FOD Awareness and Prevention Training

FOD Awareness and Prevention

To All Triumph Aviation Services Maintenance Personnel:

My goal for this training presentation is to drive home the day to day awareness and adherence of FOD prevention. Due to the nature of our business and the areas accessed, we have the potential to pose critical risks to our customers and the flying public.

It is my goal that each one of you take the next few slides to heart and then be determined that at the end of each maintenance event, you can walk away knowing that you left no trace of your existence other than the maintenance you performed and the documentation of your actions.

Byron Kilgore
Byron Kilgore
VP of Quality

FOD AWARENESS

FOD AWARENESS

FOD Awareness and Prevention is a safety control standard in the aerospace industry where small to large debris, objects, wildlife and even humans have the potential to cause:

- **Damage or destruction to aerospace equipment and articles;**
- **Injury and death to employees, visitors, crew members and passengers;**
- **Maintenance delays**
- **Safety violations**

Depending on the context, “FOD” has two meanings:

1. **Foreign Object Debris**
2. **Foreign Object Damage**

Foreign Object Debris…

Any object, particle, substance or agent that is not where it is supposed to be and could create a hazard to aircraft, equipment, cargo and personnel.

FOD AWARENESS

Examples of Foreign Object Debris:

- **Tools, parts, hardware, cushions, brushes**
- **Shavings, sanding discs, sealant, rags**
- **Paper, pens, coins, buttons, safety wire**
- **Trash, wrappers, cans**
- **Parts tags, bags, tech data**
- **Hats, gloves, eyewear, lanyards, badges**
- **Birds, rodents**
- **Dust, ash, dirt, sand, rocks**
- **Humans**

Common examples of what comes to mind when we think of FOD

Yes. Even people can become debris if they are in the wrong place at the wrong time. Example: A human ingested into an engine inlet.

FOD AWARENESS

Foreign Object Damage…

Debris that compromises the quality, functionality or economic value of an article appliance or item.

Debris at the wrong place at the wrong time can:

- **Shred fan blades of a jet engine**
- **Blow out tires at high speeds**
- **Damage vital navigation components**
- **Freeze flight control mechanisms**
- **Render hydraulic components inoperable**
- **Starve fuel systems**

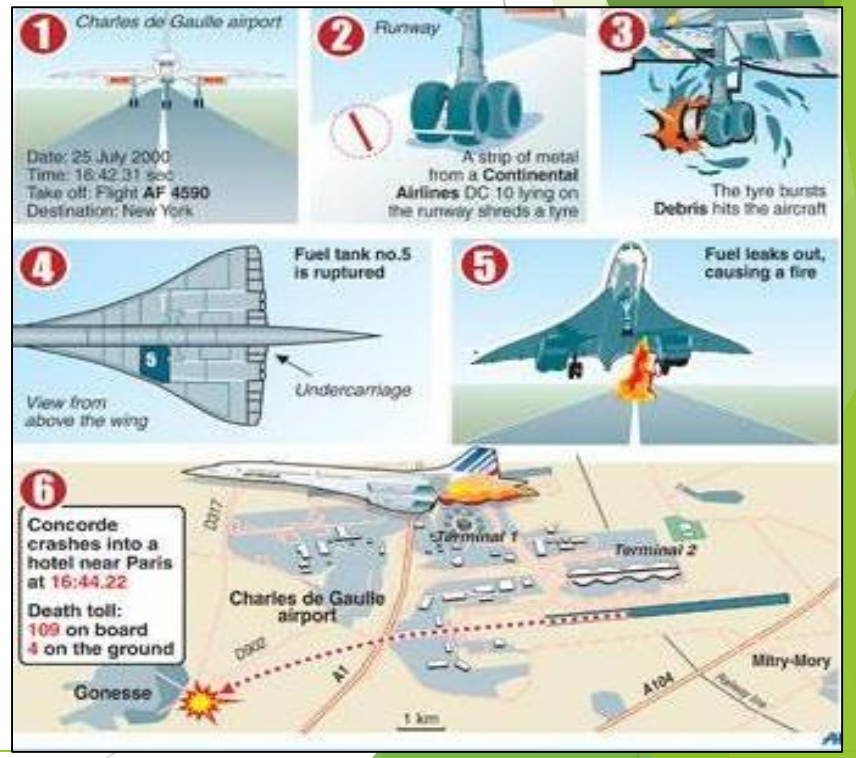
While hard numbers are difficult to calculate, it is estimated that FOD costs the civilian aviation sector 4 to 13 billion annually in damaged equipment, flight delays, efficiency, litigation and associated costs.

FOD in military environments can affect national security, reducing air defense and mission capability.

Foreign Object Damage Example:

July, 2000 Air France Flight 4590. A titanium wear strip fell off the engine cowl of a departing commercial jet and laid harmlessly on the runway. Minutes later, that small strip of titanium cut one of Concorde's tires during takeoff, which in turn disintegrated, rupturing the number five fuel tank .

113 people died. Litigation and criminal prosecution lasted for years.



Insignificant debris?

Explain insignificant now?

FOD PREVENTION

ONE OUNCE OF FOD

ONE TON OF DAMAGE

PICK IT UP

FOREIGN OBJECT DEBRIS
FOD
FOREIGN OBJECT DAMAGE
TM
© ROKAP INC.

FOD PREVENTION

Gear pins ingested in a jet engine; a wrench jammed in a flight control bell crank; a piece of safety wire that shorts out a circuit breaker panel: These represent instances when FOD creates havoc on flight safety.

Some "Big Picture" perspectives on preventing FOD:

Good Housekeeping: The most effective method of eliminating FOD. This is nothing more than keeping work areas clean, ensuring everything is picked up after task completion and accounted for prior to release.

Murphy's Law: A stray tool will migrate to the place where it will do the most damage like FOD'ing an engine or jamming a flight control. When you maintain account of tools, equipment and swarf, you have eliminated a huge potential source of FOD.

Personal Effects: Hats, pens, pencils, coins, badges, cell phones, lanyards, wallets, glasses, jewelry are critically important to control in the prevention of FOD.

Work Environment: Any number of sources can drop, blow or deposit foreign objects into critical areas on the flight line and hangar floor.

Situational Awareness: Is critical when working around operating aircraft engines to prevent ingestion of hats, ground cord, clothing, tools and...Oh yeah, you too.

FOD PREVENTION

Housekeeping

The responsibility of proper housekeeping resides not only with management but with each individual as well. If you see debris, don't walk over it – pick it up and dispose of it.

As a part of FOD prevention the following basics apply:

- ✓ Dispose of debris created by maintenance on a continuous basis
- ✓ Empty trash cans when they are full and not overflowing
- ✓ Work benches kept orderly and free of debris
- ✓ Inventory personal tools in and out. Take only what you need
- ✓ Store loose hardware in containers or bags
- ✓ Ladders, stands, and lifts are to be clean of debris at all times
- ✓ Parts racks are for parts only. No loose hardware is allowed
- ✓ All parts in racks must be appropriately capped or plugged
- ✓ Return unused (excess) parts and materials

FOD PREVENTION

Individual Responsibilities

A clean work area is fundamental to FOD prevention. TAS promotes a

"Clean as you go" policy.

Each person is responsible as a part of his maintenance activity to:

Clean up debris **"As You Go"** that has the potential to migrate such as

a. scraped free sealant pieces, drill shavings,
b. removed hardware, rivet shanks, hi-locs, collars, washers, screws, nuts.
c. rags, sealant tubes, paint brushes, sanding discs, scotch brite.

Clean your immediate area frequently during shift and thoroughly at task completion or shift.

Return equipment, hoses, lights, cords etc. to their proper storage area.

Leave the food and drinks in the break area.

Maintain control of your personal effects, tools and materials.

Examples of FOD Prevention

- Areas designated as FOD Critical
- Waste cans, bags, containers for disposal of debris.
- Tool shadowing, allows techs to maintain visual inventory.
- Covers, caps, plugs to protect from external hazards.
- Technical Data: **Warnings and Cautions**
- Inspection Verifications
- Checklists
- Task Cards
- **YOU!**


Check Interval

TASK CARD

TASK(S)

1. Detailed Inspection of Side Stay Bottom Cardan Bushes
2. Measure Clearance at Side Stay Bottom Cardan Installation IAW SB 32-1088

WARNING

PUT THE SAFETY DEVICES AND THE WARNING NOTICES IN POSITION BEFORE YOU START A TASK ON OR NEAR:

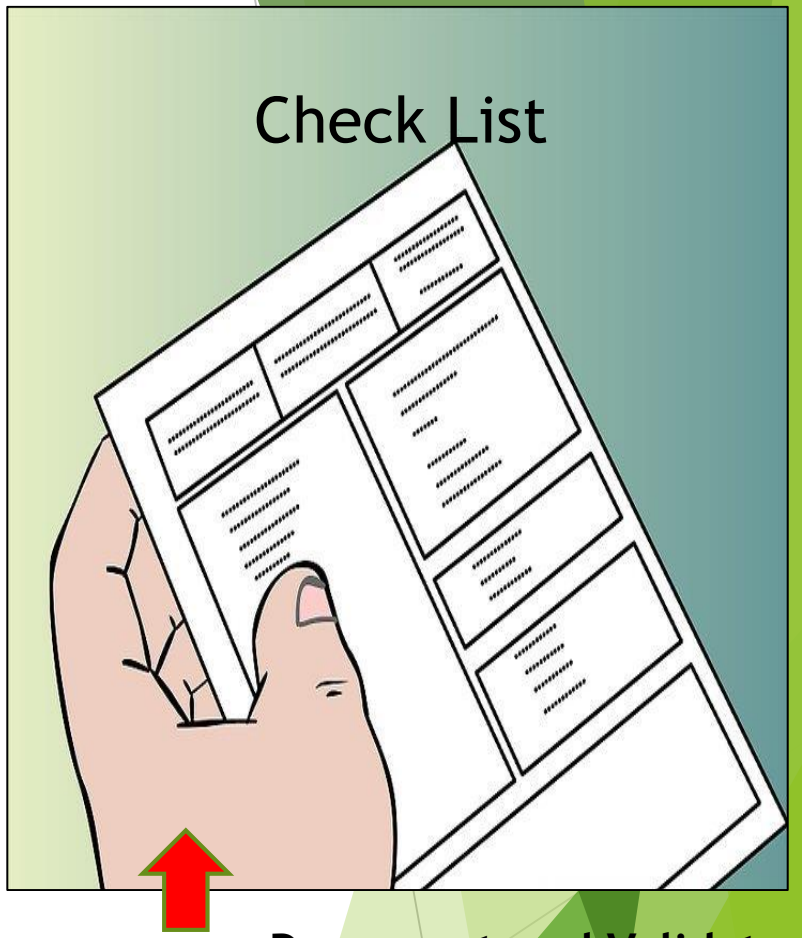
- THE FLIGHT CONTROLS
- THE FLIGHT CONTROL SURFACES
- THE LANDING GEAR AND THE APPROACH DOORS
- COMPONENTS THAT MOVE.

