International Atomic Energy Agency

INDC(NDS)-41

April 1972

Distribution:
G + Special

INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

REPORT ON THE SEVENTH FOUR-CENTRE MEETING

Brookhaven National Laboratory, 25-29 Oct 1971

Victoria May
Secretary

IAEA NUCLEAR DATA SECTION, KÄRNTNER RING 11, A-1010 VIENNA

REPORT ON THE SEVENTH FOUR-CENTRE MEETING

The Seventh Four-Centre Meeting was held at Brookhaven National Laboratory, 25-29 October 1971. Papers submitted to the meeting are organized as appendices to the minutes.

Experience with the experimental data exchanges over the past year were discussed and some modifications were made to EXFOR. Some expansions to the scope of data covered in the exchange were also suggested. The use of CINDA as an EXFOR index was recommended.

Other topics for the meeting included future four-centre cooperation on the exchange of evaluated data, on the world request list. Possible cooperation between the four-centres and other data centres was also discussed.

NDS announced its intention to invite the centres to hold their next Four-Centre Meeting at Vienna.

A list of modifications to be made to the manuals is appended as document 4CM/VII/16. A list of actions suggested and a list of specific recommendations made by the meeting participants are included as 4CM/VII/17 and 4CM/VII/18.

Victoria May
Secretary

Appended are the following documents of the meeting:

SEVENTH FOUR-CENTRE MEETING

October 25-29, 1971

Brookhaven National Laboratory

AGENDA

I. Organization and Announcements

a. Introductory remarks and election of chairman and secretaries.
b. Consideration and adoption of agenda - meeting organization.

II. Working-Policies and Coordination of Centres
without going into technical details of the EXFOR-system.

a. Short progress reports from Centres.
b. Recommendations relevant to the Centres from Nuclear Data Committees, Steering-Committees, scientific meetings or other bodies.
c. Users' data requests and response by the Centres (experimental and/or evaluated data and their relative proportion; what data are asked, by whom, for what purpose, how often? Standing requests?).
d. Completeness of compilation of data from recent experiments, e.g. within the last year.
e. Status of conversion from old experimental data files to EXFOR.
f. Responsibilities for updating and distribution of EXFOR manuals, dictionaries, and protocol.
g. Archive files.

III. Trends and developments coming up to the Centres

a. Statements from Centres.
b. Possible extension of the scope of EXFOR data and priorities.
c. Coordination of evaluation activities (world-wide newsletter, future data reviews).
d. Four-Center cooperation for RENDA.
e. Cross-links EXFOR-RENDA, checking whether new data correspond to a RENDA-entry.
f. Cross-links to INIS, UNISIST, CODATA.
g. Cooperation between the four neutron data centers and centers for nuclear structure and reaction data.

IV. EXFOR in Detail

a. Review of actions from last meeting.
b. Experiences with exchange-tapes and corrections of entries.
c. Checking programs.
d. Dictionaries: proposals for alterations and additions, i.e. pending 4C-memos, chemical compounds and any other new additions and changes.
e. EXFOR-Manual: proposals for changes and additions, i.e. pending 4C-memos and correspondence and any other new proposals.
f. LEXFOR: detailed discussion, inclusion of alterations and final approval.
g. Handling of important data outside the present scope of EXFOR.
   (a) Fission product yields and any other needed fission product data.
   (b) Half-lives and other supplementary data that may be needed for neutron-data evaluation
   (c) Capture gamma spectra.
   (d) Fission neutron spectra.
h. Other details pertaining to EXFOR.

V. CINDA in Detail

a. Completeness and literature coverage of CINDA (in particular report-series).
b. Report on the new systems at NDCC and DTIE.
c. CINDA as EXFOR index.
d. Status of publication schedule and distribution.

VI. Evaluated Data

a. World wide coordination of evaluation activities.
b. Published index and documentation.
c. Technical details concerning the exchange of evaluated data between the four centers.

VII. RENDA in Detail

Items of discussion dependent upon conclusions from agenda-item III.d

VIII. Conclusions

a. Summary, recommendations, actions, protocol amendments.
b. Next meeting.

