STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : Isotopes Extension Files DATE: October 22, 1956

FROM : R. L. Hervin and R. E. Cunningham

SUBJECT: VISIT TO LOCKHEED AIRCRAFT CORPORATION, CALIFORNIA DIVISION, BURBANK, CALIFORNIA

Department visited: Metallurgical Chemical Research Department, Building 151, Plant

Users visited: J. F. Hatta , Chief Safety Engineer, Chairman; Mr. Barron, Manager of Medical Department (not available during visit); Mr. Simon and Mr. P. M. Reedy, Jr., Group Engineers in Chemical Research; Mr. E. H. Burkhart, Department Manager.

Description of License: License No. 4-921-1 is for 1 curie of Cobalt 60 for industrial radiography and millicurie quantities of Cobalt 60, Iodine 131, for tracer studies; Strontium 90 beta gauge; and Cesium 137 for calibration and irradiation purposes.

Type and Date of visit: First evaluation visit. October 5, 1956.

Accompanied by: John E. Vaden, Engineer, Los Angeles County Health Department

I. Administrative Control

The radiological safety officer at the present time is J. F. Hattan, who is the chief safety engineer at this facility. His responsibility is in inspection, advising and assistance on any radiological safety problem. The members of the isotope committee and their administrative functions have been compiled in an administrative procedure, a copy of which is attached. The isotope committee approves in advance the application of any isotope or device involving potential radiation hazards. It will approve all proposals for the use of isotopes and arrange for necessary paper work on an intra-divisional policy at this plant. The isotope committee has sole responsibility for the use of material and decisions concerning radiation protection, procurement and records. In addition to written administrative instructions, they have also combined a standard operating procedure which delineates instructions to personnel on handling of material, security, storage, disposal, monitoring procedures and similar information. A copy of this standard operating procedure is attached to this report.

II. Material Licensed

Please refer to the introduction of this report for description of program. At the time of the visit only a few millicuries of Iodine 131 were presently being used in their experimental tracer studies on metal cleaning methods. Their cesium source has been ordered and they expect delivery within 30 days. The Cobalt 60 source which is to be used for industrial radiography will be ordered in the near future. The Lockheed Aircraft Corporation is also working with the Isotopes Specialties Company on a Ruthenium 106 back-scattering gauge for measurement of metal thicknesses. Upon completion of this project by the Isotopes Specialties Company, Lockheed will use the Ruthenium 106 backscattering gauge. The visit did not constitute a review

of their radiography program but only a review of the facility.

Disposal methods for this facility are furnished by the Isotopes Specialties Company.

III. Facilities and Equipment

Their present facilities consist of 2 rooms, each 10' x 16'. One is used for a source storage and radiography room and the other used as their instrument room and for tracer level experiments. The instrument and tracer room contains wooden and stainless steel benches and wooden cabinets. An outline of this facility is available in their original application. The sink was of porcelain and drains into sanitary sewage. The floor was of vinyl acetate linoleum and extended for a few feet up the walls of the laboratory. The walls were 1/16" lead sheets and were painted with a white enamel paint. Two standard stainless steel hoods are available and measured as 50 to 60 lfm and were adequate for their program. The second laboratory contained a lead safe approximately 3' x 2' x 2' which was previously used for the storage of radium paint. Lead bricks were also available for shielding purposes. A wooden laboratory bench was available. All benches and table tops in both laboratories were covered with vinyl linoleum and had a protective covering of mylar. Floor and walls were the same as previously described.

Remote handling devices such as pipettes, tongs, syringes, were available for their tracer studies. However, remote equipment for the industrial radiography portion of their program was not available but will be available when the sources are delivered. Instrumentation noted on their initial application was noticed in their counting room and available as described in their application. Leak testing of their sources will be accomplished by themselves or by Isotopes Specialties. Laboratories were adequately posted with radiation signs.

IV. Precautionary Procedures

A medical examination is given to each person who will be working with ionizing radiation and each employee shall be examined thereafter at definite intervals but not less than once a year. These examinations also include a blood count. Bioassay procedures are not necessary at present but will be available in case of an emergency. No overexposures were noted at this facility. The two radioisotope laboratories were initially used for x-ray machines in industrial radiography. The laboratories are surveyed on a weekly basis and whenever contamination is found, it shall be brought to the direct attention of supervision. Personnel monitoring is with pocket dosimeters and film badges by Isotopes Specialties. Please refer to the attached standard operating procedures for this facility for other precautionary procedures.

V. Records

Personnel monitoring, receipt and transfer, and disposal records were adequate.

