**REPORT DOCUMENTATION PAGE**

**1. REPORT DATE (DD-MM-YYYY)**

**2. REPORT TYPE**

Technical Papers

**3. DATES COVERED (From - To)**

**4. TITLE AND SUBTITLE**

**5a. CONTRACT NUMBER**

**5b. GRANT NUMBER**

**5c. PROGRAM ELEMENT NUMBER**

**5d. PROJECT NUMBER**

2303

**5e. TASK NUMBER**

M2C8

**5f. WORK UNIT NUMBER**

**6. AUTHOR(S)**

**7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)**

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**8. PERFORMING ORGANIZATION REPORT**

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

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Edwards AFB CA 93524-7048

**10. SPONSOR/MONITOR’S ACRONYM(S)**

**11. SPONSOR/MONITOR’S NUMBER(S)**

**12. DISTRIBUTION / AVAILABILITY STATEMENT**

Approved for public release; distribution unlimited.

**13. SUPPLEMENTARY NOTES**

**14. ABSTRACT**

**15. SUBJECT TERMS**

**16. SECURITY CLASSIFICATION OF:**

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<td>Unclassified</td>
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**17. LIMITATION OF ABSTRACT**

**18. NUMBER OF PAGES**

1121/010

**19a. NAME OF RESPONSIBLE PERSON**

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**19b. TELEPHONE NUMBER**

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(661) 275-5015

*Standard Form 298 (Rev. 8-98)*

Prescribed by ANSI Std. 239.18
MEMORANDUM FOR PRS (Contractor/In-House Publication)

FROM: PROI (TI) (STINFO) 20 September 2000

Tollison, Kerri (ERC), Drake, Greg; et al., “The Synthesis and Characterization of Methylene Bisoxyamine CH₂(O-NH₂)₂ Salts”


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APPROVED/APPROVED AS AMENDED/DISAPPROVED

______________________________ Date
PHILIP A. KESSEL
Technical Advisor
Propulsion Science and Advanced Concepts Division
The Synthesis and Characterization of Methylene Bisoxamine CH$_2$(O-NH$_2$)$_2$ Salts

Kerri Tollison*; Greg Drake; Tom Hawkins; Adam Brand; Milton McKay; Ismail Ismail*; Claude Merrill
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SRI International, Inc.
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The quest for new energetic materials for propellant research and development is an ongoing research effort at many facilities. Methylene bisoxamine, CH$_2$(O-NH$_2$)$_2$, was first synthesized in the late 1960's at Edwards Air Force Base, as a colorless, stable liquid. The diperchlorate salt was heavily investigated as a solid propellant ingredient, but was dropped because of its slight impact sensitivity. Methylene bisoxamine is an oxyamine base capable of yielding both mono- and di-protonated species, depending on the stoichiometry used in its reactions with acidic materials. We have reinvestigated this highly energetic material, and have synthesized and fully characterized a large family of new salts, including species paired with the nitrate, perchlorate, dinitramide and nitroformate anions. All of the salts were characterized by vibrational (IR, Raman), multinuclear nmr (^1H, ^13C) spectra, differential scanning calorimetry (DSC) studies, and elemental analyses. Safety testing, including friction and impact tests, were carried out on all of the new salts, as well thermal stability studies at elevated temperatures, and all these results will be presented.