Corn Hybrid Polymer Media for Coatings Removal from Delicate Substrates

Brian Yallaly, NDCEE

The NDCEE is operated by: Concurrent Technologies Corporation
Report Documentation Page

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE
MAY 2008

2. REPORT TYPE

3. DATES COVERED
00-00-2008 to 00-00-2008

4. TITLE AND SUBTITLE
Corn Hybrid Polymer Media for Coatings Removal from Delicate Substrates

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

6. AUTHOR(S)

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
National Defense Center for Energy and Environment, Operated by Concurrent Technologies Corporation, 100 CTC Drive, Johnstown, PA, 15904

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSOR/MONITOR’S ACRONYM(S)

11. SPONSOR/MONITOR’S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:

<table>
<thead>
<tr>
<th>a. REPORT</th>
<th>b. ABSTRACT</th>
<th>c. THIS PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>unclassified</td>
<td>unclassified</td>
<td>unclassified</td>
</tr>
</tbody>
</table>

17. LIMITATION OF ABSTRACT
Same as Report (SAR)

18. NUMBER OF PAGES
34

19a. NAME OF RESPONSIBLE PERSON

Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std Z39-18
Presentation Outline

- Background
- Objectives
- Technology Overview
- Proof-of-Concept Evaluation
- Demonstrations
Background

- Coatings removal and selective stripping techniques are performed routinely during maintenance, repair, and overhaul activities.

- Current processes include chemical strippers, media blasting, and manual coatings removal methods that often result in:
  - Substrate damage
    - Unnecessary rework
    - Reduced part life
  - Solvent vapor release
  - Hazardous waste generation
  - Unsafe working conditions

- Past efforts evaluated several alternative coatings removal technologies.

- Corn-based blasting media
  - Provides acceptable stripping rates
  - Does not damage delicate substrates
  - Generates biodegradable and recyclable material
Objectives

- Evaluate corn-based blasting media for removing coatings from delicate substrates
- Evaluate overall coatings removal efficacy and cost feasibility
- Determine if the process meets stakeholder requirements
- Identify approval authorities and implementation paths for corn-based blasting media at DoD facilities
- Determine feasibility and help facilitate field implementation
Corn Hybrid Polymer (CHP) Media (eStrip™ GPX)

- Polycrystalline cornstarch material
- 100% organic, non-toxic, and biodegradable
- Operating pressures range from 20-35psi
- Used in standard light abrasive blast equipment
- Considered a “drop-in” replacement for many plastic media blasting (PMB) systems
  - Meets MIL SPEC for Type VII PMB
  - Approved as Type VII by the USAF
- Generates minimal waste
- Manufactured by Archer Daniels Midland (ADM)
- Sole Government distributor is Midvale Environmental Technologies
CHP Demonstration Facility

- Demonstrations were conducted inside of Midvale’s mobile demonstration facility, facility blast booths, or in-situ (ship bulkhead)

- Media is recovered inside of the mobile facility and then disposed of by host facility personnel or Midvale
Overview of Demonstrations

- Naval Station (NS) Mayport Proof-of-Concept Evaluation
- Demonstrations
  - Naval Submarine Base (NSB) Kings Bay
  - Helispec (Fort Rucker)
  - NS Mayport
  - Robins Air Force Base (AFB)
  - Corpus Christi Army Depot (CCAD)
Proof-of-Concept Evaluation
NS Mayport

- Proof-of-concept evaluation performed February 14-15, 2006
- Participants/Stakeholders
  - In-Service Support Center (ISSC) Jacksonville (NAVAIR)
  - Fleet Readiness Center Southeast (FRCSE)
  - Robins AFB
  - Aircraft Intermediate Maintenance Detachment (AIMD) Mayport
  - Southeast Regional Maintenance Center (SERMC) Mayport
  - NSB Kings Bay Trident Refit Facility (TRF)
  - Blount Island Command (USMC Prepositioning Programs)
  - NASA
- Calculated and recorded coatings removal rates and stakeholders’ visual observations respectively.
- Performed a cost analysis for selected components.
Proof-of-Concept Components Evaluated

