# Audit Report

OFFICE OF THE INSPECTOR GENERAL

**AIR FORCE STUDY ON PAINT STRIPPING TECHNOLOGY**

Report No. 93-086

April 15, 1993



## Department of Defense

INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

April 15, 1993

MEMORANDUM FOR ASSISTANT SECRETARY OF DEFENSE (PRODUCTION AND LOGISTICS)
ASSISTANT SECRETARY OF THE AIR FORCE (FINANCIAL MANAGEMENT AND COMPTROLLER)

SUBJECT: Audit Report on the Air Force Study on Paint Stripping Technology (Report No. 93-086)

We are providing this final report for your information and use. This report was requested by the Senate Armed Services Committee. It addresses an Air Force study of the various technologies that exist to strip paint from aircraft, and an Air Force test of one paint stripping system.

Comments from the Assistant Secretary of Defense (Production and Logistics) on a draft of this report were considered in preparing this final report. The comments conformed to the requirements of DoD Directive 7560.3 and there are no unresolved issues. Therefore, no additional comments are required.

The courtesies extended to the audit staff are appreciated. If you have any questions on this report, please contact Mr. Christian Hendricks, Program Director, at (703) 692-3414 (DSN 222-3414) or Mr. James Kornides, Project Manager, at (703) 692-3420 (DSN 222-3420). The planned distribution of this report is listed at Appendix E.

Edward R. Jones
Deputy Assistant Inspector General
for Auditing

cc:
Secretary of the Air Force

**Office of the Inspector General, DoD**

Report No. 93-086
Project No. 3LB-5003

April 15, 1993

# AIR FORCE STUDY ON PAINT STRIPPING TECHNOLOGY

## EXECUTIVE SUMMARY

**Introduction.** In 1991, a joint service study on alternative paint removal processes was started in DoD. In the same year, Congress directed the Secretary of the Air Force to study and submit a report on existing paint stripping technologies including an evaluation of their potential for reducing the amount of hazardous waste produced during the stripping process. Also in 1991, the Air Force tested a turbine wheel system that strips paint from aircraft. In 1992, the Senate requested the Inspector General, DoD, to review the conduct of the Air Force study of paint stripping technologies and the Air Force test of the turbine wheel system.

**Objectives.** Our objective was to evaluate the Air Force study of paint stripping technologies. Specifically, we evaluated whether the effort was in compliance with the parameters established by Congress. We also evaluated whether the Air Force performed a valid test of a turbine wheel system. Additionally, we evaluated the effectiveness of applicable internal controls.

**Audit Results.** The Air Force study provided to Congress did not adequately assess the features of various existing paint stripping technologies, including their potential for reducing hazardous waste. As a result, the Air Force study did not provide a good overview of various technologies that existed and their benefits; and the Air Force was not in compliance with the parameters that Congress established. Preliminary screening tests completed by Air Force engineers adequately proved that the turbine wheel system they tested did not perform as claimed by the equipment's vendors.

**Internal Controls.** We evaluated internal controls over the process used to complete the Air Force study of paint stripping technologies. We also evaluated the internal controls over the test of the turbine wheel system. Although we reported that all the information required by Congress was not included in the Air Force study, we did not consider this a systemic problem and made no internal control recommendations. Additionally, no internal control weaknesses existed in the conduct of the Air Force test of the turbine wheel technology. See Part I for a description of the controls assessed.

**Potential Benefits of Audit.** Potential benefits are nonmonetary (Appendix C). Implementation of the recommendation will facilitate compliance with the congressional requirement for a study of the various paint stripping technologies and their ability to reduce hazardous waste.

**Summary of Recommendation.** We recommended that a joint service study on alternative paint removal processes be submitted to Congress upon its completion, to augment the information provided in the Air Force study on paint stripping technologies.

**Management Comments.** The Assistant Secretary of Defense (Production and Logistics) agreed to take the recommended action. No additional comments are required.

