DOCKET NO. SA-516

EXHIBIT NO. 11K

# NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

## SERVICE BULLETIN 747-28A-2194

(PAGES K-1 THRU K-26)

**Number:** 747-28A2194
Date: August 3, 1995
Revision 1: January 18, 1996
ATA System: 2822

# Revision Transmittal Sheet

JAN 29 1996

**SUBJECT:** FUEL - DISTRIBUTION - FUEL BOOST AND OVERRIDE/JETTISON PUMPS - INSPECTION

This revision includes all pages of the service bulletin.

## COMPLIANCE INFORMATION RELATED TO THIS REVISION

No more work is necessary on airplanes changed as shown in the initial release of this service bulletin.

## SUMMARY

This revision is sent to add a check of the boost pump ground wire to the accomplishment instructions, add an A-check inspection interval to the Compliance paragraph and add an optional off-wing inspection of the fuel pumps. The accomplishment instructions format has been changed to agree with Service Bulletin 757-28A0043.

The data given in Notice of Status Change 747-28A2194 NSC 1 is included in this revision.

Paragraph I.A., Effectivity, shows changes of airplane operators. Each operator should examine the Effectivity paragraph for changes.

Vertical lines are put on the left edge of each page, except in Paragraph I.A., Effectivity, to show the location of important changes.

Pages with a revision number and date, but no vertical lines, have no important changes.

## REVISION HISTORY

| | |
|---|---|
| Initial Release: | August 3, 1995 |
| Revision 1: | January 18, 1996 |

**Number:** 747-28A2194
Date: August 3, 1995
Revision 1: January 18, 1996
ATA System: 2822

## Summary

**SUBJECT:** FUEL - DISTRIBUTION - FUEL BOOST AND OVERRIDE/JETTISON PUMPS - INSPECTION

### BACKGROUND

This inspection will make sure the 747 fuel pumps will not cause a fuel leak.

Operators have sent reports of fuel leaks at the fuel boost and override/jettison pumps. The reports tell that eight fuel pumps have been removed for this reason. The removed fuel pumps had between 34,000-67,000 hours since new or since overhaul. The leaks occurred at the pump/wire bundle interface. The result of one leak was a fire at an inboard main tank jettison pump during maintenance.

It is believed that after a long time, water can get inside the potting of the wire terminal assembly and cause corrosion. The corrosion in the wire terminal assembly can cause arcing between the power pins and the pump case. The arcing causes thermal expansion of the materials inside the cap. This expansion causes failure of the cap attachment flange or the attaching screws and a subsequent fuel leak.

High current during arcing can also melt a hole through the pump end case and connector, which also causes a fuel leak.

This service bulletin will test the pump wiring insulation resistance to make sure that no conductive corrosion is in the wire terminal assembly.

### ACTION

Get access to all of the 747 fuel pumps. Do an insulation resistance check on each pump. Replace any pumps that do not pass the insulation resistance check.

### COMPLIANCE

Boeing recommends that the initial inspection be accomplished at the next opportunity when manpower and facilities are available. For pumps with insulation resistance between 1 and 5 megohms when the 500VDC is done, it is recommended that the pump be replaced. If the pump is not replaced, do the inspection of this pump at every A-check or an equivalent time. For pumps with insulation resistance greater than 5 megohms when the 500VDC is done, the inspection should be repeated at every C-check or an equal time period after the initial inspection.

### EFFECTIVITY

All 747 airplanes line positions 0001-1066.

### INDUSTRY SUPPORT INFORMATION

Boeing warranty remedies are not available for the inspection given in this service bulletin.

### MANPOWER

Total Man-hours - 8 for each airplane without a horizontal stabilizer fuel tank, body fuel tank or auxiliary override/jettison pumps.
Elapsed Time - 4 Hours

Total Man-hours - 9 for each airplane with a horizontal stabilizer fuel tank.
Elapsed Time - 4.5 Hours

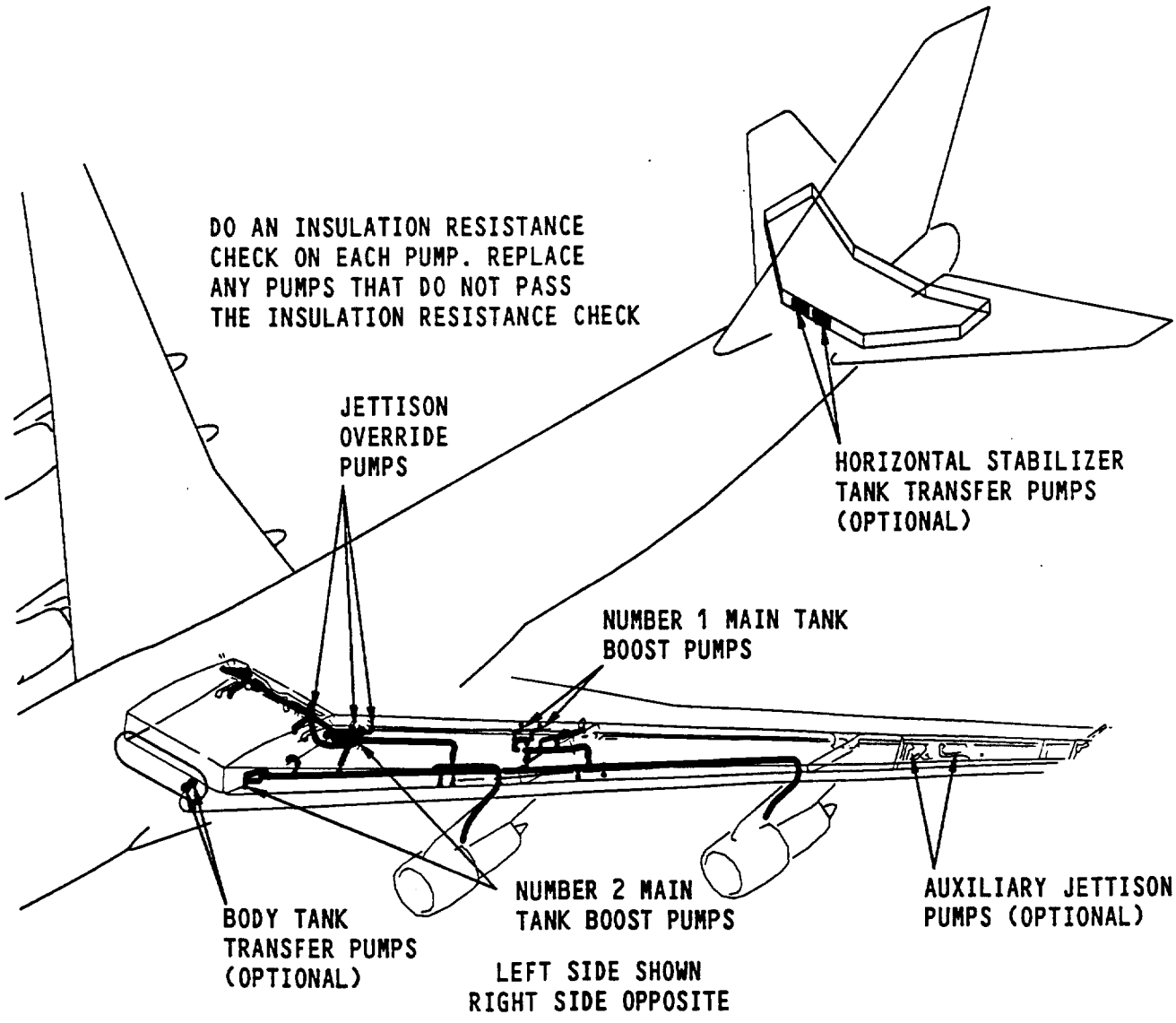
Total Man-hours - 10 for each airplane with auxiliary override/jettison pumps.
Elapsed Time - 5 Hours

