

TM 1-1520-264-23

TECHNICAL MANUAL

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

NONDESTRUCTIVE INSPECTION PROCEDURES

FOR

AH-64 HELICOPTER SERIES

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

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

TECHNICAL MANUAL

No. 1-1520-264-23

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
AH-64A Helicopter**

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.

DISTRIBUTION STATEMENT A Approved for Public Release; Distribution Unlimited

TABLE OF CONTENTS

Section/Paragraph	Page
WARNING SUMMARY	a
LIST OF ILLUSTRATIONS	viii
LIST OF TABLES	xiii
I. INTRODUCTION	1-1
1.1 GENERAL INFORMATION	1-2
1.1.1 Special Terms, Abbreviations, and Acronyms	1-4
1.1.2 How to Use This Manual	1-5
1.1.3 Inspection Item Code	1-6
1.1.4 Use of NDI Symbols	1-6
1.1.5 Use of Reference Publications	1-6
1.1.6 Related Publications	1-6
1.1.7 Description	1-6
1.1.8 Configuration	1-8
1.1.9 Airframe Stations	1-8
1.2 TYPE OF CONSTRUCTION	1-8
1.2.1 Rotor System	1-8
1.2.2 Drive System	1-12
1.2.3 Airframe and Landing Gear System	1-12
1.2.4 Engine System	1-13

TABLE OF CONTENTS - Continued

Section/Paragraph		Page
1.2.5	Flight Control System	1-13
1.2.6	Access Provisions	1-13
1.2.7	Steps, Handholds, and Walkways	1-13
1.3	MARKING AND/OR RECORDING OF INSPECTION RESULTS	1-21
1.4	NONDESTRUCTIVE INSPECTION METHODS	1-22
1.4.1	Purpose of Nondestructive Inspection (NDI)	1-22
1.4.2	Selecting the NDI Method	1-23
1.4.3	Preparation of Helicopter for NDI	1-23
1.4.4	Preparation of Part or Area for NDI	1-23
1.4.5	NDI General Safety Precautions	1-24
1.4.6	Bond Testing (BT) Method	1-24
1.4.6.1	Bond Testing Equipment	1-24
1.4.6.2	Safety Precautions During Bond Testing	1-26
1.4.7	Fluorescent Penetrant (PT) Method	1-26
1.4.7.1	Safety Precautions During Fluorescent Penetrant Inspection	1-27
1.4.7.2	Controlling Excess Fluorescent Penetrant	1-32
1.4.8	Magnetic Particle (MT) Method	1-32
1.4.8.1	Magnetic Particle Inspection Equipment	1-32
1.4.8.1.1	Magnetic Yokes and Probes	1-34
1.4.8.1.2	Hand-held Coil	1-34
1.4.8.2	Safety Precautions During Magnetic Particle Inspections	1-34
1.4.9	Demagnetization of Inspection Parts	1-34
1.4.9.1	Demagnetization Using AC	1-35
1.4.9.2	Demagnetization Using DC	1-35
1.4.10	Radiographic (RT) Method	1-35
1.4.10.1	Safety Precautions During Radiographic Inspections	1-35
1.4.10.2	Mixing of Radiographic Film Processing Chemicals	1-36
1.4.11	Eddy Current (ET) Method	1-36
1.4.11.1	Safety Precautions During Eddy Current Inspection	1-37
1.4.11.2	Eddy Current Scanning Techniques	1-37
1.4.11.2.1	Scanning Around Fasteners, Inserts, and Edges of Parts	1-37
1.4.11.2.2	Bolthole Inspection	1-37
1.4.11.2.3	Scanning Fillets and Radii	1-37
1.4.11.3	Eddy Current Instrument Standardization	1-38
1.4.11.4	Sorting Metal Using Eddy Current	1-38
1.4.12	Ultrasonic (UT) Method	1-38
1.4.12.1	Safety Precautions During Ultrasonic Inspection	1-38
1.4.12.2	Ultrasonic Instrument Standardization	1-40
1.4.13	Acceptance/Rejection Criteria	1-41

