THE CACRC is a branch of the SAE International Aerospace Division. It is an airline maintenance committee, formed in 1991 as a combination of ATA, IATA and SAE committees, with a common charter:

“To reduce the cost of maintaining composite structures through standardization of materials, techniques & training”

CACRC Meeting Xiamen, China

HAECO (Hong Kong Aircraft Engineering Co) hosted the October meeting.

Meeting Focus: Damage Identification, Assessment & Reporting.

This location was an excellent opportunity for the Asian region to participate with other airlines/operators, regulatory authorities, aircraft manufacturers, MROs, material suppliers, equipment/tooling suppliers and others. Attendees from the region included representatives from HAECO, COMAC, Asian and Middle-Eastern airlines. Updates were received from all active task groups. The main focus was on damage detection, assessment and reporting.

EASA shared the latest developments with regards to the EASA Composite Materials Safety Strategy and on behalf of the FAA with regards to the three focus areas: continued operational safety, certification efficiency and workforce education (more details are available in pages 2 and 3 of this newsletter).

The presentations are available to CACRC members on the CACRC website > Minutes and Presentations > October 2018.

To become an SAE-CACRC member contact Jordanna.Bucciере@sae.org

On the Web: www.sae.org/works/committeeHome.do?comtID=TEAAMSCACRC

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REGULATORY UPDATE - EASA

Focus area: Composite Materials Safety Strategy.

EASA UPDATES FROM THE XIAMEN MEETING:

The following is a summary of the EASA presentations to promote understanding of the European Regulations, guidance material and the role of CMH-17, the CACRC and other industry groups to help operators and MROs comply with the rules. The EASA presentations are available on the CACRC website.

- Regulations (‘hard law’) EC 2018/1139 annex II 1.1:
  “Structures and Materials: the integrity of the structure must be ensured... … and maintained for the operational life of the aircraft.”
- Certification Specifications (‘soft law’)
  CS 25-603 “The Suitability and Durability of Materials Used for Parts” (for Composite Materials see AMC 20-29)
  CS 25-571 “Damage Tolerance and Fatigue Evaluation of Structure” (See AMC 25.571)

- Acceptable Means of Compliance and Guidance Material (‘soft law’) AMC 20-29
  Composite Aircraft Structure and its companion document FAA AC 20-107B includes guidance for design, manufacturing and maintenance/repair. The procedures outlined in this AMC provide Acceptable Means of Compliance and Guidance Material for composite structures, particularly those that are essential in maintaining the overall flight safety of the aircraft critical structure.
  AMC 20-29 and AC20-107B are expected to be revised in 2020 once the EASA/FAA world-wide workshops are complete, to reflect the continued evolution of composite technology and the data collected from service experience and expanding applications.

Regulators recognise the need to engage with and harmonise activities with the industry - which includes OEMs, Operators, MROs, Approval Holders, Subject Matter Experts & Standards Organisations like NIAR, CMH-17, ASTM, & SAE - CACRC.

- CMH-17 (industry partner) Composite Materials Handbook 17 includes guidance for design, manufacturing and maintenance/repair. A Safety Management Working Group was initiated in 2006. The regulators use CMH-17 as a forum to develop guidance and document items controlled by safety management. EASA, FAA, NIAR and NCAMP feed data sets into CMH-17.
  CMH-17 Vol 3 Chapter 13 Defects, Damage and Inspection and especially Chapter 14 Supportability, Maintenance & Repair overlap with the CACRC working group. Refer www.cmh17.org

