1.0 Scope

To prevent foreign object damage (FOD) to manufactured aerospace products.

2.0 Purpose

This procedure establishes the standard to prevent and eliminate foreign object damage/debris (FOD) to products being stored, assembled, reworked, modified, and packaged at Technical Services, Inc.

3.0 Definitions

Check-Do-Check	Method where components are reviewed before starting an operation, conducting the operation if no issues are found, then reviewing the completed work to ensure no issues were introduced.
Consumables	Supplies that are expendable, i.e., rags, Q-tips, screws, nuts, washers, etc.
ESD	Electrostatic Discharge
FOD	Foreign Object Damage (FOD) – Any damage attributed to a foreign object which may or may not degrade the assembly's required safety and performance characteristics.
Foreign	Not suppose to be there per print
Good Housekeeping	Work areas are clean and organized at all time. This includes floors, shelves, work benches, light fixtures, inspection stations, etc.
Potential FOD	Condition where FOD may cause damage and/or failure should the product be put in use: • Any metal objects: wire or lead clippings, solder balls, screws, metal shavings, etc. • Food/drink/clothing • Production supplies: cotton swabs, finger cots, rags, adhesives, brushes, etc. • Tools: screwdriver bits, wrench sockets, tweezers, etc. • Fabrication Support materials: masking tape, etc. • Excessive amounts of environmental objects: hair, dust, dirt, lint, etc. • All liquids: oil, water, hydraulic fluid, etc. • Construction debris/materials

4.0 Procedure

4.1 FOD program is planned and implemented using a continuous improvement approach.

Basic elements:

1. Prevention Training and Awareness
2. Assembly sequencing "Check-Do-Check"
3. Equipment Preventative Maintenance
4. Material Handling and Controls
5. Good Housekeeping Practices
6. Tools Accountability and Control
7. Consumable items Control
8. Incident Investigation, Reporting, and feedback "Lessons Learned"
9. Hazardous Materials Control
10. Employee Awareness and Feedback

Preventive Practices:

1. Follow procedures and documentation.
2. Practice good housekeeping "Clean as you go" methods.
3. Account for all tools, hardware, and equipment at specific intervals using "Check-Do-Check" method.
4. Use appropriate inspection technology to inspect inaccessible areas.
5. Personnel must complete FOD training
6. Establish appropriate storage areas.

4.2. Measuring Performance

FOD Prevention Program target is "zero" incidents and its effectiveness is continuously monitored using methods such as:

1. Display of audit and / or incident data on Safety Inspection Report Minutes.
2. Trend Analysis and Reporting – Part of management review
3. Customer feedback

4.3. Material Handling and Parts Protection

The following control techniques provide good FOD prevention:

1. Stores personnel have been trained.
2. Materials used in packaging, handling, shipping and storage are clean and free of contamination.
3. Parts and assemblies are packaged in a manner that will preclude any chance of one item making direct contact with another during normal handling operations.
4. Packaging materials shall be chosen based on their ability to adequately resist penetration from forces either external or internal during handling and shipping operations.
5. ESD measures shall be maintained per SPC-01-P0021.
6. Materials shall be visually inspected for indications of FOD.

4.4. Housekeeping

Manufacturing and test areas must remain clean as follows:

1. Good Housekeeping practices shall be used.
2. Practice "Clean-as-you-go" techniques to prevent debris from migrating into assemblies.

4.5. Tool Accountability

Tool accountability is an important part of the FOD program in preventing inadvertent tools from being left inside deliverable assemblies. Tool accountability is determined by the Manufacturing Engineer on a product by product basis.

1. Use shadow boards where possible.
   a. If no shadow board, limit work station tools to only those required for the specific assembly step.
2. Do a quick inventory of those tools at appropriate intervals.
3. Account for all tools prior to pass unit to next operation.
4. Put all tools away before starting another assembly.
5. Stop all work if tool can not be accounted for and initiate a corrective plan.

4.6. Hardware Accountability

Hardware accountability is determined by the Manufacturing Engineer on a product by product basis. The level of hardware accountability will vary depending on a product's level of flight criticality / safety.