SEVENTH FOUR-CENTRE MEETING

October 25-29, 1971

LIST OF PARTICIPANTS

National Neutron Cross Section Center	M. D. Goldberg V. May, S. Pearlstein, Chairman
U.S.S.R. Nuclear Data Commission	A. Abramaov
Center Po Jadernym Dannym	V. Popov
C.C.D.N., European Nuclear Energy Agency	F. Fröhner H. Potters
Nuclear Data Section, IAEA	J. J. Schmidt
Columbia University	Prof. H. Goldstein, 10/28/71
Nuclear Data Project, ORNL	D. Horen, 10/28/71

SEVENTH FOUR-CENTRE MEETING

October 25-29, 1971

Brookhaven National Laboratory

SUMMARY MINUTES

I. Organization and Announcements

I.a Introductory remarks and election of Chairman and secretaries.

1. The meeting elected Dr. S. Pearlstein as Chairman and Mrs. V. M. May as Secretary. V. May was assisted by D. Cullen, M. Drake and J. Stehn.

I.b Consideration and adoption of agenda meeting organization.

2. The revised agenda, as given in Document 4CM/VII/1, was adopted.

II. Working Policies and Coordination of Centres

II.a Short progress reports from Centres.

3. Progress reports were presented for CCDN, NDS, CJD, and NNCSC. These are attached as Documents 4CM/VII/2, 4CM/VII/3, 4CM/VII/4, and 4CM/VII/5.

4. Since these reports indicate that CINDA entries were prepared and transmitted promptly while the more machine-dependent EXFOR entries were in some cases delayed, it was suggested that bimonthly transmission of CINDA entries by a Centre anticipating delays in its EXFOR transmissions, would give the other Centres knowledge at least that certain data were being prepared and could be obtained by special arrangements if they were urgently needed.

II.b Recommendations relevant to the Centres from Nuclear Data Committees, Steering Committees, Scientific Meetings, and other bodies.

5. The recommendations of these committees to NDS which affect Four-Centre cooperation are attached as Document 4CM/VII/6. These recommendations made the specific suggestions that EXFOR transmissions include the following types of data: (a) Thermal cross sections and resonance integrals, (b) Threshold reaction cross sections as a function of neutron energy and averaged over the fission spectrum, (c) Fission yields, (d) Fission neutron energy spectra, with a detailed technological description of the apparatus and environment involved, possibly even including (e) pictorial representation of the apparatus. Type (a) and (b) are already included in EXFOR transmissions. Concerning (c) and (d), it was noted that a procedure for including these data in EXFOR has not yet been provided and will be discussed under IV.g. Category (e) was deemed by all to be unsuitable for transmission by computer tape.

II.c Users' data requests and response by the Centres.

6. Various statistics from NDS, CCDN and NNCSC on requests are attached as Documents 4CM/VII/7, 4CM/VII/8, and 4CM/VII/9. Because of differences in bookkeeping amongst the Centres, the statistics given are not comparable. Furthermore, they do not invariably take into account the internal use of the data within the Centres, or all external requests such as queries answered by phone.

7. Schmidt, whose NDS report included information on this subject, recommended that the four Centres compile statistics on the reactions which have been requested and the subentries which have been retrieved. The 4-Centres agreed to do so for presentation at future meetings providing it could be done without undue additional effort.

8. Several isolated instances have been met, in which an experimenter has given his data to an interested user, but refuses to release it to a Centre. The experimenter generally feels that giving data to a Centre is tantamount to publication, and he may wish to rework his data before publishing it. This situation should be brought to the attention of the INDC.

9. Goldberg noted that he knew of a case of a different nature, in which the Physical Review attempted to delete tables of resonance parameter data from a paper submitted to it, and suggested to the author that his paper refer its readers to the Neutron Cross Section Centres or to the National Auxillary Publication Service for these parameters. This may mark a trend for the future, and it is so noted.

II.d Completeness of compilation of data from recent experiments.

10. It was noted that though the coverage of the data is fairly complete, there are still significant delays in entering data into EXFOR. All Centres were urged to enter as rapidly as possible all data that has become available since EXFOR was adopted.

II.e Status of conversion from old experimental data files to EXFOR.

11. Goldberg reported for the NNCSC that the entire SCISRS-I library had been translated into a form approximating EXFOR but with comments no more detailed than those originally in SCISRS-I. For almost all of the fissile elements the comments have now been amplified; furthermore, some errors and unintentional duplications of data sets have been eliminated. Data from area one has been checked more carefully to eliminate any errors and add any comments needed. This work yet remains to be done for the elements from Z = 1 to Z = 84.

12. Potters reported that CCDN is assisted by cooperating contact men in each country who arrange for both old and new data to be entered properly in the data file. At present Japanese data are being dealt with.