WARNING

MAKE SURE THAT THE GROUND SAFETY-LOCKS ARE IN POSITION ON THE LANDING GEAR.

Obey warnings and cautions

Inspect your work and area



Document and Validate

FOD PREVENTION

Recycled Containers. This is an example of a FOD incident not normally considered.

Lesson Learned: I was a maintenance supervisor at an MRO several years ago. On this particular day I assigned a team to service the hydraulic system and start the initial operational checks.

After servicing the hydraulic reservoir and energizing the auxiliary pump, we noticed the flight controls were sluggish coupled with a heavy smell of jet fuel in the hangar.

We finally figured it out. An empty barrel of Skydrol had been used to sump the fuel tanks and was never relabeled. The barrel containing jet fuel had been mistakenly moved back into the hydraulic fluid storage.

Essentially, we had serviced the hydraulic system with jet fuel….

Any recycled container, bottle, or drum used to contain chemicals other than what it originally was packaged for must be ***conspicuously relabeled***.

Tool Inventory Control

Personal Organization of Tools

1. Inventory tools
2. Remove for use
3. Use for maintenance
4. Return after use
5. Verify inventory

TOOL INVENTORY CONTROL

It's a matter of fact – Tool control affects safety. Leaving a tool in an aircraft or engine is not just an inconvenience, it is a safety risk. Managing and controlling your tools provides numerous benefits, the foremost of which is **Flight Safety**.

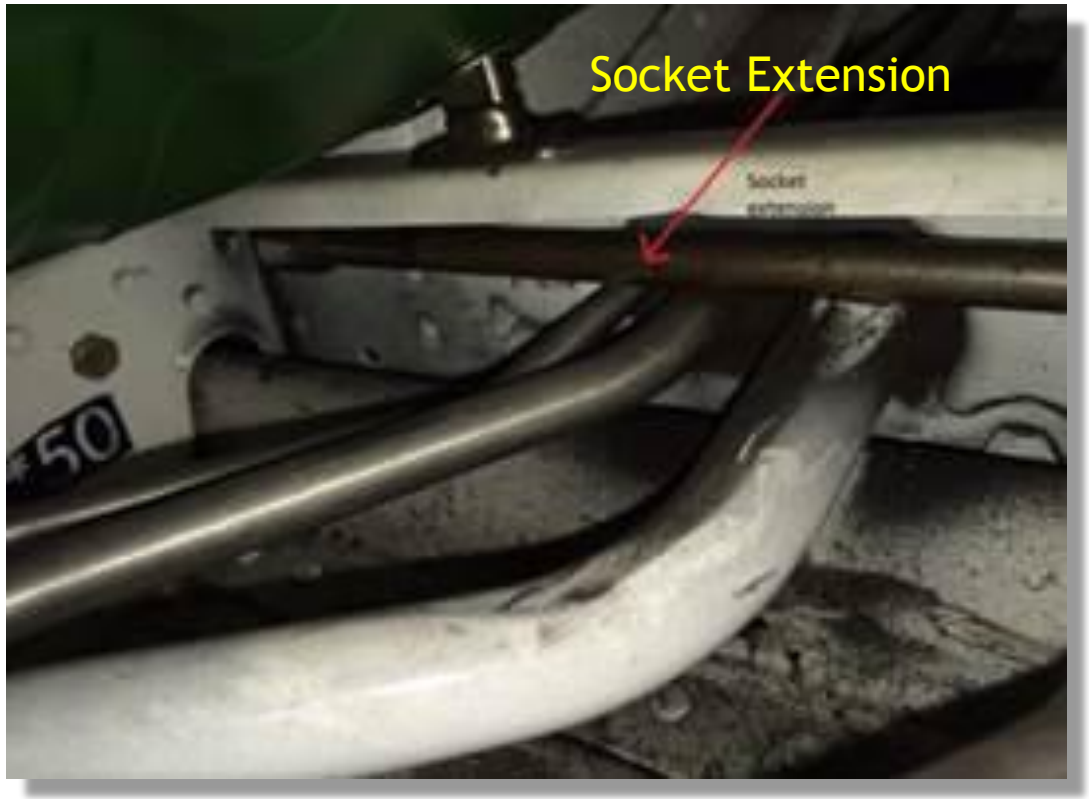
- **What's involved:** Tool control is a method to quickly determine all tools are accounted for at the end of a maintenance task. There are several ways to do this.
- **Tool shadowing**: A visual indicator for each tool to quickly determine if a tool is missing.
- **Tool identification**: The easiest method is to etch the last four digits of your SSN. This ensures that if a tool is found it can be traced to the owner and promotes compliance with missing tool reporting.
- **Tool inventory** A tool inventory must be accomplished on a regular basis so that a missing tool can be identified and reported before it affects flight safety.
- **Tool inspection**: Tools must be inspected before and after use to ensure they are in proper working order and no parts are missing. If this is not accomplished, a piece of a tool could be left in a work area or aircraft.
- **Reporting**. The company embraces a culture that encourages the reporting of missing tools.

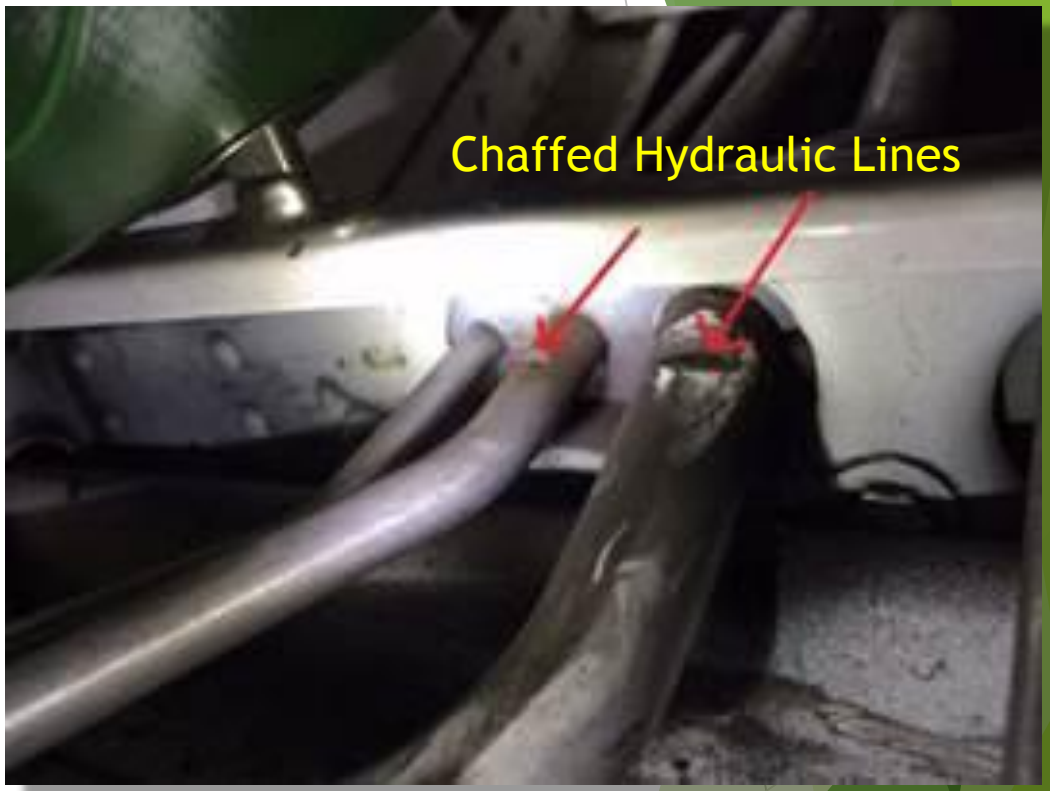
Managing and keeping track of your tools is a safety issue that cannot be ignored.

