

LINE MAINTENANCE

<u>Item No</u>	<u>LRU Name</u>	<u>LRU Part Number</u>	<u>Vendor Name</u>	<u>Aircraft Type</u>	<u>ATA Code</u>	<u>From</u>
1	Aircraft Logbooks		All	All	23-30	MASC

The evolution of electronic technology would allow aircraft maintenance technicians to record the work performed in an electronic maintenance (aircraft) logbook. The electronic logbook would have the obvious benefits of being digital and the ability to handle, share, transmit, store, etc., the data as we do any computer file. There are also some important cost savings for maintenance organizations.

Do any airlines already use electronic logbooks for their primary maintenance service records?

Do any airlines already use electronic logbooks as alternate maintenance service records?

Which regulatory authorities allow such electronic records?

NESSLE/LUFTHANSA – We are part of a working group working on electronic logbooks. We would like to see a standard for logbook, bearing in mind that different maintenance organizations doing line maintenance, base maintenance, and heavy maintenance should be able to work with the different logbook systems of the different airlines and aircraft manufacturers. This is an aim for the future to get a standard. We are trying to work with Airbus and Boeing to do so.

On whether an authority would allow such electronic records—there is for example in the JAA Regulations a statement that logbooks could be electronic or paper. I think it would be no major problem to get a certification. Yesterday, we saw that FedEx is doing it in this way.

SHARP/QANTAS – We are still using paper logbooks, although we do transfer them to computer records, as I'm sure a lot of other people do and we use real time ACARS for computer records. However, as to acceptance, we use ACARS to transfer the pilot recency records in real time. We do not have any paper backup unless there is something wrong with the ACARS system. For pilot recency our regulatory authority accepts this.

GLAPA/AIRBUS – As part of the Condor Aircraft Information Network project, Condor and Lufthansa contacted Airbus in 1998 to promote the e-logbook concept. The ultimate goal for Lufthansa, as for the other airlines, is to get the e-logbook approach and philosophy compatible with Airbus and Boeing aircraft. In 1998, Airbus launched a working group to define as a first step high-level software requirements for digital logbooks. During the five meetings, including Air Canada, Air France, Swissair, United Airlines, and Lufthansa, the group has set up a document that lists the following main items:

- Functional requirements
 - Data base content
 - System architecture
 - Guideline for human and machine interface
 - Customization
1. In a second step based on this document, the following action plan for 2001 has been setup by the working group:
 - A. To reach an e-logbook approach compatible with Airbus and Boeing aircraft. Two airlines participating in the working group have contacted Boeing with the objective of promoting the definition of a joint Airbus/Boeing e-logbook principle.
 - B. On the Airbus side, as part of the Airbus Inflight Information Services (AFIS) project available for the A340-500, -600, and A318, we are scheduled to develop in 2002-2003 an e-logbook application that will be hosted on the onboard server.

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DARTEYRE/AIRBUS – I'd like to focus on this e-logbook program which is part of the Airbus business I presented yesterday, so it really fits. It is a product that is going to be very compatible to the one I showed yesterday about maintenance. Of course, when you act with the maintenance, you are very interested to get the feedback from the pilots. So, it gives me the occasion to tell you that I have a brochure available.

BOUCHARD/FEDEX – To reiterate what we said yesterday, we do have a completely electronic logbook system currently in place. The pilot still writes it up on a piece of paper, but it gets put into the computer and the paper gets thrown away. That's a phase one approach of our electronic logbook. The phase two approach is for the pilot or the mechanic to make the write up electronically with no paper interaction at all. Part of the Titan and Vision products that FedEx is working with right now can accomplish that part.

SHARP/QANTAS – A question to the working group on the e-logbook. Do they have a draft paper that is available for comment by the rest of the industry? If not, could they consider making one available?

GLAPA/AIRBUS – Certainly, as soon as this working group has progressed substantially, a paper will be issued on this with the content of their work.

2	Interchangeability	All	All	All	All	EVA
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The interchangeability of different PNs is subject to aircraft type. For example, two PNs are interchangeable on the MD11 fleet, but it does not mean they are interchangeable on MD90s. For reminding line maintenance, we add a one-way interchangeable note on our internal computer system. To prevent error on installation, the mechanic is trained to check the IPC before installation, and the mechanic takes the responsibility to install the correct PN.

How do other operators control their parts interchangeable and prevent installation errors?

Estimated Annual Cost Penalty: \$5,000

CHLUP/CONTINENTAL – We also place our components and system interchangeability in a computer system. Of course, that computer system, which is Scepter, is only used for purchasing and reliability reasons. Its use if not permitted by maintenance for replacement of parts. The IPC has the authority for interchangeability.

NESSEL/LUFTHANSA – We solve it in the same way as EVA. We have the problem even if we have one aircraft type, maybe one flying ETOPS, one not—for one type it may be interchangeable, for the other not. We just add a note into our system so the mechanic knows there is interchangeability for a group of aircraft, and then he has to look into the IPC.

JOZIC/KLM – We have a computer system called Basic Maintenance File. It is in place of our copy of the IPC. The IPC is not updated very often, so the Basic Maintenance File can be updated directly. The mechanics can look in the maintenance file and find the interchangeability on every component.

SHARP/QANTAS – I think that if a part is not interchangeable across the whole aircraft fleet, it is not interchangeable. We define an alternate part and the condition on interchangeability goes against that.