- SAE-CACRC (industry group) Commercial Aircraft Composite Repair Committee.
  The regulators participate in, and use the CACRC as a forum to develop guidance and support industry composite maintenance standards & training efforts. Refer AIR 5719 and others for training.
  ToR MDM.059 RMT.0255 “Miscellaneous of Part-66” includes a revision to Part 66 ‘Certifying Staff’, possible training appendix (ref. SAE AIR 5719 content) because the existing Part 66 is very limited with regards to composites.
  Notice of Proposed Amendment NPA 2018/11 ‘Certification Specifications and Guidance Material for Maintenance Certifying Staff Type Rating Training’ RMT.0106 (21.039(e)). The objective of this NPA is to improve the level of safety related to the minimum syllabus of maintenance certifying staff type rating training, enabling design approval holders that comply with Annex I (Part 21) of Regulation (EU) No 748/2012 to identify the technical elements necessary to be addressed for the purpose of training of maintenance certifying staff involved in the maintenance of their products. In addition, the intent is to ensure an adequate minimum syllabus standard at organisations that comply with Annex IV (Part-147) to Regulation (EU) No 1321/2014. Open for operator input until December 2018.
  EASA Rulemaking Directorate ToR RMT.0275 (MDM.075) proposal to expand the “specialised task” cat D class rating to include welding and composite repairs has been parked.

More information on this subject can be found in the Training Task Group update on page 4.
REGULATORY UPDATE - FAA

Three focus areas: Continued Operational Safety, Certification Efficiency and Workforce Education.

FAA UPDATES FROM THE XIAMEN MEETING:

- Federal Aviation Regulations, or FARs, are rules prescribed by the Federal Aviation Administration (FAA) governing all aviation activities in the United States. The FARs are part of Title 14 of the Code of Federal Regulations (14 CFR). The parts of most relevance to composites include parts 23, 25, 27, 29, 43, 121 and 145.

- Advisory Circular AC 20-107B Composite Aircraft Structure (initial version released in 1984, rev B Change 1 released August 2010) sets forth an acceptable means, but not the only means of showing compliance with the provisions of Title 14 of the Code of Federal Regulations (14 CFR) parts 23, 25, 27, and 29 regarding airworthiness type certification requirements for composite aircraft structures involving fiber reinforced materials, e.g., carbon and glass fiber reinforced plastics. Guidance information is also presented on the closely related design, manufacturing, and maintenance aspects. It has a companion document - EASA AMC 20-29. 
  **Expect AC 20-107C in 2021/2022** once the EASA/FAA world-wide composite workshops are complete, and after completion of an AC for Structural Mods, Bonded Structure and Sandwich Structure and completion of CMH-17 (Rev H) & CACRC docs coming out of the Procedures TG.

- Advisory Circular AC 43-214A Repairs and Alterations to Composite and Bonded Aircraft Structure (superseded AC 145-6, latest revision released in July 2016) provides information and guidance concerning an acceptable means, but not the only means, of demonstrating compliance with the requirements of Title 14 of the Code of Federal Regulations (14 CFR) parts 21, 23, 25, 26, 27, 29, 31, 33, 35, 43, 91, 121, 125, 129 (U.S.-registered airplanes), 133, 135, 137, and 145 regarding procedures and facilities for repairs and alterations of structures consisting of adhesively-bonded (including metal bond) and fiber-reinforced materials (e.g., carbon, aramid, and glass-reinforced polymeric materials mentioned in the current edition of AC 20-107). Includes reference to several SAE documents, including SAE AIR4938 Composite and Bonded Structure Technician/Specialist: Training Document.

- Advisory Circular AC 65-33A Development of Training/Qualification and Certification Programs for Composite Maintenance Technicians (latest revision released June 2017), is intended as a guideline for repair organizations to develop a formal training program for qualification and certification of composite technicians that they employ. This AC contains recommendations for the experience, training, qualification, and examination of persons performing maintenance and repair of aircraft composite structures or other aviation composite components. The revision adds more focus on practical skills assessment via the addition of appendix B “Sample Repair Curriculum Practical Skills Evaluation”.

  In 2003 the FAA initiated a Center of Excellence in Advanced Materials also to be known as **JAMS** (the FAA Joint Advanced Materials and Structures Center of Excellence). The center is a joint award to two separate consortiums:
  - Center of Excellence for Advanced Materials in Transport Aircraft Structures (AMTAS) led by University of Washington
  - Center of Excellence for Composites & Advanced Materials (CECAM) led by Wichita State University. This university is also home to other composite research organisations.
  - **NIAR** is a department within Wichita State University and is also home to the National Center for Advanced Materials Performance (NCAMP), which is funded through the FAA and Air Force Research Laboratory. NIAR has been trialling composite test coupons.