TOOL INVENTORY CONTROL

Why Tool Control is Important

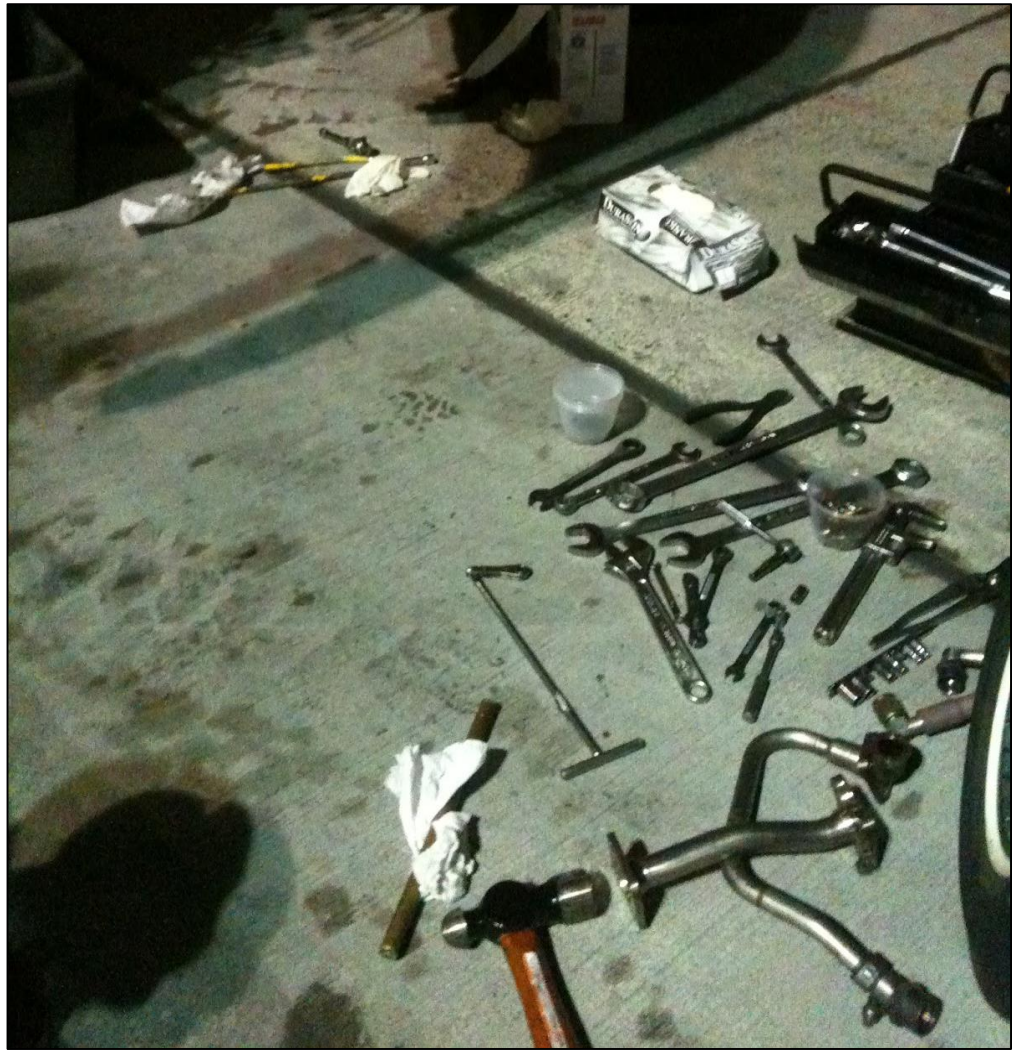
During a general visual inspection, a socket extension was found lying across three hydraulic lines. When the extension was removed, two hydraulic lines were found to be more than 75% chafed through.





Had this tool not been found, the socket extension would have eventually chafed through the lines and depleted the main hydraulic system. Seconds from disaster?

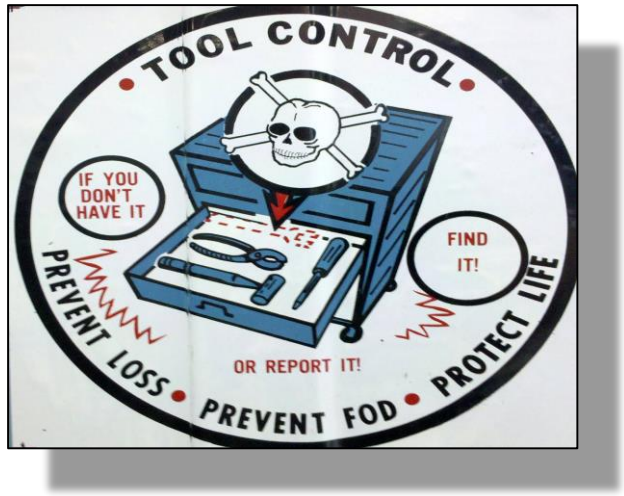
What is missing…
How would you know?



Personal Tool Management

Best Practices

- Shadowed Tool Boxes
- Inventory Control Sheets
- Plan Your Work
- Take In Only What You Need
- Clean As You Go
- Remove What You Don’t Need
- Continuous Surveillance



TOOL INVENTORY CHECKLIST

Human Factors Brief November 2017

Human factors encompass all aspects that can influence people and behavior in such a way that it can affect health, safety and performance of the entire team.

The origins of the checklist.

October 30, 1935, at Wright Air Field in Dayton, Ohio, the U.S. Army Air Corps held a competition for manufacturers vying to build the next-generation long-range bomber. It wasn't supposed to be much of a competition at all. The Boeing Corporation's gleaming aluminum-alloy Model 299 was expected to steal the show, its design far superior to that of the competition. In other words, it was just a formality.

As the Model 299 taxied onto the runway, a small group of army brass and manufacturing executives watched. The plane took off, then at 300 feet it stalled, turned on one wing and crashed killing two of the five crew members.

The investigation determined there was nothing to indicate any problems mechanically with the plane. It was "pilot error." The problem with Model 299, was that it was substantially more complex than previous aircraft. Among other things, there were four engines, each with its own fuel-mix, wing flaps, trim that needed constant tweaking, and propellers requiring pitch adjustment. While trying to keep up with the increased aircraft complexity, the pilot had failed to release the locking mechanism on the rudder controls. The Model 299 was simply too complex for anyone to fly. The unexpected winner was the smaller designed Douglas.

The army brass, convinced of the technical superiority of the Model 299, ordered a several anyway. Major Hill, the chief of flight testing, was an experienced pilot and determined advanced training was unlikely to prevent pilot error. Instead, he created what is known today as the pilot's checklist.

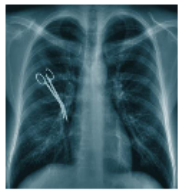
The check list was simple and short. It was printed on an index card with step-by-step instructions for takeoff, cruising, landing, and taxiing. There was nothing on the checklist the pilots didn't know. It was rather simple verifications such as, check that the instruments are set, the door closed, the rudder unlocked. Basics.

That checklist changed the course of history, flight safety and quite possibly the war. The pilots went on to fly the Model 299 a "total of 1.8 million miles" without a single accident and as a result the army ordered over 13,000 of them.

Checklists...it's why we use them.

Reasons why we use Checklists

Safety Brief November 2017



Surgeon Atul Gawande argues that one of the most basic organizational tools, the simple checklist, can improve the effectiveness of teams and individuals performing simple or complex tasks. When properly used, a checklist ensures communication and confirmation among team members and catches errors. Errors can be a matter of life or death for a patient, whose care is handled by many people, each performing different subtasks for the larger procedure.

When Gawande's team introduced a two-minute checklist to eight hospitals as part of a research study in 2008, deaths dropped 47%.

Checklists for Success?

Airplane pilots rely upon checklists to ensure that routine procedures and emergency responses are handled appropriately. In both situations, human memory is fallible. When an emergency arises, one may be injured or stressed and unable to think clearly.

Routine tasks that you perform every day can become blurred in your memory because they are so similar. These mundane tasks can benefit from a checklist, if the steps are documented to the point you don't forget them.

Example: Many times, I have been tasked to the grocery store to pick up the essentials for the week. If I have only five to six items to pick up, my chances of success by memory are high, any more than that, I had better have a checklist. Bread, milk and eggs are easy…but when you add, vanilla, carrots, peanut butter, lemon juice, rice and a package of pencils...I had better write it down and make sure I take the list with me!

Our organization uses several checklists to ensure the proper documents, packages, maintenance tasks are performed according to the requirement. I have personally witnessed the number of mistakes drop dramatically after standardization of a process coupled with a simple checklist.

Checklists for Failure!

While an important useful tool, the checklist can also fail you and your team. I would consider the Tool Inventory Control form, NAAS-025, as the most important checklist we use daily in the interest of individual and product safety.

When used as the procedures states, that everything taken into a fuel tank is documented on and verified as removed at the completion of the maintenance event, all is good. Should you fail to document taking something into the fuel tank, you are setting up yourself and the inspector behind you for failure.

The Tool Inventory Checklist is only as good as your diligent documentation. Product safety and lives are your responsibility.