TABLE OF CONTENTS – Continued

Section/Paragraph.....	Page
1.4.14 Equipment Used for NDI.....	1-41
1.4.15 Materials Used for NDI.....	1-41
1.4.16 Post Cleaning and Restoration of Part or Area After NDI.....	1-41
II ROTOR SYSTEM	2-1
2.1 CONTENTS	2-1
2.2 MAIN ROTOR DROOP STOP FOLLOWER (PLUNGER) (PT) ..	2-5
2.3 DROOP STOP RING(MT)	2-5
2.4 MAIN ROTOR BLADE (VOIDS) (BT)	2-9
2.5 MAIN ROTOR BLADE (PT)	2-12
2.6 MAIN ROTOR BLADE (RT)	2-13
2.7 MAIN ROTOR BLADE WEIGHT SUPPORT FITTINGS (ET)	2-17
2.8 MAIN ROTOR MAST (MT)	2-19
2.9 MAIN ROTOR MAST RETAINING RING (MT)	2-20
2.10 MAIN ROTOR HUB RETENTION NUT (MT)	2-23
2.11 MAIN ROTOR HEAD (HUB) (ET)	2-25
2.12 MAIN ROTOR LEAD LAG LINK (DAMPER LINK) (ET)	2-27
2.13 MAIN ROTOR DAMPER (ET)	2-30
2.14 MAIN ROTOR DAMPER TRUNION (ET)	2-31
2.15 MAIN ROTOR DAMPER ROD END (MT)	2-35
2.16 MAIN ROTOR PITCH HOUSING (ET)	2-37
2.16.1.1 STRAP PACK OUTBOARD BOLT INSPECTION (UT)	2-38.1
2.17 MAIN ROTOR FEATHERING BEARING HOUSING (ET)	2-40
2.18 MAIN ROTOR STRIKER PLATE AND SHIMS (MT)	2-41
2.19 MAIN ROTOR HUB BEARING (ET)	2-45
2.20 MAIN ROTOR LOWER SHOE (ET)	2-46
2.21 MAIN ROTOR HEAD HUB LOAD PLATE (MT)	2-49
2.22 MAIN ROTOR HUB BRACKETS (MT)	2-51
2.23 MAIN ROTOR HUB LOWER PLATE (MT)	2-52
2.24 TAIL ROTOR FORK ASSEMBLY(HEAD AND TEETER STOP)..	2-54
2.25 TAIL ROTOR BLADE (PT)	2-57
2.26 TAIL ROTOR BLADE (VOIDS) (BT)	2-58
2.27 TAIL ROTOR BLADES (FLUID) (RT)	2-61
2.28 TAIL ROTOR HUB (ET)	2-65
2.29 TAIL ROTOR CLAMPS AND LOCKING PLATES (ET)	2-66
III DRIVE SYSTEM	3-1
3.1 CONTENTS	3-1
3.2 DRIVE SHAFTS (ET)	3-4
3.3 DRIVETRAIN COUPLINGS (ET)	3-7

TABLE OF CONTENTS - Continued

Section/Paragraph	Page
3.4	DRIVETRAIN FLANGES (MT) 3-8
3.5	DAMPER AND ANTI-FLAIL SUPPORTS (ET) 3-11
3.6	FORWARD HANGER BEARING FLANGE (MT) 3-13
3.7	FORWARD HANGER BEARING SUPPORT (ET) 3-15
3.8	AFT HANGER BEARING FLANGE (MT) 3-17
3.9	AFT HANGER BEARING SUPPORT (ET) 3-18
3.10	INTERMEDIATE GEARBOX CENTRIFUGAL FAN (ET) 3-22
3.11	ENGINE NOSE GEARBOX (ET) 3-25
3.12	ENGINE NOSE GEARBOX INPUT QUILL SHAFT (MT) 3-26
3.13	MAIN TRANSMISSION (ET) 3-29
3.14	MAIN TRANSMISSION COMPRESSOR DRIVE ADAPTER (ET) 3-32
3.15	MAIN TRANSMISSION APU DRIVE FLANGE (MT) 3-33
3.16	MAIN TRANSMISSION TAIL ROTOR DRIVE FLANGE (MT) 3-36
3.17	MAIN ROTOR GEARSHAFT DRIVE GEAR TEETH (MT) 3-38
3.18	MAIN ROTOR MAST SUPPORT BASE (ET) 3-40
3.19	INTERMEDIATE GEARBOX (ET) 3-42
3.20	INTERMEDIATE GEARBOX RETAINERS (ET) 3-45
3.21	INTERMEDIATE GEARBOX FLANGE AND SHOULDERED SHAFT (MT)..... 3-48
3.22	TAIL ROTOR GEARBOX (ET) 3-49
3.23	TAIL ROTOR GEARBOX SHOULDERED SHAFT (MT) 3-51
3.24	TAIL ROTOR GEARBOX RETAINERS (ET) 3-54
3.25	TAIL ROTOR GEARBOX FORWARD AND AFT STRUT (MT) 3-56
3.26	TAIL ROTOR GEARBOX FORWARD AND AFT STRUT FITTINGS (MT) 3-59
3.27	MAIN ROTOR HEAD (HUB) (ET) 3-62
3.28	MAIN ROTOR SUPPORT MAST (MT) 3-62
IV	AIRFRAME AND LANDING GEAR SYSTEM 4-1
4.1	CONTENTS 4-1
4.2	FUSELAGE AND EMPENNAGE ACCESS DOORS, COVERS, PANELS, SKINS, AND FAIRINGS- METAL (ET) 4-5
4.3	HONEYCOMB CORE FUSELAGE PANELS, VERTICAL FIN, ETC. (BT) ... 4-6
4.4	FLUID IN HONEYCOMB CORE FUSELAGE PANELS, VERTICAL FIN, ETC. (RT) 4-10
4.5	FITTINGS, CASTINGS, AND FORGINGS (ET) 4-14
4.6	TRANSMISSION DECK (ET) 4-16
4.7	EMPENNAGE FRAME ASSEMBLIES F.S. 530 AND F.S. 547 AND ATTACHED STRINGERS (ET) 4-18
4.8	FUSELAGE SUPPORT HOLES (ET) 4-21
4.9	GUN AND AMMO SUPPORT MOUNT PADS (ET) 4-22
4.10	MAIN LANDING GEAR SHOCK STRUT SUPPORT (MT) 4-26