13. Schmidt reported that NDS has converted 247 old DASTAR entries into 82 EXFOR entries. There are 225 DASTAR entries remaining to be converted.

II.f Responsibilities for updating and distributing EXFOR manuals, dictionaries and protocol.

14. It was agreed that NDS be responsible for maintaining and updating the EXFOR Dictionaries and the Protocol, and that NNCSC be responsible for maintaining and updating the LEXFOR and EXFOR Manual (including the proposed Section VIII). It is hoped that,eventually the latter two can be combined into a single Systems Manual. (Compare memo 4C-3/43 bottom of page 11.)

[Note by meeting secretary: Section F of the Protocol must be changed to define LEXFOR responsibilities and Protocol responsibilities must be added to Section I].

II.g Archive Files

15. It was agreed that each Centre shall keep an archival copy of the latest version of each of the EXFOR entries it originated and be ready to provide the data to any Centre should it be required. Thus no one Centre is burdened with the whole archive files.

[Note: A statement to this effect must be added to Section B.3 of the Protocol]

III. Trends and developments coming up to the Centres

III.a General

16. Pearlstein submitted the following statement on the U. S. proposal for the exchange of standard cross section evaluations.

> "Recent progress toward worldwide cooperation in the field of evaluated data has been made through the offer by the USAEC to exchange evaluated data sets for cross sections used as standards. Specifically, data sets for hydrogen-1, helium-3, lithium-6, boron-10, carbon-12, and uranium-235 would be available for release. The exchange of data sets would include files in computerized form and associated documentation describing the format and data sources."

17. Abramov observed that such a limited exchange of evaluations may give the appearance that some countries are not contributing to the exchange, since all countries do not have evaluations on these particular reactions. The Soviet Union supports the free exchange of evaluated data, and recognizes even a limited proposal as a step in the right direction.

(Discussions on items III.b, III.c, III.d, and III.e were postponed, and will be covered under items IV, VI, VII).

III.f Cross-links to INIS, UNISIST, CODATA.

18. Schmidt noted that CODATA had agreed that IAEA/NDS be responsible for nuclear data, but would like to participate in nuclear data discussions.

19. The 4-Centres felt that they should keep abreast of the developments of INIS and UNISIST. NDS will have discussions with INIS on areas of mutual interest and will report back to the other centres.

III.g Cooperation between the four neutron data centers and centers for nuclear structure and reaction data.

20. Drake presented a report (document 4C/VII/10) on the Cross Section Evaluation Working Group Recommendation on Compilation of Nuclear Structure Data.

21. Pearlstein reported on a meeting hosted by NNCSC in September, 1971, of those centers in the United States active in compiling basic nuclear data. Regular meetings among this group are planned and should facilitate cooperation of the U. S. centers with international groups.

22. Schmidt explained briefly the IAEA plans regarding the IAEA non-neutron nuclear data working group (first meeting March 13-17, 1972 Vienna) and the IAEA Nuclear Data Symposium (early in 1973, possibly in France, see Document 4C/VII/11). He also outlined broadly non-neutron data needs for reactors, fusion and safeguards.

23. While the group felt that no further action was required at this meeting, it recommended that these needs be brought to the attention of the IAEA working group meeting. Also, a more detailed specification of these data needs in the future was felt desirable. The group encouraged NDS's planned preparation of a document on non-neutron nuclear data needs for nuclear applications and suggested the inclusion of reactor needs as expressed in Drake's report.

IV. EXFOR in detail

IV.a Review of actions from last meeting.

24. A list of items approved at the last 4-Center meeting but which have not been either implemented or entered into the EXFOR manual or the Protocol was presented by NDS. These will be taken care of as soon as possible.

IV.b Experiences with exchange tapes and corrections of errors.

25. Experience with exchange tapes indicates that all Centres are making the same kinds of errors. A procedure was adopted for notifying other Centres of errors found on transmission tapes via 4-Center memos.

IV.c Checking programs.

26. NNCSC, CCDN, and NDS now have format checking codes in operation. The NNCSC has developed a physics checking code which makes use of the previously measured data for each reaction to set limits against which new data may be checked. These data limits are available for other centers to use in any physics checking program they may develop.

IV.d Dictionaries.