# Table of Contents


Executive Summary i

**Part I - Introduction** 1

Background 2
Objectives 3
Scope 3
Internal Controls 3
Prior Audits and Other Reviews 4
Other Matters of Interest 4

**Part II - Finding and Recommendation** 5

Study of Paint Stripping Technology 6

**Part III - Additional Information** 11

Appendix A. Test of a Turbine Wheel System 12
Appendix B. Paint Stripping Technologies 15
Appendix C. Summary of Potential Benefits Resulting from Audit 17
Appendix D. Activities Visited or Contacted 18
Appendix E. Report Distribution 20

**Part IV - Management Comments** 22

Assistant Secretary of Defense (Production and Logistics) 23



This report was prepared by the Logistics Support Directorate, Office of the Inspector General for Auditing, DoD. Copies of the report can be obtained from the Secondary Reports Distribution Unit, Audit Planning and Technical Reports Directorate (703) 614-6303.

# Part I - Introduction

## Background

Paint and protective coatings used on military and commercial aircraft are removed before aircraft are repainted to accommodate structural inspection and to reduce weight. Paint is removed primarily with chemical paint strippers. However, chemical stripping is a labor intensive process and produces large amounts of hazardous waste.

For compliance with U.S. environmental protection initiatives, DoD and private industry are attempting to discontinue using hazardous chemicals to remove paint from aircraft. Both the Government and the commercial sector are developing and testing safer, more economical, and more environmentally acceptable paint removal systems.

There are various paint stripping technologies being pursued to replace the use of chemicals. Plastic media blasting (blasting with plastic beads) is one of several technologies being evaluated for use on DoD aircraft. However, the Military Departments and commercial airlines do not see this paint removal method as the universal solution because the process can damage some aircraft. As a result, other technologies are being developed.

Congressional Conference Report 102-311, November 13, 1991, and Senate Report 102-113, July 19, 1991, directed the Secretary of the Air Force to study the performance of the various paint stripping technologies and their potential for reducing hazardous waste generation. Specific parameters to be followed were included in the Senate report. Congress requested that the Air Force study be made available for congressional review by March 1, 1992.

The Air Force did not provide the study by March 1, 1992, which caused concern within the Senate Armed Services Committee that there may have been inconsistencies in procedures used to perform the study. As a result, Senate Report 102-352, July 31, 1992, required that the Inspector General, DoD, investigate the conduct of the study, particularly as it relates to compliance with the parameters that Congress established.

In a meeting held after the July 31, 1992, report, the Senate requested the Inspector General to evaluate the adequacy of an Air Force test of a paint stripping system, developed and built in Germany, that uses turbine wheel equipment to strip paint from aircraft. The Air Force test of that turbine wheel system was completed in October 1991.

The Air Force completed a study of paint stripping technology and submitted it to Congress on September 17, 1992.

## Objectives

Our objective was to evaluate the study the Air Force performed on paint stripping technologies. Specifically, we evaluated whether the effort was in compliance with the parameters that Congress established. We also evaluated whether the Air Force performed a valid test of a turbine wheel system. Further, we evaluated the effectiveness of applicable internal controls related to the conduct of the study and the test.

## Scope

**Review of Records.** We reviewed Senate Report 102-113 that specified the parameters the Air Force was required to follow to perform its study, "Aircraft Paint Stripping Technologies." We analyzed the Air Force's study to determine if it was conducted in accordance with the parameters. We interviewed personnel in the Air Force who performed the paint stripping study and who conducted the test of the turbine wheel system. We also reviewed and evaluated correspondence, records, and other documents covering the period from June 1988 to January 1993 that documented the Air Force's test of the turbine wheel.

**Engineering Specialists.** Engineering specialists from the Office of the Inspector General, DoD, assisted the auditors in evaluating the Air Force test of a turbine wheel system.

**Auditing Standards.** This economy and efficiency audit was made from November 1992 through January 1993 in accordance with auditing standards issued by the Comptroller General of the United States as implemented by the Inspector General, DoD, and accordingly, included such tests of internal controls as were considered necessary. Appendix D contains a list of activities visited or contacted.

## Internal Controls

We evaluated the effectiveness of internal controls established by the Air Force to perform a study of paint stripping technology in compliance with the parameters outlined in Senate Report 102-113, and to perform testing of a turbine wheel system in accordance with accepted testing methods. Although all the information required by Congress was not included in the Air Force study, we did not consider this a systemic problem and made no internal control recommendations. Additionally, no internal control weaknesses existed in the conduct of the Air Force test.