- C-130 spinner cap
  - Baseline: 0.6 ft²/hr
  - CHP: 9.8 ft²/hr

- F-15 speed brake
  - Baseline: 0.3 ft²/hr
  - CHP: 9.1 ft²/hr

- MK-92 radome panel
  - Baseline: 4.0 ft²/hr
  - CHP: 29.7 ft²/hr

- P-3 radome panel
  - Baseline: 3.0 ft²/hr
  - CHP: 12.3 ft²/hr

- SH-60 helicopter blade
  - Baseline: 1.0 ft²/hr
  - CHP: 9.0 ft²/hr

- HMMWV hood
- PCMS tiles
- NASA windbrake panels
- T-45 speed brake
- EP-3 blade antenna
- F-18 antenna cover
- Surface ship life raft shell
- LM2500 gas turbine engine bullet nose
- Locker shield
- AS2815 UHF antenna
Proof-of-Concept Results (cont.)

F-15 speed brake (Fiberglass substrate) (prior to coating removal)

SH-60 helicopter blade (Titanium/fiberglass/carbon graphite substrate) (prior to coating removal)

Coating removed to the primer at a rate of 9.1 ft²/hr (@ 33psi) with no resulting visible substrate (fiberglass) damage

Coating removed to the primer (left) at a rate of 29 ft²/hr (@ 26psi) and to the substrate (right) at a rate of 9 ft²/hr (@35 psi), with no resulting visible substrate (titanium/fiberglass/carbon graphite) damage in either case
Coating removed from P-3 radome panel (polyester fiberglass) at a rate of 12 ft²/hr with no visual damage.

Coating removed from C-130 spinner cap at a rate of 10 ft²/hr with no visual damage to the substrate (fiberglass) or embedded electrical wires.
## Cost Analysis

<table>
<thead>
<tr>
<th>Component</th>
<th>Facility</th>
<th>Baseline Process</th>
<th>Estimated Annual Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-130 Spinner</td>
<td>Robins AFB</td>
<td>Hand Sanding</td>
<td>$1,627,309</td>
</tr>
<tr>
<td>F-15 Speed Brake</td>
<td></td>
<td>Hand Sanding</td>
<td>$198,026</td>
</tr>
<tr>
<td>P-3 Orion Nose Radome</td>
<td>FRC SE</td>
<td>Hand Sanding/Chemical</td>
<td>$38,666</td>
</tr>
<tr>
<td>MH-60 Helicopter Blade</td>
<td>AIMD</td>
<td>Hand Sanding</td>
<td>$19,510</td>
</tr>
<tr>
<td>MK-92 Radome</td>
<td>SERMC</td>
<td>Hand Sanding</td>
<td>$56,991</td>
</tr>
</tbody>
</table>
NSB Kings Bay Demonstration

- Based on the successful proof-of-concept evaluation, personnel in attendance from NSB Kings Bay TRF requested a CHP demonstration at their facility.
- Demonstration performed March 21-22, 2006.
- Components Evaluated:
  - Ice Cap
    - Baseline: 1.0 ft²/hr  
    - CHP: 32.7 ft²/hr
  - Navigational Sonar System (NSS) Window
    - Baseline: 0.79 ft²/hr  
    - CHP: 25.7 ft²/hr
  - Sail Window
    - Baseline: 5.5 ft²/hr  
    - CHP: 34.4 ft²/hr
  - Clam Shell Hatch
    - Baseline: 0.4 ft²/hr  
    - CHP: 4.3 ft²/hr
- Combined cost analysis for these components showed an annual operating cost savings of $76,617.
Helispec (Fort Rucker) Demonstration

- Conducted on U.S. Army helicopter substrates on August 22-24, 2006 at Helispec facility in Brantley, AL
  - Coordinated Efforts
    - AMCOM
    - Fort Rucker Aviation Center Logistics Command (ACLC)
    - U.S. Army Research, Development, and Engineering Command (RDECOM)
    - CCAD

- Calculated and recorded coatings removal rates and stakeholders’ visual observations respectively. Coatings removed at acceptable rates (per Fort Rucker ACLC and RDECOM feedback) with no visible substrate damage
Helispec (Fort Rucker) Components Evaluated

