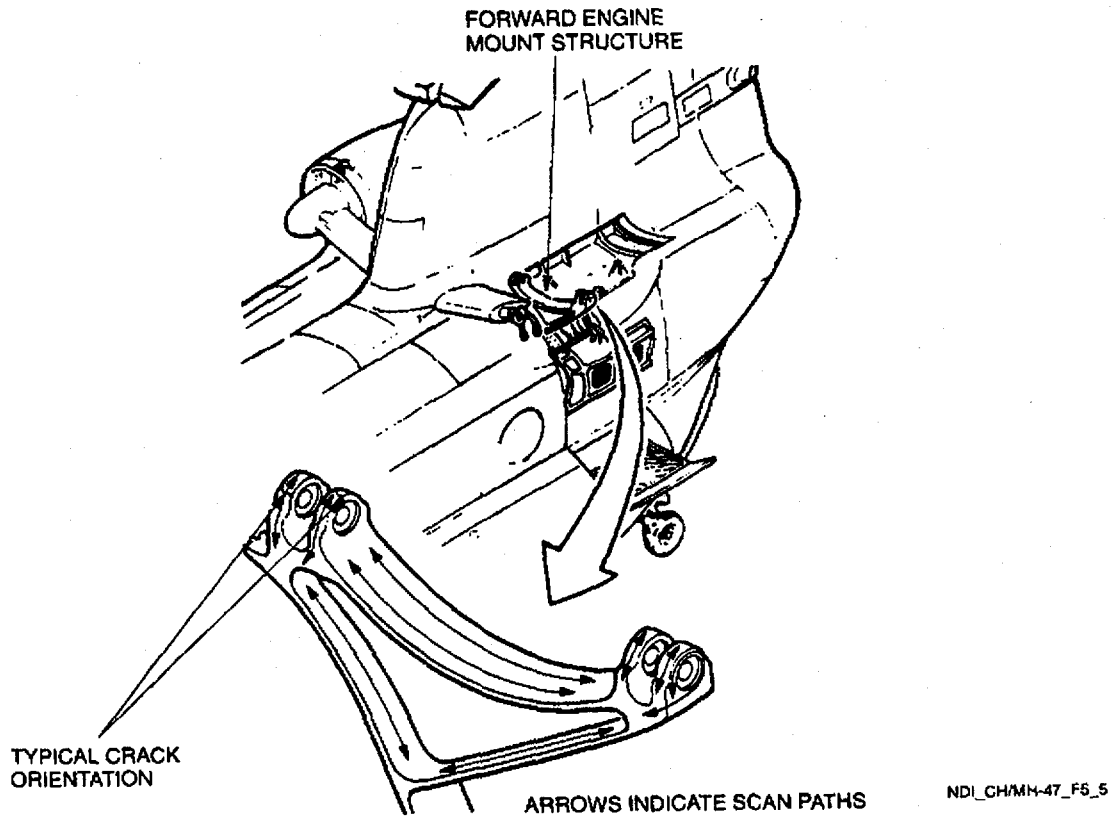


Figure 5-5. Forward Engine Mount Structure

5.5.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

5.5.5 System Securing. The engine mount structure, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

5.6 AFT ENGINE MOUNT LINK (MT).

5.6.1 Description (Figure 5-1, Index No. 6). The aft engine mount link connects the engine adapted, to the aft engine mount lugs on the structure.

5.6.2 Defects. This inspection can be used at any time but is primarily used to verify cracks found visually during excessive G-force load inspections.

5.6.3 Primary Method. Magnetic Particle.

5.6.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke
b. Magnetometer
c. Black Light
d. Fluorescent Magnetic Particles
e. Consumable Materials, refer to Table 1-8
f. Aircraft Marking Pencil, refer to Table 1-8

5.6.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the aft engine mount link shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.6.3.3 Access. Access is through the engine upper and lower doors from the engine work platform. See Figure 1-4 - CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.6.3.4 Preparation of Part. The aft engine mount link shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.6.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

5.6.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions required for this inspection are illustrated in Figure 5-6.

a. Select AC on the AC/DC power switch.
b. Place probe/yoke on part in Position 1 as shown.
c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.
d. Inspect for cracks using the black light.
e. Demagnetize before moving to the next position. Refer to paragraph 5.6.3.8.
f. Repeat steps a. through e. for Positions 2 and 3.

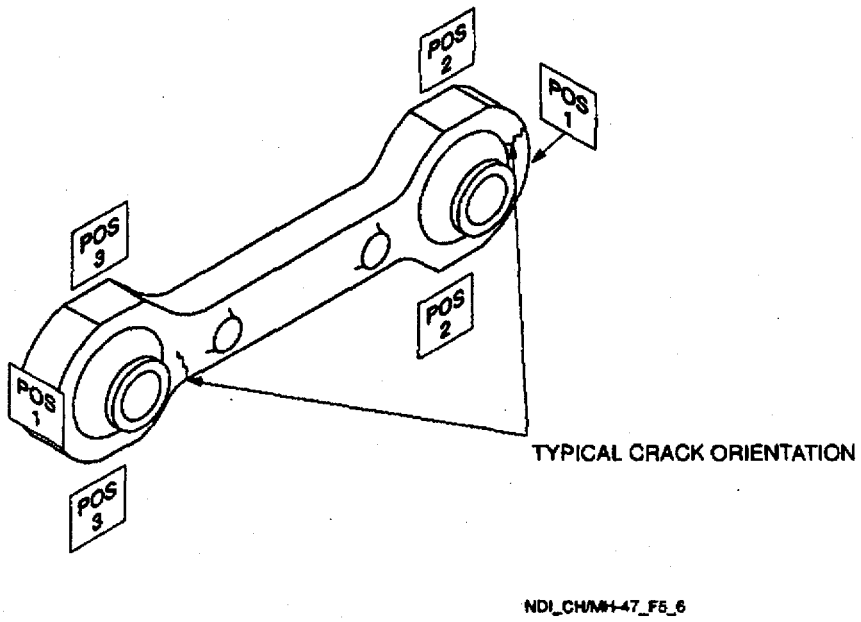


Figure 5-6. Aft Engine Mount Link

5.6.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

5.6.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

5.6.4 Backup Method. None required.

5.6.5 System Securing. Clean the aft engine mount link thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The link, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1.

5.7 CONNECTING LINK (ET).

5.7.1 Description (Figure 5-1, Index No. 7). The connecting link provides support and stability by connecting the aft engine mount to the outboard side of the forward engine mount.

5.7.2 Defects, This inspection can be used at anytime but is primarily used to verify cracks found visually during excessive G-force load inspections.

5.7.3 Primary Method. Eddy Current.

5.7.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8

5.7.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the connecting link shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.7.3.3 Access. Not applicable.

5.7.3.4 Preparation of Part. The connecting link shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.7.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0. 040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

5.7.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 5-7.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 5.7.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 5.7.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

5.7.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.7.4 Backup Method. None required.

5.7.5 System Securing. The connecting link, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1.

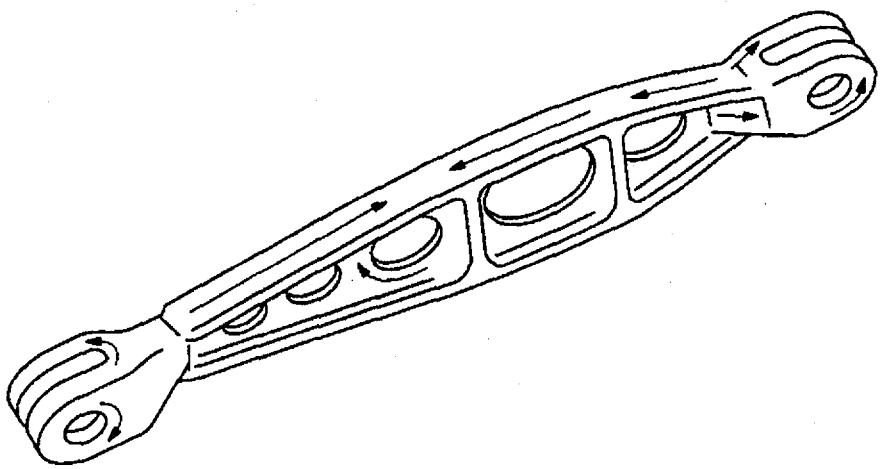


Figure 5-7. Connecting Link

5.8 AFT ENGINE MOUNT ADAPTER (ET).

5.8.1 Description (Figure 5-1. Index No. 8). The aft engine mount adapter attaches to the engine. The engine mount link attaches to the adapter and engine mount structure assemblies.

5.8.2 Defects. This inspection is to verify cracks found visually. No cracks are allowed.

5.8.3 Primary Method. Eddy Current.

5.8.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

5.8.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the adapter shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.8.3.3 Access. Access is through the engine upper and lower doors from the engine work platform.

See Figure 1-4 CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.8.3.4 Preparation of Part. The adapter shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.8.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

5.8.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 5-8.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 5.8.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 5.8.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

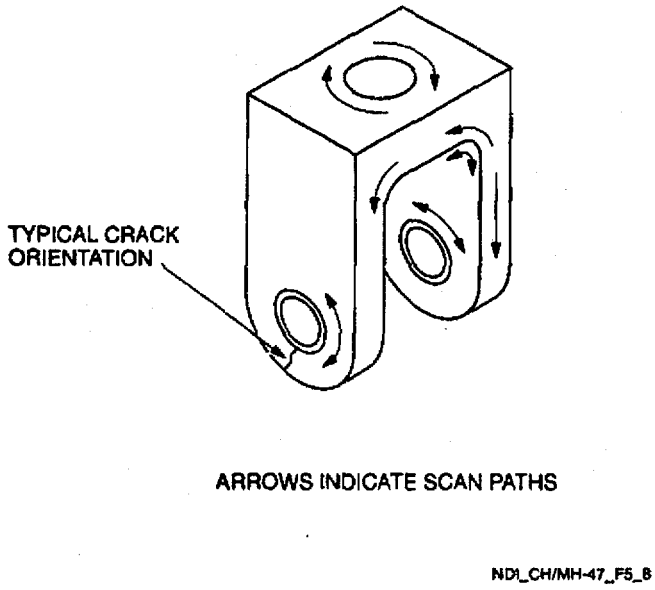


Figure 5-8. Aft Engine Mount Adapter

5.8.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.8.4 Backup Method. None required.

5.8.5 System Securing. The engine mount adapter, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

5.9 EXHAUST CONE AND STIFFENER (PT).

5.9.1 Description (Figure 5-1, Index No. 9). The exhaust system conducts the exhaust gases in a smooth flow from the engine to the atmosphere. The exhaust cone (tailpipe) is connected to the aft end of the engine by a coupling.

5.9.2 Defects. This inspection is to verify cracks found visually. Also to inspect welded repairs. No cracks are allowed.

5.9.3 Primary Method. Fluorescent Penetrant.

5.9.3.1 NDI Equipment and Materials. Inspection equipment shall be selected from the approved list in Table 1-7, and AMS-2644 level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8). DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

5.9.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the exhaust cone shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.9.3.3 Access. Access is through the engine upper and lower doors from the engine work platform See Figure 1-4 - CH-47: 20, 21, and 22; MH-47: 18, 20, and 21.

5.9.3.4 Preparation of Part. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.9.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-4. Inspect area of concern. See Figure 5-9.

5.9.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.9.4 Backup Method. None required.

