Minutes

for the

99th MIL-HDBK-5 Coordination Meeting

held in

Salt Lake City, Utah
March 20-23, 2000

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 99th MIL-HDBK-5 COORDINATION MEETING

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I. Chairman's Remarks

The Vice-Chairman, Steven Thompson, 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 Vice-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. The Vice-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 Vice-Chairman urged each person, particularly new attendees, to participate in discussion of the agenda items and to voice their company's viewpoint.

The Vice-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 99th meeting is included as an attachment to the minutes.

The Vice-Chairman announced the next (100th) MIL-HDBK-5 meeting is anticipated to be held in Dayton, Ohio in the October 2000 timeframe. Future meetings and other revisions of the Handbook will be dependent on new funding or other cooperative agreements.

II. Approval of 98th Meeting Minutes

The minutes of the 98th meeting were approved as distributed.

III. Retirements/Announcements

No retirements or announcements were made.

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.

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

16 March 2000

MEMORANDUM FOR MIL-HDBK-5 COORDINATION GROUP

FROM: AFRL/MLSC
Bldg 652, Room 122
2179 12th Street
Wright-Patterson AFB OH 45433-7718

SUBJECT: Transition Strategy

1. One year ago, at the 97th MIL-HDBK-5 meeting in Albuquerque, NM, it was announced that after several years of budget reductions to Air Force Science and Technology efforts, AFRL/ML could no longer sustain its prior level of financial support. "Bridge Funding" at 50% of the FY99 level was committed prior to our 98th meeting to support a transition period whereby alternate funding strategies could be identified. Our first option was to pursue contributions from other government agencies. Mr. Robert Eastin and myself have contacted numerous individuals within the Navy, Army, NASA, FAA, and other Air Force organizations requesting additional funding. We have briefed the Joint Aeronautical Commanders Group and Aviation Engineering Board on the current status and long term acknowledged value of MIL-HDBK-5.

2. Unfortunately, no additional funds from any government agency have been made available to date. At this point, it has become necessary to suspend technical effort on the MIL-HDBK-5 contract for 90 days starting 10 April 2000. During this time the Air Force, FAA, and Battelle will endeavor to establish a Cooperative Research and Development Agreement (CRDA) for continuation of a "Metallic Materials and Elements for Aerospace Vehicles" Handbook. The new level of effort will be dependent on industry contributions and handbook operations at Battelle. Government agency resources can still effectively be added to the existing contract to maintain a balanced and continued effort or new direction.

Sincerely,

NEAL R.ONTKO
Chairman, Military Handbook 5
Engineering and Design Data Group
Acquisition Systems Support Branch

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MINUTES OF THE 99th MIL-HDBK-5 COORDINATION MEETING

CHAPTER 1. GENERAL

No Item No. **AMS Coordination. (GCC)** R. Rice, Battelle, provided a brief status report on SAE/AMS activities. He indicated the Spring 2000 meeting will be held in Milwaukee, Wisconsin the week of May 22nd and the Fall 2000 meeting will be held in Vancouver, Canada the week of October 23rd. Jana Jackson has been assigned lead responsibility for AMS coordination for Battelle.

Action: Item continued.

No Item No. **Meetings of Potential Interest to MIL-HDBK-5 Coordination Members. (GCC)** R. Rice reviewed the list of meetings of interest to the group. An updated copy is included as an attachment to the minutes. Anyone wishing to obtain information about a specific meeting should call the indicated point of contact.

Action: Item continued.

No Item No. **Cancellation of Government Specifications and Subsequent Replacement Specifications. (GCC)** J. Jackson, Battelle, presented a status report. Periodic updates can be obtained at the AIA or DSC websites.

Action: Item continued.

No Item No. **Collection of Additional Fatigue, Fatigue Crack Growth, and Fracture Toughness Data. (GCC)** R. Rice reported that he recently sent out a broad email request for fatigue, crack growth, and fracture toughness data to update these properties on a wide range of materials currently represented in MIL-HDBK-5. To date he has received commitments for raw data and supporting documentation from only a small percentage of the material suppliers and airframe manufacturers represented on the MIL-HDBK-5 coordination group. It was agreed in general discussion within the MTG that R curve and J_{Ic} data would also be of interest, where the material toughness levels and typical product forms warrant the development of these fracture toughness data. Material and property-specific data proposals will be prepared after sufficient data are obtained from a representative collection of material suppliers.

