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March 8, 1991

Addendum to PCI-TR-344

Environmental Impact Assessment for Release of ^{85}Kr from General Electric Corp., Astro-Space Division Facilities, Located at Valley Forge, PA

1.0 GENERAL

The main purpose of the subject report was to examine the dose rates in unrestricted areas from the releases of ^{85}Kr from the GE Astro-Space facility in Valley Forge, PA. The report did not address the ^{85}Kr MPC_a since it was apparent that concentrations at the point of discharge would be well above this value[1].

However, after review of 10 CFR 20.106 and since the fan in the system has been upgraded, we think that the issue of exceeding the unrestricted MPC_a should be re-evaluated. First, the regulation states that,

> "For the purposes of this section the concentration limits in Appendix B, Table II of this part shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. *If the conduit discharges within the restricted area, the concentration may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.*"

Second, the stack flow is now approximately 425 cfm. Upon re-evaluating the data it was determined that, for routine releases, the concentration at the point of release would not exceed the MPC_a, when averaged over a period of one year, but might for an accidental release. It should be noted that the MPC_a may be exceeded for short periods of time during actual releases. Finally, the routine and accident conditions were examined in light of the changes to 10 CFR 20, which are due to be implemented in January 1993.

2.0 RESULTS

2.1 Actual Conditions

Based on the number of tests performed each year and the amount of ^{85}Kr released during each test, typical annual releases are calculated to be ≤ 1.5 Ci. Using the measured stack flow of 425 cfm, the average annual stack concentration is $\leq 2.4 \times 10^{-7} \mu Ci/ml$, or approximately 80% of the unrestricted MPC_a. The limit would not be exceeded on an annual basis, as long as the stack flow rate

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1 Due to the measured flow rate of 126 cfm in the stack.

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does not drop below 340 cfm. Again, it is obvious that the MPC_a may be exceeded for short periods of time. However, this is permitted by 10 CFR 20.106, as long as the MPC_a is not exceeded when averaged over one year. For normal operations and meteorology, it has been calculated that the concentration would average $\approx 4.7 \times 10^{-11} \mu Ci/ml$ at the nearest unrestricted area (still on GE property). Therefore, for routine releases, the intent of 10 CFR 20.106 is met at the point of discharge and at the nearest unrestricted area.

2.2 Accidental Releases

The only time that the MPC_a might be exceeded on an annual basis at the point of release is if a major malfunction occurred, releasing most of the ^{85}Kr gas present in the satellite propulsion system. This topic is addressed next.

Based on an accidental release of 6 Ci during one test[2], in addition to the maximum normal release of 1.5 Ci/yr, the total activity released could be as much as 7.5 Ci/yr. Using this value, the annual average concentration at the point of discharge would be $1.19 \times 10^{-6} \mu Ci/ml$, which exceeds the unrestricted MPC_a by a factor of four. However, it should be pointed out that:

1. this is a worst-case scenario which, to this date, has never occurred, and,

2. although the concentration at the point of discharge may exceed the unrestricted MPC_a, **the concentration at the nearest unrestricted area is calculated to be well below the MPC_a.** For example, using the release rate of 7.5 Ci/yr, and assuming worst-case conditions[3], the annual average concentration would be $\approx 2.7 \times 10^{-9} \mu Ci/ml$ or about 1/100 of the unrestricted MPC_a.

Even under these circumstances, the dose to an individual in the nearest unrestricted area is calculated to be 0.039 mrem whole body and 3.9 mrem skin dose (as calculated in PCI-TR-344), which is well below the limits in 10 CFR 20.105.

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2 This represents all the ^{85}Kr used during a test.

3 Ground level release, adverse meteorology, etc., as calculated by the EPA COMPLY program used for this study.

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2.3 Future Limits

Based on the revised 10 CFR 20, which is scheduled to be implemented in 1993 (see references in PCI-TR-344), the picture is even brighter. Although the dose limits for the general public are to be reduced, as stated in the subject report, the new regulation will raise the unrestricted MPC_a (to be called a DAC) to $7 \times 10^{-7} \mu Ci/ml$, or roughly twice the current standard. This is possible, in spite of the lower dose limits, since improvements have been made in the dosimetry calculations for immersions doses, countered by the fact that the β skin dose is now recognized as the controlling factor for ^{85}Kr immersion[4]. Since the new DAC is *higher* than the current MPC, this will have no negative impact on this dose assessment (PCI-TR-344).