5.9.5 System Securing. Clean the exhaust cone and stiffener to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI paragraph 1.4.16. The exhaust cone, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

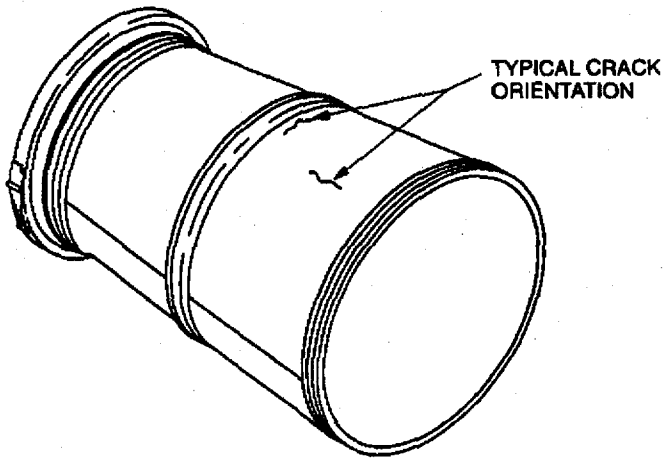


Figure 5-9. Exhaust Cone and Stiffener

5.10 FUEL DRAIN VALVE (PT).

5.10.1 Description (Figure 5-1, Index No. 10). The fuel drain valve is being used here as an example of inspecting parts while attached to the engine. Any unpainted part that is accessible can be inspected using this method with little preparation and with little or no disassembly.

5.10.2 Defects. Inspect to verify cracks found visually. No cracks allowed.

5.10.3 Primary Method. Fluorescent Penetrant.

5.10.3.1 NDI Equipment and Materials. Inspection equipment shall be selected from the approved list in Table 1-7, and AMS-2644 level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8). DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

5.10.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the fuel drain valve shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.10.3.3 Access. Access is through the engine upper and lower doors from the engine work platform. See Figure 1-4 - CH-47: 20, 21, and 22: MH-47: 18, 20, and 21.

5.10.3.4 Preparation of Part. Refer to Preparation of Part for Area for NDI, paragraph 1.4.4.

5.10.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-4. Inspect area of concern. See Figure 5-10.

5.10.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.10.4 Backup Method. None required.

5.10.5 System Securing. Clean the part to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The fuel drain valve, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

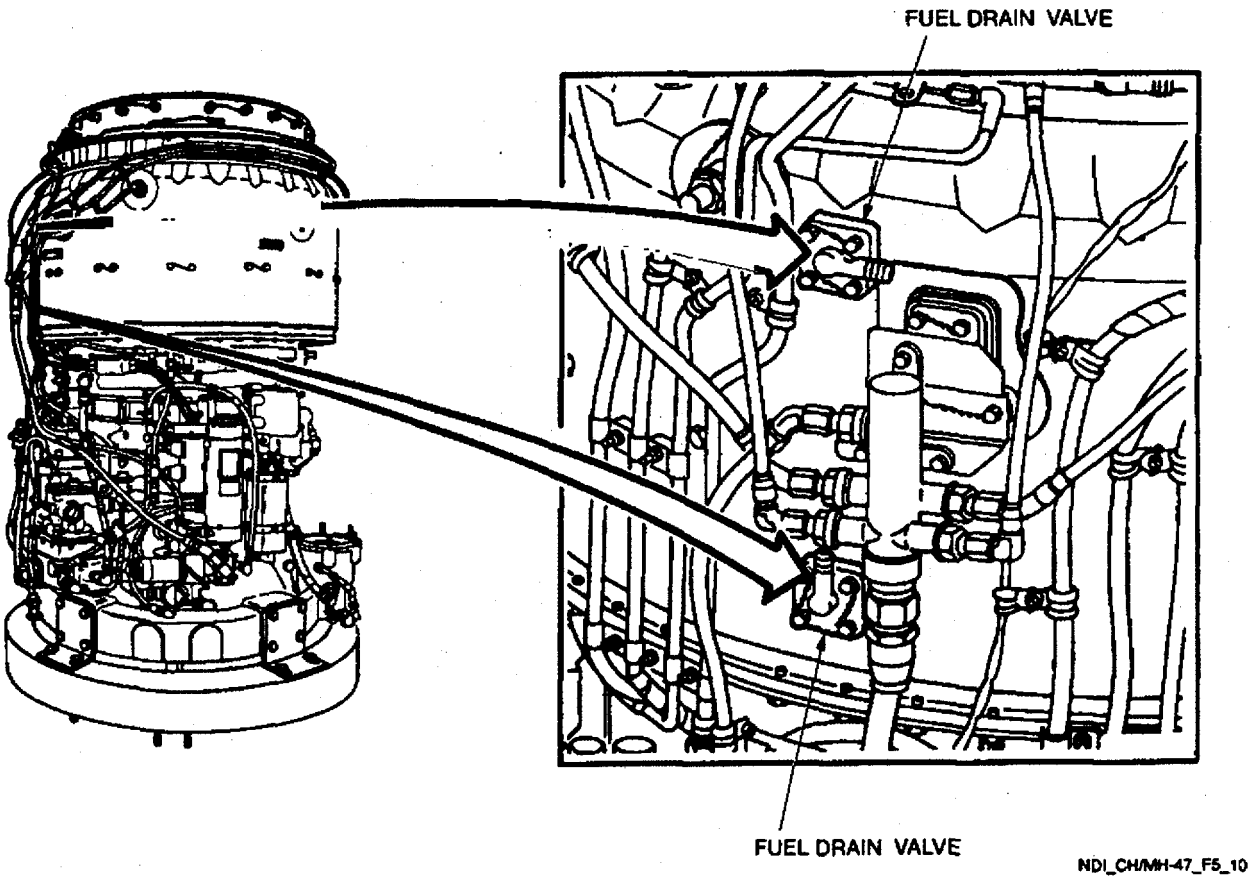


Figure 5-10. Fuel Drain Valve

5.11 COMBUSTION CHAMBER HOUSING (PT).

5.11.1 Description (Figure 5-1, Index No. 11). Induced air is compressed, mixed with fuel, and ignited in the combustion chamber. There are eight nut plates positioned on the combustion chamber housing. Method of attachment is tack-welded using inert gas method.

5.11.2 Defects. Inspect to tack welds for cracks. No cracks are allowed.

5.11.3 Primary Method. Fluorescent Penetrant.

5.11.3.1 NDI Equipment and Materials. Inspection equipment shall be selected from the approved list in Table 1-7, and AMS-2644 level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8). DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

5.11.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the combustion chamber housing shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

5.11.3.3 Access. Access is through the engine upper and lower doors from the engine work platform. See Figure 1-4 - CH-47: 20, 21, and 22: MH-47: 18, 20, and 21.

5.11.3.4 Preparation of Part. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.11.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-4. Inspect area of concern. See Figure 5-11.

5.11.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.11.4 Backup Method. None required.

5.11.5 System Securing. Clean the combustion chamber housing to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The combustion chamber housing, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the engine upper and lower doors.

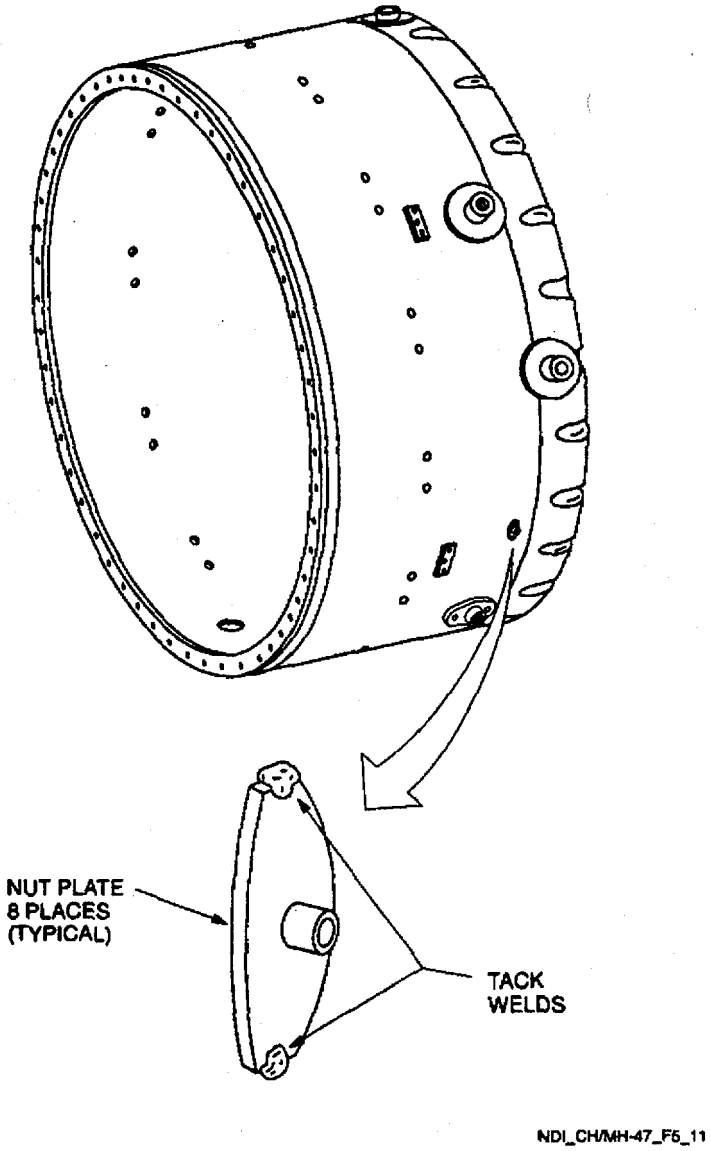


Figure 5-11. Combustion Chamber Housing

5.12 FIRESHIELD SECTION (PT).

5.12.1 Description (Figure 5-1, Index No. 12). The fireshield attaches to the aft end of the combustion chamber.

5.12.2 Defects. Inspect to verify cracks found visually.

5.12.3 Primary Method. Fluorescent Penetrant.

5.12.3.1 NDI Equipment and Materials. Inspection equipment shall be selected from the approved list in Table 1-7, and AMS-2644 level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8). DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

5.12.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the fireshield shall be removed in accordance with the applicable manuals listed in Table 1-1.

5.12.3.3 Access. Not applicable.

5.12.3.4 Preparation of Part. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

5.12.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-4. Inspect area of concern. See Figure 5-12.

5.12.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

5.12.4 Backup Method. None required.

5.12.5 System Securing. Clean the fireshield section to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The fireshield section, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1.