Possible methods used for Hardware Accountability:

1. Kit hardware by operation or task.
2. Specify and furnish tote trays.
3. Use containers with spring-loaded covers.
4. Account for all hardware prior to passing unit to next operation.
5. Stop all work if all hardware can not be accounted for and initiate a corrective plan.

4.7. Lost Items

If hardware, tools or consumables are lost during assembly:

1. Cease production activity in affected area and initiate search for item.
2. Verify that it has not made its way into the assembly. This can be done by visual inspection, blowing out the assembly or tipping it upside down.
3. All items need to be accounted for before proceeding to close the assembly.

4.8. Hazardous Materials

Hazardous Materials are controlled OPS-D0158.

4.9. Focal Point

The Quality Assurance Manager is the responsible FOD Program authority. The assigned process owner of this document is the delegated FOD focal. These responsibilities may be delegated as required to ensure completion of all tasks.

The Focal responsibilities are:

1. Program implementation, review, and revisions
2. Conducting program effectiveness audits
3. Corrective and preventative actions implementation
4. Investigating incidents reports and root cause analysis
5. Prevention techniques and associated documented instructions
6. Training
7. Trend performance reporting to personnel and senior management noise when shaken during FOD inspection.

4.10. Assembly Operations

Work instructions shall include check points for verifying no foreign object debris remains in the assembly before they are closed.

Final Box Build Inspection procedure QA-08-WI0193 and Final Assembly PRD-15-P0183 outline specific inspection for detection of foreign objects, loose hardware, or contamination.

Instructions shall include but not be limited to:

1. Each operation shall use the "Check – Do – Check" method.
2. Prior to installing assemblies that block visible inspection of already installed components and sub-assemblies, verify that it is free of debris.
3. Prior to final closing of the unit, verify that it is free of debris.
4. Identify any potential operations that have risk of creating FOD, such as splatter from soldering and recommend protection.

5.11. Test

When testing, conduct the following:

1. Verify no loose screws or tooling
2. Retain cables and connectors as required
3. After testing the unit, inspect fixtures for FOD
4. Preventative maintenance is performed
5. Inspect for cleanliness, damage, and deterioration

5.12. FOD Critical Areas

All receiving inspection, assembly, test and rework stations will be considered critical areas where FOD process control is required.

5.13. Incident Reporting

If FOD is removed as soon as it occurs it is not reportable FOD.
If FOD is found at any time other than when the FOD occurred it is reported as a Non-Conformance.

5.14. Training Requirements

All company personnel working in a FOD critical area shall be trained to this procedure upon hire and then at least once a year.

Topics shall include:

1. Proper storage, shipping, and handling.
2. Debris control techniques.
3. Good Housekeeping Practices
4. Cleaning and inspection
5. Tool and Hardware Control / Accountability
6. Control of personal items, equipment, and consumables.
7. End Item protection
8. Quality Workmanship (“Clean As You Go” and “Check-Do-Check”)
9. How to report FOD Incidents or potential incidents.
10. Metrics

Quality Assurance Manager shall monitor Non-Conformances for any FOD trends.
Trend Reports will be communicated to personnel who affect the prevention and detection of FOD.

6.0 References

Title	Type	Number
Foreign Object Damage (FOD) Prevention and Detection Program	AES Procedure	EPS0640
National Aerospace Standard, Foreign Object Damage / Foreign Object Debris (FOD) Prevention	Standard	NAS 412
ESD Practices	Procedure	SPC-01-0021
Control of Nonconforming Material	Procedure	QS-D0024
Final Box Build Inspection	WI	QA-08-WI0193
Final Assembly	Procedure	PRD-15-P0183

7.0 Records

Record Name	Record Owner	Location Stored	Retention Time
Material Rejection Report	Quality Assurance	Doc. Control/Server	10 years min.

8.0 Revision History

Rev.	Date	Description	DCR#
New	6/29/12	Initial Release	953
A			
B			
C			