3.0 RECOMMENDATIONS

3.1 Recommend that a flow sensor or low-flow alarm be installed in the subject stack vent to insure that a flow rate of at least 340 cfm is maintained ($\geq$ 80% of current flow rate) during satellite leak tests.

3.2 Recommend that a license amendment be requested which would incorporate an annual limit for releases from the leak-test procedure (7.5 Ci/yr) and, based on the subject technical report, request a point of discharge limit of $1.2 \times 10^{-6} \mu Ci/ml$ ($4 \times$ unrestricted MPC_a), averaged over one calendar year, with the provision that the 10 CFR 20, Appendix B, Table II limit will be met at the nearest unrestricted area (the GE parking lot).

3.3 Recommend that GE emergency procedures include a requirement to perform outdoor, down-wind, radiation measurements[5] to confirm the dose rates in unrestricted areas in case a significant release of ^{85}Kr is suspected (e.g., in the event of a confirmed area radiation monitor alarm, IAW DSCS TPR-05001-44).

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4 Several factors come into play here: first, the improvement in photon dose calculations; second, the change in the target organ for photon exposure; and third, the recognition of the significance of the β skin dose.

5 The down-wind direction can be determined from the helipad wind-sock (best for local wind direction), or by calling the National Weather Service at (215)936-1212.

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Radiological Protection and
Environmental Services

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PCI-TR-344

Environmental Impact Assessment for Release of ^{85}Kr from General Electric Corp., Astrospace Division Facilities, Located at Valley Forge, PA

Revision 0

February 21, 1991

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Environmental Impact Assessment for Release of ^{85}Kr from General Electric Corp., Astrospace Division Facilities, Located at Valley Forge, PA

1.0 INTRODUCTION

The General Electric (GE) Corp., Astrospace Division, located at Valley Forge, PA is a major government contractor involved in the designing, building and preparation of satellites and space vehicles for DoD and NASA. As part of the testing procedure for propellant systems, high-integrity leak tests are periodically performed on spacecraft in preparation for launch. During these tests small amounts of ^{85}Kr gas (~ 6 Ci) are used. Although the majority of the ^{85}Kr gas is recovered, a small fraction (< 10%) of the gas is lost during the test. This waste gas is normally vented to the atmosphere. The purpose of this assessment is to determine the environmental impact of these releases, and to recommend an annual limit of releases for purposes of demonstrating compliance with the appropriate Federal regulations.

2.0 GENERAL

As stated above, the radioactive noble gas, ^{85}Kr is used to perform high-integrity leak tests of propulsion systems for spacecraft. These tests are performed under contract to government agencies, mainly DoD (USAF) and NASA. The use of ^{85}Kr is sometimes mandated by the customer, since other techniques, notably helium leak testing, are not considered to be sensitive enough for the systems involved. The test normally involves placing the space vehicle in a sealed inclosure, filling the propulsion system with the noble gas, and testing for leaks by sampling the atmosphere of the enclosure. The releases occur as a result of calibrating the leak detector, transferring the gas to and from the propulsion system, venting the sealed enclosure, and from residual amounts of ^{85}Kr in the propulsion system, gas transfer system, etc. A copy of the complete procedure is enclosed as Attachment 8.1.

In accordance with the above referenced procedure, the current limit for ^{85}Kr releases is 0.5 Ci per test. However, there is presently no up-to-date documentation supporting this limit. The following sections of this report address the current and proposed NRC limits for exposure to persons in unrestricted areas, as well as limits under the National Emission Standards for Hazardous Air Pollutants (NESHAPS) [EPA 85]. The methodologies used are in compliance with these regulations and accepted methods for such analyses. Further, all calculations are documented in the enclosed Attachments.

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3.0 DISCUSSION OF REGULATORY LIMITS

3.1 10 CFR 20 LIMITS

The primary regulatory limits for release of radioactive material to an unrestricted area by a licensee are located in 10 CFR 20, sections 105 and 106 [NRC 90]. In these sections, the licensee:

3.1.1 Should not permit any individual in an unrestricted area to receive a dose in excess of 500 mrem per calendar year[1].

3.1.2 Shall not allow any individual in an unrestricted area to be exposed to more than 2 millirem in any one day or 100 millirem in any one week.

