DOCKET NO.: SA-515
EXHIBIT NO. 11P

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

DELTA AIR LINES
INTERNAL MEMORANDUM
RESPONDING TO FAA'S FPI TECHNICAL REVIEW

(28 PAGES)

Delta Air Lines

Internal Memorandum

Date: November 14, 1996

To: Jim Maucere - Director, Compliance & Quality Assurance

From: Raymond Worley - Foreman, Quality Assurance, NDT

Subject: FAA OBSERVATION

OBSERVATION NO. Q1:
A review of records in Department No. 542, indicates that recurrent training's were performed beyond the 30 day grace period.

RESPONSE:
At the time of the inspection all NDI personnel training records were current and in compliance with Delta's Nondestructive Inspection Testing Procedure Manual. The records referred to were from 1994. At that time we were transitioning from paper records to the automated Professional Education and Recurrent Learning System, (PEARL). **(1)** Delta identified the discrepancy with the PEARL record and immediately took corrective action.

ACTION - (Completed)

1. The PEARL system did not recognize recurrent training for vendor classes QCMT2V and QCPT2V. These classes have been modified and the recurrent requirement dropped. This was corrected prior to the teams findings.

Note: Reviewed PEARL records for NDT personnel, (FPI, MPI. RT, UT, ET) all recurrent training for these methods was found to be within the required time period or a letter was in the file placing them inactive.

FAA OBSERVATION
November 14, 1996

Section 14.A of Delta Air Lines Nondestructive Inspection Procedure NDT-1, Revision 10, dated May 1, 1996 - Requires "An individual remains qualified by performing work, providing instructions to trainees, and demonstrating proficiency in a method. Failure to do so within six months shall require the individual to be re-qualified by recurrent training."

OBSERVATION NO. Q2:

Delta Air Lines, Inc., does not have any "formal" procedure to administer this requirement. The Team noted that it was up to each individual's Foreman to notify the Engine Maintenance Quality Assurance Manager of inactivity.

RESPONSE:
All personnel at the time of this inspection were fully qualified in accordance with Section 14.A of Delta's Nondestructive Inspection Testing Procedure Manual. Delta agrees with the intent of the recommendation and will amend our policy as follows: **(1)** All individuals who become inactive because of short term disability, leave of absence, or temporary transfer of responsibility will be decertified in the PEARL system. **(2)** A monthly NDT Inspection Activity Report has been developed to assure compliance with the 6 month current requirement.

ACTION - (Completed)

1. NDT-1 Section 14.A was expanded to 14.A,B,C. Section 14. paragraph C describes circumstances of inactivity, and subparagraphs (1) and (2) require a Monthly NDT Activity Report as a means of tracking activity.

2. Designed a "MONTHLY NDT INSPECTION ACTIVITY REPORT" that is sent to the foreman of each person performing NDT activities at the end of every month. The report is to be returned to the Analyst, Quality Assurance, NonDesturctive Testing, Dept. 521/ATG before the tenth day of the following month.

   Note: The Monthly NDT Inspection Activity Report is compared to the reports on file and any lapse exceeding six months results in the individual being placed inactive in the method.

FAA OBSERVATION
November 14, 1996

Section: 15.A of Delta Air Lines Nondestructive Inspection Procedure NDT-1, Revision 10, dated May 1, 1996 - Requires "ALL LEVELS OF PERSONNEL SHALL BE RE-CERTIFIED AT LEAST EVERY THREE YEARS. THIS RE-CERTIFICATION SHALL BE BASED UPON (a) evidence of continuing satisfactory performance; or (b) re-qualification by examination.

OBSERVATION NO. Q3:
The Team noted that re-qualification is based primarily on continuing satisfactory performance in lieu of an examination.

RECOMMENDATION
The Team recommends that the procedure be revised to require re-qualification of an individual by taking a written and a proficiency examination.

RESPONSE:
Delta was fully in compliance with our Nondestructive Inspection Procedure Manual, under Section 15.A, which meets industry standards as specified in Specification 105. However, the recommended procedural change is an improvement of existing policy and will be implemented. **(1)** Written and proficiency exams will become a part of the re-qualification process. Delta requests that this standard be communicated by the team to the industry for revision to Specification 105.

ACTION - (Completed)
1. Revised NDT-1 Section 15.A to require re-qualification for re-certification by a written and practical examination every three years.

Note: The annual recurrent training includes a written examination. Seventy-eight recurrent exams have been administered for all methods.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. Q4:
During the Team's review, it was noted that there is no "formal" procedure to document the qualification of Processors. The Team also noted that unlike the Inspector, the Processor does not have "formal" on the Job Training (OJT).