TOOL INVENTORY CHECKLIST

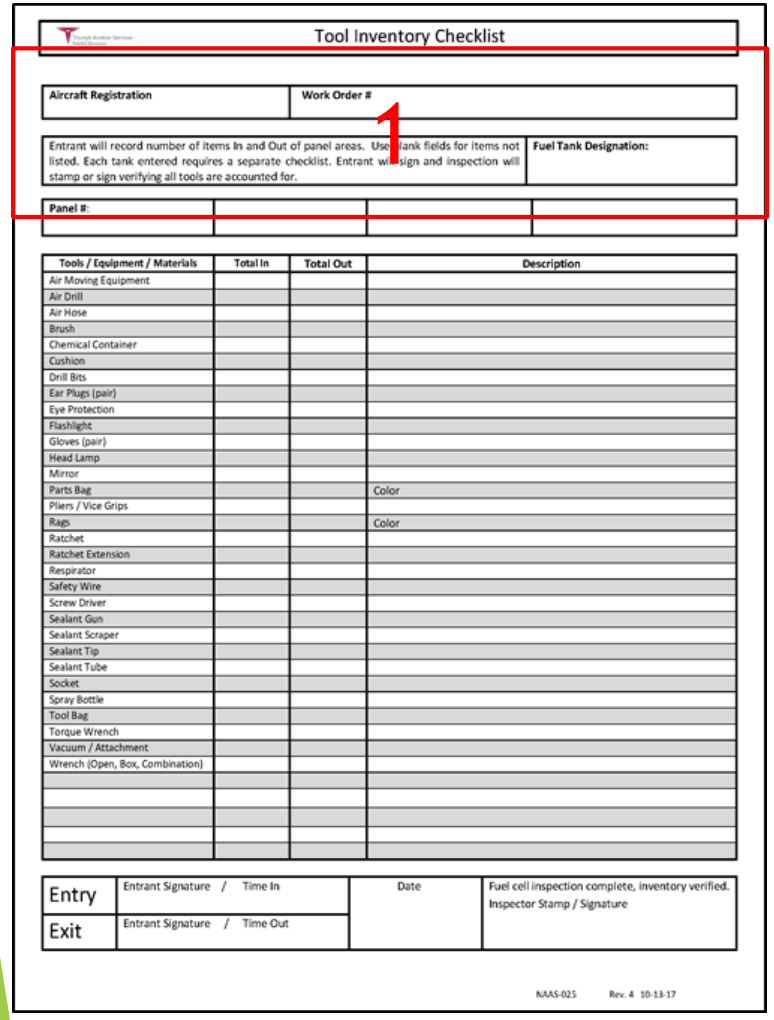
Other than the repair station work order, the Tool Inventory Checklist (NAAS-025) is probably the most utilized form in the everyday maintenance of our organization.

It has a specific use…it is no different than a checklist used by a flight crew or one that you make to go to the grocery store. Its sole intent is to maintain an inventory of the tools, equipment and materials that you take into a fuel cell and verifying the same tools, equipment and materials are removed at the completion of the task or shift.

- **It is not infallible. It is only as good as your documentation that you provide.**
- **It does not account for removals and re-assemblies, hardware, O-rings, bonding wires, Adel clamps, etc.**
- **It does not account for removed sealant debris, tie wrap ends, safety wire bits or small debris caused by maintenance.**
- **It <u>WILL NOT</u> help, should you fail to document!**
- **It is only a tool, a checklist, a reminder. You are ultimately responsible for everything you take into a fuel tank and the debris you create.**

TOOL INVENTORY CHECKLIST

So that we are all on the same page for completing the Tool Inventory Control form.



Tool Inventory Checklist

Aircraft Registration	Work Order #

Entrant will record number of items In and Out of panel areas. Use blank fields for items not listed. Each tank entered requires a separate checklist. Entrant will sign and inspection will stamp or sign verifying all tools are accounted for.

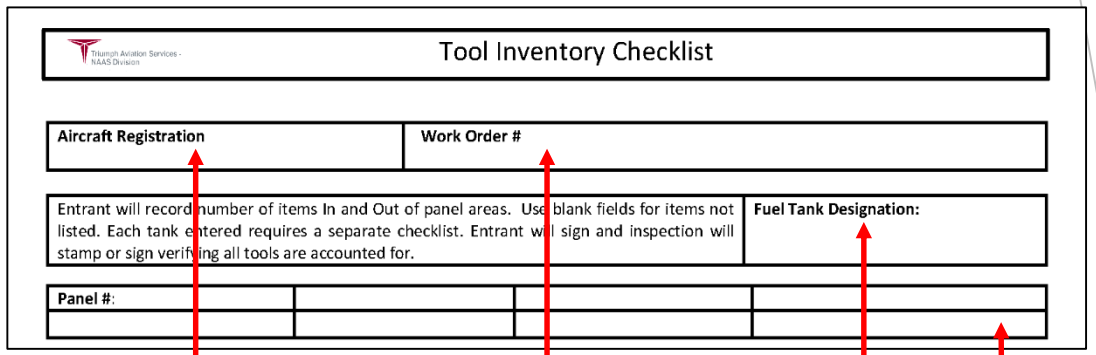
Fuel Tank Designation:

Panel #:			

Tools / Equipment / Materials	Total In	Total Out	Description
Air Moving Equipment			
Air Drill			
Air Hose			
Brush			
Chemical Container			
Cushion			
Drill Bits			
Ear Plugs (pair)			
Eye Protection			
Flashlight			
Gloves (pair)			
Head Lamp			
Mirror			
Parts Bag			Color
Pliers / Vice Grips			
Rags			Color
Ratchet			
Ratchet Extension			
Respirator			
Safety Wire			
Screw Driver			
Sealant Gun			
Sealant Scraper			
Sealant Tip			
Sealant Tube			
Socket			
Spray Bottle			
Tool Bag			
Torque Wrench			
Vacuum / Attachment			
Wrench (Open, Box, Combination)			

Entry	Entrant Signature / Time In	Date	Fuel cell inspection complete, inventory verified. Inspector Stamp / Signature
Exit	Entrant Signature / Time Out		

NAAS-025 Rev. 4 10-13-17



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Fuel Tank Designation:

Panel #:			

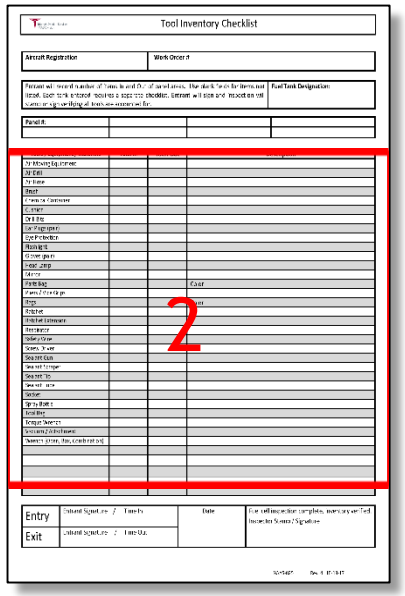
Aircraft Registration #

Work order number goes here

Fuel tank number you are entering

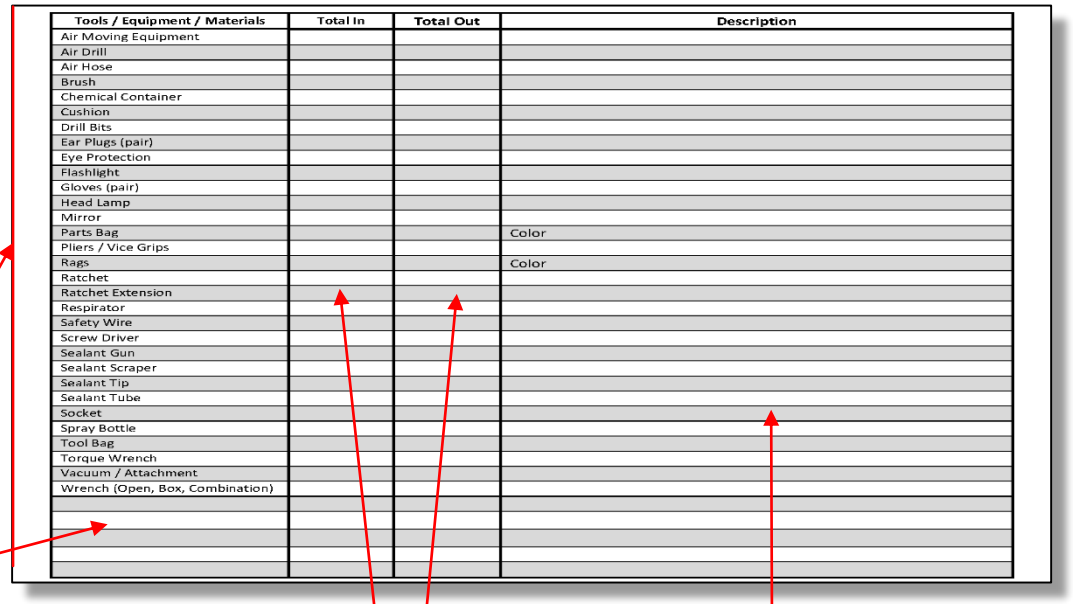
Fuel panel access number(s) entered for for the particular tank entered. Note: seven fields are provided.

TOOL INVENTORY CHECKLIST


Tool Inventory Checklist

Aircraft Registration | Work Order #

Entry | Exit | Date



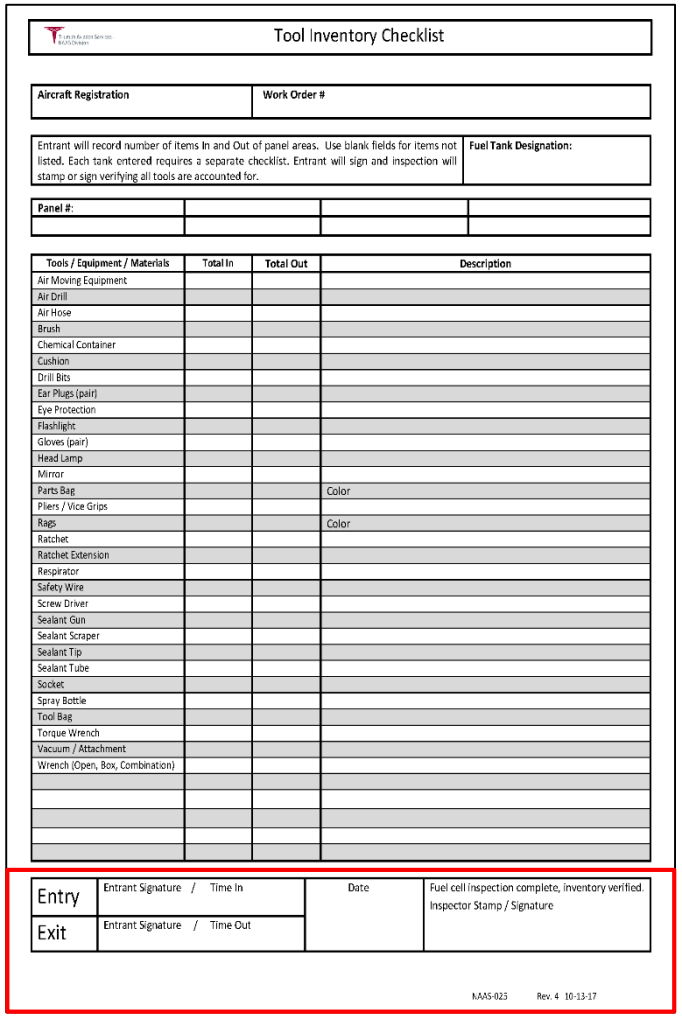
Tools / Equipment / Materials	Total In	Total Out	Description
Air Moving Equipment			
Air Drill			
Air Hose			
Brush			
Chemical Container			
Cushion			
Drill Bits			
Ear Plugs (pair)			
Eye Protection			
Flashlight			
Gloves (pair)			
Head Lamp			
Mirror			
Parts Bag			Color
Pliers / Vice Grips			
Rags			Color
Ratchet			
Ratchet Extension			
Respirator			
Safety Wire			
Screw Driver			
Sealant Gun			
Sealant Scraper			
Sealant Tip			
Sealant Tube			
Socket			
Spray Bottle			
Tool Bag			
Torque Wrench			
Vacuum / Attachment			
Wrench (Open, Box, Combination)			

