Foreign Object Elimination Plan

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1. Purpose, Scope, and Users

1.1. Purpose

The purpose of this plan is to establish how CFD Research Corporation prevents, detects, and removes foreign object debris (FOD) during manufacturing process activities.

Where there is program- and customer-specific FOD requirements, this plan addresses those unique requirements separately. In the event of a conflict between this plan and any program- and customer-specific requirement, this plan is superseded.

1.2. Scope

This plan applies to all work and storage areas designated as a FOD Prevention Area (FPA) at the Hollywood, Alabama site.

1.3. Users

Foreign Object Elimination (FOE) is the responsibility of all personnel—employees and visitors—entering an FPA.

Each area will designate a *Focal Point* to administer this plan, generally a Lead, with responsibilities as follows:
- Ability to identify and implement FOD preventive measures as needed.
- Audit work area to assess effectiveness of this plan.
- Track and display the type and amount of FOD found during FOD walkdowns using *FM-QA-0008, FOD Walkdown Report*.
- Report FOD-related incidents management and quality weekly using *FM-QA-0009, FOD Incident Report.*
- Assist with and carry out FOD-related investigations.
- Take the necessary corrective action(s) ensuring measures implemented prevent recurrence. Refer to *QSP-QA-0001, Corrective and Preventive Action Process*.

Each employee in a designated FPA has responsibilities as follows:
- Participate in FOD walkdowns at the beginning and end of each shift.
- Promptly report a suspected or known FOD incident.
- Understand the requirements of each FPA.
- Prevent, detect, and remove FOD.
- Provide feedback during FOD investigations.

The respective managers of each area have responsibilities as follows:
- Ensure this plan and any program- or customer-specific FOD requirements are followed.
- Ensure required personnel receive FOD training—initially and at defined intervals.
- Ensure FOD reports are accurate and sign off upon successful implementation of corrective action(s).
- Assist with FOD investigations and ensure corrective actions are implemented to prevent recurrence.

Quality Assurance (QA) has responsibilities as follows:
- Assists with implementation of *FM-QA-0001, Corrective and Preventive Action Request* (CPAR) per the *Corrective and Preventive Action Process*.
- Verify CPARs are logged and closed after verification of corrective action(s).
- Act when timely and effective corrective action is not achieved.
- Participate in FOD investigations.

2. Terms and Definitions

Term	Definition
Clean-as-you-go	An on-going practice of removing FOD during manufacturing, fabrication, modification, operations, and maintenance to ensure product is free of FOD.
FOD Awareness Area	An FPA where manufacturing and modification activities are open without any potential for FOD entrapment.
FOD Control Area	An FPA where assembly or modification activities occur to include but not limited to components or assemblies becoming part of a next higher level or completed assembly.
FOD Critical Area	An FPA where assembly, modification, and other operations requires the highest level of FOD prevention measures.
FOD Prevention Area (FPA)	Area where maintenance, manufacturing, modification, inspection/test, and production activities of assemblies, subassemblies, and components are carried out.
FOD Walkdown	A preventive measure where employees walk in a straight line "shoulder-to-shoulder" visually inspecting and collecting FOD in front of them and within their near peripheral line-of-sight.
Foreign Object Damage	Any damage attributable to a foreign object, expressed in physical or economic terms, that may result in degradation of product safety and/or performance.
Foreign Object Debris (FOD)	Any substance, debris, or article alien to the component, assembly, or system that could result in foreign object damage.
Foreign Object Elimination (FOE)	A plan aimed at assuring a FOD-free product or process.
Product Safety	The state in which a product is able to perform to its designed or intended purpose without causing unacceptable risk of harm to persons or damage to property. (AS9100D)
5S	A methodology resulting in a work area that is clean, decluttered, safe, and well organized. It improves quality and optimizes productivity.

3. Foreign Object Elimination Plan

3.1. General

The basic elements of this plan are as follows:
- Material handling, known as Handling, Storage, Packaging, Preservation, and Delivery (HSPPD)
- Housekeeping (Clean-as-you-go and 5S)
- Tool control and accountability
- Control of personal items (pens, badges, lapels, etc.)
- Control of hardware, consumables, and hazardous material
- Employee awareness and feedback
- FOD reporting and investigating (lessons learned)

3.2. Training

All personnel will receive training to ensure they understand the importance of preventing, detecting, and removal of FOD during manufacturing process activities based on designated FPA requirements, and any program- and customer-specific requirements.

