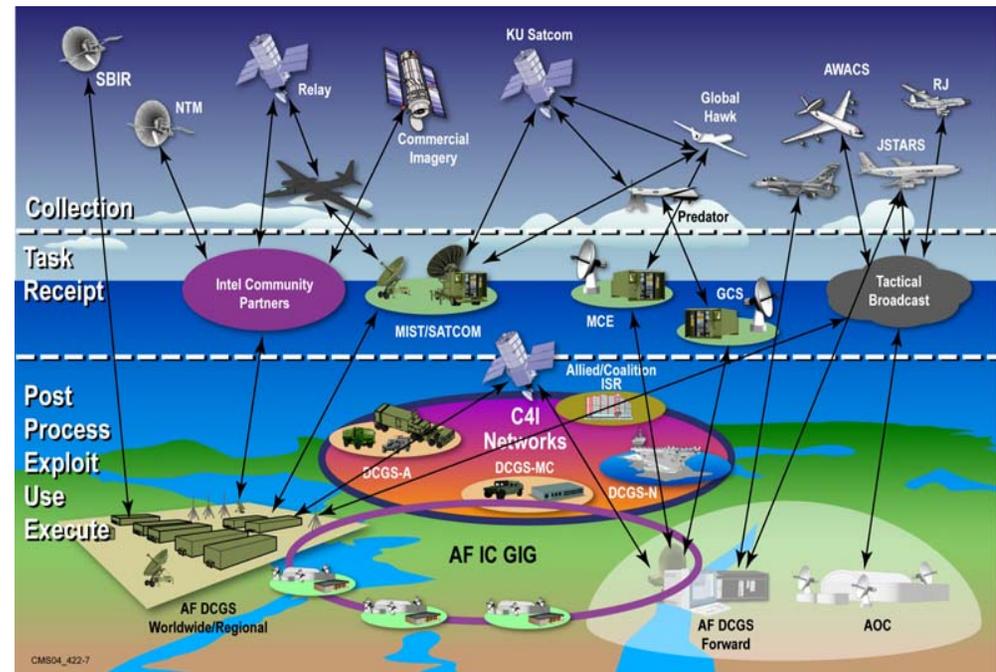

**Case Study:
Air Force Distributed Common
Ground System (AF DCGS)**

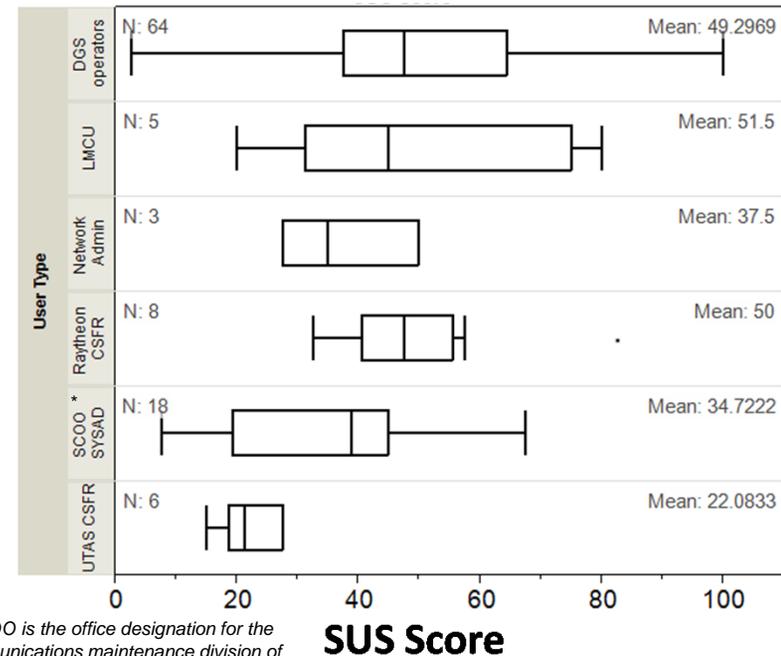
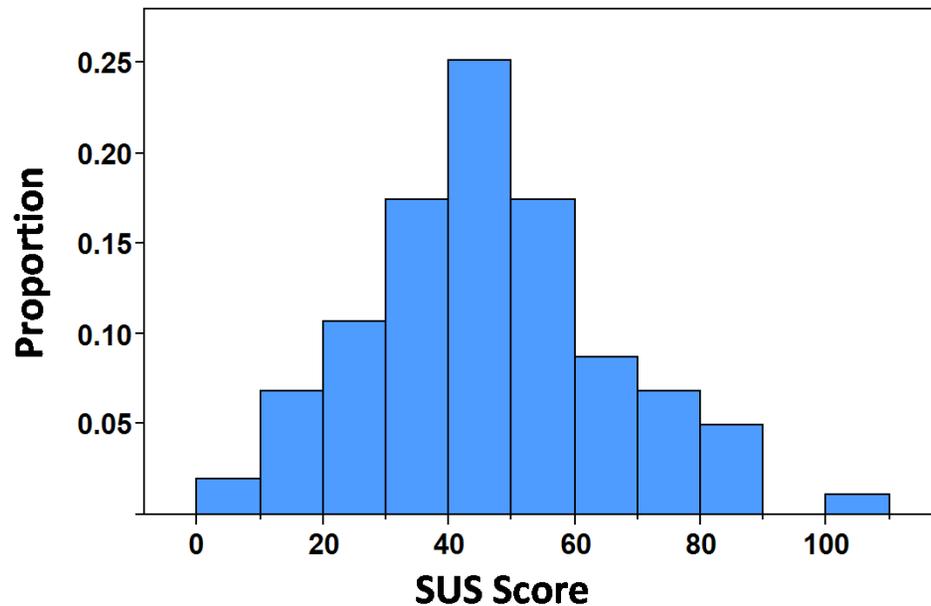
- **An intelligence enterprise system**
 - Hardware housed in 5 core sites and 16 distributed sites
 - Network connects them to each other and to other intelligence networks, sensors, and mission command systems
- **Analysts manage, process, exploit, and disseminate information from various sources**
 - Geospatial intelligence (GEOINT)
 - Signals intelligence (SIGINT)



- **Testing Bulk Release 10B, a GEOINT upgrade**
 - Hardware Capability
 - » Replace older servers that have reached end of service life
 - Software Capability
 - » Two new web applications designed to increase operator workflow and enhance ability create/modify sensor tasks

- Need to know not just *can* the operators accomplish their mission (part of effectiveness) but also *how difficult* is it for the operators to accomplish their mission (part of suitability)