Prefilled: Tools / Equipment / Materials
Use blank spaces at the bottom for items that are not prefilled on the sheet.

Enter the amounts this way III = 3 items
IIII = 4. Use this system in Total In and Total Out columns.

Use the description column for unique characteristics of tools, equipment, materials. Color of rags and bags

TOOL INVENTORY CHECKLIST



Tool Inventory Checklist

Aircraft Registration	Work Order #

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Brush			
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Cushion			
Drill Bits			
Ear Plugs (pair)			
Eye Protection			
Flashlight			
Gloves (pair)			
Head Lamp			
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Parts Bag			Color
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Rags			Color
Ratchet			
Ratchet Extension			
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Safety Wire			
Screw Driver			
Sealant Gun			
Sealant Scraper			
Sealant Tip			
Sealant Tube			
Socket			
Spray Bottle			
Tool Bag			
Torque Wrench			
Vacuum / Attachment			
Wrench (Open, Box, Combination)			

Entry	Entrant Signature / Time In	Date	Fuel cell inspection complete, inventory verified. Inspector Stamp / Signature
Exit	Entrant Signature / Time Out		

NAAS-023 Rev. 4 10-13-17

Entrant will sign his name and the time in on initial entry into the fuel cell.

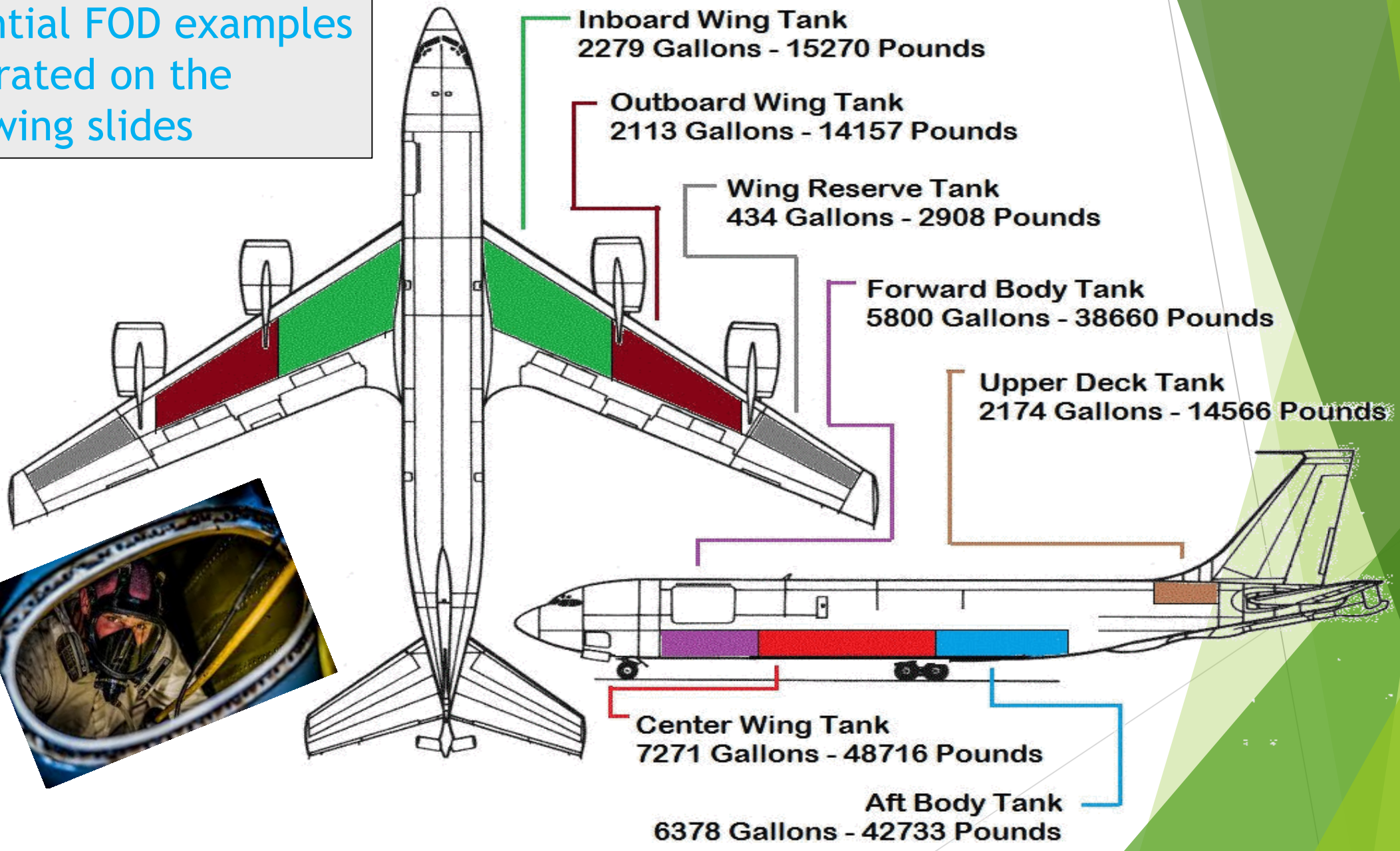
Entrant will sign out by signature and time at completion of task or the end of the shift, verifying tools, equipment, materials are accounted for.

The inspector verifying all tools, materials and equipment are accounted for, will sign off when the verification inspection is complete.

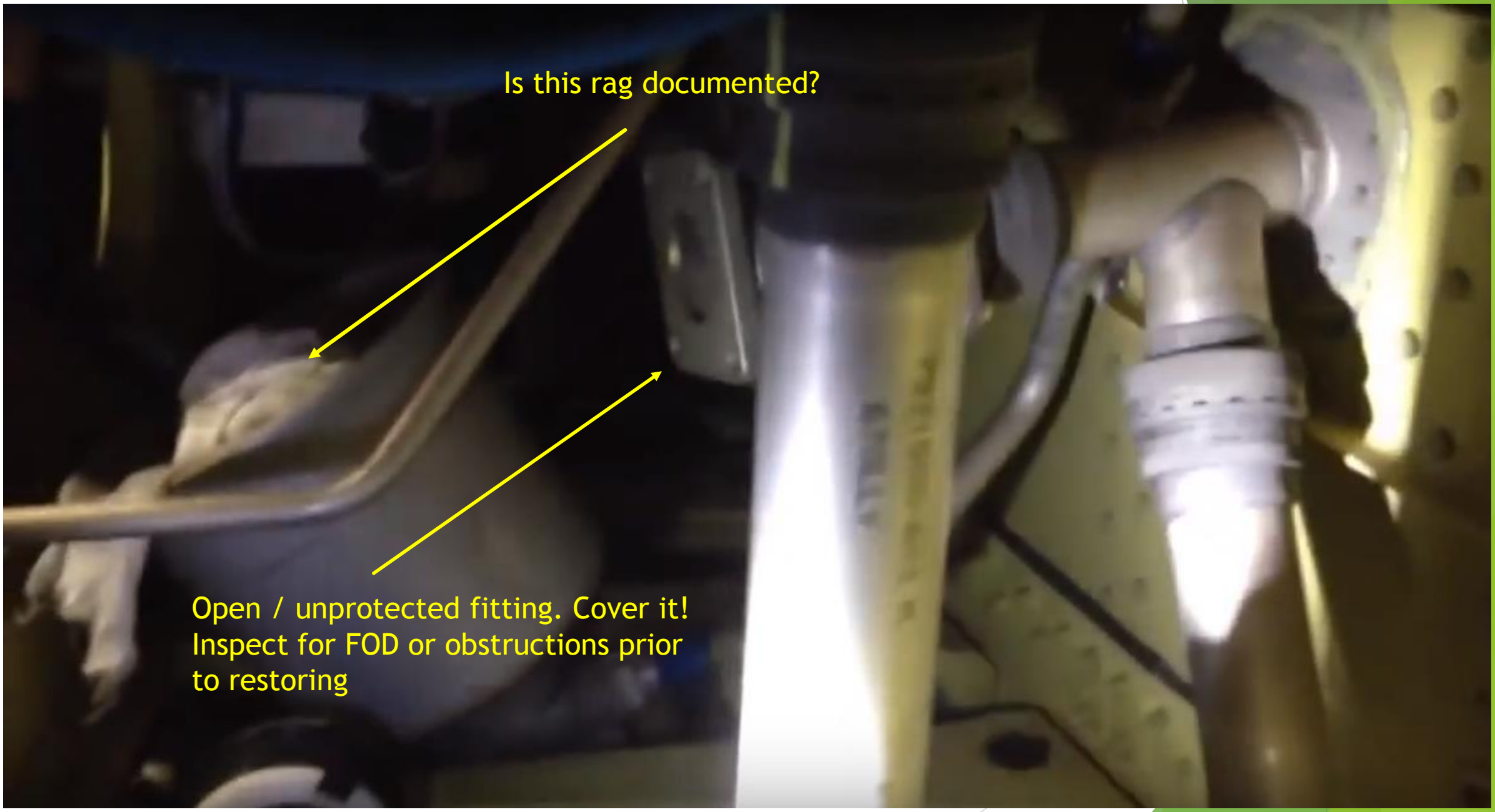
Inspector will add the date the inspection is complete. This signifies the form is closed