Action: Item continued.

No Item No. **PMP Handbook Overview. (GCC)** J. Jackson gave an overview of the status of activities related to the Preliminary Material Properties Handbook. She noted a CD-ROM of the first edition of the PMP Handbook was available for all coordination meeting registrants. This CD-ROM contains both English and metric versions of the document. It also contains an installable version of Adobe Acrobat 4.0. Earlier versions of Adobe Acrobat will not open the document files on the CD-ROM. Ms. Jackson noted that the second edition of the PMP Handbook is scheduled for completion in late summer of this year. A copy of the viewgraphs

she presented describing materials of interest for the second edition of the PMP Handbook is attached to the minutes.

Action: Item continued.

No Item No. **Tour of Hill Air Force Base. (GCC)** R. Rice coordinated a tour of Hill AFB, with the substantial assistance of T. Helsten, Battelle Ogden Office. Sixteen MIL-HDBK-5 coordination group members participated in the Tuesday afternoon tour, which included a walk-through of the F-16 and C-130 programmed depot maintenance lines, as well as a visit to the paint stripping and re-paint shop for the F-16.

Action: Item closed.

No Item No. **Special Presentation: Premium (Aircraft) Quality Aluminum Structural Castings – History and Current State-of-the-Art. (GCC)** T. Piwonka, University of Alabama, gave this special presentation. A copy of his viewgraphs and a copy of a related paper are included with the meeting minutes.

Action: Item closed.

No Item No. **Industrial Steering Group. (GCC)** The 6th ISG meeting was held on Monday, March 20th, from 1:15pm to 4:45pm. R. Rice provided a brief status report to the MIL-HDBK-5 coordination group on current ISG activities. A copy of the ISG meeting agenda and the viewgraphs shown at the general coordination meeting are included as an attachment to the meeting minutes.

Action: Item continued.

No Item No. **Guidelines Task Group. (GTG)** The GTG meeting was held on Tuesday, March 21st, from 10:15am to 12:30pm. The status of individual items reviewed by the GTG is documented under the relevant Handbook chapter within these minutes.

Action: Item continued.

No Item No. **Materials Task Group. (MTG)** The MTG meeting was held on Wednesday, March 22nd, from 8:15am to 3:45pm. The status of individual items reviewed by the MTG is documented under the relevant Handbook chapter within these minutes.

Action: Item continued.

No Item No. **Statistics Working Group. (SWG)** The SWG meeting was held on Tuesday, March 21st, from 8:15am to 10am. The status of individual items reviewed by the SWG is documented under the relevant Handbook chapter within these minutes.

Action: Item continued.

MINUTES OF THE 99th MIL-HDBK-5 COORDINATION MEETING

CHAPTER 2. STEEL ALLOYS

Item 98-10 **A- and B-Basis Properties for AerMet 100 (280 ksi). (MTG)** J. Jackson reported that the additional strength data necessary to complete the A- and B-basis analyses on AerMet 100 (280 ksi strength level) are anticipated by April 2000.

Action: Item continued.

Item 00-8 **15-5PH Extrusion Data. (MTG**) R. Rice reviewed this agenda item. It was agreed that only bar should be listed under product form in Table 2.6.6.0(b), since the derived property data currently available for 15-5PH stainless steel is limited to bar. However, it was also agreed that a footnote should be added, to recognize the other product forms covered by AMS 5659. Finally, it was also agreed that the final column of this table should be removed because AMS 5659 does not cover the H1150M condition. The updated version of Table 2.6.6.0(b) is included as an attachment to these minutes. The applicability of the derived properties shown in Table 2.6.6.0(b) for 15-5PH product forms other than bar must be confirmed before they are listed along with bar at the top of this table.

Action: Item approved. Updated table will be incorporated in Change Notice 1 of Revision H.

Item 00-1 **Corrections to Several Low Alloy Steel Mechanical Property Tables. (MTG**) R. Rice reviewed the necessary corrections to Tables 2.3.1.0(c_3) and 2.3.1.0(c_4). A decision was tentatively made to reduce the F_{ty} value in the last column of Table 2.3.1.0(c_4) to the value of 165 ksi shown in MIL-T-6735, pending a review of the MIL-HDBK-5 records. No actual yield strength data were found in the MIL-HDBK-5 files for AISI 4135 at the 200 ksi strength level. The current value of 176 ksi for AISI 4135 steel is an artifact of the original low alloy steel tables that included "generic" yield, compression, shear and bearing properties for 200 ksi tensile strength low alloy steels. These "generic" strength values were introduced in Table 2.3.1.0(c) under Item 85-17, as documented in the 70th meeting minutes. In other words, the tentative decision made at the 99th coordination meeting to reduce the F_{ty} value in the last column of Table 2.3.1.0(c_4) to the value of 165 ksi (corresponding to the 200 ksi tensile strength material) should be considered final. As a result of this change, footnote b will be eliminated (see attached table).