VI. Compliance with Regulations and Conditions of License

No non-compliance conditions were observed at the time of the visit.

EVALUATION AND RECOMMENDATIONS

5/4/56

Institution: Lockheed Aircraft Corporation
Burbank, California

Address:

Category:
RSB Representative: RLH & REC
Date of Visit: 10/5/56

Type of License

Limited	X
Broad	
Comprehensive	
General	

Pre-licensing
First X
Repeat
Post-licensing
First
Repeat
Special

Reviewed by:
RSB
Licensing

Conditions: Satisfactory; Marginal; Unsatisfactory; Not Applicable (S, M, U, NA)

I. S Administrative Control
II. S Material Licensed
S Disposal
III. S Lab Facilities
S Shielding
S Equipment
S Instrumentation
IV. S Personnel Monitoring
S Radiation Survey Procedures
S Controlled Areas
S Non-controlled areas
S Radiation Signs
V. S Records
VI. S Regulations
VII. S Terms and Conditions

Critical Evaluations: (Summary of over-all program, discussion of specific marginal and unsatisfactory conditions with recommendations for corrective action.)

A letter from H. B. Zipple written December 7, 1955, regarding tritium was discussed with personnel at this facility. The primary purpose of this letter was in the use of tritium instead of Sr 90 or radium in the making of luminous emergency signs for use in airplanes.

During the discussion Mr. C. M. Reedy, Jr., discussed the possibilities of using Ruthenium 106 in a backscatter gauge rather than using the Sr 90 beta gauge. This is presently being done thru Isotopes Specialties Company under the guidance of Mr. Goldstein.

Their standard operating procedures supplement the main ones at Lockheed as already issued and available at our office. It should be pointed out that the field representatives feel that this installation should be revisited approximately 9 months after the receipt of their sources for industrial radiography as this particular visit was a little premature for the entire review of their program. However, it is felt that their program and facilities are adequate and they could handle greater amounts of activity than they will have on hand under their license.

yes Revisit is Recommended: (When) approx. 9 mo. after receipt of sources

none (Date) Letter of Recommendation Sent to:

(Date) Letter of Compliance Received From:

LOCKHEED AIRCRAFT CORPORATION
California Division

Interdepartmental Communication

TO: ALL DEPARTMENT HEADS CONCERNED — September 19, 1956

FROM: CHAIRMAN - ISOTOPE COMMITTEE — 90-50 102 B-1 6-2306

SUBJECT: CONTROL OF RADIATION HAZARDS

PURPOSE:
This IDC has been compiled for the help of all California Division employees concerned with the use of radioisotopes or ionizing radiations. The potential hazards associated with certain materials make it necessary to establish regulations governing their general handling and use. Since radiation exposure can cause severe personal injury and possibly death, it is of utmost importance that these regulations be followed. Most of the hazards involved in the use of radiation or radioactive materials are known and so are the means for reducing these hazards to negligible proportions. Only a limited number of people within the Company may be exposed to potentially dangerous amounts of ionizing radiation and adequate measures must be taken to safeguard them.

RADIOLOGICAL SAFETY PROGRAM

1.1 Authority

Appointment of an Isotope Committee and Radiological Safety Officer is authorized in IDC, Forrest to All Executives and Department Heads, January 18, 1956, "Formation of CALAC Isotope Committee."

2.1 Organization

2.2 The Isotope Committee is composed of the following units:

MEMBER	ORGANIZATION
Chief Safety Engineer, Chairman	Safety Department
Manager of Medical Dept. (Physician)	Medical Department
Group Engineer, Chemical Research	Engineering Department
Manager, Purchasing Operations	Purchasing Department
Non-Destructive Testing Specialist	Quality Control Department

2.3 The Chief Safety Engineer is appointed Radiological Safety Officer. He "will advise on, or be available for advice and assistance on radiological safety problems."

3.1 Procurement

3.2 The Isotope Committee will approve, in advance, the acquisition of any isotopes and other materials or devices involving potential radiation hazards. It will also approve all proposals for the use of isotopes and other materials or devices involving potential radiation hazards. In addition, it will arrange for the submission of the necessary application to secure a General Authorization to procure radioisotopes and will assure that the necessary intradivisional policies and procedures are observed. The Isotope Committee, through its chairman, will keep suitable records of such transactions.