Entry	Entrant Signature / Time In	Date	Fuel cell inspection complete, inventory verified. Inspector Stamp / Signature
Exit	Entrant Signature / Time Out		

Potential FOD examples illustrated on the following slides

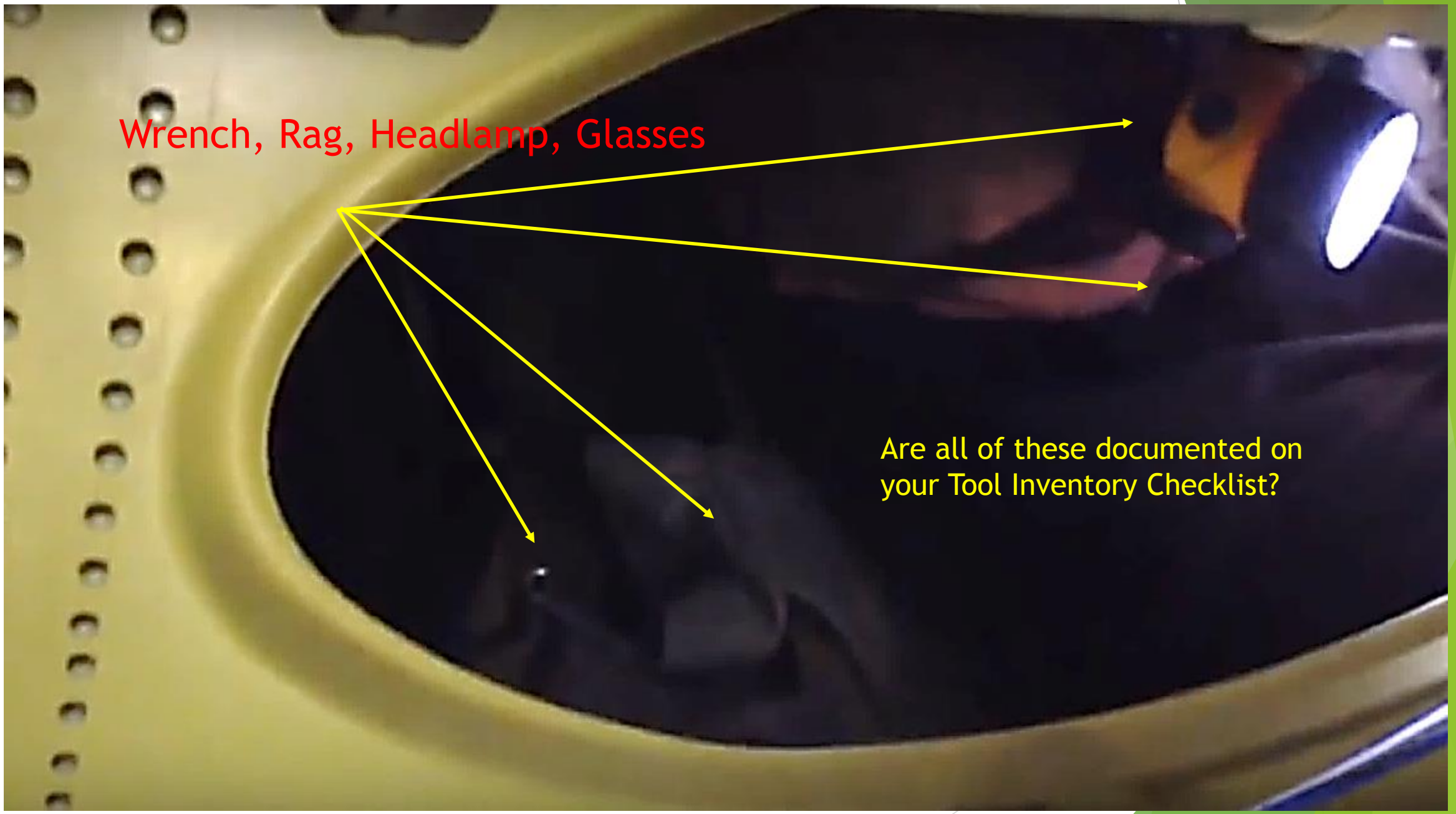



Are these items listed on your Tool Inventory Control form?
Plastic Bag
Cloth Rag

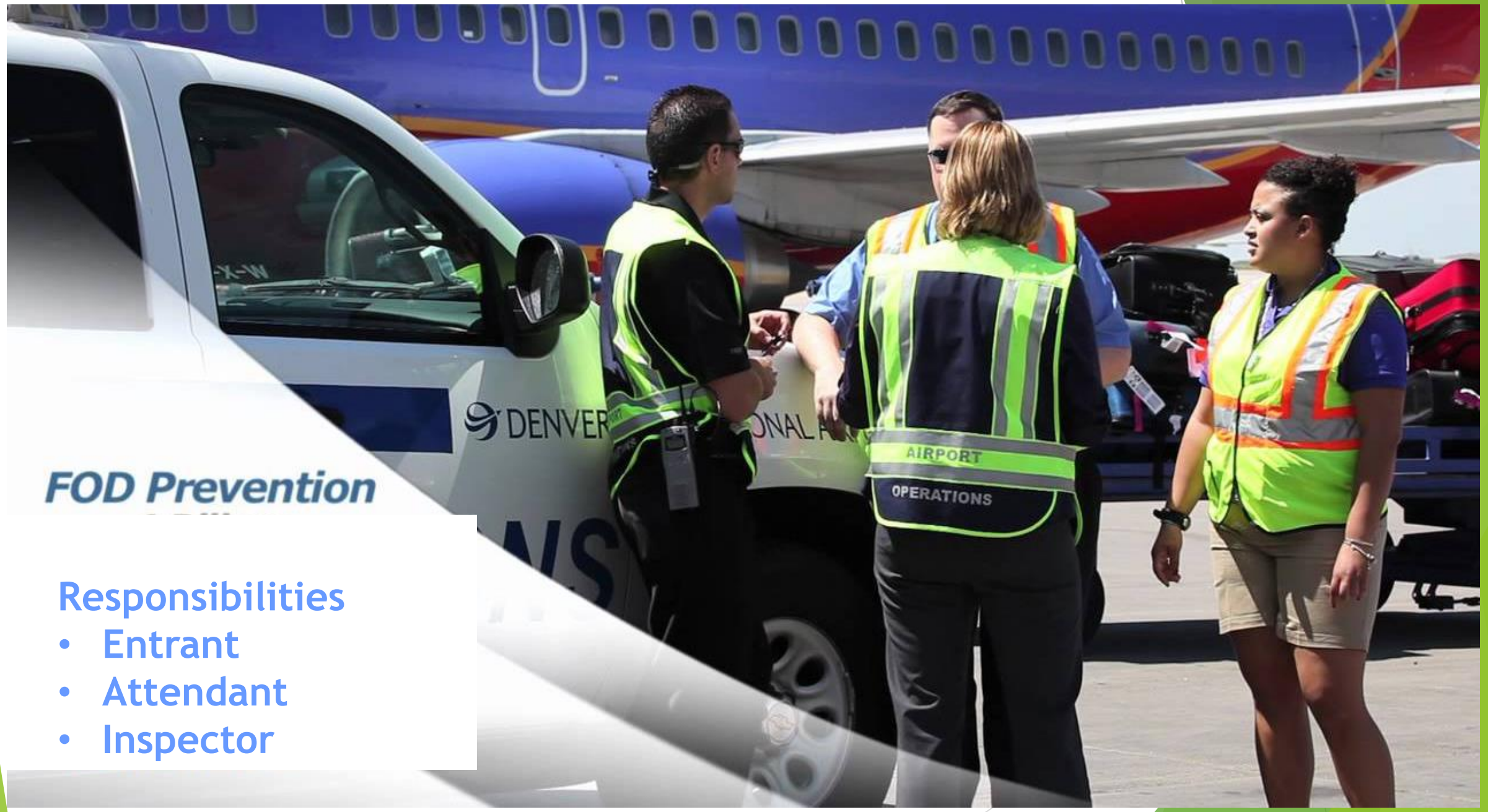

Is this rag documented?
Open / unprotected fitting. Cover it!
Inspect for FOD or obstructions prior
to restoring


Sealant tube, looking down….
Possibly hidden from sight if looking across at eye level.
Is it documented on your Tool Inventory Checklist?
This is why we use a checklist to validate inventory in and out of the fuel tanks and detailed inspections prior to OK to Close.


Bad Practice: Loose hardware and tools next to fuel access. What if they were incidentally introduced into the tank. They would not be on the inventory sheet.


Wrench, Rag, Headlamp, Glasses
Are all of these documented on your Tool Inventory Checklist?

An aircraft was grounded for intermittent fuel pressure indication. When the fuel lines were removed, a substantial amount of metal shavings were found in the inlet screens on the high pressure fuel pumps on both engines. The shavings were sent to a test lab for analysis. The report indicated the metal was consistent with airframe aluminum. Induced by Maintenance?