- **UH-60 Rotor Blade (Kevlar)**
  - CHP: 34.4 ft$^2$/hr

- **OH-58 Radio Compartment Door (aluminum)**
  - CHP: 24.3 ft$^2$/hr

- **OH-58 Pilot Door (aluminum)**
  - CHP: 12.9 ft$^2$/hr

- **UH-1H Tail Rotor Blade (honeycomb aluminum)**
  - CHP: 17.7 ft$^2$/hr (to primer), 8.7 ft$^2$/hr (to substrate)

- **UH-1H Elevator Skin (aluminum)**
  - CHP: 23.1 ft$^2$/hr

- **UH-1H Transmission Mount (cast iron)**
  - CHP: 37.5 ft$^2$/hr

- **OH-58 Cowling Cover (fiberglass)**
  - Removal rate not determined
Helispec Demonstration Results

UH-60 rotor blade
(Fiberglass substrate with sections of aluminum lightning mesh) (prior to coating removal)

Coatings removed to fiberglass substrate at a rate of 34.4 ft²/hr (@ 32psi) with no substrate damage

Coatings removed from fiberglass as well as a section of aluminum lightning mesh
NS Mayport Demonstration

Based on proof-of-concept results, a demonstration was performed at NS Mayport on October 16-24, 2006

Participants/Stakeholders
- ISSC
- FRCSE
- SERMC Mayport
NS Mayport Components Evaluated

- **MK-92 Radome (top half)**
  - CHP: 36 ft²/hr (@25psi)
- **HMMWV Hood**
  - CHP: 20.9 ft²/hr (@38psi)
- **T-45 Seal**
  - CHP: 40.1 ft²/hr (@38psi)
- **UH-60 Blackhawk Rotor Blade**
  - CHP: 25.7 ft²/hr (@32psi)
- **P-3 Radome**
  - CHP: 10.9 ft²/hr (@32psi)
- **PCMS Tiles (removed panels)**
  - CHP: 100.8 ft²/hr (@20psi) to primer
  - CHP: 67.2 ft²/hr (@20psi) to substrate

- SERMC Antenna Repair Shop blast booth was used for the MK-92 Radome
- Prototype containment system was used for in-situ PCMS tiles coatings removal from the USS Simpson (FFG 56)
MK-92 Radome

- MK-92 Radome (fiberglass honeycomb substrate)
  - Surface Area: 250 ft$^2$
  - Baseline hand sanding: 4 ft$^2$/hr = 62.5 hrs/part
  - CHP: 36 ft$^2$/hr (@25psi) = 7 hrs/part
  - Labor savings: 55.5 hrs/part
Robins AFB Demonstration

- Demonstration performed February 13-14, 2007
- Components Evaluated
  - C-130 Spinner Cap
  - MC-130H Nose Radome
  - C-130 Hat Dome
  - C-130 Tail Cove
- Robins AFB personnel determined through visual inspection that the CHP media stripped all components with no visible damage to the delicate substrate materials.
MC-130H Nose Radome

- Fiberglass Honeycomb Substrate
- Coating System:
  - MIL-PRF-23377 Type 1 Primer
  - MIL-C-83231 Type II Polyurethane Rain Erosion Coating
  - MIL-C-85285 Polyurethane Topcoat
- Strip Rate 42.35 ft$^2$/hr (@35psi)
- Coating removed to bare fiberglass substrate
- No visible substrate damage
CCAD Demonstration

- Conducted on U.S. Army helicopter substrates on March 11-13, 2008
- Participants
  - CCAD
  - RDECOM
- Calculated and recorded coatings removal rates and stakeholders’ visual observations respectively
CCAD Components Evaluated

- UH-60 Blackhawk Main Rotor Blade
- UH-60 Blackhawk Blade Cuff
- UH-60 Blackhawk Tip Cap
- UH-60 Blackhawk Tail Rotor Blade
- UH-60 Blackhawk Tail Rotor Pitch Control Arm
- UH-60 Blackhawk Stabilator
- UH-60 Blackhawk Tail Gear Case Housing
- UH-60 Blackhawk Bottom Transmission Sump Housing
- AH-64 Apache Tail Blade
UH-60 Blackhawk Rotor Blade