27. Dictionary codes must be approved prior to transmission. However, since Dictionary 14 requires no new codes it does not need prior approval. New entries to Dictionary 14 should still be sent to NDS as they are made. However, it was felt that since this is only a clerical procedure, NDS could automatically enter any new combinations it finds. An explanatory LEXFOR entry should be submitted together with the proposed new code, if appropriate.

    (This paragraph, except its last sentence, conflicts with the Protocol. A new proposal was discussed in memos 4C-3/43 page 9 and 4C-2/23 page 1.)

28. Dictionary 2: It was agreed to move STANDARD from Group 1 (*) to Group 2 (/). In this case the new codes proposed in Memo 4C-2/21 are not needed. The change should be made in LEXFOR to define when STANDARD is not pertinent.
    (A LEXFOR entry was proposed in 4C-3/43 page 10 and amended in 4C-2/23 page 1.)

29. The residual nucleus extension "G" was added to indicate a partial cross section leading to the ground state for nuclei with isomeric levels.

30. Dictionary 5: The sorting of journals alphabetically (rather than by country) was judged more useful and NDS will investigate the possibilities for resorting them.

31. The suggestion by NDS that an isotope dictionary be prepared was rejected.

32. Dictionary 9: The proposal for chemical compound codes from Memo 4C-3/34 was accepted.

33. Dictionary 10: The addition of "G" for the statistical weight factor to Dictionary 10 as suggested in memo 4C-2/21 was postponed until further documentation could be provided by CCDN.

34. Additions to Dictionary 10 and Dictionary 14 of Adler-Adler parameters as in Memo 4C-2/22 was agreed. It was noted that the typographical error AMT, AMF and AGF should read AHT, AHF, AGT.

35. NNCSC has not reviewed the physical basis for the coding of multilevel resonance parameters. They will provide a report as soon as possible.

36. Dictionary 12: It is recommended that the modifier DRT be used only in extreme cases, and an attempt should be made to define its use more carefully in LEXFOR. NNCSC will monitor the use to see if recommendations are being followed.

37. 2L2 and PAD are to be added to Dictionary 12. NNCSC will submit corresponding Dictionary 14 entries.

38. The proposal of Memo 4C-2/21 concerning the addition to Dictionary 12 of the modifiers s-wave, p-wave, etc., was rejected.

39. Dictionary 24: It is proposed the data-heading keyword EN-INC be added to Dictionary 24 to specify an incident energy for a reaction associated with a NUC-QUANT (see Memo 4C-2/21).
    (This was withdrawn in Memo 4C-1/21 top of page 3.)

40. The usage of the data-heading keyword H-LIFE in the case of isomeric levels should be added to LEXFOR.

41. The proposal of Memo 4C-2/22 for additions to Dictionary 24 was accepted with change of E-LVL-INT to E-LVL-INI.

IV.e EXFOR Manual

42. With regard to the NNCSC proposal to send out new manuals after each 4-Center meeting, the NDS and CJD expressed a preference for receiving only the updated pages. It was recommended that these be transmitted as soon as possible after the meeting.

43. It is agreed that all references in the manuals to that section identified by the keyword BIB shall read 'BIB-section' rather than bibliography or bibliographic section.

44. The NNCSC proposal on particle detected from Memo 4C-1/17 was rejected. An alternate proposal, that the particles detected in successive ISO-QUANT's of an ISO-QUANT combination be coded on successive lines under PART-DET, was accepted. It was agreed by all that the particle detected in a monitor reaction should not be coded.

45. The addition of a Section VIII to the EXFOR manual (to replace Appendix D) as proposed in Memo 4C-3/40 was approved.

46. Since there has been little operating experience with the EXFOR data, the report by the NNCSC on use of the keyword PART-DET will be postponed.

47. The NDS proposal of Memo 4C-3/37 for the coding of author's names was accepted.
    "To code a family-name modified by "junior", JR should be entered following the family name and separated from it by a blank."

48. It was agreed that there should be no restrictions on the coding of report numbers beyond in final dash in the dictionary code. The coding should follow as closely as possible the form used on original report.
    (The wording "no restriction ... code." was disagreed by NDS in 4C-3/44 because programming difficulties had not been considered.)

49. The proposal of Memo 4C-1/17 on ISO-QUANT combinations was accepted.
    "In order for the computer to identify an ISO-QUANT combination, the complete ISO-QUANT combination should be enclosed in parenthesis."

