

OKLAHOMA CITY AIR LOGISTICS CENTER

TEAM TINKER

NDI as a Critical Process

Risk Identification
and
Mitigation

Manual Surface Eddy Current on
Aircraft



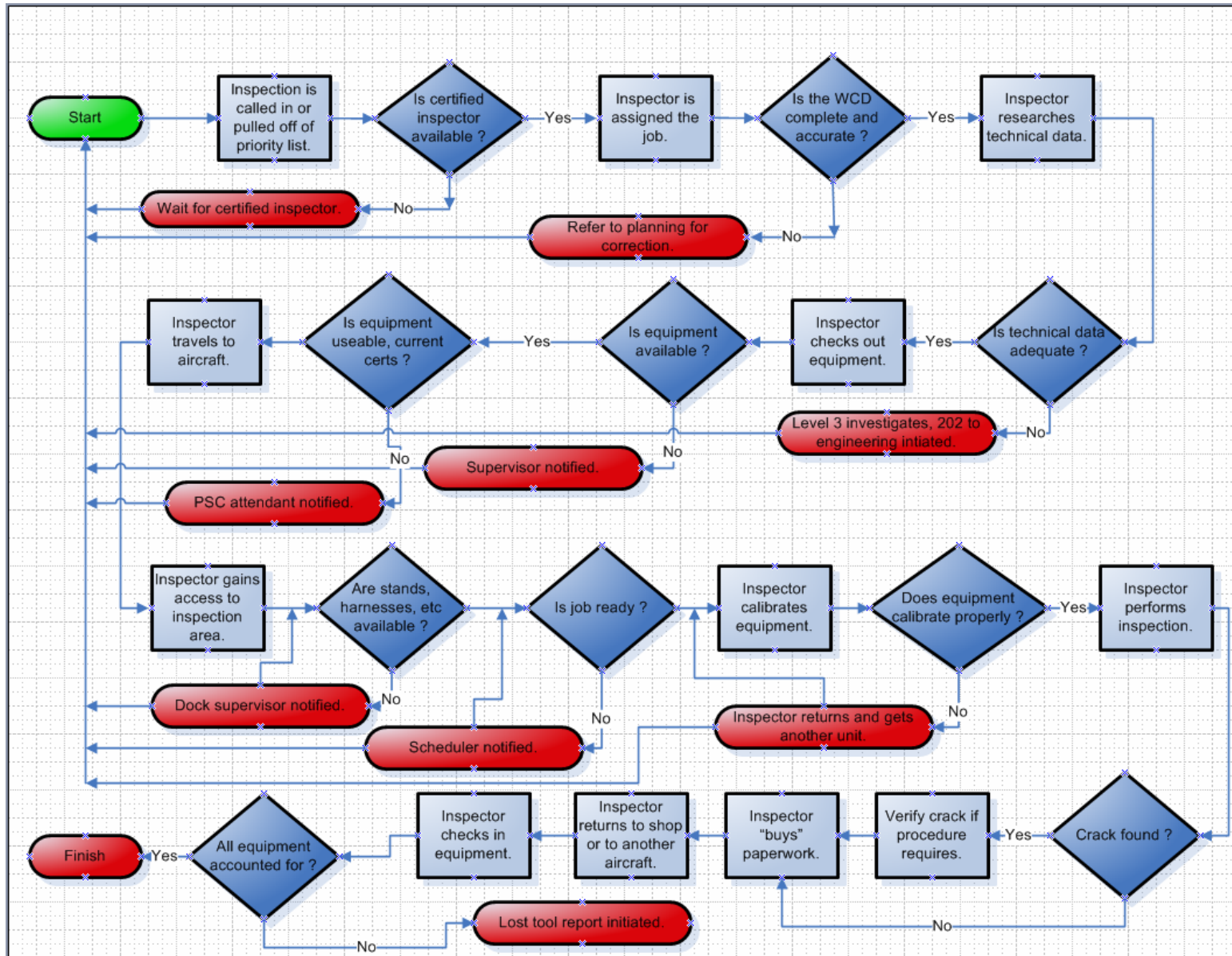
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OC-ALC NDI Program Manager

