

**Date:** December 13, 1999

**To:** MIL-HDBK-5 Coordination Group

**Subject:** Minutes of the 98<sup>th</sup> MIL-HDBK-5 Coordination Meeting

The minutes and attachments for the 98<sup>th</sup> MIL-HDBK-5 Coordination Meeting, held October 18-21, 1999, are enclosed. I would like to thank each of you for your participation. It is your input, obtained through your comments and contributions, that has helped make MIL-HDBK-5 very credible.

The next (99<sup>th</sup>) MIL-HDBK-5 Meeting will be held in Salt Lake City, Utah, the week of March 20-23, 2000. Information concerning this meeting is contained with these minutes. A formal meeting announcement will be distributed in January 2000.

If you have any items you wish to have included on the agenda for the next meeting, please provide the data/information as soon as possible to allow time for complete and proper analysis. This will enhance the likelihood of approval of the item at the 99<sup>th</sup> meeting.

Sincerely,

Neal Ontko, Chairman  
MIL-HDBK-5 Coordination Group  
Air Force Research Laboratory  
Materials and Manufacturing Directorate  
Wright-Patterson AFB, OH 45433-7718

Enclosures

NO/RCR:bkb

**Minutes**

**for the**

**98<sup>th</sup> MIL-HDBK-5 Coordination Meeting**

**held in**

**Raleigh-Durham, North Carolina  
October 18-21, 1999**

**by**

**BATTELLE  
505 King Avenue  
Columbus, Ohio 43201-2693**

**for**

**Air Force Research Laboratory  
Wright-Patterson Air Force Base, Ohio 45433**

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**MINUTES OF THE 98<sup>th</sup> MIL-HDBK-5  
COORDINATION MEETING**

**held in**

**Raleigh-Durham, North Carolina**

**on**

**October 18-21, 1999**

**I. Chairman's Remarks**

The Chairman, Neal Ontko, Air Force Research Laboratory (AFRL), Materials and Manufacturing Directorate (ML), opened the meeting and welcomed attendees. He reviewed briefly the history of the MIL-HDBK-5 program. The Chairman indicated that MIL-HDBK-5 has been maintained as a joint effort of the Department of Defense and the Federal Aviation Administration (FAA), and previously funded by the Air Force and FAA. However, budgetary restraints for FY00 and beyond are responsible for a reduction in funding. The Chairman then read a letter prepared by AFRL/MLS (see page 3). The purpose of the MIL-HDBK-5 semiannual meetings is to obtain coordination of changes and additions to the Handbook among industry, DoD, and FAA. Items for changes and additions, which may be introduced by any participant, are discussed at the meeting and a consensus is obtained. As with any military specification, actual approval of individual items is the responsibility of the coordinating governmental agency. In the event of unresolved issues, the preparing agency, in this case the Air Force as represented by the Chairman, is the final approving authority. The Chairman urged each person, particularly new attendees, to participate in discussion of the agenda items and to voice their company's viewpoint.

The Chairman gave the participants an opportunity to introduce themselves. A list of attendees with their telephone number, facsimile number, and E-mail address is attached. It was indicated that modifications and additions to the Handbook approved at this meeting will be prepared in final format by Battelle and will appear in MIL-HDBK-5H, Change Notice 1. A list of changes and additions approved at the 98<sup>th</sup> meeting is included as an attachment to the minutes.

The Chairman announced the next (99<sup>th</sup>) MIL-HDBK-5 meeting will be held in Salt Lake City, Utah. The meeting will be held March 20-23, 2000. The initial announcement for this meeting is attached. The Fall 2000 meeting (our 100<sup>th</sup> meeting) is scheduled to be held in Dayton, Ohio, sometime in October-November. Shown below is a list of cities for the spring 2001 meeting that were suggested at the 98<sup>th</sup> meeting.

- |              |                      |
|--------------|----------------------|
| 1. Reno      | 5. Dallas/Fort Worth |
| 2. Las Vegas | 6. Santa Barbara     |
| 3. St. Louis | 7. Anaheim           |
| 4. Portland  |                      |

Future meetings and revisions of the Handbook will be dependent on continued funding.

**II. Approval of 97<sup>th</sup> Meeting Minutes**

The minutes of the 97<sup>th</sup> meeting were approved as distributed.

