1 of 2

PROGRESS REPORT
October 1993–January 1994

CHERNOBYL STUDIES PROJECT

WORKING GROUP 7.0
ENVIRONMENTAL TRANSPORT
AND HEALTH EFFECTS

March 1, 1994

Technical Editor

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MASTER

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Lynn Anspaugh

Lawrence Livermore National Laboratory

- EH Monthly Detailed Summary
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BACKGROUND

BACKGROUND

In April 1988, the US and the former-USSR signed a Memorandum of Cooperation (MOC) for Civilian Nuclear Reactor Safety; this MOC was a direct result of the accident at the Chernobyl Nuclear Power Plant Unit 4 and the following efforts by the two countries to implement a joint program to improve the safety of nuclear power plants and to understand the implications of releases to the environment. A Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS) was formed to implement the MOC. The JCCCNRS established many working groups; most of these were the responsibility of the Nuclear Regulatory Commission, as far as US participation was concerned. The lone exception was Working Group 7 on Environmental Transport and Health Effects, for which the US participation was the responsibility of the US Department of Energy (DOE). The purpose of Working Group 7 was succinctly stated to be, "To develop jointly methods to project rapidly the health effects of any future nuclear reactor accident." To implement the work DOE then formed two subworking groups: 7.1 to address Environmental Transport and 7.2 to address Health Effects. Thus, the DOE-funded Chernobyl Studies Project began. Most of the initial tasks for this project are completed or near completion.

The focus has now turned primarily to the issue of health effects from the Chernobyl accident. Currently, we are extensively engaged in case-control and cohort studies of thyroid diseases among Belarussian children. Dosimetric aspects are fundamental to these studies. We are also working to implement similar studies in Ukraine. A major part of the effort of these projects is supporting these studies, both by providing methods and applications of dose reconstruction and by providing support and equipment for the medical teams.

During Fiscal Year 1993, the work conducted under the auspices of Working Sub-Groups 7.1 and 7.2 was substantially changed, and many tasks were completed. Thus, the two Sub-Groups were combined into a single Group 7.

Current FY 94 tasks for the Chernobyl Studies Project are

7.0A Management

Lynn Anspaugh and Sheilah Hendrickson
Lawrence Livermore National Laboratory.

7.1C External Dose

Harold Beck
Environmental Measurements Laboratory.

7.1F Hydrological Transport

Yasuo Onishi

Battelle Pacific Northwest Laboratories

(\$50 K direct funding to PNL). Expected completion in FY 94.

7.2A4 Chromosome Painting Dosimetry

Tore Straume and Joe Lucas

Lawrence Livermore National Laboratory.

7.2D Stochastic Effects

Marvin Goldman

University of California, Davis.

Expected completion in FY 94.

7.2F Thyroid Studies

Lynn Anspaugh

Lawrence Livermore National Laboratory.

7.2G Leukemia Studies

Lynn Anspaugh

Lawrence Livermore National Laboratory.

7.0A — MANAGEMENT

EH Monthly Summary
Chernobyl Studies Project: Summary of Financial Status
(1,000 Dollars)

Budget Category: HA-01-17

Month Ending: January 1994

DOE Project Number	LLNL Project Number	Project Title	FY 1994 Budget*	FY 1994 Total Cost To Date**	Percent Spent	Remaining Balance	Variance Linear Rate***
93-ES-966	6288-15	7.0A Management L. Anspaugh / S. Hendrickson (LLNL)	240.4	94.5	39%	145.9	14
	6288-08	7.1C External Dose Harold Beck (EML) L. Anspaugh / S. Hendrickson (LLNL)	122.0	0.0	0%	122.0	(41)
	XXXX	7.1F Hydrological Transport Yasao Onishi (PNL) \$\$\$\$ Direct Funding to PNL	50.0	18.7	37%	31.3	2
	6288-09	7.2A4 Chromosome Painting Dosimetry Tore Straume / Joe Lucas (LLNL)	100.0	0.0	0%	100.0	(33)
	6288-11	7.2D Stochastic Effects IntraUniversity Transaction to Marvin Goldman (UC Davis, \$24 K) L. Anspaugh / S. Hendrickson (LLNL)	38.0	2.0	5%	36.0	(11)
			24.0	0.5	2%	23.5	(8)
	6288-16	7.2F Thyroid Studies Lynn Anspaugh (LLNL)	510.0	81.0	16%	429.0	(89)
	6288-12	7.2G Leukemia Studies Lynn Anspaugh (LLNL)	80.0	0.0	0%	80.0	(27)
LLNL TOTALS			\$1,090.4	\$177.5	16%	\$912.9	(186)

* Includes FY 1993 carryover

** Includes commitments (Liens, Subcontracts, IUTs, ICOs, etc.)

*** Amount in parenthesis () indicates total cost to date is under the cumulative linear spending rate

3/24/94

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:
7.0A Manangement (Lynn Anspaugh / Sheilah Hendrickson)

LLNL No: 6288-15
DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits	7.5	13.3	5.5	6.8									33.1
Travel	2.9	0.4	5.6	0.5									9.4
Procurement and Expenses*	0.8	0.1	0.3	0.3									1.5
Technical Information Department	0.0	0.0	0.0	0.0									0.0
Facility/Service/Distributed Charges	0.1	0.1	0.2	0.4									0.8
LLNL Overhead+/Taxes**	5.9	9.5	4.8	29.5									49.7
TOTAL	17.2	23.4	16.4	37.5									94.5
Liens/Preliens	1.4	1.4	1.4	3.7									3.7
Budget	240.4	240.4	240.4	240.4									
Funds Available	223.2	199.8	183.4	145.9									
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.0A Management

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-15

Principal Investigator(s): Lynn Anspaugh / Sheilah Hendrickson
M&O Contractor: Lawrence Livermore National Laboratory

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

I. Project Objective

The main content of this work will continue to be to manage the overall activities of former subgroups 7.1 and 7.2, to integrate all remaining tasks into a coherent and focussed program, and to provide the additional support for buying and furnishing supplies. An additional charge is to maintain coordination with other studies of similar nature, so that duplication is avoided and the maximum leverage is obtained with the funding that is available. At the present time the European Union (formerly known as the Commission of European Communities) has a large, well-funded program that has similar goals. Thus, one of our primary goals is to maintain a close liaison with the managers of the European Union program and with the managers of other programs that have potential overlap with the DOE-funded projects.

II. Current Project Status / Monthly Progress

Efforts have continued to realign the DOE-funded Chernobyl projects along the lines agreed to with the Deputy Secretary for Health and other DOE officials; this is to focus on those studies that will support directly the elucidation of the health-effects from the Chernobyl accident. Thus, all studies that did not have a direct bearing on past, present, or future significant dose to man have been discontinued. The discontinued projects include those on atmospheric transport model development and validation, resuspension, and aquatic food-chain transport of radionuclides. Studies on terrestrial food chains are continuing, but have been moved to the context of participation in international model-validation studies. Studies on the hydrological transport of radionuclides have been continued at a reduced scale, because of the concern about continued releases to the Pripyat and Dnieper Rivers, which are the source for the 3-million inhabitants of Kiev, Ukraine. A small-scale project on the validation of methods of projecting doses from external

gamma exposure is scheduled to take place this year. Most of the effort, however, is now focussed on the dosimetric support of epidemiological studies being conducted by the National Cancer Institute scientists in Belarus and Ukraine. A new project on biological dosimetry has been implemented; this new study will primarily use the tool of fluorescent in situ hybridization analysis of stable chromosome translocations. Support has been phased out for other biological dosimetry studies using conventional chromosome analysis, glycophorin A analysis (although the glycophorin studies continue with NIH funding), and paramagnetic resonance of dentine and other materials. The latter task may be recommended for re-initiation at a later time with a different Principal Investigator.

At the end of FY 1993, Lynn Anspaugh attended a meeting sponsored by the European Union in Moscow. At that meeting, the re-initiation of their Joint Study Project 5 was discussed. This project has extensive overlap with several of our efforts, and we all agreed to make our best efforts to work within a collaborative framework. Dr. Anspaugh also traveled to Kiev, Ukraine, for further discussions on our terminating resuspension project and on our continuing projects on dosimetry research. The latter are primarily in support of radioepidemiological studies of childhood-thyroid cancer and leukemia among liquidators. A trip report is attached here.

Also, at the end of FY 1993, Dr. Mark Zheleznyak visited LLNL. He gave a seminar, and we discussed the progress on the project on hydrological transport of radionuclides. A report on his visit is attached.

As per agreement with Dr. Thomas and others in DOE Headquarters, Lynn Anspaugh has been participating in the RADTEST project within the overall umbrella of these activities and without a separate request for funds. RADTEST is a Scientific Committee on Problems of the Environment (SCOPE) effort to assemble information on the radiation doses and health effects from the testing of nuclear weapons by the countries of the US, Russia, and China (with participation invited from the UK and France). As a major project on dose reconstruction (funded in recent years by EH) for those individuals living downwind of the Nevada Test Site is just concluding and for which Dr. Anspaugh is the Scientific Director, it has been possible to participate and to provide US data with minimal preparation. During January Dr. Anspaugh participated in the first RADTEST Workshop, which was held in Vienna. A trip report is attached.

Other activities have been to place and to manage the contracts for work being done outside of LLNL. This includes the work being done by Professor Goldman of the University of California, Davis, on completing the project on assimilating data from the former Soviet Union on radiogenic health effects (for events and accidents occurring prior to the Chernobyl accident) and the work being done by SENES, Oak Ridge, on international model-validation studies. The latter is now much broader in scope than just Chernobyl, and the agreement has been with Dr. Thomas and others to not include this as a direct part of the Chernobyl Project. However, the project is currently being managed through this activity.

III. Significant Problems/Issues/Concerns

We need specific guidance on the continuing issue of providing equipment and supplies to Belarus (and later to Ukraine), as specified in the approved Protocol for the cohort study on childhood-thyroid cancer. Also, we need specific guidance from DOE on the future of the contract with SENES, Oak Ridge.

FOREIGN TRIP REPORT

Lynn R. Anspaugh

**Risk Sciences Center
Health and Ecological Assessment Division
Physical Sciences Directorate
Lawrence Livermore National Laboratory
University of California
Livermore, CA 94551-9900**

Contract No. W-7405-Eng-48

February 10, 1994

SECTION A: SUMMARY

a. Traveler

Lynn R. Anspaugh, Director, Risk Sciences Center
(510) 424-6409
Health and Ecological Assessment Division
Physical Sciences Directorate
Lawrence Livermore National Laboratory
University of California
Livermore, CA 94551-9900

February 10, 1994

b. Dates and Destinations

1/10/94-1/12/94

NATO/SCOPE RADTEST Advanced
Research Workshop, Vienna, Austria

c. Purpose of the Trip

The purpose of this trip was to attend and present four papers at the NATO/SCOPE-RADTEST Advanced Research Workshop on doses and health effects from atmospheric nuclear tests.

d. Abstract

I presented three papers at this Workshop on the dose reconstruction studies done for the residents downwind of the Nevada Test Site during the days of atmospheric nuclear weapons tests. I also presented one paper on behalf of William Robison concerning dose and radioecological studies in the Marshall Islands. The Chinese were not able to participate and their submitted papers did not relate to Chinese tests, but rather to global fallout. I had to leave early and did not hear the Russian papers, although I understand from others that the papers were very good.

SECTION B: TRIP REPORT

a. Purpose of the Trip

The purpose of this trip was to attend and present four papers at the NATO/SCOPE-RADTEST Advanced Research Workshop on doses and health effects from atmospheric nuclear tests. This workshop was intended to involve primarily the USA, the former USSR, and China. In addition, representatives from the UK and France were invited.

b. Summary of Activities

I first attended the joint meeting of the Executive Committee and the Scientific Advisory Board for the RADTEST study in my role as Co-Chairman of the U.S. Committee. (The agenda is provided as Attachment A.) We discussed the final arrangements for the Workshop, chose Chairmen for the sessions, and had general discussions concerning the overall studies to be performed. At this time we also learned that the Russians had extended an invitation to the Altai Region for the 2nd Workshop and that the 3rd would likely be held in Brussels at the invitation of the CEC and others. We also learned that the Chinese had not been able to attend, although they did send their papers. Thus, we decided to rearrange the schedule and to ask three members of the U.S. delegation to review and to present the three Chinese papers on Tuesday. Some of the U.S. papers were then moved to Monday (see Attachment B for the agenda of the workshop.)

On Tuesday I presented four papers, the three attributed to me on the agenda (Attachment B) and one on behalf of Dr. William Robison, who could not attend the Workshop. The many papers from the U.S. delegation described the recently conducted studies on dose reconstruction and health effects as they relate to the fallout from atmospheric tests conducted at the Nevada Test Site. In addition, the studies on dose reconstruction, radioecology, and health effects in the Marshall Islands were summarized.

Unfortunately, I could not stay for the entire Workshop, and I had to leave on Wednesday morning. Thus, I was not able to hear the Russian presentations, although I understand from others that they were very forthcoming in the presentation of extensive results.

c. Traveler's Role

My role is described above in Part B.

d. Recommendations

The RADTEST study appears to be a useful means of achieving interchange of information on the effects of atmospheric weapons tests, at least between the US and the former USSR. Hopefully, the Chinese will also be able to participate in the future, although the quality of their submitted papers left much to be desired. It is possible that some solid information on health effects from doses delivered at low dose rates will be forthcoming from a combination of the experience of the participants.

e. Information Pertinent to Energy Postures

None.

f. Security-Related Concerns

None.

SECTION C: APPENDIX

a. Itinerary

1/8/94	Left San Francisco
1/9/94	Arrived Vienna via Paris
1/10/94	Business began
1/12/94	Left Vienna
1/12/94	Arrived San Francisco via Paris

b. List of Persons contacted

See Attachment C for a list of attendees at the Workshop.

c. Literature Acquired

See Attachment D. In addition, I have copies of the following papers:

O.A. Pavlovski, "The Nuclear Testing Radiological Consequences for the Former USSR Population (Input Information, Models, Dose and Risk Estimates)," Institute of Nuclear Safety, Moscow, RV.26.94 (1994).

T. Kawata, "Societal Consequences of Nuclear War: Citing the Experiences of Hiroshima and Nagasaki," J. Intl. Studies No. 18: 1-11 (January 1987), RV.31.94.

S.A. Zelentsov, G.E. Zolotukhin, A.M. Matushchenko, B.N. Mikhailov, K.V. Kharitonov, G.A. Tzyrkov, and A.K. Tchernychev, "Some Characteristics of 1949-1962 Atmospheric Nuclear Testing on USSR Test Sites," RV.32.94 (1994).

Yu. Izrael and E. Stukin, "Radionuclides Deposition over Territories Adjusting to the Semipalatinsk Test Site According to the Data of Geophysical Surveys of the 60s and the 90s," Institute of Global Climate and Ecology, Moscow, RV.34.94 (1994).

R.M. Barkhudarov, "Radiological Consequences of Global Fallout of Nuclear Explosion Products at CIS Territories (1963-1986 Period)," Russian Scientific-Practical and Expert-Analytical Center, Moscow, RV.35.94 (1994).

A

NATO/SCOPE-RADTEST Advanced Research Workshop (ARW)

**ATMOSPHERIC NUCLEAR TESTS
(ENVIRONMENTAL AND HUMAN CONSEQUENCES)
10th-14th January, 1994, Vienna, Austria**

**Executive/Scientific Advisory Committee Meeting
10th January 1994**

P R O V I S I O N A L A G E N D A

- 1. INTRODUCTION AND WELCOME**
- 2. AIMS OF VIENNA 94 NATO/SCOPE RADTEST ARW
IDENTIFICATION OF SESSION CHAIRMEN
IDENTIFICATION OF RAPPORTEURS**
- 3. FUNDING OF RADTEST
(a) ADMINISTRATIVE SUPPORT TO CSS
(b) ROLE OF DOE/LLNL
(c) FOUNDATIONS
CONTINUATION OF ESSEX UNIT POST-FEBRUARY 1995**
- 4. SCOPE NATIONAL COMMITTEES AND RADTEST**
- 5. FUTURE MEETINGS OF RADTEST
SIBERIA NATO/RADTEST ARW
POSSIBLE EUROPEAN, UNION MEETINGS**
- 6. RADTEST PUBLICATIONS
NATO ASI SERIES
PUBLICATION AWARD APPLICATION (GOLD FORM)
FINAL SYNTHESIS VOLUME**
- 7. NATO REPORTING REQUIREMENTS
GENERAL REPORT (GREEN FORM)
FINANICIAL REPORT (PINK FORM)**
- 8. SCOPE OPEN EXECUTIVE COMMITTEE MEETING RADTEST PRESENTATION**
- 9. ANY OTHER BUSINESS**

1ja-few:040194

SCOPE-RADTEST

B

NATO/SCOPE-RADTEST
Advanced Research Workshop
10-14th January 1994, IAEA, Vienna, Austria

ATMOSPHERIC NUCLEAR TESTS
(ENVIRONMENTAL AND HUMAN CONSEQUENCES)

Meeting Room IV, IAEA

Monday 10th January 1994

- 09.00-10.50
 - . Registration
 - . Scientific Advisory Committee and Executive Committee Joint Meeting (Members only)
- 10.50-11.10
 - . Break
- 11.10
 - . Commence ARW
- 11.10-13.00
 - . (Plenary session)
 - . IAEA Welcoming Address
 - Mr. Boris Semenov (Deputy Director General IAEA)
 - . RADTEST Welcoming Address
 - Sir Frederick Warner (RADTEST SAC Chairman)
 - . The NATO Environmental Science Programme
 - Dr Luis Veiga da Cunha (NATO)
 - . Introduction: Background and aims of workshop
 - Prof Charles S Shapiro (RADTEST Executive Director)
- 13.00-14.00
 - . Lunch
- 14.00-15.40
 - . China Overview
 - . Presentations of previous studies (Plenary session)
 - Prof Mao Yongze (A Model for Nuclear Cloud Movement and Estimation Fallout after a Nuclear Test Explosion)
 - Prof Ye Changqing (Assessment of the Internal Radiation Dose From Fallout of Nuclear Explosions)
 - Prof Zhu Changshou (Radioactive Contamination from Nuclear Fallout and Health Evaluation in China)
- 15.40-16.00
 - . Break
- 16.00-17.30
 - . UK Overview
 - . Presentations of previous studies (Plenary session)
 - Sir Frederick Warner (Maralinga Studies)
 - . Session Roundtable Discussions
- 18.00-20.00
 - . Reception

Tuesday 11th January 1994

Monday Afternoon

- 09.00-10.50 . United States Overview
Presentations of Previous Studies
(Plenary session)
- Dr Bruce Church (Overview of US Atmospheric Tests the Nevada Test Site)
- t.b.a. (Overview of Nuclear Tests at Marshall Islands Test Site: Dr. William Robison)
- Dr Franklin Serduke (Nuclear Explosion Phenomenology and Fallout Modelling)
- Dr John F. Wild (The NTS Underground Radionuclide Source-term Inventory Project)
- t.b.a. (The Distribution of Radionuclides at the Pacific Test Site: Dr William Robison)
- 10.50-11.10 . Break
- 11.10-13.00 . Nevada Test Site (NTS) and Off-site Radiation Exposure Reconstruction Project (ORERP) (Contd.)
(Plenary session)
- Dr Bruce Church (Overview of DOE's Program to Examine the Radiation Dose to the Public from US Atmospheric Weapons Testing at the Nevada Test Site)
- Dr Lynn Anspaugh (Strategy for ORERP Summary of Historical Data)
- Dr Harold Beck (Contemporary Data Base for Dose Reconstruction)
- Dr Richard Henderson (External Exposure Estimates for Individuals Near the Nevada Test Site)
- 13.00-14.00 . Lunch
- 14.00-15.40 . Nevada Test Site (NTS) and Off-site Radiation Exposure Reconstruction Project (ORERP) (Contd.)
(Plenary session)
- Dr Lynn Anspaugh (Internal Dose Estimates)
- Dr Lynn Anspaugh (Summary of ORERP Progress)
- Prof Walter Stevens (Effect of NTS Fallout on Leukaemia and Thyroid Disease in the Nevada Test Site)
- 15.40-16.00 . Break
- 16.00-17.30 . Nevada Test Site (NTS) and Off-site Radiation Exposure Reconstruction Project (ORERP) (Contd.)
(Plenary session)
- Dr André Bouville (Exposures of American People to Iodine-131 Resulting from Atmospheric Tests Conducted at the Nevada Test Site)
- . Session Roundtable Discussions

