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TG 7.4
Form 11-5
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TG 452

SUBJECT: Aircraft Decontamination

2 JUN 1954

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FG [redacted]

TO: Commander
Strategic Air Command
Offutt Air Force Base
Nebraska

1. This letter refers to your message DMJENTN1 4849 and our message, date time group 242110Z. Attached is the final report of the Nuclear Applications Division, Task Group 7.4, on aircraft decontamination during Operation CASTLE.

2. In view of the necessity for early release of aircraft to maintenance activities, decontamination was an operational project rather than scientific. The methods used were the results of experience gained on past test operations and are believed to be the best suited for the needs of Task Group 7.4.

3. It was found that successive washings, in some cases, reduced radiation intensities, however, more than two washings did not prove profitable. Citric acid was used in some instances for decontamination of B-36 aircraft but did not speed up the decontamination process. This method was used primarily as a sample collection program as the citric acid aided in later chemical analysis. The most effective decontamination was attained through allowing time for decay and the use of scrub brushes with a detergent soap and gunk.

4. It was necessary to use a large number of personnel for washing aircraft in order to stay within the established peacetime tolerances. Under tactical conditions the maximum tolerance will undoubtedly be higher resulting in a reduction of the number of required personnel.

5. During the operation there was concern regarding the relative amounts of Beta radiation which were being absorbed on the hands of maintenance personnel working on contaminated aircraft. Since the Task Group instrumentation was limited, the scientific personnel were asked to take a group of Beta measurements on the surface of contaminated aircraft and within the engine nacelles. They utilized a "Juno" survey instrument and the reading showed the ratio of Beta to Gamma to be ten to one. Since the personnel were not to receive greater than 10r whole body radiation, it was safe to assume that the Beta radiation absorbed by the hands would not exceed 100 reps. This is of small significance since 500 reps are required to produce any skin changes.

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6. If the information furnished by this report does not satisfy your requirements in regard to decontamination of aircraft or Beta radiation, it is recommended that action be taken through normal channels to include any remaining requirements in the scientific program to be conducted during the next series of nuclear tests.

FOR THE COMMANDER:

1 Incl:
Final Report of Nuclear
Applications Division

HERSCHEL D. MAHON
Colonel, USAF
Chief of Staff

[redacted]

AFWL/HO (10)

[redacted]

HEADQUARTERS
TEST AIRCRAFT UNIT
APO 187, c/o Postmaster
San Francisco, California

12 April 1954

REPORT OF DECONTAMINATION OF B-36 AIRCRAFT

1. From the experience gained following shot BRAVO in decontamination of B-36 aircraft it was apparent that the techniques and utilization of personnel and equipment must be revised. Entirely too much time was used to decontaminate the aircraft and excessive radiation exposures were being accumulated by B-36 maintenance personnel who participated in the decontamination.

2. Decontamination is not 100% effective due to the nature of radioactivity and the inherent problem of completely cleaning all aircraft surfaces and engines. The aircraft washing personnel were required to receive additional radiation exposure during the maintenance phase. It was also apparent that the Task Group might be required, because of delays due to adverse weather, to accelerate the turn around period as scheduled for the original "Shot" program: Thus, the need for an effective and time saving decontamination program.

3. Equipment, personnel, and procedures used in decontamination for shot BRAVO were as follows:

a. Equipment:

NOMENCLATURE	CLASS	STOCK
Five (5) Decontamination Apparatus Power Driven Trucks, Mounting Liquid Agent Truck 6 x 6	50-A	5001-240035-NL
Three (3) Heaters, Water, M-1	CWS	E-5-59-2
One (1) 32,000 gal water tank		
Portable Lights		
Brush, Aircraft	AF-29	6700-123175
Maintenance stands (various types)		
Compound, Cleaning Aircraft	AF67	7300-190100
Kerosene	AF06	7500-395000
Suit, H.B.T.	AF-13B	8320-818100
Cap, Mechanic, H.B.T.	AF-13A	8310-125000
Drawers, Cotton	AF-13B	8320-275000
Undershirt, Cotton	AF-13B	8320-930000
Socks, Cotton	AF-13B	8320-810000
Shoes	AF-13D	8340-860000
Boots, Rip	AF-13D	8340-135000

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Report of Decontamination of B-36 Aircraft, cont'd

Shield, Face	AF-13D	8330-700825
Apron, Rubber	AF-13A	8310-007500-555
Gloves, Rubber	AF-13A	8310-296325
Respirator, Dust	AF-13C	8330-682000
Detergent, Powder	AF-07	7300-NL
Truck, Fuel Servicing	AF-50A	5001-770050-435

b. Personnel:

(1) One (1) officer and two (2) NCO supervisors (Rad-Safe personnel).
(2) Eleven (11) B-36 maintenance personnel/aircraft.
(3) One (1) water heater operator.
(4) Four (4) truck drivers/shift.

c. Utilizing the personnel and equipment above, the following procedures were used:

(1) After the completion of the mission and the aircraft had landed they were parked in an isolated area and allowed to decay for a specified length of time. In this case, the period was 20 hours after the initial exposure.