TABLE OF CONTENTS - Continued

Section/Paragraph	Page
4.11	MAIN LANDING GEAR CROSS TUBE MOUNTING POINTS (ET) 4-27
4.12	ROTOR SUPPORT MIXER ASSEMBLY AND MOUNTING SURFACES (MT) 4-29
4.13	ROTOR MIXER SUPPORT ASSEMBLY BOLT (MT) 4-32
4.14	TRANSMISSION ROTOR SUPPORT STRUT ASSEMBLIES (ET) 4-34
4.15	NACELLE CARRY-THROUGH POST ASSEMBLY (ET) 4-35
4.16	WING ATTACHMENT FITTINGS ON WING AND FUSELAGE (ET) 4-38
4.17	WING RACK ATTACHMENT POINTS/MOUNTS (ET) 4-41
4.18	TADS/PNVS SUPPORT FITTING (ET) 4-44
4.19	VERTICAL STABILIZER LUGS (ET) 4-46
4.20	VERTICAL STABILIZER BARREL NUTS (MT) 4-48
4.21	HORIZONTAL STABILATOR ACTUATOR FITTING (ET) 4-49
4.22	ENGINE ACCESS AND VENTILATION DOOR ASSEMBLY RIG CONNECTING LINK (PT) 4-51
4.23	AFT INBOARD ENGINE MOUNT SUPPORT (ET) 4-52
4.24	ENGINE NACELLE STRUT ATTACHMENT AREA (ET) 4-55
4.25	MAIN LANDING GEAR TRAILING ARMS (MT) 4-56
4.26	MAIN LANDING GEAR WHEELS (ET) 4-58
4.27	MAIN LANDING GEAR SHOCK STRUT HOUSING, PISTON, AND ROD ENDS (MT) 4-62
4.28	MAIN LANDING GEAR LOWER STRUCTURAL SUPPORT (MT) 4-64
4.29	MAIN LANDING GEAR JACK PAD ADAPTER (MT) 4-65
4.30	MAIN LANDING GEAR TRAILING ARM CROSS TUBE (MT) 4-68
4.31	MAIN LANDING GEAR SHOCK STRUT MOUNT SHAFT (MT) 4-70
4.32	TAIL LANDING GEAR FORK (ET) 4-72
4.33	TAIL WHEEL (ET) 4-74
4.34	TAIL LANDING GEAR SHOCK STRUT (MT) 4-76
4.35	TAIL LANDING GEAR TRAILING ARMS (ET) 4-78
4.36	TAIL LANDING GEAR ACTUATING CYLINDER ASSEMBLY (ET) 4-79
4.37	BRAKE SYSTEM COMPONENTS (PT) 4-82
4.38	GENERAL HELICOPTER ATTACHING HARDWARE (MT) 4-84
V	ENGINE SYSTEM 5-1
5.1	CONTENTS 5-1
5.2	AFT INBOARD AND AFT LOWER ENGINE MOUNTS (ET) 5-3
5.3	FORWARD INBOARD ENGINE MOUNT (MT) 5-4
5.4	FORWARD LOWER ENGINE MOUNT (MT) 5-6
5.5	ENGINE TUBING, COUPLINGS, AIR DUCTS, FITTINGS, SUPPORTS, BRACKETS, AND CLIPS (PT) 5-8

TABLE OF CONTENTS - Continued

Section/Paragraph	Page
5.6 AIR INLET ASSEMBLY (ET)	5-10
5.7 ENGINE AIR INLET "V" BAND CLAMP (PT)	5-13
5.8 STARTER FLANGE (ET)	5-14
5.9 ENGINE SHROUD (PT)	5-16
5.10 ENGINE LOAD DEMAND SPINDLE BELLCRANK SUPPORT (ET)	5-18
5.11 ENGINE COMPONENTS (PT)	5-20
VI FLIGHT CONTROL SYSTEM	6-1
6.1 CONTENTS	6-1
6.2 FLIGHT CONTROL BELLCRANKS (ET)	6-5
6.3 MAIN ROTOR SWASHPLATE SHOULDER PIN MATING BORES (ET)	6-6
6.4 MAIN ROTOR LINK BARRELS (MT)	6-9
6.5 MAIN ROTOR SCISSORS UPPER ARM (ET)	6-11
6.6 MAIN ROTOR SCISSORS LOWER ARM (ET)	6-13
6.7 PILOT/CPG COLLECTIVE STICK TUBE (ET)	6-15
6.8 PILOT/CPG COLLECTIVE STICK ROTOR HOUSING (ET)	6-17
6.9 PILOT COLLECTIVE STICK CYLINDER (ET)	6-19
6.10 FLIGHT CONTROL RODS, CONNECTING LINKS, ROD ENDS, CLEVISES, LEVERS, AND ATTACHING PARTS (ET)	6-21
6.11 PILOT COLLECTIVE STICK SUPPORT ASSEMBLY (ET)	6-22
6.12 CPG COLLECTIVE STICK SUPPORT ASSEMBLY (ET)	6-25
6.13 PILOT CYCLIC STICK (ET)	6-27
6.14 LATERAL FEEL SPRING CARTRIDGE (ET)	6-29
6.15 PILOT CYCLIC STICK HOUSING AND SUPPORT ASSEMBLY (ET)	6-31
6.16 CPG CYCLIC STICK FORWARD AND AFT LINKS (ET)	6-34
6.17 CPG CYCLIC STICK REMOTE CONTROL LEVER (ET)	6-35
6.18 CPG CYCLIC STICK FITTING ASSEMBLY (ET)	6-38
6.19 FERROUS FLIGHT CONTROL SYSTEM PUSH-PULL RODS (MT)	6-41
6.20 NONFERROUS FLIGHT CONTROL SYSTEM PUSH-PULL RODS (ET)	6-43
6.21 CPG TO PILOT LONGITUDINAL F.S. 82.80 CONTROL BRACKET (ET) ...	6-46
6.22 CPG TO PILOT COLLECTIVE F.S. 118.50 BELLCRANK (ET)	6-48
6.23 CPG DIRECTIONAL SHEAR PIN ACTIVATED DECOUPLER (SPAD) ARMS (ET)	6-50
6.24 DIRECTIONAL F.S. 121.40 BELLCRANK (ET)	6-52
6.25 DIRECTIONAL F.S. 121.40 BELLCRANK BRACKET (ET)	6-54
6.26 PILOT DIRECTIONAL SHEAR PIN ACTIVATED DECOUPLER (SPAD) TRANSDUCER ARM (ET)	6-56
6.27 PILOT DIRECTIONAL SHEAR PIN ACTIVATED DECOUPLER (SPAD) REMOTE CONTROL LEVER (ET)	6-58