4.1 Receiving and Shipping

4.2 The Receiving Department will not open potentially dangerous shipments of radioactive materials. Exceptions: Radioactive placards or aircraft instruments used in airplanes. Electronic tubes containing small amounts of radioactive material. Spark gap tubes containing less than 5 microcuries of Cesium 137. Uranium and thorium compounds not requiring A.E.C. authorization which are used as chemical re-agents in analytical procedures. Any machine which a survey indicates can not be operated in such a manner as to produce a significant amount of radiation externally. Neither will such material be inspected by Receiving Inspection Department. The Receiving Department will notify the Radiological Safety Officer that the material has been received and he will make arrangements for the unpacking and distribution to the ultimate user.

5.1 Disposal

5.2 Disposal of radioactive materials shall be accomplished by natural decay if possible, or by an authorized and approved commercial disposal service selected by the Isotope Committee. If any doubt arises in the disposal of radioactive substances, the material should be kept isolated, placarded, properly shielded, and the radiological Safety Officer notified at once.

6.1 Rules Governing Use

6.2 All work performed with ionizing radiation is subject to the regulations of the Isotope Committee.

6.3 The head of each department using radioactive materials must assume continuous responsibility to seek advice and carry out all essential safety measures. Each using department shall keep the following information on file for examination by the Committee:

(a) accurate and up-to-date inventory
(b) location of all sources
(c) record of all transfers (within Calac and outside Calac)
(d) discrepancies or losses with explanations
(e) disposal records with dates.

6.4 It shall be the responsibility of the using department head to inform the medical department and radiological safety officer of any proposed change in personnel. This is essential for the arrangement of pre-placement medical examinations and the issuance of personnel monitoring devices.

7.1 Other Employees

7.2 All employees of other divisions of the Company or of outside contractors coming under the scope of this program shall remain responsible to their own supervision for Radiological Safety. However, they shall not engage in any program detrimental to the health of Calac employees.

8.1 Supervision and Instruction

8.2 All operations involving exposure to potentially injurious levels of ionizing radiation or potentially injurious quantities of radioactive materials shall be under the supervision of competent technical personnel familiar with the hazards of exposure that may be encountered

8.3 Every employee who may be regularly or frequently exposed to ionizing radiation shall be instructed in the hazards he may encounter in the course of his duties and in methods of protecting himself and others against them. This shall be the responsibility of the department head who will obtain assistance if needed.

9.1 Medical Examinations

9.2 A pre-use medical examination shall be given to each person who may be exposed to potentially dangerous amounts of ionizing radiation. Each employee so exposed shall be examined thereafter at definite intervals but not less than once yearly while so exposed.

9.3 Medical examinations will be given to employees who have been exposed to significant amounts of ionizing radiation, shortly after such employees have been permanently removed from the exposure. This, for example, will include:

(a) transfer to another department
(b) radioisotope discontinuance in department
(c) termination.

Employees remaining in the employ of the Company shall have an additional recheck physical examination one year after permanent removal from ionizing radiation exposure.

9.4 When, in the opinion of the medical department, continued exposure to ionizing radiation is likely to injure an employee's health, such employee shall be removed from the exposure.

9.5 Cases of possible internal accumulation of radioisotopes or over-exposure to radiation shall be called immediately to the attention of the manager of the medical department.

10.1 Maximum Permissible Exposures

10.2 No employee shall be exposed to more than 0.3 r of X-rays or gamma rays or other ionizing radiation producing equivalent biologic effect in a week. For more detailed dose limits on the biological effects of other ionizing radiations equivalent to X-ray exposure and the permissible limits for whole body exposed and for hands only exposed, see California General Industry Safety Orders, Group 6, order number 3803B.

10.3 Concentrations of radioactive substances in the air of workrooms or other locations in which employees are regularly or frequently present shall not be greater than:

(a) 5×10^{-12} microcuries per cubic centimeter for alpha emitters.
(b) 10^{-9} microcuries per cubic centimeter for beta and gamma emitters.

11.1 Monitoring

11.2 Workrooms or other locations in which material giving rise to ionizing radiation is used or handled in potentially dangerous amounts shall be inspected for hazardous amounts of radiation at least weekly. When such materials are received, transferred, or used for different operations, they shall be monitored to assure safe handling. Radioactive materials in sealed containers shall be inspected for leaks at least yearly.

11.3 Equipment, machines, or totally protective installations giving rise to ionizing radiation shall be surveyed to determine stray radiation level when first installed and thereafter whenever any change is made in the installation or its use which would affect its protective features, but in no case shall monitoring be done less often than yearly.

11.4 Employees who may be subjected to ionizing radiation which could potentially exceed 0.3 r X-rays or gamma rays per week or which could potentially exceed other exposures referred to in California General Industry Safety Order No. 3803, shall wear appropriate film badges or other protective devices. These devices shall be worn on that part of the body expected to receive the greatest exposure. Records of exposure as recorded by these devices shall be reviewed by a Company physician and the Radiological Safety Officer. The medical department shall keep them on file as a permanent record. Lockheed personnel should also wear film badges and, if necessary, other appropriate devices when going on trips involving Company business, if exposure to radiation is contemplated.