GREEN/UNITED – UAL uses the IPC for configuration control, but we assign United-unique numbers to parts to handle these interchangeable issues.

SORENSEN/NORTHWEST – NWA also uses the IPC as the ultimate authority. However, we do use the stock numbering system that NWA has in our Scepter System as some indication of interchangeability. In those cases where we have had some chronic problems, we've even gone to the extent of putting a placard on the units to indicate to the mechanics what aircraft applicability they are.

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JELLEY/BRITISH AIRWAYS – BAW uses the IPC as the ultimate document for applicability. However, we have two other systems. One is a PN based system where PNs can be linked on the qualification conformer link. The second system is an aircraft applicability system by fleet and/or by tail registration. PNs can be made applicable or not applicable per aircraft. There is quite a fall back system which will tell the aircraft maintenance engineer whether it can fit or not fit, in addition to the IPC.

GLAPA/AIRBUS – With the introduction of conditional interchangeability data in the IPC, Airbus, since 1999, provides the operators with different interchangeability data depending on the location of the part in the aircraft and/or for the given aircraft model. For example, an updated part such a valve, can be fully interchangeable in one aircraft location but only one way interchangeable in another location of the aircraft. This information is clearly reflected as conditional interchangeability in the Airbus IPC.

Furthermore, Airbus considers, through dialog with the engineering departments, that line maintenance mechanics should have a wider choice of alternative spares for their maintenance activity.

Note: This information is included in the ICD (Interchangeability Conditional Document).

3	Copying Software	All	Smiths	All	20	JAL
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At the last AMC meeting, Smiths advised us that “Smiths plans to review the Boeing diskette copying process, D6-82505, to determine whether it is an acceptable method to duplicate our software. Also Smiths will issue a Service Information Letter(SIL) showing an SI-approved method of copying onboard loadable software to all affected airlines. This SIL will advise our approved method of copying software, the equipment to which it applies, and how airlines may apply for a software license.”

1. Please advise about review results of the Boeing diskette Copying Process, D6-82505.
2. Please advise if the SIL has been issued. If the SIL shows special process in which a new copying tool is required except Boeing tool D6-82505, please provide additional copies within one week of receiving our purchase order regardless of any issues.

Other operator and Smiths and Boeing comments, please.

SHARPE/SMITHS – As a result of the debate at the last AMC, we have taken an active role in the field loadable configuration management working groups that will eventually result in the issue of ARINC Report 667. It is clear from these meetings, that airlines generally do not want to be restricted to copying diskette to diskette, but would rather have the freedom to copy software to a new media, server, or mass storage device to meet their needs. For this reason, we have not pursued what was outlined last year, but have focused our efforts in support of ARINC Project Paper 667. However, should any airline have requirement to copy diskettes prior to the formal release of ARINC Report 667, we are willing to enter into an applied software license agreement which would give them permission to copy our loadable software while giving us the necessary indemnification against misuse or miscopying.

Should JAL or any other airline wish to enter into such a software license agreement, they are invited to visit us in our suite or contact us through their local customer support center.

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4	IFE Systems Software		All	All	23-30	MASC

Currently, vendors supply software to the airlines under software PN and diskette PN. Airlines file and control this software using either PN as the reference and dispense the software by various means. As our technology changes and software diskettes become replaced due to storage capability, etc., other means will be used to supply software to the airlines. For example, one such means is CD-ROM.

1. Would it be acceptable to include multiple software PNs on one single CD-ROM and how would the airlines control this software?
2. Will it be treated in the same manner as diskettes for dispensing and control?
3. Would there be any air worthiness/software certification issues with multiple PNs on a single CD-ROM?

NESSEL/LUFTHANSA – For a common storage media, we are also looking in this direction and giving this input to the working group on ARINC Project Paper 667 to maybe use a CD-ROM with different part numbers on it. This could be a solution for the future. As to the question of certification, I think one of the important aims of this ARINC 667 standard is to have common rules that are acceptable to the authorities. I think the authorities can see the complexity of the problem. We have to set standards how to copy, distribute, and to load that are acceptable. I support Smiths' focus. We should finish this working group to set international standards for this.

STORY/DELTA – I'd like to second the comments made by Lufthansa. Let's briefly go back to Item 3. This is an AMC success story. Smiths' presented last year what was their internal policy. Some of us took exception with it, we got together and worked together, and Smiths has been a vital contributor to ARINC Project Paper 667. Here is a great example of how AMC works, and we appreciate the efforts Smiths has done to support what we feel we need.

ZERBINI/LAUDA – In the meantime, we would like to have the possibility to choose between receiving CD-ROMs or diskettes. We are running, for example, a Matsushita System 2000 in our aircraft, and British Telecom is asking us if we would like to receive copies in diskettes or CD-ROM. We like the choice because one of our branches has the ability to use CD-ROMs and the other one does not.

In the meantime, we would like to know if it would be acceptable for the vendors to give us a formal approval to copy the PNs from the CD-ROMs to the diskettes for ultimate use, and to have their support with our local authorities to have these copies approved.

GLAPA/AIRBUS – General Airbus rules for media related to Field Loadable Software and Loadable Software Airplane Parts (LSAP) which is a subset of Field Loadable Software, are contained in the Airbus Specification modules, ABD100. There are different specific chapters, one for loading process compatibility, one for certification, and one for identification and marking. Aircraft program specific requirements contained in the purchaser's technical specification complements the general requirements. Airbus intends to render these requirements compatible with the emerging ARINC Project Paper 667.