Total Man-hours - 9 for each airplane with auxiliary body fuel tanks.
Elapsed Time - 4.5 Hours

K-2

**MATERIAL INFORMATION**

None




K-3

**Number:** 747-28A2194
Date: August 3, 1995
Revision 1: January 18, 1996
ATA System: 2822

**SUBJECT:** FUEL - DISTRIBUTION - FUEL BOOST AND OVERRIDE/JETTISON PUMPS - INSPECTION

## I. PLANNING INFORMATION

### A. Effectivity

1. Airplanes

Refer to Service Bulletin Index Document D6-30300, Part 3 for Airplane Variable Number, Line Number, and Serial Number data.

This service bulletin is for the airplanes shown below.

IDENTIFICATION BY CUSTOMER, CUSTOMER CODE, GROUP AND VARIABLE NUMBER

AAR AIRCRAFT TURBINE CENTER (RTC)
RB001

AER LINGUS (ARL)
RA203 RA501-RA502

AEROLINEAS ARGENTINAS (ARG)
RD122-RD127

AIR ATLANTA ICELANDIC (AID)
RA256 RD046

AIR CANADA (ACN)
RA743-RA745 RA749-RA750 RD531 RT101-RT103

AIR CHINA GROUP (BEJ)
RD781-RD783 RG164 RG211-RG213 RR451 RT031-RT033 RT876-RT880

AIR CLUB INTERNATIONAL (CLI)
RD045

AIR FRANCE (AFA)
RA252 RA257-RA259 RA262-RA263 RA265 RD271-RD272 RD651-RD655
RD657-RD659 RD721-RD722 RD791-RD792 RR302-RR309 RR331 RR332
RS751-RS752 RT071-RT075 RT121 RT591 RT711-RT716

AIR GABON S.A. (GBN)
RD661

AIR INDIA (AIN)
RA722-RA723 RA725-RA726 RA728-RA731 RD051 RS781-RS782 RU001-RU004

K-4

AIR MADAGASCAR (MAD)
RD561

AIR MAURITIUS LTD. (MAU)
RG162

AIR NEW ZEALAND, LTD. (ANZ)
RD471-RD475 RT671-RT673 RT703 RT932

ALITALIA (ALI)
RD181 RD451-RD456 RD751 RD753-RD755 RR561

ALL NIPPON AIRWAYS CO. LTD. (ANA)
RB683-RB697 RD231-RD235 RD461 RR551-RR556 RT751-RT755 RT776-RT777
RU831-RU841

AMERICAN INTERNATIONAL AIRWAYS, INC. (CKF)
RA521 RA523-RA525 RA635 RB002 RD201 RD203

AMIRI FLIGHT (ABD)
RH102

ARAB LEASING INTERNATIONAL (AAB)
RA115 RB102

ASIANA AIRLINES (AAR)
RR746-RR747 RT131-RT134 RU031-RU032

ATASCO USA, INC. (ATJ)
RA742 RA762 RB044

ATLAS AIR INC. (TLS)
RA253 RD044 RD642-RD643 RD646 RD691-RD692 RD752
RR204

AVIATION LEASING GROUP (ALW)
RA266

BOEING (TBC)
RA001

BRITISH AIRWAYS (BAB)
RA301-RA303 RA305-RA308 RA310 RA312-RA318 RB411-RB413 RD131-RD141
RD143 RD311 RT471-RT499 RU121-RU123

CAMEROON AIRLINES (CAM)
RD761

CANADIAN AIRLINES INTERNATIONAL LTD. (CDI)
RT701-RT702 RT704 RU059

CARGOLUX AIRLINES INTERNATIONAL S.A. (CLX)
RJ331-RJ333 RR301 RR701 RR721-RR722

CATHAY PACIFIC AIRWAYS, LTD. (CAT)
RD351-RD358 RR441-RR442 RR531 RR951-RR952 RS301-RS306 RT451-RT469

CHINA AIR LINES, INC. (CHI)
RD081-RD083 RD551 RG171-RG174 RR521-RR522 RT631-RT634 RT636

CITICORP AIRCRAFT MANAGEMENT, INC. (CIC)
RA559

CONTINENTAL AIRLINES, INC. (CAL)
RA217 RA551-RA552 RA561

CORSE AIR INTERNATIONAL (COR)
RA023 RA025 RA675 RA677 RG124 RS235

DUBAI AIR WING (DAW)
RG191 RG193

EGYPTAIR (EGP)
RS731-RS732

EL AL ISRAEL AIRLINES, LTD. (ELA)
RA781-RA784 RB007 RJ151-RJ152 RR225-RR226 RU081-RU083

EVA AIRWAYS CORPORATION (EVA)
RT161-RT166 RT951-RT954

EVERGREEN INTERNATIONAL AIRLINES (EVR)
RA004 RA022 RA028 RA113 RA631 RA633
RB604 RB607 RD041-RD042 RJ131 RJ133

FEDERAL EXPRESS (FED)
RR221-RR224 RR421

FLIGHTPLAN INTERNATIONAL, INC. (FLP)
RA003

GARUDA INDONESIAN AIRWAYS (GIA)
RD421-RD426 RT931 RU061-RU062

GATX CAPITAL CORPORATION (GAX)
RA030 RA216 RA245

GE CAPITAL AVIATION SERVICES, INC. (GEH)
RA005 RA009 RA632 RR504

GENERAL ELECTRIC CORP. (GEC)
RA016

GOVERNMENT OF JAPAN (JAG)
RT681-RT682

H.M. THE SULTAN'S FLIGHT (SFB)
RG009 RT440

IBERIA (LINEAS AEREAS DE ESPANA S.A.) (IBE)
RA585 RB421 RD431-RD435

INTERNATIONAL AIR LEASES (IAL)
RB006

K-6

IRAN AIR (IRN)
RA101-RA103 RA112 RA161-RA163 RB711 RD681-RD682 RG101-RG104
RJ301 RR001-RR004

IRAQI AIRWAYS (IRQ)
RG095 RJ302-RJ303

JAPAN AIRLINES (JAL)
RA526-RA528 RA532-RA535 RA537-RA548 RB721-RB723 RD055 RD221-RD227
RR261-RR262 RR265-RR267 RR361-RR362 RS001-RS002 RS251-RS259 RS263
RS265-RS268 RT641-RT657 RT861-RT864 RT966-RT967 RU801-RU809