Wednesday 12th January 1994

- 09.00-10.50 . Former Soviet Union Overview
Presentations of previous studies
(Plenary session)
- Dr Yury S Tsaturov (The Semipalatinsk and Northern Nuclear Test Sites of the USSR: General Characteristics of the Releases and Depositions and Comprehensive Programme)
- Dr Rudolph M Barhudarov (Radiological Consequences of Global Fallout Products as a Result of Nuclear Explosions in the CIS Territory (1963-1986))
- 10.50-11.10 . Break
- 11.10-13.00 . Presentations of previous studies (Former Soviet Union-overview Contd.)
(Plenary session)
- Prof Anatoly Matushchenko
- Dr Oleg A Pavlovsky (The Nuclear Testing Radiological Consequences for the Former Soviet Union)
- 13.00-14.00 . Lunch
- 14.00-15.40 . Presentations of previous studies (Former Soviet Union-overview Contd.)
(Plenary session)
- Prof Alexey G Ryaboshapko (Long-range Tropospheric Transport of Radioactive Products from Nuclear Test-sites in USA, USSR, France and China after 1963))
- Prof Yuri Izrael (Methodological Approaches to Reconstruction of Radioactive Deposition Fields and Dose Loads from Nuclear Explosions)
- 15.40-16.00 . Break
- 16.00-17.30 . Presentations of previous studies (Former Soviet Union-overview Contd.)
(Plenary session)
- Dr Eugeni D Stukin (Radionuclides Deposition over Territories Adjusting to the Semipalatinsk Test Site According to the Data of Geophysical Surveys of the 50s and 60s)
- Dr Oleg A Pavlovsky (Radiological Consequences of Nuclear Weapon Tests for Population of the Former USSR: Initial Formation, Models, Estimates of Doses and Risks)

Thursday 13th January 1994

- 09.00-10.45 . Discussion of RADTEST programme, goals methodology. Status of data concerning test explosions, requirements for future research and national data centres (Plenary session)
- 10.45-11.50 . Break
- 11.50-13.00 . Planning for 2nd RADTEST Workshop Alta study (Plenary session)
- 13.00-14.00 . Lunch
- 14.00-15.40 . Preliminary planning for publication in Advanced Science Institutes (ASI) series upon workshop material (Plenary session)
- 15.40-16.00 . Break
- 16.00-17.30 . Preliminary planning for publication in series based upon workshop material (Working groups)

Friday 14th January 1994

- 09.00-10.50 . NATO ASI Series Publication - Summary Developments of Working Groups (Plenary Session)
- 10.50-11.10 . Break
- 11.10-12.00 . Summary of achievements of workshop and directions for future work (Plenary session)
-Prof Sir Frederick Warner
-Prof Charles S Shapiro
- 12.00 . Adjourn ARW
- 12.00-13.00 . Executive Committee and Scientific A Committee Meeting (Members only)

SCOPE-RADTEST

C

NATO/SCOPE-RADTEST Advanced Research Workshop (ARW)

**ATMOSPHERIC NUCLEAR TESTS
(ENVIRONMENTAL AND HUMAN CONSEQUENCES)**

10th-14th January, 1994, Vienna, Austria

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SCOPE-RADTEST

D

L I S T O F P A P E R S : R V . 0 1 - 2 5 . 9 4

ATMOSPHERIC NUCLEAR TESTS
(ENVIRONMENTAL AND HUMAN CONSEQUENCES)
NATO/SCOPE-RADTEST Advanced Research Workshop (ARW)
10th-14th January, 1994, Vienna, Austria

Shoiijhet, J.N., Kiselev, V.I., Lagutin, A.A., Algasin, A.I. and Kolyado, V.B. Remote Results of Influence of Nuclear Radiation of Nuclear Weapon Test on Semipalatinsk Experimental Range to the Population of the Altai Territory. Paper: RV.01.94.

Barkhudarov, R. M. Radiological Consequences of Global Fallout Products as a Result of Nuclear Explosions in CIS Territory (1963-1986). Paper: RV.02.94.

Chernyshov, A., Kharitonov, K., Matushchenko, A., Mikhailov, V., Tsyrcov, G., Zelentsov, S. and Zolotukhin, G. Some Characteristics of Atmospheric Nuclear Explosions at the USSR Test Sites. Paper: RV.03.94.

Doriglasov, V., Dubasov, Yu., Dubkov, Yu, Duvnik, V., Logachev, V., Maltsev, A., Matushchenko, A., Safronov, B., Smagulov, S., Stepanov, Yu and Tsaturon, Yu. The Semipalatinsk and Northern Nuclear Test Sites of the USSR: General Characteristics of Releases and Depositions and Comprehensive Programme of Investigations of Radioecological Impact of Nuclear Tests on Surrounding Territories. Paper: RV.04.94.

Yi, Z., Mao, Y., Jiangchen, L. and Boxue, L. A Model for Nuclear Cloud Movement and Fallout Estimation. Paper: RV.05.94

Koptyug, V. A. Some Gaps in the On-going Semipalatinsk/Altai Case Study. Paper RV.06.94.

Zhu, C. and Liu, Y. Radioactive Contamination from Nuclear Fallout and Health Evaluation in China. Paper: RV.07.94.

Zhu, C., Liu, Y., Zhu, G. and Gu, Z. Radioactive Contamination from Nuclear Fallout and Health Evaluation in China. Paper: RV.08.94.

Ye, C. Assessment of Internal Radiation Dose from the Fallout of Nuclear Explosions. Paper: RV.09.94.

Pavlovsky, O. The Nuclear Testing Radiological Consequences for the Former USSR Population (input information, models, dose and risk estimates). RV.10.93.

Beck, H. L. Contemporary Data Bases for Dose Reconstructions. Paper: RV.11.94.

Henderson, R.W. External Exposure Estimates for Individuals near the Nevada Test Site. Paper: RV.12.94.

Izrael, Yu., Stukin, E., Kerzman, V. and Fedotkin, A. Radioactive Fallout in Areas Adjacent to the Semipalatinsk Nuclear Test Site. Paper: RV.13.94.

Izrael, Yu., et al. Reconstruction Methodologies for Radioactive Fallout and Dose Loads from Nuclear Explosions. Paper: RV.14.94.

Izrael, Yu., Ryaboshapko, A., Stukin. Long-range Atmospheric Transport of Radioactive Products from Nuclear Explosions Conducted in the USA, USSR, France and China after 1963. Paper: RV.15.94.

Simon, S.L., Till, J. E., Lloyd, R.D., Kerber R. L., Thomas, D. C., Preston-Martin, S., Lyon, J.L. and Stevens, W. The Utah Leukaemia Case-Control Study: Dosimetry Methodology and Results. Paper: RV.16.94.

Yi, Z., Mao, Y., Li, J-C and Liu, B. A Model for Nuclear Explosion Cloud Movement and Fallout Estimation. Paper: RV.17.94

Wild, J.F., Goishi, W., Meadows, J. W., Namboodiri, N. and Smith, D. K. The NTS Underground Radionuclide Source-term Inventory Project. Paper: RV.18.94.

Church, B. W., Wheeler, D.L., Campbell, C.M., Nutley R.V. and Anspaugh. L.R. (1990). Overview of the Department of Energy's Off-Site Radiation Exposure Review Project (ORERP). Health Physics, 59 (5), 503-510. RV.19.94.

Haywood, S.M. and Smith, J. (1990). Assessment of the Potential Radiological Impact of Residual Contamination in the Maralinga and Emu Areas. NRPB-R237. RV.20.94.

Darby, S.C., Kendall, G.M., Fell, T.P., Doll, R., Goodill, A.A., Conquest, A.J., Jackson, D.A. and Haylock, R.G.E. (1993). Mortality and Cancer Incidence 1952-1990 in UK Participants in the UK Atmospheric Nuclear Weapon Tests and Experimental Programmes. NRPB-R266. RV.21.94.

Shoyhet, Ya.N., Kiselev, V.I., Lagutin A.A., Algasin, A.I. and Kolyado, V.B. Remote Consequences of the Influence of Nuclear Weapon Tests on the Semipalatinsk Experimental Range to the Population of the Altai Territory. RV.22.94.

Kerber, R. A., Till, J.E., Simon, S.L., Lyon, J.L., Thomas, D.C., Preston-Martin, S., Rallison, M.L., Lloyd, R.D. and Stevens, W. (1993). A Cohort Study of Thyroid Disease in Relation to Fallout From Nuclear Weapons Testing. JAMA, 270 (17), 2076-2082. RV.23.94.

Stevens, W., Thomas, D.C., Joseph, J.L., Till, J.E., Kerber, R.A., Simon, S.L., Lloyd, R.D., Abd Elghany, N. and Preston-Martin, S. (1990). Leukemia in Utah and Radioactive Fallout from the Nevada Test Site. JAMA, 264 (5), 585-591. RV.24.94.

Till, J.E., Simon, S.L., Kerber, R., Lloyd, R.D., Stevens, W., Thomas, D.C., Lyon, J.L. and Preston-Martin, S. The Utah Thyroid Cohort Study: Analysis of Dosimetry Results (submitted to Health Physics, 1993). RV.25.94.

FOREIGN NATIONAL VISIT REPORT

Lynn R. Anspaugh

**Physical Sciences Directorate
Health & Ecological Assessment Division
Risk Sciences Center**

Lawrence Livermore National Laboratory, University of California

Livermore, California 94550

Contract No. W-7405-ENG-48

October 18, 1993

Mark Josefovitch Jheleznyak

Name: Mark Josefovitch Jheleznyak

Citizenship: Ukraine

Business Affiliation: Institute of Mathematical Machines and Systems
Cybernetics Center
Ukrainian Academy of Sciences
Prospect Glushkov, 42, Kiev, Ukraine

Position: Department Head, Mathematical Modeling of Water Systems

Date of Visit: September 29, 1993

Hosts: Lynn R. Anspaugh

This visit was under the auspices of the US and former USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS), which was established to implement the international agreement, "Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety Between the USA and the [former] USSR." Dr. Jheleznyak was currently on assignment in the US with the Battelle Pacific Northwest Laboratories (PNL), Earth and Environmental Sciences Center, Hydrology Section, Geosciences Department. He was an intern through the SABIT program (US Department of Commerce) to train former USSR researchers. He was also working on a continuing project of the JCCCNRS within the context of Working Group 7.1 on Environmental Transport. His particular project (7.1F: Hydrological Transport [Modeling Behavior of Radionuclides in a Soil-Aquatic System, Including Rivers and Reservoirs]) is co-led by Dr. Onishi of PNL and concerns the movement of radionuclides and toxic substances in the Pripyat-Dnieper Rivers and the Clinch River in the US. The specific purpose of this visit was to review current collaborative research studies and to plan future collaborative research within the framework of Project 7.1F. Dr. Jheleznyak is the Ukrainian subtask leader for the Project.

Dr. Jheleznyak presented a seminar, "Surface Water Transport Modeling of Radionuclides Washed-Out from the Chernobyl Plant Contaminated Zone." He explained that the Chernobyl Nuclear Power Plant is situated on the bank of the Pripyat River 20 km from its inflow in to the Kiev Reservoir (drinking water supply for the City of Kiev) on the Dnieper River. Radionuclides washed out from the heavily contaminated Chernobyl zone are transported down stream through the Kiev Reservoir and then across Ukrainian territory to the Black Sea. The radionuclides' fate in the Pripyat River and Dnieper River-Reservoir system has been studied and modeled in the Ukraine since May 1986. He further indicated that the modeling results are used to predict the radionuclide concentration at water intakes during high spring and rain flow floods and also to estimate the efficiency of special hydraulic countermeasures designed to decrease the rate of radionuclide outflow from the Pripyat River and Kiev Reservoir. The application of modeling results to radiation protection decision making was illustrated by the Pripyat River flood-plain study. Approximately 15 LLNL employees attended the seminar.

Of particular interest was the study just concluded regarding the recent flooding in the Chernobyl Nuclear Power Plant area. Much concern about the content of radionuclides in tap water in Kiev was expressed to Working Group 7.1 by personnel from the US Embassy in Kiev. Appropriate information on the situation was provided through this project to Embassy personnel.

Further discussions were held between Drs. Anspaugh and Jheleznyak on the future activities of the Hydraulic Modeling Project.

Building 3703 was the only facility visited, and no specific equipment was viewed.

Dr. Jheleznyak is a very strong scientist with competence in mathematical modeling, particularly of the movement of toxic substances by surface hydraulic processes. His visit and presentation were of much interest to several LLNL researchers, and was crucial to the planning of future activities that are being funded by the DOE through the JCCCNRS vehicle.

There is no specific exchange agreement, and there was no agenda for this visit.

No written material was given to the visitor.

Benefits to the LLNL and the DOE were to exchange information on surface hydraulic modeling processes and the planning of future activities for a DOE-funded project, which is being conducted by US, Russian, and Ukrainian scientists.

To the best of my knowledge, no classified or unauthorized sensitive subject has been disclosed to the foreign national.

Lynn R. Anspaugh, Host

18 Oct 93

Date

FOREIGN TRIP REPORT

Lynn R. Anspaugh

**Risk Sciences Center
Health and Ecological Assessment Division
Physical Sciences Directorate
Lawrence Livermore National Laboratory
University of California
Livermore, CA 94551-9900**

Contract No. W-7405-Eng-48

January 6, 1993

SECTION A: SUMMARY**a. Traveler**

Lynn R. Anspaugh, Director, Risk Sciences Center
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January 6, 1993

b. Dates and Destinations

8-30-93 to 9-01-93	Pathway Analysis & Dose Assessment (JSP5) Mtg Moscow, Russia
9-02-93 to 9-10-93	Continuation of Chernobyl Studies Project Kiev, Ukraine

c. Purpose of the Trip

The purpose of Moscow, Russia, portion of the trip was to participate with representatives from Ukraine, Belarus, Russia and the Commission of European Communities (CEC) on the formulation of a cooperative project (Pathway Analysis & Dose Assessment [JSP5]) on dose reconstruction for Chernobyl Nuclear Power Plant victims.

The purpose of the Kiev, Ukraine, portion of the trip was to continue on-going work on the joint projects on dose reconstruction for those exposed to debris from the Chernobyl Nuclear Power Plant accident.

d. Abstract

My participation in the JSP5 meeting was also to assist in determining how best to cooperate and coordinate our research efforts to reconstruct and project radiation doses to the various groups of interest (children in our epidemiological studies, liquidators, etc.) in Ukraine. As the Ukrainians are now working with both the US and several organizations sponsored by the CEC, it was agreed to combine our work of mutual interest as much as possible.

In Kiev, Ukraine, at the Radioecological Institute, we further discussed and continued our work on our joint manuscripts on resuspension in order for this project to be terminated successfully. At the Scientific Centre for Radiation Medicine, we reviewed our work to date and continued progress on the calculations on dose reconstruction for those exposed from the Chernobyl accident.

SECTION B: TRIP REPORT

a. Purpose of the Trip

The purpose of the Moscow, Russia, portion of the trip was to participate with representatives from Ukraine, Belarus, Russia and the Commission of European Communities (CEC) on the formulation of a cooperative project (Pathway Analysis & Dose Assessment [JSP5]) on dose reconstruction for Chernobyl Nuclear Power Plant victims.

The purpose of the Kiev, Ukraine, portion of the trip was to continue on-going work on the joint projects on dose reconstruction for those exposed to debris from the Chernobyl Nuclear Power Plant accident.

b. Summary of Activities

As part of the continuing efforts of the Commission of European Communities (CEC) and the United States to cooperate broadly in our efforts to provide support and collaboration with scientists in the Former Soviet Union (FSU), I was invited by Neale Kelly of the CEC in a meeting to define the content of a new CEC Project on Pathway Analysis and Dose Assessment (Joint Study Project 5, or JSP 5). The details of the invitation, the proposed agenda, etc., are provided in Attachment A. I was also invited to attend the first meeting of organizing a second project, Compiling the Atlas on the Radioactive Contamination of the European territory from the Chernobyl Nuclear Power Plant Accident, which is known as JSP 6. A fundamental reason for my invitation to participate in JSP 5 was the joint recognition by Dr. Kelly and myself and our sponsors that there is great potential for overlap in the work that the our two sponsoring organizations are attempting to perform with colleagues within the FSU.

When I arrived in Moscow, I found that the agenda had been completely restructured, and I was able to attend the meetings of both JSP5 and JSP2. The new agenda for the JSP5 program is shown in Attachment B. This meeting was hosted by the Institute for Nuclear Safety. We spent the first morning being briefed on the work of this relatively new Institute. Several of my old friends from other Institutes now work there, and I was pleased to note that the work was of very high quality. I was also surprised to find that this Institute has several contracts from groups with the United States, including the U.S. Nuclear Regulatory Commission. They have developed from scratch their own geographic information system (GIS) with the capability to lay down predicted plumes, etc. A paper on the work they are doing is provided in Attachment C.

The rest of the time for this meeting was primarily spent in discussions on the content of the new program. The conclusions of this meeting are summarized in Attachment D, which unfortunately is available only in Russian. However, the important text is almost the same as that provided to us prior to the meeting in English, and this material is provided in Attachment E.

I then attended the meeting of JSP6, which was hosted by the again relatively new Institute of Global Climate and Ecology. This Institute is headed by another old friend, Yuri Izrael, the former Chairman of the State Committee on Hydrometeorology.

Izrael's former Deputy at the State Committee, Yuri Tsaturov, is now the First Deputy Minister of Chernobyl and he also attended this meeting. The time table for the meeting is provided in Attachment F and the agenda in Attachment G. Some text on the purpose of JSP6 is provided in Attachment H and the Draft Memorandum of Meeting is provided in Attachment I.

Following the conclusion of this meeting, I traveled to Kiev, Ukraine, for more informal meetings with scientific collaborators. I met with Dr. Evgenii Garger, Director of the Ukrainian Radioecology Institute. Dr. Garger was also the co-investigator with us on the resuspension campaign mounted by us in 1991. Dr. Garger and I had extensive discussions on the completion of the publications of our work and the completion of our study agreement.

While in Kiev, I also visited the U.S. Embassy. We had provided, on an emergency basis, a rather extensive analysis on the radiological situation in Kiev as it pertained to the recent flooding of the Chernobyl area and the contamination of the River Dnieper. The information that we had provided to the Embassy from our Ukrainian friends had been much appreciated, and we were told that this was the only solidly based information that they had received on a timely basis.

I also had lengthy discussions with Prof. Ilya Likhtarev and his staff regarding our joint projects, including the work being done by Dr. Leonilla Kovgan while she is a temporary employee at LLNL. Prof. Likhtarev had also been at the meetings I attended in Moscow. Prof. Likhtarev and I made extensive progress in developing our detailed plans for future work.

c. Traveler's Role

I participated in the JSP5 meeting and continuation of on-going work in Ukraine in my role as US Leader of Working Group 7.1 of the US-FSU Joint Coordinating Committee on Civilian Nuclear Reactor Safety, Co-Leader of 7.1B Resuspension and one of the American dosimetrists working on the childhood-thyroid-cancer case-control and cohort studies in both Belarus and Ukraine. Most of my activities are detailed in the text above.

d. Recommendations

We must continue to be on top of the Joint Study Projects being implemented by the CEC. In many cases there is a major possibility of overlap and duplication. This is best resolved by working together where possible and desirable, and by keeping the lines of communication open where we are not actively working together.

e. Information Pertinent to Energy Postures

None.

f. Security-Related Concerns

None.

SECTION C: APPENDIX

a. Itinerary

8/28-29/93	Travel	San Francisco, CA, USA, to New York, NY, USA, to Moscow, Russia
8/30-9/1/93	Meetings	Moscow, Russia
9/2/93	Travel	Moscow, Russia to Kiev, Ukraine
9/2-9/93	Meetings	Kiev, Ukraine
9/10/93	Travel	Kiev, Ukraine, to Frankfurt, Germany Official Stopover
9/11/93	Travel	Frankfurt, Germany to San Francisco, CA, USA

b. List of Persons contacted

See Attachments A, B, D, and G.

c. Literature Acquired

Attachment C.

J.M. Quinault, R. Arutyunyan, P. Picat, S. Gavrilov, C. Colle, C. Friedli, M. Kanevski, V. Kiselev, P. Fache, and H. Maubert, "Preliminary Results on Transfer of Radionuclide in Soil and Crops in the Chernobyl Area," *Radioprotection* Special Issue: 467-471 (February 1993).