In direct reply to Matsushita's three questions:

1. It is a current industry practice to store different LSAP PNs on the same medium SN providing the different LSAPs are destined for one and only one target hardware LRU PN.
2. Airbus recommends that Matsushita reiterate the question in the ARINC 667 Working Group. The next working group meeting, chaired by Charles Harkey of Delta, will meet June 20-22, 2001 in Dublin, Ireland.
3. The whole issue is at present partially covered by regulations. One main reason in creating the LSAP Working Group was to generate a generally accepted industry practice to which the regulators can refer. In other words, as long as we stay within the ARINC 667 guidelines, it is unlikely that you will be in dispute with the regulators.

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HUFFAKER/BOEING - Boeing believes that floppy disks will be obsolete within five to 10 years. To ensure a smooth transition to some other media, or no media, Boeing is looking at all alternative transport media, of which CD-ROM technology is one.

There are industry-working groups such as the AEEC/AMC Future Concepts for Maintenance (FCM) currently investigating alternate means of transporting loadable software. Examples are the Loadable Software Airplane Parts Configuration Management, the Electronic Distribution of Software and the File Server Working Groups. Boeing believes that the MASC concerns would be better addressed by these working groups and welcomes their involvement.

To answer MASC's questions specifically, Boeing believes that the transport media should be transparent to the configuration management concerns being expressed, and we are not aware of any certification issues concerning the use of CD-ROM technology as an LSAP transport media.

MODERATOR – Lauda, did you have a request between you and Matsushita? Did I understand that correctly—about PNs? They should be here and perhaps you and they could get together on that item.

BAER/MATSUSHITA – We wanted to comment on the question we asked. We appreciate everybody's feedback. We understand that this is going to be an ongoing issue as software continues to develop and grow. We'd like to address the question off line regarding multiple PNs.

We also will take up the challenge to support ARINC Project Paper 667.

5	PRNAV Costs			B737	34	KLM
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Due to the introduction of PRNAV operation in Europe (after 2005), we have learned that on B737 aircraft, dual FMS installation will be required. If that is the case, the retrofit costs are high.

Are there any B737 operators in Europe already starting the project to install dual FMS on their B737 fleet?

Is anyone planning to do it in the near future?

Other operator and vendor comments, please.

Estimated Annual Cost Penalty: \$1,000

NESSEL/LUFTHANSA – We have not yet started at Lufthansa for two reasons. One, it is not clear to us now that you really need two FMS to go with this requirement. Secondly, we learned that the introduction of this PRNAV will not be before 2008. This is confirmed on the EUROCONTROL homepage. We will see how the development goes.

MESSEUDI/ROYAL AIR MAROC – RAM is operating six B737-200s in Europe. We installed the HT9001 Honeywell FMS GPS on these aircraft. A single system is on four aircraft that will be phased out before 2005. We installed dual systems on two aircraft that will be operated beyond 2005.

BARRAULT/AIR FRANCE – To my knowledge, only one FMS is required in the JAA leaflet on the PRNAV. It is true that some airports will ask the airlines to have two FMS onboard to fly the STARs and SIDs in terminal areas on some routes. Only one FMS is required today. It is a little bit early to decide for a retrofit.

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GILBERT/HONEYWELL – Any operators considering complying with PRNAV requirements should consult JAA Temporary Guidance Leaflet No. 10. It provides guidance material for the approval of aircraft for operation of PRNAV in the European area. This TGL requires that the probability of loss of all navigation information is remote, and that the probability of non-restorable loss of navigation function is extremely improbable. Operators will need to demonstrate an acceptable means of compliance with the previous requirements. Clearly, the installation of a dual system may meet these requirements.

6	Wiring Failures		Airbus Boeing Fokker	All		AUA
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Since the TWA 800 and SR 111 accident, the airline industry is well aware of the problems that could be caused by wiring failures. Especially, the results of the TWA 800 accident investigation revealed that there is room for improvement. Austrian Airlines is currently in a process to initiate a project that should finally define all the necessary steps for all applicable aircraft wiring issues. The process and steps defined in their project should ensure a safe and efficient operation of our fleet.

Therefore, may I kindly ask especially the operators to give us information on how they are dealing with this problem.

Estimated Annual Cost Penalty: Safety

NESSEL/LUTHANSA – Of course, this is an important issue for the future. There are a lot of publications on this issue. I'd like to take this opportunity to thank Airbus and Boeing for their huge effort and keeping us informed by Telex about the ongoing issues. I think we still have a lot of work to do and things to solve. It is difficult to follow all the activities. We have to a certain extent, relied on Boeing and Airbus keeping track and updating standard practices, manuals, training, etc.

STEVIK/NORTHWEST – Generally, we have found that wiring inside the pressure vessel is in much better condition than wiring outside the pressure vessel. That is not too surprising considering the conditions it is exposed to. We are going to a detailed visual inspection of wiring in the airplane. Obviously, you can't see all the wiring in the airplane, but wiring generally suffers damage by some kind of external force. If it is being damaged, normally you can see it unless it is buried deep in the airplane conduits. We haven't seen that yet.

The ATA has a Specification 117 video that provides good training for mechanics to review and be aware of wiring issues and problems.

