FORM AEC-374
(12-57)

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENS

No. 24-2261-3 Amendment No. 10
(G66)

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Part 30, Licensing of Byproduct Material, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Name **McDonnell Aircraft Corporation**	3. License number: **In accordance with application dated July 6, 1964, 24-2261-3 is amended in its entirety to read as follows:**
2. Address **St. Louis, Missouri**	4. Expiration date **July 31, 1966**
	5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
(See Page 2)	**(See Page 2)**	**(See Page 2)**

9. Authorized use

(See Page 2)

CONDITIONS

10. Unless otherwise specified, the authorized place of use is the licensee's address stated in Item 2 above.

11. A. Byproduct material licensed as Subitem Q may also be used at Wallops Island, Virginia

B. Byproduct material licensed as Subitem R may also be used at Cape Kennedy, Florida.

12. The licensee shall comply with the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation," and Part 31, "Radiation Safety Requirements for Radiographic Operations."

13. A. Byproduct material shall be used by, or under the supervision of, William L. Lester, T. C. Link, F. C. McCallister, Jr., H. E. Winn, C. J. Wolf, or Joseph F. Proechtenigt.

B. Byproduct material licensed as Subitem Q may also be used by, or under the supervision of, C. E. Sitler or R. G. Plummer.

C. The only person authorized to act as radiographer under this license is F. C. McCallister. "Radiographer" is defined in Section 31.3(a), 10 CFR 31.

(See Page 3)

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6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Thallium 204	A. Any	A. 20 millicuries
B. Cesium 137	B. Any	B. 20 millicuries
C. Cobalt 60	C. Any	C. 20 millicuries
D. Sulfur 35	D. Any	D. 20 millicuries
E. Iron 59	E. Any	E. 20 millicuries
F. Copper 64	F. Any	F. 20 millicuries
G. Calcium 45	G. Any	G. 20 millicuries
H. Zinc 65	H. Any	H. 20 millicuries
I. Gallium 72	I. Any	I. 20 millicuries
J. Arsenic 76	J. Any	J. 20 millicuries
K. Silver 111	K. Any	K. 20 millicuries
L. Cadmium 115	L. Any	L. 20 millicuries
M. Gold 198	M. Any	M. 20 millicuries
N. Americium 241	N. Plated sources (NUMEC)	N. 5 sources of 10 microcuries each
O. Promethium 147	O. Any	O. 20 millicuries
P. Any byproduct material between Atomic Nos. 3 and 83, inclusive	P. Irradiated metal and crystal samples	P. 1 curie total
Q. Hydrogen 3	Q. Tritium foil (Radiation Research Corp. Model TT-1)	Q. 400 millicuries
R. Hydrogen 3	R. Tritium foil (Radiation Research Corp. Model TT-1) contained in Lion Research Corp. carbon dioxide detector	R. 240 curies; not to exceed 6 curies per detector unit
S. Iridium 192	S. Sealed sources (Isotopes Specialties Co. Type 30)	S. 5 sources not to exceed 2 curies each
T. Cobalt 60	T. Sealed sources (Nuclear Chicago Corp. Model RR-60)	T. 2 sources not to exceed 1 curie each
U. Cobalt 60	U. Sealed sources	U. 200 millicuries
V. Cesium 137	V. Sealed sources (Nuclear Consultants, Inc. custom sources)	V. 100 millicuries; no single source to exceed 4 microcuries
W. Krypton 85	W. Sealed sources (U. S. Radium Corp. Model LAB 484-1A)	W. 8 sources of 150 millicuries each and 16 sources of 20 millicuries each

(See Page 3)

Continued from page two

9. Authorized Use

A. through N. Instrument calibration; studies of radiation damage mechanisms, crystal lattice diffusion, and solid state physics.
O. Surface damage studies.
P. Radiation damage studies.
Q. Ionization source in NRC Equipment Corporation Model 0714 pressure gauge.
R. Testing and calibration of detector units.
S. and T. "Open-air" handling technique for industrial radiography.
U. Instrument calibration.
V. Tagging of backing bars and seat ejection safety pins for detection after manufacture.
W. For use in aircraft in-flight refueling equipment.

CONDITIONS

14. Sealed sources containing byproduct material shall not be opened.

15. Sealed sources of byproduct material shall not be combined for use in open air techniquesstto produce a radiation level in excess of the level produced by the largest single source authorized by this license for open air use.