3.1.3 Shall not allow the release of radioactive materials to an unrestricted area in any effluent in excess of the limits of 10 CFR 20, Appendix B, Table II. The licensee is permitted to average these concentrations over a period of one calendar year.

Of note is the fact that the primary limits are based on whole body dose only. There are no explicit limits for dose to the skin. Since it is well known that ^{85}Kr is primarily a beta skin hazard, secondary limits for the skin are developed in this report. It should also be noted that the values in Appendix B, Table II, are based solely on whole body dose. In this report, the skin dose is considered to be controlling, and the method by which skin dose limits were derived from the 10 CFR 20 values is described further, below.

3.2 40 CFR 61, SUBPART I LIMITS

In addition to the NRC limits, the EPA limits under NESHAPS was examined. First it should be mentioned that NESHAPS explicitly omits the dose to the skin or the lens of the eye. Therefore, the only limit under NESHAPS is 10 mrem per calendar year, dose equivalent to the whole body. Methods to determine compliance with this standard are discussed further below.

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1 Technically, this annual limit only applies when incorporated as a license condition, however, good practice dictates that this be treated as a regulatory limit.

3.3 DERIVATION OF EQUIVALENT SKIN DOSE LIMITS, REVISIONS TO 10 CFR 20

It is a well known fact that the beta dose rate to the exposed skin from a semi-infinite cloud of ^{85}Kr is 80 to 100 times the whole body dose rate from the photons emitted. Therefore, in order to be conservative, skin dose limits should be derived and utilized as an ALARA principle. The current NRC regulation (10 CFR 20.105), specifies an annual whole body limit of 500 mrem/yr. to any member of the general public and an equivalent skin dose limit of 3,000 mrem/yr. should be observed[2]. Under the revised 10 CFR 20 [NRC 86], which is scheduled to become effective in January, 1993, the dose limit for exposure of persons in unrestricted areas is reduced to 100 mrem whole body effective dose equivalent per calendar year. However, the new regulation also provides data to allow the whole body effective dose equivalent to be calculated based on skin exposure. This is possible since the skin is treated as a separate organ with a non-stochastic dose limit of 50 rem/yr. for occupational exposure and with a stochastic weighing factor specified as 0.01. Using the 10:1 ratio, based on the non-stochastic value which is the limiting case[3], the dose limit for persons in unrestricted areas should be limited implicitly, to 1,000 mrem per calendar year.

3.4 DOSE LIMITS UTILIZED IN THIS REPORT

Based on the above discussions, the dose limits for the exposure of persons in unrestricted areas are based on the most restrictive regulations applicable. Therefore a dose limit of 10 mrem per year, whole body dose equivalent is utilized in compliance with 40 CFR 61, Subpart I, and a dose limit of 1,000 mrem per calendar year for the exposed skin, in accordance with the revised 10 CFR 20 limits.

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2 Based on the fact that the skin dose limit for occupational exposure is six times the whole body dose limit. Therefore, the skin dose limit for the general public is assumed to be six times their whole body limit.

3 Under the new 10 CFR 20, the limit for whole body exposure is 5 rem/yr. and the skin dose limit is 50 rem/yr. which gives us the 10:1 ratio.

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4.0 CALCULATIONAL METHODS

4.1 Dispersion/Dose Model Used

A standard computer program (COMPLY [EPA 90]) was used to calculate the dose to the nearest on-site individual in an unrestricted area, as well as the nearest off-site individual in an unrestricted area. Extremely conservative assumptions are used by this program. Two sets of calculations were performed for each distance. First, the release was calculated as a ground-level release, with 1 m/s wind speed. Next, a more realistic model was used, using an annual average wind speed for the area of 10 mph[4] (rounded down to 4 m/s), actual stack height (18 m), building height (14 m), etc. Both models were run for the nearest on-site unrestricted area (~ 23 m from release point) and the nearest off-site unrestricted area (~ 300 m from release point). In the more realistic case the model does correct for stack height and/or building wake-mixing if appropriate (based on wind speed). The models used are thoroughly described in NCRP Commentary No. 3 (screening level II) [NCRP 89]. Since the subject model only calculates whole-body doses, the results were multiplied by 100 to obtain a conservative total skin dose estimate.

This model was selected since it is conservative in its assumptions, easy for an individual inexperienced in performing dose calculations and atmospheric dispersion modeling to perform and does not require detailed meteorological data. A copy of this program utilized to generate Attachment 8.4 and training in its utilization will be provided to the GE Astrospace Safety Office with this report.