(2) Stands were placed into position, cowling removed and a gunk-kerosene mixture in the ratio of 1:5 applied over the exterior surface of the aircraft and engines. Surfaces were scrubbed while the mixture was applied. Following this, a warm water and detergent mixture was applied to remove the emulsion formed by the gunk. This in turn was followed by a water wash to remove all residue. The surfaces of the aircraft were allowed to drain for 30 minutes and then readings were made of the radiation levels.

(3) Maintenance personnel were utilized throughout the decontamination process for decontamination of their aircraft, in this particular instance for 18 hours. Other personnel were used on a 12 or more hour shift basis.

(4) AN/PDR 39C radiac instruments were used to read levels of gamma contamination. Caution must be used in making these observations as an accumulation of water in certain parts of the cowling will cause these areas to read higher following decontamination than before.

(5) The entire procedure above was repeated for a second time. It has been found that if an aircraft is thoroughly cleaned in two (2) washings it is impossible to bring the contamination level down any noticeable degree by further washings.

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Report of Decontamination of B-36 Aircraft, cont'd

4. Evaluation of the aircraft decontamination program following shot BRAVO revealed the following discrepancies:

a. Insufficient numbers of personnel were assigned to the decontamination of B-36 aircraft.

b. Maintenance crews assigned to the aircraft should not be used for decontamination because of the limited radiation exposure allowed during this operation.

c. Immediate maintenance facilities should be available for the repair of decontamination equipment. Approximately six (6) hours were lost due to breakdown of equipment, all of which was new.

d. Improper scheduling of washing crews resulted in approximately four (4) hours per aircraft lost for meal periods.

e. Adequate lighting facilities for night operations were not available.

f. Safety features for wash crews working on top of B-36 wings were not available.

5. Equipment, personnel and techniques used in decontamination for shot ROMEO were as follows:

a. In addition to equipment listed in paragraph 3a, the following were used:

(1) One (1) series of three (3) water heaters and one (1) series of two (2).
(2) Night lights installed on poles.
(3) One (1) 750 gallon oil truck for storage and dispensing of kerosene.
(4) Trapeze type safety cable and harness.

b. Personnel:

(1) One (1) officer and three (3) NCO supervisors (Rad-Safe personnel).
(2) Fifteen (15) non-aircraft maintenance personnel/6 hour shift.
(3) Three (3) heater operators (one per eight hour shift).
(4) Five (5) truck drivers per eight hour shift.
(5) One (1) fuel truck operator per twelve hour shift.
(6) One (1) automotive mechanic (24 hour call).
(7) One (1) clerk administrative (twelve hour shift).

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Report of Decontamination of B-36 Aircraft, cont'd

c. Procedures:

(1) The first major change in technique for operation ROMEO was to allow the aircraft to decay for approximately 44 hours rather than the previous 20 hours. This reduced personnel exposure by approximately 25-44%.

(2) The entire procedure for utilizing of personnel was changed. Maintenance crews removed cowling and prepared the aircraft for decontamination, but did not participate in the washing. Personnel were taken from other jobs for this purpose. Wash crews were divided into four (4) groups and put on a six (6) hour shift on a 24 hour a day basis. For the six hour shift no breaks were given. This eliminated delays previously encountered due to meals, occasional change of cloths, coffee breaks, etc. One (1) truck and equipment mechanic was kept on 24-hour call in case of breakdown.

(3) Another improvement was the installation of "telephone pole lighting". This did away with the necessity of spot lights for night work and the consequential blinding effect.

(4) Installation of a Trapeze type safety harness for airmen working on top of B-36 wings was a safety factor that increased the effectiveness of scrub personnel.

(5) A minor function accomplished was the drilling of small holes in drain area of cowling which eliminated accumulation of contaminated wash water.

(6) Supply of hot water was increased by putting two (2) more heaters into operation.