50. The proposal for data-heading keyword limitations proposed in Memo 4C-3/39 was rejected.

51. It was agreed to add the following note to the EXFOR Manual concerning the transmission of corrections.
    "In special cases, the 4-Centers would agree bilaterally to transmit corrections at less than a subentry level. It is the responsibility of the originating center to correct its archives and to provide any center who requests it with the complete corrected subentry with alter flags.
    (A modified wording was suggested in 4C-3/43 pages 11 and 15.)

The originating center shall notify the other centers of the corrections being made via 4-Center Memo. The memo should include the new date on the archive subentry and the new card images of those records to be corrected."

52. The code X was removed from the HISTORY codes.

IV.f LEXFOR

53. LEXFOR was accepted in principle with comments from the centers to be received by January 1, 1972. An update will be issued by NNCSC within 2 months after the deadline with all uncontested points remaining unchanged.

54. LEXFOR is regarded as a significant contribution to the EXFOR system. Appreciation for the efforts of Lemmel in preparing it were expressed.

55. It is the intention of NNCSC to issue a draft composite EXFOR-LEXFOR Manual, possibly before the next 4-Center Meeting. (This was commented in 4C-3/43 page 11.)

IV.g Handling of important data outside the scope of EXFOR.

(a) Fission product yields and any other needed fission data.

56. As Crouch (Harwell) is preparing by February '72 a fission product classification scheme, all 4C-memos concerning this subject will be forwarded to him by NDS. NDS will formulate a 4C-memo on the coding of fission product yields at least 2 months before the next 4-Center meeting.

(b) Half-lives and other supplementary data.

57. It was agreed that the compilation of half-lives is outside the scope of EXFOR agreements, and that there are other sources of such data, such as the Chart of the Nuclides, Table of Isotopes.

(c) Capture gamma spectra.

58. It was agreed that gamma-ray line intensities vs. gamma energy as a function of neutron energy are important. They are at present not being compiled on a regular basis at any center. NNCSC will prepare a detailed proposal of how to include these data within the EXFOR format.

59. Compilation of these data is likely to present a great additional workload to the centers. After 4-center approval of an EXFOR format for compiling capture-gamma spectra, the assistance of outside groups in the systematic compilation of this data should be sought.

(d) Fission neutron spectra

60. NDS will prepare a proposal describing how fission spectra data could be included in EXFOR.

IV.h Other details pertaining to EXFOR

61. In cases where it is impossible to obtain data and thus there will be no entry of the data into the EXFOR system, it is recommended that a BIB-section be written and sent as an EXFOR entry. A complete proposal will be submitted by NNCSC.

62. The proposal of CCDN in Memo 4C-2/21 that a new alter flag (R) be added was accepted.

"In case of complete replacement of a large number of records, e.g. rewriting of a BIB section, replacement of a table, etc. instead of the alter flags I,C,T and D, the alter flag R for the whole trajectory changed may be used. Under HISTORY should be written what has been done and why, e.g.

(710608A) Between 1.0 eV and 700 eV data replaced by a new set calculated from the old one averaging over five data points

or

(710709A) BIB section rewritten; full paper published."

(An amended wording was suggested in 4C-3/43 page 12 and agreed to in 4C-2/23.)

63. Reference to literature sources are recommended for use in free text rather than accession number references as some centers do not have accession number based systems.

64. Centers are requested to reply to the proposal of memo 4C-2/21, paragraph 3, concerning data lines without numbers referring to the ISO-QUANT.

V. CINDA in detail

V.a Completeness and literature coverage of CINDA.

65. Tubbs made a computerized check of CINDA against the CCDN data index in order to generate data tags for inclusion in CINDA 71. His analysis of the check is attached as document 4CM/VII/12. While it was possible with reasonable accuracy to identify experimental CINDA entries for which no corresponding data lines existed, the proportion of these references containing numerical data can only be guessed and no conclusions were drawn as to how much of the available data had been coded.

66. Goldstein summarized a study made by Whitehead at DTIE on 2000 entries from his area which Tubbs found to be in SCISRS-I but apparently not in CINDA. In the 551 of these that Whitehead had investigated by September 1971, roughly one third (181) were not in CINDA; 66 of these were private communications. The remaining two thirds were in CINDA but in forms not corresponding to SCISRS.

67. Lemmel's experience with CINDA 71 and its First Supplement dated March/April 1971 was that journal articles, conference papers, and progress reports were covered well and promptly, but laboratory reports in some areas were not.