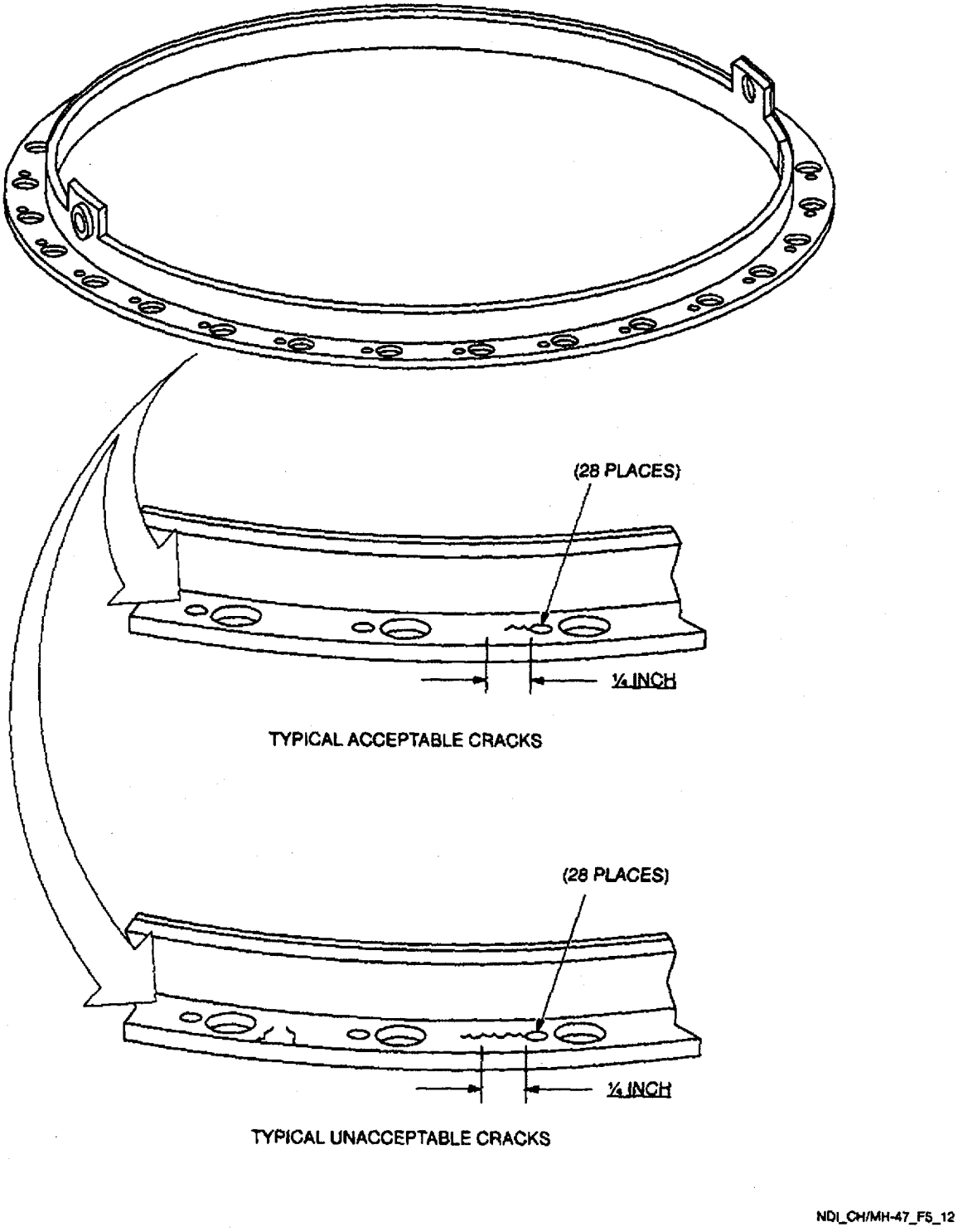


Figure 5-12. Fireshield Section

SECTION VI

FLIGHT CONTROL GROUP

6. GENERAL.

6.1 CONTENTS. The flight control group inspection items covered in this section are those items of the CH/MH-47 helicopter flight control and related hydraulic systems. The parts and components are listed in the Flight Control Group Inspection Index (Table 6-1). Corresponding inspection figures and applicable text paragraphs are listed opposite each item. The index number for each item may be used to locate it in Figure 6-1.

Table 6-1. Flight Control Group Inspection Index

Index Number	Nomenclature	Inspection Method	Paragraph Number	Figure Number
*2	Aluminum Flight Control System Connecting Links	ET	6.2	6-2
*3	Steel Flight Control System Connecting Links	MT	6.3	6-3
*4	Stainless Steel Flight Control System Connecting Links	PT	6.4	6-4
*5	Thrust Control Bellcrank and Support	ET	6.5	6-5
*6	First Stage Control Bellcranks and Supports	ET	6.6	6-6
*7	Second Stage Control Bellcranks and Supports	ET	6.7	6-7
*8	Intermediate Connecting Links	ET	6.8	6-8
*9	Bellcranks and Supports, Yokes, and Connecting Links	ET	6.9	6-9
*10	Flight Control Reservoirs/Coolers and Related Equipment	PT	6.10	6-10

NOTE: *Indicates Flight Safety Part.

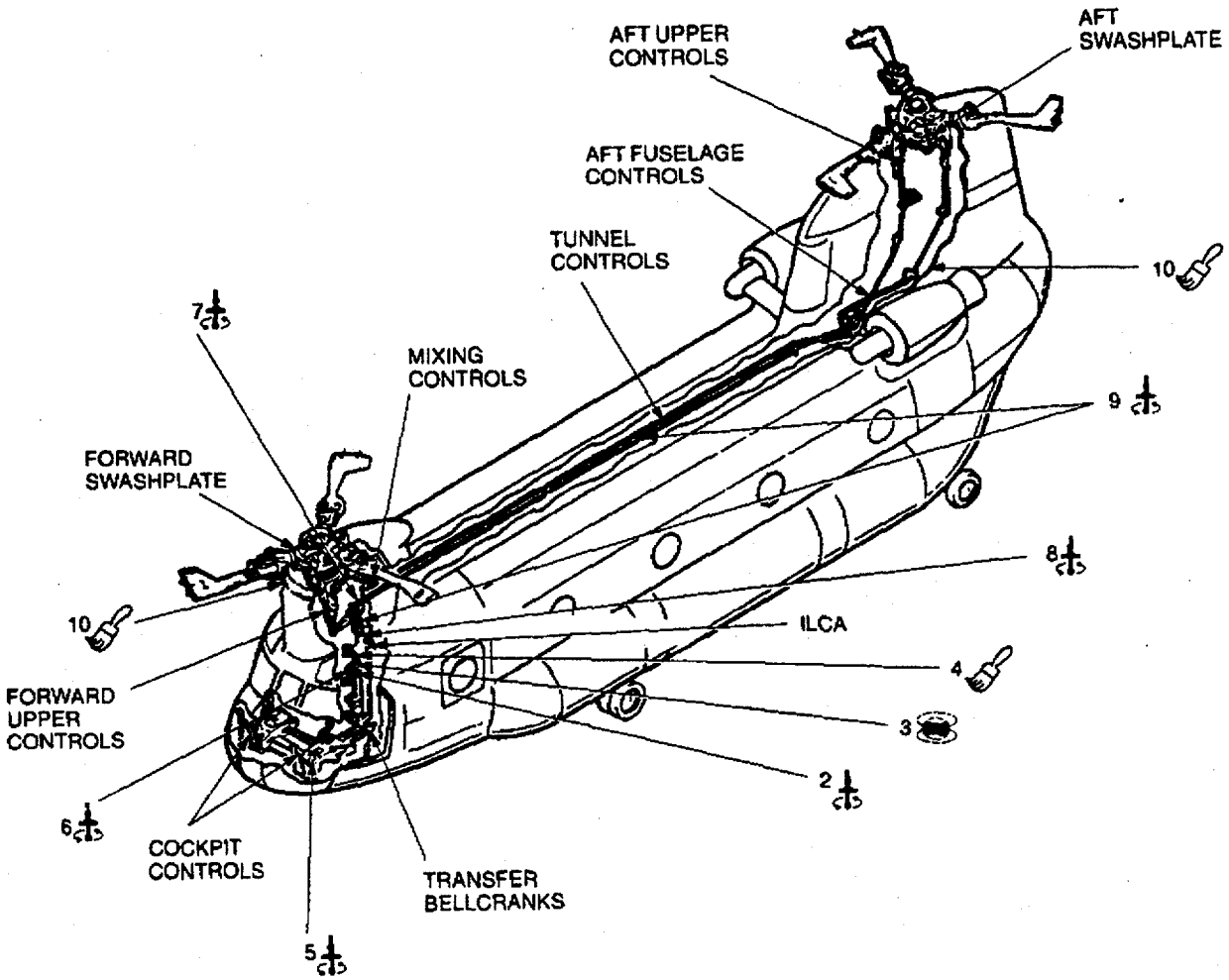


Figure 6-1. Flight Control Group

6.2 ALUMINUM FLIGHT CONTROL SYSTEM CONNECTING LINKS (ET).

6.2.1 Description (Figure 6-1. Index No. 9). Control inputs from the cockpit are transmitted through adjustable and nonadjustable mechanical linkage to the Integrated Lower Control Actuator (ILCA). The ILCA then transmits individual control motions to the first and second stage mixing units. The mixed outputs are then transmitted through a series of push-pull tubes to the upper dual-boost actuators attached to the forward and aft swashplates.

6.2.2 Defects. This inspection is to verify cracks found visually. No cracks are allowed.

6.2.3 Primary Method. Eddy Current.

6.2.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit b.
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0. 008, 0. 020, and 0. 040 EDM notches)
f. Teflon Tape, refer to Table 1-8 g. Aircraft Marking Pencil, refer to Table 1-8

6.2.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the connecting links shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.2.3.3 Access. Access is obtained through transmission work platforms, flight controls closet panel, or cockpit. See Figure 1-4 - CH-47: 9, 27, 34, and/or 47; MH-47: 16, 17, and 32.

6.2.3 4 Preparation of Part. The connecting link shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.2.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	-20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

6.2.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 6-2.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 6.2.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 6.2.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

6.2.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph1.3.

6.2.4 Backup Method. Not required.

6.2.5 System Securing. The connecting link, if removed, requires installation in accordance with the applicable technical manual listed in Table 1-1. Secure applicable work platforms and panels.

6.3 STEEL FLIGHT CONTROL SYSTEM CONNECTING LINKS (MT).

6.3.1 Description (Figure 6-1, Index No. 3). Control inputs from the cockpit are transmitted through adjustable and nonadjustable mechanical linkage to the Integrated Lower Control Actuator (ILCA). The ILCA then transmits individual control motions to the first and second stage mixing units. The mixed outputs are then transmitted through a series of push-pull tubes to the upper dual-boost actuators attached to the forward and aft swashplates.

6.3.2 Defects. This inspection is to verify cracks found visually. No cracks are allowed.

6.3.3 Primary Method. Magnetic Particle.

6.3.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Magnetic Particle Inspection Probe/Yoke

b. Magnetometer

c. Black Light

d. Fluorescent Magnetic Particles

e. Consumable Materials, refer to Table 1-8

f. Aircraft Marking Pencil, refer to Table 1-8

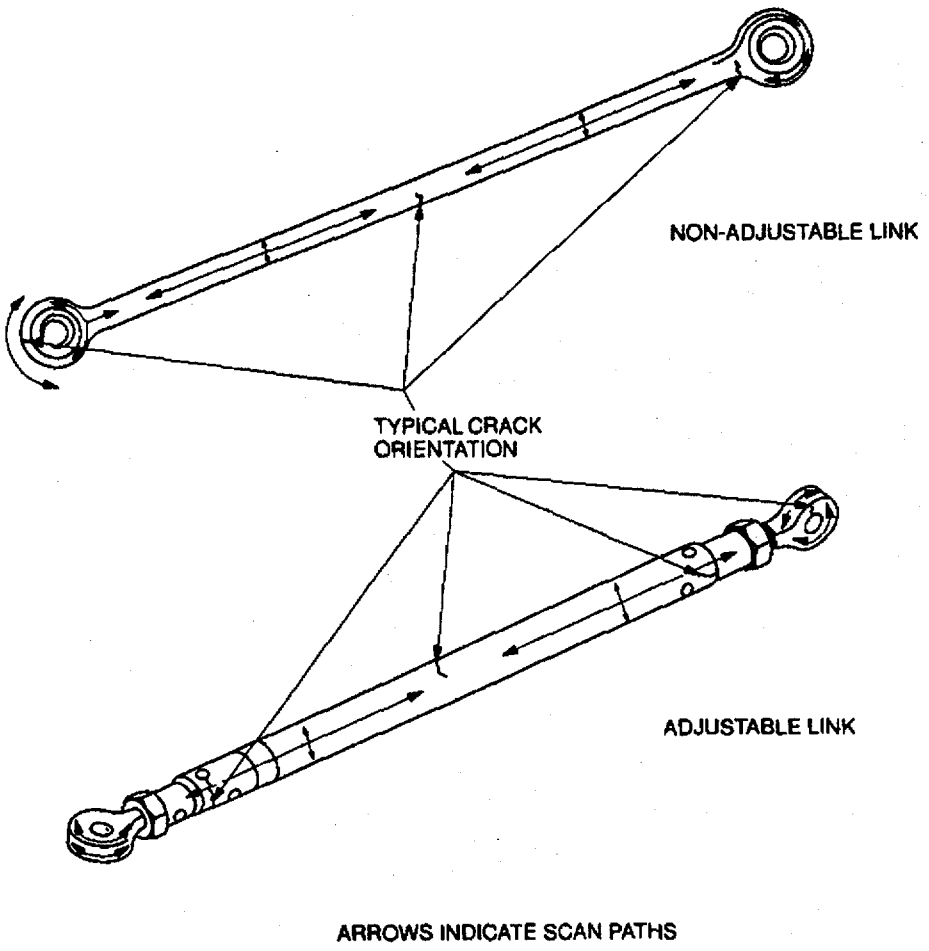


Figure 6-2. Aluminum flight Control System Connecting Links

6.3.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. if required, the connecting link shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.3.3.3 Access. Access is obtained through transmission work platforms, flight controls closet panel, or cockpit. See Figure 1-4 - CH-47: 9, 27, 34, and/or 47; MH-47: 16, 17, and 32.