## Prior Audits and Other Reviews

There has been no other audit coverage of this specific issue in the last 5 years.

## Other Matters of Interest

Some DoD activities and commercial airlines use plastic media blasting instead of hazardous chemicals to remove paint from aircraft. However, it has not always been found to be beneficial. For instance, Boeing Aircraft Company published a service letter, "Plastic Media Blasting For Paint Removal," September 14, 1992, which recommended that operators of Boeing aircraft restrict the use of plastic media blasting for removing paint and protective coatings from aluminum. The letter warned of damage to the aircraft skin and recommended that no aluminum part, assembly, or aircraft surface be stripped using plastic media blasting more than once in its lifetime.

# Part II - Finding and Recommendation

# Study of Paint Stripping Technology

The Air Force study provided to Congress did not adequately assess the features of various existing paint stripping technologies, including their potential for reducing hazardous waste. The failure to consider all technologies and their benefits occurred because the Air Force did not obtain adequate data to perform the required study from some DoD and industry sources. Additionally, the conduct of the study lacked oversight. As a result, the study did not provide a good overview of the various technologies that exist and their benefits, and the Air Force was not in compliance with parameters that Congress established.

## Background

The Congressional Conference Report 102-311 accompanying the National Defense Authorization Act for Fiscal Years 1992 and 1993 directed that the Air Force perform a paint stripping study following the guidelines set forth in Senate Report 102-113.

Senate Report 102-113 states, "The Committee directs the Secretary of the Air Force to study the efficacy and environmental waste reductions potential of various paint stripping equipment technologies. The technologies in the study should include, but not be limited to, turbine wheel plastic media dispensing systems, and hose and nozzle plastic media dispensing systems. The study should evaluate the potential savings in hazardous waste generation and media procurement of high efficiency plastic media recycling. The report should also analyze the quality control and surface damage values of media size grading and cleaning systems, and a dense particle separator."

Congressional Conference Report 102-311 also stated that the study should take advantage of existing paint stripping test data bases that had been compiled by both domestic and foreign aircraft manufacturers and airlines.

## Air Force Study

**Focus of Study.** The Air Force completed its study on paint stripping technologies on May 15, 1992, and forwarded it to Congress on September 17, 1992. The Air Force study addressed many of the congressional requirements, particularly as they related to plastic media blasting technology. It summarized the plastic media blasting technologies of the turbine wheel and the hose and nozzle media dispensing systems; the potential savings in plastic media through the recycling of the media; the quality control procedures used to minimize damage to the surface that was stripped; and the operational benefits of a dense particle separator system that was used to separate the plastic media from the paint chips and metal particles that were produced during stripping.

The study also contained short summaries about the status of several other technologies, including high pressure water, carbon dioxide, and environmentally acceptable chemicals. (A description of the various technologies is in Appendix B.) Further, the study contained information on a test of a turbine wheel plastic media blasting system that was developed and built by Schlick Incorporated in Germany. Air Force engineering personnel performed the test in Germany.

We evaluated the results of the test of the Schlick turbine wheel equipment at the request of the Senate Armed Services Committee. We concluded that the preliminary screening tests performed by Air Force engineers adequately proved that the turbine wheel system did not perform better than hose and nozzle systems already owned by the Air Force. The preliminary test also showed that further testing of that turbine wheel system would not be cost-effective. Additional details on our evaluation of the Air Force test of the turbine wheel system are included in Appendix A.

**Air Force Study Deficiencies.** The Air Force Study did not adequately address two areas, other existing technologies and hazardous waste generation.

**Existing Technology.** The Air Force study did not adequately address several existing technologies such as sodium bicarbonate (baking soda), flashlamp (high-energy light), and water ice (crystallized ice) blasting. The Air Force has already tested some of the existing technologies. For example, sodium bicarbonate technology has been tested and used at the San Antonio Air Logistics Center. Engineering personnel at the San Antonio Center informed us that in FY 1990 sodium bicarbonate was successfully used to strip paint from aircraft parts. They indicated that it was also successfully used in FY 1989 to remove paint from the skin of an aircraft.