M. Kanevsky, V. Kiselev, P. Fache, and J. Touche, "Decision-Oriented Mapping in emergency and Post-Accident Situations," *Radioprotection* Special Issue: 441-445 (February 1993).

V. Georgievky, M. Goorov, and A. Dvorjak, "Radiational Ecological Risk Analysis for Nuclear Power Plants Accidents," submitted for publication.

E. A. Savel'eva and M.F. Kanevsky, " Environmental Data Analysis, Processing and Presentation)Interpolations, Geostatistics, Fractals)," in Proc. 4th Annual Scientific & Technical Conference of the Nuclear Society, June 28-July 2, 1993.

E.D. Martynenko, M.F. Kanevsky, S.L. Gavrilov, and S.K. Starinin, "Analysis and Verification of Radionuclide Migration Models in Soil, in Proc. 4th Annual Scientific & Technical Conference of the Nuclear Society, June 28-July 2, 1993.

V.L. Tarasov, I.I. Linge, A.Ya. Klementjev, and Yu.A. Barklyanskiyi, "On the Problem of the Sociopsychological Condition of Children in Radioactive Contaminated Territories," unpublished abstract.

ГОСУДАРСТВЕННЫЙ КОМИТЕТ
РОССИЙСКОЙ ФЕДЕРАЦИИ ПО СОЦИАЛЬНОЙ ЗАЩИТЕ ГРАЖДАН И
РЕАБИЛИТАЦИИ ТЕРРИТОРИЙ, ПОСТРАДАВШИХ ОТ ЧЕРНОБЫЛЬСКОЙ И
ДРУГИХ РАДИАЦИОННЫХ КАТАСТРОФ

STATE COMMITTEE OF THE RUSSIAN FEDERATION FOR SOCIAL
PROTECTION OF POPULATION AND REHABILITATION OF REGIONS
AFFECTED BY CHERNOBYL AND OTHER RADIATION CATASTROPHES

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TELEFAX

TELEFAX

TELEFAX

Date 15 July 1993 Number of pages to follow: 8 p.

TO:

FROM:

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Y.S. Tsaturov
First Deputy of the
Chairman of
GosComChernobyl of
Russia

Dear Dr. Kelly,

We have discussed Your proposals concerning on the next meeting's date according to preliminary discussion of JSP-5 and JSP-6 projects. We would like to hold a meeting on JSP-5 in Moscow from 30 August to 1 September, 1993. Supposed participants from Russia have prepared proposals on contents of JSP-5 project's, that are enclosed. (Appendix 1).

Following Your proposals we are ready to have a meeting on JSP-6 project immediatly after the JSP-5 one. Proposals on this meeting are also eclosed. (Appendix 2).

I shall be greatful to You if You will kindly send copies of this letter to Dr.J.Sinnaeve and to Dr.S.Finzi.

Encl.: Appendix 1, 3 p. - 1;
Appendix 2, 4 p. - 1.

Sincerely Yours,

Y.S. Tsaturov

**AGENDA OF THE FIRST MEETING OF EXPERTS OF THE PROJECT ON
"COMPILING THE ATLAS ON THE RADIOACTIVE CONTAMINATION OF THE
EUROPEAN TERRITORY FROM THE CHERNOBYL NUCLEAR POWER PLANT
ACCIDENT**

Russian Federation (RF), Moscow, 2-5 September 1993).

Participants: from Russian federation	7 persons
from Belarus	2 persons
from Ukraine	2 persons
from the Commission for European Communities CEC)	3 persons

2nd September 1993

Arrival and accommodation of delegations (the first half of the day).

2. Opening of the meeting.

3. Discussion and approval of the agenda.

4. Yu.S. Tsaturov (Russian Goskomchernobyl). The importance and place of the Project on "Compiling the Atlas on the Radioactive Contamination of the European Territory from the Chernobyl Nuclear Power Plant Accident" in the implementation of the Agreement on the International Cooperation between the CEC, Belarus, Russia and Ukraine on issues, connected with the consequences of the CNPP accident.

5. Information provided by the CEC representatives on how to organize the activities within the Project.

6. General discussion on how to organize the work.

more

3d September, 1993.

1. YU.A. Izrael (IGCE) Main purposes and tasks of the Project "Compiling the Atlas of the Radioactive Contamination of the European territory from the Chernobyl NPP accident".
2. I.M. Nazarov (IGCE) Aero-gamma-spectrum method- a principal instrument for compiling maps on the density of contamination of the territory by gamma-radiating radionuclides of the artificial origin as well as maps on dose rates.
3. Sh.D. Fridman (IGCE). Principal results of the aero-gamma survey of the caesium -137 storages in soil over the territory of Belorus, Ukraine, and Russia, contaminated from the CNPP accident, contents of natural radioactive elements, as well as dose rates.
4. E.V. Kvasnikova (IGCE). The structure of the Atlas of the maps on the radioactive contamination of the European territory from the CNPP accident. Requirements to maps included into the Atlas. Determination of the content of the sections and maps of the Atlas.
5. E.D. Stukin (GNP "RAMON"). Compiling of small-scale maps on contamination of territories from the Chernobyl NPP accident by plutonium, americium and strontium-90 radionuclides.
6. R.S. Kontarovitch (SPP "Aergeophysics"). Aero-gamma spectral stations used in the Programme "Compiling the Atlas of maps on radioactive contamination of the territory of the former USSR."
7. General discussion on purposes and tasks of the Project, the structure of the Atlas, technology of compiling maps on contamination and requirements to maps and methods of their compilation.

4th September, 1993.

(The first part of the day)

Visit to the Institute of Global Climate and Ecology under the Russian Academy of Sciences and Rosgidromet (IGCE) - main organization in Russia responsible for compiling the Atlas on the radioactive contamination of the European territory from the Chernobyl NPP accident.

1. Acquaintance with scientific programmes of the Institute.
2. Acquaintance with the technology for compiling maps of the Atlas on the radioactive contamination of the territory of the former USSR, maps on gamma-ray dose rates as well as chemical contamination of territories under the effect of the Chernobyl NPP accident.
3. V.N. Vasilenko (IGCE). Compiling maps on chemical pollution of territories exposed to the radioactive impact from the Chernobyl NPP accident.

The second part of the day

4. Establishing the groups of authors and editorial groups on the Atlas on radioactive contamination of Europe from the Chernobyl NPP accident.
5. Development of the agenda of the second meeting of experts on the Project "Compiling the Atlas of the radioactive contamination of the European territory from the Chernobyl NPP accident" on the issues concerning technology and specific organization for compiling the Atlas of maps on radioactive contamination of Europe (the end of 1993, Brussels)
6. General discussion on the Project.

more

5th September, 11993.

1. Completion of the discussion on the Project
Adoption of a final document on materials of the meeting
Departure of delegations

COMMISSION
OF THE EUROPEAN
COMMUNITIES

Brussels, 28 July 1993
DG XII no.
XII/F/6 - GNE/1

DIRECTORATE GENERAL FOR ENERGY,
RESEARCH AND DEVELOPMENT
JOINT RESEARCH CENTRE
ENERGY
NATIONAL RESEARCH RESEARCH

BY FAX 1-415-423.6785

(12 pages)

Dear Lynn,

**CEC/CIS meeting in Moscow
on Pathway Analysis and Dose Assessment (JSP5)**

During the VAMP meeting in Vienna earlier this month we discussed our respective plans with regard to dose assessment, etc in the former Soviet Union. As you are aware, within the framework of the CEC/CIS joint programme on the consequences of the Chernobyl accident, we are about to launch a number of additional projects which will commence at the end of 1993.

One of these projects (JSP5) will be concerned with pathway analysis and dose assessment. I have enclosed a very brief outline of the project scope and objectives. In order to formulate and agree the detailed content of the project, Peter Jacob and myself will be attending a 3 day meeting with relevant CIS institutes in Moscow from 30 August till 1 September. Following that meeting a contract will be placed with a number of EC institutes to undertake the agreed work programme; Peter Jacob (GSF) will coordinate the work and there is likely to be participation from NRPB (UK), IPSN (France) and CIEMAT (Spain). The CIS institutes to be involved will be decided at the September meeting; a decision on who will act as the overall coordinator on the CIS side will probably not be made formally before November. For your information I am also enclosing the CIS proposals for items to be addressed during the meeting.

I took note of Lichtariov's comments when we discussed these matters at the VAMP meeting, in particular that we (CEC and US) should attempt to avoid duplication of effort in our respective interactions with CIS institutes. In this context, if you were able to attend this formative meeting of the project, we would be pleased to extend an invitation to you. Your presence would enhance the discussions in addition to helping us both avoid duplication of effort. I have not discussed this with the CIS organisers of the meeting but in the circumstances I am sure there would be no objection to this, indeed I suspect just the opposite.

Dr. Lynn R. Anspaugh
Environmental Sciences Div.,
Lawrence Livermore National Laboratory
P.O.Box 5507/L-453
Livermore, California 94550
U.S.A.

If you wish to attend the meeting could I ask you to let me know as soon as possible so that the necessary arrangements can be made with our CIS counterparts. I shall not be in the office again before the Moscow meeting but can be contacted through my secretary. I am also copying you details of a further meeting we are having with the CIS immediately following the JSP5 meeting - the second meeting is concerned with compiling atlases of contamination and of other quantities. You would be equally welcome to attend the second meeting (2-4 September) were it of interest to you.

I look forward to hearing at the earliest opportunity whether you will attend the Moscow meeting.

Regards,

Yours sincerely,

G N Kelly

Encl.

JOINT STUDY PROJECT 5

ANALYSIS OF IRRADIATION PATHWAYS AND DOSE DISTRIBUTION

Background and Significance

People, living in the contaminated areas near the region of Chernobyl accident, are worried about the reliability of information on the radiation doses they have received and have been receiving. International investigation of methods, used by the authorities for dose estimation, confirmed that they were correct and, as a rule, even exaggerated doses in comparison with their true values. However, these investigations have been conducted mainly for the averaged doses in the contaminated settlements, whereas the dose distribution among the population and critical groups have been poorly studied. Thorough investigation of the dose distribution among the affected population is of great need. These researches will contribute to the population confidence and to the confirming of adequacy of the undertaken public health measures.

Project will include a rigorous analysis of potential ways of irradiation of people, that have been living and working in the contaminated areas. Current irradiation as well as doses, that population may receive in future (according to different protective measures) will be taken into account. The distribution of radiation doses among the population in the representative total of settlements will be studied, with the main attention being paid to the groups, that may get the radiation dose exceeding averaged one. The methods of dose estimation will be checked by the program of contamination level measurements in a certain range of media and actual doses. The main attention is to be paid to persons, who may get the largest dose.

Participants

During the first year, the project is proposed to be coordinated by GSF (D) with participation of CIEMAT (E), IPSN/CEA (F), NRPB (UK) and Norway Institute.

CIS Participants

Nuclear Safety Institute (RAS)

Radiation Hygiene Institute (St. Petersburg)

Radiation Hygiene Institute, Novosybkovo Subsidiary

Biophysics Institute (RF Public Health Department)

Severtsev Institute of Evolutionary Morphology and Ecology of Animals

Radiation Medicine Scientific Center (Kiev)

Radiation Medicine Institute (Minsk)

Main Lines of Investigation in 1994-1996

1. Analysis of the radiation-hygiene situation in the contaminated regions and information about averaged and personal radiation doses, in order to choose settlements for further detailed investigations. Settlements with mean characteristics (corresponding to simulated estimations) and irregular settlements with characteristics with enormously high and low doses are to be chosen.

2. Analysis of irradiation pathways at different stages after the accident. Reconstruction of individual doses of the internal and external irradiation for the first years after the accident for the people of certain settlements with regard to personalized original data. Analysis of natural and social factors influencing the irradiation doses.

3. Estimation of variability ranges for the external and internal individual irradiation doses for population in the settlements with standard characteristics. Among them: investigation of different factors, determining irradiation doses in a certain settlement; instrumental estimations of the current irradiation doses.

4. Estimation of variability ranges for the external and the internal individual irradiation doses for population in the settlements with irregular characteristics. Among them are estimations with consideration for difference in the fallout radionuclide composition; in the coefficients of radionuclide transition to foodstuffs from the averaged values, used in official methods; changes that occurred in the settlements after the accident (protective measures, foodstuffs, behavior etc.). Instrumental estimations of the current irradiation doses.

5. More exact definition of the internal and external irradiation lifelong doses with regard to the undertaken and possible measures, as well as to the received doses.

6. Estimation of the mean population dose for certain settlements with regard to transformation of demography situation and actual distribution of irradiation doses.

7. Statistic and geostatistic analysis of spatial distributed, time depended data of contamination and irradiation doses (with consideration for different ways of radiation): space and time correlation analysis, estimation of errors, analysis of uncertainty (sensitivity).

At the first stage (1994) the following amount of work is planned to be done (items 1-4 and 7):

1. Analysis of radiation-hygiene situation in the contaminated regions and information about averaged and personal irradiation doses in order to choose settlements for further detailed investigations. Selection of the settlements for the further investigation.

2. Analysis of ways for population irradiation in different stages after the accident. Data accumulation for reconstruction of individual doses of the internal and the external irradiation for the first years after the accident.

3. Estimation of variability ranges for the external and the internal individual irradiation doses for population in the settlements with standard characteristics in comparison with official data.

4. Estimation of variability ranges for the external and the internal individual irradiation doses for population in the settlements with irregular characteristics. Instrumental estimations of the current irradiation doses.

5. Selected statistic and geostatistic analysis of the spatial distributed data of the contamination and irradiation doses.

Responsible executors:

Nuclear Safety Institute (RAS)

Radiation Hygiene Institute

Novosybkovo Subsidiary

Biophysics Institute

Institute of Evolutionary Morphology
and Ecology of Animals

more → end!

Proposed new JEP 5

PATHWAY ANALYSIS AND DOSE DISTRIBUTIONS

Some of the anxiety among those continuing to live in contaminated regions around Chernobyl arises from uncertainty, or lack of confidence, in the doses they are assessed or reported to be receiving. An international review of the methods used by the authorities to assess doses confirmed that they were basically sound and, in general, probably overestimates of the doses actually received. This review, however, was largely concerned with doses received on average in affected settlements, with less attention being given to the distribution of doses among the population or among critical groups. A more detailed investigation of the distribution of exposures in affected populations is needed, both to provide re-assurance to those affected and to confirm the adequacy of public health measures currently being taken.

The project will comprise a rigorous and exhaustive analysis of potential pathways of exposure for people continuing to live and work in the contaminated regions. Consideration will be given to current exposures and those that may be received in the future, subject to different assumptions as to the protective measures that may be taken. The distributions of dose among the population in a representative range of settlements would be examined, with particular attention given to those groups potentially exposed at levels significantly greater than the average. The dose assessment methods would be validated through a measurement programme of contamination levels in a range of environmental media and of doses actually received by people, with particular attention given to those potentially most exposed in the affected populations.

Proposed institutes

It is proposed that the project in the first year is coordinated by GSF (D) with the participation of CIEMAT (E), IPSN/CEA (F), NRPB (UK) and a Norwegian institute.

Snopeke and pl.

Proposed new JSP 6

DATA BASES AND CARTOGRAPHY

Extensive measurements have been made of the spatial and temporal variation of environmental contamination following the Chernobyl accident, particularly in the affected regions of the CIS but also over the rest of Europe and elsewhere. These measurements form a valuable data source with many diverse potential uses ranging from public information to scientific investigation. In addition, extensive measurements have been made of the transfer of radionuclides through the aquatic and terrestrial environment and of how they vary with the prevailing environmental conditions, for example soil characteristics, etc. Similarly, numerous measurements have been made of the variation of dose rates with time and of the levels of radioactive contamination in people. If properly assembled, validated and integrated, these various data sources would provide a most valuable scientific resource that would find broad use, in particular in enabling more reliable assessments of radiological impact both in the affected regions of the CIS and elsewhere. When coupled with data on the efficacy and costs of different protective measures taken after the Chernobyl accident, they would also provide a valuable data base for decisions in future on countermeasures' strategies.

The focus of this project will be the establishment of a comprehensive and integrated computerised data base of validated data for those radiological and environmental quantities of interest. The data base will be compiled in a form compatible with the REM data base and include, *inter alia*, information on the following quantities:

- levels of ground contamination for the major radionuclides (eg isotopes of iodine, strontium, caesium, plutonium and hot particles) and their variation with time
- environmental monitoring measurements made during the actual Chernobyl release
- external dose rates from deposited material and their variation with time
- population and land use characteristics
- data on those soil characteristics, etc, which may influence transfer of radionuclides to food chains

The data base will be available for use for public information purposes and for scientific investigation and will be updated and extended with time.

It is proposed that this project be coordinated by JRC Ispra and involve a further three or four institutes.

B

Agenda of the Meeting on JSP-5
29-30 August, 1993
Moscow, NSI

Analysis of irradiation ways and dose distribution

August 30, 1993

9.30 - 10.00	Meeting with the NSI Director Prof. Bolshov
10.00 - 10.40	Visit to the laboratories headed by Dr. Linge
10.40 - 11.00	Visit to Dr. Pavlovsky's laboratory
11.00 - 11.20	Coffee-break
11.20 - 11.50	Visit to Dr. Kisselev's laboratory
11.50 - 12.20	Visit to Dr. Kanevsky's laboratory
12.20 - 12.50	Visit to Dr. Gavrilov's laboratory
13.00 - 14.00	Lunch
14.00	Meeting of the working group
-	presentation of Mr. Tsaturov on main goals
of the working group
-	Mr. Kelly speaks about conditions and anticipated
tasks of the Project
-	Dr. Linge speaks on coordinated proposals of joint
researches from Russian side
-	Dr. Likhtarev presents overview on Ukrainian
approach
-	Dr. Kenigsberg's presentation on Belarus approach
-	Speakers Drs. Pavlovski, Savkin, Konstantinov,
Ramzaev and others: on dosimetry aspects of the
Project
17.45	Conclusion by Messrs. Kelly and Jakob on the CEC
approach to the content of the Project.

August, 31

9.30 - 13.00	Work on the Project content
13.00 - 14.00	Lunch
14.00 - 15.30	Discussions on timeschedule and deadlines of the Project implementation
15.30 - 16.30	Discussion of organizational matters regarding JSP-5 Project preparation and implementation

C

**ACADEMY OF SCIENCES OF THE RUSSIAN FEDERATION
NUCLEAR SAFETY INSTITUTE (NSI)
DIVISION OF RADIATION SAFETY & RADIATION RISK (RSRR)**

**L.A.BOLSHOV, NSI DIRECTOR
R.V.ARUTYUNYAN, RSRR DIVISION DIRECTOR
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*Designed for radiation safety, labour safety,
civil defence, sanitary inspection and envi-
ronment protection services and specialists*

One of the trends in the Nuclear Safety Institute activities consists in the development and implementation of software packages for radiation safety and radiation hygiene, radiation protection and environment protection problems solution.

One of the largest projects being designed and implemented at the RSRR Division is the creation of informational system containing data necessary for solution of the full complex of problems related to the elimination of consequences of the Chernobyl accident. The informational system is being created in close collaboration with basic ministries and departments involved in eliminating consequences of the Chernobyl accident.

This information system consists of a Central Data Bank (in Moscow), a number of local data banks (in contaminated areas of Russia), and data bank access software. There is a regular information exchange between the central and local data banks. The banks are implemented on IBM PC compatible computers. The information in the central and local banks is updated as new data on radiation-hygienic situation in contaminated areas appear.

IBM PC is trademark of International Business Machines Corporation

The Central Data Bank includes a number of components described further.

**A DATA BANK ON RADIATION-HYGIENIC SITUATION IN
TERRITORIES CONTAMINATED BY RADIONUCLIDES DUE TO
THE ACCIDENT AT CHERNOBYL NUCLEAR POWER PLANT**

In this data bank the information has been accumulated for about 10,000 populated areas belonging to 15 oblasts (regions) of Russia. The total number of data types (fields) is about 600. However for a specific oblast it usually doesn't exceed 100 as different data are stored for different oblasts.

Main Data Groups

- populated area name, administrative code and geographical coordinates;
- social and economic development data;
- data on types of protection measures used;
- data on soil and food products contamination by radionuclides;
- data on measured population internal and external exposure doses;
- estimates of expected population irradiation doses.