RECOMMENDATION
The FPI is highly process dependent, and therefore, the Team recommends that Delta Air Lines reconsider the use of Processors for the FPI. The Team also recommends that Delta Air Lines establish a "formal" procedure to ensure that Processors are qualified to perform their review in FPI. The Team recommends that one way this may be accomplished is to manage Processor qualifications in a way similar to that used for Inspectors.

RESPONSE:
The Processors were fully capable of performing their tasks as assigned. However, Delta agrees with the intent of the team recommendation **(1)** and will develop "formal" procedures for Processor qualifications. This will consist of formal training, On The Job Training (OJT), and a qualification test. **(2)** Processors will be certified and be given recurrent training. **(3)** All training will be documented in PEARL. **(4)** The Nondestructive Inspection Procedure Manual will be revised accordingly. Current processors will be certified by October 1, 1996.

ACTION - (Completed)

1. Revised NDT-1 Section 3.F. to define the Processor qualification. Revised NDT-1 Section 7 to specify Processors qualification requirements for certification.

2. A 20 hour P.E.A.R.L. class (QAPTPROC) "FPI Processor Training", including classroom lecture and written examination was already in place. Annual recurrent training (P.E.A.R.L. course QCPTRC) is required. (All processors have complied)

3. Revised NDT-1 Section to add a requirement for 160 hours of OJT (P.E.A.R.L. course QAPTOJTP). (All processors have complied)

4. The Processor Certification status is maintained in P.E.A.R.L. under the QAQUAL user group as PTP. (All processors have complied)

Note: Revised NDT-1 Section 12. to require all Processors to pass the visual examination. (All processors have complied)

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. Q5:
Delta Air Lines cleaning personnel receive OJT, with no formal classroom training. On the Job Training is provided on each special cleaning operation and is logged in records established within the engine cleaning department. The Team noted that sensitivity to the criticality of the engine components and the end purpose for which these components were being cleaned after being inducted into the cleaning shop was not provided as part of the OJT (critical rotating vs. static, general visual inspection vs. Nondestructive Inspection).

RECOMMENDATION
Delta Air Lines engine cleaning management personnel should incorporate special emphasis in the OJT program, pertaining to the differences in types of material and the critical nature of cleaning components which will later be released from the cleaning shop for FPI.

RESPONSE:
The team did not observe OJT during the course of their inspection, nor did they observe the mishandling of any particular part. The handling of parts, critical or otherwise is covered under Delta's Job Planning Card. (JPC). The JPC is a routing document which identifies processes and steps in the restoration process. Our processors and inspectors process all parts in accordance with the paperwork provided. **(1)** We have begun a training program in the cleaning shops to familiarize all personnel with "stamp" authority (primarily inspectors and processors in the shops) with the different cleaning procedures. **(2)** We will train all cleaning shop personnel under the same program and will incorporate special emphasis on the different materials and the cleaning of critical parts, especially those which will be subsequently fluorescent penetrant inspected.

ACTION - (Completed)
1. Training is being conducted for personnel with stamp authority and cleaning shop personnel. (390 of 450 trained)

2. This training explains the use of each process in the shop and specifies which materials it can be used on. (29 of 31 trained, hand outs provided)

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F1:

The Team noted that the Process Standards for FPI allows questionable indications to be evaluated by wiping the area once with solvent (Acetone was being utilized on the production line) using a cotton swab or fine-hair art brush and redeveloping the indication. The brush utilized on the production floor is a small stiff bristle parts cleaning brush.

Recommendation: The Team recommends that a brush be utilized in accordance with the PS FPI.

RESPONSE NO.
(Response Below)

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F2:

The solvent on the production floor the morning of August 14 was badly contaminated with fluorescing material.

Recommendation: The Team recommends that contaminated solvent be removed as soon as possible from the production area and be replaced with clean solvent.

RESPONSE F1 & F2

The brushes Delta has always used in the FPI tents are fine-haired brushes. The following actions were taken to prevent contamination of solutions: Acetone is replaced daily. **(1).** Cotton swabs or fine-hair brushes are discarded after each use. **(2).** If a swab or brush is inadvertently dipped, the acetone is discarded and replaced in a cleaned container. **(3).** There is a daily log for each FPI tent to show compliance with this policy.

ACTION - (Completed)

1. A Change was made to P/S 900-6-3-#02 to states never re-use cotton swabs or fine hair brush. Use a new swab or clean brush each operation. Cotton swabs are available to all inspection stations

Note: Lee-Steve correct words in Words in SP

2. A Change was made to P/S 900-6-3-#02 to states If used swabs or brush is inadvertently dipped, discard acetone, clean container and refill with clean acetone.