6.3.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4. Do not remove paint.

6.3.3.5 NDI Equipment Settings. Refer to Magnetic Particle Method, paragraph 1.4.8.

6.3.3.6 Inspection Procedure. A magnetic field shall be applied to the part perpendicular to the orientation of possible cracks. Positions for this inspection are illustrated in Figure 6-3.

a. Select AC on the AC/DC power switch.
b. Place probe/yoke on part in Position 1 as shown.
c. Press the test switch and apply a light coat of magnetic particle media at the same time. Remove the media momentarily before removing the current. Current should be applied for no more than five seconds.
d. Inspect for cracks using the black light.
e. Demagnetize before moving to the next position. Refer to paragraph 6.3.3.8.
f. Repeat steps a. through e. for Positions 2 and 3.

6.3.3.7 Marking and Recording of Inspection Results. Mark and record the inspection results as required by paragraph 1.3.

6.3.3.8 Demagnetization. With the switch remaining in the AC position, place the probe/yoke legs in the same position used for magnetizing. Press the test switch and withdraw the probe/yoke from the part for a distance of two feet before releasing the switch.

6.3.4 Backup Method. None required.

6.3.5 System Securing. Clean the connecting link thoroughly to remove all residual magnetic particle media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The connecting link, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure applicable work platform and panels.

6.4 STAINLESS STEEL FLIGHT CONTROL SYSTEM CONNECTING LINKS (PT).

6.4.1 Description (Figure 6-1. Index No. 4). Control inputs from the cockpit are transmitted through mechanical linkage to the Integrated Lower Control Actuator (ILCA). The ILCA then transmits individual control motions to the first and second stage mixing units. The mixed outputs are then transmitted through a series of push-pull tubes to the upper dual-boost actuators attached to the forward and aft swashplates.

6.4.2 Defects. This inspection is to verify cracks found visually. No cracks are allowed.

6.4.3 Primary Method. Fluorescent Penetrant.

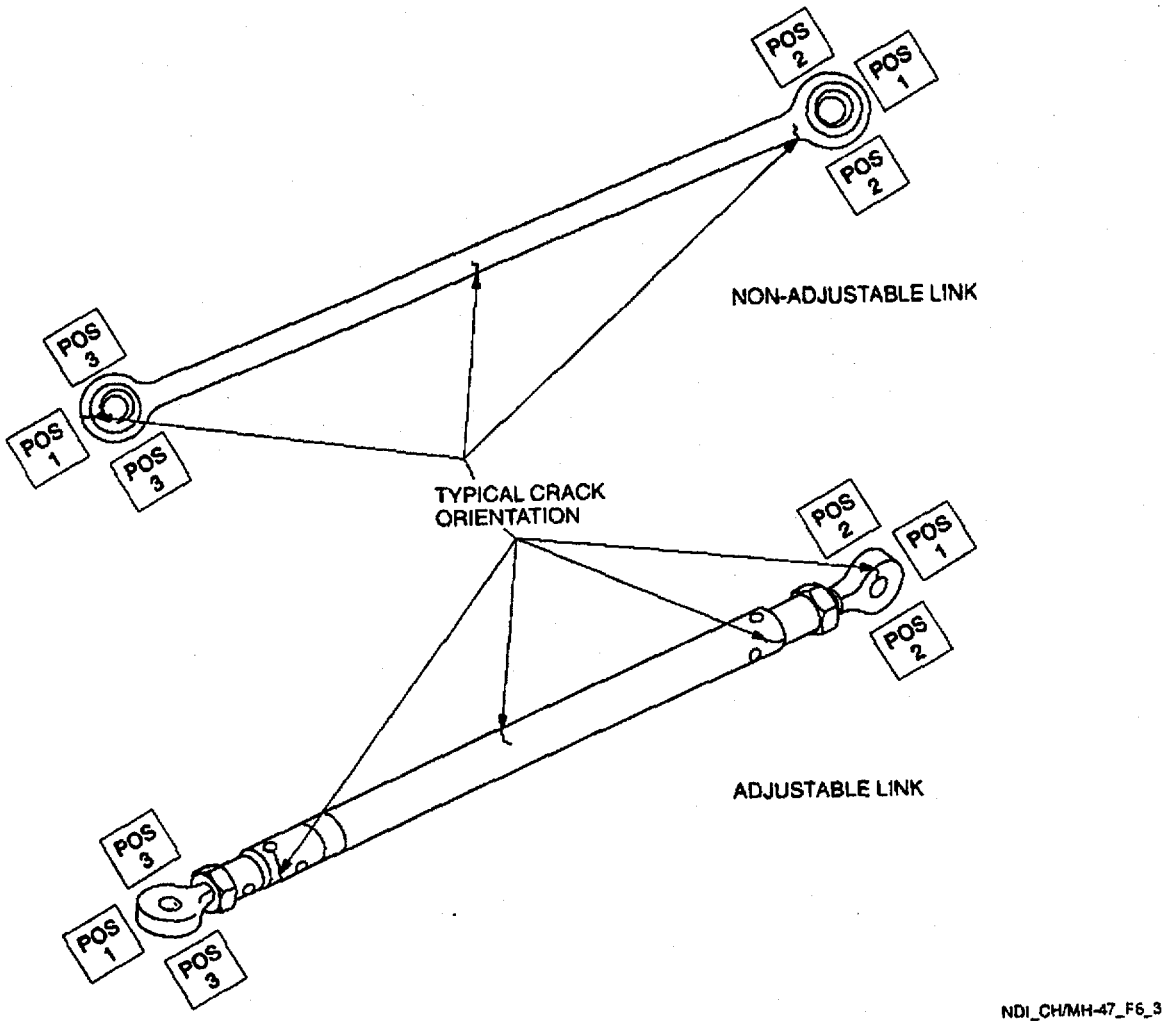


Figure 6-3. Steel Flight Control System Connecting Links

6.4.3.1 NDI Equipment and Materials. Inspection equipment shall be selected from the approved list in Table 1-7, and AMS-2644 level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8). DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

6.4.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the connecting link shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.4.3.3 Access. Access is obtained through transmission work platforms, flight controls closet panel, or cockpit, See Figure 1-4 - CH-47: 9, 27, 34, and/or 47: MH-47: 16, 17, and 32.

6.4.3.4 Preparation of Part. Protective coating shall be removed and the part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.4.3.5 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-4. Inspect area of concern. See Figure 6-4.

6.4.3.6 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3

6.4.4 Backup Method. None required.

6.4.5 System Securing. Clean the connecting link to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The connecting link, if removed, requires installation in accordance with the applicable technical manuals listed in Table 1-1. Secure applicble work platforms and panels.

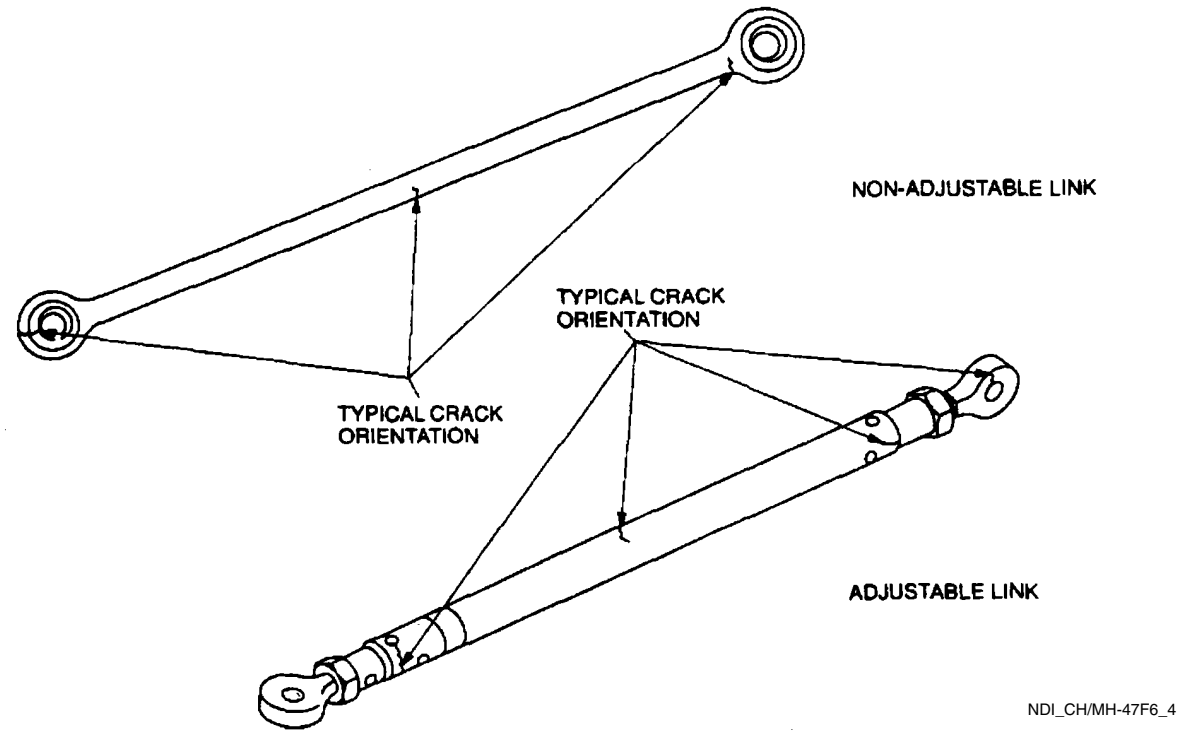


Figure 6-4. Stainless Steel Flight Control System Connecting Links

6.5 THRUST CONTROL BELLCRANK AND SUPPORT (ET).

6.5.1 Description (Figure 6-1. Index No. 5). The pilot and copilot each have a set of controls. They are interconnected under the cockpit floor so that if one set is moved, the other set moves in the same direction. Each set of controls contains a pitch and roll control stick, a thrust control, and yaw pedals.

6.5.2 Defects. Inspect for damage after removal of bent or sheared rigging pin. No cracks are allowed.

6.5.3 Primary Method. Eddy Current.

6.5.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

6.5.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. if required, the bellcrank shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.5.3.3 Access. Access through the cockpit or the landing light openings as necessary to inspect the support.