A. Administrative and Economic Characteristics

- administrative belonging (state, oblast, raion, village soviet);
- populated area type (town, settlement, village) and name;
- information about participation in a collective or state farm;
- quantity of houses (for country-side populated areas);
- size of population;
- indication of belonging to a zone (e.g., the zone of relocation or the zone of favourable socio-economic status, etc.);
- indication whether the populated area is concerned within the program of urgent (long-term) measures.

B. Geographic Data

- geographical coordinates;
- prevailing building type.

C. Data on Environmental Radioactive Contamination

- Cs-137 soil contamination (minimum, maximum, and average Cs-137 soil contamination density in the populated area according to data of the State Committee on Hydrometeorology);
- data on Strontium-90 soil contamination (minimum, maximum, and average Sr-90 soil contamination density in the populated area according to the data of the State Committee on Hydrometeorology);
- data on radionuclides of Cs and Sr content in milk (average and quantile value during the current year pasture period) on the basis of data of sanitary or veterinary inspection or of available research institutes if any; otherwise the Cs and Sr content in milk can be estimated using regional migration coefficients.

D. Data on Irradiation Doses

- estimates of actual irradiation doses of the whole body for the period from 1986 to 1990 (preceding the current year) carried out by the research institutes or calculated using the methods adopted by these institutes.
- predicted external and internal irradiation doses for 1991 and 1992 (in future for the current and for the next year), evaluated by research institutes or calculated using methods adopted by them.

E. Information Sources

All the data listed in items C, D are accompanied by bibliographic reference data fields.

The local data banks in contaminated territories contain subsets of the data types listed before and besides data of primary measurements.

Radio-Hygienic Data Bank Access Software

The radio-hygienic data bank access software allows the user to get the following information (to screen or to printer):

- all the information listed before in items A-J for any populated area included in the data bank;
- summarized data for the given state, oblast, raion or village soviet;
- reference data on problems of radiation hygiene and methods of irradiation doses estimation.

A DEMOGRAPHIC DATA BANK

The second part of the Central Data Bank contains the information on the size of population and number of people deceased on different reasons. The data were collected by the USSR State Committee of Statistics. We have the data bases on the size of population for all 73 oblasts of Russia in 1981-1991. The information is stored in dBase format (dbf-files) and contains the numbers of people of different age of male and female sex living in country and towns.

There are data bases on the number of people died from different reasons in the Demographic Data Bank. The information is available for 15 contaminated oblasts of Russia, a few oblasts in Ural Region and several "clean" oblasts (about 40 oblasts in all). 18 classes of diseases and detailed information on different neoplasms localizations is under analysis. Three-digit codes of diseases in the data base correspond to the International Classification of Diseases by WHO, 1975 revision. There are rural and urban populations of male, female and both sexes with 5 years age interval from 0 to 80 years old in the data base.

A DATA BANK ON MEDICAL STATISTICS

The Medical Statistics Data Bank contains the information on the number of ill people with neoplasms of different types. It was delivered by the USSR Ministry of Public Health for all 73 oblasts of Russia from 1982 till 1991. There are about 10 localizations of benign neoplasms for which the morbidity dynamics may be followed during this period. Some other localizations started being registered by the State statistical organizations only after Chernobyl accident (thyroid glands, etc.).

One data base was created for every oblast for one year from 1982 up to 1991. There are the total numbers of ill people and people registered for the first time for every neoplasm localization and the information on children younger 15 separately in each data base.

The information collected allows us to analyse the after-effects of small doses of irradiation on people health by methods of medical statistics and compare the sanitary situation in contaminated regions with the "clean" territories of Russia which can be taken as control ones. The possibility to follow the dynamics of different parameters for 5 years before and 5 years after Chernobyl Crash is of great importance also.

A DATA BANK ON RADIOACTIVE CONTAMINATION OF RUSSIAN FARMS

In this data bank the information is stored on structure of farms and their contamination. This information is available for the farms situated in the Bryansk, Kaluga, Oryol and Tula oblasts. The main types of the data stored include:

General information

- farm requisites including name, type, address administrative code;
- requisites of the farm administrative & economic center;

Social and Economical Development Characteristics

- the farm main activity type;
- agricultural production cost;
- main production and non-production funds cost;
- the total farm area;
- arable land, haymaking, pasture, and sown areas;

Data on the Farm Territory Contamination

- the farm areas (values) contaminated at levels of 0-1, 1-5, 5-10, 10-15, 15-30, 30-40, over 40 Ci/sq.km;
- the arable land areas contaminated at the mentioned levels;
- the summary haymaking and pasture areas contaminated at the mentioned levels.

Data on the contamination of agricultural and food products in private and collective farms

- volume of production;
- content of Cs-137 in agricultural and food products.

A DATA BANK ON RADIOACTIVE CONTAMINATION OF RUSSIAN FORESTRIES

This data bank contains information on radioactive contamination of Bryansk oblast forestries. This information is presented in the form of distribution of forestries by contamination zones. The main types of the data stored include:

General information

- forestry requisites including name, address, administrative code;
- requisites of the two populated areas situated in the neighbourhood of the forestry;

Data on the Forestry Radionuclide Contamination

- area of the radioactively contaminated forests on the territory of the forestry;
- areas of the forests contaminated at levels of 0 - 1, 1-5, 5-10, 10-15, 15-30, 30-40, over 40 Ci/sq.km;
- the forestry minimum, maximum and weighted average contamination levels, Ci/sq.km;
- the minimum, maximum and average contamination levels for the two neighbouring populated areas, Ci/sq.km.

A DATA BANK ON CHEMICAL AND TOXICOLOGICAL CONTAMINATION OF SOIL, URBAN ATMOSPHERE AND SURFACE WATERS

This data bank includes the following types of data:

- data on chemical and toxicological contamination of 63 towns and cities of Russia;
- data on contamination of rivers and lakes in 45 oblasts of Russia due to the accidents at Chernobyl, Chelyabinsk and Altai regions;
- data on chemical and toxicological contamination of agricultural areas, food products (heavy metals and pesticides).

A DATA BANK ON NORMATIVE AND TECHNICAL DOCUMENTS CONCERNING PROBLEMS OF RADIATION ACCIDENTS CONSEQUENCES ELIMINATION

This Data Bank consists of a hypertext database "RADGIGIENA" and an electronic reference "Population Protection".

The hypertext database contains the full texts of about 100 documents (2.5 Mb) including State Standards, Sanitary Norms, Temporary Permissible Levels determining safe methods of work with sources of ionizing irradiation at industrial plants, health and research institutions.

The electronic reference "Population Protection" is a text database containing the full text of the Russian Federation Law "On social protection of citizens, exposed to irradiation as a result of Chernobyl Accident" as well as texts of some other documents (about 0.3 Mb in total).

A DATA BANK ON SCIENTIFIC PUBLICATIONS AND PUBLICATIONS IN THE PRESS ON PROBLEMS OF RADIATION ACCIDENTS CONSEQUENCES ELIMINATION

Now this data bank includes databases BIO and BIBL as well as extracts from databases INIS (International Nuclear Information System), NTIS (National Technical Information System of the USA) , and databases on agricultural radiology of plants (REP) and animals (REA).

The database BIO contains bibliography and abstracts of scientific publications on radiation medicine. In the database bibliography and abstracts are accumulated for about 3000 publications (about 2 Mb).

The database BIBL includes bibliography of about 2000 publications in newspapers and magazines on Chernobyl accident.

The extracts from INIS and NTIS databases contain bibliography and abstracts of respectively 9000 and 2200 documents related to radiation accidents' consequences elimination.

The databases REA and REP contain bibliography and abstracts of respectively 600 and 900 publications on agricultural radiology.

All the mentioned databases containing bibliography and abstracts of publications either in scientific editions or in press are implemented using 3-rd network version of menu-driven Information Storage and Retrieval system designed specially for the computerized management of text (documental) data bases. This system named CDS/ISIS/M is designed by UNESCO.

A DATA BASE ON SOCIO-PSYCHOLOGICAL CONDITION OF CHILDREN IN THE CONTAMINATED TERRITORIES

This data base contains data of interrogation involving 1970 teen-agers performed by Kaluga Sociological Institute in September of 1992. This data were analyzed at the Division of Radiation Safety and Radiation Risk with the help of the SAS Program Package (USA), used for statistical treatment of data on conflicts involving pupils of 9 - 11 forms.

As a result of this analysis the teen-agers can be divided into three groups:

- calm;
- loyal;
- conflict.

The following signs turned to be statistically significant for the group distribution of the teen-agers:

- fact of witness or participation in quarrels or fights;
- situations connected with the physical violence performed by the persons of the same age;
- offence by the teachers.

The significance of the conflict factors decreases in the following list:

- social and cultural factors including wine, drugs (the most significant factors);
- psychological factors including mood, alarm, fear ;
- political factors (attitude to the government);
- socio-economic factors (the location region, attitude to the market).

INTEGRATED INFORMATION EXPERT SYSTEMS

Integrated Information Expert Systems (IIES) include a bank of models, databases, cartographic databases and information systems working in the same environment.

At the present time the bank of models includes the models of radionuclide migration by food chains, vertical soil migration, air transfer (the local Gauss model). It is planned to add the models of radionuclide transfer in water systems, dosimetric models and models of radiation risk.

Cartographic database includes electronic vector maps of the scale 1:500 000, 1:200 000. At the end of 1992 the database (scale 1:500 000) included all the zones having Cs-137 contamination over 5 Ci/sq.km due to Chernobyl accident as well as the zone affected by the accident at "Mayak" works.

Radioecological databases represent samples from the data banks on radiation-hygienic and demographic situations. For information support are used the samples from documental data banks described before.

All the information stored in the Central Data Bank together with the data bank access software allows the specialists of the Russian State Chernobyl Committee to use the system as a basis for making decisions aimed at implementing measures to moderate the consequences of Chernobyl nuclear power plant accident. Basing upon the Law of December 28, 1991 the Russian Government adopted the list of populated areas belonging to the radioactively contaminated territories. This list was prepared using the information of the Central Data Bank.

SOFTWARE PACKAGES AVAILABLE FROM RSRR DIVISION IN 1993

The RSRR Division software production consists of three groups of programs for IBM PC - compatible personal computers:

- programs for radiation doses computing;
- automatic data processing systems;
- electronic references.

The software products developed at RSRR Division were certified and recommended for practical usage by the USSR Department of Health, the State Industrial Atomic Energy Plants Supervision Committee ("Gospromatomnadzor") and the National Commission on Radiological Protection.

1. RADIATION DOSES COMPUTING

- 1.1 "ZS-HIE" (human internal exposure doses calculation).
- 1.2. "ZS-RADOFOR" (external exposure doses calculation).
- 1.3. "ZS-FIELD" (Radiation field functionals calculation).

2. AUTOMATIC DATA PROCESSING SYSTEMS

- 2.1. "ZS-Probe" (volumetric/specific activity control).

2.2. "ZS-Situation" (control of radiation-hygienic situation in populated areas).

2.3. "ZS-IDC/population" (individual dosimetric control of population).

2.4. "ZS-IDC/prof" (individual dosimetric control of professional workers).

2.5. "ZS-DBRO" (database of radioecological objects).

3. ELECTRONIC REFERENCES

3.1. "ZS-NSS" (Electronic reference containing the texts of Nuclear Safety Standards 76/87, Main Sanitary Norms 72/87).

3.2. "ZS-RN" (includes differential irradiation properties of 407 radionuclides).

MAIN WORK DIRECTIONS IN 1993

1. A global data bank including all the populated areas having Cs-137 soil contamination density not less than 1 Curie per square kilometer as a result of Chernobyl accident as well as certain additional neighbouring populated areas according to the government decree.

1.1 Data on contamination of environment, food products and doses.

2. Local data banks on individual doses of internal and external irradiation of population belonging to different occupation and age groups.

3. Protective measures analysis.

3.1 Analysis of measures carried out and expenditures related to implementation of measures which are carried out or planned.

3.2 Discovery and analysis of factors to be taken into account during a decision-making process.

3.3 Intervention levels and protective measures.

3.3.1 Analysis of intervention levels and protective measures effectiveness.

3.3.2 Development of a data bank on protective measures.

4. Maintenance of the following databases:

4.1 A database on radiation contamination levels of agricultural areas and forests.

4.2 A database on chemical and toxicological contamination of agricultural areas, food products (heavy metals and pesticides).

4.3 A database on chemical and toxicological contamination of soil, atmosphere and surface waters.

5. It is planned to start developing an Electronic Encyclopaedia on Chernobyl accident.

JOINT STUDY PROJECT 5

АНАЛИЗ ПУТЕЙ ОБЛУЧЕНИЯ И ДОЗОВЫЕ РАСПРЕДЕЛЕНИЯ

Обоснование

Люди, живущие в зараженных районах вокруг места Чернобыльской катастрофы, испытывают беспокойство в связи с тем, что они не уверены в истинности информации о дозах, которые эти люди уже получили и продолжают получать. Международное исследование методов, использованных властями для оценки доз, подтвердило, что в основе своей они были верны и, как правило, даже завышали дозы по сравнению с истинными величинами. Это исследование, однако, касалось, в основном, усредненных доз в пораженных населенных пунктах, в то время как распределению доз среди населения или среди критических групп уделялось меньшее внимание. Требуется более детальное исследование распределений по дозам облучения среди пораженного населения. Это будет способствовать как повышению уверенности среди сомневающихся, так и подтверждению адекватности предпринимаемых в настоящее время здравоохранительных мер.

Проект будет включать в себя строгий и исчерпывающий анализ потенциальных путей облучения людей, продолжающих жить и работать в зараженных районах. Будет учтено текущее облучение, равно как и те дозы, которые население может получить в будущем в зависимости от различных допущений относительно защитных мер, которые могут быть предприняты. Будут изучены распределения доз среди населения в репрезентативной совокупности населенных пунктов, причем особое внимание будет уделено тем группам населения, которые могли быть облучены значительно сильнее, чем в среднем по региону. Методы оценки доз будут проверены с помощью программы измерений уровней загрязнения в некотором диапазоне сред и доз, фактически полученных людьми. При этом первостепенное внимание будет обращено на тех, кто потенциально мог получить наибольшую по сравнению с другими дозу.

Участники

Предлагается, чтобы в течение первого года проект координировался GSF (D) с участием CIEMAT (E), IPSN/CEA (F), NRPB (UK).

Участники от СНГ

Россия

Институт радиационной гигиены (С.Петербург),
ИБРАЭ РАН,

Новозыбковский филиал Института радиационной гигиены
Институт биофизики Минздрава РФ,
Институт эволюционной морфологии и экологии животных
им. А.Н. Северцева,
Российский научный центр "Курчатовский институт"

Украина

Украинский научный центр радиационной медицины, г. Киев

Белоруссия

Институт радиационной медицины, г. Минск

Основные направления исследований на 1994-1996 гг.

1. Анализ радиационно-гигиенической обстановки на пострадавших территориях и информации по дозам облучения людей с целью выбора населенных пунктов, отличающихся по интенсивности контрмер и условиям формирования дозы, для дальнейшего углубленного исследования. Выбор и согласование процедур получения доз из первичных инструментальных данных.

2. Анализ путей облучения населения в различных фазах послеаварийной ситуации. Реконструкция доз внешнего и внутреннего облучения (исключая облучение щитовидной железы) за первые годы после аварии для жителей отдельных населенных пунктов с учетом персонифицированных исходных данных. Анализ влияния природных и социальных факторов на формирование доз облучения.

3. Оценка распределений доз внешнего и внутреннего облучения для населенных пунктов с типичными характеристиками. Изучение значимости отдельных параметров, определяющих дозовые нагрузки в пределах одного населенного пункта; инструментальные оценки текущих доз облучения.

4. Оценка распределений доз внешнего и внутреннего облучения людей для населенных пунктов с нетипичными характеристиками. Инструментальные оценки текущих доз облучения.

5. Анализ оценок пожизненных доз (70 лет) внешнего и внутреннего облучения с учетом реализованных и возможных контрмер, а также уже полученных доз.

6. Оценка популяционной дозы для отдельных населенных пунктов с учетом изменений в их демографической ситуации и реально наблюдаемого распределения по дозам облучения людей.

7. Статистический и геостатистический анализ пространственно-

распределенных, зависящих от времени данных по загрязнению и дозам облучения (с учетом различных путей облучения): пространственно-временной корреляционный анализ, оценка ошибок, анализ неопределенностей.

На первом этапе в 1994 году планируется проводить работы по направлениям 1-4 и 7 в следующих объемах:

1. Анализ радиационно-гигиенической обстановки на пострадавших территориях и информации по дозам облучения людей с целью выбора населенных пунктов для дальнейшего углубленного исследования. Выбор населенных пунктов для последующих исследований. Выбор и согласование процедур получения доз из первичных инструментальных данных.

2. Анализ путей облучения населения в различных фазах послеаварийной ситуации. Сбор данных для реконструкции доз внешнего и внутреннего облучения за первые годы после аварии.

3. Анализ распределений доз внешнего и внутреннего облучения для населенных пунктов с типичными характеристиками.

4. Анализ распределения доз внешнего и внутреннего облучения людей для населенных пунктов с нетипичными характеристиками. Инструментальные оценки текущих доз облучения.

5. Выборочный статистический и геостатистический анализ пространственно-распределенных по загрязнению и дозам облучения.

Согласовано на совещании экспертов
30 - 31 августа ИБРАЭ РАН г. Москва

Представители КЕС

Н. Келли

П. Якоб

эксперт США

А. Анспо

- от ИБРАЭ РАН

Р.В. Арутюнян

В.П. Киселев

И.И. Линге

О.А. Павловский

И.А. Осипьянц

М.Ф. Каневский

- от НИИРГ

А.Н. Барковский

- от Института биофизики

В.А. Кутьков

М.Н. Савкин

- от РНЦ КИ

В.Б. Георгтевский

М.Ю. Гуров

- от Украины

И.А. Лихтарев

А.Я. Табачный

E

JOINT STUDY PROJECT 5

ANALYSIS OF IRRADIATION PATHWAYS AND DOSE DISTRIBUTION

Background and Significance

People, living in the contaminated areas near the region of Chernobyl accident, are worried about the reliability of information on the radiation doses they have received and have been receiving. International investigation of methods, used by the authorities for dose estimation, confirmed that they were correct and, as a rule, even exaggerated doses in comparison with their true values. However, these investigations have been conducted mainly for the averaged doses in the contaminated settlements, whereas the dose distribution among the population and critical groups have been poorly studied. Thorough investigation of the dose distribution among the affected population is of great need. These researches will contribute to the population confidence and to the confirming of adequacy of the undertaken public health measures.

Project will include a rigorous analysis of potential ways of irradiation of people, that have been living and working in the contaminated areas. Current irradiation as well as doses, that population may receive in future (according to different protective measures) will be taken into account. The distribution of radiation doses among the population in the representative total of settlements will be studied, with the main attention being paid to the groups, that may get the radiation dose exceeding averaged one. The methods of dose estimation will be checked by the program of contamination level measurements in a certain range of media and actual doses. The main attention is to be paid to persons, who may get the largest dose.

Participants

During the first year, the project is proposed to be coordinated by CISF (D) with participation of CEMAT (E), IPSN/CEA (F), NRPB (UK) and Norway Institute.

CIS Participants

Nuclear Safety Institute (RAS)

Radiation Hygiene Institute (St. Petersburg)

Radiation Hygiene Institute, Novozybkovo Subsidiary

Biophysics Institute (RF Public Health Department)

Severtsev Institute of Evolutionary Morphology and Ecology of Animals

Radiation Medicine Scientific Center (Kiev)

Radiation Medicine Institute (Minsk)

Main Lines of Investigation in 1994-1996

1. Analysis of the radiation-hygiene situation in the contaminated regions and information about averaged and personal radiation doses, in order to choose settlements for further detailed investigations. Settlements with mean characteristics (corresponding to simulated estimations) and irregular settlements with characteristics with enormously high and low doses are to be chosen.

2. Analysis of irradiation pathways at different stages after the accident. Reconstruction of individual doses of the internal and external irradiation for the first years after the accident for the people of certain settlements with regard to personalized original data. Analysis of natural and social factors influencing the irradiation doses.

3. Estimation of variability ranges for the external and internal individual irradiation doses for population in the settlements with standard characteristics. Among them: investigation of different factors, determining irradiation doses in a certain settlement; instrumental estimations of the current irradiation doses.

