



# **CTIO Projects in Support of Air Force Space Command**

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# Overview



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

Upcoming

- ICBM SE: TE

-SLC-VAFB

-EAST RNG

-MSS

- **CTIO Focus/Capabilities**
- **Technology Readiness Levels (TRLs)**
- **Efforts in Progress**
  - **AFSPC & NASA Launch Coatings (CCAFS)**
  - **Pollution Prevention Opportunity Assessments (CCAFS & JDMTA)**
  - **F.E. Warren Pollution Prevention Opportunity Assessment (FEW)**
- **Upcoming Efforts**
  - **Support Equipment Coatings: Transporter Erector (ICBM SE)**
  - **AFSPC & NASA Launch Coatings (VAFB)**
  - **AFSPC Eastern Range Coatings Pollution Prevention Support (PAFB)**
  - **Missile Suspension System (VAFB)**



# CTIO Focus and Capabilities



# CTIO Focus and Capabilities



## CTIO Focus

### TRLs

### In-Progress

- AFSPC/NASA
- OPP 1
- OPP 2

### Upcoming

- ICBM SE: TE
- SLC-VAFB
- EAST RNG
- MSS

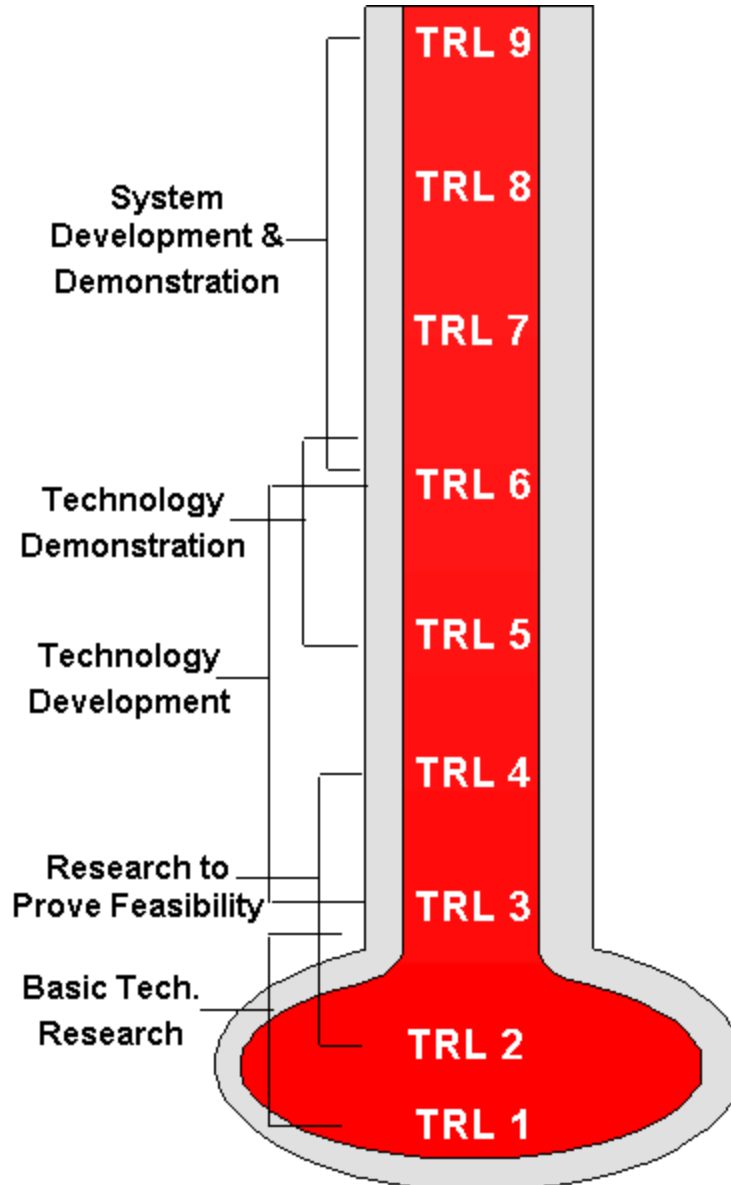
- **Primary focus is integration of Commercial Off-the-Shelf (COTS) technology**
- **CTIO provides a range of support for DoD organizations**
  - **Mechanical, chemical, and environmental testing**
    - **ISO 17025 Certified**
    - **SAE AS 5505 Accredited**
  - **Coatings Test Method Development**
  - **Technical consultation**
  - **Technology transfer**
  - **Quick reaction coating support**
  - **AF Voting Member on SAE G-8**



# Technology Readiness Assessment



- CTIO Focus
- TRLs
- In-Progress
  - AFSPC/NASA
  - OPP 1
  - OPP 2
- Upcoming
  - ICBM SE: TE
  - SLC-VAFB
  - EAST RNG
  - MSS