4.2 Source Term Used

In developing these administrative limits, it was necessary to chose a source term. The GE Astrospace Health and Safety Office reported that no more than three satellites are tested in any calendar year. For these calculations, it was assumed that three satellites were tested with 0.5 Ci of ^{85}Kr released in each test, and a fourth satellite was tested, with the accidental release of <u>all</u> 6 Ci of ^{85}Kr released accidentally. This scenario would result in a total of 7.5 Ci released in one calendar year, a very conservative value.

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4 Based on personal communications with the Environmental Group at Limerick Generating Station.

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5.0 RESULTS

Based on the most conservative methods used to calculate the dose to an individual, it was found that 7.5 Ci of ^{85}Kr could be released in one year without exceeding the dose limits of 10 mrem whole body or 1,000 mrem skin dose (results for on-site unrestricted area was 0.039 mrem whole body and 3.9 mrem skin dose per year). Based on average meteorology, this same release quantity would result in doses of 0.0034 mrem and 0.034 mrem whole body and skin dose, respectively. For the nearest off-site location, the doses are 0.00027 mrem whole body and 0.027 mrem skin dose for worse-case conditions or 0.00006 mrem and 0.0006 mrem, respectively, for average meteorology. Under no circumstances did the calculated value come within a factor of 0.01 of either the EPA or NRC annual dose limits. In fact, in the worse-case calculation, the annual release did not even exceed the daily NRC dose limit (2 mrem in any one day), which means that an accidental release of 6 Ci would not cause excessive exposures to persons in unrestricted areas either on-site or off-site.

6.0 ENVIRONMENTAL IMPACT

The environmental impact of these atmospheric releases is insignificant. The most conservative assumptions yield an annual dose of 0.039 mrem/yr whole body dose. This is 0.39% of the EPA limit of 10 mrem/yr. Skin doses are estimated to be 3.9 mrem/yr, which also happens to be 0.39% of the NRC limit in the future 10 CFR 20. For comparison, an average individual in the United States receives approximately 95 mrem/yr from unavoidable[5] natural radiation sources [BEIR 90], and 360 mrem/yr from all normal radiation sources (e.g., natural sources, including radon; medical sources; consumer products and miscellaneous sources). The nearest off-site individual would therefore receive 0.000075% additional whole-body dose. Compared to other methods of disposal (e.g., recovering gas in cylinders and disposing in a radioactive waste repository), the risks from release to the atmosphere are insignificant. For example, 7.5 Ci of ^{85}Kr would require 211 type "K" cylinders for

5 I.E., excluding radon exposure.

disposal[6] at a low-level radioactive waste disposal site. The transportation risks alone far exceed the health risk from the atmospheric release of the gas.

7.0 ALTERNATIVES

As part of the Environmental Impact Assessment, alternatives to the atmospheric release of ^{85}Kr were examined. These alternatives included not using ^{85}Kr for the leak test gas, or attempting to recover the waste gas for some other form of disposal.

7.1 First, the use of the ^{85}Kr leak test method is a contractual requirement of the customer (in this case, the USAF). GE has recommended replacing the ^{85}Kr leak test with the equally sensitive helium leak test method, but has not yet received a favorable response from the Air Force. Furthermore, as the need for these satellites is a legitimate national security concern, ceasing their construction and testing is not an viable alternative. However, GE continues to pursue the use of an alternative leak test method.

7.2 Recovery and disposal of ^{85}Kr gas. The second alternative is to recover and dispose of the waste ^{85}Kr gas by some method other than atmospheric release. To investigate this further we reviewed the EIA prepared for the disposal of the 57,000 Ci of ^{85}Kr gas contained in the Three Mile Island reactor building atmosphere following the March 28, 1979 accident [NRC 80].

Although several methods for separating the ^{85}Kr from the ambient air were proposed, the were generally rejected on cost effectiveness, time to build and install the systems, and potential hazards from alternative disposal methods, specifically the transportation and disposal of ^{85}Kr in gas cylinders. The NRC staff summarily rejected the transportation and disposal of ^{85}Kr at one of the existing low-level radioactive waste disposal sites on the basis of accident potential, and the complications of land disposal of gases. It was the Commission's (and our) belief that atmospheric release of the gas, in a controlled fashion, was the least risky of the proposed disposal methods.