Integrity - Service - Excellence



Process Flow Map

Manual Surface Eddy Current on Aircraft





Operational Risk Management



			Probability				
			Frequent	Likely	Occasional	Seldom	Unlikely
			A	B	C	D	E
S E V E R I T Y	Catastrophic	I	1	2	6	8	12
	Critical	II	3	4	7	11	15
	Moderate	III	5	9	10	14	16
	Negligible	IV	13	17	18	19	20
			Risk Levels				



Operational Risk Management



	A	B	C	D	E
1	Occurance Probability Definitions - Compiled from AFPAM 90-902 and MIL-STD-882D				
2					
3	Description	Level	Specific Individual Item	Fleet or Inventory	
4	Frequent	A	Likely to occur often in the life of an item, with a probability of occurrence greater than 1 in that life.	Continously experienced.	
5	Likely / Probable	B	Will occur several times in the life of an item, with a probability of occurrence less than 1 but greater than 0.1 in that life.	Will occur frequently.	
6	Occasional	C	Likely to occur some time in the life of an item, with a probability of occurrence less than 0.1but greater than 0.01 in that life.	Will occur several times.	
7	Remote / Seldom	D	Unlikely but possible to occur in the life of an item, with a probability of occurrence less than 0.01 but greater than 0.00001 in that life.	Unlikely, but can reasonably be expected to occur.	
8	Unlikely / Improbable	E	So unlikely, it can be assumed occurrence may not be experienced, with a probability of occurrence less than 0.0001 in that life.	Unlikey to occur, but possible.	



Operational Risk Management



SEVERITY	Catastrophic	Critical	Moderate	Negligible	Source
Mission	Complete mission failure	Major mission degradation	Minor mission degradation	Less than minor mission degradation	AFPAM 90-902
People	Death	Severe injury, occupational illness	Minor injury, Minor occupational illness	Less than minor injury, occupational illness	AFPAM 90-902
Mishap Class	Class A mishap	Class B mishap	Class C mishap		ORM Level 1 Course
Mishap Cost	> \$1,000,000	> \$200,000	> \$10,000	<\$10,000	ORM Level 1 Course
Systems (equipment, facilities, environment)	Loss of system	Major system damage	Minor system damage	Less than minor system damage	AFPAM 90-902
Budget	> 100% over budget	> 50% over budget	> 10% over budget	< 10% over budget	76th MXW
Budget	> \$1,000,000	> \$200,000	> \$10,000	<\$10,000	76th MXW
Schedule	> 100% delay	> 50% delay	> 10% delay	< 10% delay	76th MXW



Identified Risks



Manual Surface Eddy Current on Aircraft

			Probability				
			Frequent	Likely	Occasional	Seldom	Unlikely
			A	B	C	D	E
S E V E R I T Y	Catastrophic	I	1	2	6	8	12
	Critical	II	3	4	7	11	15
	Moderate	III	5	9	10	14	16
	Negligible	IV	13	17	18	19	20
Risk Levels							

#	Hazard	Risk	Control Measure(s)	Risk
1	Inadequate NDI Technical Data	4	See Action Plan	15
2	Inspector Discipline	7	See Action Plan	14
3	Inspection Difficulty - Ergonomics	7	See Action Plan	15
4	Failure of QA to Find Discrepancies	7	See Action Plan	15
5	Insufficient Level 3 Availability	9	See Action Plan	14

