April 1967 Brief 67-10083

# NASA TECH BRIEF



## Effects of Helium and Nitrogen as Pressurants in Nitrogen Tetroxide Transfer

A determination is required as to the effects of helium and nitrogen on a mass of nitrogen tetroxide during their use as pressurants to transfer the $N_2O_4$ from one vessel to another at a higher elevation. It is desired to study the thermodynamics of $N_2O_4$ plus the solubility and effervescence of He and $N_2$ in $N_2O_4$, MMH, and Aerozine 50. Special attention is given to the effects of pressure and temperature on the interrelation.

In the study of thermodynamic properties of $N_2O_4$, experimental data and thermodynamic correlations are employed. Temperature-entropy, temperature-enthalpy, and temperature-pressure-volume plots are developed. A method is also developed to predict thermodynamic properties of compounds that dissociate.

In the investigation to determine solubility of He and $N_2$ in $N_2O_4$, MMH, and Aerozine 50 as a function of temperature and propellant gas pressure, Henry's law is used. Increase of solubility with temperature and as a function of similarity ($N_2O_4$–$N_2$) are observed.

**Notes:**

1. These data may contribute to creation of new environmental systems: improved oxygen solubility in water to promote fish life; use of helium in breathing to control gas effervescence from blood during decompression.
2. Inquiries concerning these studies may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center
   Houston, Texas 77058
   Reference: B67-10083

**Patent status:**

No patent action is contemplated by NASA.

Source: Frank Bizjak and D. J. Simkin
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under contract to
Manned Spacecraft Center
(MSC-924 & 925)

Category 03