

**AGING TRANSPORT SYSTEMS RULEMAKING  
ADVISORY COMMITTEE**

**Meeting Minutes**

**Date:** April 4 - 6, 2000

**Time:** 9:00 a.m.

**Place:** Federal Aviation Administration

AANC NDI, Validation Center

3260 University Blvd., SE.

Albuquerque, NM.

**Administrative**

Kent Hollinger, the Aging Transport Systems Rulemaking Advisory Committee (ATSRAC) Chair, called the meeting to order at 9 a.m. After all participants introduced themselves, Mr. Stu Miller, Executive Director, read the advisory committee briefing statement and referred to the agenda (Handout 1).

Mr. Dick Perry, Manager of the Sandia National Labs/FAA Airworthiness Assurance NDI Validation Center gave a brief introduction and reviewed Sandia National Labs' activities with respect to vulnerabilities, risk assessment, safety of transportation systems, aging and diagnostics, environmental studies and anti-crime/anti-terrorism.

This presentation was followed by a tour of the facility and inspections of various aircraft until 11:30 a.m.

**Spec 117 Video**

At 11:30 a.m., ATSRAC reconvened to view the Spec 117 video produced by the Air Transport Association (ATA) and member airlines. The video provides training in the areas of wiring contamination, heat degradation, indirect damage, damage resulting from vibration, moisture and debris, inspection procedures and wiring maintenance and practices.

The meeting was adjourned at 11:45 a.m. for lunch.

**January 19 - 20 Meeting Minutes Approved**

At 1:15 p.m. the meeting was reconvened and opened with a discussion of the January 19 - 20, 2000 meeting minutes (Handout 2). Three minor editorial changes were made after which the minutes were unanimously approved.

## Acceleration of ATSRAC Schedule

Next, Stu Miller gave a presentation on the need to accelerate task schedules (see Handout 3). The accelerated schedule was called for by the FAA's Director, Aircraft Certification Service. Under the accelerated schedule, ATSRAC tasks are to be completed by the following dates:

Task	New Deadline
Task 1 -- Conduct Airplane Evaluations Nonintrusive Intrusive	Vote at 7/00 meeting Vote at 10/00 meeting
Task 2 -- Review Service Data Service History/Service Document Review	Vote at 7/00 meeting
Task 3 -- Maintenance Criteria <i>(Note: Not all of task submitted for vote.)</i> HIRF/Lightning Maintenance Guidance	Complete 9/00 / 10/00  Complete by 11/30/00
Task 4 -- Standard Wire Practice Improvements Standard Wiring Practice Document Standard Wiring Practice Training	Vote at 7/00 meeting Vote at 1/01 meeting
Task 5 -- Review Air Carrier Training Training Program Outline Training Program Complete	Vote at 10/00 meeting Vote at 1/01 meeting

Following the presentation, there was much discussion about the accelerated schedule. ATSRAC members voiced the following concerns about the accelerated schedule:

- It may preclude some tasks from being completed.
- It will degrade the quality of some of the products the ATSRAC will produce. Committee members emphasized that they did not want to produce poor quality products that would not be effective in the field. Some members stated they were reluctant/not willing to put their company's names to an inferior product.

- It was noted that the completion of some tasks are interdependent, and that some items are scheduled to be completed before related tasks are to be completed.
- It will impact each member's workload at their respective companies.
- Some groups may not be able to access additional resources or resources with the appropriate expertise in time to meet the schedule.

The Committee voiced general disappointment that they were given no reasons for accelerating the schedule. Several members pointed out that their companies had invested considerable time and resources in ATSRAC and might be less willing in the future to participate in similar initiatives when actions have the potential to impact the quality of product being produced. One member asked about the future of ATSRAC beyond 2000.

Several people voiced opinions that if the ATSRAC were not able to complete all tasks within the shortened time frame, they could submit to the FAA a list of what had been completed, what was left to be completed and the time it would take to complete the unfinished tasks.