6.5.3.4 Preparation of Part. The bellcrank and support shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.5.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

6.5.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 6-5.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 6.5.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 6.5.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

6.5.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

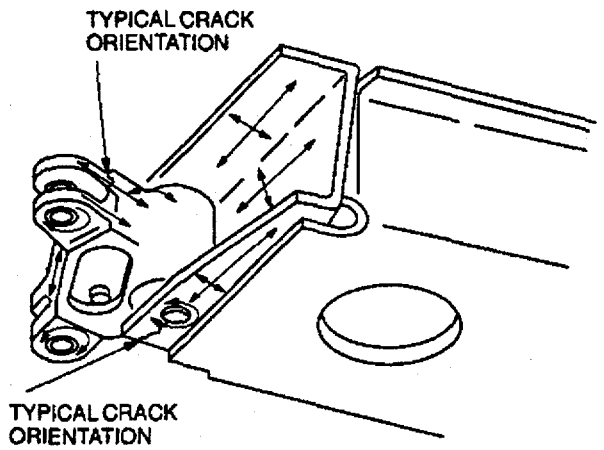


Figure 6-5. Thrust Control Bellcrank and Support

6.5.4 Backup Method. Refer to paragraph 1.4.7.

6.5.5 System Securing. The bellcrank, if removed, requires installation in accordance with the applicable technical manual listed in Table 1-1.

6.6 FIRST STAGE CONTROL BELLCRANKS AND SUPPORTS (ET).

6.6.1 Description (Figure 6-1, Index No. 6). The first and second stage controls consist of bellcranks and linkage which mix inputs from the thrust, pitch, roll, and yaw closet control motions into two motions which are transmitted directly to the forward and aft controls.

6.6.2 Defects. Inspect for damage after removal of bent or sheared pin. Pay particular attention to rigging pin holes and lug areas. No cracks are allowed.

6.6.3 Primary Method. Eddy Current.

6.6.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

6.6.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the bellcrank shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.6.3.3 Access. Access is through the flight controls closet to inspect the supports. See Figure 1-4 CH-47: 47; MH-47: 32.

6.6.3.4 Preparation of Part. The bellcranks and supports shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.6.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off.

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

6.6.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 6-6.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 6.6.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 6.6.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

6.6.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

6.6.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

6.6.5 System Securing. The bellcranks and supports, if removed, require installation in accordance with the applicable technical manual listed in Table 1-1.

6.7 SECOND STAGE CONTROL BELLCRANKS AND SUPPORTS (ET).

6.7.1 Description (Figure 6-1. Index No.7). The first and second stage controls consist of bellcranks and linkages which mix inputs from the thrust, pitch, roll, and yaw closet control motions into two motions which are transmitted directly to the forward and aft controls.

6.7.2 Defects. Inspect for damage after removal of bent or sheared rigging pin. Pay particular attention to rigging pin holes and lugs. No cracks are allowed.

6.7.3 Primary Method. Eddy Current.

6.7.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit

b. Probe, straight, shielded surface, 100 KHz-500 KHz

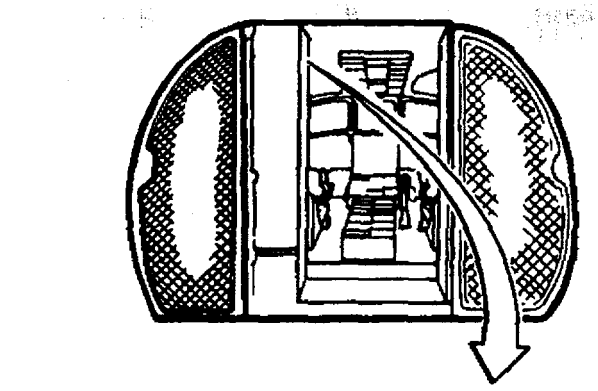
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop

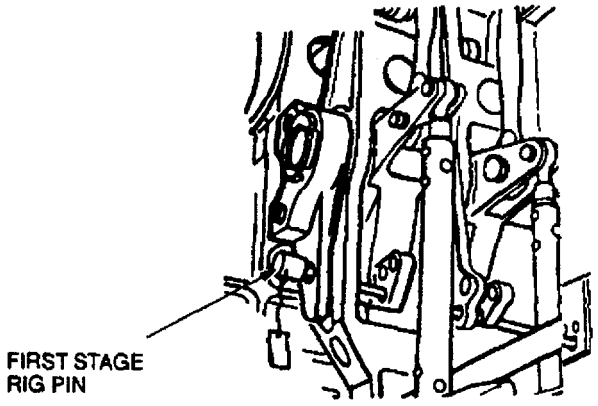
d. Cable Assembly

e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)

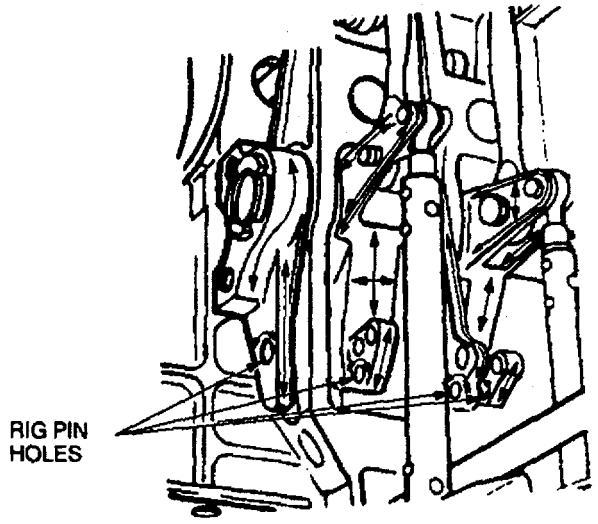
f. Teflon Tape, refer to Table 1-8

g. Aircraft Marking Pencil, refer to Table 1-8





RIG PIN INSTALLED



RIG PIN REMOVED

NDI_CH/MH-47_F6_6

ARROWS INDICATE SCAN PATHS

Figure 6-6. First Stage Control Bellcranks and Supports

6.7.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. Partial inspection for cause (visual indications, sites of mechanical damage, corrosion, etc.) may be performed on all exposed surfaces of the installed part using this procedure. If required, the bellcranks shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.7.3.3 Access. Access from the left forward transmission work platform to inspect the supports. See Figure 1-4 CH-47: 9; MH-47: 16.

6.7.3.4 Preparation of Part. The bellcranks and supports shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.7.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.

(2) Adjust phase as required to obtain horizontal lift-off. .

(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.) 6.7.3.6Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 6-7.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 6.7.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 6.7.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

6.7.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

6.7.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

6.7.5 System Securing. The bellcranks, if removed, require installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the left forward transmission work platform.

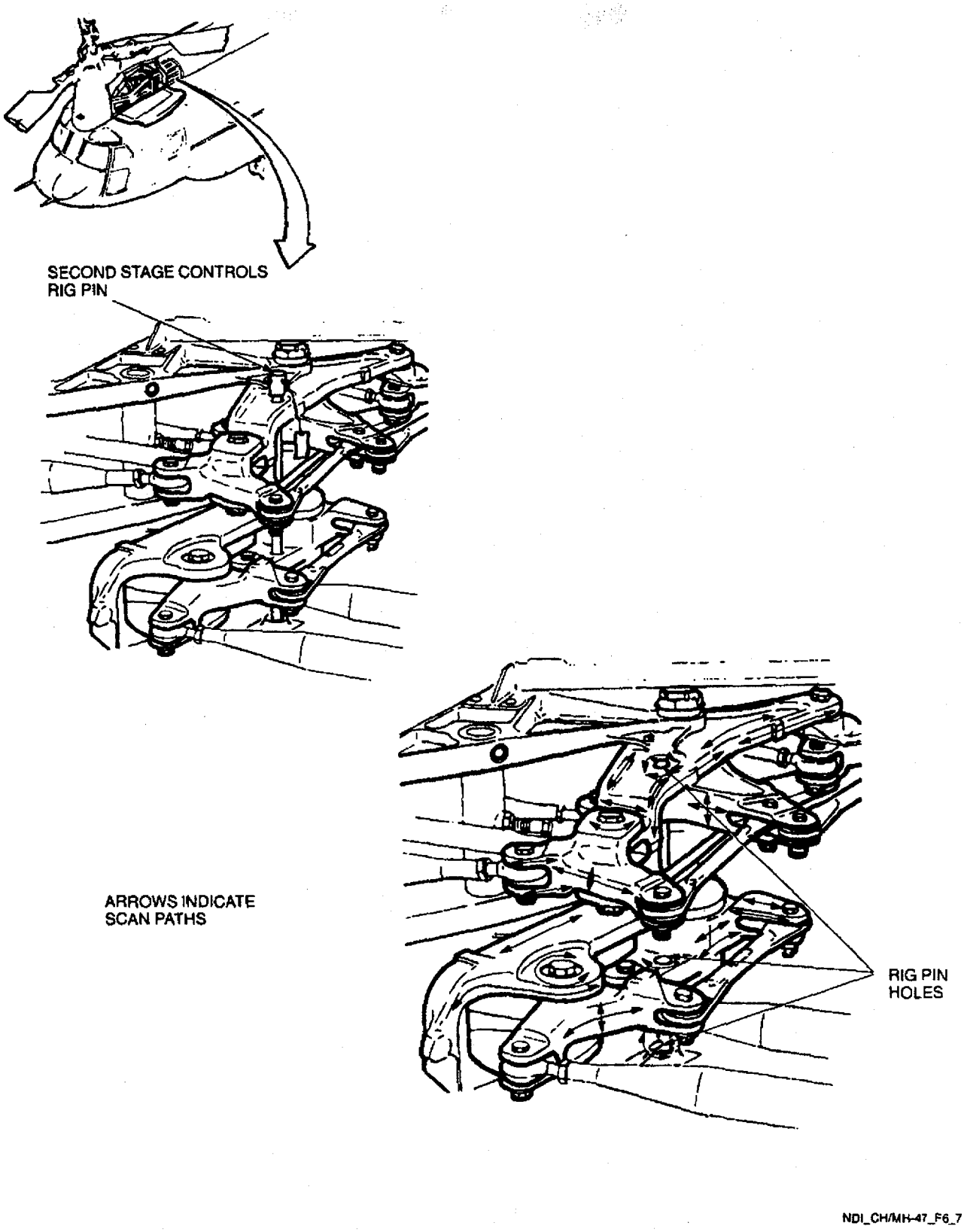


Figure 6-7. Second Stage Control Bellcranks and Supports

6.8 INTERMEDIATE CONNECTING LINKS (ET).

6.8.1 Description (Figure 6-1. Index No. 8). This inspection procedure is for the yaw, thrust, roll, or pitch ILCA intermediate connecting links.

6.8.2 Defects. Inspect the complete part after bearings and sleeves have been removed. Pay particular attention to the bores and lugs. No cracks are allowed.

6.8.3 Primary Method. Eddy Current.

6.8.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Teflon Tape, refer to Table 1-8
g. Aircraft Marking Pencil, refer to Table 1-8

6.8.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the links removed in accordance with the applicable technical manuals listed in Table 1-1.

6.8.3.3 Access. Not applicable.

6.8.3.4 Preparation of Part. The bearings and sleeves shall be removed from the links and the links shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.8.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on test block as follows:

(1) Null probe on test block.
(2) Adjust phase as required to obtain horizontal lift-off.
(3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

6.8.3.6 Inspection Procedure. Refer to Eddy Current Method paragraph 1.4.11 and Figure 6-8.

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 6.8.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 6.8.3.5 b. (1), (2), and (3) shall be repeated each time a change is made.

6.8.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

6.8.4 Backup Method. Fluorescent Penetrant, refer to paragraph 1.4.7.

6.8.5 System Securing. The connecting links require assembly and installation in accordance with the applicable technical manuals listed In Table 1-1.