68. Popov reported that CJD is expanding its coverage of literature for CINDA. Preprints are now being covered from all USSR institutes. CJD Bulletins (including Bulletins 5 and 6) and collections of abstracts will also be covered.

V.b Report on the new systems at CCDN and DTIE.

69. Goldstein informed the meeting that differences in the computers available to CCDN and to DTIE required that the CINDA systems be internally quite different at the two locations. The principal new feature in both systems is a linkage through a "block number" assigned to each measurement of Z/A/Q.

70. Tubbs has summarized CCDN thoughts on this subject in attachment 4CM/VII/13. CCDN agreed that it would work out with DTIE a scheme by which CINDA could serve as an index to data entries in EXFOR. The proposal would be circulated to the Four Centres by January 1972. The Centes agreed to evaluate the proposal and circulate their responses by March 1972.

71. The schedule for publication of CINDA and its Supplements from CINDA-71 through the CINDA-72 Supplement was submitted by NDS (Document 4CM/VII/14).

VI. Evaluated data in detail

VI.a World-wide coordination of evaluation activities.

72. The subject of world-wide coordination of evaluation activities was discussed. Schmidt reported that the August 1971 IAEA Evaluation Panel had discussed this subject. The Evaluation Panel had expressed interest in the establishment of a world-wide evaluation newsletter. Such a newsletter is expected to facilitate coordination since it might contain information about evaluation activities being carried out within each country. Schmidt gave a brief description of the French Evaluation Newsletter which is compiled by Ribon (Saclay).

73. As to the possibility of a world-wide evaluation newsletter, Schmidt suggested that if such a newsletter was started it might operate in parallel with the O.E.C.D. newsletter for a period of time. All 4-Center participants agreed that such a newsletter would be very useful.

74. Concerning the Evaluation Panel interest in a world-wide evaluation newsletter, the 4-Center participants encouraged the NDS to submit this proposal to INDC.

VI.b Published index and documentation.

75. The subject of a published index of evaluated data sets was discussed, but did not appear to be a matter of major concern to the 4-Centers at this time. CCDN intends to publish a new compilation of evaluated data sets in a CCDN Newsletter early in 1972. NDS will send to CCDN information from the Evaluation Panel on UKNDL, KEDAK and ENDF/B-II by January 1, 1972. Pearlstein said that the contents of the ENDF/B-III library will be available by January 1, 1972 and will be sent to CCDN.

VI.c Technical details concerning the exchange of evaluated data between the four centers.

76. Pearlstein reported that the August 1971 Evaluation Panel discussed the technical details of the exchange of evaluated data. Representatives at this panel had expert knowledge of the details of each of the major library formats. The translation of evaluated data from one format to another was discussed and the Panel made recommendations on how the various formats might be modified to reduce translation difficulties.

77. Evaluation format problems were discussed and it was agreed that the continued exploration of the technical details on the translation of data from one format to another would facilitate the exchange of data on a 4-center basis.

78. Abramov recommended that evaluated data formats should allow for specification of the estimated error for each cross section given. All participants agreed that error specifications were important although none of the major formats allow for this type of information at the present time. Popov mentioned that the details of the formats for error specification had been completed at Obninsk but these formats have not been formally adopted.

79. Should an agreement for the exchange of evaluated data between the 4 Centers be reached, evaluations in any of the well documented formats are acceptable until the situation can be reviewed.

80. The appearance of evaluations in little known formats is discouraged. It was recommended that changes to the major library formats be well documented and made available as soon as possible by the responsible center.

VII. RENDA in detail

VII.a RENDA format.

81. For future RENDA publications, Schmidt asked that those Centers involved in contributing to RENDA use a common format which will minimize translation difficulties for transmitting to NDS their entries for the RENDA file. NDS will distribute a suggested format for review by the Centers mindful of existing computer differences.

VII.b World Request List.

82. Schmidt recounted for consideration the proposed schedule of a first World Request List by the various organizations now involved with RENDA. (Document 4CM/VII/15)

83. During a discussion of the purposes and methodology of preparing Request Lists, it was agreed that the Four Centers follow Abramov's suggestion and recommend to the agencies sponsoring RENDA that it is desirable to include an assessment of the uncertainty of the current state of knowledge of each cross section for which a measurement is requested. This is more demanding, but also more informative, than a mere statement of errors of individual experiments.