### **Maintenance Working Group Report, Task #3**

Tony Harbottle gave a presentation on the status of Task 3 and the working group's activities (Handout 4). The working group took on new members, and membership is now complete. New members are listed on page 3 of Handout 4. Mr. Harbottle reported that the new members' qualifications would be reviewed by the ATSRAC's Chairperson and Executive Director. The presentation identified four products (pages 4 and 5, Handout 4) and the status of each. The working group proposed a change to the wording of Task 3.1 based on comments made at the January 2000 ATSRAC meeting. The proposed wording follows:

#### ***3.1 Review and Revise Maintenance Program Development Logic Process:***

*Develop a logic process to be used during maintenance program development to permit appropriate attention to be given to potential deterioration of electrical installations (wiring) where such deterioration could lead to a safety related failure effect. **The effect of the wiring failure on the equipment it serves may be assumed to be adequately addressed by existing methodology.** Consideration is also to be given to failures that could cause unacceptable degradation of lightning. HIRF and electromagnetic protection. The logic process (or processes) is required for retroactive application to the in-service fleet and for application on new models. This shall be available in the 3<sup>rd</sup> quarter of 2000. That developed for new models shall be submitted to the ATA for consideration in the next issue of their MSG-3 guidelines.*

The Committee voted on the proposed wording change, and all were in favor of the change. It was pointed out that the word “visual” has been eliminated from the DET (detailed inspection) definition.

Mr. Harbottle went on to stress the need to develop structured zonal inspection programs for different aircraft types. He also pointed out the need for rating systems to take into account factors such as lighting, contamination and so on. The use of mirrors and magnification was also discussed and there was general agreement that where and when they are used needs to be defined so that a consistent approach is ensured.

Mr. Harbottle also spoke of the need to define practices to eliminate wire bundle contamination during maintenance. There was a discussion of corrosion protection products coating wire bundles. Several people suggested that studying the effect of these materials on wire bundles should be a recommendation for future work. It was mentioned that Spec 117 addresses future conditions, there is still a need to address contamination already present in the fleet.

The presentation highlighted the fact that further data is needed before the working group is able to address single element dual load paths. Assessment of the data may result in a need for new methodologies. The working group believes that this may require some destructive testing and pointed out this activity could even result in new testing techniques that could identify life limits of certain items.

Using the enhanced definition for GVI, the working group is preparing guidelines that will address the type of deterioration that is expected to be found and addressed during a zonal inspection. Although the initial focus was on wiring, work is now underway to look at other systems. Mr. Harbottle pointed out that the recommendations resulting from this task will improve maintenance practices in other maintenance areas. Recommended improvements to GVIs include that they must be conducted within touching distance.

Ed Block asked whether the working group had taken FAA Bulletin 91-15 into consideration. Mr. Harbottle assured him that all relevant documents are being looked at.

### **Discussion and Vote on Task 3.5**

Further to ATSRAC request, Mr. Harbottle represented the Task 3 working group position given in January 2000. Mr. Harbottle stated that the working group wants to focus on Tasks 3.1 to 3.4. The working group believes that Task 3.5 should not be taken on because other groups are doing work in the area outlined by the task. The working group wants to remove Task 3.5 from their scope of work. Mr Harbottle noted that the new schedule would have a big impact on working group activities and in light of the shortened timeframe in which to complete the tasks, it made sense to remove Task 3.5 altogether. Task 3.5 relates to nonscheduled maintenance and reliability control. It was also discussed that an ATA working group was looking into "removed components" for safety implications.

A motion was made to remove Task 3.5 from Working Group 2, Task 3. The motion was revised to move Task 3.5 to another working group. All were in favor; none opposed.

Task 3 schedules were reviewed next. Mr. Harbottle stated he believed the working group could meet the new schedule; their schedule already called for many items to be completed by September 2000. He pointed out that the Task 3.1 recommendations to the ATA would be completed by September 2000. ATA would then act on the recommendations; however, implementation of the recommendations would be dependent on ATA's own internal process.

The MSG-3/ATA working group is looking at 23 other issues. The new, shortened ATSRAC deadlines would cause these issues to not get addressed. It was pointed out that the ATA working group process is a long one due to many items that need to be addressed. The new schedule calls for completion by September 2000. The task could be turned over to the ATA in September 2000, but the entire process would not be completed by that time. The timeline does not allow for a final report by the working group.

Mr. Glapa asked what the future of the ATSRAC would be if all tasks had to be completed by October 2000. Mr. Miller stated that he did not know.

A motion was made to allow Mr. Harbottle to proceed with the schedule as given. The vote was unanimous with all in favor of this approach. The Committee directed him to note any differences in schedule and specify what could and could not be produced in the timeframe allotted.

### **Task 3.5 Discussion**

The ATSRAC discussed what working group Task 3.5 should be assigned to. David Allen stated that this is not an aging systems problem – it is outside the scope of ATSRAC. Mr. Nancarrow pointed out that other groups are working on this issue. Ms. Contarino suggested that the Committee identify what groups were working the issue and pass the ATSRAC's recommendations on to them. Mr. Harbottle noted that work on this issue had been ongoing for 10 years and that there were ATA groups currently working on it. Mr. Nancarrow proposed that ATSRAC talk to the ATA about activities in this area.