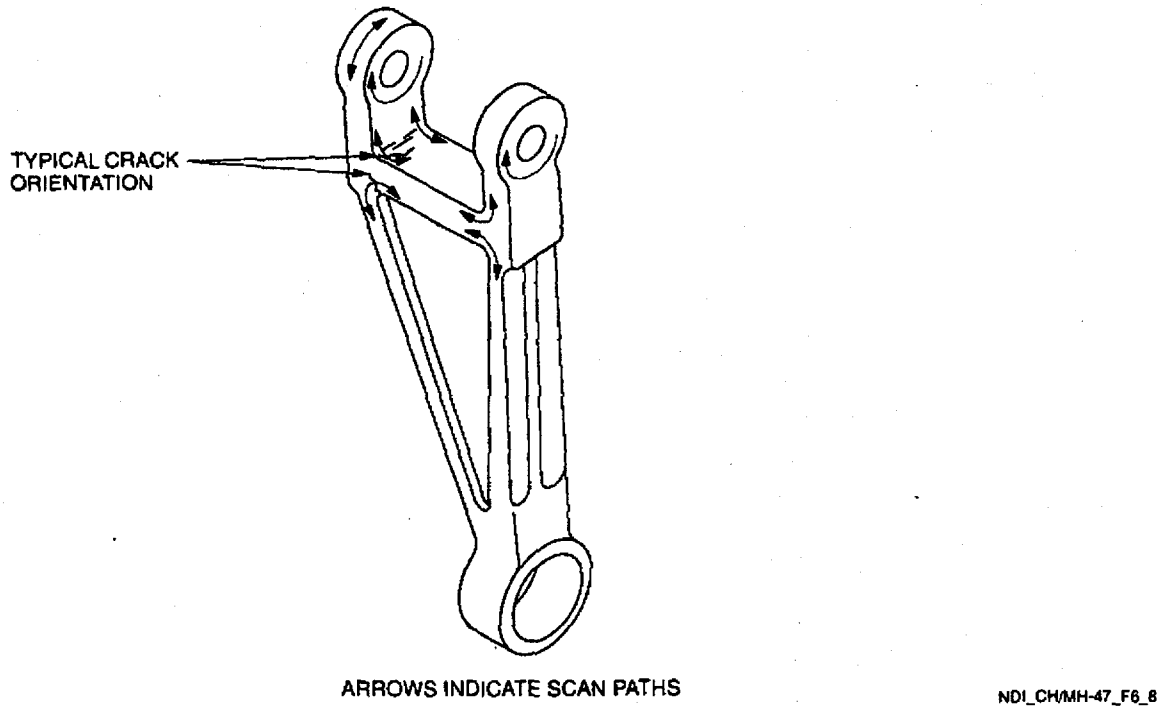


Figure 6-8. Intermediate Connecting Links

6.9 BELLCRANKS AND SUPPORTS, YOKES, AND CONNECTING LINKS (ET).

6.9.1 Description (Figure 6-1. Index No. 9). This inspection procedure can be used on all of the above parts, especially after: (1) bearings, bushings, or sleeves have been removed; and (2) bearings, bushings, or sleeves have been installed.

6.9.2 Defects. Inspect to verify cracks found visually. Particular attention shall be directed to the bore and lug areas. No cracks are allowed.

6.9.3 Primary Method. Eddy Current.

6.9.3.1 NDI Equipment and Materials. (Refer to Appendix B.)

a. Eddy Current Inspection Unit
b. Probe, straight, shielded surface, 100 KHz-500 KHz
c. Probe, right angle, shielded surface, 100 KHz-500 KHz, 90° 1/2 inch drop
d. Cable Assembly
e. Reference Block, three-notched aluminum (0.008, 0.020, and 0.040 EDM notches)
f. Reference Block, three-notched magnesium (0.008, 0.020, and 0.040 EDM notches)
g. Teflon Tape, refer to Table 1-8
h. Aircraft Marking Pencil, refer to Table 1-8

6.9.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance and the identified part removed as required in accordance with the applicable technical manuals listed in Table 1-1.

6.9.3.3 Access. Not applicable.

6.9.3.4 Preparation of Part. The part shall be thoroughly cleaned. Refer to Preparation of Part or Area for NDI, paragraph 1.4.4.

6.9.3.5 NDI Equipment Settings.

a. Make the following initial settings on the Eddy Current Inspection Unit, NORTEC-19e ^{II}.

Frequency F1	- 200 KHz	F2	- off
HdB	- 57.0		
VdB	- 69.0		
Rot	- 56°		
Probe drive	- mid		
LPF	- 100		
HPF	- 0		
H Pos	- 80%		
V Pos	- 20%		

b. Refer to Eddy Current Method, paragraph 1.4.11. Set up on applicable test block as follows:
   (1) Null probe on test block.
   (2) Adjust phase as required to obtain horizontal lift-off.
   (3) Move probe over all three notches in test block. Adjust gain to obtain a three block vertical signal when probe is passed over 0.040 inch notch in test block. (Refer to standard instrument display shown in Figure 1-7.)

6.9.3.6 Inspection Procedure. Refer to Eddy Current Method, paragraph 1.4.11 and Figure 6-9.

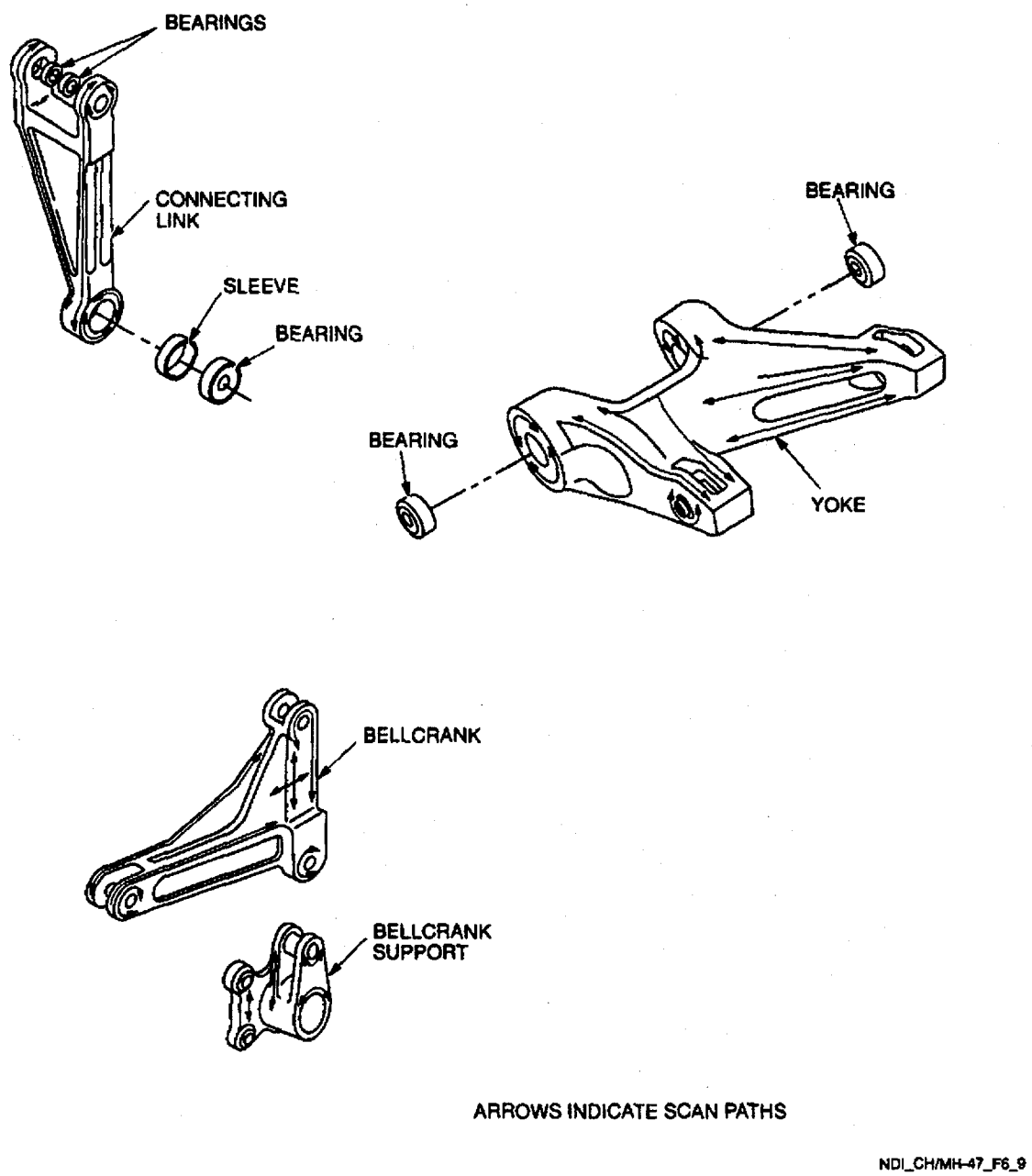


Figure 6-9. Bellcranks and Supports, Yokes, and Connecting Links

a. Place probe on part in the inspection locations and null. Adjust phase as required to obtain horizontal lift-off.

b. Inspect the part.

c. Any signal similar to the notches in the test block is cause for rejection.

NOTE

Either probe identified in paragraph 6.9.3.1 may be used depending primarily on the ease of accessibility and user friendliness. If the probes are changed, steps 6.9.3.5 b.(1), (2), and (3) shall be repeated each time a change is made.

6.9.3.7 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

6.9.4 Backup Method. None required.

6.9.5 System Securing. The part requires assembly and installation in accordance with the applicable technical manuals listed in Table 1-1.

6.10 FLIGHT CONTROL RESERVOIRS/COOLERS AND RELATED EQUIPMENT (PT).

6.10.1 Description (Figure 6-1, Index No. 10). This procedure is primarily for the flight control reservoir/cooler, but it can also apply to accumulators, the power transfer unit, and hydraulic pump casings.

6.10.2 Defects. This inspection is to verify cracks found visually.

6.10.3 Primary Method. Fluorescent Penetrant.

6.10.3.1 NDI Equipment and Materials. Inspection equipment shall be selected from the approved list in Table 1-7, and AMS-2644 level 3 penetrant materials shall be selected from the approved list in Table 1-8. Parts requiring fluorescent penetrant inspection shall be cleaned prior to inspection with n-Propyl Bromide (vapor degreasing only) (Table 1-8), DS-108 (Table 1-8). DS-108, Electron, Positron must be followed by an Acetone (Table 1-8) or Isopropyl Alcohol (Table 1-8) rinse or wipe; or drying until there is no visible solvent residue left on parts.

6.10.3.2 Preparation of Helicopter. The helicopter shall be prepared for safe ground maintenance. If required, the components shall be removed in accordance with the applicable technical manuals listed in Table 1-1.

6.10.3.3 Access. Access from the forward or aft transmission work platforms. See Figure 1-4 - CH-47: 9, 27, and/or 34: MH-47: 16 and 17.

6.10.3.4 Inspection Procedure. Perform fluorescent penetrant inspection. Refer to Fluorescent Penetrant Method, paragraph 1.4.7 and Table 1-4. Inspect area of concern. See Figure 6-10.

6.10.3.5 Marking and Recording of Inspection Results. Mark and record as required by paragraph 1.3.

6.10.4 Backup Method. None required.

6.10.5 System Securing. Clean the part to remove inspection media. Refer to Post Cleaning and Restoration of Part or Area After NDI, paragraph 1.4.16. The components, if removed, require installation in accordance with the applicable technical manuals listed in Table 1-1. Secure the forward and aft transmission work platforms.

