



# USA Foreign Object Debris Database

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# USA FOD Program

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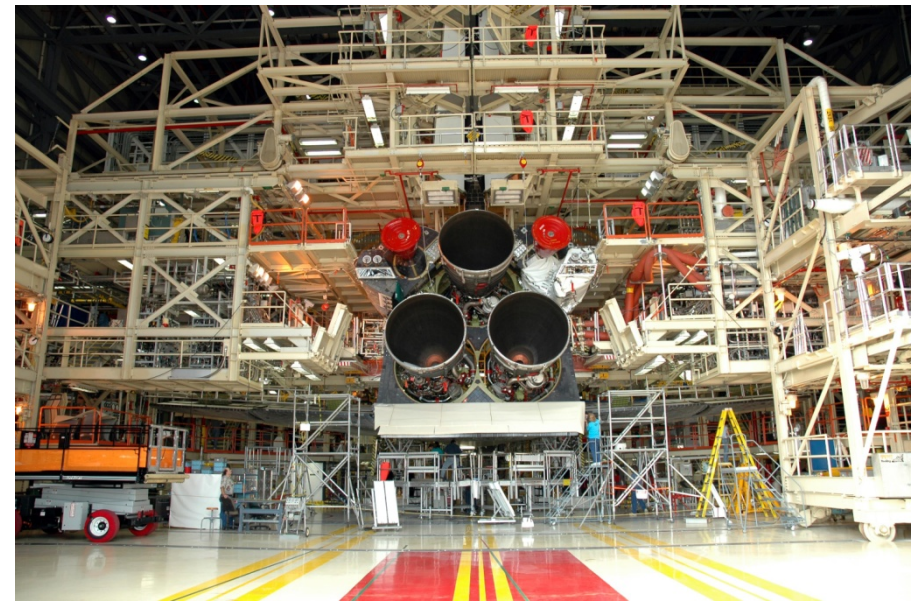
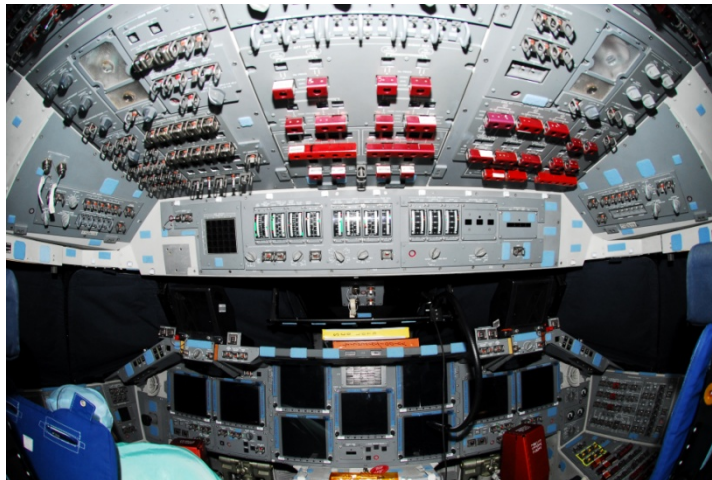
- Web based tool that monitors FOD walkdown activity
- Facilitates FOD data collection and reporting
- Provides tools for FOD data analysis
- Supports USA's systematic FOD walkdown requirements
- Currently has over 1.5 million walkdown records
- Used throughout USA operations in Florida
- NASA has selected the application for use at the Marshall Space Flight Center



# Program History

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- In 2003 Columbia Accident Investigation Board (CAIB) mandated changes to the USA FOD Program
- USA assessed industry best practices by Benchmarking six programs
- Based program on DATOM theory of Behavioral Controls
- The program provides tools that support data analysis and trending



# Process

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- **USA Shop Technicians, First Line Managers and Site Managers are required to perform daily FOD walkdowns of operational areas**
  - USA has established 630 specific attributes to be checked for FOD
    - Attributes are identified by building or location, general area and specific attribute
      - These are referred to as “Site”, “Area” and “Zone”
      - Site: Orbiter Process Facility 1
      - Area: Vehicle Forward
      - Zone: Flight Deck
- **The data collected is analyzed and issues are identified**
- **Corrective action is taken to mitigate FOD**
- **Key process monitoring metrics are provided to USA upper Management and NASA**