Mr. Glapa made a motion to withdraw Task 3.5 as not "aging related" and refer it to the groups that are already studying it. All were in favor.

### **Standard Wire Practice Working Group Report, Working Group 3, Task 4**

David Allen presented a report on Task 4 (Handout 5), reviewing and updating wiring manuals, specifications and advisory circulars. He noted that the new schedule would cut the task short, and the working group would not be able to complete the task. He

expressed disappointment that the new schedule would not permit the task to be completed. The working group is only one-third of the way completed with the task and needs the results from the intrusive inspections before their task can be completed. The new schedule calls for completion of this task by June 30, 2000 and a report to ATSRAC to be completed by the July 2000 meeting. He stated that they could draft a report with a recommendation that results from the intrusive inspections need to be addressed. He went on to state that perhaps they could generate an executive summary or bulletized list in the absence of a report because there were severe time constraints on producing a full report. He pointed out that simplifying the manuals was not possible.

It was the consensus of the working group that the detail contained in the manuals should be retained. It was pointed out that the June 2000 working group meeting should address the exact working of Task 4.1. If the working group doesn't believe it is appropriate, they should provide their rationale.

Mr. Allen pointed out that the new schedule called for completion of their task by June 30, 2000. The working group had scheduled their meetings for June 2000, September 2000 and October 2000, with completion in October 2000. He asserted that the new schedule was not possible to meet. Since part of their task included intrusive inspections, which would not be completed until September 2000, it was impossible to complete their task by June 30<sup>th</sup>. Randy Pope noted that the intrusive inspections might yield results that could change future maintenance practices. He asserted that these tasks are important and should be completed.

A proposal was made that the working group should issue a report in June 2000 based on the information they have now, then revise the report at a later date when the intrusive inspection data would be available. Several people argued that the product wouldn't be worth producing at this point.

A second proposal was made to produce a report by September 2000 with no intrusive inspection data, and a third proposal was made to produce a full report by November 2000. Mr. Nancarrow stated he felt the FAA should be made aware of the long term impacts the new schedule imposes in terms of negative impact to training and improvement to maintenance practices. He noted that full development of the recommendations would effect a robust change in the field. He also noted that the purpose of ATSRAC was to effect maximum improvement over the long term – especially in training.

Mr. Nancarrow proposed that the working groups issue an interim series of reports, and that they should point out the impacts to the tasks and contain a narrative of where the task needs to be taken for full effectiveness. Mr. Hollinger polled the group for consensus. The group favored Mr. Nancarrow's proposal. Don Andersen stated that he believed they should produce a list of what has been done, what is known, what still needs to be done, and where industry should go from here.

## **Call for Working Group Chair Status Reports**

Mr. Hollinger then called for the working group chairs to send him a status report of their tasks by Sunday evening, April 9, 2000. He requested that the reports address a list of deliverables, time constraints, and what a realistic schedule would be. He noted that ATSRAC would request direction from the FAA on continued activity.

It was proposed that ATA and AIA take the draft letter generated by Mr. Hollinger and meet with AVR-1 and AIR-1. The vote was unanimous with all in favor.

## **Training Working Group Report, Task 5**

Mike Nancarrow announced that Jeff Huber, the working group chair, had taken another job and would be leaving Boeing. Paul Lapwood would be taking the position of chairperson for the working group. Mr. Nancarrow gave the report (Handout 6) in the working group chair's absence.

The airline/repair station survey was sent to 90 airlines and repair stations. Twenty responses were received. The estimated completion date for analyzing the surveys is April 15, 2000. The working group's goals are to ascertain what type of training is necessary for aging systems and define the desired attributes. The training categories include MSG-3 update training, inspector training, training on existing/new maintenance documentation, training on Spec 117, specific task training, and human factors training.

Completion of the task is dependent on Task 3 and Task 4 data. Mr. Nancarrow noted that the completion date for this task is September 30, 2000 -- that doesn't consider the new schedule. Before the new schedule, the working group was on schedule. The idea was to use the survey results to determine where gaps might exist, then devise training to address those gaps.

Mr. Hollinger noted that the training working group activities key off of other tasks.

The April 4, 2000 meeting adjourned at 6:05 p.m.

## **Meeting Reconvened**

The meeting reconvened on April 5, 2000 at 8:00 a.m.

Mr. Hollinger noted that a briefing to AIR-1 had been scheduled for the week of April 24, 2000 in Seattle, Washington. Mr. Hollinger and Mr. Miller were scheduled to meet with AIR-1 to discuss the ATSRAC's concerns with the new schedule and its impact on outstanding tasks.

