



International Aerospace Quality Group

Foreign Object Debris/Foreign Object Damage (FOD) Prevention Training Program

FOD Training Program Objective

- The primary objectives of a FOD prevention training program is to increase employee awareness to the causes and effects of FOD, promote active involvement through specific processes & prevention techniques, and stress good work habits through work disciplines.

What is FOD?

Foreign Object Debris (FOD)

A substance, debris, or article alien to the component, assembly, system or vehicle that could cause damage.

Foreign Object Damage (FOD)

Any damage or incident attributed to a foreign object that can be expressed in physical or economic terms that may or may not degrade the product's required safety and/or performance characteristics.

FOD Training Program Topics

- **Proper storage, shipping and handling of material, components, and equipment**
- **Techniques to control debris**
- **Housekeeping**
- **Cleaning and inspection of components and assemblies**
- **Accountability/control of tools and hardware**
- **Control of personal items, equipment and consumables**
- **Care and protection of end items**
- **Quality workmanship (“Clean-As-You-Go,” Inspection)**
- **How to report FOD incidents or potential incidents**

Examples of FOD

- One should always be aware of and on the look out for FOD or Potential FOD, here are some examples of recognized FOD
 - a. Unorganized workplace
 - b. Unaccounted for tools or tool details
 - c. Scattered components on work bench
 - d. Metal chips not cleaned up in the work place
 - e. Food at workspace
 - f. Protective covers not installed or improperly installed

Outcomes of FOD

- **FOD can cause delays in manufacturing and assembly**
- **FOD can cause product failure**
- **FOD can cause loss of business**
- **FOD can cause injury and death**

FOD comes in all shapes & sizes.....

Failures Caused by FOD

- **FOD may cause many failures and damages, but worst of all – it might cause injuries and even loss of human life!**
- **FOD can also cause damage to the company's finances and reputation.**
- **It is a fact that foreign objects and/or debris have contributed to jammed flight controls, engine damage, electrical shorts, fluid contamination, control valve failures, fires and other major failure incidents that have resulted in costly material damage, loss of vehicle and of life.**
- **Foreign material comes in many shapes and forms. It may present itself as a hand tool, dust, grime, oil, metal shavings, loose nuts, bolts, cotter pins, lock wire remnants, pencil, pen, packing material, etc.**

Examples

Typical FOD



Examples

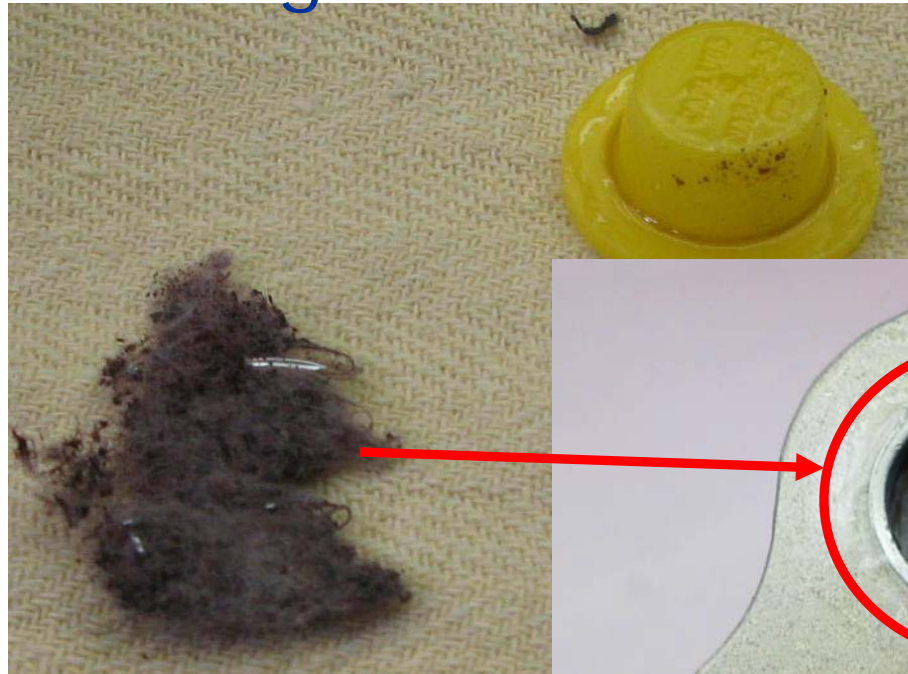
Small, seemingly insignificant items
can lead to Big Problems



Examples

Manufacturing Process Debris:

Polishing Material-FOD



Scotch bright

This pump was returned by a customer because of a foreign object.

