

GAO

Report to the Honorable  
William Dannemeyer, House of  
Representatives

August 1988

AIR FORCE  
CONTRACTING

Protecting Liquid  
Oxygen/Nitrogen  
Plants From  
Contamination



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**National Security and  
International Affairs Division**

B-231251

August 11, 1988

The Honorable William Dannemeyer  
House of Representatives

Dear Mr. Dannemeyer:

On August 14, 1987, you asked us to review the Air Force's procurement of portable liquid oxygen and nitrogen generating plants. In subsequent discussions with representatives of your Office, we agreed to examine (1) whether this procurement complies with Department of Defense (DOD) policy regarding protection against nuclear, biological, and chemical (NBC) attack and (2) whether there is evidence of conflict of interest on the part of an individual connected with this procurement. This report discusses the Air Force's compliance with DOD policy for NBC protection; the possible conflict of interest issue will be reported separately.

In accordance with DOD policy, the Air Force reviewed the need for NBC protection of its portable liquid oxygen/nitrogen generating plants and concluded that such protection was not needed because it does not plan to use the plants during an NBC attack. Having liquid oxygen/nitrogen plants that could operate in a contaminated environment would give the Air Force greater flexibility in using the equipment and allow it to better meet its requirements.

Subsequent to our review, the Department of Defense directed the San Antonio Air Logistics Center to evaluate the feasibility of incorporating NBC protection into the liquid oxygen/nitrogen plants and, if feasible, to consider modifying the existing and future contracts to provide such protection.

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**Background**

The Air Force buys liquid oxygen and nitrogen generating plants to convert normal air to liquid oxygen and nitrogen for storage and subsequent use. The oxygen is used for breathing in tactical and other types of military aircraft on high-altitude missions. It also supports Air Force medical requirements in hospitals and in aeromedical evacuation. Nitrogen is used in the guidance systems of heat-seeking missiles, in aircraft avionics equipment as a refrigerant, in certain hydraulic systems, and in support of other military systems.

On May 12, 1987, the Air Force solicited proposals to buy portable liquid oxygen and nitrogen generating plants. These will be the first portable

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plants the Air Force will buy; the Air Force already has larger, stationary plants. According to Air Force records, the portable plants will support the U.S. Air Force Central Command force deployments to Southwest Asia. The solicitation contained no requirement that the plants be NBC-protected. Five companies responded to the solicitation.

On February 17, 1988, the Air Force awarded a \$5.5 million contract to Cosmodyne, Inc., the lowest bidder, for 26 non-NBC-protected plants. (The Air Force reduced the order to 25 after the award.) The contract schedule requires the contractor to deliver the first test article 405 days after the contract date. The first production article is due 150 days after the first test article, with the contractor delivering the remaining plants at the rate of one per month. The Air Force estimates contract completion in July 1992.

The Air Force Central Command Fuels Plans Officer told us that these 25 plants will meet the needs of both the Air Force aviator and medical communities and that the Air Force has no plans to buy additional plants.

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## DOD Policy on NBC Protection

DOD policy requires that NBC protection be included in the design and acquisition of major systems that must perform mission-essential functions in an NBC environment. It also requires that each DOD component ensures that nonmajor mission-essential systems are scrutinized closely for potential impacts on mission-essential functions and exhibits appropriate NBC-contamination survivability. The generating plants, according to the contracting officer, are considered nonmajor mission-essential systems.

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## Objective, Scope, and Methodology

Our objective was to determine if the Air Force complied with the DOD policy regarding NBC protection. Since the Air Force considers the generating plant a nonmajor system, we focused on the Air Force's rationale for concluding that the system did not require NBC protection. We discussed DOD policy and the intended use of the equipment with officials of the user organizations—the U.S. Air Force Central Command, Shaw Air Force Base, South Carolina, and Headquarters, Human Systems Division, Brooks Air Force Base, Texas. We also reviewed contract and other files and held discussions at Air Force Headquarters, Washington, D.C., and at the San Antonio Air Logistics Center, Kelly Air Force Base, Texas, which awarded the contract. In addition, we discussed NBC protection technology and applications with officials at the Army Nuclear

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Chemical Agency, Springfield, Virginia; the Army Test and Evaluation Command, Aberdeen Proving Ground, Maryland; and the Army Chemical Research, Development and Engineering Center, Aberdeen Proving Ground, Maryland.