3. A new log sheet has been placed in each FPI area. The inspector is now responsible to sign a log each shift, stating he has change the bleed solvent.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F3:
The Delta Air Lines, Inc., inspector working the production line on the afternoon of August 13 was using the solvent as a cleaning aid to remove excess fluorescing material, repeatedly flooding the inspection area with a brush full of solvent in order to remove the indication.

Recommendation: The Team recommends that more careful removal of excess penetrant material during processing and retaining of personnel in proper procedures for the evaluation of indications.

RESPONSE:
The steps being taken to standardize inspection techniques, i.e.,**(1)** technique sheets, **(2)** training classes, and **(3)** On the Job Instruction (OJT) will prevent reoccurrence of the observed practice.

ACTION - (Completed)

1. The technique sheets address hard to process areas that might require special instructions. 25 new technique sheets have been generated.

2. Spot cleaning technique and solvent usage is being re-emphasized in recurrent training. Special instructions were given to inspectors processing rotating engine parts.

3. OJT instructors are provided a check list to insure these items are covered during OJT.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F4:
Delta Air Lines, Inc., has initiated the generation of FPI Technique Sheets. Delta Air Lines, Inc., furnished a Draft version of a Technique Sheet to the Team.

Recommendation: The Team recommends that Delta Air Lines, Inc., continue the generation of the technique sheets. The information included on the Technique Sheet included identification of the part, the method, the equipment, the inspection steps, aids and critical areas, along with a sketch of the component and an identification of critical inspection areas. The Technique Sheets are dated, reviewed and revisable.

RESPONSE:

(1) The development of technique sheets will be an ongoing process for NDI methods.

ACTION - (completed)

1. The proper use and handling of technique sheets has been placed in TOPPS.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F5:
Visible trash and debris were visible under the transport rollers utilized on the FPI lines. Since there are no protective covers over the tanks containing the FPI process materials, similar trash and debris is expected in the FPI material.

Recommendation: The Team recommends that improved housekeeping, and that covers or other application methods of the FPI material that would eliminate the utilization of tanks for dip application of FPI material.

RESPONSE:
(1) The transport roller areas have been cleaned and placed on a maintenance program. The present system for dip application of FPI material is old but adequate. **Note:** Until such time that the entire system can be replaced there will be instances of material falling to the bottom of the tank. **(2)** The fluid is checked for water contamination monthly, **(3)**brightness quarterly, and **(4)** emulsifiers weekly, along with**(5)** panels being run prior to the start of each shift.

ACTION - (Completed)

1. A shop maintenance program was developed to check rollers, drip pans and developer stations for cleanliness. (Weekly FPI Line House Keeping Log)
   Note: Temporary covers are provided for each tank until permeate covers are manufactured.

2. Delta's maintenance lab performs a fluid check monthly and results are given to the foreman to take action as required.

3. Turco provides a quarterly service to check the brightness. Results are given to the foreman department 542 to take action as required.

4. Qualified shop personnel perform this check weekly, (log entry required) any discrepancies noted are corrected before further use.

5. Qualified shop personnel check these panels at the beginning of each shift, a log entry is required A note in P/S 900-6-3 #02 addresses this issue

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F6:
Delta Air Lines, Inc., has chosen Process Standard 900-6-3 No. 02, Test Panels commonly referred to as TAM panels, as the quality assurance tool to be utilized on a daily basis to verify the effectiveness of the FPI process. Each Penetrant sensitivity must display a minimum number of Star-Crack Indications on the TAM panel to assure the sensitivity of the process. The panels are to be processed along with the first set of parts to be inspected per FPI line per shift. After processing, the panels should be cleaned to remove all inspection material and stored in alcohol. The TAM panels, when processed the afternoon of August 13, were so badly contaminated with background fluorescence that they were unreadable.

Recommendation: The Team recommends more attention to processing of parts to reduce indications of fluorescence contamination.

RESPONSE:
The cleaning of TAM panels was in accordance with our Process Standard. The handling and processing of panels has been reviewed and revised to the standard recommended by the team. **(1)** Delta's Process Standard is being revised accordingly. **(2)** All inspectors have been trained on the new procedure.

ACTION

1 A new P/S 900-6-3 #02 procedure for the cleaning and handling of the panels has been developed and submitted on 10/28/96. ERA # _____ will authorize the changing of the previous cleaning and handling requirements.