Several private sector companies have tested sodium bicarbonate and water ice. The tests were performed before the Air Force conducted its paint stripping study and the results of the tests appeared in the Environmental Protection Agency's conference report, "Reducing Risk in Paint Stripping," February 12, 1991. However, no information about the tests was included in the Air Force study.

**Hazardous Waste Generation.** The Air Force study did not satisfy the congressional requirement to perform an evaluation of each of the paint stripping technologies' potential savings in hazardous waste generation. The study did not compare the environmental waste reduction potential of the various technologies. Air Force personnel who performed the study indicated that there was little information on the amount of hazardous waste generated by existing or emerging technologies. Air Force personnel also stated that the actual savings of plastic media blasting technology compared to chemicals or other new technology alternatives has not been clearly documented.

Information about reductions in hazardous waste was available from both Government and commercial sources at the time the study was prepared. The report on the proceedings of the Environmental Protection Agency's international conference contained summary data about the hazardous waste generated and estimated waste disposal costs for many of the alternative paint removal processes that were in production, or development, in 1991.

For instance, data presented indicated that a commercial contractor found that use of carbon dioxide stripping resulted in a 96-percent reduction in toxic waste when compared to the waste generated by hazardous chemical stripping. The proceedings

also described use of sodium bicarbonate to strip paint and indicated that the method greatly reduced the volume of toxic waste compared to chemical stripping techniques. The amount of waste generated per minute and the estimated waste disposal costs were also provided.

**Information and Oversight.** Air Force participants in the study indicated that they concentrated on plastic media blasting and developed a plan for completing the study that focused on it. The participants indicated that plastic media blasting was the only technology in production at the time the study was performed. They also indicated that other technologies existed but they were still under development, and information about them was limited or not provided by the DoD activities surveyed. Air Force participants further indicated that personnel in activities such as the San Antonio Air Logistics Center, who had experience with technologies such as sodium bicarbonate and plastic media blasting, did not respond to requests for information on tests conducted with alternative paint stripping technologies.

We attributed the lack of information on alternative technologies in the Air Force study to insufficient oversight by Air Force management. The Air Force study was performed by the Manufacturing Technology Directorate of Air Force Materiel Command. Personnel in the Directorate indicated that they responded to the congressional request that was included in Senate Report 102-113. There was no formal tasking from the Secretary of the Air Force to perform the study, they simply attempted to adhere to the language in the congressional report. Personnel in Headquarters, Air Force Material Command, did review the report and suggested changes (specifically, to include available data on other technologies); however, there was no evidence of a follow-up review to ensure the suggested changes were made.

## Joint DoD Study

During our audit, there was another study of paint removal processes ongoing in DoD. In December 1989, DoD's Joint Policy Coordinating Group on Depot Maintenance tasked its Joint Technology Exchange Group to conduct a study of alternative paint removal processes that have potential use within the DoD depot maintenance community. At the time of the audit, personnel performing the study were compiling information, including test results, accumulated by various DoD Components based on experience with various paint removal processes.

The plan for the joint study indicated that the evaluation was being conducted to reduce the amount of pollution generated by paint removal, which was one of the depots' largest waste sources. The plan indicated that there was an increasing number of paint removal options being marketed, which had caused a proliferation of disjointed efforts to evaluate the new removal processes. As a result, the Joint Policy Coordinating Group indicated that there was potential for costly duplication and unforeseen damage to weapon systems.

The Joint Technology Exchange Group was instructed to plan and manage the study, identify the techniques and technologies to be studied, sponsor and advocate research and development initiatives, oversee joint DoD testing, and evaluate and report the results. Among the initial paint removal processes to be studied were sodium bicarbonate, carbon dioxide pellets, high pressure water, laser, and plastic media blasting.

The joint study began in January 1991. Draft reports on three of the technologies being studied were projected for completion in FY 1993. Although the DoD joint study is not tasked to evaluate every current and emerging paint stripping process, it appears to be more appropriately focused on the various technologies in existence than the Air Force study. The joint study group was collecting test data from various sources, including shipyards as well as aviation activities, and planned to publish the results of each test. The joint study group had access to environmental engineering support in each Military Department and appeared to be in a better position to offer more detailed information on the various technologies in existence and their potential to reduce hazardous waste.