We performed our review from March to May 1988 in accordance with generally accepted government auditing standards.

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## Results

According to the Air Force, it complied with DOD policy by evaluating the need for NBC protection for the portable plants and concluded that it did not need protected plants to sustain operations in a contaminated environment. The Air Force says that its policy is to reduce operations during an NBC attack to mission-essential tasks to minimize personnel exposure. Although liquid oxygen and nitrogen are mission-essential, their production in a contaminated environment, according to the Air Force, is not necessary because the Air Force will produce and store these products in tanks before an attack and after decontamination following an attack. During periods of contamination, the Air Force will satisfy its requirements with the uncontaminated stored products.

In December 1987 the Office of the Assistant Secretary of Defense, Atomic Energy, reviewed the Air Force's operational concept for these plants and concluded that it was sound, the only weakness being that the Air Force must shut down the plants before the area is contaminated. Thus, if there was an NBC attack while the plants were in operation, we were told that it would likely contaminate the system, which would require decontamination of internal parts before production could resume.

According to the office, the Air Force plans to keep the storage tanks full at all times and to shut down or move the plants to a lower risk location if there is a high probability of an NBC attack. Air Force aviator and medical community planners explained that such an attack would likely last for only a short duration (about 4 hours), and they plan to have 3 to 5 days of supplies in storage tanks at all times.

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### The Air Force Should Consider Incorporating NBC Protection in Current and Future Acquisitions

Although it is prudent to reduce personnel exposure during an NBC attack, Defense Guidance<sup>1</sup> and the Air Force's Statement of Operational Need require Air Force units to be able to survive a combined chemical/biological/conventional attack and continue operations in a toxic environment for a sustained period. The guidance also provides that systems and subsystems that can survive and operate in a contaminated environment be acquired. Nonprotected equipment cannot operate in a contaminated environment. Furthermore, during a prolonged attack, the Air Force may have to move its equipment and support its liquid oxygen/nitrogen requirements from outside a contaminated environment.

Although the Air Force may be able to sustain its operations by using storage tanks or generating equipment located outside the contaminated environment, having portable equipment that could operate in such an environment would give the Air Force more options on when and where to produce liquid oxygen/nitrogen. It also would reduce the chances of the plants becoming contaminated if they were being operated at the time of an NBC attack.

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### DOD Recognizes Value of NBC Protection

The Office of the Secretary of Defense recognizes the value of NBC protection for portable liquid oxygen/nitrogen generating plants. In reviewing the Air Force's decision not to have NBC-protected plants, the office stated that although such protection is not essential, it is certainly desirable. As a result, it directed the Air Force to buy only the units needed to meet immediate needs and to consider in future procurement the expanded capability and operational versatility offered by an NBC survivable system consistent with the state-of-the-art at that time.

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### Filtering Material Approved for NBC Protection

Activated carbon is an approved filtering system for protection of military equipment in an NBC environment and is currently in use on military weapon systems. As of May 1988, the Army was purchasing these filters for \$370 each.

The Air Force equipment specialist for the portable liquid oxygen/nitrogen plants the Air Force is buying told us the current plant's design uses a filter to remove dust before air enters into the plant's internal parts. He believes that the Air Force could incorporate an approved carbon filter into the design of the plant to provide NBC protection.

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<sup>1</sup>This is written guidance on goals and priorities that the Secretary of Defense provides the military departments.

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## Conclusions

In accordance with DOD policy, the Air Force reviewed the need for NBC protection for its portable liquid oxygen/nitrogen generating plants and concluded that it could sustain military operations without producing liquid oxygen/nitrogen in a contaminated environment. However, even though the Air Force may be able to sustain military operations without producing liquid oxygen/nitrogen in a contaminated environment, having NBC-protected plants would give the Air Force greater flexibility in using the equipment and allow it to better meet Defense Guidance and the Air Force's own requirements. It also would provide greater protection of the system's internal parts if the plants were operated at the time of an NBC attack, thus eliminating the need for extensive decontamination before resuming production. The activated carbon filter currently approved for use by the military appears to be an inexpensive system that the Air Force could incorporate into the design of the liquid oxygen/nitrogen generating plant that the Air Force is procuring.

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## Recommendations

We recommend that the Secretary of the Air Force review the current procurement of portable liquid oxygen and nitrogen generating plants to determine if it is feasible to add approved filters to the plants, which would protect them in the event of an NBC attack. If the Air Force can obtain protection at an acceptable cost, the Secretary should modify the current contract and/or delivered units to incorporate these filters.