## **Aging Systems Task Force (ASTF) Report**

Randy Pope presented a draft report on Tasks 1 and 2 (Handout 7) that summarized the results of the ASTF nonintrusive wiring inspection survey and service data review. He noted that the intent of the nonintrusive inspections was to assess the overall condition of the fleet with regard to wiring and to identify any airplane model-unique areas of concern. The report describes the task force's methodology and findings.

Some of the ASTF's findings were recommended for OEM review and some resulted in alerts, service bulletins (SBs) and airworthiness directives (ADs). Mr. Pope reported that the ASTF's recommendations would be completed on schedule.

Future activities for the ASTF include the creation of AD teams which will coordinate with OEMs on significant items and possible SB upgrades. They anticipate that coordination with the OEMs will be completed by June 30, 2000. They also expect that all of their AD work will be completed by June 2000. Items that will require additional engineering analysis will be covered in the appendices to the final report. Mr. Pope noted that some items may not be disclosed due to confidentiality issues. He also noted that the B-747 data would be forthcoming; Boeing is currently reviewing the B-747 service history data.

Bill Schultz noted that the recommendations listed on pages 9 and 13 of the ASTF report were very valuable and that the final report should highlight these items. He also commented on the effect of structural corrosion inhibitors on gaskets, seals and other items, pointing out that ATSRAC should identify what the structural corrosion inhibitors are and what their effects on these items are. A comment was made that the ASTF did not identify any issues of this nature during visual inspections, and that Tony Harbottle's group would consider the longterm effects and make recommendations.

A vote was taken on the interim report presented by Mr. Pope. There was unanimous approval of the report and next steps.

### **Role of OEMs in Continuing Airworthiness**

Robert Manelski gave a joint Airbus/Boeing briefing (Handout 8) on the role of OEMs in continuing airworthiness. First, he summarized the proposals made at the January 2000 ATSRAC meeting and pointed out that the proposal to eliminate the service history review for nonelectrical systems is pending a decision by ATSRAC. The ATSRAC had deferred making a decision to the April 2000 ATSRAC meeting so that the processes for continuing airworthiness could be reviewed and considered before making a decision on this issue.

Mr. Manelski reviewed OEM type certificate holder responsibilities under the FARs and JARs, which cover instructions for continuing airworthiness, data collection and analysis, identification of unsafe conditions, reporting to the regulatory authorities, dissemination of information, interim and/or terminating actions, implementation followup, airworthiness directives, airplane flight manuals and technical support. He also provided a partial list of reportable events and discussed the functions of the safety review boards

and pointed out that each Boeing model airplane has a safety review board. There is a common board for Airbus models. Safety board representation includes engineering, safety, human factors, customer support, maintenance and flight operations. Each step in the process has time limits, and regular reviews of emerging issues are undertaken. The presentation pointed up the fact that the OEMs use service experience to improve design.

The DGAC commented that they impose an artificial limit on the design life of an aircraft and the FAA doesn't.

When queried as to how many events are reported, Mr. Manelski stated that Boeing receives approximately 300,000 telex reports and 10,000 nontelegraph reports per year. This does not include e-mail reports, for which he did not have a number. Safety items forwarded to regulatory agencies are approximately 20 per week for Boeing and 10 per week for Airbus.

Mr. Manelski pointed out that there are regular reviews of emerging issues inside OEMs, between OEMs and with regulatory agencies. ADs are generated as a result of this process, with the longterm result being the development of new design criteria for derivatives. He concluded the presentation with the statement that the proposal to eliminate the service history review for nonelectrical systems would be discussed as an agenda item that afternoon.

Mike Nancarrow emphasized that the point of Mr. Manelski's presentation was that all OEMs have a process in place to handle issues -- whether they are an aging issue or not.

David Harper asked what process is in place to find items that are not obvious, such as lap joints and other items. Mr. Harper noted that a structured approach is important. Boeing representatives responded by stating that many other items are routinely reported and put into the same safety analysis process that required items are. They noted that items are often discovered when other items are inspected.

A question about how after market installation problems are addressed was asked. Boeing representatives stated that their company did their best to deal with these. Many STC holders contact OEMs for information and technical input. They stated that in many cases, an STC holder may not get Boeing approval, but they would not get a technical objection if an item was not determined to be unsafe. Stu Miller noted that the FAA recognizes this as being a weak area, and stated that work of this nature should be held to the same level of scrutiny. Bill Schultz stated that OEMs struggle with this issue because they sometimes see STC items they wouldn't normally approve of. Mr. Schultz pointed out that this is highly dependent on the capability of individual STC holders.