# Data Input Process

- USA personnel walkdown each Zone and records the result in the FOD application
  - The application supports five different results
    - No FOD Found
    - Flight Hardware Not Present
    - Area Closed Out
    - Area Inaccessible
    - FOD Found



# FOD Found Input

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- If FOD is found the application captures the following elements:
  - The types of FOD found
  - The location where it was found
    - **Red:** within or near flight hardware (3 feet)
    - **Blue:** administrative areas within a facility
    - **Yellow:** Any area between Red and Blue
  - The action taken
    - Removed
    - Reported
  - The Problem Report Number if one was generated



# Results

- A key indicator of the success of the FOD program is post launch debris assessment
- Shop management has used FOD data to **limit Liberated FOD**
  - Designed standard attachment for Flex Line Dog Tags
  - All signs were removed and replaced with decals
- **The entire USA Team is focused on eliminating Left Behind FOD**
  - FOD Cone bags have been positioned at all levels of the launch pad
  - Daily FOD Sweeps
  - Senior Management Pre Launch Walkdowns
- **STS 127 post launch assessment did not find any Left Behind FOD.**



*STS-124 Liberated FOD*



*STS-124 Left Behind FOD*



# Analysis Tools - FOD Search

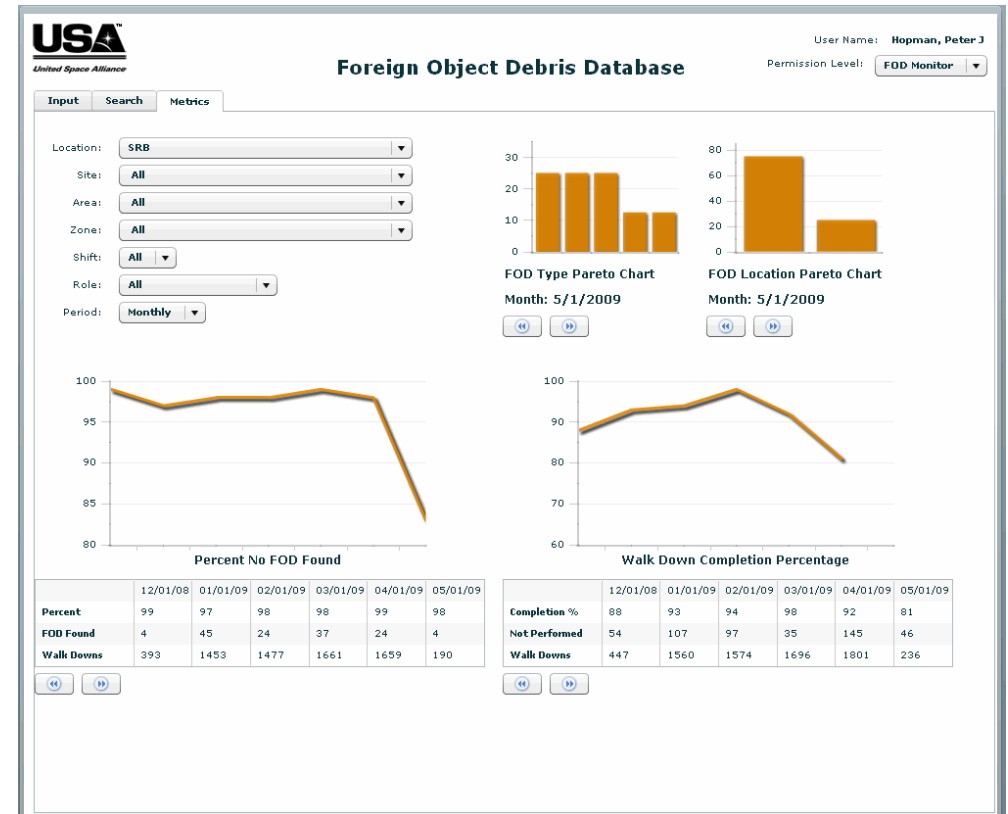
- The application provides a search utility
  - Filters by
    - Date Range
    - Site, Area and Zone
    - Red, Blue and Yellow
    - FOD Walkdown Result
    - FOD Type
    - FOD Location
  - Users can export their results to Microsoft Excel