JOZIC/KLM – We have obtained this video and are showing it to our mechanics during refreshment courses in the ground school. We believe it is a very big issue—the awareness of the maintenance people. That is why we have on our web page information about wire aging and ATA Specification 117.

HAWTHORN/DELTA – There have been several seminars by AWIGG that address this issue of aging wiring and what to do about it. They have reached some conclusions. They are working on hot spots throughout aircraft—pressure areas, external areas. One of the conclusions is that external forces, as was previously mentioned, cause about 50% of the deterioration.

SHARP/QANTAS – We've identified basic housekeeping as one of the issues in wiring looms. Inspecting inside wiring looms is likely to cause more problems than it saves. For housekeeping around wiring looms, you first need to remove any general debris that collects over the years. These are ignition sources. If anything does go wrong, this will make things much worse. Secondly, and particularly, it is important to remove any metallic shavings. This includes training of mechanical personnel on the importance of removing all shavings after mechanical modifications.

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COPPA/BOEING - Boeing has been an active participant in the FAA-sponsored Aging Transport Systems Rulemaking Advisory Committee chartered with determining a course of action with regard to airplane electrical systems. The culmination of two years of research did not identify any concerns with the safety of electrical wiring. Recommendations concerning maintenance and certification program enhancements have been provided to the FAA for consideration. Boeing, Airbus and Lockheed are providing operators periodic coordinated status updates on the status of this program. Further information concerning the outcome of these recommendations should be forthcoming from the FAA in the next few months.

Two years of research by the industry teams did not identify any concerns with the safety of any type of electrical wiring, nor did any wire types reflect endemic integrity concerns. Although the FAA has not yet mandated action, Boeing is taking steps to implement many of the ATSRAC recommendations. Boeing is presently updating the Standard Wiring Practices Manual to include wiring inspection and cleaning methods. We have or are developing zonal inspections for our older airplane models. We have developed and are offering an electrical system maintenance and handling training course. Finally, we have identified several existing wiring modifications for additional emphasis.

It is important to point out that these actions are considered to be enhancements of the existing instructions for continued airworthiness. Specific information concerning inspection, maintenance, and repair of airplane wiring is already available within the existing maintenance documentation.

Boeing will update the Standard Wiring Practices Manual to include:

- Wiring cleaning practices.
- Wire inspection procedural guidelines.
- Expand and clarify wire damage definitions and conditions for repair or replacement.
- Add procedures for the protection of wiring and electrical system components during maintenance activities.
- Expand and clarify rigid and flexible conduit damage definitions and conditions for repair or replacement.

Development of these enhancements is ongoing. Incorporation of the information into the SWPM is expected to occur in stages during the upcoming months, with completion by year's end.

In addition, Boeing will be participating with industry in an effort to define a common SWPM structure to be included in ATA 2100. This effort is expected to conclude in November 2001. Any expected changes to the Boeing SWPM as a result of this effort, or a related date of availability, have not been defined at this time.

GLAPA/AIRBUS – As requested, my answer will address Items 6, 7, and 8.

In 1998, the FAA was requested by the Gore Commission to expand the Aging Airplane Program to non-structural components to better address wiring systems. The FAA has formed the ATSRAC (Aging Transport System Rulemaking Advisory Committee) to develop, coordinate, and follow up the implementation of the various initiatives addressed by dedicated working groups.

The FAA aging system program as launched was initially limited to airplanes with type certificate older than 20 years (B727, B737, B747 classic, DC8, DC9, DC10, L1011 and A300). The initial strong focus is on airplane wiring, which is perceived as a high visibility issue inside and outside the aerospace industry.

Airplane manufacturers are fully participating and supporting the FAA advisory committee tasks and follow on efforts. As far as Airbus operators are concerned, Operator Information Telexes (OIT) have been issued over the past two years to inform and update operators about the status of the activities.

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OIT References:

AI/SE 999.0015/99, AI/SE 999.0092/99, AI/SE 999.0175/99, AI/SE 999.006/00, AI/SE 999.0164/00, AI/SE 999.0027/01

The main highlights of the past two years and consequences for the Airbus' operators are as follows:

- Limited number (3) of electrical system SBs, already mandated by a CN (French DGAC AD) and upgraded to mandatory status with subsequent Advisory Directives (AD) (FAA).
- Limited number (1) of repetitive inspection AD/CN with mandated terminating action
- Application of a complementary simplified "MSG3 analysis" to aging airplanes
- Better definition of general visual inspection requirements for electrical systems
- Requirements for improved training on electrical inspections and installations.

The current status is that industry oversight of aging systems activities is following on to:

- Define enhanced maintenance programs
- Enhance electrical standard wiring practice and guidelines manuals
- Increase oversight/regulatory involvement in STC applications
- Continue development effort in new techniques and technologies to detect and mitigate the consequences of wiring failure.

The planning for the above activities are defined in detail during meetings of the FAA's Aging Advisory Committee. Operators are encouraged to review the existing publication (OIT and SIL) on the aging airplane systems programs and to provide their comments to Airbus.

In conclusion, Airbus is actively participating in the aging systems program. As this program was initiated on the Airbus A300 B2/B4, a dedicated and detailed presentation on this matter will be provided to our wide body operators at our next symposium that is planned for June this year in Munich, Germany.