6. In summation, B-36 aircraft were decontaminated in one half to one third the time on ROMEO as compared to BRAVO. Maintenance crews did not accumulate excessive doses of radiation and were able to perform maintenance without undue fatigue.

7. For specific times, dates, and intensity readings see the attached chart. (Chart #1)

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Report of Decontamination of B-36 Aircraft, cont'd

8. Chart #2 and #3 indicates the radiation exposure savings on maintenance personnel following shot ROMEO.

9. Chart #4 indicates a few details of the cloud sampling operation.

FINIS A. MITCHELL
Major, USAF
Chief, Nuclear Applications
Division

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CHART #1

B-36

	Acft #1083 BRAVO	Acft #1083 ROMEO	Acft #1086 BRAVO	Acft #1086 ROMEO
1st Survey	1 Mar 1120 1400 mr/hr	27 Mar 1600 250 mr/hr	2 Mar 0900 1100 mr/hr	27 Mar 1210 3200 mr/hr
Type of Decon	Decay	Decay	Decay	Decay
2d Survey	4 Mar 0245 500 mr/hr	29 Mar 1200 60 mr/hr	2 Mar 800 mr/hr	29 Mar 0540 220 mr/hr
Type of Decon	Gunk	Gunk	Gunk	Soap & Water
3d Survey	4 Mar 1130 280 mr/hr	29 Mar 1453 34 mr/hr	2 Mar 400 mr/hr	29 Mar 1145 120 mr/hr
Type of Decon	Gunk		Gunk	Gunk
4th Survey	5 Mar 80 mr/hr	30 mr/hr	3 Mar 400 mr/hr	60 mr/hr
Type of Decon	Released	Released	Released	Released
Hours of Decon	18 hours	2:20 hours	18 hours	5:30 hours
Personnel	17	26	17	26
Manhours Required	306 hours	61 hours	306 hours	163 hours
Water Used	3200 gal	950 gal	3200 gal	3650 gal
Gunk Used	220 gal	83 gal	220 gal	140 gal
Soapy Water Used	2000 gal	1400 gal	2000 gal	3000 gal
Kerosene Used	1010 gal	321 gal	1010 gal	560 gal
Truck Maint Required	Minor	Minor	Minor	Minor

(Intensity readings are the highest found on a particular survey and are subject to Geometry, Personnel and Instrument error.)

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(Multiply personnel x hours to decon for manhours required.)

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CHART #2 [redacted]

RADIATION EXPOSURE OF B-36 MAINTENANCE CREWS

Acft #1086

BRAVO (Decontamination plus Maintenance Film Badge Readings)	ROMEO (Maintenance Readings only)
645 mr/hr	470 mr/hr
765 mr/hr	380 mr/hr
540 mr/hr	595 mr/hr
610 mr/hr	655 mr/hr
1200 mr/hr	700 mr/hr
1080 mr/hr	440 mr/hr
830 mr/hr	560 mr/hr
560 mr/hr	470 mr/hr
395 mr/hr	465 mr/hr
6425 MR total for crew	4835 mr/hr total

Saving of 25% exposure

CHART #3

Acft #1083

345 mr/hr	550 mr/hr
970 mr/hr	530 mr/hr
960 mr/hr	620 mr/hr
1370 mr/hr	630 mr/hr
295 mr/hr	0
960 mr/hr	720 mr/hr
860 mr/hr	530 mr/hr
620 mr/hr	00
440 mr/hr	860 mr/hr
520 mr/hr	0
520 mr/hr	0
7860 mr/hr total for crew	4440 mr/hr

Saving of 44% exposure

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CHART #4

SAMPLING INFORMATION B-36, #1086

Shot Name:	BRAVO (1 Mar 54)	ROMEO (27 Mar 54)
Shot Time:	0645	0630
Penetration Time:	1025-1105	0951-1100
Intensities during Penetration	1.5-4 R/hr	2.1-5 R/hr
Background leaving cloud	0.4 R/hr	1.5 R/hr
In cloud exposure	3.0 R	3.0 R
Time of Landing:	12:05	12:00

SAMPLING INFORMATION B-36, #1083

Shot Name:	BRAVO (1 Mar 54)	ROMEO (27 Mar 54)
Shot Time:	0645	0630
Penetration Time:	1114-1214	1310-1454
Intensities	3 R/hr	.08 R/hr
Background leaving cloud:	1 R/hr	.03 R/hr
In cloud exposure:	2.45 R	.3 R
Background on landing (cockpit)	0.7 R/hr	.03 R/hr
Time of landing:	1300	1554

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