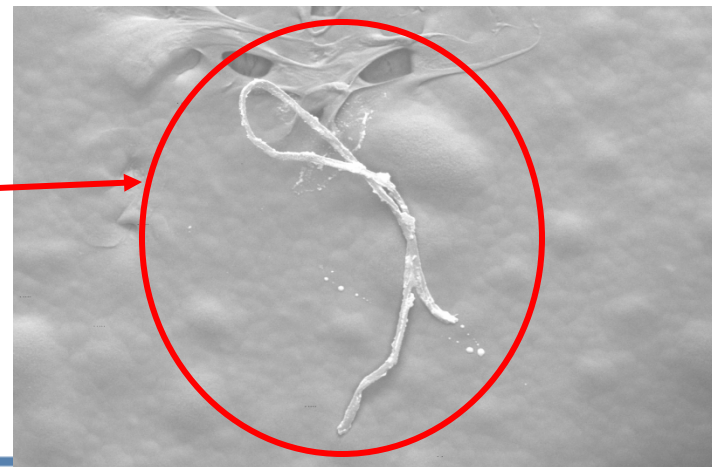


Examples

Assembly Process Debris:

Fabric In Sealed Assembly-FOD

- ✘ Product leaked during acceptance testing
- ✘ Leak was caused by a nylon fiber contaminant preventing seal integrity at a manifold interface
- ✘ The nylon fiber came from clothing or a lab coat



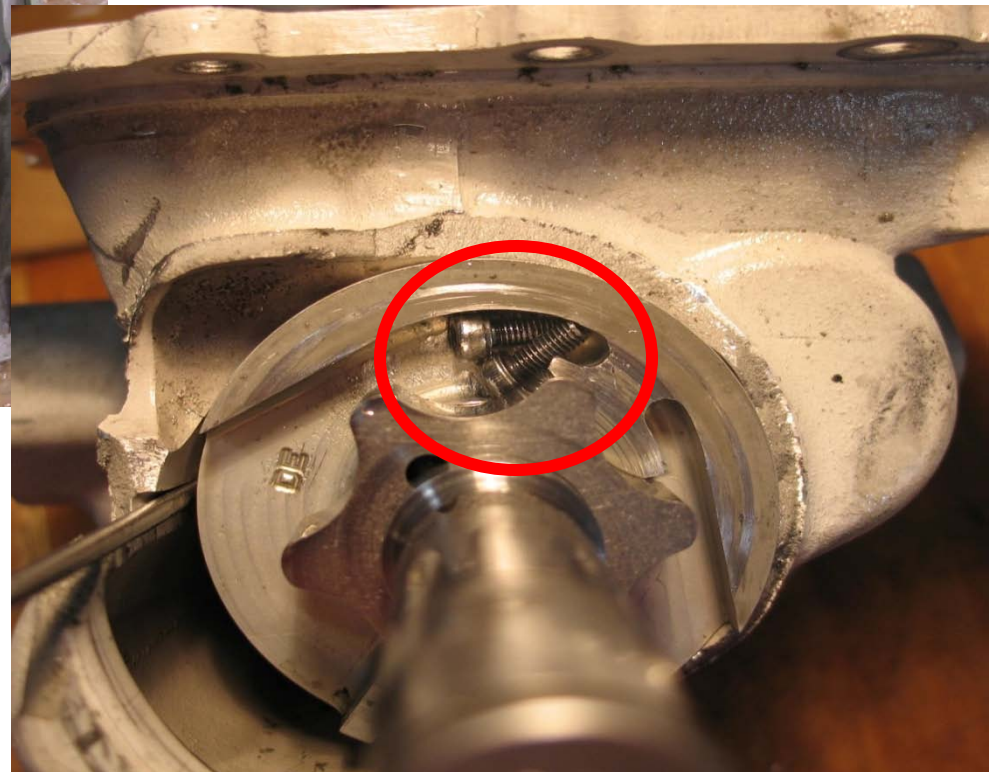
Examples

Assembly Process Debris:

Fasteners-FOD



This pump blew after ingesting several screws at the customer. Small FOD can cause big problems.