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6 For disposal at low-level radioactive waste facilities gas cylinders may not contain more than 1½ atmospheres. Since GE supply cylinders are at 2,000 psi, this means that 91 cylinders would be required to dispose of the ^{85}Kr gas contained in one high-pressure cylinder.

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8.0 REFERENCES

BEIR 90 National Research Council. *Health Effects of Exposure to Low Levels of Ionizing Radiation.* BEIR V. Washington, DC: National Academy Press; 1990.

EPA 85 US Environmental Protection Agency (EPA). National emission standards for hazardous air pollutants; standards for radionuclides, 40 CFR Part 61. *Federal Register.* 50 FR 505190. Washington, DC; US Government Printing Office; 1985.

EPA 90 US Environmental Protection Agency (EPA). *User's Guide for the COMPLY Code.* Washington, DC: US Environmental Protection Agency; 1990.

NCRP 89 National Council on Radiation Protection and Measurements (NCRP). *Screening Techniques for Determining Compliance with Environmental Standards: Releases of Radionuclides to the Atmosphere.* NCRP Commentary No. 3. Bethesda, MD: National Council on Radiation Protection and Measurements; 1989.

NRC 80 US Nuclear Regulatory Commission. *Environmental Assessment for Decontamination of the Three Mile Island Unit 2 Reactor Building Atmosphere (with Addendum).* NUREG-0662. Washington, DC: US Nuclear Regulatory Commission; 1980.

NRC 86 US Nuclear Regulatory Commission. 10 CFR Parts 19, et al., standards for protection against radiation; proposed rule; extension of comment period and republication. *Federal Register.* 51 FR 511092. Washington, DC; US Government Printing Office; 1986.

NRC 90 US Nuclear Regulatory Commission. Title 10, Energy, Part 20, Standards for Protection Against Radiation. *Code of Federal Regulations.* Washington, DC; US Government Printing Office; 1990.

8.0 ATTACHMENTS

8.1 General Electric Astrospace Division. Test Procedure for Propulsion System External Leak Test for DSCS III Program [Unclassified]. DSCS TPR-05001-44, Revision A, December 1988.

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8.2 General Electric Astrospace Division. Propulsion System Leak Test for DSCS III [unclassified] (summary of procedure, with emphasis on health physics related sections) and Data Sheets 8 & 3 (^{85}Kr release calculations) for test ending 11/16/90.

8.3 General Electric Astrospace Division. Letter to Krypton-85 DSCS File, from John McLaverty, dated Feb. 8, 1991. Subject: Ventilation Flow Rate Survey for Krypton-85 Exhaust Duct in High Bay Area.

8.4 Computer print-outs (4) of COMPLY code runs for GE Astrospace Kr-85 release limits.

02/14/91 12:28

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS FROM THE COMPLY CODE, VERSION 1.2, SEPT. 1989

Prepared by:

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Aerospace Division
Valley Forge, PA

John McLaverty
(215) 354-1085

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation Programs
Washington, D.C. 20460

Kr-85 Release Limits

SCREENING LEVEL 2

DATA ENTERED:

Nuclide	Release Rate (curies/YEAR)
KR-85	7.5ØØE+ØØ

Distance from the source to the receptor is 23 meters.

Default mean wind speed not used.
Mean wind speed is 1.ØØ m/sec.

NOTES:

Input parameters outside the "normal" range:

Wind speed is unusually LOW.

RESULTS:

WHOLE BODY dose: 3.9E-Ø2 (mrem/year).

*** COMPLY at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

Kr-85 Release Limits

SCREENING LEVEL 2

DATA ENTERED:

Nuclide	Release Rate (curies/YEAR)
KR-85	7.5ØØE+ØØ

Distance from the source to the receptor is 3ØØ meters.

Default mean wind speed not used.
Mean wind speed is 1.ØØ m/sec.

NOTES:

Input parameters outside the "normal" range:

Wind speed is unusually LOW.

RESULTS:

WHOLE BODY dose: 2.7E-Ø4 (mrem/year).

*** COMPLY at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

Kr-85 Release Limits

SCREENING LEVEL 2

DATA ENTERED:

Nuclide	Release Rate (curies/YEAR)
KR-85	7.500E+00

Release height 18 meters.

Building height 14 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 23 meters.

Building width 14 meters.

Default mean wind speed not used.
Mean wind speed is 4.00 m/sec.