TABLE OF CONTENTS - Continued

Section/Paragraph	Page	
6.28	PILOT DIRECTIONAL SHEAR PIN ACTIVATED DECOUPLER (SPAD) BELLCRANKS (ET)	6-60
6.29	DIRECTIONAL F.S. 156.07 BELLCRANK (ET)	6-62
6.30	DIRECTIONAL F.S. 159.98 BELLCRANK AND BRACKET (ET)	6-64
6.31	DIRECTIONAL F.S. 164.33 BELLCRANK BRACKET AND ATTACHING AREA ON DECK (ET)	6-66
6.32	PILOT LONGITUDINAL SHEAR PIN ACTIVATED DECOUPLER (SPAD) OUTER AND INNER LEVER (ET)	6-68
6.33	PILOT/CPG DIRECTIONAL CONTROL PEDAL RELEASE HANDLE (ET)	6-69
6.34	PILOT/CPG DIRECTIONAL CONTROL PEDAL RELEASE SHAFT (MT)	6-73
6.35	PILOT/CPG DIRECTIONAL CONTROL PEDAL RELEASE NUTS (MT)	6-75
6.36	DIRECTIONAL F.S. 199.25 TAIL ROTOR FITTING (ET)	6-77
6.37	DIRECTIONAL F.S. 275 ROTOR CONTROL BRACKET (ET)	6-79
6.38	DIRECTIONAL F.S. 348 BELLCRANK (ET)	6-81
6.39	DIRECTIONAL F.S. 348 TAIL ROTOR BRACKET (ET)	6-83
6.40	TAIL ROTOR SWASHPLATE CONTROL BELLCRANK (MT)	6-85
6.41	TAIL ROTOR DRIVE LINKS (ET)	6-86
6.42	EXTERIOR SURFACES OF ALL FERROUS HYDRAULIC COMPONENTS (SERVOCYLINDERS, ACTUATORS, RESERVOIRS, ETC.) (MT)	6-88
APPENDIX A	MAINTENANCE ALLOCATION CHART	A-1
APPENDIX B	EQUIPMENT LISTING	B-1
APPENDIX C	ILLUSTRATED FIELD MANUFACTURE ITEMS LIST	C-1
ALPHABETICAL INDEX		Index 1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	Nondestructive Inspection Symbols	1-7
1-2	General Configuration of AH-64A Helicopter	1-9
1-3	Fuselage Stations, Buttlines, Centerline, and Waterlines	1-10
1-4	Access Provisions	1-14
1-5	Bond Testing Reference Block Displays	1-25
1-6	Portable Magnetic Particle Inspection Equipment	1-33
1-7	Signatures of EDM Notches in Test Block	1-39
1-8	Typical Metal Sorting Display	1-40
2-1	Rotor System	2-3
2-2	Main Rotor Droop Stop Follower (Plunger)	2-6
2-3	Droop Stop Ring	2-8
2-4	Main Rotor Blade (Voids)	2-10
2-5	Main Rotor Blade	2-13
2-6	Main Rotor Blade	2-15
2-7	Main Rotor Blade Weight Support Fittings	2-18
2-8	Main Rotor Mast	2-21
2-9	Main Rotor Mast Retaining Ring	2-22
2-10	Main Rotor Hub Retention Nut	2-24
2-11	Main Rotor Head (Hub)	2-26
2-12	Main Rotor Lead Lag Link (Damper Link)	2-29
2-13	Main Rotor Damper	2-32
2-14	Main Rotor Damper Trunnion	2-34
2-15	Main Rotor Damper Rod End	2-36
2-16	Main Rotor Pitch Housing	2-39
2-17	Main Rotor Feathering Bearing Housing	2-42
2-18	Main Rotor Striker Plate and Shims	2-44
2-19	Main Rotor Hub Bearing	2-47
2-20	Main Rotor Lower Shoe	2-49
2-21	Main Rotor Head Hub Load Plate	2-50
2-22	Main Rotor Hub Brackets	2-52
2-23	Main Rotor Hub Lower Plate	2-53
2-24	Tail Rotor Fork Assembly (Head and Teeter Stop)	2-56
2-25	Tail Rotor Blade	2-57
2-26	Tail Rotor Blade (Voids)	2-60
2-27	Tail Rotor Blades (Fluid)	2-63
2-28	Tail Rotor Hub	2-67
2-29	Tail Rotor Clamps and Locking Plates	2-70
3-1	Drive System	3-2