KAZAKHSTAN AIRLINES (KAZ)
RG192

KLM ROYAL DUTCH AIRLINES (KLM)
RD381-RD383 RD601-RD607 RS711-RS713 RT001-RT011 RT531-RT535

KOREAN AIR LINES, INC. (KAL)
RD053 RD071-RD072 RD091 RD441-RD442 RG221-RG222 RJ132
RR021-RR025 RR201 RR336 RS291-RS292 RS786 RT061
RT571-RT586

KUWAIT AIRWAYS CORPORATION (KUW)
RD202 RD204 RT151

LUFTHANSA GERMAN AIRLINES (DLH)
RD182-RD183 RD291-RD292 RD641 RD644-RD645 RD647-RD649 RD771-RD775
RR202-RR203 RR205-RR206 RT041-RT047 RT431-RT439 RT441

MALAYSIAN AIRLINES SYSTEM BERHAD (MAS)
RD142 RD144 RS771 RT021-RT022 RT741-RT750

MARTINAIR HOLLAND N.V. (MTH)
RJ321-RJ322 RR310

MIDDLE EAST AIRLINES S.A. (MEA)
RD622-RD623

NASA (NAS)
RA908 RB601

NORTH AMERICAN AIRLINES, INC. (NNA)
RB043

NORTHWEST AIRLINES, INC. (NWA)
RA351 RA353 RA358 RA369-RA373 RD241-RD243 RD251-RD262
RR005 RR341-RR345 RR431-RR432 RT401-RT410

OKADA AIR (OKD)
RA522

OLYMPIC AIRWAYS (OLY)
RD022 RD048-RD050

PAKISTAN INTERNATIONAL AIRLINES CORP. (PIA)
RD003-RD004 RD101-RD104 RD701-RD702

K-7

PANAIR, INC. (PNR)
RG122

PHILIPPINE AIRLINES, INC. (PAL)
RD171-RD172 RD411-RD414 RD592-RD593 RE001 RU051-RU052 RU060

POLAR AIR CARGO (PAO)
RA007 RA013 RA027 RA401-RA405 RA634 RB041

POTOMAC CAPITAL INVESTMENT CORP. (PCI)
RA671

PS GROUP, INC. (PSG)
RA910 RA914

QANTAS AIRWAYS, LTD. (QAN)
RD517-RD519 RD532-RD533 RH111-RH112 RS271-RS276 RT551-RT568

QATAR AIRWAYS (QTA)
RB681-RB682

ROYAL AIR MAROC (RAM)
RD671 RT717

ROYAL FLIGHT OMAN (GOVT. OF OMAN) (RFO)
RG161 RG163

SABENA S.A. (SAB)
RS761-RS762

SAUDI ARABIAN AIRLINES CORP. (SVA)
RB741-RB748 RH121 RR526 RS311-RS320

SAUDI ROYAL FLIGHT (SRF)
RH101 RH122 RS699

SINGAPORE AIRLINES, LTD (SIA)
RD056-RD059 RR503 RR566 RR851-RR853 RS231-RS234 RS237-RS241
RS741-RS743 RT501-RT529

SOUTH AFRICAN AIRWAYS (SAA)
RB071-RB075 RD741 RG121 RG123 RG125-RG126 RS211-RS212
RS236 RT781-RT784

SOUTHERN AIR TRANSPORT, INC. (STT)
RD043 RR263-RR264 RR501

SWISSAIR (SWS)
RS221-RS222 RS701-RS703

SYRIAN ARAB AIRLINES (SYR)
RG141-RG142

S583 (583)
RD166-RD167

THAI AIRWAYS INT'L PUBLIC CO., LTD. (TII)
RD361-RD366 RS341-RS342 RT691-RT698

K-8

THE AGES GROUP (AGJ)
RB004

THE CIT GROUP/CAPITAL FINANCE CO. (TCI)
RD621

TOWER AIR, INC. (TOW)

| | | | | | |
|---|---|---|---|---|---|
| RA012 | RA015 | RA024 | RA034 | RA106 | RA201 |
| RA309 | RA311 | RB003 | RB005 | RB042 | RD001-RD002 |
| RD047 | RD052 | RD054 | RD571 | | |

TRANS WORLD AIRLINES, INC. (TWA)

| | | | | | |
|---|---|---|---|---|---|
| RA104-RA105 | RA107-RA110 | RA114 | RA164 | RA581-RA582 | RA651 |
| RA674 | RD021 | | | | |

UNITED AIR LINES, INC. (UAL)

| | | | | | |
|---|---|---|---|---|---|
| RA406-RA418 | RA903-RA907 | RB010-RB012 | RD301-RD302 | RD513-RD516 | RG001-RG007 |
| RG091 | RT411-RT412 | RT601-RT622 | | | |

UNITED PARCEL SERVICE (UPS)

| | | | | | |
|---|---|---|---|---|---|
| RA006 | RA026 | RA029 | RA033 | RA901-RA902 | RA911-RA913 |
| RA915-RA916 | RB605 | | | | |

USAF - 747 E-4B PROGRAM (UO1)
RB013-RB016

VARIG AIRLINES (VAR)

| | | |
|---|---|---|
| RD581-RD583 | RS331-RS333 | RS721-RS722 |

VIRGIN ATLANTIC AIRWAYS LTD. (VAA)