A question was asked whether ATSRAC recommendations would be made available through a structured process to STC holders and after market installers. The response was that it depended on what recommendations ATSRAC finally submits to the FAA. Some recommendations may become rulemaking actions.

## SDR Data Mining

Chris Smith made a presentation (Handout 9) on an analysis his staff performed of the Service Difficulty Report (SDR) database. The analysis was done to determine whether failure trends related to aging systems could be identified. The approach was to examine all SDRs submitted between 1985 and 1999, and pull out those related to systems using ATA codes and other types of descriptors. The SDRs were correlated with years since manufacture and generally divided into two age groups: SDRs submitted 6 to 10 years since manufacture and SDRs submitted 16 to 20 years since manufacture. Because data was only available from 1985 to the present and because the population of aircraft of interest is now twenty years old, the population of aircraft within the two age groups is variable with respect to years since manufacture. Hence, the data had to be normalized by number of aircraft in each age group.

The analysis did not reveal any trends that might indicate that aging systems are deteriorating at an excessive and unmanageable rate. Data were analyzed by ATA code, part name, part condition, and severity. Failure rates were relatively constant between the two age groups. Some differences between these age groups were not supported by sufficient data to be considered statistically significant.

Dr. Smith compared the trends in mechanical systems reporting with trends in electrical wire SDR reporting. The electrical wire reporting (as determined by a part field containing some variation of the word "wire") showed a more substantial increase than any mechanical system.

Complete details of the analysis are available in the report that Dr. Smith submitted to ATSRAC for the official record.

David Harper asked how many of the reports were related to safety wiring. Stu Miller stated that a previous analysis had shown that very few were related to safety wiring. It was noted that "electrical" was one of the top ten failures noted in the SDR data.

Kent Hollinger commended Dr. Smith on the excellent work done to analyze the SDR data.

Comments offered on the SDR data consist of:

- Contents of the SDR "remarks" section are somewhat subjective, due to the reporter's interpretation of the failure;
- Perhaps the frequency of inspection and maintenance should be factored in. SDR data consists of nonroutine service difficulties. It doesn't include actions taken as a result of routine inspections. It was pointed out that any time maintenance or a routine inspection is done, the mechanic also checks associated wiring; and

- Some wiring damage occurs inadvertently during maintenance of other items. This damage may not always be discovered until much later.

### **FAA Position on Nonelectrical Inspections**

Stu Miller presented the FAA's position on nonelectrical inspections next. The FAA wants to sample nonelectrical systems during the intrusive inspections to support the data gathered. The FAA does not want to limit the activity to data only. Mr. Miller stated that the ATSRAC needed to discuss what items should be sampled.

It was agreed that no other nonintrusive inspections would be done. Many on the committee were concerned whether, given the new schedule, there would be enough time to accomplish these activities. Chris Smith stated that he believed 6 aircraft would be sufficient for data collection from the intrusive inspections. He felt that ATSRAC needed to provide more focus for this activity.

Mike Nancarrow stated that the data didn't support doing nonelectrical system sampling and didn't believe anything useful would be learned. He wanted to know what the technical basis was for proceeding in this manner, and pointed out that the FAA's Associate Administrator for Regulation and Certification had stated on many occasions that everything should be data driven.

David Harper stated that he believed this provided an opportunity for ATSRAC to be proactive. Someone else pointed out that a limited sample size may lead to inaccurate suppositions. Don Andersen suggested that ATSRAC focus on common problems across all aircraft types and not focus on ATA codes. David Harper suggested looking at flight control systems and fuel systems. Mike Nancarrow suggested focusing on dual load paths.

Stu Miller made a motion that ATSRAC accept that current maintenance/industry practices are addressing nonelectrical systems.

The JAA suggested looking at the effects of fatigue on load carrying items such as actuators. Chris Smith suggested looking at flap settings. Robert Manelski disagreed, saying he didn't see these as an aging issue because they are line replaceable items; they don't stay on the aircraft for the life of the aircraft. Mr. Manelski believes the data has been exhausted and that ATSRAC needs to decide what, in its best judgment, are the other items that need to be looked at.