Action: Item approved. Updated table will be incorporated in Change Notice 1 of Revision H.

Item 00-2 **Update Air Melted Low Alloy Steel Tables to Include Specific Thickness Ranges and Elongation Values with Each Column of Data. (MTG)** This new item was established based on S. Thompson's recommendation to include the specific thicknesses and elongation values in the low alloy steel tables that correspond to each column of information.

Action: New item to be addressed and reviewed at the next coordination meeting.

MINUTES OF THE 99th MIL-HDBK-5 COORDINATION MEETING

CHAPTER 3. ALUMINUM ALLOYS

No Item No. **Special Presentation - Part I: Development of New Generation Al-Li Alloys at McCook Metals, L.L.C. (MTG)** A. Cho, McCook Metals, L.L.C., gave this special presentation.

Action: Item closed.

No Item No. **Special Presentation - Part II: AA2297 Usage for Fighter Aircraft. (MTG)** J. T. Amin, Lockheed Fort Worth, gave this special presentation. A copy of his presentation is included with the meeting minutes.

Action: Item closed.

Item 95-28 **Review of the Fracture Toughness Tables in Chapter 3. (MTG)** R. Rice provided a status report on fracture toughness data collection efforts. He indicated that many of the entries in the current 3-page table of fracture toughness properties at the beginning of Chapter 3 will probably have to be updated to take into account plane strain fracture toughness properties that vary as a function of product thickness. An example of fracture toughness properties that vary as a function of product thickness was included in Item 00-3 for 7040-T7451 plate.

Action: Item continued.

Item 98-2 **Design Properties for Russian Alloy 1163-T7 (2224A-T351). (MTG)** J. Jackson provided a status report. A sponsor is still needed to obtain an AMS specification.

Action: Item continued.

Item 98-14 **A- and B-Basis Tensile Properties for 7150-T7751 Aluminum Alloy Plate. (MTG)** J. Jackson provided a status report on this item. She indicated that a substantial collection of tensile property data was supplied just prior to the meeting. She indicated that a data proposal would be prepared for consideration at the next coordination meeting.

Action: Item continued.

Item 98-15 **A- and B-Basis Tensile Properties for 7150-T77511 Aluminum Alloy Extrusions. (MTG)** J. Jackson presented this data proposal. Minor editorial changes were suggested and approved (see attached table).

Action: Item approved. Table 3.7.5.0(c_2) will be incorporated in Change Notice 1 of Revision H.

Item 98-18 **Clad 2524-T3 Sheet and Plate Typical Stress-Strain Curves. (MTG)** R. Rice reviewed this handout item at the MTG meeting. A full-range stress strain curve was also shown in viewgraph form. The final stress-strain curves are included as an attachment to these minutes.

Action: Item approved. Approved additions will be incorporated into Change Notice 1 of Revision H.

Item 00-3 **A- and B-Basis and Derived Properties for 7040-T7451 Aluminum Alloy Plate 3.001 to 8.500 inches. (MTG)** J. Jackson presented this agenda item. She indicated that the original agenda item should be replaced by an updated handout item. A number of required corrections were also identified in the handout item. It was agreed by MTG members that the required corrections would be reviewed on a quick-turn-around basis by a small group of volunteer reviewers before the 7040-T7451 plate data is incorporated into Change Notice 1 of Revision H. The following individuals volunteered to review the corrected item on a 14-day basis (Battelle to send out the corrected copy by 3/29/00, with responses due back to Battelle by 4/5/00): S. Thompson, AFRL/MLSC; D. Chong, Boeing St. Louis; J. Pillers, Boeing Seattle; I. Whittaker, Boeing Seattle; V. Dangerfield, Pechiney Rolled Products; A. Cho, McCook Metals; S. Goetchius, Pratt & Whitney; M. Hahn, Northrop Grumman; W. Zinsser, Cessna Aircraft; and P. Brouwer, Alcoa. A copy of the reviewed and corrected handbook pages are included as an attachment to these minutes.