Examples

Food In The Workplace:

Food-FOD



**Oatmeal on a
Turbine Blade!!**

Examples

Food In The Workplace: General Housekeeping (6 S)-FOD



What is 6-S?

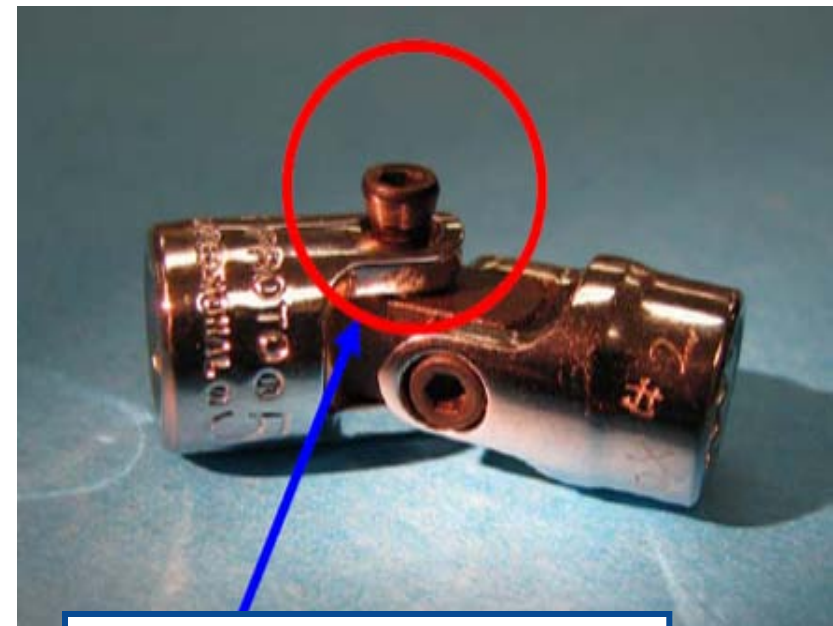
Every Thing has a Place and Every Place has a Thing!

- Sort – Discard everything that you don't use
- Shine – Clean!
- Straighten – Label & organize in a way to promote work flow
- Standardize – Assign rolls and responsibilities, standardize processes
- Sustain – Audit on a set frequency to make sure the 6S program is being maintained
- Safety – Keep the work area safe and walk ways clear

We can layout our areas so they flow better and are easier to clean and maintain.

Examples

Tool Control: Tool Details-FOD



After repeated use, the screw backs out of flex socket

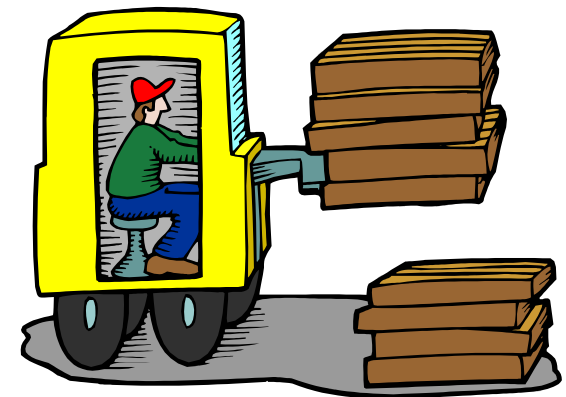
Proper storage, shipping and handling of material, components, and equipment.

- **Handle and store parts, assemblies, fixtures, and equipment in a manner that prevents damage, deterioration, or contamination.**
- **Be aware of any special handling considerations, this may include hazardous material requirements as applicable.**
- **Properly store equipment and tooling in designated areas**
- **Use protective caps and material as specified.**
- **Be aware of any ESD requirements the product may be effected by.**

Examples

PART PROTECTION & MATERIAL HANDLING

- Packaging & Shipping our product creates an opportunity for objects to invade them.
- By adding a FOD check along with a quality inspection, we can push FOD problems back to their sources. This will eventually make our jobs easier.
- Upon Receiving and Prior to Shipping Material Inspect for:
 - » Proper part number
 - » Proper packaging
 - » Damage
 - » Cleanliness
 - » Foreign Object Debris/Damage
- Report any Non-Compliance per Procedure.