16. A. Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be put into use until tested.

Notwithstanding the periodic leak test required by the preceding paragraph, any licensed sealed source containing byproduct material is exempted from periodic leak tests provided that quantity of byproduct material contained in the source does not exceed ten times the quantity specified for the byproduct material in Column II, Schedule B, Section 30.71, 10 CFR 30.

B. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

(See Page 4)

For the U. S. Atomic Energy Commission

Continued from page three

CONDITIONS

16. continued

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Materials Licensing, U. S. Atomic Energy Commission, Washington, D. C., 20545, describing the equipment involved, the test results, and the corrective action taken. A copy of such report shall also be sent to the Director, Region III, Division of Compliance, USAEC, Oakbrook Professional Building, Oak Brook, Illinois, 60523.

17. Notwithstanding, and in lieu of, the requirements of Sections 20.203(f)(1) and 20.203(f)(4), 10 CFR 20, bucking bars and seat ejection safety pins referenced in Item 9V shall be labeled with an uncolored standard radiation symbol and the legend "Contains Radioactive Material, AEC License 24-2261-3".

18. The licensee is authorized to receive, possess and use sealed sources of Iridium 192 and Cobalt 60 where the radioactivity exceeds the maximum amount of radioactivity specified in Item 8 of this license provided:

A. Such possession does not exceed the quantity per source specified in Item 8 by more than 20% for Iridium 192 or 10% for Cobalt 60; and

B. Records of the licensee show that no more than the maximum amount of radioactivity per source specified in Item 8 of the license was ordered from the supplier or transferor of the byproduct material.

19. Except as specifically provided otherwise by this license, the licensee shall possess and use byproduct material described in Items 6, 7 and 8 of this license in accordance with statements, representations and procedures contained in applications dated October 6, 1958 and March 22, 1961, and in related documents and amendments as follows:

A. Administrative instructions entitled "Safe Practice Procedures" submitted May 22, 1959.

B. Letter dated May 13, 1959, from W. L. Koster.

C. Operating and emergency procedures entitled "Radiographic Procedures (Iridium 192)" and dated August 1, 1961.

D. Letter dated September 8, 1961, from W. L. Koster.

For the U. S. Atomic Energy Commission

Original Signed by
Robert E. Brinkman

Date JUL 2 1 1964

by Isotopes Branch
Division of Materials Licensing
Washington 25, D. C.

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REB 7/30/64

McDONNELL Aircraft Corporation
Lambert-Saint Louis MUNICIPAL AIRPORT • BOX 516, ST. LOUIS 66, MO.

9 DEC 1964

Ref: USAEC-220-2407

United States Atomic Energy Commission
Washington 25, D. C.

Attention: Robert E. Brinkman
Isotopes Branch
Division of Licensing and Regulation

Subject: Byproduct Material License Modification

Enclosures: (1) AEC Form 313 (3 copies)

Gentlemen:

1. Enclosure (1) is submitted in application for modification of Byproduct Material License #24-2261-3, issued to McDonnell Aircraft Corporation. This license, as presently written, authorizes possession and use of 240 curies of tritium (hydrogen-3) in the Lion Research Corporation Carbon Dioxide Detector.

2. The above detector has been modified by replacing the tritium-containing foil by a similar foil containing a salt of americium-241. This material is placed on thin stainless steel substrate, then a gold foil overlay is pressure welded to the top surface to form a sealed ionization source within the detector. As with the previous model, the ionization source is sealed within the interior of the detector and in no instance is it opened by McDonnell personnel. Any repair to this portion of the device is by the vendor at his facility.

3. Should other information be required, please do not hesitate to contact me.

Yours very truly,

MCDONNELL AIRCRAFT CORPORATION

W. L. Kester

W. L. Kester
Scientist
Research Division

DEC 1 1 1964

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Form AEC-313 (2-57)

ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved. Budget Bureau No. 38-R027.3.

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application. If application is for renewal of a license, complete only Items 1 through 7 and indicate new information or changes in the program as requested in Items 8 through 15. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tenn. Attention: Isotopes Extension, Division of Civilian Application. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30 and the licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc.)*

McDonnell Aircraft Corporation
Box 516
St. Louis, Mo. 63166

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a).)*

McDonnell Aircraft Corporation
Box 516
St. Louis, Mo. 63166

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Flight Test

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

24-2261-3

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

Same as Item R in Original License

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)*

Same as Original License

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

Americium - 241

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

$AmCl_3$ sealed Source manufactured by Radiation Research Corp.
(500μc maximum per foil; two foils per device - maximum
1 millicurie per device)
20 devices - total 20 millicuries.