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**III. Retirements/Announcements**

Bernie Beal notified the MIL-HDBK-5 coordination group that he has begun “full-time retirement”.

Mike Tarkanian, Boeing – Expendable Launch Systems, also notified the MIL-HDBK-5 coordination group that he will no longer be attending coordination meetings.

Certificates of appreciation were given to both individuals.

**IV. Order of Business**

The order in which items were discussed followed the chronology of the agenda. The activity on specific agenda items is recorded in these minutes in numerical order, by chapter. A list of new item numbers assigned at this meeting is attached.

Some of the items were approved on a 60-day basis. Comments for items approved on a 60-day basis should be sent to the Chairman or Secretary of the Handbook within 60 days from the date of the cover letter. If no comments are received on an item within the 60-day period, the item is considered approved and will appear in MIL-HDBK-5H, Change Notice 1. If there are negative comments that are considered technical in nature, approval of the item will be withdrawn and the item will be readdressed at the next meeting.



**DEPARTMENT OF THE AIR FORCE**  
AIR FORCE RESEARCH LABORATORY  
WRIGHT-PATTERSON AIR FORCE BASE OHIO 45433

14 Oct 1999

MEMORANDUM FOR AEROSPACE INDUSTRY

FROM: AFRL/MLS  
2179 12<sup>th</sup> Street, Room 122  
Wright-Patterson AFB OH 45433-7718

SUBJECT: MILITARY-HANDBOOK-5 "Metals Materials and Elements for Aerospace Vehicle Structures

1. MIL-HDBK-5 has long been recognized within the aerospace community as an invaluable source of unbiased, high quality design allowable information for a host of aerospace applications. It is also recognized as a valuable tool for the transition of advanced materials to routine use and for maintaining the structural integrity of operational systems. It is for these reasons that the Materials and Manufacturing Directorate (ML) has maintained an active role in MIL-HDBK-5 activities for over 38 years.
2. As I'm sure you know, several years of budget reductions to the AF Science and Technology accounts have resulted in the reduction or elimination of a wide range of critical programs across AFRL. Within the Materials and Manufacturing Directorate alone, we have experienced five consecutive years of significant reductions in our core budget, and we are now at a point where we must look for alternate sources of funding to sustain MIL-HDBK-5 activities in the future.
3. Options we are currently pursuing include: full funding for MIL-HDBK-5 from another government source; a CRADA arrangement; and an industry/government consortium. Our technical leadership and program management team will continue to support all Handbook activities during this transition period. We have also provided a limited amount of "bridge" funding in FY00 at 50% of the FY99 level. Unfortunately, this level will require a substantial reduction in the FY00 effort unless a near term solution to the funding problem is found. No funding from ML for FY01 is available.
4. I therefore urge each of you to work with our team to help identify the alternate funding strategies and resources that will allow MIL-HDBK-5 to continue its heritage as a valuable resource in the aerospace community.

Sincerely,

A handwritten signature in black ink, reading "Gary K. Waggoner", is written over a horizontal line.

Gary K. Waggoner, Chief  
Systems Support Division  
Materials and Manufacturing Directorate

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**MINUTES OF THE 98<sup>th</sup> MIL-HDBK-5  
COORDINATION MEETING**

**CHAPTER 1. GENERAL**

No Item No.     **AMS Coordination. (GCC)** W. Benson, Battelle, provided a brief summary of SAE/AMS activities. The Fall 1999 SAE/AMS meeting took place during the same week as the MIL-HDBK-5 meeting. The minutes of SAE/AMS Committee D (Nonferrous Alloys) will be summarized and presented at the 99th Coordination Meeting. A table that summarizes the actions taken on AMS specifications contained in MIL-HDBK-5 that are maintained by Committee D, Nonferrous Alloys, is included as an attachment to the minutes.

Action: Item continued.

No Item No.     **Meetings of Potential Interest to MIL-HDBK-5 Coordination Members. (GCC)** W. Benson reviewed the list of meetings of interest to the group. A revised copy of the meetings of potential interest is included as an attachment to the minutes. If you wish to obtain additional information about a particular meeting, please call the indicated point of contact.

Action: Item continued.

