



**WESTERN SPACE AND MISSILE CENTER,
VANDENBERG AFB CA**
SLRSC Western Range Depot Optics Group (WRDOG)

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The following Cost Avoidance Initiative covers a five year period following the introduction of the polymer *First Contact*, discovered by Dr. James Hamilton of the University of Wisconsin-Platteville and manufactured by *Photonic Cleaning Technologies*.

Fundamental Assumptions:

- Industry rule-of-thumb recommendation is that optical mirrors are to be recoated after 10 years of service.
 - Currently these coatings are cleaned using a “drag wipe” method which introduces the risk of scratching the coating.
 - The traditional methodology requires the use of hazardous chemicals such as spectroscopic grade Acetone and Methanol and high grade Isopropanol (isopropyl alcohol).
 - The current lens cleaning procedure used on both missile test ranges requires both special training and experience with optics.
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Financial Impact Estimate Based on a 5-Year Extrapolation:

Western Range has 5 each 24-in aperture telescopes

- Cost to recoat is $\$60,000 \times 5 = \mathbf{\$300,000}$ (includes labor cost to dismantle, disassemble, transport, reinstall the mirrors and to re-collimate the telescope)
 - All WR telescopes (except DOAMS) exceed the 10 year service coating useful life.
 - Each of these telescopes could require as much as 70 days to dismount, recoat, transport, remount and re-collimate (system alignment).
 - There would be a significant handling risk in the mirror removal, transportation and recoat and reinstallation process.
 - The recoat vendor accepts no liability for the handling of these optics.

Western Range has 2 each 36-in aperture telescopes

- Cost to recoat is $\$110,000 \times 2 = \mathbf{\$220,000}$ (includes labor cost to dismantle, disassemble, transport, reinstall the mirrors and re-align the telescope)
 - Each of these telescopes has exceeded the 10 year useful coating life expectancy.
 - Each of these telescopes would require a minimum of 70 days each to process.
 - In addition, due to the size and weight and location on a remote mountain peak, there exists a very high handling risk in the mirror removal, crating, transportation, recoat, and reinstallation process.
 - The recoat vendor accepts no liability for the handling of these optics.

Western Range has 60 each 12” medium aperture telescopes in active inventory

- Cost to recoat each optical system is \$6,000 x 60 = **\$360,000**
 - Each telescope is over 20 years old and has never been recoated.
 - Each of these telescopes would require a minimum of 45 days for vendor turn around time (vendor has taken up to a year in some cases).
 - There is a significant handling risk in the removal, transportation and recoat process. The recoat vendor accepts no liability for the handling of these optics.
 - The polymer cleaning method was found to avoid recoating even in some extreme cases and greatly reduced handling risks; also the associated turn-around time and labor costs.

Western Range has 686 Camera Lenses (Nikon, Pentax, Schneider, etc.) in active inventory.

- Cost to recoat 20% of the front and rear elements is approximately \$300 each x 686 elements = **\$205,800**
 - Cameras lenses often have 5 or more elements. However, the front and rear elements are most commonly in need of recoat.

Lens cleaning materials cost over 5 years is approximately **\$30,000** (lint-free tissue, powder-free gloves, spectroscopic grade chemicals, etc).

*Total Estimated savings over a five year period = **\$1,115,800***

Subjective Evaluation

- **Environmental Impact - No hazardous waste is generated.** Over 90% of previously used harsh solvents (‘hazardous material source’) has been eliminated.
- **Customer satisfaction** - What has historically taken up to a year to turn around is now being accomplished in less than 30 days. This translates to a higher customer ‘performance approval rating’ and greater award fees.
- **Training** – No special optical background, prior experience, training, education, or special skills necessary; eliminates the need for complicated optical cleaning methodologies and stringent, time consuming cleaning procedures.
- **Acceptance testing** – provides an excellent method for optical acceptance tests; only very old, damaged (degraded) or poor quality optical coatings are at risk.
- **Eliminates or greatly minimizes most clean room issues** – minimizes dust and particulate concerns; radically reduces special handling concerns. Fingerprints are removed easily and the polymer acts as a surface protection coating.

*Total Estimated Impact over the life of the SLRSC contract = **Priceless***