Action: Item approved after completion of 14-day approval cycle. Approved additions will be incorporated into Change Notice 1 of Revision H.

Item 98-23 **Collection of Plane-Stress Fracture Toughness Data. (MTG)** R. Rice presented a status report on this item. He indicated that the interest in plane-stress fracture toughness data was broader than just aluminum alloys (even though this item has been carried under Chapter 3). Alloy-specific item numbers will be assigned as new collections of plane-stress fracture toughness data are collected and analyzed.

Action: Item continued.

Item 99-10 **Incorporation of Fatigue Data on 7050-T7451 Thick Plate into MIL-HDBK-5**. (MTG) R. Rice presented this data proposal. He noted that a correction to the runout points shown in Figure 3.7.3.2.8(b) was necessary. He also said that the strain-life plot shown in Figure 3.7.3.2.8(d) would be re-plotted to make the secondary grid lines more visible. He also agreed to re-plot the data shown in Figure 3.7.3.2.8(f) to clearly differentiate the T/2 and T/4 location test samples. S. Thompson, AFRL, requested that the mean trend line shown for some of the S/N curves be re-examined to make sure they did not extend beyond the limits covered by the guidelines. R. Seeley, Haynes International, requested that the references cited for Figure 3.7.3.2.8(d) be verified for their accuracy. See attachment.

Action: Item approved. Added and updated information will be incorporated into Change Notice 1 of Revision H.

Item 00-6 **A and B-Basis Properties for 2297-T8R85 Plate. (MTG)** J. Jackson reviewed a handout that described her initial data analyses on this new alloy. She indicated that a formal data proposal to include this material in MIL-HDBK-5 would be prepared as soon as an AMS specification is finalized. A. Cho, McCook Metals, offered to provide fatigue, crack growth, and fracture toughness data on this alloy.

Action: Item continued.

Item 00-9 **Including EXCO Ratings in MIL-HDBK-5. (MTG)** R. Rice gave a brief status report on this item. He indicated that commitments for submission of Exco data had been received from several suppliers. G. Nanni, Bell Helicopter, offered to supply a copy of an applicable ASTM standard that documents Exco ratings on a number of different aluminum alloys.

Action: Item continued.

Item 00-10 **Reference for Weldability of Aluminum in Section 3.1.3.4. (MTG)** J. Jackson reviewed this agenda item. The new reference was approved. However, there are discrepancies in the welding ratings of some alloys and tempers between the Aluminum Association, SAE, and MIL-HDBK-5 documents. J. Yudin of Universal Alloy, V. Dangerfield of Pechiney Rolled Products, and P. Brouwer of ALCOA have offered to determine the correct welding rating where there is a discrepancy or where no ratings exist.

Action: Item continued.

Item 00-4 **Changes to Table 3.7.3.0(b1) for 7050-T7451 Aluminum. (MTG)** R. Rice reviewed this brief agenda item. He noted that a typographical error had been found in the F_{bru}, e/D = 2.0 B-value for the 7.001 – 8.000 inch thickness range. The number should be 138 ksi, rather than 158 ksi. Fortunately, the error was found before this information, which was documented in the 98th meeting minutes, was published in MIL-HDBK-5. The table was also updated to reflect the change in the specification minimum value for elongation in the ST orientation from 2 to 3 percent.

Action: Item approved. Corrected Table 3.7.3.0(b_1) will be incorporated into Change Notice 1 of Revision H.

Item 00-5 **Review of Converted Effect of Temperature Curves in MIL-HDBK-5. (MTG)** R. Rice reviewed this handout item. He explained that several minor discrepancies had been found between the original hand-drawn graphics in MIL-HDBK-5 and the converted vector graphics [such as Figure 3.2.3.1.1(b)]. It was agreed at the 99th coordination meeting that a supplemental review of the new vector graphics would be desirable. The breakdown of Handbook figures listed below represents 12 sets of approximately 50 vector graphics each (scanned graphics are not the focus of this particular review, since a number of those curves are already being updated for Change Notice 1). Appendix E in MIL-HDBK-5 Revision H documents which

figures have been converted to vector graphics. Several people volunteered at the 99th coordination meeting to review a limited number of the original hand-drawn curves in Revision G with the new vector graphics in Revision H. These individuals have been assigned a set of vector graphics to review by June 1, 2000.