No Item No.     **Cancellation of Government Specifications and Subsequent Replacement Specifications. (GCC)** W. Benson presented a status report. Currently, 156 MIL and Fed specifications have been converted to AMS word-for-word specifications. Some of these specifications have been canceled and superseded by existing AMS specifications. M. Fernandes, Kaiser Aluminum, led the discussion on word-for-word conversion of two MIL specifications to AMS specifications (QQ-250/4 and QQ250/5).

Action: Item Continued.

No Item No.     **Collection of Additional Fatigue, Fatigue Crack Growth, and Fracture Toughness Data. (GCC)** R. Rice, Battelle, indicated that he plans to complete a major revision to the fracture toughness tables in MIL-HDBK-5, once comprehensive new data collections are obtained from the major material suppliers and users. He also wants to expand the base of fatigue and crack growth information presented in the Handbook. Coordination group members who have access to substantial collections of fatigue, fatigue crack growth or fracture toughness data not currently represented in MIL-HDBK-5 should send the information to Mr. Rice by January 31, 2000, if the information is to be considered at the Spring 2000 coordination meeting.

Action: Item Continued.

No Item No.     **Special Presentation. (GCC)** R. Seeley, Haynes International, gave a presentation on ASME international materials acceptance procedures. A copy of his presentation is included as an attachment.

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No Item No.     **PMP Handbook Overview. (GCC)** J. Jackson, Battelle, gave a brief overview of the Preliminary Material Properties Handbook. The overview included: the purpose of the handbook, a comparison to MIL-HDBK-5, data submission requirements, and an overview of the materials included in the first report. A request was made for data on additional materials for inclusion in the second report. A copy of this presentation is included as an attachment.

Action: Item Continued.

No Item No.     **Discussion of ASTM Reference Standards. (GCC)** T. Kilinski, Battelle, led a discussion regarding the potential for ASTM to pull test methods E9 (compression) and E238 (pin-bearing) from the standards due to lack of a precision and bias statement. The consequence of this is that MIL-5 would not have a documented test standard from which to reference compression and pin-bearing testing. The discussion focused on determining other possible publications that could possibly carry the test procedures. Companies who would be able to provide assistance with either material supply, machining, or testing to assist in the completion of round-robin testing to produce the required precision and bias statement for these test methods should contact Tom Kilinski.

Action: Item continued.

No Item No.     **Industrial Steering Group. (GCC)** R. Rice provided an overview of ISG-supported activities. He indicated that future ISG activities would be coordinated through a MIL-HDBK-5 web-site. A copy of the handout on the beta version of this web-site is enclosed.

Action: Item continued.

No Item No.     **Guidelines Task Group. (GTG)** R. Rice noted the GTG had met on Tuesday, October 19, and reviewed the guidelines-related items in the overall agenda.

Action: Item continued.

No Item No.     **Materials Task Group. (MTG)** R. Rice indicated the MTG had met on Wednesday, October 21, and reviewed the items involving changes or additions to the material property data included in Chapters 2 through 7 of MIL-HDBK-5.

Action: Item continued.

No Item No.     **Statistics Working Group. (SWG)** R. Rice noted the SWG had met on Tuesday, October 19, and J. Kinatader reviewed all the items involving changes or additions to the statistical methods in Chapter 9.

Action: Item continued.

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**CHAPTER 2. STEEL ALLOYS**

Item 98-10      **A- and B-Basis Properties for AerMet 100 (280 ksi). (MTG)** J. Jackson noted that the additional LT data will be supplied for A- and B-Basis analysis by the next meeting.

Action: Item continued.

No Item No.      **15-5PH Extrusion Data (MTG)** J. Pillar, Boeing, indicated an interest in expanding the base of design properties in MIL-HDBK-5 on 15-5PH extrusions.

Action: New item.

**CHAPTER 3. ALUMINUM ALLOYS**

No Item No.      **Die Forging Working Group. (DFWG)** P. Brouwer, Alcoa, the Chairman of the DFWG, reviewed the current group activities. The DFWG minutes are included as attachments to the minutes.

Action: Item continued.