FOD Prevention

Responsibilities

- Entrant
- Attendant
- Inspector

FOD PREVENTION RESPONSIBILITIES

Responsibilities. Each of us in our organization has a role and responsibility when it comes to **Flight Safety** and **FOD Prevention**. These roles and responsibilities are reviewed in this section.

Game Plan. A game plan for each maintenance event is vital to the safety of the aircraft and the team. Each team member must have a clear understanding as directed by the Supervisor for; who what when and where responsibilities.

Responsibilities are detailed on the following slides.

- **Supervisor**
- **Entrant**
- **Attendant**
- **Inspector**

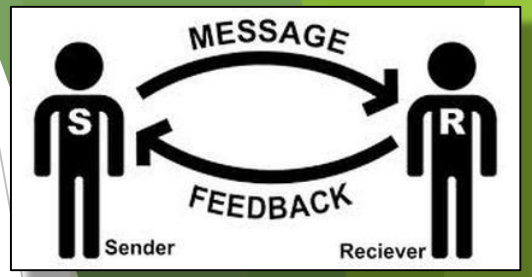
Flight Safety

3. Maintenance Release

2. Maintenance Execution

1. Maintenance Assignments

FOD PREVENTION RESPONSIBILITIES



Communications

Interpersonal communications of the maintenance team members is vital in the prevention of FOD, safety and success of the event. The Supervisor is responsible for setting up the game plan and communicating it to the team of **who** is responsible, **what** is expected, **when** the sequences are to happen and the **where** of each specific sequence.

Without a specific game plan from the supervisor, each member will have his own idea on who what when and where, thereby creating potential maintenance and safety gaps in the maintenance event.

Open communications between all team members promotes cohesiveness, teamwork and most important; Safety.

Lesson learned: As a maintenance supervisor at an MRO, I would call for the crew at the end of the shift to "clean up." After the crew left I would notice the hangar floor was clean but the rest of the bay looked sloppy and unorganized.

I finally realized; "clean up" to the crew meant…sweep the floor. From then on, I assigned specific duties to each crew member to accomplish when I called for "clean up."

The appearance and organization of the hangar bay changed overnight.

FOD PREVENTION RESPONSIBILITIES

Supervisor

The supervisor is ultimately responsible for the actions of his team which directly contributes to flight and personnel safety and success of the maintenance event.

Through effective oversight of the maintenance personnel, adherence to established procedures, the supervisors role is critical to providing a FOD free product.

Responsibility of the Supervisor includes:

- Communicating to the crew the maintenance responsibilities of each member.
- Confined Space briefing and contingencies prior to fuel cell entry.
- Oversight of the crew assignments and maintenance performed.
- Enforcing FOD prevention procedures.
- Ensuring customer related procedures are communicated and followed
- Coordinating current technical data / access from the respective customer.

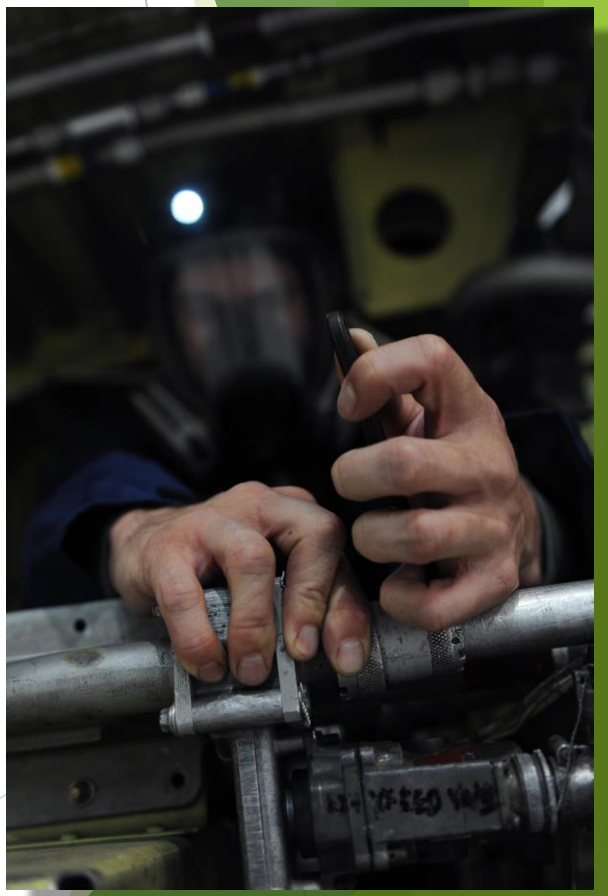
An effective Supervisor is one that has as passion for flight safety, adhering to procedures and demanding those under his control follow his lead and expectations.

A true leader has the confidence to stand alone, the courage to make tough decisions, and the compassion to listen to the needs of others. He does not set out to be a leader, but becomes one by the equality of his actions and the integrity of his intent.
—Douglas MacArthur

FOD PREVENTION RESPONSIBILITIES

Entrant: You are responsible for the maintenance you accomplish in the fuel cell including taking responsibility for a FOD free condition when you exit for the last time.

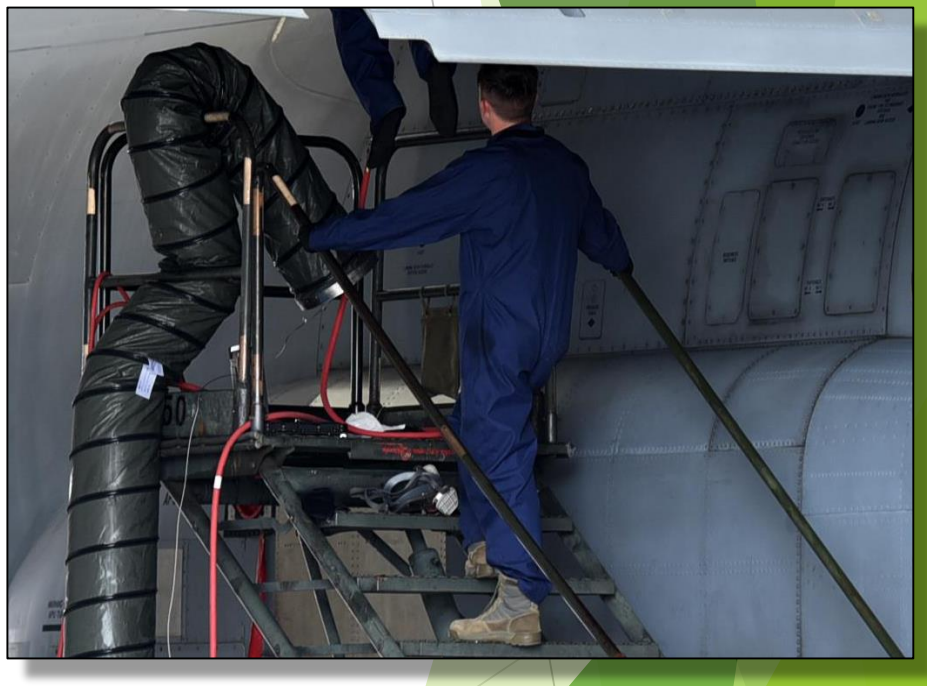
- Know the game plan.
- Formulate your strategy of what needs to be accomplished from the game plan
- Gather tools and PPE as required for tank entry. Only take in what you need.
- Fill out the Tool Inventory Control form (TIC) NAAS-025.
- Double Check…Is there anything on your person you failed to document on the TIC form such as; hat, glasses, lanyard, head lamp, consumables?
- Perform your maintenance…if you come out of the tank, be sure that you document anything that you bring out or take back in on the TIC form.
- After completing the maintenance task;
  a. Inspect your work
  b. thoroughly clean the tank of any debris that you may have created
  c. thoroughly inspect the tank for any FOD remaining
- Inventory all items after last exit and document removals on the TIC.
- Document maintenance accomplished.
- If maintenance is complete, call for inspection and OK to Close.



FOD PREVENTION RESPONSIBILITIES

Confined Space Attendant (CSA)

Responsibility: CSAs are responsible the entrants safety, monitoring atmospheric conditions as well maintaining constant communications.



The CSA plays a huge role in the prevention of induced FOD.

Why?

The CSA sees everything that is coming in and out of the fuel cell.

Best CSA Practices:

- Take ownership of the fuel tank you are monitoring.
- Verify the initial inventory with the entrant of tools, materials and equipment documented on the Tool Inventory Control (TIC) form.
- Keep the entrants TIC form with you. Log everything in and out from initial entry
- Don’t let the entrant access the tank without verifying that nothing else is being taken in or out that isn’t documented.
- Validate the TIC with the entrant when maintenance is complete or the shift is over that all items are accounted for.

FOD PREVENTION RESPONSIBILITIES

Inspector

The inspector has the responsibility of being the second set of eyes in the course of maintenance and the last line of defense in the prevention of FOD.

- Inspectors have the authority, delegated by the VP of Quality to stop maintenance at any point in regards to flight or personnel safety issues.

Inspectors are responsible to:

- Validate that tools, materials, equipment listed on the TIC form are accounted for at the completion of the task or shift.
- Ensure the maintenance accomplished is in accordance with the AMM and addresses the work criteria of the work order.
- Validate debris, tools, equipment, and materials are removed by thorough internal inspections.
- Granting OK to Close only after validation the fuel cell is completely FOD free.
- Audit the work orders and associated documents to ensure all maintenance, maintenance entries and inspections are complete prior to signing the maintenance release.

OK to Close Responsibilities

Maintenance Responsibilities

Prior to OK to Close grant from Inspection, Maintenance personnel are responsible for the following...