Chris Smith and Stu Miller proposed that ATSRAC accept that a review of the maintenance, SDR and Boeing/Airbus data do not support the existence of significant nonelectrical systems degradation that is not being controlled by current standard industry practices. All voted in favor of this statement. Subsequent discussion modified the statement even further. Everyone ultimately agreed on the following:

*A review of maintenance and service difficulty data do not support the existence of significant nonelectrical systems degradation that is not being directly, adequately and comprehensively addressed and managed under existing maintenance programs.*

Next, it was noted that the ATSRAC needed to look at nonobvious items, such as uninspectable dual load paths. It was also noted that they needed to be practical about what they decide to look at, given the new schedule constraints. ATSRAC needs to develop a definition of nonelectrical aging criteria. It was suggested that they use the original definition for aging systems, but remove the words "electrical."

This definition was voted on. One voting member opposed the definition; the remainder voted in favor of the definition.

### **Dual Load Paths and Aging Electrical System Definition**

A statement was made that dual load paths for flight controls would fall under the definition given above. A logic path needs to be developed for use during intrusive inspections. Focus areas should be developed, also. Christopher Davies believes there must be other failure modes, other than actuators, that need to be addressed. He doesn't believe actuators are the best choice. There was general comment that load bearing flight control load paths that would lead to catastrophic failure should be identified.

A vote was taken to focus on single element dual load path elements and to complete this work by September 2000. Everyone voted in favor of this proposal.

Followup comments to the proposal were that the ATSRAC should not just focus on failure, but also focus on degradation such as corrosion, fatigue and latent failures. There was discussion of the need to give the group that would be doing the inspections specific focus, direction and schedules.

Randy Pope suggested that other experts be added to the group. Don Andersen suggested that the focus be given by item, then formulate a list of followon items. He suggested convening a brainstorming session of "experts." The output from this effort would have to be given to Chris Smith soon in order to meet the September 2000 completion date. Stu Miller said he would have to get FAA approval for this. Chris Smith stated that he didn't believe a brainstorming session of experts would yield anything very valuable.

Continuing discussion centered around the fact that the existing intrusive inspections team was comprised of wiring/electrical experts. If this task were given to the intrusive inspections team, they would need a protocol for the nonelectrical inspections, since they did not have nonelectrical expertise. Someone stated that this may not be in the purview of the intrusive inspections team in that they may not have any aircraft with single element dual load path scenarios. It was also stated that they may not have a statistically significant sample number. It was pointed out that a separate research and development

program may exist that already addresses these issues. It could be recommended that the FAA convene a separate group to look at flight controls.

Robert Manelski made the following proposal:

*Having reviewed the data available (e.g., SB, SDR, current industry practices and nonintrusive inspection, et. al.) and extending the knowledge of this group to hypothesis beyond this data, we conclude the following:*

- 1. The data does not point to any potential candidate system or component to which the aging systems effort should be extended.*
- 2. Based on hypothesis, we agree to the need for an assessment of single element dual load path flight control components as identified by the FAA R & D plan.*
- 3. Should the FAA deem further efforts are necessary outside of the above, we recommend that ATSRAC be chartered to do so as part of specific extended tasking statements or as a part of the existing five-year FAA aging nonstructures research program. Further, any such efforts should fit the ATSRAC definition of aging systems.*

Everyone favored items 1 and 2, above, but there was considerable discussion about including item 3, above. The majority was against item 3. Bob Robeson proposed the following amendment to item 3:

- 3. Should the FAA deem further efforts are necessary outside of the above, we recommend that ATSRAC be chartered to provide oversight to the FAA's five-year aging nonstructural systems research program to develop the data necessary for further activities. Any such efforts should fit the ATSRAC definition of aging systems.*

A vote was taken on the modification (Handout 10) to item 3 proposed above and the majority (12) were in favor of the modification. The approved proposal is as follows:

*Having reviewed the data available (e.g., SB, SDR, current industry practices and nonintrusive inspection, et. al.) and extending the knowledge of this group to hypothesis beyond this data, we conclude the following:*

- 1. The data does not point to any potential candidate system or component to which the aging systems effort should be extended.*
- 2. Based on hypothesis, we agree to the need for an assessment of single element dual load path flight control components as identified by the FAA R & D plan.*
- 3. Should the FAA deem further efforts are necessary outside of the above, we recommend that ATSRAC be chartered to provide oversight to the FAA's five-*

*year aging nonstructural systems research program to develop the data necessary for further activities. Any such efforts should fit the ATSRAC definition of aging systems*

After this, there was a discussion of the need to do a service history review for single point dual load path flight control elements. It was suggested that the group look at primary element failure and identify where dual load path elements and features are, then look at service history and SBs. A vote was taken on doing a service history review of single point dual load path components by June 30, 2000. Eleven members voted in favor, and three members voted against the proposal. The motion passed.