HAMERS/FOKKER – Reference to Item 6, Fokker participates in the Aircraft Fuel Safety Program. We keep our operators informed by all kinds of service publications, service letters, and technical operation notices. Recently, we issued SB 128037 for fuel wiring safety inspection. If any one is interested, please contact me.

7	Aging Aircraft Wiring	Airbus Boeing	All	FDX
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Aging aircraft wiring is getting a lot of attention in the news media. We're asking the airframers to comment on current and future plans to inspect aging wiring for signs of deterioration, chemical degradation of the insulation, moisture damage, etc.

Please comment on whether specific wire types are showing integrity problems.

See comments to Item 6 above.

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8	Aging Aircraft Wiring			All		KLM

Worldwide there are many work groups active in investigating, defining, and figuring out the impact of wire and systems aging. A lot of information is also published on the internet. A lot of airlines are busy to define the appropriate maintenance program or procedures to minimize the risk of wire aging deterioration of the systems and wiring.

To our surprise, airframe manufacturers are still silent and no new information is added to the Standard Wiring Practices Manual (for example, Boeing document D6-54446). We would like to be informed if airframe manufacturers are planning to issue the revision to the standard wiring practices manuals?

When is the revision planned to be issued?

Other operator and vendor comments, please.

Estimated Annual Cost Penalty: \$10,000

See comments to Item 6 above.

9	Wing Rewiring			B747-100 B747-200 B747-300		KLM
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We are aware that some airlines decided to rewire the wing leading edge. The decision to replace the wiring is made because of many complaints.

We would like to know which airlines have rewired the wing leading edge and what is the experience after rewiring?

Estimated Annual Cost Penalty: \$10,000

STURM/EVERGREEN INTL – We have elected to increase our inspection in that area because of the high turbulence. As far as a blanket rewire, we have chosen not to do that.

KLINK/FEDEX – We don't have any B747s, but regarding the MD10, with exception of the power feeder cables, FedEx has completely rewired the MD10 aircraft as part of the DC10 to MD10 conversion. We thought that rewiring was advantageous to perform while the aircraft was in a heavy maintenance status and access to the critical areas was available.

We are also performing A310 wing trailing edge rewiring.

COPPA/BOEING - The wing leading edge is one of the harshest areas for wire bundle installations due to high vibration, exposure to elements, and exposure to airplane fluids. While wire bundles installed in this area sometimes experience damage due to the harsh environment, Boeing does not recommend that operators perform hard time replacements of all of the leading edge wire bundles. Further, we are unaware of any operators who have replaced the leading edge wire bundles. Boeing generally does not recommend replacement of wire bundles or special wiring inspection unless a fault is experienced or an area is disturbed for other reasons. Service Letter 747-SL-20-048 offers guidelines on performing wiring inspections on areas that may experience degradation during long term operation of B747 airplanes.

SHARP/QANTAS – I believe part of this leading edge wire replacement has to do with the Separation AD if you go the Boeing BFG route. We chose to go the Smiths route. One thing we have found that when we disconnect the tank 2 and 3 connectors, we've frequently found fuel leakage that requires replacement of the tank harnesses. We are very concerned that there is a worldwide shortage of these harnesses that might slow down compliance with this AD.

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10	Wire Marking			All		VRG

Varig uses a Kingsley type KVE-7B hot stamp wire marking machine to stamp wires for new installations and maintenance. With the introduction of new generation wires, most notably the BMS 13-60 type wire, it has become a very difficult task to generate reliable markings using this machine. We have modified the temperature and pressure regulations on the machine, but the stamps still easily erases when the wire is handled and installed.

Varig would like to know if other operators are performing these markings. If in-house, what type/manufacturer of equipment is being used and what is the effective cost scale of wire marking to justify the investment?

Other operator and vendor comments, please.

KLINK/FEDEX – FedEx uses the U-Bank 67505 machine. It works find for BMS 13-60 wire.

HAWTHORN/DELTA – Delta uses a Spectrum Technology laser wire-marking device, Capri 50, which is very efficient on most types of wire, especially the thin walled new generation wiring.

SHARP/QANTAS – Qantas has recently purchased a Spectrum Technology Capri 50 UV wire marker. We believe this is required. We used to use hot wire stamping, that I believe is recommended against by Boeing. I think just about everybody will have to move to UV wire marking. This is the basis on which we justified our purchase.

HAWTHORN/DELTA – I agree with Qantas. After several discussions and a few talks with the FAA, they highly recommended not using hot stamping any more. They are leaning toward ink jet and especially UV laser wire markers.

ILLES/AIRBUS – This answer will address Item 10 and 11.

Airbus is aware of two main laser technologies: The UV/Excimer laser, used by Spectrum Technology, which introduces pigment in the cable coating which changes color to produce a mark. In addition, there is a CO₂ laser that removes the outer layer of a specially manufactured wire exposing a black undercoat to produce the mark. Airbus uses both the CO₂ and UV/Excimer laser machines.

The main advantage of the laser process is that it is not aggressive to the wire insulation. There are several other benefits:

- A wide range of wire insulation types used in aerospace industry can be marked.
- There is no need for a round profile or a flat surface for a physical contact as it was the case when using hot stamp heads.
- The laser process allows printing of single core and sheathed multi-core screened, or unscreened cables.
- It is suitable for modern very small diameter wires.
- The speed for manufacturing marked wires is high.