- Fiberglass Honeycomb Substrate with Aluminum Lightning Mesh
- Coating System:
  - MIL-PRF-23377 Primer
  - MIL-C-46168 Topcoat
- Strip Rate 15.3 ft²/hr (@30psi) (Baseline: 1.5 ft²/hr)
- Coating removed to bare fiberglass substrate
- No visible substrate damage

UH-60 Rotor Blade Section
Prior to CHP Blasting

UH-60 Rotor Blade Section
CHP Blasting Various Pressures
UH-60 Blackhawk Stabilator

- Aluminum and Kevlar Substrates
- Coating System:
  - MIL-PRF-23377 Primer
  - MIL-C-46168 Topcoat
- Strip Rate: Aluminum Section: 32.1 ft²/hr (@25psi) (Baseline: 34.5 ft²/hr)
  Kevlar Section: 15.1 ft²/hr (@32psi) (Baseline: 2.05 ft²/hr)
- Coating removed to bare substrates
- No visible substrate damage
Summary

Based on these demonstrations, CHP has been implemented or is in the process of implementation at:
- FRCSE
- Robins AFB
- NSB Kings Bay TRF

Demonstrations have shown CHP to be effective without damage to delicate substrates and have shown substantial stripping rate increases over baseline coatings removal methods.
Acknowledgements

- NDCEE Executive Agent
  Mr. Tad Davis, DASA (ESOH)

- NDCEE Program Director
  Mr. Hew Wolfe, ODASA (ESOH)

- NDCEE Program Manager
  Dr. Charles Lechner, ODASA (ESOH)

- NDCEE Contracting Officer’s Representative
  Mr. Tom Moran, ODASA (ESOH)

- NSWCCD
- USAEC
- ISSC Jacksonville
- FRCE
- NSB Kings Bay
- NASA AP2
- AMCOM
- USMC
- Simmon AAF, Fort Bragg

- U.S. Navy CNO, N45
- NAVAIR
- FRCSE
- NS Mayport
- Robins AFB
- TACOM
- RDECOM
- CCAD
Contact Information

NDCEE Task 429 N1 Technical Monitor
Name: Dr. Scott Sirchio
Organization: NSWCCD
Email: scott.sirchio@navy.mil
Phone Number: 301-227-5196

NDCEE Task 429 A7 Technical Monitor
Name: Mr. Tom Guinivan, P.E., BCEC
Organization: USAEC
Email: thomas.guinivan@us.army.mil
Phone Number: 410-436-5910

NDCEE Project Manager
Name: Mr. Brian Yallaly
Organization: CTC
Email: yallalb@ctc.com
Phone Number: 904-486-4007

This work was funded through the Office of the Assistant Secretary of the Army (Installations and Environment) and conducted under contract W74V8H-04-D-0005 Task 0429.
Back-up/Support Slides
## Proof-of-Concepts Results

<table>
<thead>
<tr>
<th>Component</th>
<th>Coating System</th>
<th>Substrate</th>
<th>Process</th>
<th>Strip rate (ft²/hr)</th>
<th>Comments</th>
<th>Nozzle Pressure (psi)</th>
<th>Strip rate (ft²/hr)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-130 Spinner</td>
<td>Surface primer with polyurethane erosion resistant coating (7-9 mils total)</td>
<td>Fiberglass with electrical wires embedded</td>
<td>Hand Sanding</td>
<td>0.6</td>
<td>Significant damage to substrates and wires embedded within</td>
<td>35</td>
<td>9.8</td>
<td>Coating removed to the substrate with no visible damage</td>
</tr>
<tr>
<td>F-15 Speed Brake</td>
<td>Wash Primer, followed by polyurethane, finished with anti-static topcoat (15 mils total)</td>
<td>Fiberglass</td>
<td>Hand Sanding</td>
<td>0.3</td>
<td>Extremely time consuming and substrate damage often noted</td>
<td>33</td>
<td>9.1</td>
<td>Coatings removed to primer with no visible substrate damage</td>
</tr>
<tr>
<td>P-3 Radome</td>
<td>Epoxy primer and polyurethane topcoat (10 mils total)</td>
<td>Polyester fiberglass</td>
<td>Hand Sanding</td>
<td>3.0</td>
<td>Extremely time consuming and substrate damage often noted</td>
<td>23</td>
<td>12.3</td>
<td>100% removal of topcoat and primer with no visible substrate damage</td>
</tr>
<tr>
<td>SH-60 Helicopter Blade</td>
<td>Polyurethane, Titanium, fiberglass, and carbon graphite matrix</td>
<td>Hand Sanding</td>
<td>1.0</td>
<td>Fiber waste is not contained and sanding process is not worker friendly</td>
<td>26</td>
<td>29.0</td>
<td>Coating removed to primer with no visible substrate damage</td>
<td></td>
</tr>
<tr>
<td>MK-92 Radome</td>
<td>Enamel (7-9 mils)</td>
<td>Honeycomb fiberglass</td>
<td>Hand Sanding</td>
<td>4.0</td>
<td>Extremely time consuming and labor intensive</td>
<td>37</td>
<td>29.7</td>
<td>Topcoat and 50% of first primer removed with no visible substrate damage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>37</td>
<td>32.1</td>
<td>Coating removed to primer on majority of area and selectively removed to the substrate in one small area</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# NSB Kings Bay Demonstration Results