Item 99-9      **Footnote to Fracture Toughness Table Addressing Residual Stresses. (DFWG)** P. Brouwer, Alcoa, presented this item at the 98<sup>th</sup> meeting. Bob Bucci, Alcoa, put together a first draft of this cautionary footnote and was presented at the 97<sup>th</sup> meeting. Feedback from Mike Gruber and Ian Whittaker, both of Boeing, resulted in some minor changes to the original suggestions from Bob Bucci. The footnote will read as follows:

Products that do not receive a mechanical stress-relieving process (e.g. -T73 & -T74 tempers) have the potential for induced residual stresses. As a result, care must be taken to prevent fracture toughness properties from bias resulting from residual stresses.

This footnote was assigned Item No. 99-9.

Action: Approved. Revision to appear in MIL-HDBK-5H, Change Notice 1.

No Item No.      **Special Presentation. (GCC)** P. Lequeu, Pechiney Rhenalu, gave a presentation on Pechiney materials development activities. A copy of his presentation is attached to the minutes.

No Item No.      **Special Presentation. (MTG)** P. Brouwer gave a presentation on 7055-T7X Replacement Products for 7178-7075-T6 Aluminum Alloys. A copy of his presentation is attached to the minutes.

Item 95-28      **Review of the Fracture Toughness Tables in Chapter 3. (MTG)** R. Rice requested that all coordination group members help compile a new database of plane strain fracture toughness data on materials included in MIL-HDBK-5. Data

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provided by the January 31, 2000 will be reviewed before the 99<sup>th</sup> coordination meeting and discussed at the Materials Task Group meeting. Raw data will be held proprietary if requested. Electronic data submissions would be simplest to process; please contact Mr. Rice with any questions.

Action: Item continued.

Item 97-5      **A- and B-Basis and Derived Properties for 7050-T7451 Aluminum Alloy Plate, 6.001 to 8.000 inches. (MTG)** W. Benson reviewed this proposal as a handout item. Based on recommendations made at the 97<sup>th</sup> Meeting, the A- and B-basis and derived property values were computed using data compiled for the 6.001 to 8.000 thickness range. The T<sub>99</sub> values from the adjusted normal method and the T<sub>90</sub> values from the Weibull method were used.

Action: 60-day approval. Revision to appear in MIL-HDBK-5H, Change Notice 1.

Item 98-2      **Design Properties for Russian Alloy 1163-T7. (MTG)** J. Jackson reviewed a handout including the document for the PMP Handbook. The PMP document includes typical tensile properties indicating their average, standard deviation, and skewness. Preliminary design properties were presented in the handout using Weibull, Pearson, and Non-Parametric analysis for tensile properties in the L and LT directions. A proposal for inclusion of the data that meets MIL-HDBK-5 guideline requirements will be prepared once the AMS specification has been approved.

Action: Item continued.

Item 98-14     **A- and B-Basis Tensile Properties for 7150-T7751 Aluminum Alloy Plate. (MTG)** P. Brouwer presented a status report. Data will be available by the next meeting.

Action: Item continued.

Item 98-15     **A- and B-Basis Tensile Properties for 7150-T77511 Aluminum Alloy Extrusions. (MTG)** P. Brouwer presented a status report. Data will be available by the next meeting.

Action: Item continued.

Item 98-16     **A- and B-Basis Tensile Properties for 7050-T74 Aluminum Alloy Die Forgings. (MTG)** W. Benson indicated that more data were needed to complete the analysis of tensile properties. P. Brouwer indicated that the data were being collected and will be provided to Battelle for review and analysis.

Action: Item continued.

Item 98-17     **A- and B-Basis Tensile Properties for 7050-T7452 Aluminum Alloy Die Forgings. (MTG)** W. Benson presented the agenda item. Due to variations in

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forging thickness at locations where test specimens were extracted, data were provided for thickness ranges rather than for specific thicknesses. The mid-range thickness was used in all calculations and no regression analyses were possible. Both  $T_{99}$  and  $T_{90}$  values were obtained by Weibull and Nonparametric methods and derived properties were computed using the appropriate reduced ratios.

Action: Item approved. Revision to appear in MIL-HDBK-5H, Change Notice 1.