For these reasons Airbus has progressively introduced since 1991 laser marking wire technology in replacement of hot stamp printing process in aircraft production. The manufacturers of laser marking machines can provide details on the most suitable units to match the requirements of the operators in terms of cost versus throughput.

HUFFAKER/BOEING - The Boeing Process Specification, BAC5152, identifies three procedures to put an identification mark on wire insulation: A hot stamp procedure, ink jet marking, and UV laser marking. However, Boeing uses UV laser marking equipment in their production facilities due to the high volume of wire that is marked. In addition to the speed advantage over other procedures to put an identification mark on a wire or cable, the UV laser has the inherent advantage that it does not have the potential to damage the wire insulation.

LINE MAINTENANCE (cont'd)

<u>Item No</u>	<u>LRU Name</u>	<u>LRU Part Number</u>	<u>Vendor Name</u>	<u>Aircraft Type</u>	<u>ATA Code</u>	<u>From</u>
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Additional details regarding the processes, procedures, and type of equipment used for the hot stamp procedure and the UV laser marking will be provided to be included in the minutes of this meeting.

Additional Details:

Once the UV laser equipment has been commissioned, it requires less operator experience or skill than the hot stamp procedure, to make a satisfactory mark.

At this time, Boeing does not use the Ink Jet procedure to mark wires that have Teflon insulation, although this method is utilized for other wire types. However, there are some developments being undertaken with Ink Jet wire marking systems that may make the Ink Jet procedure a viable low-cost candidate in the future. When using the Hot Stamp Method, the marks made on the wire must meet Dielectric test requirements. A Dielectric test must be done when any one of the variable parameters associated with the equipment settings is changed. This test ensures that the wire has not been damaged during the marking process. Legibility Test per the specification section 11.7 and Rub Test per the specification section 11.9 are also required.

Boeing has found that to put a mark on BMS13-60 wire, or any Teflon insulated wire effectively with Hot Stamping equipment, that use of Bex print heads which are designed to match the contour of the wire give the best protection against damage to the insulation. The quality, and permanence of the hot mark depends on these factors:

- The type and quality of the marking foil
- The temperature of the platen
- The pressure of the print head on the wire
- The time that the print head is on the wire insulation
- The compatibility between the radius of the print head and the outside diameter of the wire that has to have a mark

Boeing has found that the BMS13-53 Type1, Class1 marking foils manufactured by Maple Roll Leaf give a satisfactory identification mark on BMS13-60. The Maple Roll Leaf PN is SF29145. The manufacturers of the marking foils used on the hot stamp equipment have not developed any new foils to use on Teflon insulation material.

Equipment reliability and maintenance constraints make it is desirable to keep the platen temperature at as low a temperature as possible. Given this constraint, the key element that affects the quality of the mark becomes the experience and skill of the hot stamp equipment operator to find the right balance between pressure and dwell time.

Additional UltraViolet (UV) Laser marking information:

The major problem that occurs when a UV Laser is used to make an identification mark is that the contrast between the mark and the background (wire insulation) must meet the Contrast Test (section 11.8) requirement of the BAC5152.

Two factors influence the achievable contrast that can be obtained on BMS13-60 wire and cable. The first is the capability of the Teflon tape that is on the outside surface of the BMS13-60 wire to respond to the UV stimulation. The second important factor is the maintenance condition of the UV laser. When the mark on the wire has a contrast of less than 55%, maintenance is required on the equipment

LINE MAINTENANCE (cont'd)

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Boeing currently uses these UV lasers:

- Spectrum Capri 50
- Spectrum Capri 60
- Spectrum Capri 100
- Spectrum Capri 500

11	Laser Wire Marking Devices		DAL
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Delta manufacturers wiring kits for aircraft systems upgrades on a regular basis. With the increasing use of Teflon insulated wire by manufacturers, Delta would like to solicit comments and suggestions on laser wire marking devices, with areas of interest being wire handling capacity, durability, ease of use, serviceability, and cost.

Delta currently uses Spectrum Technology laser wire marking units.

See comments to Item 10 above.

12	Avionics Units Batteries	All	All	All	Teledyne
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Many avionics units use batteries to maintain memory when power is removed from the unit. Non-rechargeable batteries have an expected life span that varies depending on the type battery and amperage drain when in use. The vendor of an avionics unit is obligated to inform the airlines of a recommended frequency the battery should be changed.

1. How do airlines prefer to be informed of this recommended time replacement of the batteries (SLs, SILs, stickers on the unit, CMMs, other)? Remember, it is a recommended time replacement, not mandatory. The airline has the choice to remove the unit "On Condition" vs "Hard Time."
2. How are other vendors informing the airlines of expected battery life and recommendation time change?

SORENSEN/NORTHWEST – We'd like to be informed in the CMM.

ERNI/SR TECHNICS – We also like to see it in the CMM.

DESROSIERS/AIR CANADA – We'd like to see it in the CMM also.

MODERATOR – Can we just see a show of hands? I see a majority.

LAXAR/AUSTRIAN AIRLINES – We'd also like to see it in the CMM, but furthermore, we would appreciate seeing it in the aircraft manufacturer Maintenance Planning Document (MPD). This will make our internal process in defining the on-aircraft maintenance program easier.

NESSELER/AIR WISCONSIN – We also would like to always see it in the CMM and the MPD. In addition, there are several batteries that on some units are very deep within the unit and on individual cards. We request of our suppliers a sticker on the LRU to easily discern what the birth date of battery is.