- FAA/NIAR presentations, recaps and breakout sessions: [https://www.niar.wichita.edu/niarfaa/WorkshopRegistration.aspx](https://www.niar.wichita.edu/niarfaa/WorkshopRegistration.aspx)

The FAA has relied heavily on participation from other authorities, government agencies and industry to develop composite policies and guidance.

More FAA updates in Newsbites on back page.
TRAINING TASK GROUP (TTG)

Enhancing safety and contributing to maintenance cost reduction by providing standardized training curricula and standards in support of the creation of an industry-wide certification program.

TRAINING UPDATES FROM THE XIAMEN MEETING:

- Work continued on the draft AIR 6825 “Identification and Assessment of Damage to Composite Aircraft Structures Training Document” for certifying staff. As mentioned in the previous newsletter, regulators are content with the training requirements for composite repair technicians, and are now focusing on the minimum training requirements for LAMES / A&P mechanics to help them gain knowledge, training & confidence concerning composite structure damage assessment. The regulators have once again joined forces with the CACRC to develop an acceptable curriculum which will focus on the differences in the visual appearance of damage compared to traditional metal aircraft, to give the first respondent the knowledge on how to identify and assess damage with confidence. It will also heighten awareness within the ramp/hangar environment to trigger additional inspections after an event. As we know, metallic fuselage dents are visible due to plastic deformation, whereas composite structures are different, in that the structure can "bounce back" rather than remain dented.

  • Relies on "Just Culture" reporting philosophy.
  • The TTG has met on several occasions this year and has drafted a document which contains 4 training modules.
  • This training will be more detailed than part 66 training, but not as detailed as composite technician training.
  • Intend to include "NDT for non-NDT personnel" e.g. Airbus Line Tool, Boeing Ramp Damage Checker, perhaps Dolphicam & others.
  • Some operators currently invest 3 days training their staff on Boeing specific training on this subject, and another 3 days on Airbus specific training. This document is designed to cover both.
  • The regulators require this training to be acceptable to the OEMs in the first instance.

EASA Rule 25.571 states: “damage falls under 4 categories: Fatigue, manufacturing defects, environmental, and accidental”

⇒ AMC 20-29 Para 8 Fatigue and Damage Tolerance states: "... must show that catastrophic failure due to fatigue, environmental effects, manufacturing defects, accidental damage will be avoided throughout the operational life of the aircraft," and "All technicians, inspectors and engineers involved in damage disposition and repair should have the necessary skills to perform their supporting maintenance tasks on a specific composite structural part."

⇒ Aiming to have AIR 6825 ready for ballot by June 2019 meeting.


- AIR 4844: glossary of industry-specific terminology. A folder has been created in the CACRC website called “Glossary Additions” under committee work area. CACRC members are encouraged to enter their glossary suggestions into this folder.

- E-Qualified - Performance Review Institute (PRI) composite repair practical examination reviewed earlier this year and feedback given to PRI. Several CACRC members are contributing to the examination criteria - initial and recurrent.

With regards to the above work there is an overlap with CMH17 Volume 3 Chapter 13 (Defects, damage and inspection) and Chapter 14 (Supportability, maintenance and repair). The next CACRC meeting in Wichita will be combined with a CMH-17 meeting to pool resources and avoid duplication.

Further to the EASA NPA discussed on page 2, the NPA is to improve the level of safety related to the minimum syllabus of maintenance certifying staff (MCS) type rating training (TRT), enabling design approval holders (DAHs) that comply with Annex I (Part 21) of Regulation (EU) No 748/2012 to identify the technical elements necessary to be addressed for the purpose of training of maintenance certifying staff involved in the maintenance of their products. In addition, the intent is to ensure an adequate minimum syllabus standard at organisations that comply with Annex IV (Part-147) to Regulation (EU) No 1321/2014.

These proposals are expected to enhance safety & mitigate risk related to maintenance errors due to inadequate training and to establish a TRT minimum std. Operators currently have varying levels of training. This document will standardise that training.
SURFACE PREPARATION:

SOLVENT CLEANING PRIOR TO BONDING

Surface preparation prior to bonding is a critical stage of any bonded repair.