- Completion of all maintenance with in the fuel cell.
- Inspect your maintenance. You accomplished the maintenance, you are responsible.
- Thoroughly clean and inspect the cell for FOD. *(This includes any FOD that may have been left by other maintenance teams that were previously in the fuel cell. Once we open a fuel tank we take complete ownership of anything left behind).*
- *After coming out of the fuel tank, conduct an inventory of tools, equipment and materials listed on the TIC form. If all is accounted for, sign off on the TIC form. ***
- *Sign off your maintenance on the work order.*
- *Call for inspection and OK to close.*
- *Close access immediately after OK is granted and the work order stamped.*

**** During tool inventory, check each for serviceability and missing pieces or parts****

Lesson learned: *We were involved in a major stand down event at an MRO where it was discovered the sealant gun trigger was missing when it was returned to the tool room.*

OK to Close Responsibilities

Inspection Responsibilities:

OK to Close is the last of the critical steps that can be accomplished in the Prevention of FOD in a fuel tank. The OK to Close responsibility falls directly on the Inspector. This inspection must always be accomplished with uncompromised diligence.

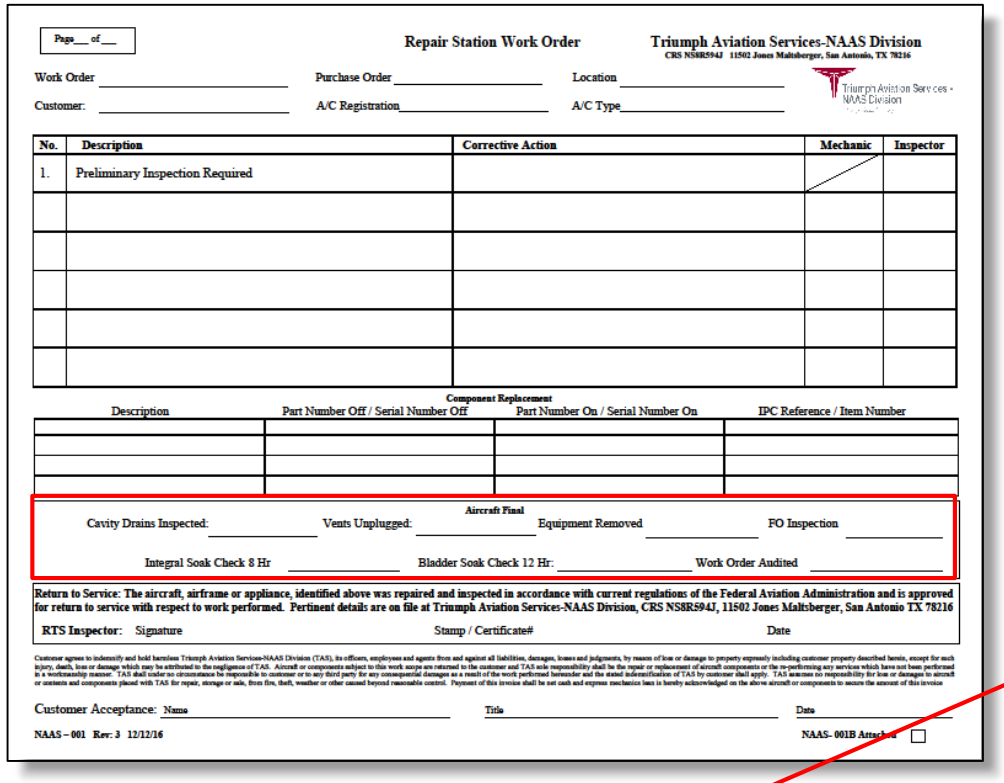
You may be pressured to rush through an OK to Close inspection…Do Not Do It!

We can live with a disgruntled customer from missing a deadline and knowing we delivered a FOD free aircraft as opposed to dealing with a irate customer with FOD in his fuel tank after we gave in and rushed an OK to Close inspection.

Once OK to Close is granted, monitor the closing of the plates to ensure that nothing else goes into the tank. Maintenance is finished at that time….if they have to go back in, start the process all over again from the beginning.

Prior to final release, inspect the areas as noted in the next slide. If another inspector gave OK to Close on other tanks, all you must do is verify that the OK to close inspection was documented in those tanks. If there is something missed in those tanks, that inspector(s) will be dealt with separately.

OK to Close Responsibilities



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Repair Station Work Order

Triumph Aviation Services-NAAS Division
CRS NS8R594J 11502 Jones Maltsberger, San Antonio, TX 78216

Work Order _____ Purchase Order _____ Location _____

Customer: _____ A/C Registration _____ A/C Type _____

No.	Description	Corrective Action	Mechanic	Inspector
1.	Preliminary Inspection Required			

Component Replacement

Description	Part Number Off / Serial Number Off	Part Number On / Serial Number On	IPC Reference / Item Number

Aircraft Final

Cavity Drains Inspected: _____ Vents Unplugged: _____ Equipment Removed _____ FO Inspection _____

Integral Soak Check 8 Hr _____ Bladder Soak Check 12 Hr: _____ Work Order Audited _____

Return to Service: The aircraft, airframe or appliance, identified above was repaired and inspected in accordance with current regulations of the Federal Aviation Administration and is approved for return to service with respect to work performed. Pertinent details are on file at Triumph Aviation Services-NAAS Division, CRS NS8R594J, 11502 Jones Maltsberger, San Antonio TX 78216

RTS Inspector: Signature Stamp / Certificate# Date

Customer agrees to indemnify and hold harmless Triumph Aviation Services-NAAS Division (TAS), its officers, employees and agents from and against all liabilities, damages, losses and judgments, by reason of loss or damage to property expressly including customer property described herein, except for such injury, death, loss or damage which may be attributed to the negligence of TAS. Aircraft or components subject to this work scope are returned to the customer and TAS sole responsibility shall be the repair or replacement of aircraft components or the re-performing any services which have not been performed in a workmanship manner. TAS shall under no circumstance be responsible to customer or to any third party for any consequential damages as a result of the work performed hereunder and the stated indemnification of TAS by customer shall apply. TAS assumes no responsibility for loss or damages to aircraft or assets and components placed with TAS for repair, storage or sale, from fire, theft, weather or other caused beyond reasonable control. Payment of this invoice shall be net cash and express mechanics lien is hereby acknowledged on the above aircraft or components to secure the amount of this invoice

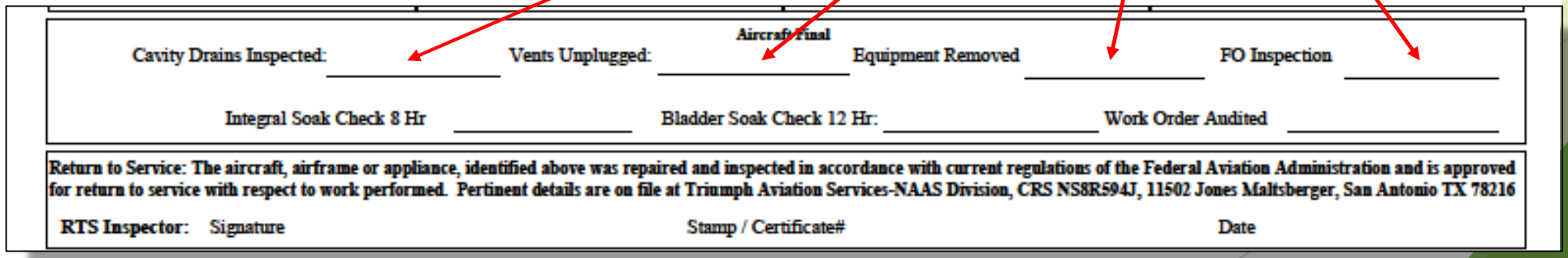
Customer Acceptance: Name _____ Title _____ Date _____

NAAS – 001 Rev: 3 12/12/16 NAAS- 001B Attached ☐

Critical Inspection Steps…

These four verifications are imbedded in the TAS work order for a reason.

Inspectors, you must take a critical look at each one of these items as they are all FLIGHT SAFETY related.



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RTS Inspector: Signature Stamp / Certificate# Date

Consequences of Failing to Follow Procedures

Lesson learned: I was employed as a Journeyman Specialist for a government contractor at Ft. Campbell Kentucky. My assignment for the day was replacing the forward cowling tracks and roller assemblies on a UH-60 in the area where the serviceman is pictured below. I was stepping off the maintenance stand to the upper deck holding a coffee can of assorted hardware (worst practice) when I slipped and dumped the entire contents into the electrical and hydraulic accessories and swashplate.

I was horrified. I didn't say anything to anyone and set out to find the scattered hardware, but I soon realized, the loose hardware was in a FOD critical area and it was eating at my conscience.

I swallowed my pride and reported it to my supervisor. The ensuing dress down that I got from my leadership followed by the army brass was difficult, although well deserved. At least eight GIs and I searched for hours looking for loose hardware.

I have no idea how long the Army continued to inspect this particular Black Hawk and I don't recall it moving in the remainder of my last year of tenure.

This incident bothered me for a long time, but in the end, I'm proud that I stood up and did the right thing.

Consequences of Failing to Follow Procedures

Maintenance Errors and Doing the Right Thing.

As a Management team, we understand that humans are susceptible to error.

For this reason, I would like to make something very clear….

- Should you make an error in judgement, mistake, forget something, lose something, compromise safety….whatever the situation (even if you think you might have done something wrong). Do the right thing…report it immediately and we will work through the situation.
- If you willingly know that you did something wrong, such as an act that compromises personal and flight safety and fail to report it…the consequences can be harsh.

There are two ways that I see dealing with a Human and Maintenance Error:

- **One is Easy**
- **One is Hard**

The Easy Way: Own up to your mistake and deal with the consequences. I promise you, if you are honest, up front and there is no evidence of gross negligence, we will get through it.

Hard Consequences