CCDN Progress Report since the Paris Four-Centre meeting

1. INTRODUCTION

During the period under review the CCDN has continued to disseminate information on literature, experimental data and evaluated data, and to answer requests for measurements in the field of neutronics. There have been no new activities.

2. CINDA

The CCDN has continued to prepare entries for its service area, to carry out computer operations on behalf of the three European centres and to send exchange tapes to DTIE. The reprogramming of the CINDA system is also in progress, and it is hoped that by the time CINDA 72 is published the new programmes will be in operation. The main object of the work is :

- to have the system running under direct access in order to speed up all the operations;
- to include a regular link with the NEUDADA library to make CINDA the International Data Index.

3. EXPERIMENTAL DATA

NEUDADA continued to be the system on which the CCDN bases its activity of collection and distribution of experimental data to customers of its service area. During the period under consideration the CCDN answered ~160 requests, ~15% of which were forwarded by NDS on behalf of laboratories in the USSR and their own service area.

Apart from the activity on EXFOR, described in more detail under another item on the agenda, the main activity of the experimental data group was the systematic correction of the so-called "internal" file of the NEUDADA library, the addition of uncoded data and the recompilation of the comments. The CCDN has derived considerable benefit in this task from the appointment of liaison officers, and it is hoped to continue this scheme.

4. EVALUATED DATA

CCDN's activities in this field continued to be restricted to the collection and distribution of evaluated nuclear data libraries. During the past year the following files were added to those already available :

- Pu^{239}, Pu^{240} and Pu^{241} data by Ribon in U.K. format;
- The capture and scattering cross-sections of 192 fission products by Cook in U.K. format;
- A partial re-evaluation of the Benzi high-energy capture cross-sections for isotopes with $32 \leq Z \leq 66$ with the addition of $\sigma_{n,2n}$.

The programmes for the edition of the libraries and for retrievals are in course of implementation.

5. RENDA

In accordance with the proposals made at the 14th meeting of the EANDC, responsibility for producing the next edition of RENDA has been turned over to the INDC. A four-centre co-operation will be worked out in which NDS will care for publication of the list and will operate the computer system. The next issue will, however, be based on the following agreement: CCDN will prepare entries from areas 1 and 2, and NDS those from areas 3 and 4. The computer operations will be executed by CCDN at Saclay, while publication will be the task of NDS.

14th October 1971

PROGRESS-REPORT FROM IAEA NUCLEAR DATA SECTION

1. INTRODUCTION

This is only a short account of the progress made during the past year's period; for a more comprehensive description we refer to the report of NDS to INDC, INDC(NDS)-31/L, submitted to INDC at its last meeting in July 1971 in Bombay.

During the past year, Bak (Korea), Koster (South Africa), Konshin (USSR), Kaas (Austria), and Lorenz (USA) have left NDS. Bak, Koster, and Kaas have recently been replaced by Lemley (USA, LASL), Calamand (France), and Lammer (Austria) respectively. Dr. Konshin will soon be replaced by Dr. Vlassov from Kiev, there is still no replacement for Mr. Lorenz.

2. DATA CENTRE ACTIVITIES

2.1. Experimental and evaluated data

The conversion of old DASTAR into EXFOR entries is half-way completed, almost two thirds of the priority 1 DASTAR entries have been converted.

The progress in the compilation of data has been held up by the fact that for budgetary reasons the posts of the main compilers Bak and Koster had to be kept open for more than six months. With the arrival of the replacing staff members, compilation of new entries has been taken up to the required extent; in particular the procedures have been brought up to date which are to make sure that data originating from the NDS service area are completely compiled into EXFOR.

As long as there is no Four-Centre data index NDS keeps its old index GINDU, which references all entries of experimental and evaluated data in the NDS data files including now also EXFOR entries. The next edition, CINDU 10, will be published shortly.

Regarding the promotion of data centre use, NDS, similarly to CCDN and NNCSC, has recently published a little brochure describing its objectives and activities. In the same context a field trip of Hans Lemmel to laboratories in six East European countries at the end of 1970 deserves mentioning. This trip helped particularly to improve NDS' knowledge of nuclear data needs and activities in these countries. A more comprehensive account of this field trip is to be found in INDC(NDS)-31/L, Appendix J.

The service functions of NDS are routinely recorded in three logs, a request log, designed to keep continuous account of all nuclear data requests which are sent to and from the NDS, and two logs for distribution of experimental and evaluated data. These logs in particular permit statistical analysis of the data centre's use. Up-to-date

statistics regarding nuclear data requests and the dissemination of experimental and evaluated data, covering in particular the period since the start of the EXFOR exchange, 1 July 1970, until 15 October 1971, are contained in Appendices 1 and 2 to this report.