<table>
<thead>
<tr>
<th>Component</th>
<th>Coating System</th>
<th>Substrate</th>
<th>Process</th>
<th>Strip rate (ft²/hr)</th>
<th>Comments</th>
<th>Nozzle Pressure (psi)</th>
<th>Strip rate (ft²/hr)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ice Cap</td>
<td>Epoxy primer and antifoulant topcoat (<em>Mare Island</em> 150/151)</td>
<td>Fiberglass</td>
<td>PMB followed by Hand Sanding</td>
<td>1.0</td>
<td>1 hour with PMB (significant damage), 8 hours of hand sanding</td>
<td>27</td>
<td>32.7</td>
<td>Antifoulant topcoat removed to the primer with no visible substrate damage</td>
</tr>
<tr>
<td>NSS Window</td>
<td>Epoxy primer and antifoulant topcoat</td>
<td>Kevlar</td>
<td>PMB followed by Hand Sanding</td>
<td>0.79</td>
<td>1 hour with PMB (significant damage), 12 hours of hand sanding, followed by several steps of repair due to substrate damage</td>
<td>23</td>
<td>25.7</td>
<td>Antifoulant topcoat removed to the primer with no visible substrate damage</td>
</tr>
<tr>
<td>Sail Window</td>
<td>Epoxy primer and antifoulant topcoat</td>
<td>Fiberglass</td>
<td>PMB</td>
<td>5.5</td>
<td>Significant substrate damage often noted</td>
<td>40</td>
<td>34.4</td>
<td>Antifoulant topcoat removed to the primer with no visible substrate damage</td>
</tr>
<tr>
<td>Clam Shell Hatch</td>
<td>Epoxy primer and antifoulant topcoat (<em>Mare Island</em> 151/153)</td>
<td>Fiberglass</td>
<td>Hand Sanding</td>
<td>0.4</td>
<td>Extremely time consuming</td>
<td>28</td>
<td>4.3</td>
<td>Layered coating remaining - would need to optimize the CHP process for this application</td>
</tr>
</tbody>
</table>
## Helispec Demonstration Results