- Goal is to assess the usability of AF DCGS fitted with the Bulk Release 10B software upgrades
- Test team used the **System Usability Scale (SUS)**
 - Academically validated 10 question survey
 - Can compare results across users within this test as well as between tests (e.g. Bulk Release 10B vs. future version)
- **SUS was administered to:**
 - DCGS operators at the end of each mission
 - System administrators / network maintainers
 - Original equipment manufacturers field representatives

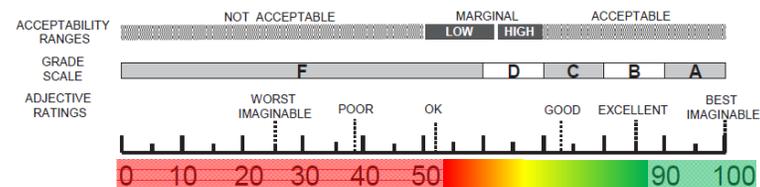
Bulk Release 10B is difficult to use



* SCOO is the office designation for the communications maintenance division of the 10th Intelligence Squadron

- **Average System Usability Scale (SUS) score was ~45 (80% CI [42.6, 47.5])**
 - Based on 104 test participants
 - Significantly lower than the minimum score of 70 for a system to be considered acceptable
 - » Only 10 of 64 Distributed Ground Station operators rated the system usability ≥ 70

- **Operators, system administrators, maintainers, and original equipment manufacturers all scored the usability as low**