| | | | | | |
|---|---|---|---|---|---|
| RA560 | RA702 | RA909 | RB008-RB009 | RD121 | RT945-RT946 |

WILMINGTON TRUST CO. (WTC)
RA002

WORLDWIDE AIRCRAFT HOLDING CO (WAH)
RG008

K-9

IDENTIFICATION BY VARIABLE NUMBER

| | | | | | |
|---|---|---|---|---|---|
| RA001-RA034 | RA101-RA115 | RA161-RA164 | RA201-RA203 | RA216-RA217 | RA245-RA246 |
| RA251-RA266 | RA301-RA318 | RA351-RA360 | RA369-RA373 | RA401-RA418 | RA501-RA502 |
| RA521-RA528 | RA532-RA548 | RA551-RA552 | RA559-RA561 | RA581-RA582 | RA585 |
| RA601-RA602 | RA631-RA635 | RA651-RA652 | RA671-RA677 | RA701-RA702 | RA721-RA731 |
| RA741-RA745 | RA749-RA750 | RA761-RA762 | RA781-RA784 | RA901-RA916 | RB001-RB016 |
| RB041-RB044 | RB071-RB075 | RB101-RB102 | RB411-RB413 | RB421 | RB601-RB607 |
| RB681-RB697 | RB711 | RB721-RB723 | RB741-RB748 | RD001-RD004 | RD021-RD022 |
| RD041-RD059 | RD071-RD072 | RD081-RD083 | RD091-RD092 | RD101-RD104 | RD121-RD127 |
| RD131-RD144 | RD166-RD167 | RD171-RD172 | RD181-RD183 | RD201-RD204 | RD221-RD227 |
| RD231-RD235 | RD241-RD243 | RD251-RD262 | RD271-RD272 | RD291-RD292 | RD301-RD302 |
| RD311 | RD351-RD358 | RD361-RD366 | RD381-RD383 | RD411-RD414 | RD421-RD426 |
| RD431-RD435 | RD441-RD442 | RD451-RD456 | RD461 | RD471-RD475 | RD513-RD519 |
| RD531-RD533 | RD551 | RD561 | RD571 | RD581-RD583 | RD591-RD593 |
| RD601-RD607 | RD621-RD623 | RD641-RD649 | RD651-RD659 | RD661 | RD671 |
| RD681-RD682 | RD691-RD692 | RD701-RD702 | RD721-RD722 | RD741-RD742 | RD751-RD755 |
| RD761 | RD771-RD775 | RD781-RD783 | RD791-RD792 | RE001 | RG001-RG009 |
| RG091 | RG095 | RG101-RG104 | RG121-RG126 | RG141-RG142 | RG161-RG164 |
| RG171-RG174 | RG191-RG193 | RG211-RG213 | RG221-RG222 | RH101-RH102 | RH111-RH112 |
| RH121-RH122 | RJ131-RJ133 | RJ151-RJ152 | RJ301-RJ303 | RJ321-RJ322 | RJ331-RJ333 |
| RR001-RR005 | RR021-RR025 | RR031 | RR201-RR206 | RR221-RR226 | RR261-RR267 |
| RR301-RR310 | RR331-RR332 | RR336 | RR341-RR345 | RR361-RR362 | RR421-RR422 |
| RR431-RR432 | RR441-RR442 | RR451 | RR501-RR504 | RR521-RR522 | RR526 |
| RR531 | RR551-RR556 | RR561 | RR566 | RR701 | RR721-RR722 |
| RR746-RR747 | RR851-RR853 | RR951-RR952 | RS001-RS002 | RS201 | RS211-RS212 |
| RS221-RS222 | RS231-RS241 | RS251-RS259 | RS263 | RS265-RS268 | RS271-RS276 |
| RS291-RS292 | RS301-RS306 | RS311-RS320 | RS331-RS333 | RS341-RS342 | RS699 |
| RS701-RS703 | RS711-RS713 | RS721-RS722 | RS731-RS732 | RS741-RS743 | RS751-RS752 |
| RS761-RS762 | RS771 | RS781-RS782 | RS786 | RT001-RT011 | RT021-RT022 |
| RT031-RT033 | RT041-RT047 | RT061 | RT071-RT075 | RT101-RT103 | RT121 |
| RT131-RT134 | RT151 | RT161-RT166 | RT401-RT412 | RT431-RT441 | RT451-RT469 |
| RT471-RT499 | RT501-RT529 | RT531-RT535 | RT551-RT568 | RT571-RT586 | RT591 |
| RT601-RT622 | RT631-RT636 | RT641-RT657 | RT671-RT673 | RT681-RT682 | RT691-RT698 |
| RT701-RT704 | RT711-RT717 | RT741-RT755 | RT776-RT777 | RT781-RT784 | RT861-RT864 |
| RT876-RT880 | RT931-RT932 | RT945-RT946 | RT951-RT954 | RT966-RT967 | RU001-RU004 |
| RU031-RU032 | RU051-RU052 | RU059-RU062 | RU081-RU083 | RU121-RU123 | RU801-RU809 |
| RU831-RU841 | | | | | |

2. Spares

None

K-10

**B. Reason**

This inspection will make sure the 747 fuel pumps will not cause a fuel leak.

Operators have sent reports of fuel leaks at the fuel boost and override/jettison pumps. The reports tell that eight fuel pumps have been removed for this reason. The removed fuel pumps had between 34,000-67,000 hours since new or since overhaul. The leaks occurred at the pump/wire bundle interface. The result of one leak was a fire at an inboard main tank jettison pump during maintenance.

It is believed that after a long time, water can get inside the potting of the wire terminal assembly and cause corrosion. The corrosion in the wire terminal assembly can cause arcing between the power pins and the pump case. The arcing causes thermal expansion of the materials inside the cap. This expansion causes failure of the cap attachment flange or the attaching screws and a subsequent fuel leak.

High current during arcing can also melt a hole through the pump end case and connector, which also causes a fuel leak.

This service bulletin will test the pump wiring insulation resistance to make sure that no conductive corrosion is in the wire terminal assembly.

Revision 1 is sent to add a check of the boost pump ground wire to the accomplishment instructions, add an A-check inspection interval to the Compliance paragraph and add an optional off-wing inspection of the fuel pumps. The accomplishment instructions format has been changed to agree with Service Bulletin 757-28A0043. The data given in Notice of Status Change 747-28A2194 NSC 1 is included in this revision.

**C. Description**

Get access to all of the 747 fuel pumps. Do an insulation resistance check on each pump. Replace any pumps that do not pass the insulation resistance check.

Revision 1 - No more work is necessary on airplanes changed as shown in the initial release of this service bulletin.

PLEASE SEND A REPORT OF YOUR INSPECTION PROGRAM. ALSO, SEND THE INSPECTION RESULTS WHEN EACH INSPECTION IS COMPLETE.

SEND TO: BOEING COMMERCIAL AIRPLANE GROUP
ATTENTION: MANAGER, AIRLINE SUPPORT

**D. Compliance**

Boeing recommends that the initial inspection be accomplished at the next opportunity when manpower and facilities are available. For pumps with insulation resistance between 1 and 5 megohms when the 500VDC is done, it is recommended that the pump be replaced. If the pump is not replaced, do the inspection of this pump at every A-check or an equivalent time. For pumps with insulation resistance greater than 5 megohms when the 500VDC is done, the inspection should be repeated at every C-check or an equal time period after the initial inspection.

**E. Approval**

This service bulletin was examined by the Federal Aviation Administration (FAA). The changes specified in this service bulletin comply with the applicable Federal Aviation Regulations (FAR) and are FAA approved. This service bulletin and the FAA approval were based on the airplane in its original Boeing delivery configuration or as modified by other FAA approved Boeing changes.