## Conclusion

The Air Force study of paint stripping did not provide a complete overview of the various paint stripping technologies that exist and their benefits. Current and emerging technologies were not adequately presented and the potential of the various technologies for reducing hazardous waste was not addressed. A DoD joint study group, that was evaluating various paint stripping technologies at the time of the audit, appeared to be in a better position to provide Congress with the information that it requested. Submission of the joint study group's report to Congress is appropriate, given the timing and content of the product, and it would preclude overlap that would result from further Air Force efforts.

## Recommendation for Corrective Action

We recommend that the Assistant Secretary of Defense (Production and Logistics) obtain the study by the Chairman of the Joint Policy Coordinating Group on Depot Maintenance, of alternative paint removal processes, and provide the study to Congress as an addendum to the Air Force study of paint stripping technologies.

## Management Comments

The Assistant Secretary of Defense (Production and Logistics) concurred with the Recommendation and stated that when it is completed, executive level summary information on the Joint Paint Removal Study will be provided to Congress. The complete text of the Assistant Secretary's comments is in Part IV of this report. No additional comments are required.

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# Part III - Additional Information

# Appendix A. Test of a Turbine Wheel System

In response to a request from the Senate Armed Services Committee, we evaluated a test conducted by the Air Force of the Schlick turbine wheel system.

## Background

One of the latest methods developed for removing paint from aircraft skins is to blast it off using plastic media (fine sand-like particles of plastic). The plastic media can be delivered under pressure using different dispensing systems. One method of dispensing the plastic media is to use hose and nozzle equipment (similar to a fireman's hose except that compressed air is used). Another method is to use a turbine wheel whereby the media is fed into a spinning wheel and shot out against the skin of an aircraft.

DoD and commercial airlines use hose and nozzle systems to strip paint from aircraft. For example, all five Air Force Air Logistics Centers and the Naval Aviation Depot at Cherry Point Marine Air Station, North Carolina, are using the hose and nozzle system to strip removable aircraft components. However, this system is used only on a selected number of aircraft due to the differences in the materials, thickness of the aircraft skin, and potential for damage. The use of the turbine wheel method has not been approved or accepted by the military or commercial airlines in the United States.

## Productivity, Reliability, Availability, and Maintainability (PRAM) Project

In 1991, the Air Force established a PRAM project to evaluate turbine wheel technology. The objective of the project was to evaluate the economic benefit of the turbine wheel system as opposed to the existing hose and nozzle system.

The PRAM project cost was estimated at $925,000. The Air Force planned to accomplish the project in four phases. Phase I, the process qualification phase, was to consist of a complete material characterization test. Phase II and Phase III of the project included system design and procurement of one prototype turbine wheel. Phase IV called for procurement of four additional wheels. Advancement to each higher phase of the project was dependent on the successful testing and cost-effectiveness of the system.

# Test of a Turbine Wheel System

The Air Force tested one turbine wheel system in Phase I of the PRAM project. In October 1991, the Air Force performed a test on the turbine wheel system that was developed and built by Schlick Incorporated. The Air Force effort was initiated as a result of claims made by Schlick and an American company, Striptech International, that the turbine wheel developed by Schlick was fast and did very little damage to the aircraft skin. The Air Force anticipated that it would be especially good on large aircraft, such as the C-5 and B-52. Those aircraft have large surface areas that are ideally suited to the turbine wheel method of paint stripping.

The Air Force considered the Schlick turbine wheel equipment worthy of initial testing under Phase I of the PRAM Program. The test of the Schlick turbine wheel equipment was conducted at Schlick Incorporated Plant, Metelen, Germany, from September 20, 1991, through October 6, 1991.

Initially, the Air Force planned to perform a full materials characterization test on the system. This test would consist of an Almen arc height test (test of damage caused by a process), fatigue and crack growth tests, and a blast pattern uniformity test. An economic evaluation was also planned that included a strip rate test, a media consumption test, and a mass flow controllability test. However, upon completion of preliminary Almen arc height and strip rate tests, the Air Force concluded that the system did not perform as claimed.