Solvent cleaning prior to bonding or painting differs from general cleaning in that a higher level of cleanliness is required. OEMs have known this for decades, which is why the structural repair manuals and associated process specifications contain detailed instructions on how to best prepare a surface for bonding. SAE Aerospace Recommended Practice ARP 4916 “Masking and Cleaning of Epoxy and Polyester Matrix Thermosetting Composite Materials” was created in 2011 and is the standard to which many OEMs refer when writing their solvent cleaning procedures. The following is one example of the 2-cloth method:

1. Put selected cleaning agent on the first clean cloth to make this cloth moist. Do not saturate the cloth. Do not dip the cloth into the cleaning agent.
2. Move the 1st cloth across the part that is to be cleaned.
3. Use a 2nd dry clean cloth to wipe the part before the cleaning agent on the part dries.
4. Continue this procedure until a clean part of the dry cloth stays clean.
5. Do the last wipe with a clean dry cloth before the cleaning agent on the part dries.
6. Let the part that has been cleaned dry for a minimum of 15 minutes.

For repair areas surrounded by paint, remember to start the wipe from the centre of the repair area and wipe contamination away from the repair, not toward it.

A composite repair can be compared to the tale of a farmer taking his produce to market in an overloaded barrow.

The farmer asked a villager how long would it take him to get to the town square - to which came the reply:

“The road is very bumpy. If you go carefully, it will take about two hours. If you hurry, it will take all day.”

Old School:

A once-popular solvent cleaning method in the 1980s & 90s was the 2-stage wipe-on, wipe-off process using a polar solvent followed by a non-polar solvent.

Water is polar and dissolves other polar substances like ammonia, ethanol, etc. and soap.

MEK is non-polar and dissolves other non-polar substances like fats, oils, grease, gasoline, etc.
REPAIR TECHNIQUES TASK GROUP (RTTG)

Contributing to maintenance cost reduction by providing harmonized repair techniques. Taking best practice and making it the standard.

REPAIR TECHNIQUES UPDATE FROM THE XIAMEN MEETING:

- **ARP5701 Lay-Up** of Pre-Preg Composite Materials is ready for review/ballot. Key aspects: cleanliness is essential. Contact materials must be carefully chosen. Temperature and humidity control post surface preparation.

- Revising **ARP5431 Repair Tooling** introduction of new technology included (Additive Manufacturing/3-D printing), new section for tool inspection and storage (need input regarding good/poor practices), draft to be completed via webex, target for next meeting June 2019.

- AIR5702 Storage and Handling of Epoxy Thermosetting Composite Materials review complete, draft validated.

- **AIR XXXX Local Controlled Contamination Area** (CCA) continuing to develop, yet to be published.

- Airline group question reduced drying cycles for low temperature wet layup repairs.

- Also working on airline group question regarding the recording of elevated temperature exposure record keeping.

- Future activities include removal of fittings - best practice to avoid damage.

- New forums suggested for future meetings - to share repairs on new aircraft models, and to share experience on repairs.

- Bi-monthly webex meetings every second Tuesday.

**High priority issue for further consideration:** Investigate the possibility of shorter moisture removal cycles to reduce aircraft down-time. This may involve the use of research organisations.

PROCEDURES TASK GROUP (PTG):

Evolving composite repair practices into a model similar to that of the metal industry through the acceptance and implementation of standards.

PROCEDURES UPDATE FROM THE XIAMEN MEETING:

The Procedures Task Group failed to reach a quorum and therefore did not meet.

**Work In Progress:**

COMPOSITE DURABILITY

Teardown of a carbon-fiber aircraft part.

TEAR-DOWN OF AN 18 YEAR-OLD CARBON-FIBER STABILIZER:

- The following article takes excerpts from a DOT/FAA/AR-12/1 report published in 2013 on the teardown evaluation of a 737-200 carbon-fibre horizontal stabilizer, and a Composites World article "The FAA: Keeping up with aerocomposites evolution".