Training subjects include as follows:
- Proper handling, storage, packaging, and delivery of material, components, and equipment specific to each work area.
- Housekeeping (Clean-As-You-Go, 5S, and FOD Walkdowns)
- Tool control and accountability
- Control of personal items, equipment, consumables, etc.
- FOD reporting and investigating
- FPA designations and requirements

3.3. Prevention, Detection, and Removal Techniques

3.3.1. *FOD Prevention Area Identification*

FPAs will be clearly marked using signage, boundary markers, and/or boundary barriers with signage attached. Where an area requires temporary FPA identification, the Focal Point, respective manager, and QA will meet to approve the level and type of requirements needed followed by posting the required signage and/or barriers. Refer to Appendix A - FPA Markings.

3.3.2. *Hollywood FOD Prevention Areas*

Designated FPAs are as follows:
- QA Inspection
- Inventory locker/warehouse
- Assembly and testing

3.3.3. Clean-As-You-Go

Employees must ensure their work area remains clean by making housekeeping a daily routine, such as:
- Cleaning the work area when a task completes.
- Cleaning the work area when FOD can migrate to an out-of-sight or inaccessible area that could result in damage or an appearance of poor workmanship.
- Ensuring FOD is removed at completion of the process, prior to the next planned process, or an inspection point.
- Cleaning the area after work is completes and prior to inspection.
- Cleaning at the end of each shift.
- Immediately picking up and discarding dropped items.

3.3.4. FOD Walkdowns and Finding Categories

FOD Walkdowns are performed by those familiar with the FPA. Employees will form a straight line and walk "should-to-shoulder" visually inspecting and collecting FOD in front of them and within their near peripheral line-of-sight. At the end of the walk, items will be placed in a clear locking bag for documenting on a *FOD Walkdown Report* and then displayed with the updated weekly FOD chart. Afterwards, the walkdown team will discuss what was found and how to prevent recurrence.

FOD findings are categorized as follows:
- MSP – Miscellaneous Small Parts (nuts, bolts, screws, washers, etc.)
- CON – Consumables (cotton tip applicators, cable ties, safety wire, etc.)
- TOOLS – Tools (sockets, test lead, cutters, etc. to include broken pieces of tools)
- PI – Personal Items (pens, badge, ring, key, paper, paper clip, etc.)
- GNRL – General Debris (any scrap material, shavings, plastics, lid, etc.)

The Focal Point tracks and posts weekly and aggregate FOD data on the FPA's whiteboard. Unless otherwise directed, a *FOD Incident Report* is not required for items found during a FOD walkdown. Refer to [Appendix B – FOD Findings by Category Example](#) for a FOD chart example.

3.3.5. Tool Control and Accountability

To ensure each tool is controlled and accounted for, employees are issued five (5) "Tally" labels with their initials and must:
- Inventory their respective toolbox or shadow board to account for all items.
- Place their "Tally" label in place of the removed item.
- Enter the removed item into the respective sign-out sheet.
- At the end of the shift, account for their "Tally" labels.
  - Each "Tally" label can become FOD; therefore, must be controlled.

When equipment is out for calibration or taken out of service, an "Out for Calibration" or "Out of Service" label with the responsible person's initials will be used in place of a "Tally" label. An entry in the respective sign-out sheet is required to show who placed the label and the reason.

3.3.6. Hardware Control and Accountability

Hardware accountability ensures loose or excess hardware and its associated material does not become FOD. Methods used to control hardware from becoming FOD are as follows:
- Clean-as-you-go.
- Kit hardware by work order (WO).
- Furnish and specify tote trays.

FPA controls:
- Hardware will be segregated and clearly identified to show its status.
- Hardware taken into a manufacturing area shall be properly stored/contained.
- Hardware that cannot be retained must be completely removed from a manufacturing area.

3.3.7. Shadow Box/Shadow Board

Implementation of shadowing a toolbox or storage board provides visibility when a specific, marked location's item is missing or in use and by who.

3.3.8. Material Protection and Handling

Any employee that handles, packages, stores, and ships material will receive material protection and handling instructions within the respective WO traveler operation per *QSP-MFG-0006, Planning for Product Realization* to include any program- and customer-specific requirements.

To ensure materials are properly protected and handled:
- Materials and accessories used in during HSPPD that contacts another part or assembly must be FOD free.
- Material shall be packaged in a manner that precludes the chance of an item contacting another item during normal handling.
- Consideration must be given to protective material, so it does not become FOD.
- Care must be taken with items subject to Electrostatic Discharge (ESD) damage. ESD may be considered FOD damage. Proper handling, grounding, and protective packaging must be defined and adhered to.

Each person shall visually inspect material for the following:
- Nicks, dents, abrasions, scratches, and the like that may impact form, fit, function, and product safety.
- Grease, preservatives, corrosive material, and similar FOD.
- Dirt, dust, shavings, and filings.