- Item 98-18      **Clad 2524-T3 Sheet and Plate Typical Stress-Strain Curves. (MTG)** P. Brouwer made a short presentation on this item. A request was made by R. Rice for back-up data illustrating linearity of log-stress vs. log-plastic strain trends (an underlying assumption when using the Ramberg-Osgood formulation to analytically represent the stress-strain curve up to the yield strength).
- Action: 60-day approval. Revision to appear in MIL-HDBK-5H, Change Notice1.
- Item 98-23      **Collection of Plane-Stress Fracture Toughness Data. (MTG)** R. Rice discussed this agenda item in conjunction with Item 95-28. The focus in this case will be on thin section fracture toughness properties of aluminum alloys.
- Action: Item continued.
- No Item No.      **Precision Modulus Procedure. (GTG)** T. Kilinski, Battelle, led a discussion regarding the state of the precision modulus procedure presented at the 93<sup>rd</sup> coordination meeting. ASTM has stated that it would not support a stand-alone document for this test procedure, nor incorporating this procedure into the current elastic modulus test method. The possible options would be to incorporate the test method into MIL-5, or find another document that would be willing to incorporate it as a documented test method.
- Action: Item continued.
- Item 99-10      **Incorporation of Fatigue Data on 7050-T7451 Thick Plate into MIL-HDBK-5. (MTG)** R. Rice gave a presentation based on a handout for this item. He indicated that a data proposal would be prepared for the 99<sup>th</sup> coordination meeting to incorporate these strain and load control fatigue data on 7050-T7451 thick plate into MIL-HDBK-5.
- Action: Item continued.
- No. Item No.      **Including EXCO Ratings in MIL-HDBK-5. (MTG)** R. Rice requested that EXCO data on structural aluminum alloys be submitted to Battelle to allow the creation of a new table for inclusion in Chapter 3 of MIL-HDBK-5. Data submitted by February 1, 2000, will be compiled for review at the 99<sup>th</sup> coordination meeting.
- Action: New item.

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**CHAPTER 4. MAGNESIUM ALLOYS**

No items presented.

**CHAPTER 5. TITANIUM ALLOYS**

No Item No.     **Special Presentation. (GCC)** T. Bayha, Howmet, gave a presentation on an allowables development effort on Ti-6Al-4V castings. A copy of his presentation is included as an attachment to these minutes.

Action: Item closed with no action.

No Item No.     **Typical Properties for Russian Alloy VT-16. (MTG)** J. Jackson reviewed a handout including the document for the PMP Handbook. VT-16 alloy has been used as a fastener material. The PMP document includes typical tensile, shear, and elongation properties indicating their average, standard deviation, and skewness. Preliminary A- and B-Basis design properties using Weibull, Pearson, and Non-Parametric analysis were presented for informational purposes in the handout.

Action: Item closed.

Item 99-11     **A & B Analysis on Ti-64 up to ¾” Thick Castings. (MTG)** J. Pillars, Boeing Seattle, has already provided the available raw data on Ti-6A-4V castings. Additional data has also been provided by E. Lee, Navy. These data will be analyzed for the next coordination meeting.

Action: New item.

**CHAPTER 6. HEAT RESISTANT ALLOYS**

No Item No.     **Typical Properties for Haynes 230 Sheet, Bar, and Plate. (MTG)** J. Jackson reviewed a handout including the document for the PMP Handbook. The PMP document includes typical tensile and elongation properties indicating their average, standard deviation, and skewness for sheet, plate, and bar forms. Preliminary A- and B-Basis design properties using Weibull, Pearson, and Non-Parametric analysis were presented for informational purposes in the handout. Since this alloy has an AMS specification, a proposal for inclusion of the data that meets MIL-HDBK-5 guideline requirements will be prepared for the next meeting.

Action: Item continued.

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**CHAPTER 7. MISCELLANEOUS ALLOYS AND HYBRID MATERIALS**

Item 95-35     **A- and B-Basis and Derived Properties Program for 6092/SiC/25p-T6P Particulate Extrusion. (MTG)** J. Jackson presented a status report indicating that the request for an SAE/AMS specification for this alloy has been dropped.

Action: Item closed without action.

Item 95-36     **A- and B-Basis and Derived Properties Program for 6092/SiC/17.5p-T6P Particulate Reinforced Extrusion. (MTG)** J. Jackson presented a status report indicating that an SAE/AMS specification has not been issued.

Action: Item closed until SAE/AMS specification issued.