2. Personnel that process the TAM panels received instruction on the importance of, and proper processing of the panels.

Note: Submitted Pending ERA

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F7:
The TAM panels are not processed in the same way as parts are. At the development stage, a spray non-aqueous developer is used rather than the air delivered developer applied to the parts normally inspected.

Recommendation:
The Team recommends that TAM panels see the same processing as the parts per the Process Standards for FPI, including the application of developer.

RESPONSE:
Delta does not spray non-aqueous developer on TAM panels. The spraying of non-aqueous developer on TAM panels is non-existent and the observation as written is confusing. The TAM panels are processed in the same way as parts including the application of the dry powder developer.

ACTION - (Completed)

1. The use of NAD on panels for developing purposes is prohibited. A note in P/S 900-6-3 #02 was added to address this issue.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F8:
The panels are not checked for contamination/cleanliness before being used as quality standards.

Recommendation:
The Team recommends the application of non-aqueous developer and viewing under a Black light to detect contamination of the TAM panels before each utilization of TAM panels as a verification tool for the FPI process.

RESPONSE:
(1) A new Process Standard procedure has been developed to process TAM panels.
(2) The standard recommended by the team has been incorporated. (Reference Response F6)

ACTION

1 We attempted to follow the teams recommendations, However the pre-check cleaning recommended by the team could not be supported. Pratt/Whitney Magnaflux were contacted concerning the cleanliness problem. Recommendation was to discontinue the use of NAD as a pre-check of the panel.

2 A new P/S 900-6-3 #02 procedure for the cleaning and handling of the panels has been developed and submitted on 10/28/96. ERA # _____ will authorize the changing of the previous cleaning and handling requirements.

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RESPONSE:
The steps being taken to standardize inspection techniques, i.e.,**(1)** technique sheets, **(2)** training classes, and **(3)** On the Job Instruction (OJT) will prevent reoccurrence of the observed practice.

ACTION - (Completed)

1. The technique sheets address hard to process areas that might require special instructions. 25 new technique sheets have been generated.

2. Spot cleaning technique and solvent usage is being re-emphasized in recurrent training. Special instructions were given to inspectors processing rotating engine parts.

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RESPONSE:

(1) The development of technique sheets will be an ongoing process for NDI methods.

ACTION - (completed)

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November 14, 1996

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Recommendation: The Team recommends that improved housekeeping, and that covers or other application methods of the FPI material that would eliminate the utilization of tanks for dip application of FPI material.

RESPONSE:
(1) The transport roller areas have been cleaned and placed on a maintenance program. The present system for dip application of FPI material is old but adequate. **Note**: Until such time that the entire system can be replaced there will be instances of material falling to the bottom of the tank. **(2)** The fluid is checked for water contamination monthly, **(3)**brightness quarterly, and **(4)** emulsifiers weekly, along with**(5)** panels being run prior to the start of each shift.

ACTION - (Completed)

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   Note: Temporary covers are provided for each tank until permeate covers are manufactured.

2. Delta's maintenance lab performs a fluid check monthly and results are given to the foreman to take action as required.

3. Turco provides a quarterly service to check the brightness. Results are given to the foreman department 542 to take action as required.

4. Qualified shop personnel perform this check weekly, (log entry required) any discrepancies noted are corrected before further use.

5. Qualified shop personnel check these panels at the beginning of each shift, a log entry is required A note in P/S 900-6-3 #02 addresses this issue

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Recommendation: The Team recommends more attention to processing of parts to reduce indications of fluorescence contamination.

RESPONSE:
The cleaning of TAM panels was in accordance with our Process Standard. The handling and processing of panels has been reviewed and revised to the standard recommended by the team. **(1)** Delta's Process Standard is being revised accordingly. **(2)** All inspectors have been trained on the new procedure.

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FAA OBSERVATION
November 14, 1996

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Recommendation:
The Team recommends that TAM panels see the same processing as the parts per the Process Standards for FPI, including the application of developer.

RESPONSE:
Delta does not spray non-aqueous developer on TAM panels. The spraying of non-aqueous developer on TAM panels is non-existent and the observation as written is confusing. The TAM panels are processed in the same way as parts including the application of the dry powder developer.

ACTION - (Completed)

1. The use of NAD on panels for developing purposes is prohibited. A note in P/S 900-6-3 #02 was added to address this issue.

OBSERVATION NO. F8:
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Recommendation:
The Team recommends the application of non-aqueous developer and viewing under a Black light to detect contamination of the TAM panels before each utilization of TAM panels as a verification tool for the FPI process.