K-11

If an airplane has a non-Boeing modification or repair that affects a component or system also affected by this service bulletin, the operator is responsible for obtaining appropriate regulatory agency approval before incorporating this service bulletin.

**F. Industry Support Information**

Boeing warranty remedies are not available for the inspection given in this service bulletin.

K-12

**G. Manpower**

Approximately 8 man-hours and 2 persons are necessary to do this inspection for each airplane without a horizontal stabilizer fuel tank, body fuel tank or auxiliary override/jettison pumps.

Approximately 9 man-hours and 2 persons are necessary to do this inspection for each airplane with a horizontal stabilizer fuel tank.

Approximately 10 man-hours and 2 persons are necessary to do this inspection for each airplane with auxiliary override/jettison pumps.

Approximately 9 man-hours and 2 persons are necessary to do this inspection for each airplane with an auxiliary body fuel tank.

This estimate is for direct labor only, done by an experienced crew. Adjust the estimate with operator man-hour data if necessary. The estimate does not include lost time. These are some examples of lost time:

- Time to adjust to the workplace
- Time to schedule the work
- Time to examine the work
- Time to cure the materials
- Time to make the parts
- Time to find the tools.

**H. Material - Price and Availability**

None

**I. Special Tools - Price and Availability**

None

**J. Weight and Balance**

None

K-13

**K. References**

1. Existing Data:

   a. 747 Maintenance Manual (AMM) Subject 20-41-01, 28-22-03 and 28-31-01

   b. 747-400 Maintenance Manual (AMM) Subject 20-41-01, 28-17-04, 28-22-03 and 28-31-01

   c. Standard Wiring Practices Manual (SWPM) Subject 20-20-00 and 20-60-01

   d. 747 Corrosion Prevention Manual (D6-41910) Subject 20-40-00

2. Data supplied with this service bulletin:

   None

3. Installation Drawings:

   None

**L. Publications Changed**

None

**M. Electrical Load Data**

Not changed

## II. MATERIAL INFORMATION

### A. Parts Necessary For Each Airplane

New O-rings are necessary if any fuel pumps are removed or replaced. Refer to the Accomplishment Instructions, Note 2, Table 1 for the necessary AMM subjects to get the O-ring part numbers.

### B. Parts Necessary to Change Spares

None

### C. Special Tools and Equipment

1. A special megohmmeter is necessary to do the electrical check of the fuel pump on the airplane. The megohmmeter must have 10VDC and 500VDC voltage supply options with a maximum short circuit current of 5 milliamperes. We use a QuadTech model 1864 megohmmeter. Any equivalent meter is acceptable. The QuadTech model 1864 is available from:

   QuadTech (OPK96)
   100 Nickerson Road
   Marlborough, Massachusetts USA 01752-4696
   Attention: Tom Skarbek
   Phone: (800) 253-1230 or (508) 485-3500
   Facsimile: (508) 485-0295

   NOTE: Test equipment for the low voltage on-wing safety check must be limited to a maximum short circuit power dissipation of 0.05 Watts. Test equipment for the high voltage on-wing check must be limited to a maximum short circuit power dissipation of 2.5 Watts.

2. A standard megohmmeter like the General Radio 1644A, or equivalent, may be used if the insulation resistance test is done off of the airplane.

### D. Existing Parts Accountability

None

K-15

## III. ACCOMPLISHMENT INSTRUCTIONS

NOTES:

1. The paragraphs identified with a letter give the general work instructions and the necessary tests.
2. To replace a fuel pump, refer to Table 1 for the necessary maintenance manual procedure.

TABLE 1

| PUMP NAME | AMM REFERENCE | QTY | NOTES |
|---|---|---|---|
| Boost Pump | 747 AMM 28-22-03 | 8 | |
| | 747-400 AMM 28-22-03 | 8 | |
| Jettison/Override Pump | 747 AMM 28-31-01 | 6/10 | 747 airplanes with auxiliary override/jettison pumps have 4 additional pumps (2 each) in the outboard reserve tanks. |
| | 747-400 AMM 28-31-01 | 6 | |
| Horizontal Stabilizer Transfer Pump | 747-400 AMM 28-17-04 | 2 | 747-400 airplanes with horizontal stabilizer tail fuel. |
| Body Tank Transfer Pump | 747 AMM 28-22-03 | 2/4 | 747 airplanes with body fuel tanks installed. |

3. Send any fuel pump that does not pass the visual inspection or the insulation resistance test to a maintenance repair facility. At the maintenance repair facility, do the inspection procedure for insulation resistance given in the applicable component maintenance manual.
4. Obey all of the warnings and cautions given in the specified manual sections.

A. Make sure that the airplane is in an area which permits air to circulate freely.

B. Make sure that fire fighting equipment is available near the test location.

C. Make sure that the airplane and work stands are grounded. Refer to the 747 or 747-400 AMM 20-41-01, Static Ground Procedure.

D. For all 747 airplanes except the 747-400, open these circuit breakers:

1. On the P14 panel, open these circuit breakers and attach DO-NOT-CLOSE tags:

a. C00801, FUEL BOOST PMP MAIN AFT 1

b. C00803, FUEL BOOST PMP MAIN AFT 2

c. C00809, FUEL BOOST PMP MAIN FWD 3

d. C00811, FUEL BOOST PMP MAIN FWD 4

e. C00835, FUEL OVRD/JTSN PUMP CTR LEFT

f. C00833, FUEL OVRD/JTSN PUMP FWD 2

K-16

g. C00838, FUEL OVRD/JTSN PUMP FWD 3

h. C01673, PUMP JETT OVRD AUX TK 1 OUTBD (RD121 and RJ151 only)

i. C01674, PUMP JETT OVRD AUX TK 4 OUTBD (RD121 and RJ151 only)

j. C01688, XFR PUMP 1 FWD BODY TK (RA161-RA163, RD225-RD227, RD231-RD235, RD301-RD302, RS318-RS320 and RS699 ONLY)

k. C01689, XFR PUMP 1 AFT BODY TK (RA161-RA163 only)

2. On the P15 panel, open these circuit breakers and attach DO-NOT-CLOSE tags:

a. C00802, FUEL BOOST PMP MAIN FWD 1

b. C00804, FUEL BOOST PMP MAIN FWD 2

c. C00808, FUEL BOOST PMP MAIN AFT 3

d. C00810, FUEL BOOST PMP MAIN AFT 4

e. C00836, FUEL OVRD/JTSN PUMP CTR RIGHT

f. C00834, FUEL OVRD/JTSN PUMP AFT 2

g. C00837, FUEL OVRD/JTSN PUMP AFT 3

h. C01671, PUMP JETT OVRD AUX TK 1 INBD (RD121 and RJ151 only)

i. C01672, PUMP JETT OVRD AUX TK 4 INBD (RD121 and RJ151 only)

j. C01690, XFR PUMP 2 FWD BODY TK (RA161-RA163, RD225-RD227, RD231-RD235, RD301-RD302, RS318-RS320 and RS699 ONLY)

k. C01691, XFR PUMP 2 AFT BODY TK (RA161-RA163 only)