Striptech International claimed that the turbine wheel system could strip off paint more rapidly than other plastic media blasting systems with no damage to the aircraft skin. Air Force documents indicated that the Air Force expected to see a system that stripped at a rate of 15 square feet per minute with an arc height (deterioration of the metal) of less than .001 using Type II media (urea formaldehyde).

Test results obtained from Air Force engineers indicated that the strip rate achieved by the turbine wheel system using 30/40 grit (large pieces) Type II media was 3.9 square feet per minute. The test produced an arc height of .010 that was unacceptable. Further testing with a smaller grit reduced the arc height to .005. However, the strip rate decreased to 2.13 square feet per minute.

According to Air Force engineering personnel, the results with Type II media were disappointing. The information the engineering personnel provided us indicated that the Air Force is achieving better arc heights (.003) using hose and nozzle equipment. Air Force engineers considered an arc height of .005 too damaging to aluminum.

Air Force records also showed that, in conjunction with the contractors, Air Force engineers blasted additional strips using alternative media, including wheat starch, Type V media (acrylic), and the shells of walnuts. The media types had not previously been tested in the turbine wheel system. Wheat starch and Type V media were made available for the test by the Air Force in its effort to give the turbine wheel system every possible opportunity to demonstrate that it was better than other systems.

The test results of wheat starch provided an Almen arc height of .0027, but when slung from the turbine wheel the media broke down rapidly. The breakdown resulted in

ineffective paint removal. The Air Force engineers believed that the media held promise for use in hose and nozzle systems, but not in the existing Schlick turbine wheel.

According to test documentation, the best preliminary screening tests results were achieved with the Type V media and walnut shells. The test records indicated that Type V media resulted in a strip rate of 3.25 square feet per minute and that the media held up well. However, the arc height achieved with Type V media was .0038, which was no better than the arc height the Air Force achieves with hose and nozzle systems.

Using walnut shells in the turbine wheel, the Air Force obtained a very good arc height of .002. However, upon further investigation, the Air Force determined that walnut shells would not work well in a production setting. Air Force engineers found that the media is explosive and can support a mold and fungus that would constitute a health hazard.

Air Force engineers indicated that a bigger turbine wheel would result in an improved strip rate regardless of the type of media used. However, the Almen arc height test results, using a workable media such as Type V, indicated that the turbine wheel system would not be an improvement over hose and nozzle systems.

As a result of the Almen arc height tests using plastic media and other problems associated with the alternative media, the Air Force decided not to conduct a thorough materials characterization test of the Schlick system.

Air Force engineering personnel indicated that Almen arc height testing is routinely used by the Air Force to predict the fatigue caused by an engineering method without going through the expensive process of fatigue testing. The Almen arc height tests were considered good indicators of the fatigue problems that will occur in metal, including aluminum, as a result of the stripping process.

Because of the results of the preliminary tests of the turbine wheel in Germany, Air Force engineers indicated that it would not be cost-effective for the Air Force to fund further testing of that system. They indicated that a full materials characterization test would cost approximately $200,000 and the Air Force did not wish to expend the funds because the preliminary tests provided sufficient information to conclude that the Schlick turbine wheel system was no less damaging to aircraft than their existing hose and nozzle system.

Personnel in the PRAM project office indicated that the goal of a PRAM project is to adapt existing off-the-shelf commercial equipment to Air Force use. In this case, the existing equipment did not show promising almen arc height data or a strip rate that would make it economical in a life cycle cost analysis. During the audit, the PRAM project office withdrew the remaining PRAM phases and funding for the turbine wheel project.

## Conclusion

The Air Force did not perform a thorough test of the Schlick turbine wheel system. However, the Air Force's preliminary screening tests were valid tests and they provided sufficient information for the Air Force to conclude that further expensive testing of the existing Schlick turbine wheel system would not be prudent.