Examples

Manufacturing Process Debris: Machining Chips-FOD

Machining
Chips



Examples

Manufacturing Process Debris: Tumbling Media-FOD



Methods For Preventing FOD

Key Attributes of Robust FOD Prevention

- **FOD Awareness and Training** – Promote participation in FOD elimination and provide frequent training.
- **Material and Part Handling** – Move and store all parts and production tooling in a way that prevents all damage and corrosion.
- **General Housekeeping and 6-S** – Implement good cleaning practices as well as organization of parts, tools, and supplies.
- **FOD Reporting** – Know who to contact and what to do in an actual, or suspected, FOD event

Methods For Preventing FOD

Key Attributes of Robust FOD Prevention

- **FOD Management** – Assign a person or people to be the FOD focal point
- **Processes** – Use prevention, detection, and cleaning to eliminate process media and debris
- **Tool Accountability** – Know where your tools are and the condition they are in.
- **Measuring Performance/Metrics** – Track FOD incidents and finding, use Root Cause and Corrective Actions to make improvements

Methods For Preventing FOD

Key Attributes of Robust FOD Prevention

- **Communication and Feedback** – Put up Posters or FOD Alerts in common areas so that all personnel are aware of FOD Risks
- **Consumable Control** – Keep Consumables out of FOD critical area and use on a “take as needed” basis
- **Hardware Accountability** – Know what you have used and how much you should have left
- **Personnel Control** – Identify FOD Control Areas, allowing only the required personnel and tools access

Simple Rules To Help Prevent FOD

- **Establish processes to prevent, detect, and clean debris at proper intervals.**
- **House keeping (Clean as you go) Keep your work area clean and organized.**
- **Maintain tool awareness, organize tools so they are easily accounted for, do so before and after your work assignment.**
- **Secure loose tools with appropriate equipment or methods.**
- **Account for all material and equipment used in the process, (e.g. shadow boxes, cut-outs, and designated storage locations for tooling and equipment).**

Simple Rules To Help Prevent FOD

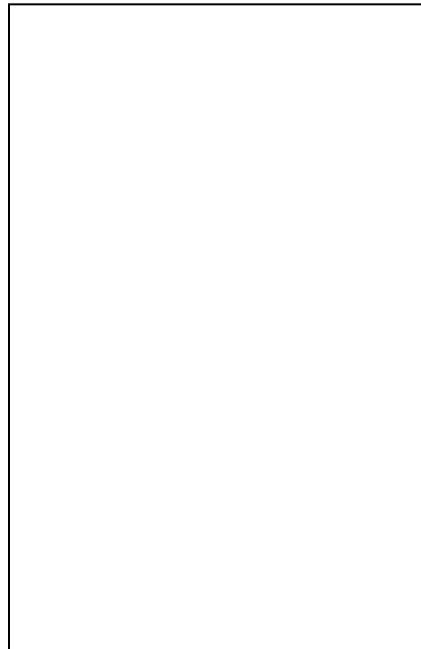
- **Verify that your clothing and accessories (e.g. pens, staples, strings) do not contaminate or provide an avenue for contamination.**
- **Handle and store parts, assemblies, fixtures, and equipment in a manner that prevents damage, deterioration, or contamination.**
- **Inform your Supervisor or Team Leader of any condition that may lead to a potential FOD induced failure or incident.**
- **Ensure that all assembly layouts are free from foreign objects prior to layout inspection.**

Simple Rules To Help Prevent FOD

- **Ensure that each component or pre-assembly is thoroughly clean.**
- **Ensure that all sub-assemblies ready for final build-up are properly protected to prevent FOD.**
- **Ensure workbenches are faced with a hard wearing material.**
- **Prevent visible particles from entering the immediate work bench area of assembly.**

Simple Rules To Help Prevent FOD

- Utilize cleaning cloths that are non-shedding fiber in nature.
- Post FOD alert prevention signs in designated areas.



ATTENTION VISITORS!!!

ASSEMBLY & TEST ARE FOD CONTROLLED AREAS
Strict Adherence to FOD Control Procedures is Mandatory

Entrance to Assembly & Test areas requires:
 Engine Center FOD Badge/Sticker Displayed
 -OR-
 Escort by FOD Certified Employee

P&W Employees, Resident Customers, Resident Suppliers:
 •Obtain FOD Certification Badges / Stickers upon completion of FOD training.