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
3-2	Drive Shafts	3-5
3-3	Drivetrain Couplings	3-9
3-4	Drivetrain Flanges	3-10
3-5	Damper and Anti-Flail Supports	3-13
3-6	Forward Hanger Bearing Flange	3-14
3-7	Forward Hanger Bearing Support	3-16
3-8	Aft Hanger Bearing Flange	3-19
3-9	Aft Hanger Bearing Support	3-21
3-10	Intermediate Gearbox Centrifugal Fan	3-24
3-11	Engine Nose Gearbox	3-27
3-12	Engine Nose Gearbox Input Quill Shaft	3-28
3-13	Main Transmission	3-31
3-14	Main Transmission Compressor Drive Adapter	3-34
3-15	Main Transmission APU Drive Flange	3-35
3-16	Main Transmission Tail Rotor Drive Flange	3-37
3-17	Main Rotor Gearshaft Drive Gear Teeth	3-39
3-18	Main Rotor Mast Support Base	3-41
3-19	Intermediate Gearbox	3-44
3-20	Intermediate Gearbox Retainers	3-47
3-21	Intermediate Gearbox Flange and Shouldered Shaft	3-49
3-22	Tail Rotor Gearbox	3-52
3-23	Tail Rotor Gearbox Shouldered Shaft	3-54
3-24	Tail Rotor Gearbox Retainers	3-57
3-25	Tail Rotor Gearbox Forward and Aft Strut	3-58
3-26	Tail Rotor Gearbox Forward and Aft Strut Fittings	3-61
4-1	Airframe and Landing Gear System	4-3
4-2	Fuselage and Empennage Access Doors, Covers, Panels, Skins, and Fairings - Metal	4-7
4-3	Honeycomb Core Fuselage Panels, Vertical Fin, etc	4-9
4-4	Fluid in Honeycomb Core Fuselage Panels, Vertical Fin, etc	4-12
4-5	Fittings, Castings, and Forgings	4-15
4-6	Transmission Deck	4-17
4-7	Empennage Frame Assemblies F.S. 530 and F.S. 547 and Attached Stringers	4-20
4-8	Fuselage Support Holes	4-23
4-9	Gun and Ammo Support Mount Pads	4-25
4-10	Main Landing Gear Shock Strut Support	4-27
4-11	Main Landing Gear Cross Tube Mounting Points	4-30

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
4-12	Rotor Support Mixer Assembly and Mounting Surfaces	4-31
4-13	Rotor Mixer Support Assembly Bolt	4-33
4-14	Transmission Rotor Support Strut Assemblies	4-36
4-15	Nacelle Carry-Through Post Assembly	4-39
4-16	Wing Attachment Fittings on Wing and Fuselage	4-41
4-17	Wing Rack Attachment Points/Mounts	4-43
4-18	TADS/PNVS Support Fitting	4-45
4-19	Vertical Stabilizer Lugs	4-47
4-20	Vertical Stabilizer Barrel Nuts	4-49
4-21	Horizontal Stabilator Actuator Fitting	4-51
4-22	Engine Access and Ventilation Door Assembly Rig Connecting Link	4-53
4-23	Aft Inboard Engine Mount Support	4-54
4-24	Engine Nacelle Strut Attachment Area	4-57
4-25	Main Landing Gear Trailing Arms	4-59
4-26	Main Landing Gear Wheels	4-61
4-27	Main Landing Gear Shock Strut Housing, Piston, and Rod Ends	4-63
4-28	Main Landing Gear Lower Structural Support	4-66
4-29	Main Landing Gear Jack Pad Adapter	4-67
4-30	Main Landing Gear Trailing Arm Cross Tube	4-69
4-31	Main Landing Gear Shock Strut Mount Shaft	4-71
4-32	Tail Landing Gear Fork	4-73
4-33	Tail Wheel	4-75
4-34	Tail Landing Gear Shock Strut	4-77
4-35	Tail Landing Gear Trailing Arms	4-80
4-36	Tail Landing Gear Actuating Cylinder	4-82
4-37	Brake System Components	4-83
4-38	General Helicopter Attaching Hardware	4-85
5-1	Engine System	5-2
5-2	Aft Inboard and Aft Lower Engine Mounts	5-5
5-3	Forward Inboard Engine Mount	5-7
5-4	Forward Lower Engine Mount	5-9
5-5	Engine Tubing, Couplings, Air Ducts, Fittings, Supports, Brackets, and Clips	5-11
5-6	Air Inlet Assembly	5-13
5-7	Engine Air Inlet "V" Band Clamp	5-14
5-8	Starter Flange	5-16
5-9	Engine Shroud	5-17
5-10	Engine Load Demand Spindle Bellcrank Support	5-19
5-11	Engine Components	5-21