Item 96-19     **A- and B-Basis and Derived Properties Program for 6092/SiC/17.5p-T6P Reinforced Rolled Sheet. (MTG)** J. Jackson presented a status report indicating that an SAE/AMS specification has not been issued.

Action: Item closed until SAE/AMS specification issued.

**CHAPTER 8. STRUCTURAL JOINTS**

No Item No.    **Fastener Industry Working Group. (FIWG)** J. Pratt, Textron Aerospace Fasteners, reported the FIWG meeting was attended by eight fastener industry representatives and consultants and ten members of the FTG. Action items resulting from the meeting are included in the attached minutes.

Action: Item continued.

Item 95-37     **Static Joint Strength of AHG AL905 100-Degree Flush Head 7050 Rivets in Clad 2024-T3 Sheet. (FTG)** S. Ford, Tec-Con, presented the proposed joint allowables table. The table shown in the handout required an additional head height footnote, head height reference numbers, and load values rounding adjustments. The updated table is attached to these minutes. A 60-day approval on this item was requested.

Action: 60 day approval. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-8     **Inclusion of NAS 1921B (S) in Table 8.1.3.2.2(g). (FTG)** S. Ford presented the proposed joint allowables table. The current Table (8.1.3.2.2(g)) will be updated to include the single action, and single action with drive anvil configurations. These two additional configurations were shown to meet the existing design allowables for Table 8.1.3.2.2(g) as published. The only change to the current table will be to add the additional two rivet designations to the "Rivet Type" section. The revised table was not presented in the agenda, but is included in these minutes for reference.

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Action: Item approved and closed. Revised table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-13      **Addition of Brazing Strength Design Factors. (FTG)** S. Ford reported that the FTG reviewed the agenda item, but felt that a few areas of this section still need to be addressed – specifically, the specified minimum clearance dimension of 0.010 inches. Work will continue on this section.

Action: Item continued and assigned an item number.

Item 99-14      **Changes to Section 8.1.2 Solid Rivets. (FTG)** S. Ford presented the item for approval with one additional editorial change. The word “head” should be replaced with “tail” for the two occurrences in this section.

Action: Item approved and assigned an item number. Revision to appear in MIL-HDBK-5H, Change Notice 1.

Item 95-13      **Static Joint Strength of AF3222 Blind 100-Degree Flush Head Rivets in Clad 2024-T3 Sheet, and**

Item 95-14      **Static Joint Strength of AF3223 Blind Protruding Head Rivets in Clad 2024-T3 Sheet. (FTG)** T. Kilinski stated that these two items would be presented for approval at the next (99<sup>th</sup>) coordination meeting.

Action: Item continued.

Item 95-15      **Static Joint Strength of CR3222 Blind 100-Degree Flush Head Rivets in Clad 2024-T3 Sheet, and,**

Item 95-16      **Static Joint Strength of CR3223 Blind Protruding Head Rivets in Clad 2024-T3 Sheet. (FTG)** T. Kilinski stated that these two items would be presented for approval at the next (99<sup>th</sup>) coordination meeting.

Action: Item continued.

Item 99-15      **Static Joint Strength of AF3212 Blind Flush Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda was modified to only include design data for sheet thicknesses within the range of supplied test data. A note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

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Item 99-16      **Static Joint Strength of CR3212 Blind Flush Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda only includes design data for sheet thicknesses within the range of supplied test data. Therefore, a note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-17      **Static Joint Strength of HC3212 Blind Flush Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet. (FTG)** T. Kilinski presented a revised proposed allowables Table 8.1.3.2.2(q) for approval. The table given in the agenda was modified to include a footnote for yield critical data. Also, the shear strength footnote refers to the company standards drawings. The revised table 8.1.3.2.2(q) is attached to these minutes.

Action: Assigned item number. Approved and closed. Revised Table 8.1.3.2.2(q) to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-18      **Static Joint Strength of AF3213 Blind Protruding Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented the proposed allowables table for approval. The table given in the agenda was modified to only include design data for sheet thicknesses within the range of supplied test data. A note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-19      **Static Joint Strength of CR3213 Blind Protruding Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda only includes design data for sheet thicknesses within the range of supplied test data. Therefore, a note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-20      **Static Joint Strength of HC3213 Blind Protruding Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet. (FTG)** T. Kilinski presented a revised proposed allowables Table 8.1.3.1.2(n) for approval. The table given in the agenda was modified to update the shear strength footnote to refer to the company standards drawings. The revised Table 8.1.3.1.2(n) is attached to these minutes.