- **Produce quantitative summaries and graphs**
 - The nature of the SUS allows for valid estimates of uncertainty and even statistical modeling
- **Further investigate trends / particularly low scores by going through free response comments**
- **In this case, particularly low scores (e.g. UTAS CFSR) likely due to insufficient training, CONOPS, TTPs, and documentation on the system**
 - Contractor field representatives know how system is *supposed to work* and that it *can work*
 - Since they observe that it *isn't* working as designed, they rate it as very unusable

Lessons Learned / Opportunities for Improvement

- **Additional data and better data collection techniques could have produced more / improved analyses**
- **Record the mission associated with an operator's score**
 - Would allow for quantitative comparisons by mission
 - Was the software more usable on some missions than others?
- **Include an anonymous identifier on all surveys and free response sheets**
 - Would allow the test team to match scores with comments
 - Any characteristic associated with those who scored usability particularly high or low?

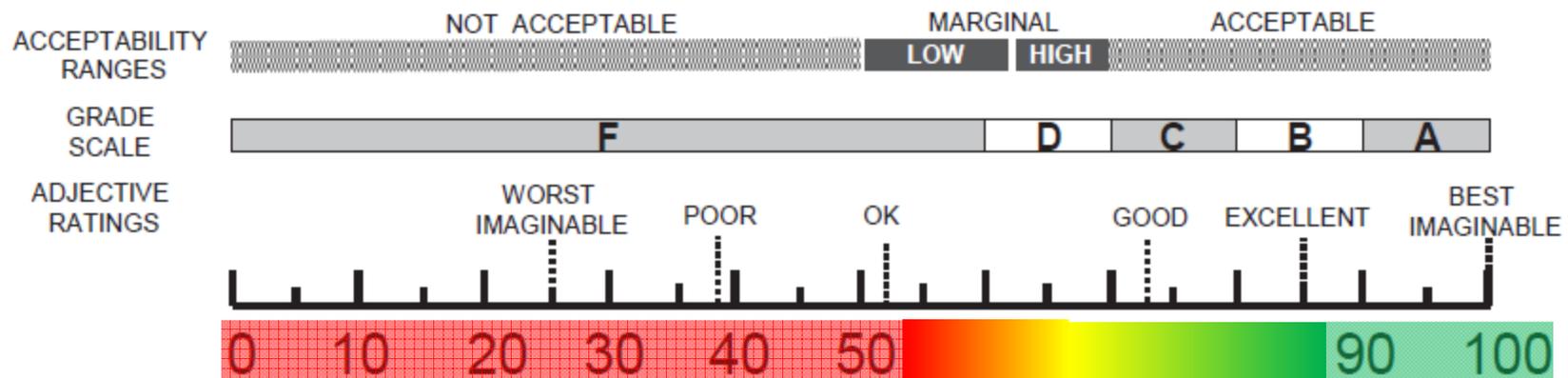
- **Analyzing surveys by factor (user type, version, etc.) can be very insightful**
 - Always conduct appropriate statistical analysis and include uncertainty estimates
- **Combination of quantitative SUS results *with* free response comments can provide useful information to test teams and program managers**

BACKUP

IDA System Usability Scale (SUS)

Usability: “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 92401 part 11)

- Developed by Brooke (1996)
- Reliability & Validity Assessment: Bangor, Kortum, & Miller (2008)
 - 2234 tests over 10 years
 - Reliability = .91 (very high)
 - Sensitive to usability differences





Sample of Free Response Comments

- **“Most of the issues that arise with the BR-10B system are due to a lack of TTPs when working with the system. Once these issues are understood there is little to no mission impact. However, there are no apparent benefits when working with 10B over 10.1”**
- **“BR-10B system is great in theory, but poorly implemented. Program still not fully functional. Complete lack of training, for a system that changes the entire way of issuing targets.”**
- **“I do not remember going to a training class for BR-10B. Other than that, BR-10B with 10.1 TTPs functions the same as 10.1.”**
- **“The system is much better implemented when using 10.1 TTP's for research. Workflow has potential to be more effective than 10.1, however it has fundamental problems.”**
- **“Although the MOC does not use BR-10B, when issues on 10B cause us to be unable to exploit HA imagery, the mission in general gets backed up. From what I gather, most of our analysts would rather not use 10B.”**