

# Paint Spraying Equipment Reliability/Maintainability, Field Unit Baselineing Study

## ***Background:***

In August of 1995, the USAF, through WL/MLSS, initiated the Coating Technology Integration Office (CTIO). The purpose of the CTIO was to establish a state-of-the-art facility for testing and evaluation of advanced materials, equipment and processes for aircraft refinishing, and to integrate these advancements and other “best practices” into routine USAF operations. CTIO was tasked with baselining the current status and operations of aircraft surface refinishing facilities at the USAF Air Logistic Centers (ALC) and Major Command (MAJCOM) field units. The purpose of baselining was to gather information on the facilities, equipment, processes and procedures, materials, training, and documentation. The baselining activity was divided into two projects, one covering the ALCs and the other the field units. This project Final Report summarizes the MAJCOM field unit baselining activities.

**Project Sponsor/Customer:** AFMC/CEVV; Air Force wide  
**Period of Performance:** Oct 95 – Sep 97

## ***Objective:***

The objective of the Major Command Field Unit (FU) Baselineing Project was to develop equipment and integrated product/process test methods for qualification of aircraft coatings, including surface preparation and painting processes as applicable under field unit conditions. The major objectives of the FU baselining effort include the following:

- Develop a generic process flow chart or diagram with process timing information. Characterize key variables that may influence coating quality. Included a review of record keeping procedures to provide insight into historical coating problems.
- Develop a basic understanding of the typical environmental conditions existing during repaint/ paint processes. Document the process so new coatings can be tested at the on-site extremes required for successful application.
- Document typical coating failures experienced at FUs. Develop screening methods for proposed new coating systems.

- Document process equipment used at the FUs for standard depaint/paint operations. Enables CTIO to purchase appropriate equipment to emulate on-site processes in their test facility.

Information collected during this program will be incorporated with data from other contract efforts to develop an integrated test method applicable to standard FU painting operations and to define the appropriate criteria to measure success

**Status:**

The baseline sites were selected based upon suggestions from the CTSC as being representative of a wide range of environmental and process conditions experienced during aircraft coating operations. The sites surveyed were as follows:

- Dover AFB, DE
- Eglin AFB, FL
- Hurliburt AFB, FL
- Luke AFB, AZ
- McGuire AFB, NJ
- Mountain Home AFB, ID
- Patrick AFB, FL
- Randolph AFB, TX

Documentation was developed based on previous experience with ALC baselining questionnaires, and was structured to identify unique methods, conditions, equipment, training/quality control procedures, and materials used at each baselined field unit. Interviews were conducted with the field units to gain an understanding of the rationale used to make decisions concerning painting an aircraft (based on schedule or environmental factors), the criteria for acceptable job performance, and how each shop documented and responded to customer feedback.

From a systems approach, the first operation in aircraft refinishing is the removal of the old or defective coatings. Of the field units baselined, the depainting process used on airframes, with the exception of Randolph AFB, was scuff sanding of the existing coatings. Technically speaking, scuff sanding is a depaint process, but at the field units it is used more as a surface preparation operation than for actual depainting to the bare

substrates. Although all the field units have some off-airframe component stripping capabilities (chemical, Aquamiser, PMB, etc.), only Randolph AFB has a dedicated PMB facility for full airframes. Luke AFB paints totally stripped aircraft, but they are received after they are flown to Luke without paint from either Randolph's or Hill's PMB booths. Both Randolph and Hill use Type V plastic media, and are equipped with heavy particle separators in well-maintained facilities. The facilities used for scuff sanding at the field units were generally of adequate capacity, but were in need of additional lighting and improved environmental and temperature controls.

Surface cleaning and preparation processes are deemed by the FU personnel to be one of the most important production variables affecting coating system performance. However, most field units performed only solvent wipe cleaning after partial scuff sanding. Only Randolph and Luke applied chromate conversion coating. Randolph also did this on aircraft which were stripped to the bare substrate. Most solvent wiping is done at the field units with alcohol or MEK solvents.

As with the ALCs, significant differences exist in the coating material combinations (primers and topcoats) used on aircraft at field units. In some cases, different coating systems are used on a given aircraft depending on where it is recoated. The procedures used to apply the coatings are similar among the field units; equipment was found to vary at the sites. As with depainting facilities, improvements in climate control were desired, and pollution controls were found to be lacking or non-existent. Lack of ventilation/filter equipment at most FU painting facilities was found to be one of the largest contributors of pollution at the field units. Most field units were found capable of using newer, more efficient paint guns, but such equipment was not universally applied.

Efforts were made to develop as complete and accurate a set of data as possible in compilation of this MAJCOM FU Baseline Report. Due to the lack of standard USAF source documents at a centralized location for some of the technical areas, specifically related to chemical usage and pollution sources, the data presented here were obtained from on-site interviews with FU personnel. The numerical data in this document has also been reviewed with each FU in an attempt to be as accurate as possible. The data in this report will be used in simulating FU environments in the laboratory for integration projects and for developing metrics for evaluation of the effective reduction of pollution sources. Hopefully, as a working document, the coating system equipment and processes used periodically will be updated by the CTIO as the FU workloads change

and as new materials, equipment and processes are implemented to improve performance or reduce pollution.

The painting facilities at the field units operate under more severe environmental conditions than those at the ALCs. Although painting generally occurs under acceptable conditions, temperature/humidity extremes routinely occur. Scheduling has an impact on the coating application process at the field units, but less so than at the ALCs. Fewer individuals complained of not enough time allocated for curing at the field units than was the general case at the ALCs. The primary problem reported during the FU baselining with the new high-solids primers and topcoats was the clogging of equipment and poor color match. Most of the sites are switching to newer HVLP spraying equipment which may be able to accommodate the high-viscosity characteristics of these coating systems. Poor color matching remains a persistent problem at the field units, which can be particularly annoying since partial repaints/spot touch-ups are common at these sites.

The following capabilities are recommended for the CTIO laboratory to accurately recreate the coating application processes at the FU paint facilities:

- Supplies of all the coating materials (primers and topcoats) will need to be obtained from the appropriate ALC or FU, as required.
- One or more of each of the primary paint guns (including brands) with appropriate nozzles in use at any of the painting facilities will be required.
- Laboratory facilities are required to enable the paint facilities to be accurately simulated, such as high capacity compressed air supplies, various fluid feed and air hoses, and a painting facility where temperature and humidity can be controlled over a wide range
- Capabilities to monitor and control wet and dry film thicknesses.
- Specimen supports will enable panels to be held in various orientations (overhead, vertical, and horizontal) painting positions.

**Final Report:** Titled: "Paint Spraying Equipment Reliability/Maintainability, Field Unit Baselining Study"

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