NOTES:

Input parameters outside the "normal" range:

None.

RESULTS:

WHOLE BODY dose: 3.4E-03 (mrem/year).

*** COMPLY at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

Kr-85 Release Limits

SCREENING LEVEL 2

DATA ENTERED:

Nuclide	Release Rate (curies/YEAR)
KR-85	7.5ØØE+ØØ

Release height 18 meters.

Building height 14 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 3ØØ meters.

Building width 14 meters.

Default mean wind speed not used.
Mean wind speed is 4.ØØ m/sec.

NOTES:

Input parameters outside the "normal" range:

None.

RESULTS:

WHOLE BODY dose: 6.ØE-Ø5 (mrem/year).

*** COMPLY at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

********** END OF COMPLIANCE REPORT **********

SECTION 4
TEST AND OPERATION

4.1 TASK 1 - PREOPERATIONS CHECK LIST

ITEM	VERIFY	OPERATION
1-1	______	Verify Propulsion System pressure/temperature calibration tables are available.
1-2	______	Verify equipment of Paragraph 3.1 is accumulated and validated.
1-3	______	Verify materials of Paragraph 3.2 are accumulated and certified.
1-4	______	Verify the current issue of DSCS-TPR-05001-44 is available.
1-5	______	Verify personnel radiation dosimeters are available for all operating personnel.
1-6	______	Verify 8 radiation warning signs are available for posting test area and roof.
1-7	______	Verify 4 high pressure warning signs are available.
1-8	______	Verify 2 emergency procedures for Krypton-85 leakage, Appendix A, are available.
1-9	______	Verify Scott paks are available outside the test area for operating personnel (Minimum of 2).
1-10	______	Verify KR-85 exhaust stack is operational. Record stack velocity from in line flowmeter or have the RSO measure the velocity using a thermoanemometer. Record velocity: ______ fpm (must be greater than 340 fpm).
1-11	______	Verify radiation monitor equipment is available.
1-12	______	Verify MAGE/EAGE calibrations are current.
1-13	______	Verify pressurization trailer (C5A) proof pressure validation is current.
1-14	______	Record test facility temperature and humidity: Relative Humidity ______% Temperature ______°F
1-15	______	Verify all propulsion system latch valves are open. LV1 ____ LV2 ____ LV3 ____ LV4 ____ LV5 ____ LV6 ____

TASK 1 COMPLETE

TEST CONDUCTOR: ______________________________ DATE: ______________

TEST CONTROLLER: ______________________________

4.2 TASK 2 - LEAK TEST EQUIPMENT SET-UP

CAUTION

THIS TASK INVOLVES HIGH PRESSURE GAS. USE OF SAFETY GLASSES IS REQUIRED. ALL PRESSURE LINES WILL BE RESTRAINED WITH LEAD SHOT BAGS AND RESTRAINING CABLES. THIS TASK INVOLVES THE USE OF A RADIOACTIVE CALIBRATION SOURCE (BA-133). RADIATION DOSIMETERS MUST BE WORN BY ALL PERSONNEL INSIDE THE RADIATION CONTROLLED AREA.

ITEM	VERIFY	OPERATION
2-1	______	Place the appropriate radiation warning signs at all access points to the radiation controlled leak test area and roof.
2-2	______	Place high pressure warning signs at all access points to the high pressure tests area.
2-3	______	Post copies of Krypton-85 leakage emergency procedure in leak test area.
2-4	______	Verify all test personnel are familiar with Krypton leakage emergency procedure.
2-5	______	Verify all personnel are familiar with emergency evacuation route.
2-6	______	Verify that Task 1 has been completed and signed off.
2-7	______	Connect portable gas hood to facility exhaust stack with 4" flexible duct. Secure each end with hose clamps.
2-8	______	Turn on exhaust stack fan. Notify Maintenance (Ext. 4067) of test schedule.

CAUTION

EXHAUST STACK FAN MUST REMAIN ON DURING ALL OPERATIONS THAT REQUIRE USE OF HE/KR-85 GAS MIXTURE.

ITEM	VERIFY	OPERATION
2-9	______	Verify protective frame is removed from H1 or H7 dolly.
2-10	______	Verify solar array covers are removed from each array. N/A if solar array covers are not installed.

TEST CONDUCTOR: ______________________________ DATE: ______________

TEST CONTROLLER: ______________________________