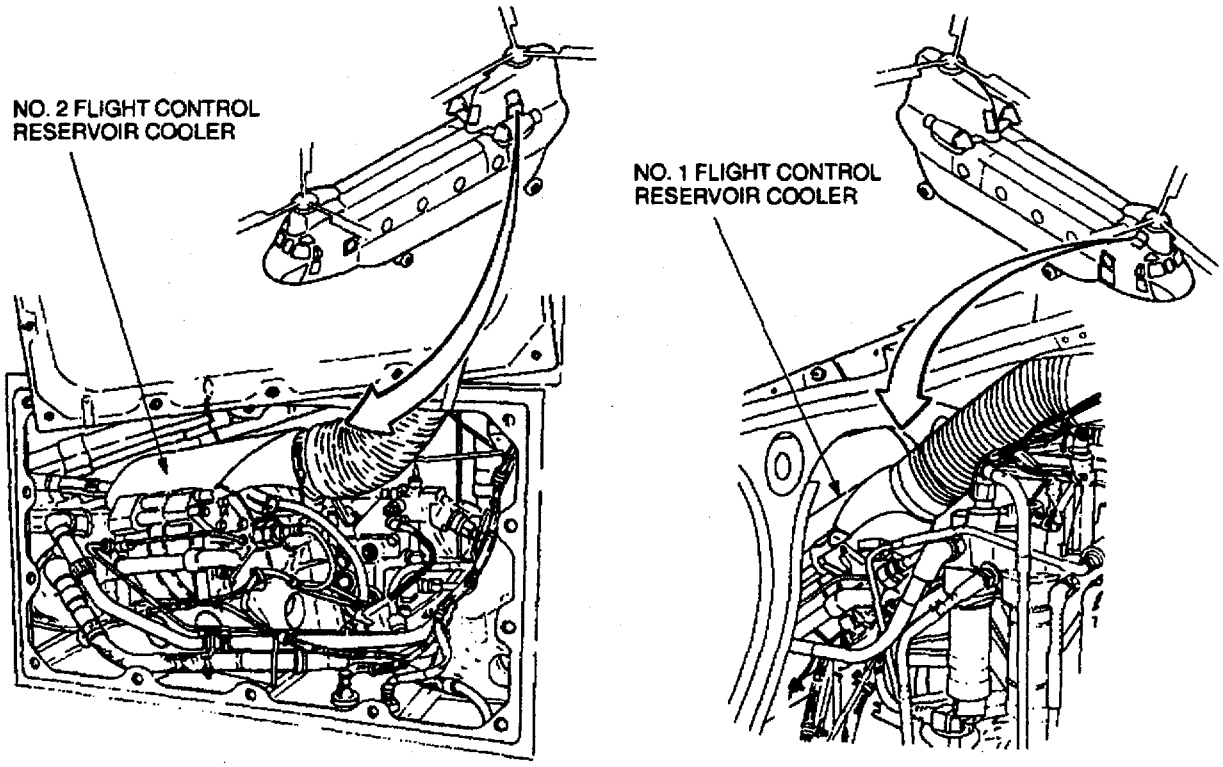


Figure 6-10. Flight Control Reservoirs/Coolers and Related Equipment

APPENDIX A

MAINTENANCE ALLOCATION CHART
NONDESTRUCTIVE INSPECTION

NDI METHODS/EQUIPMENT
001 Fluorescent Penetrant Method
002 Magnetic Particle Method
003 Eddy Current Method
004 Ultrasonic Method
005 Bond Testing Method
006 Radiographic Method

NOMENCLATURE OF END ITEMS
HELICOPIER, CH/MH-47 SERIES

(1) PROCEDURE NUMBER	(2) COMPONENT/ASSEMBLY	(3) INSPECT FOR	(4) MAINTENANCE CATEGORY			(5) INSPECTION EQUIPMENT REQUIREMENTS	(6) REMARKS
			AVUM	AVIM	DEPOT		
2.2	Rotary-Wing Head	Cracks		√		002	
2.3	Hub Oil Tank	Cracks		√		003	Backup 001
2.4	Pitch Varying Shaft	Cracks		√		002	Backup 001
2.5	Rotor Hub	Cracks		√		002	Backup 001
2.6	Vertical Hinge Pin Flanges	Cracks		√		002	
2.7	Pitch Varying Shaft Bore Liner	Cracks		√		002	Backup 001
2.8	Horizontal Hinge Pin	Cracks		√		002	Backup 001
2.9	Centrifugal Droop Stop	Cracks		√		003	
2.10	Centrifugal Droop Stop Bolts	Cracks		√		002	
2.11	Rotary-Wing Blade	Voids		√		005	
2.12	Pitch Link	Cracks		√		002	Backup 001
2.13	Ball Spherical Bearing	Cracks		√		003	Backup 001
2.14	Weather Protective Cover	Voids		√		005	

NOMENCLATURE OF END ITEMS
HELICOPIER, CH/MH-47 SERIES

(1) PROCEDURE NUMBER	(2) COMPONENT/ASSEMBLY	(3) INSPECT FOR	(4) MAINTENANCE CATEGORY			(5) INSPECTION EQUIPMENT REQUIREMENTS	(6) REMARKS
			AVUM	AVIM	DEPOT		
3.2	Driveshaft Adapters (Aluminum)	Cracks		√		003	Backup 001
3.3	Driveshaft Adapters (Steel)	Cracks		√		002	
3.4	Forward Driveshafting Tubes	Cracks		√		003	Backup 001
3.5	Aft Driveshafting Tubes	Cracks		√		003	Backup 001
3.6	Engine Driveshaft (Two Piece)	Cracks		√		003	Backup 001
3.7	Engine Driveshaft (One Piece)	Cracks		√		003	Backup 001
3.8	Driveshaft Adapter Plate	Cracks		√		001	
3.9	Engine Transmission Adapter	Cracks		√		002	Backup 001
3.10	Combining Transmission Adapter	Cracks		√		002	Backup 001
3.11	Forward Transmission Slider Shaft	Cracks		√		002	Backup 001
3.12	Forward Transmission Outside Surface	Cracks		√		003	Backup 001
3.13	Aft Slider Shaft	Cracks		√		002	Backup 001
3.14	Aft Rotor Shaft	Cracks		√		002	
3.15	Aft Rotor Shaft Support	Cracks		√		003	Backup 001
3.16	Combining Transmission Outside Surface	Cracks		√		003	Backup 001
3.17	Aft Transmission Outside Surface	Cracks		√		003	
3.18	Engine Transmission Quill Shaft	Cracks		√		002	
3.19	Engine Transmission Outside Surface	Cracks		√		003	Backup 001
3.20	Transmission Oil Cooler Assemblies	Cracks		√		001	

NOMENCLATURE OF END ITEMS
HELICOPIER, CH/MH-47 SERIES

(1) PROCEDURE NUMBER	(2) COMPONENT/ASSEMBLY	(3) INSPECT FOR	(4) MAINTENANCE CATEGORY			(5) INSPECTION EQUIPMENT REQUIREMENTS	(6) REMARKS
			AVUM	AVIM	DEPOT		
4.2	Honeycomb Cores and Panels	Voids		√		005	
4.3	Airframe Structures	Cracks		√		003	
4.4	Forward Transmission Support Structures	Cracks		√		003	
4.5	Dynamic Absorber Support Structure	Cracks		√		003	
4.6	Cabin Equipment Support Structure	Cracks		√		003	
4.7	Pods	Voids		√		005	
4.8	Pods	Voids		√		006	
4.9	Rescue Hatch Lower Door Gearbox Assembly	Cracks		√		002	
4.10	Rescue Hatch Lower Door Gearbox Housing and Cover	Cracks		√		003	
4.11	Cargo Ramp	Voids		√		005	
4.12	Combining Transmission Support Fittings and Longitudinal Beams	Cracks		√		003	Backup 001
4.13	Composite Pylon Hinged Fairings (Work Platform)	Voids		√		005	
4.14	Forward Landing Gear Support Structure	Cracks		√		003	
4.15	Landing Gear Wheel	Cracks		√		003	
4.16	Landing Gear Axle	Cracks		√		002	
4.17	Forward Landing Gear Strut Piston Tube	Cracks		√		002	
4.18	Aft Landing Gear Structure	Cracks		√		003	
4.19	Forward Landing Gear Torque Arm	Cracks		√		003	
4.20	Lower Drag Link Assembly Hardware	Cracks		√		002	
4.21	Lower Drag Link	Cracks		√		003	
4.22	Center Cargo Hook	Cracks		√		002	

NOMENCLATURE OF END ITEMS
HELICOPIER, CH/MH-47 SERIES

(1) PROCEDURE NUMBER	(2) COMPONENT/ASSEMBLY	(3) INSPECT FOR	(4) MAINTENANCE CATEGORY AVUM	AVIM	DEPOT	(5) INSPECTION EQUIPMENT REQUIREMENTS	(6) REMARKS
4.23	Aft Pylon Equipment Support Structure	Cracks		√		003	Backup 001
5.2	Engine Oil Pump, fuel Control, and Accessory Gearbox Flanges	Cracks		√		003	
5.3	Engine Mount Caps	Cracks		√		003	Backup 001
5.4	Engine Mount Adapter	Cracks		√		003	
5.5	Forward Engine Mount Structure	Cracks		√		003	Backup 001
5.6	Aft Engine Mount Link	Cracks		√		002	
5.7	Connecting Link	Cracks		√		003	
5.8	Aft Engine Mount Adapter	Cracks		√		003	
5.9	Exhaust Cone and Stiffener	Cracks		√		001	
5.10	Fuel Drain Valve	Cracks		√		001	
5.11	Combustion Chamber Housing	Cracks		√		001	
5.12	Fireshield Section	Cracks		√		001	
6.2	Aluminum Flight Control system Connecting Links			√		003	
6.3	Steel Flight Control Connecting Links	Cracks		√		002	
6.4	Stainless Steel Flight Control System Connecting Links	Cracks		√		001	
6.5	Thrust Control Bellcrank and Support	Cracks		√		003	Backup 001
6.6	First Stage Control Bellcranks and Supports	Cracks		√		003	Backup 001
6.7	Second Stage Control Bellcranks and Supports	Cracks		√		003	Backup 001
6.8	Intermediate Connecting Links	Cracks		√		003	Backup 001

NOMENCLATURE OF END ITEMS
HELICOPIER, CH/MH-47 SERIES

(1) PROCEDURE NUMBER	(2) COMPONENT/ASSEMBLY	(3) INSPECT FOR	(4) MAINTENANCE CATEGORY			(5) INSPECTION EQUIPMENT REQUIREMENTS	(6) REMARKS
			AVUM	AVIM	DEPOT		
6.9	Bellcranks and Supports, Yokes, and Connecting Links	Cracks		√		003	
6.10	Flight Control Reservoirs/ Coolers and Related Equipment	Cracks		√		001	

APPENDIX B
EQUIPMENT LISTING

Nomenclature	Part Number/ Specification	Manufacturer	National Stock Number
Fluorescent Penetrant Method			
Fluorescent Penetrant Inspection Kit	AMS-2644 Type I, Method C Level 3	General Services Administration (GSA)	6850-00-703-7406
Black Light UV Kit	FMI	Spectronics Corp. 956 Brush Hollow Rd. Westbury, NY 11590-1731	6635-00-566-5198
Black Light Meter	J-221	Ultraviolet Products Inc., DBA UVP Inc. 5100 Walnut Grove Ave. P.O. Box 1500 Upland, CA 91778	6695-00-488-5451
Black Light Bulbs	A-A-1765	General Services Administration (GSA)	6240-00-233-3680
Filter UV	3901	Magnaflux Div. of Illinois Tool Works Inc. 1301 W Ainsle St. Chicago, IL 60656	6635-00-736-5177
Magnetic Particle Method			
Yoke and Coil Kit	YL-61	Magnaflux Div. of Illinois Tool Works Inc. 1301 W Ainsle St. Chicago, IL 60656	4920-01-145-3924
Black Light	ZB26	Spectronics Corp. 956 Brush Hollow Rd. Westbury, NY 11590-1731	6635-00-611-5617
Magnetic Particle Inspection Probe	DA200	Parker Research Corp. 2642 Enterprise Rd. Clearwater, FL 33575-1917	6635-00-022-0372
Magnetometer	2480	Sterling Mfg. Co. 1845 E. 30th St. Cleveland, OH 44114-4438	6635-00-391-0058