For the 747-400, open these circuit breakers:

1. On the P414 panel, open these circuit breakers and attach DO-NOT-CLOSE tags:

a. C00801, FUEL BOOST PMP MAIN AFT 1, position B5

b. C00803, FUEL BOOST PMP MAIN AFT 2, position R18

c. C00809, FUEL BOOST PMP MAIN FWD 3, position J5

d. C00811, FUEL BOOST PMP MAIN FWD 4, position A8

e. C00835, FUEL OVRD/JTSN PUMP CTR LEFT, position D2

f. C00833, FUEL OVRD/JTSN PUMP FWD 2, position C2

g. C00838, FUEL OVRD/JTSN PUMP FWD 3, position C5

2. On the P415 panel, open these circuit breakers and attach DO-NOT-CLOSE tags:

a. C00802, FUEL BOOST PMP MAIN FWD 1, position B35

K-17

b. C00804, FUEL BOOST PMP MAIN FWD 2, position G29

c. C00808, FUEL BOOST PMP MAIN AFT 3, position M29

d. C00810, FUEL BOOST PMP MAIN AFT 4, position A35

e. C00836, FUEL OVRD/JTSN PUMP CTR RIGHT, position M32

f. C00834, FUEL OVRD/JTSN PUMP AFT 2, position A38

g. C00837, FUEL OVRD/JTSN PUMP AFT 3, position B38

3. For airplanes with a horizontal stabilizer fuel tank, open these circuit breakers on the P85 panel and attach DO-NOT-CLOSE tags:

a. C3141, HORIZ STAB XFER/JETT PUMP L

b. C3142, HORIZ STAB XFER/JETT PUMP R

E. Get access to the airplane fuel pumps. Refer to Table 1 for the fuel pump AMM references. In the applicable AMM subjects, do the steps necessary to get access to the fuel pump electrical connector.

F. Do a visual inspection of the wire terminal assembly, the electrical connector and the wire insulation on the fuel pump.

1. Examine the pump for the following conditions:

a. Signs of a fuel leak

b. Signs of heat discoloration

NOTE: Clean the cap as given in Boeing Standard Wiring Practices Manual 20-60-01 after the inspection for heat discoloration.

c. Signs of bulges, bent flanges, broken screw, medium to heavy corrosion damage (as specified in the 747 Corrosion Prevention Manual Subject 20-40-00, Part I, General Information - Corrosion Removal Techniques, Paragraph 3.A), etc.

2. If the results of the visual examination of the fuel pump are:

a. None of the conditions in paragraph F.1 are found, go to paragraph G.

b. One or more of the conditions in paragraph F.1 are found,

1) Replace the fuel pump.

2) Go to paragraph G.

G. Do an insulation test of the fuel pump.

1. Disconnect the electrical connector of the fuel pump.

2. Use a AVTRON Model T477W bonding meter or an equivalent ohmmeter. Refer to Boeing Standard Wiring Practices Manual 20-20-00, paragraph I.

3. Use the ohmmeter to measure the resistance between pin 4 of the electrical connector installed on the pump and the braided bonding jumper. The braided bonding jumper is installed between the pump motor impeller and the airplane structure.

K-18

NOTE: The measurement between pin 4 and the bonding jumper is a continuity check, not a bonding resistance check.

a. Record the resistance measured between pin 4 and the braided bonding jumper on the data sheet shown in Figure 2.

b. If the resistance is less than or equal to 10 ohms, continue the test. Go to paragraph G.4.

c. If the resistance is more than 10 ohms, replace the fuel pump. Go to paragraph G.2 and do the insulation resistance test on the replacement pump.

4. This insulation resistance test can be done on the airplane with the fuel pumps installed or off of the airplane with the fuel pumps removed.

a. If the insulation resistance test is done on the airplane use a QuadTech megohmmeter, or equivalent, with the specifications given in paragraph II.C.1. Set the megohmmeter for 10 VDC and go to step G.5.

CAUTION: The fuel pumps are in flammable leakage zones. Each pump is tested at 10 VDC before it is tested at 500 VDC. The 10 VDC test is to find fuel pumps with low insulation resistance that can arc or overheat when a high voltage is applied. the results of the 10 VDC test determine if the 500 VDC test is done on a fuel pump installed on the airplane.

b. If the insulation resistance test is done off of the airplane use a megohmmeter with the specifications given in either paragraph II.C.1 or II.C.2. This test must be done in less than two hours after the pump is removed. Go to step G.6.

5. Use the megohmmeter to measure the resistance between pin 4 and each of pins 1, 2 and 3 of the electrical connector installed on the pump.

a. Record each resistance measured between pin 4 and pins 1, 2 and 3 on the data sheet shown in Figure 2.

b. If each resistance measured between pin 4 and pins 1, 2 and 3 is equal to or greater than 1 megohm, go to paragraph G.6.

c. If any resistance measured between pin 4 and pins 1, 2 and 3 is less than 1 megohm, replace the fuel pump. Go to paragraph G.2 and do the insulation resistance test on the replacement fuel pump.

6. Set the megohmmeter for 500 VDC.

7. Use the megohmmeter to measure the resistance between pin 4 and each of pins 1, 2 and 3 of the electrical connector installed on the pump.

a. Record each resistance measured between pin 4 and pins 1, 2 and 3 on the data sheet shown in Figure 2.

b. If each resistance measured between pin 4 and pins 1, 2 and 3 is equal to or greater than 5 megohm, go to paragraph G.8.

c. If any resistance measured between pin 4 and pins 1, 2 and 3 is below 1 megohm, replace the fuel pump. For pumps that have an insulation resistance from 1 to 5 megohms, it is recommended that the pump be replaced. If the pump is not replaced, do this test on the pump at every A-check or an equivalent time. If the pump was replaced go to paragraph G.2 and do the insulation resistance test on the replacement fuel pump. If the pump was not replaced go to Paragraph G.8.

K-19

8. If the pump was removed to do this test, install the pump. Refer to the AMM as specified in Table 1 to get the necessary instructions.

   NOTE: New O-rings are required to install the fuel pump. Refer to the AMM as specified in Table 1 to get the part numbers for the O-rings.

   If the pump was not removed to do this test, connect the electrical connector of the fuel pump.