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
6-1	Flight Control System	6-3
6-2	Flight Control Bellcranks	6-7
6-3	Main Rotor Swashplate Shoulder Pin Mating Bores	6-8
6-4	Main Rotor Link Barrels	6-10
6-5	Main Rotor Scissors Upper Arm	6-12
6-6	Main Rotor Scissors Lower Arm	6-14
6-7	Pilot/CPG Collective Stick Tube	6-16
6-8	Pilot/CPG Collective Stick Rotor Housing	6-18
6-9	Pilot Collective Stick Cylinder	6-20
6-10	Flight Control Rods, Connecting Links, Rod Ends, Clevises, Levers, and Attaching Parts	6-23
6-11	Pilot Collective Stick Support Assembly	6-25
6-12	CPG Collective Stick Support Assembly	6-27
6-13	Pilot Cyclic Stick	6-29
6-14	Lateral Feel Spring Cartridge	6-31
6-15	Pilot Cyclic Stick Housing and Support Assembly	6-33
6-16	CPG Cyclic Stick Forward and Aft Links	6-36
6-17	CPG Cyclic Stick Remote Control Lever	6-38
6-18	CPG Cyclic Stick Fitting Assembly	6-40
6-19	Ferrous Flight Control System Push-Pull Rods	6-42
6-20	Nonferrous Flight Control System Push-Pull Rods	6-45
6-21	CPG to Pilot Longitudinal F.S. 82.80 Control Bracket	6-47
6-22	CPG to Pilot Collective F.S. 118.50 Bellcrank	6-49
6-23	CPG Directional Shear Pin Activated Decoupler (SPAD) Arms	6-51
6-24	Directional F.S. 121.40 Bellcrank	6-53
6-25	Directional F.S. 121.40 Bellcrank Bracket	6-55
6-26	Pilot Directional Shear Pin Activated Decoupler (SPAD) Transducer Arm	6-57
6-27	Pilot Directional Shear Pin Activated Decoupler (SPAD) Remote Control Lever.....	6-59
6-28	Pilot Directional Shear Pin Activated Decoupler (SPAD) Bellcranks	6-61
6-29	Directional F.S. 156.07 Bellcrank	6-63
6-30	Directional F.S. 159.98 Bellcrank and Bracket	6-65
6-31	Directional F.S. 164.33 Bellcrank Bracket and Attaching Area on Deck	6-67
6-32	Pilot Longitudinal Shear Pin Activated Decoupler (SPAD) Outer and Inner Lever	6-70
6-33	Pilot/CPG Directional Control Pedal Release Handle	6-72
6-34	Pilot/CPG Directional Control Pedal Release Shaft	6-74
6-35	Pilot/CPG Directional Control Pedal Release Nuts	6-76

LIST OF ILLUSTRATIONS - Continued

Figure	Title	Page
6-36	Directional F.S. 199.25 Tail Rotor Fitting	6-78
6-37	Directional F.S. 275 Rotor Control Bracket	6-80
6-38	Directional F.S. 348 Bellcrank	6-82
6-39	Directional F.S. 348 Tail Rotor Bracket	6-84
6-40	Tail Rotor Swashplate Control Bellcrank	6-86
6-41	Tail Rotor Drive Links	6-88
6-42	Exterior Surfaces of All Ferrous Hydraulic Components (Servocylinders, Actuators, Reservoirs, etc.)	6-90

LIST OF TABLES

Number	Title	Page
1-1	Supporting Technical Documentation	1-3
1-2	Access Provisions	1-17
1-3	Penetrant Procedure (Type I, Method A)	1-28
1-4	Penetrant Procedure (Type I, Method B)	1-29
1-5	Penetrant Procedure-Portable or Field Application (Type I, Method C)	1-30
1-6	Penetrant Procedure (Type I, Method D)	1-31
1-7	Equipment Used for NDI	1-42
1-8	Materials Used for NDI	1-43
2-1	Rotor System Inspection Index	2-1
3-1	Drive System Inspection Index	3-1
4-1	Airframe and Landing Gear System Inspection Index	4-1
5-1	Engine System Inspection Index	5-1
6-1	Flight Control System Inspection Index	6-1

SECTION I

INTRODUCTION

1. INTRODUCTION.

a. This manual contains instructions for accomplishing Nondestructive Inspection (NDI) of the AH-64A helicopter 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 AH-64A Aircraft 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 of 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, nor 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 applicable 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 Troop Command, ATTN: AMSAT-I-MP, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798.