4. Estimation of variability ranges for the external and the internal individual irradiation doses for population in the settlements with irregular characteristics. Among them are estimations with consideration for difference in the fallout radionuclide composition; in the coefficients of radionuclide transition to foodstuffs from the averaged values, used in official methods; changes that occurred in the settlements after the accident (protective measures, foodstuffs, behavior etc.). Instrumental estimations of the current irradiation doses.

5. More exact definition of the internal and external irradiation lifelong doses with regard to the undertaken and possible measures, as well as to the received doses.

6. Estimation of the mean population dose for certain settlements with regard to transformation of demography situation and actual distribution of irradiation doses.

7. Statistic and geostatistic analysis of spatial distributed, time depended data of contamination and irradiation doses (with consideration for different ways of radiation): space and time correlation analysis, estimation of errors, analysis of uncertainty (sensitivity).

At the first stage (1994) the following amount of work is planned to be done (items 1-4 and 7):

1. Analysis of radiation-hygiene situation in the contaminated regions and information about averaged and personal irradiation doses in order to choose settlements for further detailed investigations. Selection of the settlements for the further investigation.

2. Analysis of ways for population irradiation in different stages after the accident. Data accumulation for reconstruction of individual doses of the internal and the external irradiation for the first years after the accident.

3. Estimation of variability ranges for the external and the internal individual irradiation doses for population in the settlements with standard characteristics in comparrison with official data.

4. Estimation of variability ranges for the external and the internal individual irradiation doses for population in the settlements with irregular characteristics. Instrumental estimations of the current irradiation doses.

5. Selected statistic and geostatistic analysis of the spatial distributed data of the contamination and irradiation doses.

Responsible executers:

from Nuclear Safety Institute (RAS)

I.I. Linge
O.A. Pavlovskii
I.A. Osip'yants
M.F. Kanevskii

from Radiation Hygiene Institute
from Novozybkovo Subsidiary

M.I. Balonov
V.P. Ramzaev
V.I. Parhomenko

from Biophysics Institute

L.A. Il'in

from Institute of Evolutionary Morphology
and Ecology of Animals

I.N. Ryabov

F

TIME-TABLE

of the first meeting of experts of the Project on "Compiling
the Atlas on the radioactive contamination of the European
territory from the Chernobyl nuclear power plant accident"
(Moscow, 1-2 September 1993)

1 September

1. Opening of the meeting	10.00
2. Discussion and approval of the agenda	10.15-10.45
Coffe break	10.45-11.10
3. Discussion of the main goals of the Project	11.10-13.00
Lunch	13.00-14.00
4. Discussion of the available materials and survey techniques	14.00-15.30
Coffe break	15.30-15.50
Discussion	15.50-17.00

2 September

General discussion on all issues	10.00-13.00
Coffe break	11.00-11.20
Lunch	13.00-14.00
Discussion	14.00-15.30
Proposals to the Action Plan	15.30-16.30

AGENDA OF THE FIRST MEETING OF EXPERTS OF THE PROJECT ON
"COMPILING THE ATLAS ON THE RADIOACTIVE CONTAMINATION OF THE
EUROPEAN TERRITORY FROM THE CHERNOBYL NUCLEAR POWER PLANT
ACCIDENT"

Russian Federation (RF). Moscow, 1-2 September 1993).

Participants:	from Russian Federation	12	persons
	from Belarus	1	persons
	from Ukraine	2	persons
	from the Commission for European Communities (CEC)	2	persons

1 September - the first day of the meeting

I. Opening of the meeting.

II.. Discussion and approval of the agenda.

III. Discussion of the main goals of the Project.

1. Yu.S.Tsaturov (Russian Goskomchernobyl). The importance and place of the Project "Compiling the Atlas on the Radioactive Contamination of the European Territory from the Chernobyl Nuclear power Accident" in the implementation of the Agreement on the International Cooperation between the CEC, Belarus, Russia and Ukraine on issues, connected with the consequences of the CNPP accident.

2. Yu.A.Izrael (RF, IGCE). Main purposes and tasks of the Project "Compiling the Atlas on the Radioactive Contamination of the European Territory from the Chernobyl NPP Accident".

3. Information provided by the CEC representatives on how to organize the activities within the Project.

IV. Discussion of the available materials and survey techniques.

1. The main results of the aero-gamma-spectrum surveys of the caesium-137 storages in soils over the territories of Belarus, Ukraine and Russia, contaminated from the CNPP accident, contents of natural radioactive elements, as well as dose rates (the representative of the Russian Federation -

Fridman Sh.D., IGCE).

2. Presentation of the Ukraine representatives.

3. Presentation of the Belarus representatives.

V. Discussion of the survey techniques.

1. I.M.Nazarov (IGCE) Aero-gamma-spectrum method- a principal instrument for compiling maps on the density of contamination of the territory by gamma-radiating radionuclides of the artificial origin as well as maps on dose rates.

2. E.V.Kvasnikova (IGCE). The structure of the Atlas of the maps on the radioactive contamination of the European territory from the CNPP accident. Requirements to maps included into the Atlas. Determination of the content of the sections and maps of the Atlas.

3.E.D.Stukin (GNP "RAMON"). Compiling of small-scale maps on contamination of territories from the Chernobyl NPP accident by plutonium, americium and strontium-90 radionuclides.

4. R.S.Kontarovitch (SPP "Aerogeophysics"). Aero-gamma spectral stations used in the Programme "Compiling the Atlas of maps on radioactive contamination of the territory of the former USSR".

DISCUSSION

2 September - the second day of the meeting

General discussion on all issues.

1. The purposes and tasks of the Project, the content of the Atlas on the radioactive contamination of the European territory.

2. The technology of compiling the maps on the contamination of the territory, technique and methods of the implementation of the work (exchange of the information, measurements).

3.The membership of the author and editorial teams on the Atlas on radioactive contamination of Europe.

4. Financial issues.

5. Adoption of the future action plan on the Project.

6. Proposals to the agenda, terms and place of holding the second meeting of experts on the Project "Compiling the

Atlas on Radioactive Contamination of the European Territory from the CNPP Accident" on the issues concerning technology of investigation and specific organization activity for compiling the Atlas.

7. CLOSING OF THE MEETING.

General discussion on all issues.

DRAFT

MEMORANDUM

OF THE FIRST MEETING OF EXPERTS OF THE PROJECT ON "COMPILING
THE ATLAS ON THE RADIOACTIVE CONTAMINATION OF THE EUROPEAN
TERRITORY FROM THE CHERNOBYL NUCLEAR POWER PLANT ACCIDENT

(Moscow, 1-2 September 1993)

The representatives of the Russian Federation (RF), Belarus, Ukraine and CEC took part in the meeting. The list of the participants is attached at the end of the Memorandum.

The meeting was held in the Institute of Global Climate and Ecology (IGCE) under the Roshydromet and Russian Academy of Sciences. The Institute is responsible for the Project.

The meeting was opened by the first deputy chairman of the Russian Goskomchernobyl Yu.S. Tsaturov, who determined the importance and the place of the Project in the implementation of the Agreement on the International cooperation between the CEC, Belarus, Russia and Ukraine on the problems connected with the consequences of the CNPP accident. The coordinator of the Project from the RF side Yu.A. Izrael informed the meeting about the major purposes and tasks of the Project.

Main results of the aero-gamma-survey of the caesium-137 storage, contents of natural radioactive elements as well as dose rates over the territory of Russia, Belarus and Ukraine were presented (Fridman Sh.D., RF, IGCE). Presentations were made by representatives of CEC, Ukraine and Belarus.

Some scientific and methodics information was presented (ref. Appendix).

During the meeting the following issues were discussed:

1. Purposes and tasks of the Project, the content of the Atlas on the radioactive contamination of the European Territory.

2. The technology of compiling maps of the contaminated territory, the technique and methods how to carry out the work (exchange of information, measurements).

3. The membership of author and editorial teams on the Atlas on radioactive contamination of Europe.

APPENDIX

A LIST OF SCIENTIFIC INFORMATION

1. I.M.Nazarov (IGCE) Aero-gamma-spectrum method - a principal instrument for compiling maps on the density of contamination of the territory by gamma-radiating radionuclides of the artificial origin as well as maps on dose rates.

2. E.V.Kvasnikova (IGCE). The structure of the Atlas of the maps on the radioactive contamination of the European territory from the CNPP accident. Requirements to maps included into the Atlas. Determination of the content of the sections and maps of the Atlas.

3.E.D.Stukin (GNP "RAMON"). Compiling of small-scale maps on contamination of territories from the Chernobyl NPP accident by plutonium, americium and strontium-90 radionuclides.

4. R.S.Kontarovitch (SPP "Aerogeophysics"). Aero-gamma spectral stations used in the Programme "Compiling the Atlas of maps on radioactive contamination of the territory of the former USSR".

4. Financial issues.

5. Adoption of the future Action Plan on the Project.

As a result of the discussion the participants of the meeting arrived at a conclusion, that in 1994 the following tasks are of high priority:

i. Determination of specific ways of compiling the European Atlas and inventorying the work done in the European countries on the radioactive contamination from the CNPP accident and background radioactivity. Consider it desirable to compile the following maps for Europe:

- caesium-137, strontium-90, plutonium-239 contamination density;
- dose rate from the radioactive contamination by natural radioactivity, cosmic radiation.

Besides the maps, the Atlas should incorporate brief texts describing them, and a principle and technology of their compilation.

ii. Unified requirements to the maps should be specified:

- scale of maps;
- measurement units;
- technological requirements to materials;

iii. Countries participating in compiling the Atlas should be determined, as well as those where supplementary investigations are to be conducted. The possible carrying out of such works at a national level or with the help of other countries should be determined within the framework of the CEC. The possible funding of such works should be specified.

iv. A detailed Action Plan on the Project should be developed and its funding should be determined.

To provide the coordination of works under the Project and to prepare material for publication it is necessary to:

1. Establish a coordinating group headed by coordinators-representatives of the RF and CEC. The representatives of the Ukraine, Belarus, Sweden and Germany should be members of the group (the list should be left open).

2. To request the European countries about their participation in the Project. To ask participating countries to nominate national coordinators of the Project and to

establish national coordinating groups if necessary.

3. The organization of the works under the Project with participating countries and the preparation of material for publishing the Atlas should be consider as a major task of the Central Coordinating Group. The preparations of maps by countries and respective national materials are a major task of National Coordinating Groups.

4. To hold the second meeting on the Project at the beginning of 1994 in CEC. in Brussel. The Project coordinators should develop in October 1993 the draft agenda for the second meeting and prepare more detailed materials on the Project content.

7.1C — EXTERNAL DOSE

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.1C External Dose [Harold Beck—EML] (Lynn Anspaugh / Sheilah Hendrickson)

LLNL No: 6288-08

DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits													0.0
Travel													0.0
Procurement and Expenses*													0.0
Technical Information Department													0.0
Facility/Service/Distributed Charges													0.0
LLNL Overhead+/Taxes**													0.0
TOTAL				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liens/Preliens													
Budget				122.0									
Funds Available				122.0									
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

3/14/94

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.1C External Dose

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-08

Principal Investigator: (Harold Beck, Environmental Measurements Laboratory)
M&O Contractor: Lawrence Livermore National Laboratory
Lynn Anspaugh / Sheilah Hendrickson

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

With the agreement of Mr. Beck this report has been prepared by Lynn Anspaugh.

I. Project Objective

To improve and validate methods of forecasting doses and dose commitments from external exposure. This is of major importance, as the external dose from the Chernobyl accident (and most other releases of radioactive materials to the environment) is a major contributor to dose. As ^{137}Cs is now the dominant radionuclide and it has a half-life of 30 years, this is a long-term problem that cannot be adequately resolved within a short time period.

II. Current Project Status / Monthly Progress

Funding received in January 1994 Financial Plan and released for spending in late February 1994.

Preliminary discussions for a workshop in June or July 1994 took place among Lynn Anspaugh, André Bouville and Harold Beck. The purpose of this workshop is to assess the validity of external dose-projection models. We plan to assemble modelers and individuals with data bases on external exposure rate as a function of time and to compare models with actual data on the external exposure rate as a function of time and living patterns from locations impacted by the Chernobyl accident. In this regard, the participation of scientists from the Former Soviet Union is essential.

The group will develop a consensus model (with opportunity to include other models of individual support) that is consistent with the currently available data and make predictions for the next five to thirty years. At some point within the next five to

ten years we hope to reassemble the surviving members of the group to compare the predictions with the actual data accumulated by then.

III. Significant Problems/Issues/Concerns

None.

IV. Assistance Required of EH-40 Staff

None at this time.

**7.1F - HYDROLOGICAL
TRANSPORT**

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.1F Hydrological Transport (Yasao Onishi—PNL)

\$\$\$ DIRECT FUNDING TO PNL

LLNL No: none

DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits				13.9									13.9
Travel				0.0									0.0
Procurement and Expenses*				1.3									1.3
Technical Information Department				0.1									0.1
Facility/Service/Distributed Charges				3.4									3.4
LLNL Overhead+ /Taxes**				n/a									0.0
TOTAL	0.0	0.0	0.0	18.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.7
Liens/Preliens													
Budget	50.0	50.0	50.0	50.0									
Funds Available	50.0	50.0	50.0	31.3									
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

3/14/94

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.1F Hydrological Transport

DOE Project Number: 94-ES-1031

LLNL Project Number: N/A

Principal Investigator: Yasuo Onishi

M&O Contractor: Pacific Northwest Laboratory (direct funding)

Address each item, if applicable.

- I. **Project Objective**
- II. **Current Project Status / Monthly Progress**
Administrative (meetings organized).
Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
Travel. Include copy of foreign trip report.
- III. **Significant Problems/Issues/Concerns**
Substantial changes in project expectations, protocol, funding.
Problems occurring or anticipated (corrective actions).
- IV. **Assistance Required of EH-40 Staff**
Identify EH-40 staff member(s) with each requests.

\$\$\$ DIRECT FUNDING TO PNL

I. Project Objective

The project Objective is to assess radionuclide migration in the water and soil environment with mathematical modeling to provide information on potential health impact and remediation requirement associated with the Chernobyl accident. Specifically, radionuclide distributions in the Pripyat-Dnieper river system from the Chernobyl Nuclear Plant to the Black Sea will be predicted under major flooding of the Pripyat River, because flooding can significantly increase radionuclide concentrations in these rivers. For the Iput River basin in Russia, we will combine Landsat data and available Chernobyl data to characterize the area. These results will be then fed to a watershed/groundwater model to predict potential runoff and soil scouring areas from where ^{137}Cs can migrate overland to receiving surface water. Identification of major radionuclide source locations can then be used for potential remedial activities. We will also initiate to examine radionuclide contaminations in the groundwater near the Chernobyl Nuclear Plant to study interactions with the Pripyat River, especially during flooding periods.

These studies tests/improves predictive methodologies for aquatic environmental assessment. The study results themselves will also be directly used by CIS countries for identifying necessary remediation activities and their effectiveness.

II. Current Project Status/Monthly Progress

For the flooding assessment of the rivers, we have evaluated radionuclide migrations under 1993 summer flooding with real time while the flooding was occurring. We evaluated field data supplied by Ukrainians on river flows of the Pripyat and the Dnieper rivers and radionuclide concentrations in the Pripyat River through computer linking between us. With these data, Ukrainians and us working together conducted mathematical modeling to predict radionuclide migration in the Dnieper River for

emergency evaluation. These results were submitted to the Ukrainian Government for their emergency response decision for Kiev City drinking water supply. With their request, some of these assessment results were also supplied to the U.S. Embassy in Kiev.

For the Iput River basis, Landsat data were combined site information, e.g., ^{137}Cs distribution on the land surface, maps, ground cover. Evaluation of the combined Landsat-site information results revealed uncertainty on these results, attributed to the uncertainty on the data supplied by our Russian joint working organization, SPN Typhoon. Subsequently a Typhoon researcher went to a small catchment within the Iput watershed and provided us the additional information in the ground cover and road maps. These additional information will then be used to re-calibrate the Landsat Data analysis for this small area. With this new re-calibration results, we will then improve our determination of the ground cover for the entire Iput River basin by the Landsat Data analysis.

During this period, there are following two publications on this work:

- 1). Onishi, Y., M.J. Zheleznyak, and O.V. Voitsekhovitch. 1994 "Hydrologic and Remedial Assessment for Chernobyl Nuclear Accident." In: Energy Review (a journal in Japan) accepted.
- 2). Witherspoon, P.A., B.A. Faybishenko, E.R. Landa, R.P. Parizeck, M. T. van Gunuchten, O. Weres, Y. Onishi, A.V. Konoplev, O.V. Voitsekhovitch, Y.O. Yakovlev, and M.J. Zheleznyak. 1993. "The Serious Earth Sciences Problems of Radionuclide Contamination from the Chernobyl Disaster." Presented at the 1993 American Geophysical Union Conference, December 1993, San Francisco.

During this period, we had three researchers from Ukraine and Russia to work with us on our USA/CIS joint Program 7.1.F. at PNL for three to four months under the umbrella of U.S. Department of Commerce's SABIT Program. SABIT provided the travel expenses and their monthly income for these three CIS scientists through PNL. They were Dr. Oleg Voitsekhovitch at the Ukrainian Institute of Hydrometeorology and Minister of Chernobyl Affairs in Kiev, Dr. Mark Zheleznyak at the Cybernetic Centers in Kiev, and Dr. Alexander Golubenkov at the SPN Typhoon in Obninsk, Russia. SABIT accepted two (and probably one more) additional Ukrainians to work with us on Program 7.1.F. at PNL for this summer. SABIT is also considering accepting two additional Ukrainian scientists to work with us on Program 7.1.F. for the next fiscal year.

Dr. Y. Onishi traveled to Vienna, Austria, to attend an IAEA meeting on river/reservoir group of VAMP program to evaluate the field data and radionuclide modeling results of Dnieper River and the Clinch/Tennessee Rivers. Dr. Onishi received additional necessary field data on the Dnieper River modeling from Ukrainian participants at the IAEA meeting. The necessary travel expenses for Dr. Onishi to attend the meeting was provided by IAEA.

III. Significant Problems/Issues/Concerns

We need \$80K to conduct and prepare reports on the above stated work for FY 1993, as we indicated in our proposal. We have received \$50 K for this year.

IV. Assistance Required of EH-40 Staff

We hope that EH-40 can provide us additional \$30 K for this fiscal year.

Hydrologic and Remediation Assessment for Chernobyl Nuclear Accident

Yasuo Onishi¹, Mark J. Zheleznyak², and Oleg V. Voitsekhovitch³

The Chernobyl nuclear accident released approximately 50 million curies (or 4 %) of the fission products and activates in Reactor Unit No. 4 of the Chernobyl Nuclear Plant to the atmosphere during the 11 days following April 26, 1986, including 1.3 million curies of ¹³⁷Cs and 0.24 million curies of ⁹⁰Sr (Izrael et al. 1987). The Chernobyl Nuclear Plant is located approximately 100 km north of Kiev, Ukraine, along the west bank of the Pripyat River, which joins the Dnieper River 30 km downstream at the Kiev Reservoir. Subsequent to the accident, the Dnieper-Pripyat river watershed in Ukraine, Russia, and Belarus was heavily contaminated by fallout of radionuclides (Onishi et al. 1993). The contaminated surface soil then became a source of long-term influx of ⁹⁰Sr and ¹³⁷Cs into the Pripyat and Dnieper rivers; the Dnieper passes through six reservoirs before discharging into the Black Sea, about 1000 km downstream (Konoplev et al. 1992).

About 20 million people in Ukraine consume water from the Dnieper River between Kiev and the Black Sea and thus, are exposed to the impacts of the radionuclides in the river through drinking water, irrigation, and fishing (Prister et al. 1992. Repin and Berkovsky 1992). Thus, radionuclide migration into and within the rivers is important for determining potential dose to people through aquatic pathways and for evaluating effectiveness of current and future remediation of the consequence of the Chernobyl nuclear accident.