- In the late 1970s and early 1980s, NASA, through its AirCraft Energy Efficiency (ACEE) Advanced Composites Structures Program, challenged large-transport manufacturers in the USA to use graphite material to redesign existing aircraft components. The program’s goal was to develop the necessary data and technology to achieve production commitments to advanced composites. The graphite/epoxy horizontal stabilizers that were developed by Boeing for its 737 as part of this effort were put into commercial service in 1984. They have performed outstandingly, with no service incidents reported. This has led to increased confidence in, and acceptance of, composites for primary aircraft structure.

- The subject 737-200 horizontal stabilizer entered service in August 1984, was in service for 18 years, and was retired in 2002 after completing 48,000 flights and 52,000 hours of service.

- The FAA report provides a summary of the B-737 horizontal stabilizer teardown and findings of the aging aircraft study. Non-destructive Inspection (NDI) methods were conducted on the structure prior to disassembly. The current state-of-the-art inspection methods were used to evaluate their accuracy in detecting flaws in the structure. Inspection methods prior to teardown included thermography, RapidscanTM, laser UT, and Boeing NDI. NDI inspections conducted after teardown included TTU (Through transmission) and PE (Pulse echo) ultrasonics. Results indicate the composite structure maintained its structural integrity over its service life and did not show significant degradation or detrimental signs of aging.

- The B-737 horizontal stabilizer, shown in figure 17, consists of a structural box, an aluminum leading edge, a stabilizer lip, a fixed fiberglass honeycomb trailing edge and ribs, an elevator, and body gap covers. Each stabilizer is secured to a metal center structure with three lugs at the rear spar and two lugs at the front spar. The structural box was redesigned using CFRP composites so that maximum commonality was achieved with the existing metal configuration and that both structures are interchangeable in terms of geometry and aerodynamic shape. No modifications to the interface with the center section were made to meet the interchangeability requirements. The bending and torsional stiffness of the composite stabilizer as well as its aerodynamic shape and planform were made comparable to the metal stabilizer to meet control effectiveness and flutter requirements. Furthermore, the composite stabilizer was designed to be damage tolerant, and its strength, durability, inspectability, and serviceability equivalent to that of the metal structure.

- The objective of the horizontal stabilizer teardown was to evaluate the aging effects on the performance of the composite structure after 18 years of service or 48,000 flights, which is the equivalent of about two-thirds of its design service lifetime. The main goal was to evaluate the structural health of aged composite structure. To accomplish this, the research was divided into several non-destructive and destructive subtasks. The goal of the non-destructive inspections was to characterize the state of the structure after 18 years of service and to investigate the existence and extent of flaws introduced during manufacture or service using current methods used in the field as well as more sophisticated methods, including thermography, laser UT testing, Rapidscan, etc. The objective of the destructive inspection and evaluation was to confirm the existence of flaws using NDI to conduct mechanical tests, thermal analysis, physical tests, and image analysis, and to compare the data to that generated during the design phase, whenever possible.

- The main observation following disassembly was that the stabilizer ... appeared to be in very good condition, with no evidence of deterioration, corrosion, or pitting that is typically observed for a metallic structure with a similar service history.

- Moisture levels in the structure were as predicted by design, typically < 1.1%.

- For mechanical tests where baseline data was available (1970s certification and test data), the residual strengths met or exceeded the baseline values. No significant degradation was noted in any of the tests.

- The upper skin scans showed excessive porosity from manufacture - up to 7%. They also found a very porous repair. Void contents observed in these parts are not allowed according to today’s standards.

- PE results using today’s equipment capabilities showed the improved accuracy/sensitivity of the current inspection methods compared to those used in the 70s.

The teardown provides closure to a successful NASA program and affirms the viability of composite materials for use in structural components. From all data generated, the margins were sufficient to warrant a "no significant degradation" conclusion.
REPAIR MATERIALS TASK GROUP (RMTG):

Improving the availability of repair materials.

MATERIALS UPDATE FROM THE XIAMEN MEETING:

The Repair Materials Task Group did not meet at Xiamen. The recent materials survey had a very low response rate. Executive discussion focussed on how to get a higher participation rate from airlines.