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 set-up 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 AH-64A helicopter. 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 AH-64A helicopter, 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 instructions 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-E1444 DA PAM 738-751	Standard Practice for Magnetic Particle Inspection 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
MIL-STD-6866	Inspection, Liquid Penetrant
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 1-1520-238-23	Aviation Unit and Intermediate Maintenance Manual, Helicopter, Attack, AH-64A Apache
Chapter 1	Aircraft General
Chapter 2	Airframe
Chapter 3	Landing Gear System
Chapter 4	Power Plant
Chapter 5	Rotors
Chapter 6	Drive System

Table 1-1. Supporting Technical Documentation - Continued

Document	Description
Chapter 7	Hydraulic and Pneumatic Systems
Chapter 11	Flight Control System
TM 55-2840-248-23 (series)	Aviation Unit and Intermediate Maintenance Instructions, Engine Aircraft, Turboshaft Model T700-GE-701

1.1.1 Special Terms. Abbreviations. and Acronyms.

AC	Alternating Current
APU	Auxiliary Power Unit
AVIM	Aviation Intermediate Maintenance
AVUM	Aviation Unit Maintenance
BL	Buttline
BT	Bond Testing Method
C	Celsius
CCW	Counterclockwise
CL	Centerline
CPG	Co-Pilot/Gunner
CRT	Cathode Ray Tube
CW	Clockwise
DC	Direct Current
EDM	Electrically Discharged Machined Notches
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
ID	Inside Diameter
INBD	Inboard
IR	Infrared
KHz	Kilohertz
LCD	Liquid Crystal Display

LH	Left-hand (left side of aircraft aft looking forward)
LPF	Low Pass Filter
MAC	Maintenance Allocation Chart
MAX	Maximum
MHz	Megahertz
MIN	Minimum
MLG	Main Landing Gear
M/R	Main Rotor
MT	Magnetic Particle Method
NDI	Nondestructive Inspection
OUTBD	Outboard
P/N	Part Number
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauged
PT	Fluorescent Penetrant Method
RH	Right-hand (right side of aircraft aft looking forward)
ROT	Rotation
RT	Radiographic Method
SPAD	Shear Pin Activated Decoupler
STA	Station
TLG	Tail Landing Gear
TM	Technical Manual
T/R	Tail Rotor
UT	Ultrasonic Method
VdB	Vertical Decibels .(Gain)
V Pos	Vertical Position
WL	Waterline

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

- I Introduction.
- II Rotor System
- III Drive System
- IV Airframe and Landing Gear System
- V Engine System
- VI Flight Control System

Section I contains the introduction and general information pertaining to the AH-64A helicopter and Nondestructive Inspections. Sections II through VI contain detailed inspection procedures for specific items located within each system. In general, inspection items are grouped with respect to part location and function. To use the manual, it is necessary to know the system and name of the inspection item.

When the system and part name are known:

- a. Turn to the applicable section of the manual covering that system. 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 AH-64A helicopter. 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 AH-64A advanced attack helicopter is a twin engine helicopter designed specifically for the attack helicopter role. The helicopter accommodates an aircrew of two in a tandem configuration. The helicopter delivers various combinations of ordnance while providing maximum helicopter survivability and aircrew protection.

Maximum helicopter survivability is achieved by providing redundant systems/components ballistic resistance, high impact survivability, reduced detectability, and wire strike protection. The wings provide mounting surfaces for four external pylons, which can carry external fuel tanks, point target missiles, 2.75-inch folding fin aerial rocket launchers, or a symmetrically loaded combination of any two weapon racks.



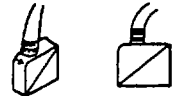

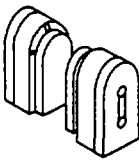
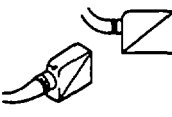


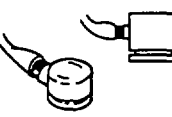








The helicopter is powered by two T700-GE-701 or T700-GE-701C engines which drive the main rotor through individual engine nose-mounted gearboxes and a main transmission. The main transmission power takeoff shaft drives the tail rotor through intermediate and tail rotor gearboxes.

METHOD OF INSPECTION

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

	FLUORESCENT PENETRANT		ULTRASONIC
	MAGNETIC PARTICLE		RADIOGRAPHIC
	EDDY CURRENT		BOND TESTING

SUPPLEMENTAL SYMBOLS

	RADIOGRAPHIC FILM PLACEMENT		MAGNETIC CONTOUR PROBE		ULTRASONIC SHEAR OR SURFACE WAVE TRANSDUCER TOP MOUNTED
	RADIOGRAPHIC FILM IDENTIFICATION MARKER		MAGNETIC STATIONARY UNIT		ULTRASONIC SHEAR OR SURFACE WAVE TRANSDUCER END MOUNTED
	RADIOGRAPHIC AIMING POINT		MAGNETIC PARTICLE COIL		ULTRASONIC LONGITUDINAL WAVE TRANSDUCER
	RADIOGRAPHIC TUBEHEAD LOCATION		DIRECTION OF EDDY CURRENT SCAN		EDDY CURRENT BOLT HOLE PROBE
	BOND TEST STANDARD PROBE				EDDY CURRENT GENERAL PURPOSE PROBE
	BOND TEST NONMETALLIC PROBE				EDDY CURRENT RADIUS PROBE
	BOND TEST MINI-PROBE				

NDI_AH-64_F1_1

Figure 1-1. Nondestructive Inspection Symbols

The auxiliary power unit drives the accessory drive section of the main transmission to provide full electrical, pneumatic, and hydraulic power to the helicopter when the main engines are not on line. The auxiliary power unit is also used to provide pressurized air system air to start the main engines.

Flight controls are mechanically actuated, hydraulically powered, and electrically assisted in all flight control axes.