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## DOD Comments

The Department of Defense agreed with our conclusions and recommendations (see app. I). The Air Force has directed the San Antonio Air Logistics Center to evaluate the feasibility of incorporating NBC protection into the liquid oxygen/nitrogen plants and, if feasible, to consider modifying the existing and future contracts to provide such protection.

Copies of this report are being provided to the Chairmen, House and Senate Committees on Appropriations and on Armed Services, House Committee on Governmental Operations, and Senate Committee on Governmental Affairs; the Secretaries of Defense and the Air Force; the

Director, Office of Management and Budget; and other interested parties upon request.

Sincerely yours,

A handwritten signature in cursive script that reads "Frank C. Conahan".

Frank C. Conahan  
Assistant Comptroller General





# Comments From the Director of Defense Research and Engineering, Department of Defense



DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING

WASHINGTON, DC 20301-3010

11 AUG 1988

Mr. Frank C. Conahan  
Assistant Comptroller General  
National Security and Internal Affairs Division  
United States General Accounting Office  
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense response to the General Accounting Office (GAO) Draft Report, "AIR FORCE CONTRACTING: Protecting Liquid Oxygen/Nitrogen Plants from Contamination". The Department concurs with the findings and recommendations of the report.

The detailed DoD comments are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Sincerely,

A handwritten signature in cursive script, appearing to read "Robert C. Duncan".

Robert C. Duncan

Enclosure  
As stated

GAO DRAFT REPORT - DATED JUNE 7, 1988  
(GAO CODE 392371) OSD CASE 7672

"AIR FORCE CONTRACTING: PROTECTING LIQUID  
OXYGEN/NITROGEN PLANTS FROM CONTAMINATION"

DEPARTMENT OF DEFENSE COMMENTS

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FINDINGS

- o **FINDING A: The Air Force Liquid Oxygen and Nitrogen Generating Plant Program.** The GAO explained that the Air Force buys liquid oxygen and nitrogen generating plants to take normal air and convert it to liquid oxygen and nitrogen for storage and subsequent use. The GAO further explained that oxygen, for example, is used for breathing in tactical and other types of aircraft, while nitrogen is used in guidance systems for heat-seeking missiles and other military systems as well. The GAO reported that, on May 12, 1987, the Air Force solicited proposals to buy portable liquid oxygen and nitrogen generating and charging plants, the first purchase of this type by the Air Force (which also has larger, stationary plants). The GAO found that, although the portable plants will support the U.S. Air Force Central Command (CENTAF) force deployments to Southwest Asia, there was no requirement for nuclear, biological and chemical (NBC) protection. The GAO reported that, on February 17, 1988, Cosmodyne, Inc. (one of five bidders), was awarded a \$5.5 million contract for 25 non-NBC-protected liquid oxygen/nitrogen generating plants to be completed in July 1992. The GAO reported that, according to the CENTAF Fuels Plans Officer, the 25 plants will meet the needs of both the Air Force aviator and medical communities and the Air Force has no plans to buy additional portable plants. (pp. 2-3/GAO Draft Report)

DoD Response: Concur

- o **FINDING B: DoD Policy On Nuclear, Biological, and Chemical Protection.** The GAO reported the policy requires that NBC survivability must be included in the design and acquisition of major systems required to perform mission essential functions in an NBC environment. The GAO further reported that, while the policy applies to systems designated as major, it also directs each DoD component to ensure nonmajor mission-essential systems are scrutinized closely for potential impacts on mission-essential functions and exhibit

Enclosure

Now on pp. 1-2.

Now on p. 2.

appropriate NBC-contamination survivability. The GAO was informed by the contracting officer that the generating and charging plants are considered nonmajor mission-essential systems. (pp. 3-4/GAO Draft Report)

DoD Response: Concur

- o **FINDING C: Air Force Compliance With DoD/Nuclear, Biological, and Chemical Policy.** The GAO found that the Air Force complied with DoD policy, inasmuch as the need for NBC protection for the portable plants was evaluated. The GAO reported that, based on the evaluation, the Air Force concluded it did not need NBC protected plants to sustain operations in a contaminated environment. The GAO observed that, during an NBC attack, it is Air Force policy to reduce operations to mission essential tasks, in order to minimize personnel exposure. The GAO also observed it is the Air Force position that, while liquid oxygen and nitrogen are mission-essential, their production in a contaminated environment is not necessary because the Air Force will produce and store these products in tanks prior to an attack and after decontamination following an attack. The GAO noted that, in addition, the Air Force maintains if there were an NBC attack (while the generating plants were in operation), it would likely contaminate the system, which would require decontamination of internal parts before production could resume. (pp. 4-5, pp. 7-8, GAO Draft Report)

Now on pp. 3, 5.