# Appendix B. Paint Stripping Technologies

## Carbon Dioxide

The carbon dioxide method uses small frozen pellets of carbon dioxide. The pellets are propelled against painted surfaces. The thermal shock causes the paint and primer to quickly shrink and break the bond between the paint and aircraft skin. One commercial contractor found that use of carbon dioxide stripping resulted in a 96-percent reduction in toxic waste generated when compared to the waste generated by hazardous chemical stripping.

## Environmentally Acceptable Chemicals

Alternative chemicals (to hazardous methylene chloride) are used to strip the paint from an aircraft. Possible elimination of 100 percent of hazardous chemicals can be achieved, excluding the paint itself.

## Flashlamp

The flashlamp method uses a high-energy light source to "vaporize" the coatings. The flashlamp method leaves a carbon deposit on the aircraft that must be removed with either a controlled chemical or carbon dioxide pellets.

## High Pressure Water Blasting

Water blasted at high pressures (20,000 to 30,000 pounds per square inch) is used to remove surface coatings. The water is blasted through a nozzle to erosively degrade and remove paint coatings. Water blasting can reduce hazardous waste by 90 percent over hazardous chemicals.

## Laser

Laser beams are used to remove paint by targeting laser energy directly onto the coating surface. Environmental issues include containment of possible volatiles released into the atmosphere during paint vaporization, as well as disposal of the burned paint ash that may contain eight heavy metals.

## Plastic Media Blasting

A process whereby plastic beads are propelled through either a hose and nozzle or a turbine wheel is used to remove coatings from aircraft structures and component parts. The waste stream of the plastic media blasting consists of an inert nonhazardous plastic dust, paint chips, trash accumulated in the system, and a small amount of hazardous heavy metal found in the paint chips.

## Sodium Bicarbonate

Baking soda is propelled by compressed air onto the aircraft surface to remove paint. The baking soda flows through a nozzle to strike the aircraft surface and disintegrates, taking with it the paint coating. The filtered paint chips are the only potentially hazardous waste material, thus greatly reducing the volume of toxic waste compared to chemical stripping techniques.

## Water Ice Blasting

Crystallized ice is used in this nonabrasive technique. The process fractures the paint coating by blasting it with various size ice particles through a nozzle. The spent media is water, which can easily be separated from the paint chips. Therefore, there is no spent media to compound hazardous waste disposal problems.

# Appendix C. Summary of Potential Benefits Resulting from Audit

| Recommendation Reference | Description of Benefit | Type of Benefit |
|---|---|---|
| Recommendation | Compliance. DoD will fully comply with congressional requirements by providing a joint study on alternative paint removal processes to Congress as an addendum to the Air Force study on paint stripping technology. | Nonmonetary |

# Appendix D. Activities Visited or Contacted

**Office of the Secretary of Defense**

Assistant Secretary of Defense (Production and Logistics), Washington, DC

**Department of the Air Force**

Secretary of the Air Force, Office of Legislative Liaison, Washington, DC
Secretary of the Air Force, Management Policy and Program Integration, Washington, DC
Assistant Secretary of the Air Force (Financial Management and Comptroller), Washington, DC
Air Force Material Command, Wright-Patterson Air Force Base, OH
Manufacturing Technology, Wright-Patterson Air Force Base, OH
Headquarters San Antonio Air Logistics Center, Kelly Air Force Base, TX
Headquarters Oklahoma City Air Logistics Center, Tinker Air Force Base, OK

**Department of the Navy**

Naval Air Systems Command, Washington, DC
Naval Aviation Depot, Cherry Point Marine Air Station, NC

**Defense Activities**

Joint Depot Maintenance Analysis Group, Dayton OH

**Non-Defense Activities**

U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxic, Washington, DC

## Appendix D. Activities Visited or Contacted

### Congressional Committees

Senate Armed Services Committee Staff Members, Washington, DC

### Contractors

Schlick-America Inc, Randallstown, MD
Striptech International, Mount Pleasant, SC
Southwest Research Institute, San Antonio, TX
Battelle Corporation, Columbus, OH

# Appendix E. Report Distribution

**Office of the Secretary of Defense**

Assistant Secretary of Defense (Production and Logistics)
Assistant Secretary of Defense (Public Affairs)
Comptroller of the Department of Defense