A curved canopy structure provides integral rollover protection. The canopy has a blast shield between the two crew stations. Each crew station contains an adjustable armored seat. The seats incorporate armored wings which pivot to facilitate entrance to, and exit from, the crew stations.

1.1.8 Configuration. The general configuration of the AH-64A helicopter is shown in Figure 1-2.

1.1.9 Airframe Stations. Fuselage stations, waterlines, buttlines, and centerlines provide an accurate method of locating or installing parts and/or equipment in the airframe (Figure 1-3). All dimensions are in inches. Dimensions have FS, WL, CL, or BL in front of the numbers.

a. Fuselage Stations. Fuselage stations (FS) are distances from a point in front of the helicopter nose. The first station is zero (0.00).

b. Waterlines. Waterlines (WL) are distances from a point below the helicopter. They follow the centerline.

c. Centerline. Centerline (CL) is an imaginary line that passes through the center of the helicopter. The centerline runs from the nose to the tail.

d. Buttlines. Buttlines (BL) are distances from the centerline. They start at the centerline and show the distance to each side of the helicopter. Buttlines will be either to the left or right side.

These dimensions help you find any point on the helicopter. Each point shown on the following pages is a part of the helicopter you can see.

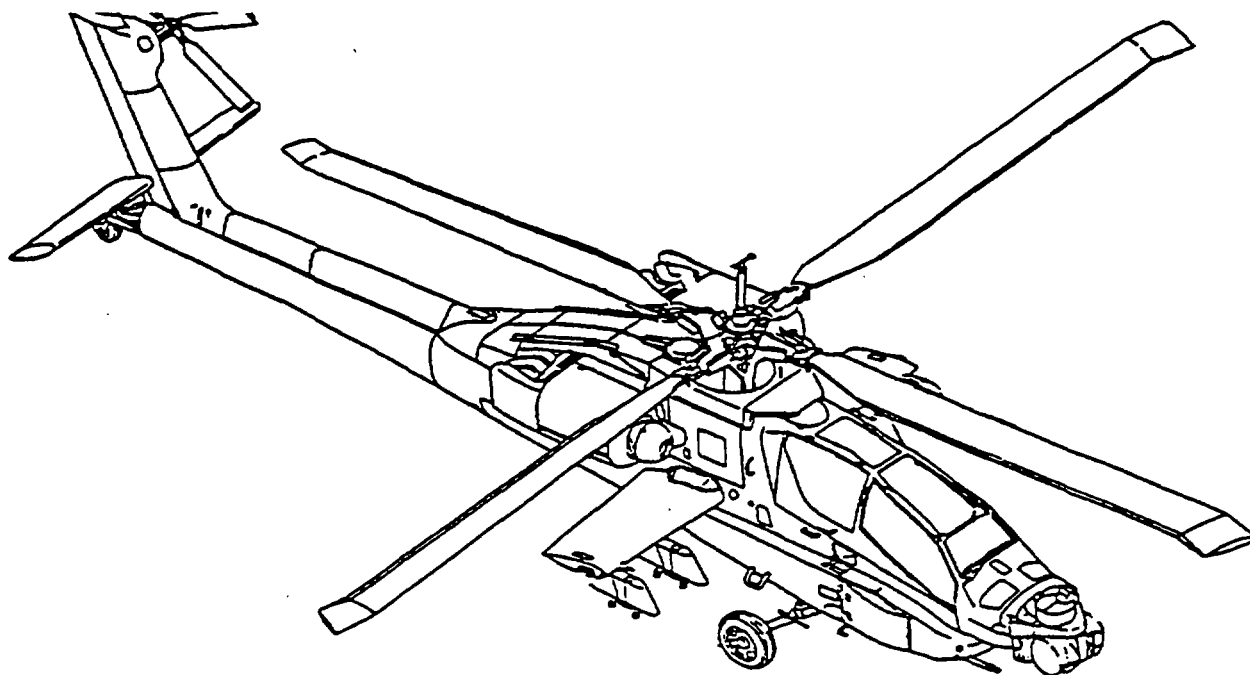
1.2 TYPE OF CONSTRUCTION.

NOTE

The following paragraphs describe the type of construction and materials used in the manufacture of the major AH-64A helicopter components.

1.2.1 Rotor System. The rotor system interfaces with the drive system and flight controls system. The rotor system provides lift, thrust, directional flight, and anti-torque control for the helicopter. The rotor system includes the main rotor assembly, a single, four-bladed, 48-foot diameter main rotor that provides vertical, longitudinal, and lateral flight capabilities; the tail rotor assembly, a single, four-bladed, nine-foot diameter teetering tail rotor that provides anti-torque and directional flight capabilities; and controls and indicators, various cockpit-mounted controls and indicators used by the aircrew for operating the rotor system. The controls and indicators provide indications of system operational performance.

The main rotor assembly is secured to the upper portion of the static mast and main drive shaft. The main rotor head assembly is a fully articulated assembly that provides attachment points for the four main rotor blade assemblies. The main rotor head assembly provides the means to drive the main rotor blade assemblies in a counterclockwise rotation while providing feathering, flapping, and lead-lag movement of each blade.



NDI_AH-64_F1_2

Figure 1-2. General Configuration of AH-64A Helicopter