RESPONSE:
(1) A new Process Standard procedure has been developed to process TAM panels.
(2) The standard recommended by the team has been incorporated. (Reference Response F6)

ACTION

1 We attempted to follow the teams recommendations, However the pre-check cleaning recommended by the team could not be supported. Pratt/Whitney Magnaflux were contacted concerning the cleanliness problem. Recommendation was to discontinue the use of NAD as a pre-check of the panel.

2 A new P/S 900-6-3 #02 procedure for the cleaning and handling of the panels has been developed and submitted on 10/28/96. ERA # _____ will authorize the changing of the previous cleaning and handling requirements.

Note: Submitted Pending ERA

OBSERVATION NO. F9:
Two TAM panels from the production line and one used as a training aid were evaluated for contamination the morning of August 14. All were found to be contaminated with both fluorescent material and a light blue material which possibly was oil, emulsifier, or other cleaning agent. Numerous attempts were made by Delta Air Lines, Inc., personnel to clean the TAM panels. Simple wipes with solvent were unsuccessful at removing the contamination. Only the training aid panel was satisfactorily cleaned completely. The training aid panel was successfully processed and viewed with the comment from the inspector that they were the brightest and sharpest indications that he had seen.

Recommendation: The Team recommends that contamination of the panels be minimized and that adequate cleaning of the TAM panels be conducted as necessary.

RESPONSE:
Validation TAM panels were being cleaned in accordance with Process Standard 900-6-3 No., an industry standard. Considerable testing has been conducted since the team visit. **(1)** A new procedure has been developed, including the use of Non Aqueous Wet Developer (NAWD) which will be incorporated into Delta's Process Standard. It was noted during testing with newly acquired panels, which had not been run, that the solvent in NAWD creates a **(2)** blue haze on the test panel when viewed under black light. This may explain some of the difficulties encountered during the panel tests conducted by the team.

ACTION - (Completed)

1. P/S 900-6-3 #2 was revised. The panels are stored in clean solvent only. The panels are cleaned before placement in the solvent. The solvent is changed monthly. (Log entry required) The use of new ultrasonic cleaners has improved the cleaning procedure.

2. The new cleaning and handling procedures was incorporated in P/S 900-6-3 #2 and addresses the blue haze and how it relates to test panel effectiveness.

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FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F10:
On March 4, 1996, Pratt & Whitney indicated their intention to replace all FPI processes performed under Service Process Operation Procedures 82 (high sensitivity FPI processing) with Service Process Operations Procedures 84 (ultra high sensitivity FPI processing). Delta Air Lines has the necessary equipment and materials available and has practically implemented the change. There was some stumbling on the part of a Delta Air Lines Processor identifying the ultrahigh sensitivity penetrant material as a Delta 2, and the high sensitivity material as a Delta 1.

Recommendation
The Team recommends that the FAA's Delta Certificate Management Office, Atlanta, assure the transition is complete for the documentation and training (including recurrent) that must accompany the change.

RESPONSE:
(1) The Job Planning Cards (JPC's) which accompany all parts identify the Type Penetrant and Class of material to be used for FPI parts. All tanks are clearly marked as to Class of material. **(2)** Training classes have been conducted reinforcing procedures.

ACTION - (Completed)

1 Some paperwork may not provide the questioned penetrant information. In the event of such paperwork, the employee should refer to revised P/S 900-6-3 stating the sensitivity of each fluorescent penetrant used.

2. Complete

OBSERVATION NO. F11:
Developer is applied during the FPI process at Delta Air Lines via an air stream under a hood.

Recommendation: For areas such as long narrow holes, such as tie bolt holes, the Team recommends reviewing the developer application process to assure that developer is adequately applied to areas that may be difficult to access.

RESPONSE:
It is recognized throughout the industry that there are limitations on the use of FPI for certain parts. Delta follows manufacturer specifications and accomplishes inspections in accordance with established guidelines.**(1)** Developer application is being reviewed to assure coverage in difficult to access areas.

ACTION - (Completed)

1 We have purchased and installed new hand held sprayer to provide better part coverage. In addition, we purchased small bulb type applicators for dry powder developing. This type applicator will aid in developer coverage of bolt hole and blind areas.

Note: Bulb type applicators for dry powder are in use.

OBSERVATION NO. F12:
The transport rings utilized for parts holding during the FPI process become easily contaminated with fluorescent material. One inspector was noted having a difficult time inspecting the inside of a hole because of the high fluorescent background from the transport ring visible through the hole. He tried shielding the ring from view with his glove, but it also was contaminated with fluorescent material.