## Technology Readiness Level (TRL)

(Definitions taken from DoD 5002-R, 5 Apr 2002)



# Technology Readiness Assessment



CTIO Focus

TRLs

In-Progress  
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- OPP 1  
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## TRL 9

- **Best material formulation, application processes, and equipment proven through successful mission operations**

## TRL 8

- **Best material formulation, application processes, and equipment qualified through test and demonstration**

## TRL 7

- **Best material formulation, application processes, and equipment demonstrated in an operational environment**

## TRL 6

- **Best material formulation, application processes, and equipment demonstrated in a relevant environment**

## TRL 5

- **Top material formulations validated in a relevant environment**

## TRL 4

- **Candidate material formulations tested against full spectrum of tests in laboratory. Material specification is frozen**

## TRL 3

- **Screening test weed out poor material formulations. Detailed material specification is developed**

## TRL 2

- **Material formulations vary wildly. Key requirements are documented**

## TRL 1

- **Basic principles of materials observed and reported. Requirements are non-specific and incomplete**



# Efforts In Progress



CTIO Focus

TRLs

In-Progress

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- OPP 1

- OPP 2

Upcoming

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-MSS

- **Efforts in Progress (FY-08, FY-09)**
  - **AFSPC & NASA Launch Coatings**
    - **Cape Canaveral Air Force Station(CCAFS)**
  - **Pollution Prevention Opportunity Assessments**
    - **Cape Canaveral Air Force Station(CCAFS)**
    - **Jonathan Dickinson Missile Tracking Annex (JDMTA)**
  - **F.E. Warren (FEW) Pollution Prevention Opportunity Assessment**



# **AFSPC & NASA Launch Coatings**



CTIO Focus

TRLs

In-Progress

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- OPP 1
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Upcoming

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- **Project Goals/Requirements**

- Investigate Low/No VOC non-hazardous (high temperature) alternative coating solutions for launch facilities.
- This funding addresses field testing of alternative coating systems for AFSPC launch facilities at the launch facility.
- Coating System to survive 1 launch
- Follow on project from NASA's coating evaluation Phase I



# AFSPC & NASA Launch Coatings

TRL  
8



**Depaint with Blast Recovery System (BRS)**

**Metallization**



**GE Ablative Application**



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

Upcoming

- ICBM SE: TE

-SLC-VAFB

-EAST RNG

-MSS

## Current Status

- **Depaint, Coating, and Metallization complete**

## Final Tasks

- **Small equipment Dem/Val**

## Focus Areas

- **High temperature coating**
- **Environmentally friendly coatings and depaint process**



# **Pollution Prevention Opportunity Assessments (CCAFS & JDMTA)**



# P2 Opportunity Assessments

TRL  
↓  
N/A



CTIO Focus

TRLs

In-Progress  
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- OPP 2

Upcoming  
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- **Project Goals/Requirements**
  - **Opportunity assessment of de-painting, surface preparation, & coating application process' currently used at AFSPC range operations (CCAFS & JDMTA).**
  - **Provide data analysis and recommendations, a Cost Benefit Analysis and assessment to reduce environmental burden/risk processes and identify alternative environmentally preferable coating systems.**
  - **Analysis existing processes, hazardous waste disposal, environmental regulations, environmental control equipment, & identify new equipment necessary to perform revised process.**



# P2 Opportunity Assessments

TRL  
↓  
N/A



CTIO Focus

TRLs

In-Progress  
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## Current Status

- Site surveys have been completed
- Researching and evaluating alternatives

## Focus Areas

- Pollution prevention
  - Radar
  - Towers
  - Maintenance operations



Melbourne, Telemetry Radar



# **F.E. Warren AFB Pollution Prevention Opportunity Assessment**



# F.E. Warren P2 Opportunity Assessment

TRL  
↓  
N/A



CTIO Focus

TRLs

In-Progress

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- OPP 1

- OPP 2

Upcoming

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- **Project Goals/Requirements**

- **Evaluate the missile maintenance activities/processes, determine environmental preferable alternatives and calculate payback for implementing alternatives.**
- **Significant emphasis will be:**
  - **Identifying environmentally preferred alternatives for surface preparation,**
  - **Eliminating chromates in solids and liquids used for corrosion control,**
  - **Identifying technologies for de-painting operations**
  - **Reduction of hazardous waste generation**
  - **Reduction of environmental vulnerability across all media from the rework/repair modifications for the Minuteman III program**



# F.E. Warren P2 Opportunity Assessment

TRL  
↓  
N/A



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

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## Current Status

- **Site visit complete**
- **Research/evaluate alternatives**

## Focus Areas

- **Shop processes**
- **Rivet Mile**
- **Power production facility**
- **Environmentally friendly solvents**



