General Guidance for LTMS Statistics

**Getting Statistical Support**

From initial test development through test maturation and monitoring, statistical tools and considerations are present at each stage. It is important that industry stakeholders have a good foundational knowledge of these statistical tools in order to optimize test method stability and performance. The industry statisticians group at the time of development of this document have determined that it is inappropriate to provide in-depth statistical recommendations here, as many of the statistics topics cannot be placed into a “one-size-fits-all” solution or recommendation. However, several resources exist to aid Surveillance Panels chairs and other industry stakeholders, including:

* Internal Company Statistician
* Sub B Data Analyst Group (Statisticians Group)
  + A list of statisticians who volunteer their company time to support Subcommittee B statistical considerations is available on the home page of the Test Monitoring Center (TMC) website (astmtmc.org). On the right-hand side a link entitled “Data Analyst List” opens a pdf document with names, emails, phone numbers, and company affiliation for statistics group members. For new requests, it is recommended to use the group email link provided to contact the entire group. As this is a volunteer group, a member with available time and resources will reply to your request.
* Industry Statistical Training
  + From time-to-time there may be a need to refresh the entire industry or a subset of the industry (such as SP chairs and test sponsors only) on key statistics topics of interest at the time. A request for this training to occur can be routed to the statistics group or through the chair of the Technical Guidance Committee (TGC). Some examples of topics which can be covered in the training include:
    - Control charts and their proper creation, application, and interpretation
    - Guidelines for taking action resulting from control chart activity
    - Precision matrix design considerations
    - Guidelines for updating targets vs. correction factors
    - Understanding severity adjustments
    - Recommendations for introducing new hardware or critical test items such as fuel
    - Lessons learned
  + These presentations are stored under the meeting minutes section of the TGC (<https://astmtmc.org/ftp/docs/technicalguidancecommittee/minutes/>). An example of a presentation given in October of 2022 is also provided in this Surveillance Panel Handbook.

**The LTMS Document**

The Lubricant Test Monitoring System (LTMS) is an industry reference testing system to monitor and control non-reference testing and provide best tools and actions to give accurate and equitable oil evaluation. It is a tool used to identify differences among industry test results and to assist the industry to level the playing field for non-reference testing. No matter where or when a non-reference is tested, the goal of LTMS is to bring all results to parity.

As test stands and test laboratories are calibrated by the ASTM TMC, the LTMS document defines the calibration in terms of test severity and precision and is checked by the application of control charts to reference test results. The LTMS document explains how to use the control charts for each test type. [Microsoft Word - ltms.docx (astmtmc.org)](https://urldefense.com/v3/__https:/www.astmtmc.org/ftp/docs/ltms/ltms.pdf__;!!D-JDmu3Lc2wo0Jiybg!ZPrn6Ywb7GEwlyFKShBN2J0E-cKB0SMG8P1npcZ8Dp0ZgPFTzf2vzpMa-4iOnc9zkvNJXY34g6AXXRCoizXC6hY$)

**Relevant ASTM Statistics Methods**

All ASTM methods are required to provide precision and bias statements according to ASTM Form and Style Guidelines ([Form and Style Manual for ASTM Standards or “Blue Book”](https://urldefense.com/v3/__https:/www.astm.org/media/pdf/bluebook_FormStyle.pdf__;!!D-JDmu3Lc2wo0Jiybg!dNQ24d3dS65RuJC12yWQta2xoNfAvSqConzG8Htr6Yh4_QdZdoFf6gPHYD8W17DTJaZ_JuC7Dm0E$)). Precision is commonly referred to as “repeatability” and “reproducibility”. For the majority of tests in ASTM Committee D02, the precision statements are developed following practice ASTM D6300. However, since the minimum testing requirements of this practice are often too cost prohibitive to be feasible for tests falling under D02 Subcommittee B, Sub B tests do not typically use this practice, but instead follow the guidance of the industry statistics group and industry stakeholders who consider optimal precision matrix designs with the available resources at the time. From the precision matrix data, the repeatability and reproducibility statements are generated.

For control charts, ASTM Committee D02 tests with high test volumes general follow practice ASTM D6299. Sub B tests do not typically use this practice, but instead use control charts outlined in the LTMS document (linked above).

For outlier testing of a data set, a popular method is ASTM E178. This practice has been used for Sub B test methods in certain situations, but Sub B statisticians often use other appropriate methods and reasoning based on sample size or other situational considerations.