Recommendation: The Team recommends Delta Air Lines, Inc., review techniques for viewing of inside of holes, improve if necessary, and adequately share with FPI process inspectors.

RESPONSE:
(1) The development of technique sheets will aid in the inspection process of viewing critical areas. Also, (2) clean transport rings will be substituted prior to the FPI inspection to minimize fluorescent background exposure.

ACTION - (Completed)

1 The technique sheets include information regarding critical area of inspection. Special inspection (bolt holes) requirements are listed on the technique sheet.

2 A procedure of using only clean transport rings during the inspection phase of the FPI procedure has been implemented.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F13:

One inspector was noted touching the component to be inspected, and smearing the inspection area, before inspecting it.

Recommendation: The Team recommends recurrent training at Delta Air Lines address this issue.

RESPONSE:
The recently developed technique sheet will minimize handling of parts **(1)** All FPI personnel have been trained on the new procedure. It needs to be noted on the day the process was reviewed the part in question had been under inspection for approximately ten minutes. This was communicated to the team member.

ACTION - (Completed)

1 The technique sheet includes a note requiring the Inspector to "look before you touch". Inspectors have been trained on this procedure.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. F14
There appears to be no uniform way of handling and indexing components during evaluation in the inspection booth.

Recommendation: The Team recommends a uniform, consistent handling procedure be established for components in the inspection booth.

RESPONSE:
(1) The recently developed technique sheet specifically states how a part is to be indexed and handled. **(2)** All FPI personnel have been trained on the new procedure.

ACTION - (Completed)

1. Technique sheets includes a note on the requirement of indexing a part for inspection. Technique sheets include the proper information on required tooling or fixtures used for the inspection.

2. Inspectors have been trained on this procedure.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. C1:
There were noted discrepancies between audits performed by TURCOm the provider of cleaning chemicals, and Delta Air Lines, Inc., concerning cleaning tank solution contents. The corrective actions taken to bring the cleaning solution tanks within specification, by adding chemicals, were significant. No attempt was made by the Team to verify which was the correct audit.

RECOMMENDATION The Team recommends that Delta Air Lines, Inc., establish weekly comparison inspections/audits within the engine cleaning department to review both TURCO and Delta Air Lines, Inc., audit reports of cleaning tank chemical composition. When disparities between reports are noted they should be rectified before further processing.

RESPONSE:
(1) Cleaning tank solutions are checked weekly by Delta's Maintenance Lab with the results of the checks provided within a few hours.. In addition, Turco periodically checks tank solutions and their results are reviewed by the cleaning shop foreman. When there is a discrepancy between test results, appropriate action is taken immediately to ensure that the proper concentration of solution is present in the tank. It is not uncommon that significant adjustments will be made based on the number of parts run in any given period

Action
Delta Process Standard 900-1-3-2, #03, pg. 6, para. F. will be revised to read as follows:
F. Control Procedures
Control testing of cleaning tanks will be conducted by the Maintenance Laboratory, Dept. 224, ATL, per the manufacturers recommended procedures on a weekly basis with test results and recommendations sent to the Fore- man-Engine Cleaning, Dept.271,ATL. The Turco represen- tative may be contacted on an as needed basis to support the Maintenance Laboratory.

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. C2:
Interviews with Delta Air Lines, Inc., management and shop personnel indicate that Delta Air Lines has written procedures for cleaning processes for engine components. These written processes are developed by Delta Air Lines Process Engineering, either from the Original Equipment Manufacturer (OEM) Instructions for Continued Airworthiness, Chemical Product Distributors or Delta Air Lines Process Engineering. A full comparison of OEM data to Delta Air Lines Interpretative instructions was not conducted as part of this review. Delta Air Lines, Inc., process instructions for the cleaning of engine components are dictated by the Shop source of the component being inducted for cleaning on Job Planning Cards (JPC's). The components inducted into the engine cleaning shop are accompanied by this Delta Air Lines JPC which lists the cleaning process to be applied to the component. Specific cleaning process steps for those JPC's are contained in a manual, which is generally located in the cleaning shop Foreman's office and are available to shop personnel.

Specific process steps to clean engine components are not located at the cleaning worksites for cleaning personnel to review before commencing cleaning operations. Cleaning operations appear to be committed to memory for the components being cleaned, which could lead to errors in the cleaning process due to human factors.

RECOMMENDATION: The Team recommends establishing engine cleaning instructions, or job aid instructions, such as material types, chemical solutions to be used, temperatures and dwell times. These process instructions should also accompany the component through the cleaning process and be readily available at the work sites so that operators will not have to rely on memory recall for cleaning processes.