	Collection of Vector Graphics	Volunteer Reviewer
Set 1	Fig. 1.6.4.4(a) through Fig. 2.5.1.1.2	
Set 2	Fig. 2.5.1.1.3 through Fig. 2.6.8.0	
Set 3	Fig. 2.6.8.1.2 through Fig. 3.2.1.1.1(d)	
Set 4	Fig. 3.2.1.1.1(e) through Fig. 3.2.3.1.6(e)	I. Ibrahim, Boeing
Set 5	Fig. 3.2.3.1.6(f) through Fig. 3.2.3.4.6(h)	D. Chong, Boeing
Set 6	Fig. 3.2.3.4.6(i) through Fig. 3.2.10.1.3	M. Hahn, Northrop Grumman
Set 7	Fig. 3.2.10.1.4 through Fig. 3.6.2.2.1(c)	
Set 8	Fig. 3.6.2.2.1(d) through Fig. 3.7.3.2.6(g)	
Set 9	Fig. 3.7.3.2.6(h) through Fig. 3.7.5.2.6(d)	
Set 10	Fig. 3.7.6.2.6(a) through Fig. 4.2.3.2.6(a)	
Set 11	Fig. 4.3.2.1.4 through Fig. 6.3.5.1.6(b)	
Set 12	Fig. 6.3.5.1.6(c) through Fig. 9.3.2.5(d)	

Other people who can help review a set of vector graphics are encouraged to contact R. Rice at Battelle.

Action: Item continued.

CHAPTER 4. MAGNESIUM ALLOYS

No Chapter 4 items were discussed or proposed for future consideration by the MIL-HDBK-5 coordination group.

CHAPTER 5. TITANIUM ALLOYS

99-11 **A- and B-Basis Design Mechanical Properties for Ti-6-4 Castings. (MTG)**
J. Jackson reviewed this agenda item. The data presented is not representative of current work. The number of suppliers with thickness information included was corrected from four to five. Additional data information was provided and is included as an attachment. Current data will be provided for further analysis.

Action: Item continued.

CHAPTER 6. HEAT RESISTANT ALLOYS

No Item No. **Special Presentation: Development of an Ultra High Strength Version of the Nickel-Base Haynes 242 Alloy. (MTG)** R. Seeley, Haynes International, gave this special presentation. A copy of his presentation is included as an attachment to these minutes.

Action: Item closed with no action.

Item 99-12 **Design Properties for Haynes 230 Sheet, Bar, and Plate. (MTG)** J. Jackson presented a handout. A few changes were made. The thickness range was changed in Tables 6.3.9.0(b) and (c) from 0 to (insert symbol for < or =). Also in both tables, the word "alloy" was inserted after HAYNES® 230®. In Figure 6.3.9.0(a), "phase change" and the dashed line were removed (see attachment).

Action: Item approved.

Item 00-7 **Updated Reference to Cryogenic Handbook in Section 6.1.1.1. (MTG)** J. Jackson presented this agenda item. The reference was updated and added to the end of the chapter (see attachment).

Action: Item approved. The wording and reference in the agenda item will be incorporated into Change Notice 1 of Revision H.

CHAPTER 7. MISCELLANEOUS ALLOYS AND HYBRID MATERIALS

No Chapter 7 items were discussed or proposed for future consideration by the MIL-HDBK-5 coordination group.

CHAPTER 8. STRUCTURAL JOINTS

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

Action: Item continued.

Item 99-13 **Addition of Brazing Strength Design Factors. (FTG)** T. Kilinski reported that Randy Goode, Lockheed Martin, will work on the revision of Section 8.2.3. The revised section will be included in the next meeting agenda.

Action: Item continued.

Item 95-13 **Static Joint Strength of AF3222 Blind 100-Degree Flush Head 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 show a shear strength of 50 ksi. In addition, footnote "d" was modified to reference the Allfast part specification. The revised table is attached to these minutes.

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

Item 95-14 **Static Joint Strength of AF3223 Blind Protruding Head 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 show a shear strength of 50 ksi. In addition, footnote "d" was modified to reference the Allfast part specification. The revised table is attached to these minutes.