**Metallization Demonstration**



# Upcoming Efforts



CTIO Focus

TRLs

In-Progress

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Upcoming

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- **Efforts in Progress (FY-09, FY-10)**
  - **Support Equipment Coatings: Transporter Erector (ICBM SE)**
  - **AFSPC & NASA Launch Coatings**
    - **Vandenberg Air Force Base(VAFB)**
  - **AFSPC Eastern Range Coatings Pollution Prevention Support**
    - **Patrick Air Force Base (PAFB)**
  - **Missile Suspension System (VAFB)**



# AFRL

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## Support Equipment Coatings: Transporter Erector



# Transporter Erector



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

Upcoming

- ICBM SE: TE

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-MSS

- **Project Goals/Requirements**

- **Continuation of Low/No VOC Corrosion-Preventive Coatings for ICBM Missile Support Equipment**
- **Incorporation of metal wire arc spray (MWAS) technology where possible**
- **Incorporation of cold spray repair technology where possible**
- **Incorporation of low-VOC coatings for AGE use**
- **Lower hazardous waste production and environmental impact of operations**



# Transporter Erector



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

Upcoming

- ICBM SE: TE

-SLC-VAFB

-EAST RNG

-MSS

## Current Status

- **Project plan in routing for approval**

## Focus Areas

- **Environmentally friendly liquid coatings**
- **Metallization-zinc 85/15**
- **Cold spray**



# AFRL

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## **AFSPC & NASA Launch Coatings (VAFB and PAFB)**



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA  
- OPP 1  
- OPP 2

Upcoming

- ICBM SE: TE  
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-EAST RNG  
-MSS

- **Project Goals/Requirements**

- This program builds upon the technology demonstrations performed in collaboration between NASA and AFSPC at Cape Canaveral Air Force Station (CCAFS). Previous programs by NASA, AFSPC, and AFRL to investigate Low/No VOC non-hazardous alternative coating solutions have identified alternate coating systems for launch facilities.
- Investigate Low/No VOC non-hazardous (high temperature) alternative coating solutions for launch facilities.
- This funding will address field testing of alternative coating systems for AFSPC launch facilities in the applicable installation and/or range locations.



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

Upcoming

- ICBM SE: TE

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-MSS

## Current Status

- **Test plan in progress**

## Focus Areas

- **Ceramic coatings**
- **Environmentally friendly liquid coatings**
- **Metallization**
- **Cold spray**
- **Depaint process/improvements**



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# Eastern Range Coatings Pollution Prevention Support



# Eastern Range Coatings Pollution Prevention Support

TRL  
8



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

-OPP 1

-OPP 2

Upcoming

-ICBM SE: TE

-SLC-VAFB

-EAST RNG

-MSS

- **Project Goals/Requirements**
  - **Currently, the authorized coating system for AFSPC facilities results in the large release of volatile organic compounds (VOCs), hazardous air pollutants (HAPs), heavy metals (Cr(VI)), and impacts on waste disposal.**
  - **This funding will address field testing of alternative coating systems for AFSPC launch facilities in the applicable installation and/or range location.**



# Eastern Range Coatings Pollution Prevention Support

TRL  
8



CTIO Focus

TRLs

In-Progress

-AFSPC/NASA

- OPP 1

- OPP 2

Upcoming

- ICBM SE: TE

-SLC-VAFB

-EAST RNG

-MSS

## Current Status

- **Test plan in progress**

## Focus Areas

- **Depaint process/improvement**
- **Environmentally friendly liquid coatings**
- **Metallization**
- **Metallization repair**
  - **Cold Spray**
  - **Remetallization**



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# Missile Suspension System



# Missile Suspension System



CTIO Focus

TRLs

In-Progress

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Upcoming

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- **Project Goals/Requirements**
  - **Demonstrate/Validate metallization for high-temperature applications**
  - **Platform is the Minuteman III weapons system support equipment (MSS) for the 309 MMXG depot refurbishment squadron located at Vandenberg AFB**
  - **Project carried forward suggestions from a P2OA for Vandenberg AFB**
    - **Reviewed coatings work performed by other DoD groups**
      - NASA TEERM
      - AFRL/RXBT
      - AFRL/RXSSO



# Missile Suspension System



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**Missile Suspension System (MSS)**



**Red-Oxide Primer with Latex Topcoat-Post Launch**



# Missile Suspension System



CTIO Focus

TRLs

In-Progress  
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- OPP 1  
- OPP 2

Upcoming  
- ICBM SE: TE  
-SLC-VAFB  
-EAST RNG  
-MSS

## Current Status

- **Test plan for Dem/Val is currently in routing**

## Focus Areas

- **Metallization –Al**



# Questions???

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