On the radar:

- Thermoplastic parts.
- Additive Manufactured (3-D printed) parts.
- Resin infused parts.
- Standardised repairs to the above.
- Wider cure temperature range for 250°F metalbond adhesives?
- Reduced vacuum pressure during metalbond vacuum curing?
- Meets every second Wednesday of the month.

OPEN SESSION DISCUSSION TOPICS:

- Market forces continue to apply pressure on manufacturers to reduce costs.
- Thermoplastic market is growing, much cheaper to produce.
- Prepregs have proven performance, but have associated high cost due to material manufacture, storage, shipping, and of course the cost of running an autoclave.
- AMS 2950 stabilized, AMS 2890 QPL, AMS 2980 rev B published. Availability of kits
- new spec AMS 6885 134 gsm and 194 gsm.
- AMS 6885 Carbon Intermediate Modulus Tape Prepreg material - Structural Applications.
- AMS 3970 revision in progress incl storage life, additional cure cycle for thicker lay-ups.
- Special fastener availability, standardisation of such fasteners.
- Lightning strike protection materials.
- Suppliers such as Heatcon are working on improving the visibility of stock so end users can quickly see what is available.
- With regards to further standardisation of composite materials - modern aircraft are designed to be as light weight and fuel efficient as possible, resulting in the use of many specialised composite materials. There is no single composite repair material suitable for all applications. Therefore rationalisation of composite materials is somewhat limited, especially in the higher temperature range materials.
- Focus has switched to availability of small quantities of materials and kits.
INSPECTION TASK GROUP (ITG):
Enhancing aircraft safety by assessing & improving NDI flaw detection performance in composite aircraft structures.

INSPECTION UPDATES FROM THE XIAMEN MEETING:
The Inspection Task Group failed to reach a quorum and therefore did not meet.

OPEN SESSION DISCUSSION TOPICS:

- Collaborating with the Training Task Group which is developing white paper regarding line personnel and includes NDI for non-NDI inspectors
- Updating ARP 5089 Composite NDI Handbook. Currently focuses on honeycomb, adding solid laminates. Ply drop-off areas are challenging to inspect with instruments. Line Sizing Tool, RDC, DolphiCam, or thickness measuring instrument, plot the area and send it to OEM.
- AIR 7491 drafted Composite Inspector Training.
- Composite Bond Integrity Assessment under Composite Repair Tear-Down.
- Remote NDI Expert Assessment. To improve responsiveness, safety and aircraft availability. Assess performance, gain confidence, guide evolution, etc. DolphiCam, etc.
- Drone-Based visual inspections. Working closely with Delta Airlines. Automated to ensure 100% coverage.
- Airbus is already performing drone-based inspections - key area is that the inspector needs to teach the machine what is damage and what is not (skin waviness, paint finish, etc.).
- One operator shared their experience with this type of inspection technique - would like to use in the line environment for lightning strike inspections, etc., however there are several issues regarding the use of drones on an airfield requiring permits to fly. Also challenges regarding drone use in hangars. EASA provided some additional guidance on this.
- Turning attention to thickness measuring equipment rather than a “Go/No-Go instrument” for damage reporting on composite airframes to help speed up the damage reporting and assessment for in-service aircraft.

High priority issue for further consideration:

⇒ Develop inspection tools and techniques to non-destructively measure bond strength.
⇒ Investigating Ultrasonic Guided Wave (UGW) non-destructive inspection method to detect internal damage.
⇒ Testing on bolted joints as well. Investigations continue.

IMPROVED HEATER BLANKET:
HEATCON has been developing a revolutionary new heater blanket which improves temperature control over heat-sink areas and reportedly ensures all areas reach the required cure temperature.

Look for the HCS9400-02 Smart Susceptor™ composite curing system - should be available in the new year.

Demonstrated at recent SAMPE & MRO meetings.