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

Item 95-15 **Static Joint Strength of CR3222 Blind 100-Degree Flush Head Rivets in Clad 2024-T3 Sheet**, T. Kilinski presented a revised proposed allowables table for approval. The table given in the agenda was modified to show a shear strength of 50 ksi. In addition, the tolerance in footnote "b" was modified to show ±0.0005 inch, and footnote "d" was modified to reference the Textron Aerospace Fasteners part specification. The revised table is attached to these minutes.

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

Item 95-16 **Static Joint Strength of CR3223 Blind Protruding Head 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 show a shear strength of 50 ksi. In addition, the tolerance in footnote "b" was modified to show ±0.0005 inch, and footnote "d" was modified to reference the Textron Aerospace Fasteners part specification. The revised table is attached to these minutes.

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

Item 00-11 **Changes to Table 8.1.2.1(b) Shear Strength Correction Factors for Solid Protruding Head Rivets. (FTG)** T. Kilinski presented a revised table for approval. The updated table corrected an error in the row alignment in which the Rivet Strength Factor was one row above the correct sheet thickness location.

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

Item 00-12 **Removal of Tables for Allfast parts AF3212, AF3213, AF3242, and AF3243 from MIL-HDBK-5H, CN1. (FTG)** T. Kilinski discussed a new item in which Allfast requested the removal of the design allowable tables for parts AF3212, AF3213, AF3142, and AF3243 prior to the printing of MIL-HDBK-5H, Change Notice 1. These tables were approved at the 98th meeting. The Fastener Task Group discussed this item and could not reach a consensus to approve the request. Therefore, discussions on this item will be continued at the next meeting.

Action: Assigned item number. Item continued.

CHAPTER 9. GUIDELINES FOR THE PRESENTATION OF DATA

Item 94-26 **Production Methods and Their Impact on Design Allowables. (SWG)** R. Rice reviewed a handout prepared by J. Kinateder, Battelle, which included a draft guideline proposal. The draft includes two new proposed statistical methods – (1) to demonstrate at a desired level of statistical confidence that no change in properties has occurred, and (2) to demonstrate at a desired level of statistical confidence that the new properties are significantly lower. Since this item was not available for review before the meeting, it was held open for review and approval at the next coordination meeting.

Action: Item continued.

Item 98-3 **Procedure for Analyzing Lower Tail Censoring. (SWG)** R. Rice reviewed the results of analyses performed by J. Kinateder. These analyses showed that the precision of statistical methods for estimating the 1st and 10th percentile tends to be poor, even when the level of censoring is accurately known. Therefore, the tentative recommendation was made to eliminate censored data from consideration when collecting data for computation of design minimum properties. This issue will be given further consideration prior to the next coordination meeting, in terms of whether any revisions should be made to the guidelines to more specifically and quantitatively address this issue.

Action: Item continued.

Item 99-1 **Proposed Modification to Figure 9.2.6-Procedure for Computation of T_{99} and T_{90} Values. (SWG)** R. Rice reviewed the proposed replacement to Figure 9.2.6, which was split into two figures to avoid confusion regarding the meaning and validity of T_{99} and T_{90} statistical values compared to A and B-basis values. The corrected versions of these figures are included as an attachment to these minutes. Figure 9.2.6(a) describes the computation of T_{99} and T_{90} values by the three approved methods, while Figure 9.2.6(b) describes the translation of these values into A- and B-basis values.

Action: Item approved. Updated Figures 9.2.6(a) and (b) will be incorporated into Change Notice 1 of Revision H.

Item 98-7 **Complete Restructuring of Chapter 9 Guidelines to Improve Usability. (GTG)** R. Rice reported that work on the restructuring of the Chapter 9 guidelines was on hold until questions regarding continued MIL-HDBK-5 coordination are resolved.

Action: Item continued.

Item 99-27 **Revised Analytical Techniques for Analysis of Fastened Joints. (FIWG)** T. Kilinski gave an update on the development of the statistical analysis procedure proposed for use on Chapter 8 allowable tables. The draft of the procedure was given in the meeting agenda. To date, the procedure has been well received. If funding permits, a proposal to approve the procedure will be submitted at the next meeting.

Action: Item continued.

Item 99-29 **S-Basis Definition and Wording. (GTG)** This item was discussed extensively within the GTG. It was agreed that the current wording in the Handbook should be updated. The revised text that was agreed upon by the GTG is included as an attachment to these minutes.

Action: Item approved.

No Item No. **Definitions Plus. (GTG)** R. Rice reviewed this handout. There was some debate regarding the applicability of the proposed definitions for inclusion in MIL-HDBK-5. The item was tabled since no consensus was reached within the GTG.