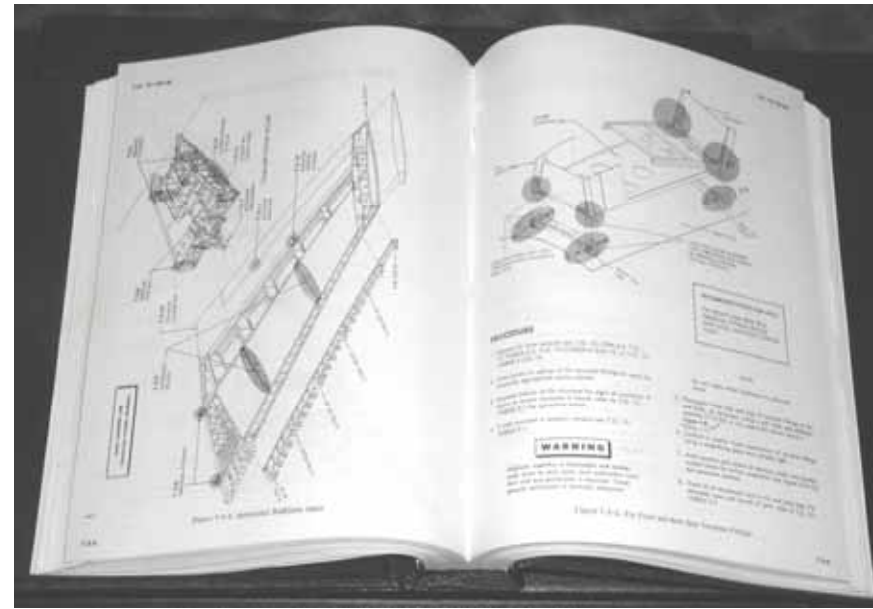


Risk Mitigation Action



Hazard: Inadequate NDI Technical Data

- Almost a daily occurrence
- Problems can occur in the work control documents, process orders, statements of work, specifications, drawings, or technical orders
- While not all technical orders are completely inadequate, may contain procedures or portions of procedures that are inadequate
- Problems range from equipment obsolescence to incorrect references, ergonomics to the inspection simply does not work, to conflicts between directives





Risk Mitigation Action



Aircraft Technical Data

- Performing a procedure by procedure performance verification
- Engineering has designated equipment specialist to work TO changes

Commodities Technical Data

- Contract and contractors in place reviewing all commodities technical data
- Developing procedures where inadequate technical data exists

Engines Technical Data

- Level 3 availability prohibiting proactive approach
- Problems are corrected as identified



Risk Mitigation Action



Hazard: Inspector Discipline





Risk Mitigation Action



Hazard: Inspection Difficulty - Ergonomics

- There are multiple instances where the ergonomics of the inspection increases the difficulty of the inspection
- Surface eddy current on top of a wing is vastly different from inside of a wing tank holding the probe, a flashlight and a mirror
- Difficulties can include confined spaces, overhead inspection, temperature, lighting, large areas or large number of fasteners





Risk Mitigation Action



Status

- Consider breaking up inspections to reduce monotony
 - Break an 8 hour inspection into two 4 hour inspections
- Working to reduce the inspector burden
- Conformal eddy current probes



Risk Mitigation Action



Hazard: Failure of QA to Find Discrepancies

- Intense Unit Condition Inspection (UCI) preparation found several process problems
- QA reported no NDI failures
- Identified lack of comprehensive NDI knowledge
- Identified NDI specific training to be required and placed requirement in Quality Manual
- All Groups have now hired personnel with NDI experience





Risk Mitigation Action



Hazard: Insufficient SME's in NDI

- Tinker NDI expertise has degraded over the last 13 years from 12 to 8 Level 3 certified engineers and technicians
- Initial 12 Level 3's held 42 certificates, current 8 hold 22
- This year alone we have seen three retirements and five transfers
- Continued proliferation of NDI technology and processes (laser holography, digital x-ray, automated immersion phased array ultrasonics, sonic infrared, etc)
- Lack of Level 3 SSQ Qualification Officials pulling resources from NDI process oversight
- Groups report that increasing workload, lean and transformation initiatives was already straining existing Level 3's. **One Group expanding from 5 NDI shops to 13.**



Risk Mitigation Action



- 2 individuals have earned 3 ASNT certificates
- Took ASNT ultrasonic testing on October 20, 2006
- Candidates have been attending Level 3 ultrasonics and radiography classes
- Groups have identified current and future Level 3 requirements
- Begin justifying additional positions to senior leadership
- Level 3 engineering slots are among the hardest engineering positions to fill



Risk Mitigation Action



Hazard: Inspector Discipline

- Complacency was identified by ASC/EN as a potential danger

It was discussed that allowing one-self to become distracted, pushed by production pressure, or otherwise complacent was far more likely to happen than inspector integrity issues.