9. Make sure all the fuel pumps are visually inspected and tested for insulation resistance.

   a. If all fuel pumps had the visual inspection and insulation resistance test done, the visual inspection and insulation resistance test are completed. Go to paragraph H.

   b. If the visual inspection and insulation resistance test was not done on any fuel pump, do a visual and insulation resistance test on the pump that is not tested. Go to paragraph F.1.

H. Remove the DO-NOT-CLOSE identifiers and close the circuit breakers that were opened in Paragraph D.

I. Put the airplane back into serviceable condition.

K-20

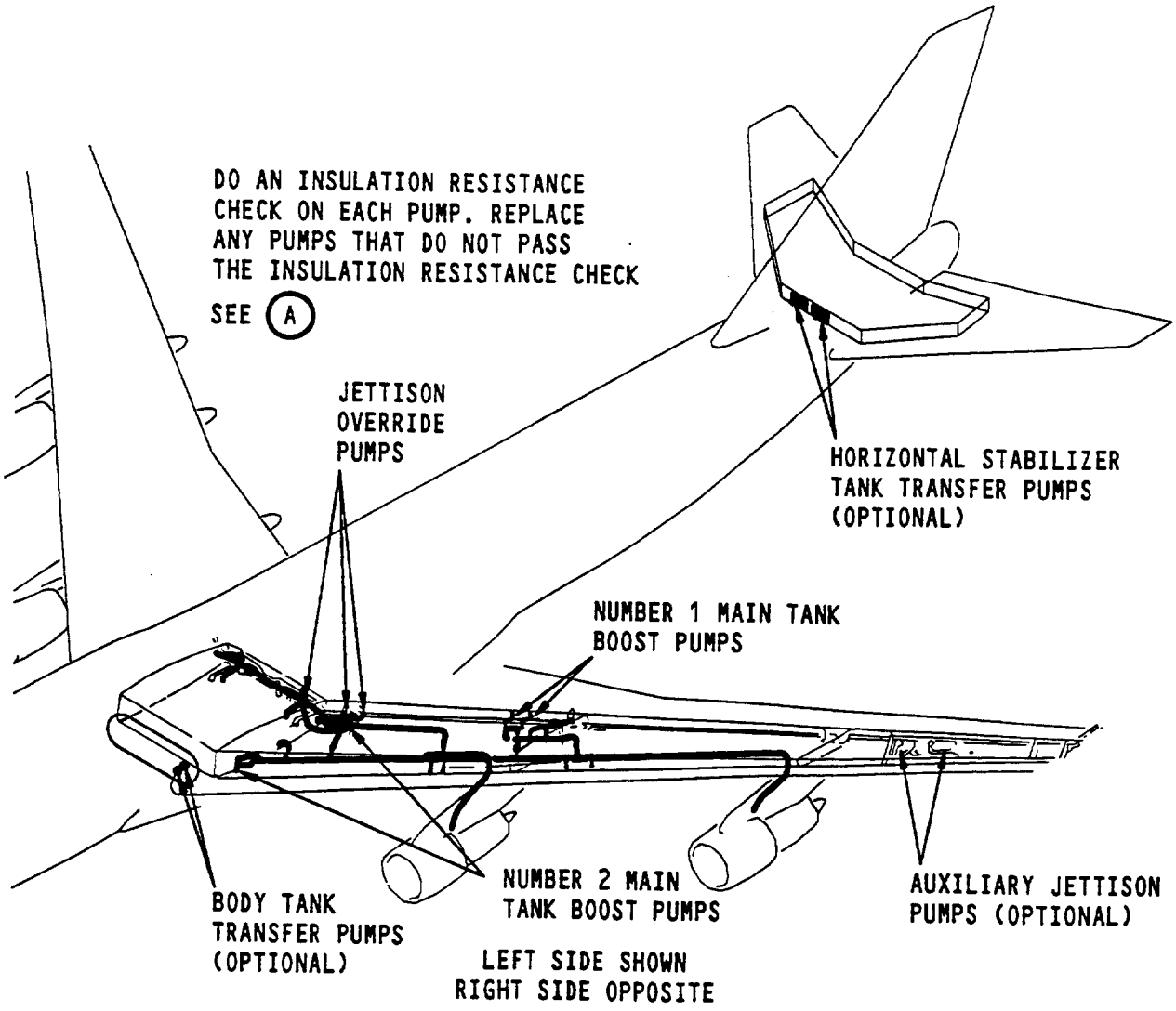
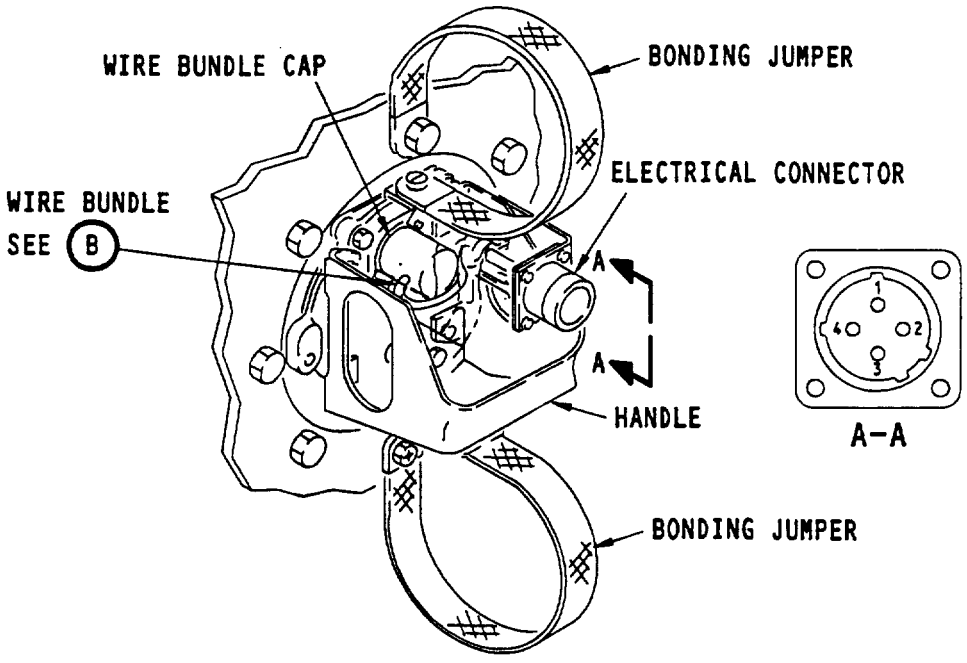