Action: Item closed with no action.

Item 00-13 **Rewrite of Section 9.4 Properties of Joints and Structures. (FTG)** T. Kilinski requested that an item number be assigned to cover the rewriting of this section.

Action: Assigned item number. Item continued.

Item 00-14 **Summary of Recommended Testing Standards within MIL-HDBK-5. (GTG)** R. Rice reviewed a draft summary table of testing standards within MIL-HDBK-5. Several corrections and additions were offered within the GTG. Additional inputs prior to the next coordination meeting are solicited. The current goal is to finalize the content of this table in time to include it in the rewritten introductory section of Chapter 9, which is being covered under Item 98-7.

Action: Item continued.

Item 00-15 **Summary of Heat, Lot, and Sample Size Requirements within MIL-HDBK-5. (GTG)** R. Rice reviewed a draft summary table of heat, lot and sample size requirements within MIL-HDBK-5. Several corrections and additions were offered within the GTG. Additional inputs prior to the next coordination meeting are solicited. The current goal is to finalize the content of this table in time to include

it in the rewritten introductory section of Chapter 9, which is being covered under Item 98-7.

Action: Item continued.

No Item No. **Historical Review of MIL-HDBK-5 Round-off Procedures. (GTG)** R. Rice reviewed this agenda item within the GTG. It was generally agreed that the round-off procedure used in MIL-HDBK-5 is non-standard; but there was disagreement on whether the procedure should be changed. No consensus was reached.

Action: Item continued.

Item 00-16 **Limitations of the Sequential Pearson Procedure for Skewed Data. (SWG)** R. Rice discussed this agenda item within the GTG. He explained that the sequential Pearson method had been found to produce unrealistic allowable estimates for very highly skewed data sets, with skewness levels below –1.0 and above 1.0. He noted that these extreme levels of skewness were relatively rare in practice, and that severe sample skewness could sometimes be traced to inconsistencies or errors in the raw data. In any case, the proposed amendment to Section 9.2.6.2 of the guidelines was approved.

Action: Item approved.

No Item No. **Regression for Skewed Data. (SWG)** R. Rice gave a status report on this item. He explained the limitations of the current regression analysis procedures and indicated that this limitation was typically avoided by subdividing large data sets into small thickness ranges and computing allowables for these more limited conditions where thickness has an insignificant effect on properties. The introduction of more advanced regression analysis procedures, which allow for non-normal distributions of residuals, would allow the development of allowables with smaller sample sizes over wider thickness ranges.

Action: Item continued.

No Item No. **Proposal to Change Backoff Limit to Percentage of Standard Deviation in the Sequential Weibull and Sequential Pearson Procedures. (SWG)** R. Rice described this proposed change to the guidelines. An argument was made that the backoff limit should be based on a percentage of the mean value, rather than the standard deviation. Another argument was made that the backoff limit should be held at a constant value up to some relatively high strength level, such as 100 ksi. Since no consensus was reached on how the issue should be handled, the item was continued.

Action: Item continued.

Item 00-17 **Clarification of the Bias of the Normal Method. (SWG)** R. Rice discussed this agenda item, which was prepared by J. Kinateder. Several editorial corrections were noted and a question was raised about the accuracy of the vertical scale shown

in Figure 9.2.6.1. Because of the number of changes and points of uncertainty within this item, it was agreed to continue this item until the next coordination meeting.

Action: Item continued.

Item 00-18 **Correction to the Weibull Acceptability Test. (SWG)** R. Rice explained an error that was found in the Weibull acceptability test in Revision H of MIL-HDBK-5. He explained that the error would not effect the accuracy of statistical values computed using the Weibull procedure; but it could effect the conditions under which a Weibull distribution was considered appropriate to use.

Action: Item approved.

Item 00-19 **Evaluation of the Pros and Cons of Adding the Date of Last Revision to Tables and Figures in MIL-HDBK-5. (GTG)** Questions periodically arise regarding when particular tables and figures were included in MIL-HDBK-5. Since MIL-HDBK-5 has been maintained and updated for over 40 years, the "age" of tables and figures varies greatly. The question is complicated by the fact that some tables contain data that were entered at 3 or 4 different time periods, due to changes in thickness ranges within a specification, updated properties for specific conditions within a table, or conversion of S-basis values to A and B-basis values.

Action: New item number assigned.