Risk Mitigation Action



Status

- Morale and production pressure have been identified as major drivers
- Largest variable in the NDI process is the human element
- Working to reduce the inspector burden
- Inspectors do as much paperwork as NDI

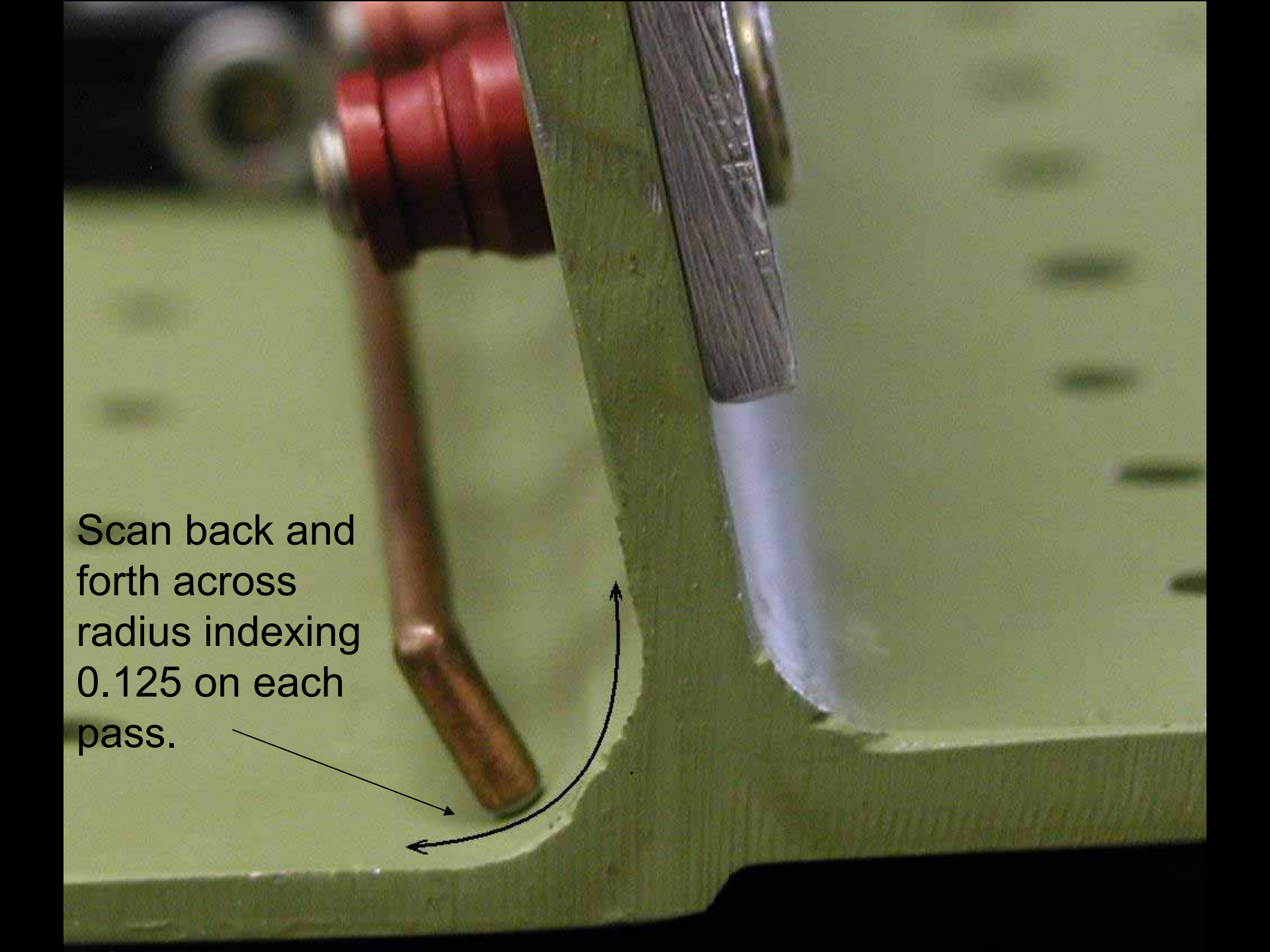


Risk Mitigation Action

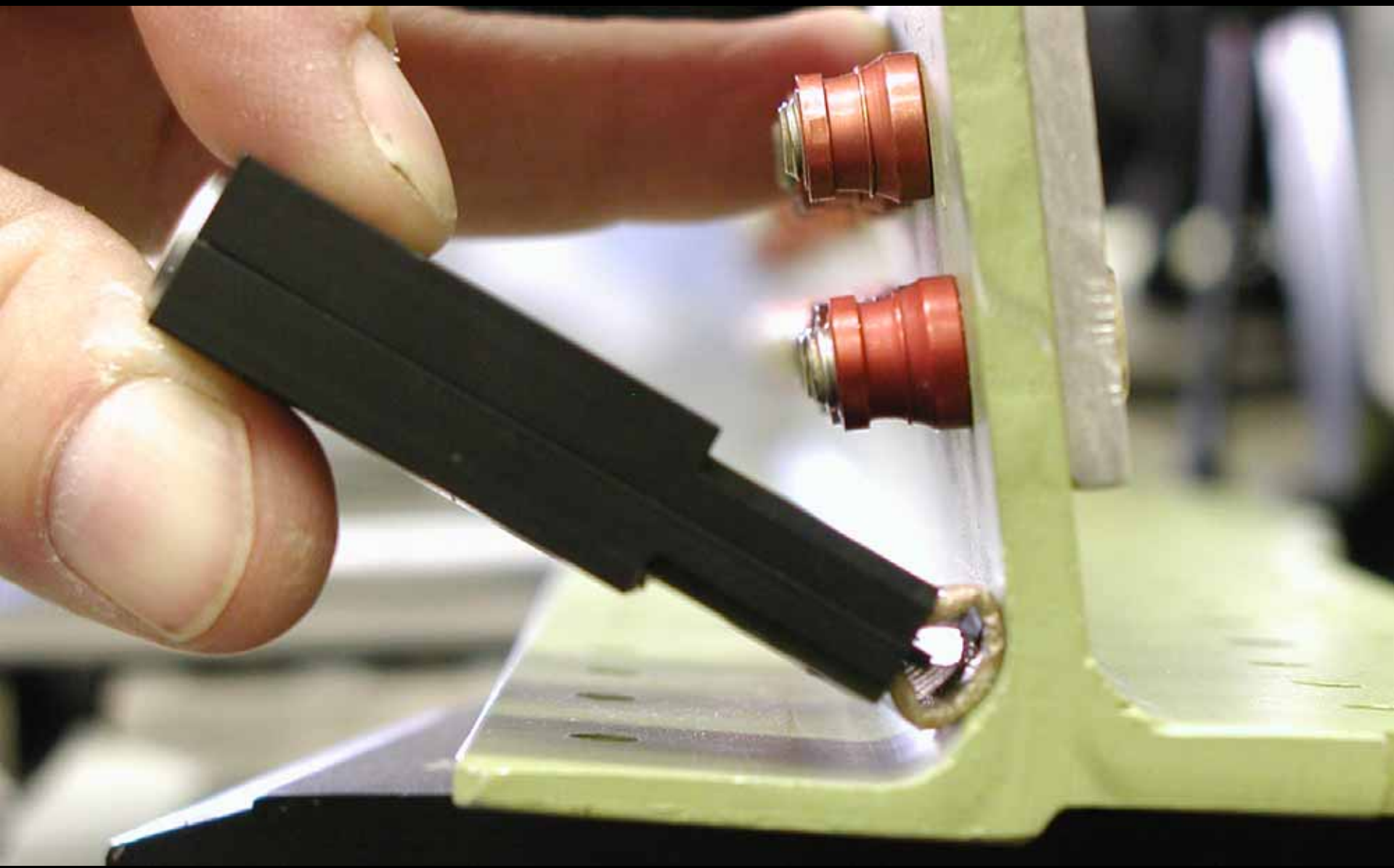


Status

- Consider breaking up inspections to reduce monotony
 - Break an 8 hour inspection into two 4 hour inspections
 - Semi-Automated defect reporting
 - Computer form with drop down boxes, etc
- Conformal eddy current probes

A close-up photograph of a grinding wheel dressing operation. A red grinding wheel is mounted on a spindle and is in contact with a metal workpiece. A dressing tool, which has a copper-colored tip, is being used to dress the grinding wheel. The workpiece is a light-colored metal with a chamfered edge. A curved arrow indicates the dressing path across the radius. A straight arrow points from the text to the dressing tool tip.

Scan back and forth across radius indexing 0.125 on each pass.





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Apr 19, 1995



Sep 11, 2001