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Action: Assigned item numbers. Approved and closed. Revision to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-21      **Static Joint Strength of AF3242 Blind Flush Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda was modified to only include design data for sheet thicknesses within the range of supplied test data. A note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-22      **Static Joint Strength of CR3242 Blind Flush Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda only includes design data for sheet thicknesses within the range of supplied test data. Therefore, a note was added to the table to prohibit extrapolation of design data outside of the given values. Yield critical data was footnoted. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-23      **Static Joint Strength of HC3242 Blind Flush Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet. (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda was modified to only include design data for sheet thicknesses within the range of supplied test data. A note was added to the table to prohibit extrapolation of design data outside of the given values. Yield critical data was footnoted. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item numbers. Approved and closed. Revision to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-24      **Static Joint Strength of AF3243 Blind Protruding Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables Table 8.1.3.1.2(m) for approval. The table given in the agenda was modified to only include design data for sheet thicknesses within the range of supplied test data. A note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

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Action: Assigned item number. Approved and closed. Revised Table 8.1.3.1.2(m) to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-25      **Static Joint Strength of CR3243 Blind Protruding Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet (FTG)** T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda only includes design data for sheet thicknesses within the range of supplied test data. Therefore, a note was added to the table to prohibit extrapolation of design data outside of the given values. Also, the shear strength footnote refers to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item number. Approved and closed. New table to appear in MIL-HDBK-5H, Change Notice 1.

Item 99-26      **Static Joint Strength of HC3243 Blind Protruding Head Locked Spindle Aluminum Alloy Rivets in Clad 2024-T3 Sheet. (FTG)** T. Kilinski presented the proposed allowables table for approval. The table given in the agenda was modified to update the shear strength footnote to refer to the company standards drawings. The revised table is attached to these minutes.

Action: Assigned item numbers. Approved and closed. Revision to appear in MIL-HDBK-5H, Change Notice 1.

**CHAPTER 9. GUIDELINES FOR THE PRESENTATION OF DATA**

Item 94-26      **Production Methods and Their Impact on Design Allowables. (SWG)** J. Kinatader, Battelle, presented an approach at the SWG to demonstrate that no reduction in properties has occurred (within a specified tolerance). This concept was generally accepted, but questions were raised about the wording regarding lots and heats. P. Brouwer, Alcoa, J. Yuden, Universal Alloys, and M. Catcher, Haynes Intl., agreed to help write and review text on requirements to assess affects of production methods and their impact on design allowables. It was also requested that a method be provided for demonstrating that a reduction in properties has occurred. Guidelines proposal, including two methods and revised text on lots and heats will be provided at next meeting.

Action: Item continued.

Item 98-3      **Procedure for Analyzing Lower Tail Censoring. (SWG)** J. Kinatader presented results of an investigation showing, that for normally distributed data, the proportion of the data censored (correct statistical term is “truncated” but “censored” will be used for historical reasons) below a specified threshold (e.g., specification value) can be estimated fairly precisely with existing methods. More importantly, with the estimate of proportion censored,  $T_{99}$  and  $T_{90}$  can be estimated with reasonable precision. It was concluded that any procedure for dealing with censoring in the Handbook will simply provide a test for significant censoring, allowing existing methods in the Handbook to be used if the censoring is

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insignificant. The next step is to investigate methods for estimating the degree of censoring in distributions tolerating skewness, such as the Weibull and the Pearson.

Action: Item continued.

- Item 99-1      **Proposed Modification to Figure 9.2.6-Procedure for Computation of  $T_{99}$  and  $T_{90}$  Values. (SWG)** J. Kinaterder presented a proposed change to Figure 9.2.6, which presents a flowchart describing approved methods of computing  $T_{99}$  and  $T_{90}$ . The change included a footnote highlighting the freedom to use any of the three approved methods. Also, for the nonparametric approach, a change to the text was proposed discriminating between sample sizes required for computing  $T_{99}$  and  $T_{90}$ . This met with some opposition and a compromise to create a second figure was agreed upon to clarify the issue. The second figure will illustrate how to compute A and B values from  $T_{99}$  and  $T_{90}$  values. The two figures will be numbered Figure 9.2.6a and Figure 9.2.6b.