(Response Below)

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. C3:
The Team observed that changes to cleaning processes when necessary are developed by Delta Air Lines, Inc., Process Engineering and routed to the cleaning shop for inclusion into this manual. The cleaning personnel are advised of these changes to the cleaning processes by the shop foreman or lead cleaners. It is not clear that should cleaning process operations change, with the absence of the foreman or lead cleaner, those changes would be distributed to cleaning personnel.

RECOMMENDATION: The Team recommends that a more formal process be established so that all cleaning personnel are consistently aware of changes made in the cleaning processes.

(Response Below)

FAA OBSERVATION
November 14, 1996

OBSERVATION NO. C4:
There is no apparent procedures to verify with Delta Air Lines, Inc., Process Engineering that cleaning process changes have been implemented in the shop department.

RECOMMENDATION The Team recommends that a consistent method be established to ensure that cleaning process changes are properly implemented and documented with Delta Air Lines, Inc., Process Engineering

(Response Below)

RESPONSE TO NO. C2/C3/C4:
(1) Copies of the applicable Process Standards have been made and covered with mylar film. These copies have been put in a notebook that is placed at the beginning of the "cold line", the "hot line, in the blast area and adjacent to the ultrasonic cleaners and varsol booths. **(2)** The cleaning shop foreman (or his designee in his absence) has the responsibility of maintaining the current information in these notebooks. When the Process Standards Manual is revised, the Technical Procedures personnel, who actually replaces the superseded pages in the manual gives a copy of the highlight sheet to the cleaning shop foreman (or his designee, in his absence). The foreman reviews the revisions to the highlight sheets to determine if any of the cleaning procedures have been changed. If so, he runs copies of the latest pages and places them in the aforementioned notebooks in lieu of the superseded procedures. **(3)** The foreman then puts a "read and sign" sheet in front of the notebook and insures that all personnel read the revised pages and sign the sheet to indicate that they have read and understand the changes. These "read and sign" sheet will be retained in the cleaning shop Foreman's office.

Action - (Completed)

1. Procedures are posted at the required areas.

2. Foreman insures the current process standard is posted.

3. Read & Sign for every revision placed in Process Standard & Controlled Supplementary Information. (up to date 10/28/96)

FAA OBSERVATION
November 14, 1996

Section 4.C(1)(a)(1) of Delta Air Lines Process Standard 900-1-1 No. 18 - Requires that "Maintain tank solution at normal operating level with TURCO 5948R...at 145° to 155°F".

OBSERVATION NO. C5:
The Team noted that tank solutions are checked weekly to ensure that proper temperatures are maintained. This check is recorded on a log sheet which records the temperatures for the TURCO 5948R and TURCO 4181 tanks. The acceptable temperature range noted on this log sheet (tank #1 cold line (CL)) is 140°F to 180°F, which is not in accordance with the temperature range identified in the noted Process Standard. A review of this log sheet indicates that the solution temperature has been out of limits for approximately a month.
In addition, the TURCO 4181 solution temperature (tank #3 CL) has been out of limits for approximately a month also.

RECOMMENDATION: The Team recommends that tank temperatures be maintained in accordance with the noted Process Standards, and that the FAA Delta Certificate Maintenance Office, Atlanta, assures Delta Air Lines, Inc., compliance with this standard. Additionally, the Team recommends that Delta Air Lines, Inc., ensure that cleaning equipment temperatures are in range as indicated on temperature meters at the cleaning tanks, prior to processing components on a daily basis.

Response
(1) We agree with the RECOMMENDATION to install temp sensing gages and have initiated the necessary paperwork to get them installed. **(2)** We are now checking the solution temps twice each day and adjustments are made to any tank out of limits. **(3)** Equipment Mtc. department is replacing valves that cannot maintain the proper solution temp.

Action (Completed)
1. Complete

2. Solution is checked twice each day with a portable gauge and adjustments made.
   Note: Replaced heat controllers on two tanks

3. Replaced valves

FAA OBSERVATION
November 14, 1996

Section 4.D.(1)(c) of the Delta Air Lines Process Standard 900-1-1 No. 18 requires a hot water rinse following the TURCO 5948R step.

OBSERVATION NO. C6 :

This step was not performed during the cleaning process.

RECOMMENDATION: The Team recommends that FAA Delta Certificate Maintenance Office, Atlanta, assures compliance with this Process Standards.

(Response Below)

FAA OBSERVATION
November 14, 1996

Section 4F.(2) of the Delta Air Lines Process Standard 900-1-1 No. 18 requires a hot water rinse following the TURCO 4181 step.