**Department of the Air Force**

Secretary of the Air Force, Office of Legislative Liaison
Secretary of the Air Force, Management Policy and Program Integration
Assistant Secretary of the Air Force (Financial Management and Comptroller)
Air Force Materiel Command
Headquarters San Antonio Air Logistics Center
Headquarters Oklahoma City Air Logistics Center
Manufacturing Technology, Air Force Materiel Command
Air Force Audit Agency

**Defense Agencies**

Director, Defense Contract Audit Agency
Director, Defense Intelligence Agency
Director, Defense Logistics Agency
Director, Defense Logistics Studies Information Exchange
Director, National Security Agency

**Non-DoD Activities**

Office of Management and Budget
U.S. General Accounting Office
National Security and International Affairs Division, Technical Information Center
National Security and International Affairs Division, Defense and National Aeronautics and Space Administration Management Issues
National Security and International Affairs Division, Military Operations and Capabilities Issues

**Non-DoD Activities** (Cont'd)

Chairman and Ranking Member of the Following Congressional Committees and Subcommittees

Senate Committee on Appropriations
Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Government Affairs
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
House Committee on Armed Services
House Committee on Government Operations
House Subcommittee on Legislation and National Security, Committee on Government Operations

# Part IV - Management Comments

# Assistant Secretary of Defense (Production and Logistics) Comments

PRODUCTION AND LOGISTICS

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, DC 20301-8000

April 6, 1993

(L/MD)

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE

THROUGH: CHIEF, CAIR/APPI /RW 6 APR 93

SUBJECT: Draft Report on the Audit of the Air Force Study on Paint Stripping Technology (Project No. 3LB-5003)

This memorandum responds to your February 26, 1993, request for comments on the subject draft report. If you have any questions regarding these comments, please contact Jay Berry or Lt Col Dan Falvey at 695-5315.

Robert I. Mason for

Jeffrey A. Jones
Acting Deputy Assistant Secretary
(Logistics)

Attachment

## Assistant Secretary of Defense (Production and Logistics) Comments

DASD(L) Response to the OIG Draft Report on the Audit of the Air Force Study on Paint Stripping Technology (Project No. 3LB-5003) dated February 26, 1993

**Finding:** "The Air Force did not adequately assess the features of various existing paint stripping technologies, including their potential for reducing hazardous waste, in its study of paint stripping technologies. This failure to consider all technologies and their benefits occurred because the Air Force did not obtain adequate data to perform the required study. There was also a lack of oversight over the conduct of the study. As a result, the study did not provide a good overview of the various technologies that exist and their benefits, and the Air Force was not in compliance with the parameters established by Congress."

**Response:** We partially concur with the finding. As your report notes, the Air Force assessment of the plastic media blasting technologies was adequate. The Air Force focused their study on mature technology, and dealt on a more limited basis with alternative technologies that are undergoing further study. We feel the Air Force study was fully responsive to the Congressional direction. However, as noted in the audit, other information is being gathered that may be of value to the Congress, and as it is finalized, it should be provided to the interested committees.

**Recommendation:** "We recommend that the Assistant Secretary of Defense (Production and Logistics) obtain the study of the Chairman, Joint Policy Group on Depot Maintenance, which examines alternative paint removal processes and provide it to Congress as an addendum to the Air Force study of paint stripping technologies."

**Response:** We concur with your recommendation. When it is completed, we will provide executive level summary information on the Joint Paint Removal Study to Congress. The majority of the five technology assessments should be completed this calendar year, though some of the projects on the less mature technology may delay the transmittal of information.

# Audit Team Members

| | |
|---|---|
| Shelton R. Young | Director, Logistics Support Directorate |
| Christian Hendricks | Program Director |
| James L. Kornides | Project Manager |
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# INTERNET DOCUMENT INFORMATION FORM

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**B. DATE Report Downloaded From the Internet: 05/08/99**

**C. Report's Point of Contact: (Name, Organization, Address, Office Symbol, & Ph #):** **OAIG-AUD (ATTN: AFTS Audit Suggestions)**
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**400 Army Navy Drive (Room 801)**
**Arlington, VA 22202-2884**

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