



DEPARTMENT OF THE NAVY
NAVAL AIR SYSTEMS COMMAND
NAVAL AIR SYSTEMS COMMAND HEADQUARTERS
WASHINGTON, DC 20361 -0001

IN REPLY REFER TO

NAVAIRINST 4870.2
AIR-536A
4 Jun 90

#1990063
A-434

NAVAIR INSTRUCTION 4870.2

From: Commander, Naval Air Systems Command

Subj: SHOT PEENING OF AIRCRAFT COMPONENTS

Encl: (1) Shot Peening of Aircraft Components During Rework and Repair Format
(2) Waiver Request for Shot Peening of Aircraft Components Format

1. Purpose. To establish and implement policy for the application of shot peening in the manufacture and rework of aircraft components.
2. Scope. This instruction applies to all peening operations used to enhance the part life by utilizing residual stresses from shot peening to attain required fatigue lives.
3. Background. Shot peening is a recognized method of improving the fatigue characteristics and damage tolerance in manufactured metallic aircraft components. The large magnitude of improvement possible, the difficulty of verifying the improvement through inspection, and the potential for in-service degradation of peening benefits require establishing a uniform policy for shot peening.
4. Policy. For parts dependent upon the residual stresses from peening to attain required fatigue life, the following requirements will apply:
 - a. Manufacture will be by computer monitored and controlled shot peening except as approved by the Naval Air Systems Command Headquarters (NAVAIRHQ). SAE Aerospace Material Specification (SAE AMS) AMS B87BC (AMS 2xxx in final form) will be the controlling document when issued. Control limits which shutdown the process prior to exceeding critical parameters and documentation of process records (including any 100 percent inspections imposed as a result of process control discrepancies) will be required.
 - b. Prior to or concurrent with the preliminary design review, the contractor must submit, for Government approval, the following analyses:



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(1) A strength and life analysis that identifies the magnitude of life enhancement required from peening, assesses the potential for degradation in life enhancements during operation and support, and identifies appropriate safeguards against degradation including the establishment of a proposed inspection interval that accounts for likely degradation.

(2) A report describing planned manufacturing process controls and nondestructive inspection.

c. Life certification and qualification testing (along with the strength and life analysis) will include the verification of the proposed inspection interval.

d. Except as approved by NAVAIRHQ, peening required during repair or rework to attain fatigue life will be by computer controlled and monitored processes or will conform to the same specifications and standards used for original manufacture.

e. All full scale development and life certification or qualification testing will be conducted on parts peened as per production requirements. The hardware configuration for testing necessary to verify a proposed inspection interval will be approved by the Government prior to the start of testing.

5. Definition. The term shot peening as used herein means the cold working of a surface layer in metal parts to reduce the surface tensile stresses. The purpose of the working process is to induce residual compressive stresses in specified surfaces, for the purpose of increasing fatigue life and/or inhibiting stress corrosion cracking. "Shot" as used herein refers to the medium used for cold working of surfaces and may be made from cast iron, cast steel, cut steel wire ceramic or glass as specified or approved. Computer monitored/controlled shot peening refers to the microprocessor controlled peening system designed to achieve the desired intensity and coverage. The required parameters for intensity, shot mass flow, air pressure, oscillation, turntable rotation, cycle time etc. are to be controlled through maximum and minimum limits which when reached will shut the equipment down. A comprehensive data record will be produced to document process integrity.

6. Action

a. NAVAIRHQ

(1) Assistant Commander for Fleet Support and Field Activity Management (AIR-04) will initiate action to conform with paragraph 4(d) of this instruction immediately following release of this instruction. Full compliance with paragraph 4(d) for all ongoing repair and rework will be accomplished not later than

June 1994. Pending final release of SAE AMS B87BC, draft AMS B87BC-2 of that document will be used as guidance. Application of microprocessor control, as required by paragraphs 4(a) and 4(d) above, may be constrained by availability of equipment and/or hardware configuration. This is to be taken into account in the review and approval of the contractor's proposed approach set forth in the strength and life analysis of paragraph 4(b)(1) of this instruction and/or case by case review of Naval Aviation Depot (NAVAVNDEPOT) waiver requests.

(2) Deputy Assistant Commander for Aviation Depot (AIR-43) will

(a) initiate action to provide microprocessor controlled peening at all NAVAVNDEPOT's as soon as possible;

(b) provide guidance and direction to the NAVAVNDEPOT regarding the implementation of policy;

(c) Forward disposition instructions received from AIR-05 to NAVAVNDEPOTs concerning waiver requests.