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

To be used as ionization source in Lion Research Corporation carbon dioxide detector.
To replace present foils containing H^3 (Item R in present license).
Average radiation is 1.2 mr/hr at 5 cm from surface. (8 mr at surface on one side)

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(Continued on reverse side)

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Form AEC-313 (2/57)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS *(Include make and model number of each)*	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE *(mr/hr)*	WINDOW THICKNESS *(mg/cm²)*	USE *(Monitoring, surveying, measuring)*

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* Yes No

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

Date 8 December 1964

McDonnell Aircraft Corporation
Applicant named in Item 1

By: W. L. Foster

Scientist
Title of certifying official

WARNING.—18 U. S. C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE : 1957 O-F—424004

McDONNELL Aircraft Corporation
Lambert-Saint Louis MUNICIPAL AIRPORT • BOX 516, ST. LOUIS, MO. 63166

5 JAN 1965

Ref: USAEC-220-2438

United States Atomic Energy Commission
Washington 25, D. C.

Attention: Isotopes Branch
Division of Licensing and Regulation

Subject: Application of Byproduct Material License (Control No. 64401)

Reference: (a) Our Telephone Conversation 29 December 1964

Gentlemen:

1. In accordance with Reference (a) the following additional information is submitted.

2. McDonnell Aircraft Corporation at present possesses several carbon dioxide detectors which make use of a tritium-containing foil as an ionization source. Studies made by the Lion Research Corporation have showed that greatly improved performance can be had with these detectors when the tritiated foil is replaced by one containing americium-241 as the active material. In view of this, we wish to substitute americium-241 foils for the tritiated ones presently being used.

3. The new ion sources, manufactured by Radiation Research Corporation, are made by coating one side of a stainless steel foil with an americium salt. A gold foil is next pressure welded over the top to form a leak-proof sandwich.

4. The new foils, after testing, are transferred to the Lion Research Corporation where they are installed in the carbon dioxide detectors in place of the tritium-containing foils. After installation, the detector compartment is sealed shut.

5. No operations such as inspection, calibration and testing by McDonnell personnel require the opening of the ion chamber. Any malfunction involving this portion of the device will necessitate returning the detector to the manufacturer for repair.

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6. In this manner, McDonnell is in essence obtaining and using a doubly sealed source. The ion source is a sealed source and the ion chamber is a sealed source which is to be opened only by the vendor at his facility.

7. Each carbon dioxide detector received at McDonnell will be accompanied by

   a. A certification by Radiation Research Corporation that the americium-241 source has been leak tested and found to be free of contamination.

   b. A certification by Lion Research Corporation that the detectors have been tested after sealing and found to be free of contamination.

8. McDonnell Aircraft Corporation, upon receipt of each detector, will perform a leak test, the results of which will become a part of the permanent record of each device.

9. Leak tests made at McDonnell will be performed in the following manner:

   a. A two inch diameter ashless filter paper will be used to wipe all exposed surfaces of the detector.

   b. The paper will be burned in a 1 inch diameter cup and counted in an RCL Model 10200 flow counter. The counter will be calibrated using americium-241 and will be operated in the proportion region.

10. Any counts above background will be considered as contamination and will be cause for returning the device to the vendor for inspection.

11. Should other information be required, please do not hesitate to contact me.

Yours very truly,

MCDONNELL AIRCRAFT CORPORATION

W. L. Kester
Scientist
Research Division

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U. S. ATOMIC ENERGY COMMISSION
MATERIAL LICENSE
Supplementary Sheet

License Number 24-2261-3 (G66)

Amendment No. 11

McDonnell Aircraft Corporation
St. Louis, Missouri

Attention: William L. Kester, T. C. Link, F. C. McCallister, Jr., C. S. Sitler, H. E. Winn, C. J. Wolf, Joseph F. Froechtenight, R. G. Plummer

In accordance with application dated December 8, 1964, License No. 24-2261-3 is amended as follows:

To amend:

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
R. Americium 241	R. Foil manufactured by Radiation Research Corp. and contained in Lion Research Corp. carbon dioxide detector	R. 20 millicuries; not to exceed 1 millicurie per detector

9. Authorized use

R. Testing and calibration of detector units.

Condition 19E is added to read as follows:

19. E. Application dated December 8, 1964 and letter dated January 5, 1965 from W. L. Kester.

Date JAN 12 1965

For the U. S. Atomic Energy Commission
Original Signed by
Robert E. Brinkman

by Isotopes Branch
Division of Materials Licensing
Washington 25, D. C.

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