12.0 Maintenance of Protective Devices

12.2 When it is found by monitoring or otherwise, that any shielding or other protective device is defective, insufficient, or inoperative, such shielding or device shall be promptly repaired or augmented as may be needed, and operations involving production of ionizing radiation shall not be resumed until adequate repairs or changes are completed.

12.3 Whenever it is found, by personnel monitoring or otherwise, that any employee is exposed to a weekly dosage of ionizing radiation greater than permissible limits, immediate steps shall be taken to locate the condition giving rise to such exposure and the operation giving rise to such exposure shall be discontinued until such condition is corrected. The employees who have been exposed to excessive radiation shall be referred immediately to the Manager of the Medical department.

13.0 Handling of Radioactive Materials

13.2 Spillage of radioactive materials or other contamination of floors, walls, or workbenches shall be removed promptly and monitored for adequate decontamination. Clothing contaminated by spillage shall be changed promptly and persons monitored for adequate decontamination. Contaminated clothing shall be decontaminated by facilities equipped to cope safely with the problem. See National Bureau of Standards Handbooks Nos. 42 and 48.

13.3 Surfaces shall be designed and used to afford easy and safe decontamination. See National Bureau of Standards Handbook No. 48 for details.

13.4 Smoking or eating shall not be permitted in workrooms. Cosmetics shall not be applied in such rooms.

13.5 At the close of each work period, persons who are exposed to dangerous amounts of radioactive materials shall have their faces, hands, hair, and clothes inspected for contamination.

13.6 There shall be no pipetting by mouth.

13.7 Laboratory coats and rubber gloves must be worn whenever open and breakable sources are handled. When a hazard exists to the eyes, chemical goggles must be worn.

13.8 Materials which involve potential danger of radioactive dust or gases must be handled in an approved, ventilated hood. Approved dust respirators are available for emergency use.

14.1 Storage of Radioactive Materials

14.2 Potentially dangerous amounts of radioactive materials stored in a workroom or other location where employees are regularly or frequently present shall be enclosed in containers of such thickness and construction that employees will not be exposed to radiation in amounts greater than set forth in Safety Order 3803.

14.3 Each container of radioactive materials shall be labeled to indicate:

1. That the material is radioactive
2. The chemical name of the material or the isotope
3. The amount or quantity of the radioactive material
4. The date received and the person responsible for the material.

14.4 Radioactive materials should be housed in fireproof containers.

15.1 Warning signs

15.2 All locations or installations where ionizing radiation from radioactive materials may be encountered in injurious amounts shall be posted with warning signs, signals, or lights. Magenta shall be the basic color for the radioactive warning symbol and the background shall be yellow.

16.1 Rooms and Buildings

16.2 Plans for all new rooms or buildings and for the alterations of existing ones shall be submitted to the Isotope Committee for consideration and approval.

Jack F. Hatton

JFH/e jk

IN REPLY REFER TO:
OSP:EP

Oak Ridge, Tennessee
November 25, 1955

Mr. L. B. Manohl
Lockheed Aircraft Corporation
Burbank, California

Subject: LUMINOUS MARKERS FOR AIRCRAFT

Dear Mr. Manohl:

This office has received a letter dated November 14, 1955, from Mr. C. [illegible] Hallhausen, [illegible] Radium Corporation, relative to Lockheed Aircraft Corporation's interest in the use of radioisotope containing luminous emergency markers.

In Mr. Hallhausen's letter he states that remarks made by our Mr. Joseph Wechurek in a letter dated October 20, 1955, have presented some obstacles in terms of a decision by your firm to adopt the use of radioisotope luminous markers. Mr. Hallhausen has particularly drawn our attention to the statement made in this letter that a serious radiological hazard could result from the breakage of a luminous marker containing Strontium 90. The remark in itself is true insofar as such breakage resulted in the general dispersal of hazardous levels of Strontium 90. However, one would not normally envision the occurrence of this sort of radiological situation under ordinary conditions of use of this type of marker.

A serious radiological situation would not be expected to present itself if the marker developed a small fissure or other minor defects which were not likely to result in elimination of hazardous amounts of Strontium 90 to the exterior of the marker. In the event that a cracked source was discovered during periodic examination of these markers, however, then it is certainly appropriate to suggest that a determination be made as to the extent of any leakage radioactivity on the surface of the marker itself. If leakage radioactivity is found, smear samples of the area immediately around the defective source would be indicated, as well as decontamination of this local area if necessary. Damaged or leaking markers should be removed from use and repaired or disposed of. One would not normally expect any other remedial steps to be necessary.