(3) Assistant Commander for Systems Engineering (AIR-05) systems, subsystems, and commodity managers will

(a) revise general equipment specifications and procurement specifications to incorporate the above policy;

(b) review for approval, contractor analyses submitted per new specification requirements and NAVAVNDEPOT waiver requests;

(c) assist class desk and weapon system program managers in implementing the policy;

(d) review part listings provided by NAVAVNDEPOT's to determine which require microprocessor controlled peening and their relative priority;

(e) review request for waivers submitted by NAVAVNDEPOT's and determine it's acceptability for incorporation into rework or repair procedures; and

(f) provide disposition instructions on waiver request to NAVAIRHQ (AIR-43).

(4) Product Integrity Management Division (AIR-516) will participate in the establishment of the American Metals Engineering Committee (AMEC) Computer Monitored Shot Peen Specification and provide inputs as necessary to AMEC to achieve a specification consistent with the Naval Air Systems Command (NAVAIR) policy.

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(5) Air Vehicle Division (AIR-530) will participate in the establishment of the AMEC Computer Monitored Shot Peen Specification and provide inputs as necessary to AMEC to achieve a specification consistent with the NAVAIR policy.

(6) NAVAIRHQ program managers will implement the policy for all design and development programs initiated after the date of this instruction. For previously initiated programs and follow-on procurement, implementation will be decided on a case by case review. Every effort will be made to implement the policy into all ongoing design and development efforts.

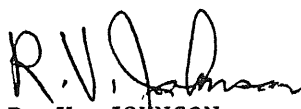
b. NAVAVNDEPOT'S will

(1) prepare a listing of all parts being shot peened at rework and repair annually per enclosure (1) and submit to NAVAIRHQ (AIR-43) 90 days after date of instruction and annually thereafter;

(2) submit a request for waiver for each item proposed for shot peening which does not meet the requirements of this instruction per enclosure (2) and submit to NAVAIRHQ (AIR-43) for approval; and

(3) define specifications, procure equipment, and implement microprocessor controlled peening for all parts identified by NAVAIR.

7. Reports. NAVAIR 4870-1 has been assigned to the requirements in paragraph 6b above, and is approved for 3 years from the date of this instruction.


R. V. JOHNSON
Deputy Commander

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SHOT PEENING OF AIRCRAFT COMPONENTS

DURING

REWORK AND REPAIR FORMAT

SUBMISSION DATE _____

1. ACTIVITY SUBMITTING REPORT
2. COGNIZANT INDIVIDUAL
3. LISTING OF ITEMS BEING SHOT PEENED, FOR EACH:
 - A. NOMENCLATURE OF ITEM
 - B. NEXT HIGHER LEVEL ASSEMBLY
 - C. FINAL SYSTEM USING ITEM
4. PRESENT PROCESS UTILIZED FOR SHOT PEENING
5. PLANS FOR IMPLEMENTING NAVAIRINST 4870.
6. HISTORY OF THE SHOT PEENING PROCESS UTILIZED
7. ADDITIONAL INFORMATION AS NECESSARY

WAIVER REQUEST

FOR

SHOT PEENING OF AIRCRAFT COMPONENTS FORMAT

As a minimum the waiver for computer controlled shot peening will address the following:

SUBMISSION DATE

1. Activity Requesting Waiver
2. Cognizant Engineer
3. Cognizant Engineer Code and Phone
4. Affected System/Subsystem
5. Nomenclature of System
6. Reason for waiver request
(Cost Benefit Analysis)
7. Alternate Peening Method Proposed
8. No. of Items Affected

Encl (2)

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the AMEC Computer Monitored Shot Peen Specification and provide inputs as necessary to AMEC to achieve a specification consistent with the Naval Air Systems Command (NAVAIR) policy.

b. AIR-05 systems/subsystems/commodity managers will (1) revise general equipment specifications and procurement specifications to incorporate the above policy, (2) review for approval, contractor analyses submitted in accordance the new specification requirements and Naval Aviation Depot (NAVAVNDEPOT) waiver requests, (3) assist class desk and weapon system program managers in implementing the policy and (4) review NAVAVNDEPOT provided part listings to determine which require micro processor controlled peening and their relative priority.

c. Program Managers will implement the above policy into all design/development programs initiated after the date of this notice and assess the possibility of implementation into ongoing programs.

d. AIR-43 will initiate action to provide micro processor controlled peening at all NAVAVNDEPOT as soon as possible.

e. AIR-43 will provide guidance and direction to the NAVAVNDEPOT regarding the implementation of the policy and require the following actions:

(1) Each NAVAVNDEPOT will submit a listing of all parts currently being peened at repair/rework.

(2) Each NAVAVNDEPOT will define specifications, procure equipment and implement micro processor controlled peening for all parts identified by NAVAIR (AIR-05).

7. Cancellation Contingency. This notice remains in effect until incorporated into a NAVAIR instruction.



L. E. BLOSE

Assistant Commander for

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