SHARP/QANTAS – If the recommendation by the OEM is usage dependent, then we'd like to see the premise on which their recommendations are based, as well as just a basic recommendation.

GLAPA/AIRBUS – The problem of batteries inside LRUs is just an example for life limited items. For such items, vendor recommendations are often contained in the vendor CMM and may be complemented by vendor SILs. An operator may decide whether or not to incorporate these recommendations in its approved maintenance program. These recommendations are not included in the Airbus MPD.

LINE MAINTENANCE (cont'd)

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However, in circumstances where the impact of not complying with the vendor recommendation is shown to lead to a potential safety, operational, or significant economic impact then Airbus can issue a covering document, such as a SIL, which would then be reflected in the MPD. In these circumstances it would be normal practice to revisit the MSG-3 analysis leading to a possible maintenance review board report update to reflect inservice experience.

HURTAK/FEDEX – We concur with Qantas’ recommendation to have any qualifying or unusual requirements specified in the CMM.

13	Antenna Gaskets		TA Mfg	All	23 & 34	KLM
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We are seriously thinking about introducing corrosion resistant antenna gaskets for different types of antennas.

Is there any airline using the gaskets and what is the experience?

Is Boeing able to provide IPC coverage for the gaskets?

Estimated Annual Cost Penalty: \$10,000

NESSEL/LUFTHANSA – In 1998 to 1999 we started evaluation of these new gaskets with positive results. Therefore, we decided for fleetwide introduction on every overhaul of aircraft to install the new gaskets. At the beginning we had some minor problems with the size of the gaskets. This has been solved. We see this development as very positive. One of the advantages is saving time during placement because you don’t have to seal the antenna.

CHLUP/CONTINENTAL – We’ve had good luck with the Av-Dec gel gaskets in our COMM centers on the belly of the aircraft. They are working out very well.

KLINK/FEDEX – Using FAA field approval, FedEx has installed TA gaskets on their radio altimeter antennas for DC10 and B727 aircraft with positive results. Plans are also in work to install these gaskets on the MD10. We are providing our experience and evaluation on the gaskets to Boeing for action.

NESSELER/AIR WISCONSIN – AWI uses the corrosion resistant gaskets as well. We have had no negative results.

REAVES/SOUTHWEST – We are in the process of retrofitting all our airplanes with the TA gaskets and have had good results as of this time.

SHARP/QANTAS – We’ve been trying gel gaskets on our B737s and had great success. We are looking at extending the CTL on antenna removals.

MABBITT/MONARCH AIRLINES – Could Boeing respond to the question when they plan to start installing gel antenna gaskets?

COPPA/BOEING – Several operators report to us positive results and it appears that is borne out by the comments made here.

We have initiated a service-related problem to qualify and certify a gasket for most antenna installations. One such gasket being considered is the Aero Bond gasket manufactured by TA Manufacturing. Upon certification, the IPC will list the gasket PNs for spares and the Airplane Maintenance Manuals will add antenna installation procedures to use the gasket as an alternate method of installation to that already specified in the manuals. Boeing is targeting the certification effort by the 4th quarter 2001. Status of the certification efforts will be regularly provided via Fleet Team Digest (FTD) articles.

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McCANN/KIRKHILL-TA – We've been licensed by Boeing since 1998 to design and manufacture Aero Bond antennas gaskets. During that time, we've had successful laboratory testing and actual flight testing by airline customers using Boeing, Douglas, and Airbus aircraft. We have recently received an STC and PMA from the FAA for L-Band, TCAS, VHF COMM, Marker Beacon and radio altimeter for the above mentioned aircraft.

STEVIK/NORTHWEST – What models of airplane will be done by the 4th quarter of 2001?

COPPA/BOEING – It will be on all airplane models, almost all antenna installations with the exception of the MD11 radar altimeter and the B717 radar altimeter. Those things have a certification basis on the gaskets, or the present method of installation of those antennas.

FULLER/BOEING – We do not plan to do radar altimeter for any model where autoland is concerned. The DC9, which doesn't have autoland, will probably be approved in that location. The DC10, MD11, B717 with triple radar altimeter installations is the exception where we will approve it. We will not approve the DC10 and MD11 for the radar altimeter based on the autoland certification. That would also apply to the MD80 for operators using autoland.

HODOWANIC/MIDWEST EXPRESS – You're saying that for MD80s without autoland being used, we will be able to use these gaskets in relation to the radar altimeters?

FULLER/BOEING – That is correct. We will have to specify if you are an autoland operator since we are not going to approve use for these radar altimeters.

FERRARI/LAUDA – I'd like to request more information about autoland for installing or not installing gaskets? We do not understand the reason.

MODERATOR – Lauda is requesting Boeing to provide more information on why you are not going to address the autoland airplanes? FedEx might have an interest in that too.

FULLER/BOEING – We have a BOCOM message that was sent to FedEx explaining why we would not approve it. For anyone that would like a copy, it gives the details why.

14	Gel Gaskets	Boeing	All	23 & 34	COA
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We know from the FTRP meetings that Boeing is nearly finished evaluating the usefulness of gel gaskets under antennas. The last communication had Boeing asking which antennas pose the greatest need.