3.4.   Manufacturing Activities

3.4.1.   *Standard Practices*

Practices expected throughout manufacturing, assembly, and test activities are as follows:
- "Clean-As-You-Go" and 5S.
- Upon final operation, such as machining, fabrication, and assembly, clean the material to ensure it is FOD free.
- Sufficiently protect material and equipment from splatter accumulation during a special process such as brazing, soldering, welding, plating, and painting.
- Visual inspect material and eqipment for foreign object damage prior to installation, rework, and repair as needed.
- Verify part integrity before any assembly activity.
- Verify appropriate protective devices—protective caps, plugs, dust covers, and packaging—are properly installed.
    - Material missing protective devices must be inspected for presence of FOD, and if necessary, cleaned and followed by installing the protective device.
- Protect material by employing appropriate FOD barriers and displaying signage.
- Safeguard sensitive material and assemblies—engines, fuel lines, oil lines, cable harnesses, etc.—from FOD entrapment.

3.4.2.   *Lost Material*

Any time material is lost during manufacturing or maintenance, the affected area's activity must immediately stop. Next, a search must commence by personnel familiar with the affected area and no other person may enter the area. This search must continue until the material is found or there is assurance the material is not contained within a product or assembly. If the material cannot be found upon completion of the search, a *FM-QA-0002, Nonconforming Report* must be generated per *QSP-QA-0002, Control of Nonconforming Material Process*.

Employees shall be aware that promptly and properly reporting lost tools, hardware, and other material will not result in disciplinary action. Failure to report or conceal lost tools, hardware, or other material considered FOD, will result in disciplinary action up to and including termination.

3.4.3.   *Investigating and Reporting*

Any actual or potential FOD incident shall be promptly reported and investigated. When an incident occurs, manufacturing and maintenance activities shall immediately stop. Next, an investigation must be initiated to determine the root cause. Corrective action will be required to prevent recurrence and to provide lessons learned to share across other manufacturing and inspection areas. The root cause may be determined by visual observations, analyses, or locating of missing material, such as hardware.

FOD found during an inspection and testing activity, audit, or abandoned within a FOD sensitive/critical area will be documented using *FOD Incident Report*. When in doubt,

QA will make final determination whether a found item is considered a foreign object or tool.

FOD Incident Report includes as follows:
- Date of incident
- Location of incident (FPA)
- Who discovered and how (in work activity, WO operation, etc.)
- FOD description
- FOD category
- Part affected and if applicable, serial number
- Who was notified (Focal Point, Manager, QA)
- Root cause
- Lessons learned

FOD Incident Reports are initially presented to the respective Focal Point. The Focal Point makes required personnel aware of actual and potential FOD incidents noted in the *FOD Incident Report* to gain feedback and notate any lessons learned. Working with QA and the respective manager, the Focal Point assists with all phases of a CPAR.

4. References

- QSP-MFG-0006, Planning for Product Realization
- QSP-QA-0001, Corrective and Preventive Action Process
- QSP-QA-0002, Control of Nonconforming Material Process
- AS9146, Foreign Object Damage (FOD) Prevention Program - Requirements for Aviation, Space, and Defense Organizations
- NAS412, Foreign Object Damage (FOD) Prevention Guidance Document
- Appendix A – FPA Markings
- Appendix B – FOD Findings by Category Example

5. Quality Records

- FM-QA-0001, Corrective and Preventive Action Request
- FM-QA-0002, Nonconformance Report
- FM-QA-0008, FOD Walkdown Report
- FM-QA-0009, FOD Incident Report

6. Process Objective

To ensure FOD is eliminated throughout all manufacturing activities.

7. Appendix A – FPA Markings

FPA Designation	Marking/Signage	Work Activity
FOD Awareness		Lowest level of FOD risk with minimal detriment to form, fit, or function of hardware. Within this FPA, there is a low potential of material, subassemblies, and assemblies becoming exposed to FOD. Food and drink **are permitted in designated area so long as each are in a closeable container.**
FOD Control		Medium level of FOD risk with the potential of affecting form, fit, or function of hardware. Within this FPA, this is medium potential of material, subassemblies, and assemblies becoming exposed to FOD and moderately damaged. Hardware performance may be restricted but within required parameters. Food and drink **are permitted in a designated area within the FPA**.
FOD Critical		Highest level of FOD risk with a high potential impact to form, fit, or function of hardware. Within this FPA, there is a high potential of material, subassemblies, and assemblies becoming exposed to FOD. Deterioration, malfunction, and/or complete failure of subassemblies, assembly, and system may result. Human life is at risk. Food and drink **are not permitted**.

8.   Appendix B – FOD Findings by Category Example

FOD Category	Legend	Qty
MSP	Miscellaneous Small Parts	3
CON	Consumables	6
TOOLS	Tools	2
PI	Personal Items	1
GNRL	General	8

FOD Count by Category

3	6	2	1	8
MSP	CON	TOOLS	PI	GNRL