OBSERVATION NO. C7:

This step was not performed during the cleaning process.

RECOMMENDATION: The Team recommends that the FAA Delta Certificate Maintenance Office, Atlanta, assures Delta Air Lines, Inc., compliance with this Process Standards.

(Response Below)

RESPONSE C6 & C7:
It must be clearly understood that the process observed by the Team was not an actual hub. At the Team's request, a raw piece of stock was used for demonstration purposes only. Our review of the Process Standard relating to these methods identified inconsistencies between the process flow chart and the written instructions. The written process for the titanium hub requires placing the hub in a vat containing TURCO 5948R for approximately 30 minutes. The hub is then rinsed in cold tap water, followed by a hot water rinse. The hub is then placed into a vat with TURCO 4181 and cold water rinsed. The final rinse is with hot water for flash drying, (hot flash rinse). **(1)** We have requested our process engineering department to review the need for a hot water rinse when parts are to be immediately dipped in a second degreaser, such as TURCO 4181. Any change in the cleaning process policy will be reviewed with the appropriate manufacturers prior to implementation. Additionally, **(2)** all cleaning shop personnel will be alerted to and trained on any changes in procedure (See Responses Q5 and C2/C3/C4).

Action - (Completed)

1. M&P issued a manual change ER/A 354241-14 approved on 9/17/96 to revise Process Standard 900-1-1,#18

2. Shop personnel alerted by Read & Sign. (C/W - up to date 10/28/96)

The Delta Air Lines, Inc. Process Standard 900-6-3 No. 02, dated June 15, 1996 - The Process Standard requires degreasing all parts immediately prior to the FPI process.

OBSERVATION NO. C8

TURCO 4181 is utilized after the degreasing operation, and is not included in the Process Standards for FPI process.

RECOMMENDATION: The Team recommends that Delta Air Lines, Inc., clarify the appropriate step for the utilization of the TURCO 4181 material in the processing of critical engine components. The Team also recommends that Delta Air Lines bring both the Delta Air Lines Process Standard 900-1-1 No. 18, and the PS FPI into compliance with each other.

RESPONSE:
(1) The FPI Process Standard will be revised to include degreaser TURCO 4181.

Action - (Complete)

1. Turco 4181 is an alkaline cleaner not a degreaser. Because degreasing with 5948R precedes the 4181 cleaning step, subsequent degreasing may not be necessary. C (a) of PS 900-6-3 #02 has been revised per ER/A 354241-14 to eliminate degreasing prior to FPI if the part has been previous degreases and does not have rust preventives or airborne contaminates.

Delta Air Lines, Inc., Process Standards for FPI processing correctly states that it is absolutely necessary that parts to be FPI inspected be free from all surface contamination.
The Delta Air Lines, Inc., cleaning operation assumes that the nondestructive inspection organization can/will screen material coming in for suitability for FPI processing. The NDI organization can only determine if the parts are too dirty for inspection, not if they have been cleaned adequately to allow FPI processing. Estimates from the nondestructive inspection organization ranged from 5-15 percent for material returned to the cleaning operation because it was too dirty for FPI processing.

OBSERVATION NO. C9:
There is no assurance that the material received by the Nondestructive Inspection organization for FPI processing was clean enough for an adequate FPI.

RECOMMENDATION: The Team recommends that the Delta Air Lines, Inc., nondestructive organization reevaluate the suitability of the cleaning processes performed prior to FPI. The Team also recommends that the FAA Delta Certificate Management Office, Atlanta, assures Delta Air Lines, Inc., compliance with the Process Standards.

RESPONSE:
There is no universal standard for assessing the cleanliness of parts. Delta views the rejection of parts for inadequate cleaning as a positive step in the quality process. Delta works with the engine manufacturers to develop cleaning standards which will be acceptable for all engine types. As a result, there may be times when the initial process because of adaptability may not be the preferred method and additional cleaning is required. Inspectors have been assigned to the cleaning shop while cleaning processes and procedures are under review
The Pratt & Whitney Overhaul Standard Practices Manual 70-33-00 Page 1 gives guidance on checking parts for adequate cleanliness. The guidance is used by Delta Inspection prior to the FPI process. **(1)** Delta is reviewing with our engine manufacturers the different criteria suggested by each. **(2)** A process will be developed as the Delta standard and **(3)** be included in Delta's Process Standards Manual.

Action
1. EIR 900-6-3-351-52, EIR 900-6-3-351-52, EIR 900-6-3-351-52
2. Open
3. Open