<table>
<thead>
<tr>
<th>Component</th>
<th>Substrate</th>
<th>Baseline Process</th>
<th>Nozzle Pressure (psi)</th>
<th>Strip rate (ft²/hr)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH-60 Rotor Blade</td>
<td>Kevlar with Section of Aluminum Lightning Mesh</td>
<td>Hand Sanding</td>
<td>32</td>
<td>34.4</td>
<td>Coating removed completely to substrates (i.e., Kevlar and aluminum) with no visual substrate damage</td>
</tr>
<tr>
<td>OH-58 Radio Compartment Door</td>
<td>Aluminum</td>
<td>Chemical Stripping/Hand Sanding</td>
<td>35</td>
<td>24.3</td>
<td>Topcoat and the majority of the primer removed with no visible damage to the underlying substrate</td>
</tr>
<tr>
<td>OH-58 Pilot Door</td>
<td>Aluminum</td>
<td>Chemical Stripping/Hand Sanding</td>
<td>35</td>
<td>12.9</td>
<td>Topcoat and the majority of the primer removed with no visible damage to the underlying substrate</td>
</tr>
<tr>
<td>UH-1H Tail Rotor Blade</td>
<td>Honeycomb Aluminum</td>
<td>Chemical Stripping/Hand Sanding</td>
<td>30</td>
<td>17.7</td>
<td>Coatings removed to the primer with no visual damage to the underlying substrate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35</td>
<td>8.7</td>
<td>80% of the primer removed with no visual damage to the underlying substrate</td>
</tr>
<tr>
<td>UH-1H Elevator Skin</td>
<td>Aluminum</td>
<td>Chemical Stripping/Hand Sanding</td>
<td>35</td>
<td>23.1</td>
<td>Coatings completely removed to the substrate with no visible damage</td>
</tr>
<tr>
<td>UH-1H Transmission Mount</td>
<td>Cast Iron</td>
<td>Chemical Stripping/Hand Sanding</td>
<td>32</td>
<td>37.5</td>
<td>Coatings completely removed to the substrate with no visible damage</td>
</tr>
</tbody>
</table>
## NS Mayport Demonstration Results

<table>
<thead>
<tr>
<th>Component</th>
<th>Substrate</th>
<th>Baseline Process</th>
<th>CHP</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMMWV Hood</td>
<td>Fiberglass</td>
<td>Various</td>
<td>38</td>
<td>20.9              CARC topcoat removed to primer with no visual substrate damage</td>
</tr>
<tr>
<td>T-45 Seal (access panel)</td>
<td>Aluminum</td>
<td>Not determined</td>
<td>38</td>
<td>40.1              Coating and primer removed</td>
</tr>
<tr>
<td>UH-60 Blackhawk Rotor Blade</td>
<td>Kevlar with Section of Aluminum Lightning Mesh</td>
<td>Hand Sanding</td>
<td>32</td>
<td>25.7              Coating removed completely to substrates (i.e., Kevlar and aluminum) with no visual substrate damage</td>
</tr>
<tr>
<td>P-3 Radome</td>
<td>Polyester Fiberglass</td>
<td>Hand Sanding</td>
<td>32</td>
<td>10.9              Coating removed completely to substrate with no visual substrate damage</td>
</tr>
<tr>
<td>MK-92 Radome</td>
<td>Fiberglass Honeycomb</td>
<td>Hand Sanding</td>
<td>25</td>
<td>36                Coating removed to primer with no visual substrate damage</td>
</tr>
<tr>
<td>PCMS Tile (Panel)</td>
<td>Foam</td>
<td>Chemical</td>
<td>20</td>
<td>100.8             Selective stripping of topcoat only</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>67.2              Removal to substrate</td>
</tr>
</tbody>
</table>
## CCAD Demonstration Results

<table>
<thead>
<tr>
<th>Component</th>
<th>Substrate</th>
<th>Baseline Process</th>
<th>Nozzle Pressure (psi)</th>
<th>Strip rate (ft²/hr)</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH-60 Blackhawk Main Rotor Blade</td>
<td>Titanium and fiberglass with lightning mesh covering portions of fiberglass</td>
<td>Hand Sanding</td>
<td>30</td>
<td>15.3</td>
<td>Coating and primer removed</td>
</tr>
<tr>
<td>UH-60 Blackhawk Tip Cap</td>
<td>Graphite composite with nickel abrasion strip on edge. Portions covered with copper and stainless steel mesh.</td>
<td>Hand Sanding</td>
<td>25</td>
<td>33.5</td>
<td>Coating removed to primer</td>
</tr>
<tr>
<td>UH-60 Blackhawk Tail Rotor Blade</td>
<td>Fiberglass with aluminum lightning mesh covering entire surface</td>
<td>Hand Sanding</td>
<td>30</td>
<td>23.5</td>
<td>Coating removed to lightning mesh</td>
</tr>
<tr>
<td>UH-60 Blackhawk Stabilator</td>
<td>Aluminum and Kevlar sections</td>
<td>AI: PMB Kevlar: Hand Sanding</td>
<td>AI: 25 Kevlar: 30</td>
<td>AI: 32.1 Kevlar: 15.1</td>
<td>Coating and primer removed</td>
</tr>
</tbody>
</table>