Action: Item continued.

- Item 99-4      **Selecting the Appropriate Regression Method. (SWG)** J. Kinaterder presented a proposed guidelines modification illustrating the need for good test data to select an appropriate regression model in the presence of a dimension effect. Proposal generally accepted, with a change proposed for Figure 9.6.3, regarding movement of the test for “equally spaced” data towards the top of the flowchart, and a change in that wording. Change identified in No Item No. Significant Regression with Significant Lack of Fit will also be incorporated. Copy of revised figure attached.

Action: 60- day approval. Revision to appear in MIL-HDBK-5H, Change Notice 1.

- No Item No.      **Correction to Formula for Skewness in Preliminary Material Properties Handbook. (SWG)** J. Kinaterder presented a formula for skewness to replace the formula currently provided in the PMP Handbook. One problem with the previous formula was that the value of skewness depended on the units used (metric or English). The corrected formula is location and scale invariant, and matches the formula for skewness used by Microsoft Excel.

Action: Item approved and closed.

- No Item No.      **Significant Regressions with Significant Lack of Fit. (SWG)** J. Kinaterder presented this item (issue raised by P. Brouwer) indicating an apparent oversight in Figure 9.6.3, which currently allows use of single-population methods (Weibull, Pearson, Nonparametric) if there is a significant regression effect, but also a significant lack of fit for both the linear and quadratic models. See Item 99-4 for proposed revision.

Action: Closed. All actions addressed under Item 99-4.

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No Item No.     **Regression for Skewed Data. (SWG)** J. Kinateder presented this item to remind the committee that, although significant efforts have been made over the past ten years to account for skewness when calculating  $T_{99}$  and  $T_{90}$ , these methods are ignored if properties are related to product dimension (i.e., if there is a significant regression effect). A strawman approach for accounting for skewness was presented in a handout for this item (which will become Item No. xxx), based on methods already approved. For the next meeting, Battelle will provide examples documenting the magnitude of the errors that can be made by ignoring skewness in a regression setting, and show whether the proposed approach reduces those errors.

Action: New item.

Item 98-7     **Complete Restructuring of Chapter 9 Guidelines to Improve Usability. (GTG)** R. Rice indicated that a total of nine individuals provided comments on the first complete draft of the revised Chapter 9 guidelines. He said that these comments would be incorporated into a second draft and distributed to the original reviewers by early next year.

Action: Item Continued.

Item 99-28     **Calculation of Metric Equivalent Design Properties From MIL-HDBK-5 Tables. (GTG)** R. Rice presented this brief agenda item. The item was accepted as presented.

Action: Item number assigned. Approved and closed. Revision to appear in MIL-HDBK-5H, Change Notice 1.

No Item No.     **Definitions Plus. (GTG)** R. Rice introduced this new item as a handout. He asked coordination group members to review these proposed new definitions and offer corrections and/or additions by January 31, 2000.

Action: New item.

No Item No.     **Recommendation for Revision of Fastener Guidelines. (FIWG)** S. Ford stated that the FTG recommended closing this item until the completion of Item 99-27 (Revised Analytical Techniques for Analysis of Fastened Joints). After a revised statistical method has been chosen and approved, the effort to revise the fastener guidelines will be reinstated.

Action: Item closed.

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Item 99-27

**Revised Analytical Techniques for Analysis of Fastened Joints. (FIWG)**

T. Kilinski reviewed the current status of this item and presented data comparing a new analysis method against the current method. He also discussed the plan to try the new approach on data sets containing “problem regions” (i.e., min/max grip region and data with significant outlying points) to see how the method accounts for these areas and determine if further adjustments are required. A copy of the presentation made at the FIWG session is included in the FIWG minutes (see Chapter 8).

Action: Assigned item number. Item continued.

Item 99-29

**S-Basis definition and wording. (GTG)** R. Rice requested that a new item be established to address some inconsistencies that currently exist in the guidelines with respect to the statistical significance of S-basis properties.

Action: New item number.