More details in the June 2019 CACRC Newsletter.
NEWS BITES: The presentations given at the October 2018 SAE-CACRC meeting are posted on the SAE event website:

https://www.sae.org/works/committeeHome.do?comtID=TEAAMSCACRC

Presentations are only available to CACRC members. Contact your local CACRC member or the SAE administrator Jordanna Bucciere for more information.

The Airbus A350 SRM is called an ASR (Air vehicle or Aircraft Structural Repair) manual for managing in-service damage on A350 aircraft. The reason for the new manual is due to the A350 being a completely new program with a high use of composite material, new design principles and associated methods…

SAE Aerospace Standards update from Alan Ao (SAE): ensuring compliance with European law. Increased controls relating to how information is shared. For more details refer to the SAE International Standards Works website.

Benefits of participating in the CACRC from Jan Popp (Lufthansa): networking with other operators to discuss composite repair challenges, face-to-face discussions with OEMs, contribute to the creation and revision of international standards, one-on-one discussions with regulatory authorities and provide feedback & input into regulatory documents like EASA AMC 20-29 / FAA AC 20-107, AC 65-33, etc.

Damage Information Required for Assessment and Analysis from Francois Museux (Airbus): sizing (types) of damage, location, dimensions, proximity to other damage/repairs, reporting back to the OEM, accurate and complete data required to prevent towing and re-approach. Possibly copy the IATA/ATA spec 2500?

Damage Checklist from Arne Lewis (Boeing): Boeing Service Letter 787-SL-51-001-F “Damage Reporting and Repair Plan/Design Guidelines” was published due to the widespread variation of report-backs to Boeing and covers all Boeing aircraft types. It was the first service letter published for the 787 to ensure operators understand the information that needs to be provided. OEMs advise damage reports often lack sufficient information. Not specific to composites either - OEMs advise they have similar issues with metallic structure damage reporting. MROs advised that different operators have different reporting methods, up to 40 different forms. Discussion around standardizing the report back forms. Possibly copy the reliability IATA/ATA spec 2500?

Additive Manufacturing (including 3-D Printing) from Simon Waite (EASA): AM is defined by the material and process built directly into the part or repair. It is rapidly evolving and there are many AM methods in use. Popular in their ability to create complex parts. Challenging issue due to process sensitivity. For more info refer to Simon’s presentation. EC No 216/2008 is changing, refer EC No 216/2008 annex 1a, 21A.31 relating to materials, and GM 21.A.147(a) relating to production. Regulators are struggling with the appropriate level of guidance since there are so many materials, processes and applications. FAA memorandum AIR100-16-130-GM18 “Engineering Considerations for Powder Bed Fusion Additively Manufactured Parts” “Priority is safety - not reduce the current level of safety. Regulators are prioritizing activities with respect to novelty and criticality. Certification memo EASA CM-S-008 Issue 1 “Additive Manufacturing” provides guidance relating to the use of AM technologies subject to EASA Regulations. AM will be subject to increased oversight by the regulators. For low criticality, non-metallic items working on a shared database with NIAR / NCAMP ULTEM 9085. CMH-17 (SAE AM meetings).

MRO Trends in the Coming Years from Tony Manion (on behalf of Mark Hayman of Aviation Services Research Centre): Part of Hong Kong Polytech and co-founded by Boeing 2012. Provides MRO solutions to ensure sustainable aviation industry growth across China and South-East Asia. Predicting significant growth in this region (esp. China) in the next 9 years. 2 significant projects - automated NDI and 3-D scarfing.

Thermoplastics Discussion lead by Ray Kaiser (SAE): Emerging technology. Very limited use on commercial aircraft at present, but likely to grow. EASA confirmed increased use. Is now the time to develop a minimum standard for thermoplastic welding?

About the CACRC

The Commercial Aircraft Composite Repair Committee is a branch of:

SAE Aerospace Standards

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Coming Up In Future Issues:

Double bagging
Major / minor repairs
Lower vacuum levels for metalbonds
Core cleaning
ATEX regulations
On-tool extraction
Smart Susceptor blankets

Lessons learned / operator experience shared including DVD repairs, bolt-on repair patches, trailing edge wedge repairs.

Plus updates from the next CACRC meeting in Wichita, USA June 2019.