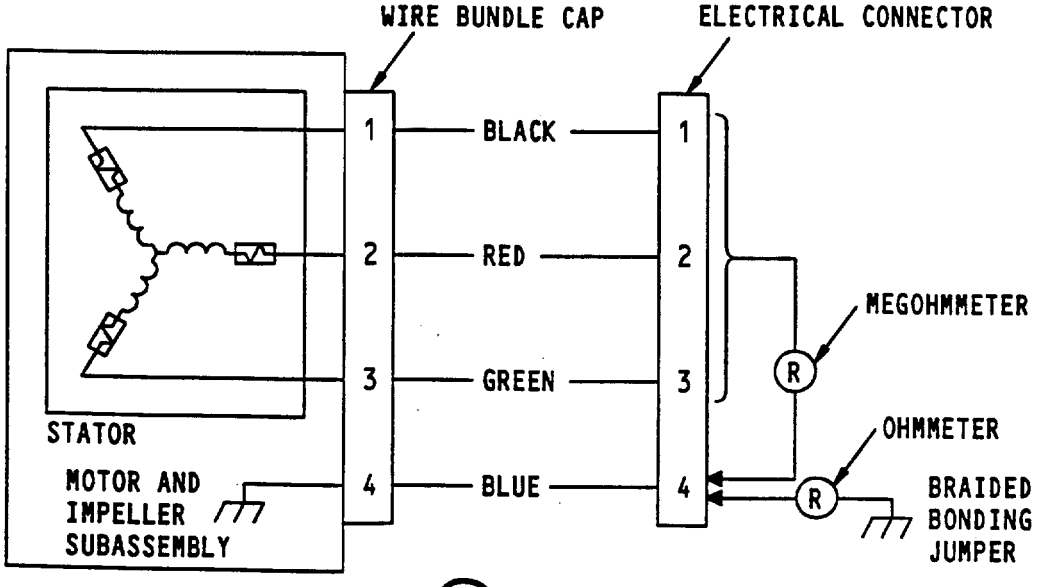

FIGURE 1. AIRPLANE FUEL PUMP INSPECTION

K-21




TYPICAL

A




B

R50681

FIGURE 1. AIRPLANE FUEL PUMP INSPECTION

K-22

BLANK PAGE

FIGURE 1. AIRPLANE FUEL PUMP INSPECTION

K-23

| 747 FUEL PUMP INSPECTION DATA SHEET | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AIRPLANE TAIL NBR: | | HRS/CYCLES: | | DATE: | | | | | | | | |
| PUMP NAME | INSTALLED PUMP | | | GRND RESIS TANCE IN OHMS | RESISTANCE IN MEGOHMS (INSULATION CHECK) | | | | | | NEW PUMP (IF NECESSARY) | |
| | | | | | 10 VDC | | | 500 VDC | | | | |
| | PART NBR. | SERIAL NBR. | TSO/TSN OVHL/NEW | PIN 4 | PIN 1 | PIN 2 | PIN 3 | PIN 1 | PIN 2 | PIN 3 | PART NBR. | SERIAL NBR. |
| NBR 1 MAIN FWD BOOST PUMP | | | | | | | | | | | | |
| NBR 1 MAIN AFT BOOST PUMP | | | | | | | | | | | | |
| NBR 2 MAIN FWD BOOST PUMP | | | | | | | | | | | | |
| NBR 2 MAIN AFT BOOST PUMP | | | | | | | | | | | | |
| NBR 2 MAIN OUTBOARD OVRD/JETTISON PUMP | | | | | | | | | | | | |
| NBR 2 MAIN INBOARD OVRD/JETTISON PUMP | | | | | | | | | | | | |
| CTR WING TANK LEFT OVRD/JETTISON PUMP | | | | | | | | | | | | |
| CTR WING TANK RIGHT OVRD/JETTISON PUMP | | | | | | | | | | | | |
| NBR 3 MAIN FWD BOOST PUMP | | | | | | | | | | | | |
| NBR 3 MAIN AFT BOOST PUMP | | | | | | | | | | | | |

FIGURE 2. DATA SHEET







K-OH

| | INSTALLED PUMP | | | RESISTANCE IN OHMS | RESISTANCE IN MEGOHMS | | | | | | NEW PUMP (IF NECESSARY) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 10 VDC | | | 500 VDC | | | | |
| PUMP NAME | PART NBR. | SERIAL NBR. | TSO/TSN OVHL/NEW | PIN 4 | PIN 1 | PIN 2 | PIN 3 | PIN 1 | PIN 2 | PIN 3 | PART NBR. | SERIAL NBR. |
| NBR 3 MAIN OUTBOARD OVRD/JETTISON PUMP | | | | | | | | | | | | |
| NBR 3 MAIN INBOARD OVRD/JETTISON PUMP | | | | | | | | | | | | |
| NBR 4 MAIN FWD BOOST PUMP | | | | | | | | | | | | |
| NBR 4 MAIN AFT BOOST PUMP | | | | | | | | | | | | |
| HORIZONTAL STAB TANK LEFT TRANSFER PUMP | | | | | | | | | | | | |
| HORIZONTAL STAB TANK RIGHT TRANSFER PUMP | | | | | | | | | | | | |
| INSERT DATA FOR ANY BODY TANK TRANSFER PUMPS OR RESERVE TANK OVERRIDE/JETTISON PUMPS IN THE LINES THAT FOLLOW: | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

FIGURE 2. DATA SHEET

PLEASE SEND TO:

BOEING COMMERCIAL AIRPLANE GROUP
ATTN: ROY COTTON M/S 04-EC
P.O. BOX 3707
SEATTLE, WASHINGTON 98124-2207

BOEING

Commercial Airplane Group

747 Service Bulletin

**Number:** 747-28A2194
Date: August 3, 1995
Revision 1: January 18, 1996
ATA System: 2822
Prepared By: Bill Bottenberg

## Evaluation Form

**SUBJECT:** FUEL - DISTRIBUTION - FUEL BOOST AND OVERRIDE/JETTISON PUMPS - INSPECTION

Use this evaluation form to tell us what you think of the quality of this service bulletin. We will use the data that you give us to improve the quality of our service bulletins. Please include data about these or other items:

- Did this service bulletin meet your estimate of quality?
- How easy is this service bulletin to understand?
- Are the Planning Information, Material Information and Accomplishment Instructions satisfactory?
- Will you do this service bulletin fully? If not, please tell us why.
- Is the Manpower estimate satisfactory?

NOTE: Please do not use this evaluation form to tell us to make changes to your manuals. To make these changes, please use a Publication Change Request (PCR) form.

Please give us this data:

OPERATOR: _____ TODAY'S DATE: _____

PREPARED BY: _____ TITLE: _____

ORGANIZATION: _____ TELEX CODE: _____

TELEPHONE NUMBER: _____ BASE: _____

COMMENTS: _____

If necessary, please use the other side. Thank you for the time you used to give us your comments.

Give the completed evaluation form to your Boeing Field Service Representative or send the evaluation form directly to this address:

T.J. Taylor, Manager
Service Bulletin Engineering
Boeing Commercial Airplane Group
P.O. Box 3707, Mail Stop 20-85
Seattle, WA 98124-2207