DoD Response: Concur. The rationale offered by the Air Force is sound and accommodated by present storage systems and procedures.

- o **FINDING D: The Air Force Should Consider Incorporating NBC Protection In Current and Future Acquisitions.** The GAO observed that, while it appears prudent to reduce personnel exposure during an NBC attack, Defense Guidance and the Air Force Statement of Operational Need clearly require Air Force units to be able to survive a combined chemical/biological/conventional attack and continue operations in a toxic environment for a sustained period. The GAO noted the Defense Guidance also provides for systems and subsystems to be designed and acquired that can survive and operate in a contaminated environment. Since non-protected equipment cannot operate in a contaminated environment, the GAO further noted that in the event of a prolonged attack, the Air Force may find itself having to physically move its equipment and support its liquid oxygen/nitrogen requirements from outside the contaminated environment. The

GAO concluded that, although the Air Force may be able to sustain its operations from tanks in storage or from generating equipment located outside the contaminated environment, having portable equipment which could operate in a contaminated environment would give the Air Force more options on when and where it could produce liquid oxygen/nitrogen. In addition, the GAO concluded that it would also reduce the chances of the plants becoming contaminated, if they were being operated at the time of an NBC attack. (pp. 5-8/GAO Draft)

Now on p. 4.

DoD Response: Concur. The equipment is designed for portability.

See p. 4.

- o **FINDING E: OSD Recognizes Value of NBC Protection.** The GAO observed that the Office of the Secretary of Defense (OSD) recognizes the value of NBC protection for the portable liquid oxygen/nitrogen generating plants. According to the GAO, the Office of the Assistant to the Secretary of Defense (Atomic Energy) (OATSD/AE) stated that, while NBC protection for the generating plants is not essential, it is nonetheless desirable. The GAO found that the OATSD(AE) directed the Air Force to buy only the portable equipment needed to meet its immediate needs and directed that future procurements consider the expanded capability and operational versatility offered by an NBC survivable system, consistent with the state-of-the-art at that time.

DoD Response: Concur. The key to the OSD position is that the requirement for the NBC hardening of equipment must be consistent with the state-of-the-art.

- o **FINDING F: Filtering Material Approved For NBC Protection.** The GAO observed that activated carbon is an approved filtering system for protection of military equipment in an NBC environment and, as of May 1988, was being purchased by the Army at a cost of \$370 each. The GAO learned that the current filter used by the Air Force is designed to remove dust before air enters into the internal parts of the generating plant. The GAO reported it is possible that an approved carbon filter could be incorporated into the design of the plant. The GAO concluded the activated carbon filter, currently approved for use by the military, appears to be an inexpensive system that the Air Force could incorporate into the design of the liquid oxygen/nitrogen generating plant the Air Force is procuring. (pp. 6-8/GAO Draft Report)

Now on pp. 4, 5.

DoD Response: Concur. The DoD agrees that the practicality of adding presently approved filters to the LIN/LOX systems should be evaluated.

RECOMMENDATIONS

- o **RECOMMENDATION 1:** The GAO recommended that the Secretary of the Air Force review its current procurement to determine if it is feasible to add approved filters to the liquid oxygen/nitrogen generating plants so as to protect them in the event of an NBC attack. (p. 8/GAO Draft Report)

Now on p. 5.

DoD Response: Concur. On June 29, 1988, the Air Force requested the San Antonio Air Logistic Center to evaluate the feasibility of adding an approved filter system to the LIN/LOX plants being purchased and, if it proves practical to do so, modify the contract accordingly, (and any subsequent contracts).

- o **RECOMMENDATION 2:** The GAO further found that, if the Air Force can obtain protection at an acceptable cost, the Secretary of the Air Force should modify the current contract and/or delivered units to incorporate an NBC filtering system. (p. 8/GAO Draft Report)

Now on p. 5.

DoD Response: Concur. (Same comment as Recommendation 1)

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