### **Status of Intrusive Inspections**

Chris Smith gave a presentation (Handout 11) on intrusive inspections. The plan was to inspect 6 to 8 aircraft, but the Intrusive Inspections Working Group felt it should be limited to 6 aircraft, given the new time constraints. The specimen types to be sampled were to be in benign and severe locations. They were not by aircraft model, but rather by wire type.

To date, 3 aircraft have been inspected visually -- an A-300 (mfg. 1978), a DC-9 (mfg. 1967) and a B-747 (mfg. 1973). The inspections were done in September 1999, November 1999 and January 2000. The objectives were to assess the:

- Adequacy of visual inspection for detection of hazardous wire degradation; and
- Condition of wire installations in aged aircraft.

The approach was to perform:

- Detailed visual inspections of select zones;
- Nondestructive testing (NDT) of preselected wire specimens within those zones; and
- Laboratory assessment of the preselected specimens.

Dr. Smith cautioned that the findings he presented in the remainder of the presentation were not given to draw statistical conclusions. Rather, they were provided to encourage discussion about the conduct of the intrusive inspections. At this point, inference from the data would be inappropriate. From the 3 intrusive inspections that were completed, there were several findings on each aircraft, none of which warranted immediate action by operators, manufacturers or regulatory authorities.

Of the three aircraft inspected, NDT was done on only the A-300. Two techniques were used, neither of whose results corresponded with each other or any of the visual findings (i.e., each technique found different flaws or conditions). Two more aircraft have been scheduled for NDT, one of which was partially completed. NDT would be evaluated after the third aircraft is completed, and lab testing was to begin immediately. The

baseline for testing was established at 20-year old unused wire. Dr. Smith expected that the final report would be ready by September 2000.

At this point, there were concerns expressed about damage occurring as a result of decommissioning the aircraft and how that might skew the data. Some of the aircraft were inspected 7 months after decommissioning.

The meeting was adjourned at 6:10 p.m.

### **Meeting Reconvened**

The meeting was reconvened at 8:00 a.m. on April 6, 2000.

### **Status of Arc Fault Circuit Breakers**

The meeting continued with a presentation (Handout 11, continued) from Chris Smith on the status of arc fault circuit breakers (AFCB). Inspections of B-737 fuel boost pump wire inspections revealed wire chafing and exposed wire with age. In addition, under certain conditions, circuit breakers do not pop. These were identified as areas of concern. The purpose of the AFCB program is to eliminate the occurrence of arcing faults and potential consequences.

An advisory meeting on AFCB was held in Denver, Colorado on March 23, 2000. The meeting was "information only" with the expectation that performance and product requirements, arc fault test methods and standards development would follow. Discussion areas included grounding requirements, physical configuration, arc fault indicating system, maintenance, troubleshooting, repair, reset policy for thermal and arc fault trips, environmental requirements, test and qualification methods and the formation of an SAE standards working group.

More information about AFCB can be obtained at the following website:

<http://aar400.tc.faa.gov/agingsystems/>

### **Mixing of Wire Types**

Stu Miller presented information on wire vibration tests (Handouts 12 and 13) provided by Bob Swaim, National Transportation Safety Board (NTSB). The NTSB is primarily concerned with mixing of wire types, interwire chafing, possible cold flow problems with Teflon and other wire types and Kapton arcing events that could melt lower temperature insulators. The presentation described the test procedures, visual observation before electrical testing, the test results and conclusions drawn. Much of the presentation drew data and conclusions from U.S. Navy Report TR-2333. The Navy tests were designed to evaluate the ability of wire insulations to resist degradation due to wire to wire abrasion when mounted in a harness configuration.

As a result of electrical testing, failure points on the wire samples varied, with about half of the failures occurring in areas of the bundles that were unsupported between moving and stationary parts. Failure points were frequently in a grooved or worn area of a wire. Failure spots also appeared in all areas of the bundles, many times in areas where insulation degradation resulting from vibration testing was not apparent.

After the presentation, there was much discussion. Mike Nancarrow voiced concerns as to what initiated these concerns (accidents, current accident investigations). General questions were asked as to why the FAA was bringing this subject to the attention of the ATSRAC. Mike Nancarrow reiterated his previous question and asked what the expected outcomes were. Stu Miller stated that there was not enough information presented to make decisions, and that perhaps these items should be tasked to a working group. Mike Nancarrow stated that page 4 of the U.S. Navy Report TR-2333 states, "wire should be selected based on its application." He pointed out that OEMs already do this.

Dan Strachan mentioned that this subject was discussed at the March 2000 NEMA aerospace meeting. He stated that these tests had already been done by the military and OEMs. One item was specifically discussed -- abrasion due to metal filings.