HYDROLOGIC ASSESSMENT AND COUNTERMEASURES

1991 Winter Flood

The Pripyat River floodplain directly across from the Chernobyl Nuclear Plant received a significant amount of ¹³⁷Cs and ⁹⁰Sr deposition with ⁹⁰Sr concentrations of up to 1000 $\mu\text{Ci}/\text{m}^2$ (Figure 1) accounting for approximately half of all ⁹⁰Sr entering the Pripyat River (Voitsekhovitch et al. 1990). To assess the impact of ⁹⁰Sr desorption from the floodplain sediment into the Pripyat River during flooding, the unsteady, two-dimensional model WATOX-2 (Zheleznyak et al. 1993) was applied to the Pripyat River and its approximately 2-km-wide and 10-km-long floodplain. The model predicted that under a 4-year flood, all the floodplain will be covered by the river water and that the maximum ⁹⁰Sr concentration in the river will

1, Pacific Northwest Laboratory, Richland, Washington, U.S.A, operated by Battelle Memorial Institute for U.S. Department of Energy under Contract DE-AC06-76RLO 1830

2, Cybernetic Centers of Ukrainian Academy of Sciences, Kiev, Ukraine

3, Ukrainian Hydrometeorological Institute, Kiev, Ukraine

S9309086.4

FIGURE 1. ^{90}Sr Distribution in the Chernobyl Close-In Zone and in the Floodplain Area of the Pripjat River, Ukraine

be increased by more than 20 times over the normal ^{90}Sr concentrations in the river. The predicted ^{90}Sr level in the river at Yanov Bridge (at the downstream end of the floodplain) will go up to 270 pCi/L (Figure 2), which exceeds the local drinking water standard of 100 pCi/L for ^{90}Sr .

The model prediction showing significant increase in ^{90}Sr concentration in the Pripyat River stimulated the search for effective countermeasures. One of several remediation approaches considered was construction of an earthen dike along the Pripyat River in the floodplain to block off flooding there. For this dike case, the predicted ^{90}Sr concentration in the river at the Yanov Bridge was lowered to 75 pCi/L (Figure 3), satisfying the drinking water limit. As a result, the decision to construct such a dike was made in 1990.

In January 1991, before construction of the dike, an ice jam formed in the Pripyat River between the Yanov Bridge and the town of Chernobyl, flooding this floodplain for the first time after the 1986 accident. During this flood, measured ^{90}Sr concentrations in the Pripyat River water near the bridge increased to 250-300 pCi/L. This level is very close to the simulated values for the 4-year flood, thus confirming the validity of the simulation results. Subsequently the 10-km earthen dike was constructed in 1991 along the river to prevent further flooding.

1993 Summer Flood

Despite these remediation measures, the problem of increasing of ^{90}Sr concentrations in the Pripyat and Dnieper rivers during high floods still remains. In July-August 1993, heavy rainfall in the Belarus and Ukraine districts of the Pripyat River catchment made water levels in the upper tributaries and the main river unusually high for summer flooding. From the second week of July to late August, Pripyat River discharges increased from 250 m³/s to 1200 m³/s near Chernobyl.

This flooding caused ^{90}Sr concentrations in the river to be increased. Because of the heightened public concern about radionuclide levels in the river, we conducted an emergency evaluation of radionuclide distributions in the Dnieper River while the flooding was occurring. Near the Chernobyl area, the maximum ^{90}Sr concentration in the Pripyat River became about 20-25 pCi/L in early August; near the Pripyat River mouth, the concentration was elevated to 35 pCi/L. The peak ^{90}Sr concentration in the Kiev Reservoir (a main source of drinking water for Kiev) was 12 pCi/L. However, by the end of August 1993, the ^{90}Sr concentration at the mouth of the Dnieper River at the Black Sea has not yet exceeded 6-8 pCi/L. If the 10-km dike had not been constructed, ^{90}Sr concentrations in the Pripyat River, and thus also in the Dnieper River, would have been much higher.

Unlike ^{90}Sr , ^{137}Cs concentrations in the Pripyat River during the flood did not rise significantly from the pre-flooding levels. Concentrations of ^{137}Cs in river water around the Chernobyl site reached only 5-7 pCi/L. In the middle of July, ^{137}Cs in the Kiev Reservoir and Kanev Reservoir in the further downstream were 2-5 pCi/L and 1-3 pCi/L, respectively.

Based on these measured radionuclide levels, additional model results, and water purification in a water treatment station, ^{90}Sr concentrations in the city of Kiev's drinking water were estimated to be less than 8 pCi/L. Estimated ^{137}Cs concentrations for the Kiev

FIGURE 2. ^{90}Sr Concentrations in the Pripjat River and Its Floodplain Under the Four-Year Flood Conditions

FIGURE 3. Predicted ^{90}Sr Concentrations With the Dike Installed Along the Pripjat River Under the Four-Year Flood Conditions

drinking water were two orders of magnitude lower than the drinking water standard of 500 pCi/L for ^{137}Cs . Thus the water was determined to be safe for Kiev Citizens to drink during the 1993 summer flood.

SUMMARY AND CONCLUSIONS

Field data evaluation and modeling were performed to determine potential impacts that summer and winter flooding have on the levels of radionuclides in these rivers. The study revealed that flooding is a critical factor that increases radionuclide concentrations in the rivers. However, the construction of 10-km dike in the floodplain across from the Chernobyl Nuclear Plant was proved to be effective for reducing ^{90}Sr concentrations in the Pripyat River.

REFERENCES

- Izrael, Y. A., V. A. Petrov, and C. I. Avdushin. 1987. "Radioactive Contamination of the Environment in the Chernobyl Accident Impacted Zone." In: *Meteorology and Hydrology*, 2, pp. 5-12 (in Russian).
- Konoplev, A. V., V. A. Borzilov, A. A. Bulgakov, A. I. Nikitin, M. A. Novitsky, and O. V. Voitsekhovitch. 1992. "Case Study No. 8 - Hydrological Aspects of the Radioactive Contaminations of Water Bodies Following the Chernobyl Accident." In: *Hydrological Aspects of Accidental Pollution of Water Bodies*, WHO No. 754, World Meteorological Organization, Geneva, Switzerland, pp. 167-190.
- Onishi, Y., G. M. Petrie, L. W. Vail, O. V. Voitsekhovitch, M. J. Zheleznyak, V. M. Shershakov, and A. V. Konoplev. 1993. "USA/CIS Coordinating Committee and Its Hydrological Studies." In: *Proceedings of the United Nations UNESCO Workshop on Hydrologic Impact of Nuclear Power Plant System*, September 23-25, 1992, Paris, France, UNESCO Press, Paris.
- Prister, B., N. Loschilov, L. Perepelyatnicova, and G. Petepelyatnicova. 1992. "Efficiency of Measures Aimed at Decreasing the Contamination of Agricultural Products in Areas Contaminated by the Chernobyl NPP Accident." In: *The Science of the Total Environment*, 112, pp. 79-87.
- Repin, V. G., and V. D. Berkovsky. 1992. *Dose Assessment for Population Living along Dnieper Cascade due to Water Consumption and Associated Risk for Human Health*. Institute of Radiation Medicine, Kiev, Ukraine (in Russian).
- Voitsekhovitch, O. V., V. V. Demchuk, and G. V. Lapter. 1990. *Analysis of the Secondary Effects of Radioactive Contamination of the Pripyat River Following Flooding of Floodplain Areas in the Chernobyl NPP Near Zone*. Ukrainian Hydrometeorological Institute, Kiev, Ukraine (in Russian).
- Zheleznyak, M. J., R. I. Demchenko, Y. I. Kuzmenko, P. V. Tklich, N. N. Dzuba, and I. V. Mezhueva. 1993. "Mathematical Modelling of Radionuclide Dispersion in the Water Bodies of the Chernobyl NPP Zone and in the Dnieper Reservoirs." In: *Proceedings of the United Nations UNESCO Workshop on Hydrologic Impact of Nuclear Power Plant System*, September 23-25, 1992, Paris, France, UNESCO Press, Paris.

The Serious Earth Science Problems of Radionuclide Contamination From the Chernobyl Disaster

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 R Landa (US Geological Survey, Reston, VA 20092; 703-648-5898);
 W Page (Florida Atlantic University, Fort Lauderdale, FL 33301; 305-760-5654);
 R Parizek (Pennsylvania State University, University Park, PA 16802; 314-365-3012);
 T van Genuchten (US Salinity Laboratory, USDA, ARS, Riverside, CA 92501; 909-369-4847);
 Weres (Sonoma Research Company, Vineburg, CA 95487; 707-252-4620);
 Onishi (Pacific Northwest Laboratory, Richland, WA 99352; 509-376-3302);
 V Konoplev (SPA Typhoon, Obinsk, Russia 249020, 708439-71896)
 V Voitsekhovitch (Ukrainian Hydrometeorological Institute, Kiev, Ukraine 252028; 704-265-8686);
 O Yakovlev (Ukrainian State Committee on Geology, Kiev, 252003, 704-228-3394);
 I Zheleznyak (Cybernetics Center, Kiev, Ukraine 252207; 704-266-1583)

grim picture is evolving from the Chernobyl NPP explosion as more evidence is gathered on radionuclide contamination produced by this disaster. Contamination is widespread in Belarus, Russia and Ukraine. The lower limit for soil contamination from ^{137}Cs is taken as $0.5 \mu\text{Ci}/\text{m}^2$, 100,000 km^2 (or 20%) of Ukraine is contaminated. If the lower limit is $1.0 \mu\text{Ci}/\text{m}^2$, 41,000 km^2 is contaminated. In 1986, 90,000 people were evacuated because of potential health hazards from a 30-km area (100 km^2) surrounding the power plant. Contamination by ^{137}Cs in this area exceeds $15 \mu\text{Ci}/\text{m}^2$; some areas along the Pripyat River flood plain within this 30-km zone have ^{90}Sr and ^{137}Cs contamination levels in the range of 40-1000 $\mu\text{Ci}/\text{m}^2$.

The terrestrial pathway contributes most of the dose-forming component to the diet. The dose limit is 0.5 rem/yr. Compulsory evacuations of 49,000 residents were carried out in 1989-1991 because exposures exceeded this limit. Contaminated milk, which provides 75%-85% of the dose, has not been found in an area that extends from 300 km east to 400 km west of Chernobyl. The aquatic pathway could contribute up to 15% of dose to more than 20 million people using the Dnieper River waters through drinking, irrigation and fishing. This river basin is directly connected to the contaminated 30-km zone, and indirectly, through various upgradient tributary rivers, to practically all contaminated areas in Belarus and Ukraine.

The major problems for earth scientists are to understand the physical-chemical processes of the radioactive fallout, the dynamics of its transformation in the environment, and, as a consequence, the biologic accessibility of the radionuclides. What is desperately needed are methods of controlling or removing the contamination from the soils. Also needed are assessments of surface runoff, soil erosion and associated radionuclide transport over large and small watersheds in a very large land area. In addition, there is the complex problem of radionuclide migration in the Dnieper River system and its six reservoirs, and its effects on the concentrations of ^{90}Sr and ^{137}Cs during spring floods.

1. 1993 Fall Meeting
2. 001-49478
3. (a) P A Witherspoon
427 Hearst Mining Bldg.
University of California
Berkeley, CA 94720

(b) Tel: 510-642-5390
or 510-527-5573

(c) FAX: 510-527-1336
4. H
5. (a) 09
(b) 1872, 1881, 1830
- 6.
7. Zero
8. \$70 check enclosed
9. C
- 10.
11. No

APPENDIX 1

PARTICIPATING ORGANIZATIONS FOR VAMP RIVERS AND RESERVOIR

MODELING

**FOREIGN TRAVEL TRIP REPORT
VIENNA, AUSTRIA - NOVEMBER 1993
Prepared on December 21, 1993**

SUMMARY

1. Traveler's Name

**Yasuo Onishi
Senior Program Manager
Pacific Northwest Laboratory
509-376-8302
FTMS #9307820
December 21, 1993**

2. Date and Destination

11/20-11/27, Vienna, Austria. International Atomic Energy Agency (IAEA)

3. Estimated Costs and Funding Sources

Travel: IAEA provided all travel expenses, including plane ticket cost and living expenses.

Labor: \$4,800 funded by the related services Memorandum Purchase Order with Lawrence Livermore National Laboratory (LLNL). LLNL charged the expenses to EH-422 of DOE.

4. Purpose

The purpose of the travel was to attend a meeting of the Rivers and Reservoir Subgroup of the IAEA/Commission of European Communities (CEC) Coordinated Research Programme on Validation of Environmental Model Prediction (VAMP) held during November 22 through 26, 1993, in Vienna, Austria, to evaluate computer model testing results currently submitted to IAEA. The Rivers and Reservoir Subgroup's activity is focused on testing various aquatic models with Chernobyl nuclear accident data collected by Ukrainians and Russians and data on radionuclides released to the Clinch and the Tennessee Rivers in the United States.

5. Abstract

The traveler, Dr. Yasuo Onishi, attended meetings of the Rivers and Reservoir Subgroup of the VAMP Program at IAEA in Vienna, during November 22-26, 1993, to evaluate aquatic model testing. The first test case is the Dnieper River aquatic pathway of the Chernobyl accident to predict radionuclide migration and accumulations in the river from the Kiev Reservoir to the river mouth at the Black Sea, radionuclide accumulation in fish, and potential dose through the aquatic pathway to humans. The second case deals

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Centimeter

Inches

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2 of 2

with radionuclides in the Clinch and the Tennessee Rivers. The models being applied vary from box models to a finite different model with different expressions of radionuclide adsorption mechanism. With some measured data received during the November meeting, the Rivers and Reservoir Subgroup prepared a part of the VAMP River report which is to be completed in August 1994.

DETAILED REPORT

Dr. Yasuo Onishi attended meetings of the Rivers and Reservoir Subgroup of the IAEA/CEC Coordinated Research Programme on Validation of Environmental Model Prediction (VAMP) held in Vienna, Austria, during November 22-26, 1993. Under this subgroup, box and one-dimensional models are being tested for their adequacy to predict radionuclide migration and accumulations in river-reservoir systems, aquatic food chains, and aquatic pathway dose estimates. The following are two test cases selected for this purpose:

R1. Clinch and Tennessee River case

Scenario 1.

Predict concentrations of ^{60}Co , ^{137}Cs , ^{106}Ru , and ^{90}Sr in water column, bed sediment and fish in the Clinch River at River Kilometer 23.3 (River Mile 14.5), and in the Tennessee River at River Kilometer 749.0 for 1961-1963. Also estimate radionuclide concentrations in fish and the radiation dose to an individual from aquatic pathway.

Scenario 2.

Predict vertical distributions of sediment sorbed ^{137}Cs concentrations in the Tennessee River at River Kilometer 913.1 (River Mile 567.5).

R2. Dnieper River-Reservoir case

Predict concentrations of ^{137}Cs and ^{90}Sr in water, suspended sediment, bed sediment in the Dnieper River in Ukraine after the Chernobyl accident till now. Also estimate the radionuclide concentrations in fish, Kiev drinking water, probabilistic distributions of dose and radiological risk through the water pathway.

Up to eight groups from Austria, France, Russia, the Ukraine, United Kingdom and United States are participating in these model testings, as shown in Appendix 1.

Measured radionuclide data on the Clinch/Tennessee River and Dnieper River were provided to IAEA from Dr. Gordon Blaylock in the United States and Dr. Oleg Voitsekhovitch in Ukraine for the November 1993 Rivers and Reservoir Subgroup meeting. Key data are shown in Appendix 2. With these data, Dr. Onishi and other participants of the subgroup meeting started evaluating initial results of some model predictions as well as validity of these measured data for the model comparisons. The meeting participants are shown in Appendix 3. All the participants are modelers directly involved in the actual modeling of these two cases.

Each participant presented model descriptions of their own models, and some initial results of the simulations. One major difference between the box models and the finite different model (the TODAM model developed by Dr. Onishi) to predict radionuclide distributions within the

riverbed is that all box models applied to these cases use sedimentation rate as input, while the TODAM model predicts the sedimentation rate as one of the unknowns. Thus, when the sedimentation rate is known, the box models eliminate one uncertainty; thus, predict more accurate radionuclide distributions within the bed. However, if this rate is not known, the box model will have a limited usage to predict the radionuclide distributions within the bed.

Another important difference, among the models applied, is how to deal with radionuclide adsorption/desorption. Most models use the distribution coefficient, K_d , while a Russian model developed by Dr. Konoplev uses the more fundamental approach based on geochemistry. Thus, similar to the sedimentation rate consideration, if a site specific K_d is known, the models using K_d as input provide a better prediction of radionuclide concentrations than the Konoplev model. However, if the value of the site specific K_d is not known, then former models' applicability will be limited much more than the model using more fundamental geochemical reactions of radionuclides.

The participants also decided to ask additional information and clarification from Drs. Blaylock and Voitsekhovitch, including additional radionuclide data for more model comparisons within the current study areas.

The participants were also assigned to prepare parts of the VAMP Rivers and Reservoir Subgroup Report, and these prepared parts were then reviewed by all the participants on the last meeting date (November 26). The participants, and Drs. Blaylock and Voitsekhovitch, are now requested by IAEA to update the writing with their review comments and to submit the revised writing to IAEA by January 31, 1994. The table of contents of the report is shown in Appendix 4. The Final Report is planned to be completed in August 1994.

Document exchanges during Dr. Onishi's visit to IAEA are listed in Appendix 5.

D N I E P E R R E S E R V O R S

Scenario

SCENARIO TEAM LEADER: OLEG VOITSEKHOVITCH, HMI, Ukraine

N	Country, Institute	Modellers team Leader	WATER	SEDIM	PROFIL	FISH	DOSES
1	AUSTRIA, Atominsitute AI	M.Tschurlovits	□	□		□	□
2	FRANCE, IPSN	J.Garnier- Laplace				■	
3	ITALY, ENEA	L.Monte	■	■			
4	RUSSIA, TAYPHOON	A.Konoplev I.Kryshev			□	□	□
5	UKRAINE, Cybernetics Center, CC	M.Zheleznyak	□	□	□	□	□
6	UKRAINE Hygiene Center, HC	A.Serdjuk				■	■
7	UKRAINE, Hydrometeo- rological Institute, HMI	I.Bilyi			□		
8	UNITED STATES, BATTELLE, PNL	B.Templeton B.Napier Y.Onishi	■	■	■		■

CLINCH-TENNESSEE

River Scenario

SCENARIO TEAM LEADER: GORDON BLAYLOCK, ORNL, USA

N	Country, Institute	Modellers team Leader	WATER	SEDIM	PROFIL	FISH	DOSES
1	AUSTRIA, Atominstitute AI	M.Tschurlovits	■	■		■	■
2	FRANCE, IPSN	J.Garnier- Laplace				■	
3	RUSSIA, TAYPHOON	A.Konoplev I.Kryshev			■	□	□
4	UKRAINE, Cybernetics Center, CC	M.Zheleznyak	■	■	■	■	■
5	UKRAINE Hygiene Center, HC	A.Serdjuk	■	■		■	■
6	UNITED KINGDOM, NRPB	J.Brown	□	□		□	
7	UNITED STATES, BATTELLE, PNL	Y.Onishi	■	■	■		
8	UKRAINE, Hydrometeo- rological Institute	I.Bilyi			□		

APPENDIX 2

^{137}Cs DISTRIBUTION WITHIN THE RIVERBED AT THE TENNESSEE RIVER KILOMETER 913.1
(RIVER MILE 567.5), AND ^{137}Cs AND ^{90}Sr DISTRIBUTIONS IN THE DNIEPER RIVER

Tennessee River Mile 567.5: pCi/gram dry wt Cs-137

pci/gram drywt cm depth

5.245500	0.000000
5.289100	2.000000
5.826000	4.000000
5.552200	6.000000
5.158800	8.000000
4.944300	10.000000
5.969700	12.000000
6.123000	14.000000
7.447400	16.000000
7.341200	18.000000
6.998900	20.000000
6.198100	22.000000
6.585900	24.000000
6.625200	26.000000
7.709300	28.000000
8.069100	30.000000
11.193700	32.000000
10.846600	34.000000
10.090900	36.000000
9.547500	38.000000
11.699300	40.000000
12.358500	44.000000
12.006500	48.000000
15.054900	52.000000
20.341000	56.000000
17.797400	60.000000
19.628200	64.000000
24.846900	68.000000
48.865500	72.000000
55.023100	76.000000
58.354600	80.000000
28.660400	84.000000
13.014000	88.000000
18.585000	92.000000
10.642400	96.000000
13.106400	100.000000
5.838100	104.000000
0.8714000	108.000000
0.2484000	112.000000
0.2704000	116.000000
0.0000000E+00	120.000000

Tennessee River
Mile 567.5

137 Cs (total) concentration in waters of Dniepers reservoirs in 1986, pCi/l

(60-70%
2-4%)

RESERV	MONTHS							
	5	6	7	8	9	10	11	12
Kiev	300-500	300-200	200-100	90-70	60-30	40-20	25-15	15-10
Kanevsk	150-50	15-40	10-30	10-20	10-5	6-4	4-5	3-5
Krement	10-20	10-20	8-15	5-10	3-2	1-2	1-1,5	0,8-1,2
Dneprod	2-5	6-10	5-10	2-5	1-2	0,8-1,2	0,7-1	0,7-0,9
Zaporoz	2-5	4-8	4-8	2-4	0,8-1	0,8-1,0	0,7-1	0,6-0,8
Kahovsk	2-4	2-4	2-3	1-2	0,4-0,5	0,3-0,5	0,3-0,4	0,3-0,4

← start from June with June data as initial condition.