OFFICE ▶				
SURNAME ▶				
DATE ▶				

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[illegible]

It can be concluded that sealed radioisotope sources which have been properly designed and constructed will find many needed and useful applications. Such sources can be used safely insofar as one adopts adequate measures for periodic inspection to assure that their integrity, in terms of leakage radioactivity is being maintained.

Very truly yours,

E. Eugene Fowler, Chief
Allocations Branch
Isotopes Division

OFFICE ▶	Isotopes			
SURNAME ▶	Fowler:rc/bp			
DATE ▶	11-25-55	11-25-55		

MANUFACTURERS OF
LUMINOUS PAINTS
RADIUM SOURCES
RADIATION SOURCES
RADIOACTIVE SPECIALTIES
ZINC PLATES
ETCHED AND LITHOGRAPHED
"UNDARK"
LUMINOUS MATERIALS
"ISOTRON"
STATIC ELIMINATORS
"RADELIN"
X-RAY SCREENS
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PLANTS AND LABORATORIES
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CABLE ADDRESS
RADELIN NEW YORK

UNITED STATES RADIUM CORPORATION

535 PEARL STREET, NEW YORK 7, N.Y.

November 14, 1955

8922

Dr. E. Eugene Fowler
U. S. Atomic Energy Commission
Oak Ridge, Tenn.

Dear Dr. Fowler:

As I have mentioned to you on several occasions, we have about concluded arrangements with several of the aircraft companies to provide them with luminous emergency marking incorporating Thallium 204. We have casually mentioned Tritium and Krypton which we eventually hope to use, but have not emphasized the possibilities because of present uncertainties regarding availability and timing of the program. Several aircraft companies have progressed to the point where specifications are now written, prints approved and purchase orders are waiting. Orders are small at present, which we consider an ideal situation, as it offers the opportunity to educate the user before large scale requirements materialize.

One company, in particular is of considerable importance to us at the moment and I would greatly appreciate an assist from you. Lockheed Aircraft Corporation of Burbank, Calif. [illegible] on October 5, 1955, requesting certain information. On October 20, 1955, Mr. Hachurek replied to Mr. L. E. Gaucht of Lockheed with a very excellent letter which confirmed all the information which we had previously furnished the customer and in fact suggested even more liberal test requirements than we had suggested and which we had incorporated into the Lockheed specification which I showed you at Oak Ridge on October 31st.

One paragraph in Mr. Hachurek's letter, however, about the entire program and Lockheed refuses to proceed unless the Commission will confirm my explanation that the matter is not as serious as it has been interpreted. The paragraph in question states:

> "The breakage of a luminous marker containing Strontium 90 or Thallium 204 could present a very serious hazard indeed. The immediate precautions usually necessary in accidents of this kind involve isolation of the affected area and obtaining the services of a specialist in radiological health safety problems to minimize the situation. Under ordinary circumstances a similar accident with a Tritium luminous marker probably would involve minimal hazard".

The above is a perfectly correct statement and most innocent, but has been interpreted by Lockheed to mean grounding of a plane and decontamination comparable

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November 14, 1955

Dr. F. Eugene Fowler

to that employed on ships used in the Bikini tests. Actually, except for a major catastrophe of very unusual nature, an accident to a luminous marker will usually consist of a crack or some minor defect, will not involve loss of radioactive material and will require only removal of the marker from service with proper disposal. Loss of radioactive as envisioned by the paragraph would be almost impossible and if it did occur, would probably take place during a major crash and scatter would take care of hazard. Lockheed has interpreted the paragraph to cover any and all minor cracks and ruptures, and I am sure this is not Mr. Machurek's intent.

This question is serious from our standpoint and a clarifying statement from you or Mr. Machurek would be very much appreciated.

The mention of Tritium is not serious but does cause confusion. We are anxious to push its use and intend to do so as soon as we know availability and approximate timing of the program. Its emphasis at this time creates much confusion, and we have promised all our customers we will make it available as soon as we are in a position to obtain adequate quantities.

Thanks for any help you can give to clarify the Lockheed situation. We have new and interesting aircraft applications coming up.

Very truly yours,

UNITED STATES RADIUM CORPORATION

C. A. Wallhauser
Vice President

CAW/ar
CC: Mr. Warner Gray, Lockheed Aircraft
Mr. William C. Doran