Patrick Glapa stated that Airbus had already done wire to wire abrasion testing (Handout 14). In Handout 14, he described the standards used and test specimens. They found good mechanical performance and minor degradation on outer insulation. Their conclusion was that, for the wire types tested, mixing of wire types had no impact on cable condition. Their findings showed that performance was lined to proper harness installation. Mike Nancarrow stated that Boeing agreed with Airbus' findings.

Ed Block noted that the Navy report disagreed with Airbus' findings. Kent Hollinger noted that there appeared to be some contradictions in the Navy report. Bill Schultz stated that there may be something else happening other than abrasion. Perhaps other dynamics were causing the material changes. RaNae Contarino stressed the importance of comparing like items. Luci Crittendon pointed out that the Navy study was old -- 17 years old. Mike Nancarrow stated that they did not know what the context of the Navy report was or how it related to commercial operations. He also stated that Boeing had no reports of problems in this area. Dan Strachan pointed out that the Navy study was done under lab conditions, and that the results could vary greatly from results produced under real world conditions. Mr. Strachan believes intrusive inspections should be used to look at these issues, also. Mike Nancarrow agreed and suggested locating information on wire conditions under high temperature/high vibration environments and distribute it to the committee before the next meeting.

The ALPA representative requested that midspan specimens be taken for microscopy from the aircraft scheduled to undergo intrusive inspections. Chris Smith agreed to do so and provide the results to the committee.

Mike Nancarrow asserted that Boeing design manuals allow mixing of wire types and that you cannot take one study and base new action on it. RaNae Contarino submitted

that there were wire problems from a DoD perspective and concurred that DoD flight operations occur in a very different environment from commercial air carriers.

Ed Block asked why the committee seemed to be discounting AC 25-16 and AC 29.2B. No one had a definitive answer for this question, but Stu Miller commented that he thought the ACs had drawn from the Navy report. Patrick Glapa suggested getting information from engine manufacturers about wire harnesses functioning in high vibration environments. Ed Block stated that he had concerns that there were bigger issues than just abrasion. He believes there may be issues with mixing wire types, service life, flammability requirements and so on. Dan Strachan said he wanted to take information with him about this issue to the aerospace group meeting in June to get their feedback. Mike Nancarrow stated that he wanted the expected outcomes from mixing wire types to be defined for the next ATSRAC meeting.

### **Future Meetings**

The following meetings have been scheduled. There was some discussion that the January 17 - 18, 2001 meeting should be held somewhere other than Washington, DC due to the elections and subsequent swearing in of the next President of the United States. It was suggested that perhaps the meeting could be held at Airbus facilities in Miami, FL, but arrangements need to be finalized and the specific location needs to be provided. A complete list of future meetings follows:

<b>Date</b>	<b>Location</b>
July 19 - 20, 2000	FAA, Bessie Coleman Conference Center, 800 Independence Ave., SW, Washington, DC
October 11 - 12, 2000	FAA, Bessie Coleman Conference Center, 800 Independence Ave., SW, Washington, DC
January 17 - 18, 2001	FAA, Bessie Coleman Conference Center, 800 Independence Ave., SW, Washington, DC

### **Action Items**

Mr. Hollinger reviewed the action items from past meetings. All carryover items had been completed.

### **Adjournment**

The meeting adjourned at 10:07 a.m. on April 6, 2000.

Kent Hollinger  
Chair

Approved:

## **ACTION ITEMS**

1. Summarize issues for the letter to the FAA. (Kent Hollinger)
2. Provide a draft of the letter to the FAA for review. (Kent Hollinger)
3. Communicate the results of the April 28, 2000 meeting with AIR-1 to the ATSRAC.  
(Kent Hollinger)
4. Provide additional information on mixing wire types before the next ATSRAC meeting. (RaNae Contarino)
5. Provide information on wire usage by system type. (Mike Nancarrow)
6. Pull mid-span sample of wire for microscopy as part of the intrusive inspections.  
(Chris Smith)
7. Provide additional information and rationale for the origins of data included in AC 25-16 and AC 29.2B. (Stu Miller)
8. Contact engine manufacturers about wiring and have them provide someone to make a presentation at the next ATSRAC meeting. (Bob Robeson)
9. Continue to monitor the implementation of ATA code 97.
10. Provide resumes of the new working group members to the Chair and Executive Director. (Tony Harbottle)
11. Normalize SDR data and provide it to the ATSRAC electronically before the next meeting. (Chris Smith)
12. Send Robert Manelski's presentation to ATSRAC members. (Stu Miller/Terry Stubblefield)