Nomenclature	Part Number Specification	Manufacturer	National Stock Number
Eddy Current Method			
Eddy Current Inspection Unit	NORTEC-19e[II] 901736801	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	6635-01-419-0694
Cable Assembly, Coaxial 6-feet long (1 required)	CBM-6	NDT Engineering Corp. 7056 S. 220th St. Kent, WA 98032	5995-01-278-1271
Reference Block-Three-Notched Aluminum	TBS-1 1902510	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	
Reference Block-Three-Notched Titanium Kent, Wa 98032	SRS-0824T	NDT Engineering Corp 7056 S. 220TH St.	
Reference Block-Three-Notched Magnesium	SRS-0824M	NDT Engineering Corp 7056 S. 220TH St. Kent, Wa 98032	
Reference Block-Block of Six Conductivity Sample	1902474	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	
Probe, Right Angle, Shielded Surface P/100 KHz-500 KHz/A/90.516	MT-905-60	NDT Engineering Corp. 7056 S. 220th St. Kent, WA 98032	
Probe, Straight, Shielded Surface P/100 KHz-500 KHz/A/0.0/4	MP-60	NDT Engineering Corp. '7056 S. 220th St. Kent, WA 98032	
Ultrasopnic Method			
Ultrasonic Inspection Unit	USD-15S	KrautKramer Branson 50 Industrial Park Road Lewistown, PA 17044	6635-01-417-5467

Nomenclature	Part Number Specification	Manufacturer	National Stock Number
Bond Testing Method			
Bondmaster	9016600-99	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	6635-01-432-9954
Cable Assembly	SBM-CPM-P11 9117789	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	
Probe, Mechanical Impedance Analysis	S-MP-4 9317808	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	
Probe Holder, Spring Loaded	BMM-H 9316874	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	6635-01-407-8842
Test Block, Composite Defect Standard #1	1916451	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	
Test Block, Composite Defect Standard #3	1916453	Staveley Instruments, Inc. 421 North Quay St. Kennewick, WA 99336	
Test Block, Aluminum Honeycomb with 0.020 Inch Thick Aluminum/Fiberglass Skin	Refer to Appendix C		
Test Block, Aluminum Honeycomb with 0.040 Inch Thick Aluminum Skin	Refer to Appendix C		
Test Block, Aluminum Honeycomb with 0.063 Inch Thick Aluminum Skin	Refer to Appendix C		
Radiographic Method			
Tripod X-Ray Tubehead Stand	3-000A-0754 PDSANE480	Staveley Aerospace Systems, Inc. Chatsworth, CA 91311	6635-01-067-6315
AIX Warning Light W/Stand	153001	American Industrial X-ray Inc	6210-01-374-4594

Nomenclature	Part Number Specification	Manufacturer	National Stock Number
X-Ray Unit (LPX60 Water-Cooled Digital)	3-000-0723	LORAD Corp. 36 Apple Ridge Rd. P.O. Box 710 Danbury, CT 06813-0710	6635-01-417-1830

APPENDIX C

ILLUSTRATED FIELD MANUFACTURE ITEMS LIST

Introduction

A. This appendix contains complete instructions for manufacturing nondestructive inspection support accessories in the field.

B. An index order is provided for cross-referencing the number of the item to be manufactured to the figure number which covers fabrication criteria.

C. All bulk materials needed for manufacture of an item are listed by part number or specification number

D. See Figure C-1.

Item Number	Support Accessories
WS-2	Test block with aluminum honeycomb (0.75 or 1.0 inch) between 0.020
	fiberglass skin and a 0.063 aluminum skin
WS-4	Test block with aluminum honeycomb (0.75 or 1.0 inch) between a 0.040
	aluminum skin and a 0.020 skin

NOTES

1. **All dimensions (+/-) 1/16 inch. Break all sharp edges and corners.**
2. **Scuff sand the adhesive side of the fiberglass panel.**
3. **Scotchbrite scuff and alcohol/acetone rinse the adhesive side of the aluminum panels.**
4. **Milling or grinding of core cutouts is preferable over crushing techniques. A rotary file or end mill cutter should produce acceptable results.**
5. **Polyolefin disks (inserts) should be flush with core if not slightly recessed.**
6. **Mix adhesives per manufacturer's instructions; exercise caution applying around inserts.**
7. **Moderate weight should be applied to the panels throughout the cure cycle.**

BULK MATERIALS

1. 2024-T3 aluminum panels (0.020, 0.040 and 0.063 inch thick) specification QQ-4-250/5
2. Fiberglass panel 0.020 inch thick, specification MIL-I-24768/27
3. Aluminum honeycomb core 0.75 or 1.0 inch thick, 1/8 cell size specification MIL-C-7438-G
4. Polyolefin disks 0.025-0.030 inch thick (High-Density Polyethylene or Polypropylene)
5. Adhesive EA934 or equivalent

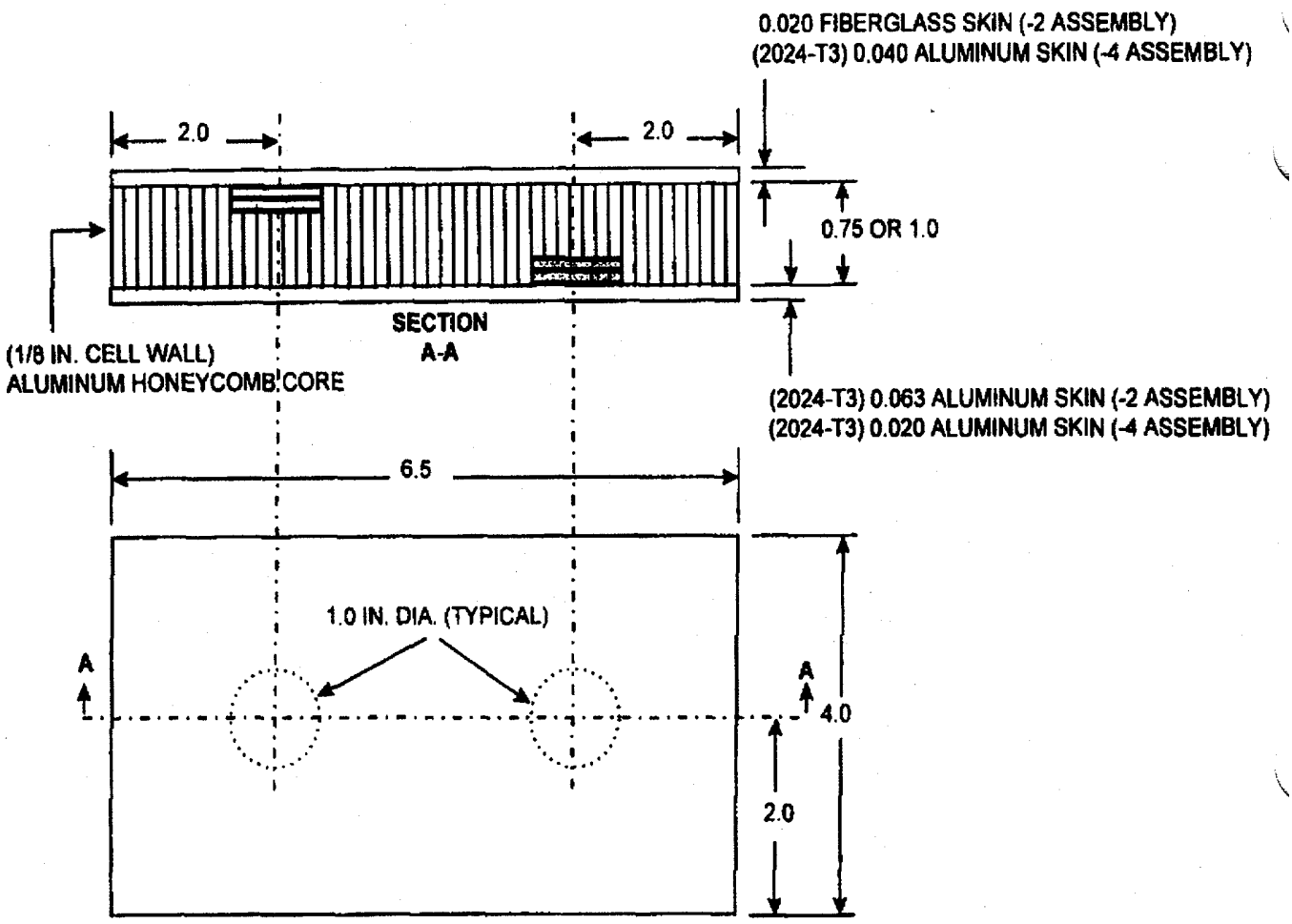


Figure C-1. Composite Test Blocks

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INDEX - Continued'

INDEX - Continued'

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
02774

DISTRIBUTION:
To be distributed in accordance with Special Distributiion List.

These are the instructions for sending an electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@wherever.army.mil>
To: 2028@redstone.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19−OCT−93
8. ***Pub no:*** 55−2840−229−23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04−JUL−85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123−123−1234
17. ***Problem:*** **1**
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem below line 27.

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS

For use of this form, see AR 25–30; the proponent agency is ODISC4.

Use Part II (*reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)

DATE: 8/30/02

TO: (*Forward to proponent of publication or form)(Include ZIP Code)*
Commander, U.S. Army Aviation and Missile Command
ATTN: AMSAM–MMC–MA–NP
Redstone Arsenal, AL 35898

FROM: (*Activity and location)(Include ZIP Code)*
MSG, Jane Q. Doe
1234 Any Street
Nowhere Town, AL 34565

PART 1 – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE
TM 9–1005–433–24	16 Sep 2002	Organizational, Direct Support, And General Support Maintenance Manual for Machine Gun, .50 Caliber M3P and M3P Machine Gun Electrical Test Set Used On Avenger Air Defense Weapon System

ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON
1	WP0005 PG 3		2			Test or Corrective Action column should identify a different WP number.

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788–1234	

TO: (*Forward direct to addressee listed in publication)*	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**
Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM–MMC–MA–NP Redstone Arsenal, AL 35898	MSG, Jane Q. Doe 1234 Any Street Nowhere Town, AL 34565	8/30/02

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

PUBLICATION NUMBER	DATE	TITLE

PAGE NO.	COLM NO.	LINE NO.	NATIONAL STOCK NUMBER	REFERENCE NO.	FIGURE NO.	ITEM NO.	TOTAL NO. OF MAJOR ITEMS SUPPORTED	RECOMMENDED ACTION

PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE
MSG, Jane Q. Doe, SFC	788–1234	

RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS For use of this form, see AR 25–30; the proponent agency is ODISC4.	Use Part II (*reverse)* for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/ Supply Manuals (SC/SM)	DATE
TO: (*Forward to proponent of publication or form)(Include ZIP Code)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	FROM: (*Activity and location)(Include ZIP Code)*	

PART 1 – ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS

PUBLICATION/FORM NUMBER	DATE	TITLE

ITEM NO.	PAGE NO.	PARA–GRAPH	LINE NO. *	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES AND REASON

** Reference to line numbers within the paragraph or subparagraph.*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/ AUTOVON, PLUS EXTENSION	SIGNATURE

TO: (*Forward direct to addressee listed in publication)* Commander, U.S. Army Aviation and Missile Command ATTN: AMSAM-MMC-MA-NP Redstone Arsenal, AL 35898	**FROM:** (*Activity and location) (Include ZIP Code)*	**DATE**

PART II – REPAIR PARTS AND SPECIAL TOOL LISTS AND SUPPLY CATALOGS/SUPPLY MANUALS

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PART III – REMARKS (*Any general remarks or recommendations, or suggestions for improvement of publications and blank forms. Additional blank sheets may be used if more space is needed.)*

TYPED NAME, GRADE OR TITLE	TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION	SIGNATURE

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN: 075197-000