To answer Boeing's question, belly-mounted antennas have a greater need than top-mounted antennas. Antennas that operate at a higher frequency have a greater need than antennas that operate at a lower frequency. Using this logic, the greatest need is the radar altimeter antennas, followed by the TCAS antennas. Transponder and DME antennas should also have a need but so far have not posed as great a problem as the bottom VHF Com.

When does Boeing plan to finish evaluating and start installing gel antenna gaskets?

Continental Airlines has good experience with AV-Dec gel gaskets.

See comments to Item 13 above.

*****99-005*****

SECU and PCU	49-164-05	BAE Systems	CRJ	27-60	ACA
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The SECU and PCU interface is the main cause of the reliability issue of the airplane.

LINE MAINTENANCE (cont'd)

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When will the SECU update be available?

Other operator and vendor comments, please.

WITHERS/BAE SYSTEMS – Since BAE Systems reported at the last AMC, we have continued to support Bombardier in the development of the –06 SECU standard program initiated to introduce spoiler system design improvements by means of software and minor hardware changes. We have provided extended system BITE capability software to Bombardier where it has undergone extensive ground testing and is scheduled to commence flight evaluation in late April 2001. The hardware modifications have been successfully evaluated and completion of the hardware definition is awaiting the issue of the Bombardier formal report and authorization to proceed. Bombardier is planning –06 SECU certification in June. Current predictions are for the new standard to be introduced into service in June/July 2001.

JOVANOVIC/BOMBARDIER – Here is the action plan for the spoiler system upgrade on Canadian Regional Jets:

December 2000	Start of software certification testing Extensive ground testing of flight software successfully completed.
February 2001	Final ground testing of maintenance software ongoing
April 2001	Target start of flight tests
June 2001	Target Transport Canada certification
July 2001	Target FAA and JAA certification. Upgrade begins

NESSLER/AIR WISCONSIN – AWI currently has an MTBUR of the PCU at 4,300 hours and MTBUR of the SECU at 3,462 hours. We look forward to the program.

BLONDEAU/AIR CANADA – Regarding the answer from Bombardier, I would like to have more details regarding the plan for Air Canada units to be modified. They stated they are starting July 2001 for the certification completion of FAA/JAA. As for BAE Systems, are they going to be ready as well to upgrade the units to –06? When can we send our units to BAE Systems?

WITHERS/BAE SYSTEMS – Yes, we are intending to have the capability to update the SECU when the new –06 SECUs are introduced into service. We invite Air Canada to come visit me afterwards to discuss the program in more detail.

LINE MAINTENANCE (cont'd)

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*****99-009*****						
	Elevator PCU Pressure Sensor	317100-1001	Parker	B757	27	UPS

UPS is experiencing untimely elevator PCU removals due to PCU sensor failures. The sensor is not a line replaceable unit; therefore, when the sensor fails, PCU replacement is required.

Although the UPS sensor MTBF figures appear high, our greatest concern is having unwarranted PCU removals that affect our on-time performance. UPS have requested Parker address sensor failures due to coil contamination. Parker is in the process of qualifying a new sensor as a replacement for the existing sensor; however, this is not based on reliability but on produceability. Boeing is skeptical that this will correct the EICAS indication problem.

Are other airlines experiencing similar problems?

Are they aware of Boeing's position on the new sensor?

UPS 1998 Elevator PCU Sensor MTBUR = 54,568 hours
 UPS 1998 Elevator PCU Sensor MTBF = 77,955

The Boeing sensor specification states MTBF shall not be less than 130,000 hours. Parker claims the MTBF of the sensor is greater than two times the Boeing specified reliability or 260,000 hours.

CHLUP/CONTINENTAL – I'm concerned about the statement here that indicates Parker is in the process of qualifying a new sensor that is not based on reliability but produceability. That seems like the wrong way to go. What good is a unit that fails a lot and we have to change it out often? We want to see a reliable unit and a line replaceable unit. This is an item we submitted last year also.

BINGHAM/UPS – UPS understands that Boeing intends to use an alternate vendor for the PCU sensor as a means to provide resolution to the sensor reliability issue. UPS questions why Boeing has chosen to resolve this issue through the development of an alternatively manufactured sensor.

However, we look forward to adopting a new sensor if it is proven to be reliable and affordable. UPS believe that Boeing should consider some form of allowance to operators as a transition to a new sensor if it proves to be the solution to our problems. We've had no warranty consideration for all of our problems related to the existing sensor. Therefore, if the original sensor has been found to be ineffective by Boeing, we feel that the operator should not be expected to bear the entire burden of all the problems we had or the additional costs of moving to the corrected sensor.

HUFFAKER/BOEING – There has been a change in direction for the sensor. Parker will no longer be the supplier of this part after their existing production contract expires at the end of 2001. Moog, the supplier of the elevator rotor PCUs, has been selected by Boeing to be the new supplier of the differential pressure sensor for the new production hardware. As currently planned, the new sensors will be available for production and incorporation during the 1st quarter of 2002. After market availability is similarly timed.

It is unfortunate that Parker's redesign effort for the sensor was not brought to completion. The development schedule for Parker's new sensor continued to be delayed due to their overall priorities. However, Boeing believes that the course of action now being taken will result in a more reliable differential pressure sensor and PCU monitor system. Boeing understands that Parker will continue to support their current design, and may, after contract expiration, continue to manufacture their sensor for after market distribution and their efforts toward their improved sensor.