Data Review Operating Procedures – February 2011

1. Data Source and Documentation

Data documentation requirements that are traditionally required with datasets will be maintained and recorded. A checklist will be provided to the data source to aide in the data submittal procedure. These data should be used to establish traceability and pedigree of the data. In addition to this documentation, a material and process specification should be submitted for the dataset to be considered as "fully approved". A reduced version of the material and process specification should be made publicly available when the dataset is submitted.

In addition to the material and process specification, if the dataset was used during an FAA certification program, all conformity documentation should also be submitted to establish the highest degree of pedigree and to promote use of the shared database concepts.

2. Test Methods

MIL-HDBK-17 Approved Methods
The test methods on which the data is based will be closely scrutinized. If the method is the one recommended by MIL-HDBK-17 in Volume 1, Chapter 6, the data will be accepted without question. If the data was obtained using an older version of the approved specification and not a current one, discrepancies will be noted but it will not impact the decision to accept the data.

Non-MIL-HDBK-17 Approved Methods
If the data was obtained from a test specification that is not on the MIL-HDBK-17 approved list, deviations from the approved procedure will be noted. If, by expert opinion, there are significant differences, the supplier of the data may be requested to perform comparison testing for the properties in question. If the methods are thought to produce similar results to the approved method the data will be accepted and the deviations from the standard method noted. For the data to be acceptable, the standard which was followed has to be publicly available and in its final form. Otherwise, the data will only be accepted as if tested by an approved standard and deviations noted.

Failure Modes and Locations
Descriptions of the failure modes should accompany each data set. The failure modes should be reported as specified in the standard test procedure. The most important aspect that will be addressed is what type of failure was obtained: fiber breakage for tensile loading unless it is in the direction where there are no fibers, acceptable compressive failure excluding buckling, matrix failure for shear loading. Tab failures will be accepted if the strength values fall within the test population.

3. Normalization

The normalization used during the data analysis procedure will follow engineering practice using cured ply thickness (CPT). The data will be normalized with respect to the nominal cured ply thickness of the entire dataset using measurements obtained from a variety of layup and test methods. Using this nominal value, the corresponding fiber volume fraction will be calculated using the nominal fiber aerial weight for the dataset. Exceptions to this will be if material is within 2% of the standard normalizing fiber volume fraction (rounding up or down accordingly) used historically by the handbook. These normalization values are:

Unidirectional - 60%
Fabric - 57%
Glass - 50%

4. Data Reduction

The flow chart Fig 8.3.1.1, Volume 1 will be followed including the use of engineering judgment as required. For the ASAP method the minimum number of batches is three and the minimum number of environments are also 3. This applies to any data larger than n=18. For exploratory data, no data analysis will be performed.

5. Engineering Judgment

Not all data conforms perfectly to statistical data reduction. Some adjustments to statistical analysis may be needed so that data that is essentially good can be published in MIL-HDBK-17. Experience has shown that a blind application of the flow chart in Fig. can result in rejection of good data or basis values that are physically unrealistic. Four locations in the flow chart are identified where engineering judgment may be appropriate. They all occur as a result of not passing a statistical test. Each of them will be discussed next.

- Failure of the K-sample Anderson-Darling test for equivalence of batches. The k-sample results should only be accepted if (1) batches behave similarly at most environments, i.e., there is a trend that one batch is consistently lower or higher, (2) Coefficients of variation are higher than 3%.
- Failure of the Levene's test for equivalence of coefficients of variation. Coefficients of variation should be examined at all environments to determine why the test failed. If there is a very high or a very low environment that environment may have to be eliminated. There are cases where the coefficients of variation are closely bunched together and the test is a very poor discriminator. The tendency here will be to accept data when the coefficients of variation fall within the 3-9%, as those values are representative of composite material.

- Failure to the Anderson-Darling test to conform to normal distribution. The graphical method should be used as a back-up. If both methods fail than the data is not normal.
- Interpretation of the Anderson-Darling results to select the appropriate statistical distribution for basis calculations.

Other areas that have to be addressed are to treat unequal replication in the batch or environment.

6. Existing Dataset Review

Once data is approved for inclusion into the handbook within Volume 2, the data may be periodically reviewed by the DRWG to assure that the current industry values are within the range of the published values. Based upon industry data that may be brought before the DRWG over concern of the existing handbook property data, the data may be chosen to be removed from the handbook or revised based upon current data presented to the DRWG. This procedure will require a vote of the existing DRWG voting membership as to the course of action to be taken (removed or revised).