Site-Area-Zone	Date-Shift	Person-Role	Fod Found
OPF-2 - AFT - Platform 12 L/R	3/5/2009 - Shift:1	Barnes, Mark S - Stumble On	Exterior - Removed - PR: Plastic Shims, Tie Wraps, Tape
OPF-2 TPS - Midbody - Mid Flo	3/12/2009 - Shift:1	Barnes, Mark S - Stumble On	Exterior - Removed - PR: Plastic Shims, Tie Wraps, Tape Rubber, RTV, Hoses, Gasket,
OPF-1 - AFT - Platform 19 L/R	3/4/2009 - Shift:1	Barnes, Mark S - Site Manager	Exterior - Removed - PR: Rope, Cord, Tethers, String, D
OPF-1 - Midbody - Platform 8 L	3/10/2009 - Shift:1	Barnes, Mark S - Site Manager	Exterior - Removed - PR: Clean Room Garments, Gloves Rubber, RTV, Hoses, Gasket,
OPF-2 TPS - AFT - Aft Floor Lev	3/17/2009 - Shift:1	Barnes, Mark S - Stumble On	Exterior - Removed - PR: Rubber, RTV, Hoses, Gasket,
OPF-2 TPS - Forward - Fwd Flo	3/31/2009 - Shift:1	Barnes, Mark S - Stumble On	Exterior - Removed - PR: Rubber, RTV, Hoses, Gasket, Rope, Cord, Tethers, String, D
OPF-2 - AFT - Platform 12 L/R	3/24/2009 - Shift:1	Barnes, Mark S - Site Manager	Exterior - Removed - PR: Rope, Cord, Tethers, String, D
OPF-2 TPS - Forward - Fwd TPS	3/3/2009 - Shift:1	Barnes, Mark S - Site Manager	Exterior - Removed - PR: Rubber, RTV, Hoses, Gasket, Rope, Cord, Tethers, String, D
OPF-2 - Forward - Platform 1 L	3/3/2009 - Shift:1	Barnes, Mark S - Site Manager	Exterior - Removed - PR: Organic Materials (Feathers, Ir Office Material (Cardboard, Sh



# Analysis Tools - FOD Metrics

- The application provides four metrics
  - The percent of walkdowns performed where FOD was not found
  - The percentage of required walkdowns that were completed
  - FOD Type Pareto Chart
  - FOD Location Pareto Chart
- Users can drill down on specific data elements
  - Monthly or weekly data
  - Site, Area and Zone
  - Work shift



# FOD Database Architecture – Geek Talk

- Web based tool

- The current user interface is written in Adobe Flex
  - Provides a Flash based interface
  - Allows drag and drop
  - Section 508 compliant
- Adobe ColdFusion provides data communication between the user interface and the database
- Data is housed in a SQL Server 2005 database

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private function saveFOD(n:Number):void
{
    var formIsValid:Boolean;
    var validatorArr:Array = new Array(validateZone);
    var validatorErrorArray:Array = Validator.validateAll(validatorArr);
    formIsValid = validatorErrorArray.length == 0;
    listTypeOtherArray=[];
    rKeys = '';

    for (var i:Number=0; i < lRed.dataProvider.source.length; i++)
    {
        if(lRed.dataProvider[i].data != -1)
            rKeys += lRed.dataProvider[i].data + ',';
        else{
            var tmpRed:Object = new Object()
            tmpRed.label = lRed.dataProvider[i].label;
            tmpRed.color = _coreUtil.c.Red
            listTypeOtherArray.push(tmpRed);
        }
    }
    yKeys = '';

    for (i=0; i < lYellow.dataProvider.source.length; i++)
    {
        if(lYellow.dataProvider[i].data != -1)
            yKeys += lYellow.dataProvider[i].data + ',';
        else{
            var tmpYellow:Object = new Object()
            tmpYellow.label = lYellow.dataProvider[i].label;
            tmpYellow.color = _coreUtil.c.Yellow
            listTypeOtherArray.push(tmpYellow);
        }
    }
    bKeys = '';

    for (i=0; i < lBlue.dataProvider.source.length; i++)
    {
        if(lBlue.dataProvider[i].data != -1)
            bKeys += lBlue.dataProvider[i].data + ',';
        else{
            var tmpBlue:Object = new Object()
            tmpBlue.label = lBlue.dataProvider[i].label;
            tmpBlue.color = _coreUtil.c.Blue
            listTypeOtherArray.push(tmpBlue);
        }
    }
}
```



# Contacts

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