Visitors:
 •Affix stickers to visitor badge after review of Foreign Object Damage Prevention guidelines.

Return all badges to the Plant Protection Lobby Desk in Building 130 at end of visit

• Not FOD Trained? You must remain on main aisles unless escorted
 • Escort required? - Contact Plant Protection @ 344-4074





Emergency 5111

Lost Item Program

Any time an item is lost during an assembly, manufacturing, or maintenance task, cease activity in the affected area and initiate a search for the item.



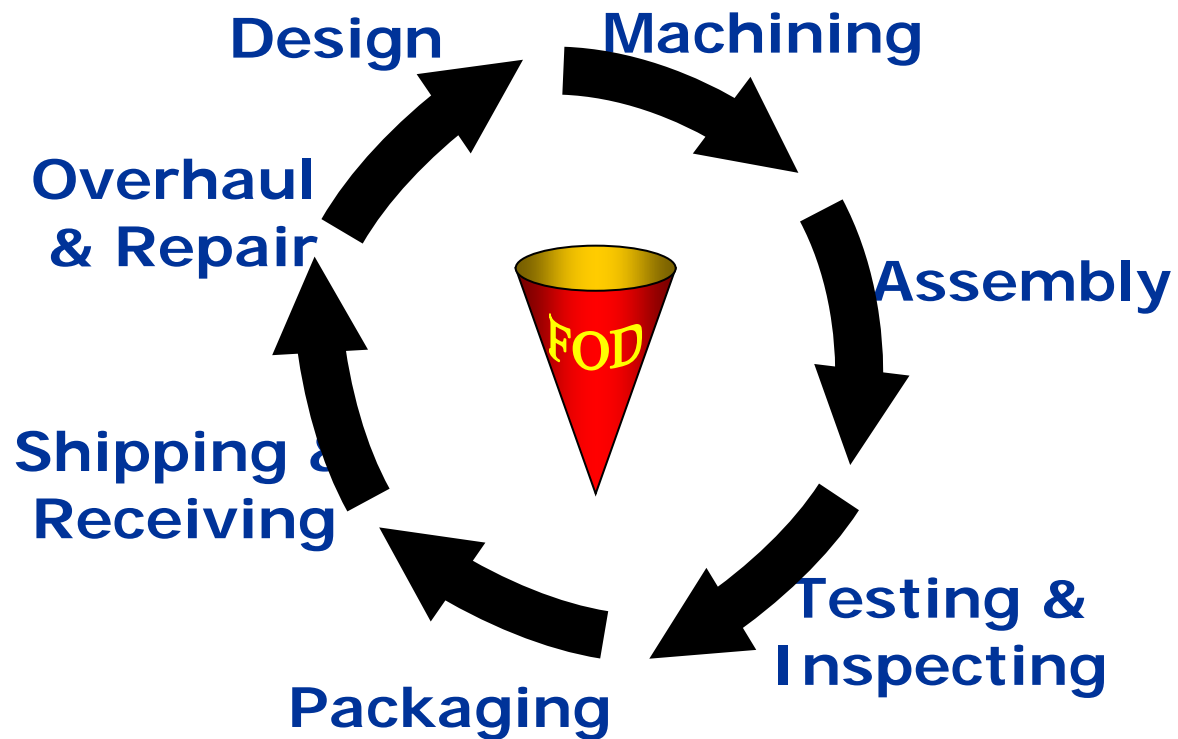
Continue this search until the item is found or adequate program results are achieved and properly documented according to the lost item procedure.

PEOPLE IN THE PROCESS

FOD elimination should be a focus at ALL steps

From initial design to shipment, there are many opportunities for foreign objects to invade the product.

Preventing FOD at only one step is not sufficient.



Responsibility for FOD

- It is **EVERYONE'S** responsibility to recognize and prevent FOD
- Don't rely on the person who looked before you...

...or the person who will look after you

**FOD Prevention requires
TEAM EFFORT!!**

RESOURCES

There are a lot of publically accessible organizations who focus on FOD elimination, for more information:

- [The F.O.D Control Corporation](#)
- [FODNews.com](#)
- [National Aerospace FOD Prevention, Inc. NAFPI](#)
- [Insight SRI –FOD Papers](#)
- [National Center for Aerospace & Transportation Technologies](#)

Questions?