Monthly averaged ranges of magnitude of Sr-90 concentration in waters of Dniepers reservoirs in 1986, pCi/l

RESERVOIR	MONTHS							
	5	6	7	8	9	10	11	12
Kiev	150-50	70-30	65-40	40-25	25-35	30-20	17-25	10-15
Kanevskoe	10-15	25-40	30-50	28-38	25-30	25-35	20-30	10-15
Krementch	4-8	5-10	8-12	10-16	16-20	20-30	15-20	12-20
Dneprodze	2-3	2-3	3-5	5-7	7-10	8-12	12-20	12-20
Zaporozhs	2-3	2-3	3-4	4-6	6-8	8-10	10-16	10-16
Kahovskoe	0,3-0,7	0,8-1,2	2-3	2-3	1-2	1,5-2	1,5-2	1-2

APPENDIX 3

LIST OF PARTICIPANTS IN THE VAMP RIVERS AND RESERVOIR SUBGROUP

MEETING IN NOVEMBER 1993

LIST OF PARTICIPANTS

**CM of the Rivers and Reservoirs Sub-group of the
Validation of Model Predictions (VAMP) Programme
22-26 November 1993, Vienna**

AUSTRIA

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APPENDIX 4

TABLE OF CONTENT OF THE VAMP RIVERS AND RESERVOIR MODELING REPORT

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- 1.2 Aims and Goals of Rivers and Reservoir Sub Group project**
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- 2.2 Dnieper reservoir cascade**

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- III.2 Models of Cybernetics Center in Ukraine
(Dr. Zheleznyak)**
- III.3 Models of Hygiene Center in Ukraine
(Dr. Zheleznyak, Serdjuk)**
- III.4 Model of ENEA in Italy
(Dr. Monte)**
- III.5 Model of IPSN in France
(Drs. Garnier-Laplace)**
- III.6 Model of Typhoon in Russia, vertical profile
(Dr. Konoplev)**
- III.7 Model of Typhoon in Russia, fish
(Dr. Kryshev)**
- III.8 Models of PNL in United States
(Drs. Onishi and Perkins)**

APPENDIX IV Catchment Processes

APPENDIX 5

DOCUMENTS EXCHANGED

DOCUMENTS RECEIVED

1. Hard copy and floppy disk for Hydrodynamic and radionuclide data in the Dnieper River.
2. Garnier-Laplace, Jacqueline, Jean-Pierre Baudin. "The Model *Transaqua*: A Tool for Simulating the Transfer of Radionuclides Through Aquatic Trophic Chains." Institut de Protection et de Sûreté Nucléaire, IPSN/CEA. France.
3. Gontier, G., M. Gerino, G. Stora, J. P. Melquiond, 1991. "A New Tracer Technique for *In Situ* Experimental Study of Bioturbation Processes.", Radionuclides in the Study of Marine Processes, pp. 187-196.
4. Gontier, Gilles, Christian Grenz, Dominique Calmet, and Michel Sacher, 1992. "The Contribution of *Mytilus* sp. in Radionuclide Transfer between Water Column and Sediments in the Estuarine and Delta Systems of the Rhône River." Estuarine, Coastal and Shelf Science, 34, pp. 593-601.
5. Prister, B., O. Nasvit, N. Tkachenko, Y. Kutlakhmedov, M. Fomovsky. "Risk assessment and Environmental Problems of Water Use in the Zone of Influence of Chernobyl."
6. Tschurlovits, M. "Sediment Investigations From the View of Recent Radiation Protection Standards - Requirements and Fulfilment." Paper presented by J. Sas-Hubicki. To be presented at IAEA Meeting on "The Role of Sediments in the Transport and Accumulation of Radioactive Pollutants in Waterways," May 1984, Budapest, Hungary. Atmoninstitut der Österreichischen Universitäten, Wien, Austria.

DOCUMENTS PROVIDED

1. Onishi, Yasuo, June-July 1993. "Contaminant Transport Modeling in Surface Waters." NATO Advanced Study Institute: Lecture Series, "Computer Modeling of Free-Surface and Pressurized Flows," June 28 through July 9, 1993. Pullman, WA.
2. Onishi, Yasuo, G. M. Petrie, L. W. Vail, O. V. Voytscekhovitch, M. J. Zheleznyak, V. M. Shershakov, and A. V. Konoplev, September 1992. "USA/CIS Coordinating Committee and Its Hydrologic Studies." Proceedings of the UNESCO Workshop on "Hydrologic Impacts of Nuclear Power Plant Systems," held in Paris, France, on September 23-25, 1992.
3. Onishi, Yasuo, September 1992. "Contaminant Migration and Accumulation in Estuarine and Coastal Waters." Proceedings of the UNESCO Workshop on "Hydrologic Impacts of Nuclear Power Plant Systems," held in Paris, France, on September 23-25, 1992.
4. Onishi, Yasuo, and Donald S. Trent, March 1992. "Turbulence Modelling for Deep Ocean Radionuclide Disposal." International Journal for Numerical Methods in Fluids, Vol. 15, 1059-1071 (1992).
5. Onishi, Yasuo, Hans C. Graber, and Donald S. Trent, "Preliminary Modeling of Wave-Enhanced Sediment and Contaminant Transport in New Bedford Harbor." In: Nearshore and Estuarine Cohesive Sediment Transport. Ashish J. Mehta (ed.), American Geophysical Union, 1993.

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7.2A4 — CHROMOSOME PAINTING DOSIMETRY

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.2A4 Chromosome Painting Dosimetry (Tore Straume / Joe Lucas)

LLNL No: 6288-09

DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits													0.0
Travel													0.0
Procurement and Expenses*													0.0
Technical Information Department													0.0
Facility/Service/Distributed Charges													0.0
LLNL Overhead+/Taxes**													0.0
TOTAL					0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liens/Preliens													
Budget					100.0								
Funds Available					100.0								
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.2A4 Chromosome-Painting Dosimetry

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-09

Principal Investigator: Tore Straume and Joe Lucas
M&O Contractor: Lawrence Livermore National Laboratory
(Lynn Anspaugh / Sheilah Hendrickson)

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
Administrative (meetings organized).
Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
Substantial changes in project expectations, protocol, funding.
Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
Identify EH-40 staff member(s) with each requests.

I. Project Objective

The project objective is to use chromosome painting to provide dose estimates for selected individuals as needed for post-Chernobyl-accident surveillance and epidemiology studies. We plan to score approximately 10,000 cells during FY 1994.

II. Current Project Status / Monthly Progress

Funding received in January 1994 Financial Plan and released for spending in late February 1994.

Although this is the first month of this project, we have received a blood sample from a Ukrainian who was exposed to a known dose in connection with the Chernobyl accident. This individual was selected for study because of the level of ^{137}Cs exposure and the availability of independent measurements that facilitates intercalibration of biodosimetry (chromosome painting) with other dosimetric methods. Results will be available soon and other test cases are now being explored.

III. Significant Problems/Issues/Concerns

N/A.

IV. Assistance Required of EH-40 Staff

N/A.

7.2D — STOCHASTIC EFFECTS

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:

7.2D Stochastic Effects [Marvin Goldman—UCD] (Lynn Anspaugh / Sheilah Hendrickson)

LLNL No: 6288-11

DOE No: 94-ES-1031

7.2D Stochastic Effects [Marvin Goldman—UCD] (Lynn Anspaugh / Sherrill Hendrickson)

Cost Item	Months												Year-to-Date
	1993			1994									
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits				0.5									0.5
Travel				0.0									0.0
Procurement and Expenses*				1.3									1.3
Technical Information Department				0.0									0.0
Facility/Service/Distributed Charges				0.0									0.0
LLNL Overhead+ /Taxes**				0.2									0.2
TOTAL				2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Liens/Preliens IUT \$24 K			24.0	23.5									23.5
Budget			38.0	38.0									
Funds Available			38.0	36.0									
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts													
** General & Administrative (G&A)													
+ LDRD; Division and Directorate Burdens, etc.													

3/14/94

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.2D Stochastic Effects

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-11

Principal Investigator: Marvin Goldman
M&O Contractor: Lawrence Livermore National Laboratory
(Lynn Ansbaugh / Sheilah Hendrickson)

Contract to:
IntraUniversity Transaction (IUT): UC, Davis

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

I. Project Objective

Complete and print proceedings for the bilateral stochastic workshop held at the University of California, Davis, June 15-19, 1992. Participants used the most recent estimates of stochastic risk to understand somatic effects of low-level radiation. The proceedings will also include reviewed data compiled on the exposed populations from the South Urals regions of Russia.

II. Current Project Status / Monthly Progress

Funding mechanism from Lawrence Livermore National Laboratory to University of California, Davis, established December 1993.

To date, no monthly progress information submitted to LLNL.

III. Significant Problems/Issues/Concerns

N/A.

IV. Assistance Required of EH-40 Staff

N/A.

7.2F — THYROID STUDIES

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

LLNL No: 6288-16
DOE No: 94-ES-1031

Project:
7.2F Thyroid Studies (Lynn Anspaugh)

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits	16.2	7.3	14.0	4.8									42.3
Travel	0.0	0.0	0.6	2.5									3.1
Procurement and Expenses*	1.1	0.1	0.0	1.1									2.3
Technical Information Department	0.3	0.0	0.0	0.6									0.9
Facility/Service/Distributed Charges	0.0	0.2	1.1	0.0									1.3
LLNL Overhead+ /Taxes**	11.7	5.3	10.1	4.1									31.2
TOTAL	29.3	12.9	25.8	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.1
Liens/Preliens													
Budget	510.0	510.0	510.0	510.0									
Funds Available	480.7	467.8	442.0	428.9									
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Burdens, etc.													

3/14/94

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.2F Thyroid Studies

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-16

Principal Investigator: Lynn Ansbaugh
M&O Contractor: Lawrence Livermore National Laboratory

Address each item, if applicable.

- I. Project Objective**
- II. Current Project Status / Monthly Progress**
 - Administrative (meetings organized).
 - Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).
 - Travel. Include copy of foreign trip report.
- III. Significant Problems/Issues/Concerns**
 - Substantial changes in project expectations, protocol, funding.
 - Problems occurring or anticipated (corrective actions).
- IV. Assistance Required of EH-40 Staff**
 - Identify EH-40 staff member(s) with each requests.

I. Project Objective

To develop and implement a long term epidemiology study to detect thyroid disease among persons, especially children, who were exposed to the iodine radionuclides during and/or following the Chernobyl accident. (1) Develop a clinical surveillance program for a large fixed cohort of known tissue dose, particularly in children, (2) and agree on procedures for detecting thyroid dysfunction, methods to define and reconstruct exposure levels and doses, and ways in which standardization of procedures and quality control might be assured, and (3) identify and facilitate needs for training, equipment and supplies to conduct the study.

The primary goals at this time are to conduct case-control and cohort studies of childhood-thyroid cancer in Belarus and Ukraine.

The epidemiological aspects of these projects are being undertaken by scientists at the National Cancer Institute, who are assisted with funding from the Department of Energy, Office of Health. The goal of the work described here is twofold: (1) to provide radiation doses to the thyroid for the Ukrainian and Belarussian individuals to be studied (this work is being performed by Ukrainian, Belarussian, and Russian scientists with the advice and assistance of Lynn Ansbaugh and André Bouville of the National Cancer Institute) and (2) to provide material and equipment to the Ukrainian, Belarussian, and Russian scientists to aid in the overall aspects (including clinical) of the studies.

II. Current Project Status / Monthly Progress

Work on developing these studies has been ongoing for several years.

We are now quite far along on a case-control study of 119 children with thyroid cancer and 238 controls in Belarus. Doses for some of these children have been available for some time, as their thyroids were measured immediately after the accidents. Some other children have had doses calculated on the basis of "passport doses." Substantial additional work will be necessary, as many of the children with thyroid cancer do not currently have calculated doses. Further, all of the doses calculated so far need to be verified and validated as much as possible on the basis of comparison with values calculated with traditional environmental transport models and with more studies on the calibration of the instruments used for the original thyroid measurements. Some of these calibration measurements have already been made in Belarus, but additional measurements will be made this year with the Belarussian instruments in the United States.

After considerable work and negotiation, a protocol for the cohort study of childhood-thyroid cancer in Belarus has been agreed upon and it has been approved by a National Cancer Institute Review Committee.

As part of the case-control and cohort studies to be undertaken in Belarus, two scientists (one from Belarus and one from Russia) working on dosimetry problems visited LLNL. See attached visit report.

Efforts are also underway to undertake a case-control and a cohort study of childhood-thyroid cancer in Ukraine. These negotiations began later and have been more difficult; at this time there is not yet an approved and reviewed protocol for the cohort study, but efforts are continuing to develop the protocol and to implement a case-control study. A Workshop with several Ukrainian scientists was held in Bethesda on October 4-9, 1993, to try to resolve the remaining issues in the cohort protocol. (See attached letter to Dr. Bruce Wachholz from the Ukrainian Minister of Health Dr. Yuriy P. Spizhenko.) Dr. Ilya Likhtarev, Head of the Department of Dosimetry and Radiation Hygiene of the Ukrainian Scientific Centre for Radiation Medicine, made it clear during this meeting that he was dissatisfied with dosimetry issues being lumped within an epidemiological protocol only, and that he wanted to develop a separate protocol for dosimetry research.

Following the October meeting in Bethesda, Dr. Likhtarev visited LLNL for further discussion on the overall cooperation between the US and Ukraine on dosimetry issues. See attached visit report. Joining in these discussion was Dr. Leonilla Kovgan, a Ukrainian scientist from Likhtarev's Department who had been on temporary assignment at LLNL since June 1993. Dr. Kovgan returned to the Ukraine in January 1994 (see attached visit report). At this October meeting we discussed extensively the work of Dr. Kovgan and we also planned for the development of a separate dosimetry protocol.

An additional meeting was held in early December in Bethesda when the Ukrainian Minister of Health (Dr. Yuriy P. Spizhenko), Dr. Likhtarev, and Dr. Olga Tsvetkova visited for further talks with DOE, NCI, and NRC officials. Lynn Anspaugh was able to meet with the Ukrainians, also, as he was in the Washington area for another purpose. During this time, Dr. Terry Thomas (representing DOE) and Dr. Spizhenko signed an agreement (copy attached) establishing a separate dosimetry project. Prior to this meeting Lynn Anspaugh had prepared an initial draft dosimetry protocol; further work was done during the week on this protocol by Drs. Anspaugh and Bouville and a draft was given to Dr. Likhtarev for further work by the Ukrainian side.

III. Significant Problems/Issues/Concerns

The protocol for the Belarussian cohort study indicates the delivery of a large amount of equipment and supplies to the Belarussian Minister of Health. As yet, no mechanism to accomplish this has been formally approved by the DOE, although LLNL has volunteered to manage and track this process. An early decision on this is important in order to move ahead in an orderly way.

IV. Assistance Required of EH-40 Staff

See Section III above. We are awaiting a decision by Dr. Pettengill.

FOREIGN NATIONAL VISIT REPORT

Lynn R. Anspaugh

**Physical Sciences Directorate
Health & Ecological Assessment Division
Risk Sciences Center**

Lawrence Livermore National Laboratory, University of California

Livermore, California 94550

Contract No. W-7405-ENG-48

January 20, 1994

**Sergei Mikhailovich Chinkarev
Vladimir Viatcheslavovitch Drozdovitch**

Name: Sergei Mikhailovich Chinkarev
Citizenship: Russia
Business Affiliation: Institute of Biophysics of Health Ministry
123182, Givopisnaya St. 46, Moscow, Russia
Position: Scientist

Name: Vladimir Viatcheslavovitch Drozdovitch
Citizenship: Belarus
Business Affiliation: Research Institute of Radiation Medicine
Dosimetry Laboratory
Masherov Avenue 23, Minsk, 220600, Belarus
Position: Research Associate

Date of Visit: November 29 through December 17, 1993

Hosts: Lynn R. Anspaugh, Primary Host
Tore Straume
Sheilah Hendrickson

This visit was under the auspices of the US and former USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety, which was established to implement the international agreement, "Memorandum of Cooperation in the Field of Civilian Nuclear Rector Safety Between the USA and the USSR." The specific purpose of this visit was to work with us on dose reconstruction in support of epidemiological studies of radiogenic thyroid cancer in Belarus. We explored and discussed advanced techniques of Monte Carlo simulation of environmental transfer processes, validation of models for external dose projection, and use of ^{129}I or other long-lived radionuclides as surrogates for more common and important short-lived radioiodines. This was a key visit of support of DOE and NCI epidemiological studies in Belarus. **This is not a sensitive or classified subject.**

We extensively reviewed progress being made in our current collaborative research studies, which are funded by DOE and jointly being performed by the National Cancer Institute (NCI), LLNL, and the two Soviet Institutes represented by the visitors. One of the activities was to prepare draft materials to be polished into papers to be submitted for publication on the subject of dose reconstruction. Of particular interest during this period was discussion of the technique of accelerator mass spectroscopy for the measurement of ^{129}I in environmental samples. Plans, schedules and deadlines were formulated and agreed upon for work to be performed during the next three months. Extensive discussions and formulations of plans were also made for future direction of our current research.

Building 3703, 2925, 361,362, 378, 379, 412, 591 and 4675 (Central Cafeteria) were the facilities visited. Specific equipment viewed was the apparatus used to extract iodine from environmental samples.

These visitors are both well known to me from visits to the former Soviet Union, and we have been engaged in a collaborative effort for several years. This was their first visit to the United States, and it was very useful in furthering our collaborative research in dose reconstruction.

There is no specific exchange agreement, and there was no agenda for this visit.

See attached for the list of written material given to visitors.

Benefits to the LLNL and the DOE were progress made in the dose reconstruction for the epidemiological studies of radiogenic thyroid cancer in Belarus. This information is viewed as being of major importance in the determination of the stochastic effects of radiation delivered at low dose rates.

"To the best of my knowledge, no classified or unauthorized sensitive subject has been disclosed to the foreign nationals."

Lynn R. Anspaugh, Coordinating Host

24 Jan 94

Date

December 17, 1993

To Lynn Anspaugh

LIST REFERENCES, WHICH WERE COPYING IN LLNL.

1. ICRP Publication 23. Chapter 1. X. Thyroid gland.
2. Radiological Assessment. A textbook on Environmental Dose Analysis. Edited by John E. Till and H. Robert Meyer. 1983.
3. Whircker F.W. and Kirchner T.B. PATHWAY: A Dynamic Food-chain Model to Predict Radionuclide Ingestion after Fallout Deposition. Vol. 52. No. 6. pp. 717-737. 1987.
4. Breshears D.D. et al. Uncertainty in Predictions of Fallout Radionuclides in Food and of Subsequent Ingestion. Vol. 57. No. 6. pp. 943-953. 1989.
5. Voigt G., Muller H., Paretzke H.G., Prol G., etc. Experimental determination of transfer coefficients of Cs-137 and I-131 from fodder into milk of cows and sheep after the Chernobyl accident. Vol. 57, pp. 967-973, 1989.
6. Handl J., Pfau A. and Huth F.W. Measurement of I-129 in Human and Bovine Thyroid in Europe - Transfer of I-129 into the Food Chain. Vol. 58, pp. 609-618, 1990.
7. Muller H. and Prohl G. ECOSYS-87: A Dynamic Model for Assessing Radiological Consequences of Nuclear Accident. Vol. 64. pp. 232-252. 1992.
8. Straume T. and Carsten A.L. Tritium Radiobiology and Relative Biological Effectiveness. Vol. 65. No. 6. pp. 657-672.
9. Straume T. Tritium Risk Assessment. Vol. 65. No. 6 pp.
10. Kerber R.A., Till J.E. and et al. A Cohort Study of Thyroid Disease in Relation of Fallout From Nuclear Weapons Testing. JAMA. November 3, 1993 - Vol 270. No. 17. pp. 2076-2082.
11. Elmore D. and Phillips F. Accelerator Mass Spectrometry for Measurement of Long-Lived Radioisotopes. Science. 236. pp. 543-550. 1987.

МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ

MINISTRY OF HEALTH OF UKRAINE

08.08.93 № _____

На № _____

Bruce W. Wachholz, Ph.D.
Executive Plaza North,
Suite 530
National Cancer Institute
National Institutes of Health
Bethesda, Maryland 20892

Dear Dr. Wachholz:

In accordance with plans of Working Group 7 (in a framework of Russian US-Ukraine cooperation) our experts has prepared and sent to you residual information needed to complete the final draft of the thyroid cohort study protocol.

We hope that by mid-September you will be able to send to us the variant of final draft of the thyroid protocol.

We appreciate very much the efforts of the American side to increase the level of our collaboration and fully agree with the opinion about expediency to hold two workshops in Bethesda.

From the Ukrainian side we propose following experts to attend a workshops:

a) on the thyroid study:

Prof. Tronko N.
Prof. Epshtein E.
Prof. Oleynik V.
Prof. Bogdanova T.
Prof. Likhtaryev I.
Prof. Cheban A.
Prof. Boyarskaya O.
Dr. Sobolev B.

Dr. Bobyleva O.
b) on the leukemia study:
Prof. Bebeshko V.
Prof. Ledoschuk B.
Prof. Repin V.
Prof. Drozdova V.
Dr. Fedorenko Z.
Prof. Prisyazhniuk A.
Prof. Klimenko V.
Dr. Kartushin G.

As a coordinator of Working Group 7 I'll try to take part in a final stage of the discussions about thyroid cohort study protocol and also, if possible, to visit NIH and NCI and other appropriate organizations in your country.

Sincerely,

Yuriy P. Spizhenko
Minister

FOREIGN NATIONAL VISIT REPORT

Lynn R. Anspaugh

**Physical Sciences Directorate
Health & Ecological Assessment Division
Risk Sciences Center**

Lawrence Livermore National Laboratory, University of California

Livermore, California 94550

Contract No. W-7405-ENG-48

October 20, 1993

Ilya Aronovich Likhtarev

Name: Ilya Aronovich Likhtarev

Citizenship: Ukraine

Business Affiliation: Medical Sciences Academy of Ukraine
Ukrainian Research Center for Radiation Medicine
Department of Dosimetry and Radiation Hygiene
Melnikova St., 53, Kiev-50, Ukraine

Position: Department Head
Department of Dosimetry and Radiation Hygiene

Date of Visit: October 11-14, 1993

Hosts: Lynn R. Anspaugh

This visit was under the auspices of the US and former USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS), which was established to implement the international agreement, "Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety Between the USA and the [former] USSR." The specific purpose of this visit was to work with us on the dose-reconstruction studies for the epidemiological studies in Ukraine. We explored and discussed the advanced techniques of Monte Carlo simulation of environmental transfer processes and the validation of models for external dose projection and use of ^{129}I or other long-lived radionuclides as surrogates for more common short-lived radionuclides. This was a key visit to DOE's future epidemiological studies in Ukraine.

We extensively reviewed our current collaborative research studies and progress that is jointly being performed by the National Cancer Institute (NCI), LLNL, and Dr. Kovgan, who is on temporary assignment here from Dr. Likhtarev's Department. We reviewed the just completed Ukrainian preliminary results for the external exposure and internal dose from radiocesium to the Ukrainian population. These data will be used to support the radioepidemiological studies. Plans, schedules and deadlines were formulated and agreed upon for work to be performed during the next three months. Extensive discussions and formulations of plans were also made for future direction of our current research.

Dr. Likhtarev presented a seminar, "Problems Related to the Estimation of Radiation Doses Resulting from the Chernobyl Accident." He has responsibilities for dose reconstruction and projection for the people evacuated from Chernobyl, those still living in the contaminated areas, and the liquidators (workers who very early worked to clean-up the accident). Many studies in progress were described by Dr. Likhtarev.

Building 3703 and the Central Cafeteria were the only facilities visited, and no specific equipment was viewed.

Dr. Likhtarev is head of a large Department that consists of approximately eight large laboratories. He is an excellent scientist with competence in dose reconstruction and dosimetry. His visit and presentation were of much interest to several LLNL researchers, and were crucial to the planning of future activities that are being funded by the DOE through the JCCCNRS vehicle.

There is no specific exchange agreement, and there was no agenda for this visit.

Written material given to Dr. Likhtarev consisted only of publications in the open literature that pertain to the measurement of stable translocations in chromosomes with the FISH technique.

Benefits to the LLNL and the DOE were to achieve progress in the accomplishment and planning of dose-reconstruction activities of direct interest to DOE-funded epidemiological studies of the health impacts from the Chernobyl accident.

"To the best of my knowledge, no classified or unauthorized sensitive subject has been disclosed to the foreign national."

Lynn R. Anspaugh, Host

22 Oct 93
Date

FOREIGN NATIONAL VISIT REPORT

Lynn R. Anspaugh

**Physical Sciences Directorate
Health & Ecological Assessment Division
Risk Sciences Center**

Lawrence Livermore National Laboratory, University of California

Livermore, California 94550

Contract No. W-7405-ENG-48

March 24, 1994

Dr. Leonilla N. Kovgan

Name: Dr. Leonilla N. Kovgan
Citizenship: Ukraine
Business Affiliation: Academy of the Medical Sciences of Ukraine
Ukrainian Research Center for Radiation Medicine
Position: Senior Scientist

Date of Visit: June 1, 1994, through January 7, 1994

Hosts: Lynn R. Anspaugh
Sheilah M. Hendrickson
Tore Straume
Personnel from Health and Ecological Assessment Division

This visit was under the auspices of the US and former USSR Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS), which was established to implement the international agreement, "Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety Between the USA and the former USSR." The specific purpose of this visit was to work on defining external exposure and internal dose from radiocesium to the Ukrainian population. These data will be used to support dose-reconstruction studies upon which several radioepidemiological studies will be published. Techniques of Monte Carlo simulation of environmental transfer processes, validating models for external dose projections and use of ^{129}I and other long-lived radionuclides as surrogates for more common short-lived radionuclides and plans for future epidemiological studies in the Ukraine were explored. **This is not a sensitive or classified subject.**

We made extensive progress on our current collaborative research studies that are jointly being performed by the National Cancer Institute (NCI), LLNL, and the Ukrainian Research Centre for Radiation Medicine where Dr. Kovgan is employed. Dr. Kovgan defined and completed the Ukrainian preliminary results for the external exposure and internal dose from radiocesium to the Ukrainian population. This was a major and important accomplishment and these data will be used to support radioepidemiological studies. A review of this work with extensive discussions for plans, schedules and deadlines took place in October 1993 by André Bouville (NCI), Lynn Anspaugh (LLNL) Leonilla Kovgan (LLNL/Ukrainian Research Centre for Radiation Medicine), and Ilya Aronovich Likhtarev (Department Head, Department of Dosimetry and Radiation Hygiene, Ukrainian Research Centre for Radiation Medicine). Discussions and formulations of plans were also made for future direction of our current research.

Buildings 3703, 4202, 4203, 4204, 4207, 361, and Cafeterias 4675, 312, and 125 were the facilities visited. No specific equipment was viewed.

Dr. Kovgan is a highly competent scientist, and she spent most of her time working on refining the Ukrainian database that she brought here with her and in preparing materials

for two publications. One will be on the dose from external exposure, as based on actual measurements of external dose; another will be based on normalized dose from ingestion of ^{137}Cs as based on actual measurements of whole body content of ^{137}Cs . In addition Dr. Kovgan was able to learn about many of the US techniques of dose reconstruction and of Monte Carlo simulation using PC-based systems. An additional side benefit was the improvement in communication with the Ukrainians through her physical location here.

There is no specific exchange agreement, and there was no agenda for this visit. Dr. Kovgan was a LLNL temporary employee from June 1, 1993, through January 7, 1994.

See attached for the list of written material that Dr. Kovgan shipped to her home.

Benefits to the LLNL and the DOE were to achieve progress in the accomplishment of dose-reconstruction activities of direct interest to DOE-funded epidemiological studies of the health impacts from the Chernobyl Nuclear Power Plant accident.

"To the best of my knowledge, no classified or unauthorized sensitive subject has been disclosed to the foreign national."

Lynn R. Anspaugh, Coordinating Host

24 March 1994

Date

SCILS Data Entry Form

Port: Bibliographic Information

Software - Data on Radiation Dosages -

Number of Authors: —

Reference Number (UCRL #) N/A

Requester Information

Name: Dr. Ilyana A. Likhacheva

Affiliation:

Address: Dept of Dosimetry & Radiation Hygiene
Ukrainian Research Center for Radiation Medicine

Country: 253050 - Kiev 50 - Ukraine

Telephone number:

Request Information

Request type: (choose one of the following)

☐ Contacted at foreign conference	☐ Relayed through another person at the facility
☐ Contacted at U.S. Conference	☐ Relayed through another person outside facility
☐ Contacted while on foreign travel	☐ Telephone call
☐ Letter/fax	☐ Unknown
☐ Postcard	☒ Foreign national visitor/Assignee at facility

Request Date: 1-13-94

LLNL SCILS Contact Name: Betty Rothacker Ext. 3-4840

SCILS Data Entry Form

Report Bibliographic Information

Title: ① Radiocological Studies - Related to the Baneberry
Event, ② Health Physics Magazine -
Abstracts + Journals

List of Authors: UCRL - Korda - Phelps - Anisovich - Potter - Chapman - Hamb
Peterson - Crawford

Reference Number (UCRL #) 51027 - Health Physics Volume # 59 - 11 - 90

Requester Information

Name: Dr. Ilyia Likhatchev

Affiliation:

Address: Dept. of Dosimetry + Radiation
Hygiene - Ukrainian Research Center
for Radiation Medicine - MENIKOVA Str. 53

253050, Kiev-50 Ukraine

Country: Ukraine

Telephone number:

Request Information

Request type: (choose one of the following)

☐ Contacted at foreign conference

☐ Relayed through another person at the facility

☐ Contacted at U.S. Conference

☐ Relayed through another person outside facility

☐ Contacted while on foreign travel

☐ Telephone call

☐ Letter/fax

☐ Unknown

☐ Postcard

☒ Foreign national visitor/Assignee at facility

Request Date: 1-13-94

LLNL SCILS Contact Name: Patty R. Loeber Ext. 3-4840

SCILS Data Entry Form

Bibliographic Information

① Ingestion dose journals & charts.

of Authors: U.S. Working Group - Lynn R. Anspaugh - Chairman
Korean Working Group - Ilya A. Likhitsar - Chairman

Reference Number (UCRL #) N/A

Requester Information

Name: Ilya A. Likhitsar

Affiliation:

Address: Dept. of Dosimetry &

Radiation Hygiene -

Korean Research Center for Radiation Medicine

Country: 253050, KIPU - 50, Ukraine

Telephone number:

Request Information

Request type: (choose one of the following)

☐ Contacted at foreign conference

☐ Relayed through another person at the facility

☐ Contacted at U.S. Conference

☐ Relayed through another person outside facility

☐ Contacted while on foreign travel

☐ Telephone call

☐ Letter/fax

☐ Unknown

☐ Postcard

☒ Foreign national visitor/Assignee at facility

Request Date: 1-13-94

LLNL SCILS Contact Name: Betty Spitzer Ext. 3-4840

SCILS Data Entry Form

Report Bibliographic Information

Title: ① Russian-English Dictionary - Charts - Radiation
Doseages - Notes

List of Authors: ① A.M. Taube ② L.W. Litvinova, A.D. Miller, R.C. Doglioli
③ Leonilla Kudgan

Reference Number (UCRL #)

Requester Information

Name: Dr. Olga Likhitarian

Affiliation:

Address: Dept. of Dosimetry & Radiation Hygiene
Ukrainian Research Center for Radiation
Medicine

Country: 253050, Kiev - 50 - Ukraine

Telephone number:

Request Information

Request type: (choose one of the following)

☐ Contacted at foreign conference	☐ Relayed through another person at the facility
☐ Contacted at U.S. Conference	☐ Relayed through another person outside facility
☐ Contacted while on foreign travel	☐ Telephone call
☐ Letter/fax	☐ Unknown
☐ Postcard	☒ Foreign national visitor/Assignee at facility

Request Date: 1-13-94

LLNL SCILS Contact Name: Betty Kothacker Ext. 3-4840

SCILS Data Entry Form

International Seminar on Intervention Levels & Countermeasures for Nuclear Accidents
 Bibliographic Information:

Survey of the Background in Agricultural Radiocological System
and Qinshan Nuclear Power Station & Transfer Experiment of ^{60}Co + ^{125}I
Crop Plants. Rapid translocation frequency analysis in human decidua
after exposure to ionizing radiation. (13)

of Authors: Xu Shining, Zhao Wenhe, Huo Hanxin (2) J.N. Lucas, A. Alon, T. Stronegger
Pogensee, K. Kodama, M. Nakano, K. Ohtaki, H.-U. Weier, O. Rinke de Wit, T. Gray, G. Little

Reference Number (UCRL #) (2) Int. J. Biol. Vol 62, #1, 53-63 (3) List of Participants

Requester Information:

Name: Dr. Il'ya Likhatchov

Position:

Address: Dept. of Dosimetry & Radiation Hygiene
Kranian Research Center for Radiation Medicine

Country:

Telephone number:

Request Information:

Request type: (choose one of the following)

☐ Contacted at foreign conference	☐ Relayed through another person at the facility
☐ Contacted at U.S. Conference	☐ Relayed through another person outside facility
☐ Contacted while on foreign travel	☐ Telephone call
☐ Letter/fax	☐ Unknown
☐ Postcard	☒ Foreign national visitor/Assignee at facility

Request Date: 1-13-94

LNL SCILS Contact Name: Betty Rothacher Ext. 3-484D

SCILS Data Entry Form

Report Bibliographic Information:

Title: *Charts - Radiation damages - Notes -*

List of Authors: *Leonida Kougan*

Reference Number (UCRL #)

Requester Information:

Name: *Dr. Ilyia A. Likhatorov*

Affiliation: *Dept. of Dosimetry & Radiation*

Address: *Hygiene*

*Ukrainian Research Center
for Radiation Medicine*

Country: *253050 - Kiev 50 - Ukraine*

Telephone number:

Request Information:

Request type: (choose one of the following)

☐ Contacted at foreign conference

☐ Relayed through another person at the facility

☐ Contacted at U.S. Conference

☐ Relayed through another person outside facility

☐ Contacted while on foreign travel

☐ Telephone call

☐ Letter/fax

☐ Unknown

☐ Postcard

☒ Foreign national visitor/Assignee at facility

Request Date: *1-13-94*

LLNL SCILS Contact Names

Betty Rothacker Ext. 3-4840

SCILS Data Entry Form

port Bibliographic Information:

② Russian English Dictionary, ③ English Russian Dictionary
Journals & Correspondence, Notes, & Charts

List of Authors:

List of Authors: ① ~~Alm Tjorne, T. D. L. Lunn, A. D. Miller, R. D. Ogilby~~
 ② V. D. Amkin, Z. S. Vigodskaya, N. N. IL'ina ③ Leonilla Kovaleva
 Lynn Ansarugh

Reference Number (UCRL #) NA

Requester Information:

Name: Dr. Illya B. Nikhtarov

Affiliation:

Address: Dept. of Dermatology & Radiation
Oncology - Ukrainian Research Center
for Radiation Medicine

Country: 2530.50 Kiev-50 - Ukraine

Telephone number:

Request Information:

Request type: (choose one of the following)

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☐ Contacted at U.S. Conference	☐ Relayed through another person outside facility
☐ Contacted while on foreign travel	☐ Telephone call
☐ Letter/fax	☐ Unknown
☐ Postcard	☒ Foreign national visitor/Assignee at facility

Request Date: 1-13-94

LLNL SCILS Contact Name:

Betty P. Thacker Ext. 3-4840

December 2, 1993

MEMORANDUM OF MEETING

We met on Tuesday, November 30, 1993 at the Department of Energy in Germantown, Maryland to discuss the activities of Working Group 7 of the Joint Coordinating Committee for Civilian Nuclear Reactor Safety in Ukraine. We agreed that the structure of Working Group 7 in Ukraine will consist of the following projects:

- Thyroid Studies
- Leukemia Studies
- Study of Cataracts among Chernobyl Liquidators
- Dosimetry - This project will coordinate dosimetry components of the health studies and will support the development of methods for reconstructing doses to individuals.

Bilateral support of these studies is contingent upon favorable scientific peer review of protocols and availability of resources. A co-project leader will be selected for each project by each side. New projects may be added at a future time by mutual agreement.

Terry L. Thomas, Ph.D.
Co-Leader of Working Group 7 for U.S.

Yuriy P. Spizhenko, M.D., Ph.D.
Co-Leader of Working Group 7 for Ukraine

7.2G — LEUKEMIA STUDIES

EH Monthly Detailed Summary
Chernobyl Studies: Summary of Financial Status
(1,000 Dollars)

Project:
7.2G Leukemia Studies (Lynn Anspaugh)

LLNL No: 6288-12
DOE No: 94-ES-1031

Cost Item	Months												Year-to-Date
	1993 Oct	Nov	Dec	1994 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Salary/Benefits													0.0
Travel													0.0
Procurement and Expenses*													0.0
Technical Information Department													0.0
Facility/Service/Distributed Charges													0.0
LLNL Overhead+/Taxes**													0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Liens/Preliens													
Budget	80.0												
Funds Available	30.0												
* Includes supplies; procurements; cost incurred from IUTs, ICOs, subcontracts ** General & Administrative (G&A) + LDRD; Division and Directorate Overhead, etc.													

EH-40 Monthly Report
October 1993 through January 1994

Project Title: Chernobyl Studies
7.2G Leukemia Studies

DOE Project Number: 94-ES-1031

LLNL Project Number: 6288-12

Principal Investigator: Lynn Anspaugh
M&O Contractor: Lawrence Livermore National Laboratory

Address each item, if applicable.

I. Project Objective

II. Current Project Status / Monthly Progress

Administrative (meetings organized).

Technical accomplishments (research highlights, publications or presentations, services provided, deliverables).

Travel. Include copy of foreign trip report.

III. Significant Problems/Issues/Concerns

Substantial changes in project expectations, protocol, funding.

Problems occurring or anticipated (corrective actions).

IV. Assistance Required of EH-40 Staff

Identify EH-40 staff member(s) with each requests.

I. Project Objective

Development of a protocol (study plan) for a systematic epidemiologic and etiologic study of the post-Chernobyl experience with leukemia. Obtain new information on time-response, dose-response and influence of dose rate on radiation leukemogenesis by (a) develop a leukemia registry to establish two cohorts (clean-up workers and fall-out victims); plan a case-control study of clean-up workers; (b) standardize and validate diagnose of leukemia, promote physical dose reconstruction; explore potential of biological dosimetry for case-control study of clean-up workers; (c) identify need and facilitate ancillary training needs for selected former-soviet scientists.

The primary goal at this time is to conduct a study of leukemia incidence among liquidators (or other highly exposed individuals) in cooperation with Ministry of Health officials in Ukraine.

The epidemiological aspects of this project is being undertaken by scientists at the National Cancer Institute, who are assisted with funding from the Department of Energy, Office of Health. The goal of the work described here is to provide radiation doses to the bone marrow for the individuals to be studied (this work is being performed by Ukrainian scientists with the advice and assistance of Lynn Anspaugh and André Bouville of the National Cancer Institute).

II. Current Project Status / Monthly Progress

A US leukemia Working Group has been trying to establish this project for several years. Progress has been slow, as there is difficulty in establishing a workable means of

defining and locating a population for study and in establishing a solid basis for reconstructing radiation doses.

The US working group has prepared a draft protocol, but many details remain to be worked out.

A joint US-Ukrainian meeting to make further progress on this project is scheduled for February 1994.

During the October-December time period when Dr. Likhtarev made two visits to the Washington area and one visit to LLNL, extensive discussions were held on methods to reconstruct radiation doses to liquidators—both for the purposes of the proposed leukemia study and also for a proposed study on the induction of cataracts in this population. Pertinent material has been included in the draft protocol for the new dosimetry-research project, which is discussed in the previous section.

DATE

FILMED

8/4/94

END