2.2. CINDA

In April this year CINDA 71 was published for the first time by IAEA on behalf of the four CINDA Centres. CINDA 71 showed as particular feature an improvement in readability and a reduction in cost by using Linotron 505 phototypesetting. A first supplement to CINDA 71 has been published in August 1971, the future CINDA publication schedule is as follows:

15 January 1972	CINDA 71, Suppl.2 including Suppl.1
1 July 1972	CINDA 72
1 December 1972	CINDA 72, Supplement.

The number of CINDA entries which was approximately 55.000 in CINDA 69, has increased to more than 75.000 in CINDA 71; this represents an increase almost twice as large as it used to be in earlier editions. As a consequence, CINDA 72 will probably have to be published in two volumes retaining the order of the entries by Z,A. The completeness of CINDA coverage from the NDS service area is under good control.

2.3. Data Reviews

Recent NDS reviews cover the following data:

- fast fission cross sections for Pu-239, Th-232, Np-237 and U-238,
- α (Pu-239) (cooperation with Harwell),
- fast U-238 capture,
- $\bar{\nu}$ (E) data for all heavy nuclides,
- prompt fission neutron spectra, and
- thermal data of the main Pu isotopes and their fission products.

These reviews are published or being finished and were mostly performed in preparation of or in response to IAEA panels and specialists meetings.

Future plans concern a third update of the 2200 m/sec fission constants, a revised review of prompt fission neutron spectra (action from fission spectrum consultants meeting), a review of fast U-235 fission cross sections for the Second IAEA Panel on Neutron Standard Reference Data in November 1972, and a status report on neutron data

used in reactor radiation measurements for the next meeting of the IAEA Working Group on Reactor Radiation Measurements in June 1972.

The computational tool which has been applied to all of the reviews performed to date by NDS is a "weighted least-squares autogonal polynomial fitting programme", which had been developed at and taken over from CERN at Geneva.

3. COORDINATING ACTIVITIES AND SURVEYS

For the IAEA panel on Neutron Data Evaluation, Vienna, 30 August - 3 September 1971, NDS has prepared a worldwide survey of neutron data evaluation needs and activities in IAEA Member States. This survey is just being improved by contributions from the evaluation groups concerned and will be published together with all other papers submitted to the panel and the panel's recommendations and conclusions in proceedings to be issued during the first quarter of 1972.

The responsibility for the production, distribution and review of the request list for neutron data measurements for reactors, RENDA, has been transferred from EANDC (ENEA/CCDN) to INDC (IAEA/NDS). Simultaneously its scope is extended from an OECD to a fully international scale. NDS and CCDN are preparing a first draft of this request list for distribution to INDC and EANDC members at the end of February 1972. Comments from INDC and EANDC members will be discussed at the forthcoming INDC Meeting in July 1972, and before the end of 1972 a final first worldwide RENDA be issued. Afterwards a Four-Centre cooperation for the preparation of input to regularly update RENDA editions is suggested, which is outlined in a separate document submitted to this meeting.

Upon request of INDC, NDS has made an enquiry into nuclear data needs for thermonuclear fusion reactors. From the response received from the main fusion groups NDS is at present preparing a request list which will be submitted to the next INDC Meeting, after screening by the IAEA Fusion Council.

Regarding nuclear data requests for safeguards, procedures have been agreed inside and outside IAEA which ensure the full screening of safeguards nuclear data requests from the safeguards point of view before reaching INDC for discussion. At present NDS, in cooperation with the Agency's Division of Safeguards Development, is preparing an official nuclear data request list for safeguards purposes; the edition of this list, however, will still take some time.

With the appropriation of US$ 15.000 for FY 72, NDS has initiated a small programme regarding the supply of accelerator targets and samples for nuclear data measurements particularly for developing countries. A number of requests have been received already, the

availability of the requested materials is discussed with the relevant groups at BCMN, Geel, and at Oak Ridge. The IAEA is guided in its assistance by the recommendations of INDC to which these questions have to be submitted.

4. MEETINGS

In 1971 NDS held two topical meetings, a consultants meeting on the Status of Prompt Fission Neutron Spectra, 25-27 August, and a somewhat larger panel on Neutron Nuclear Data Evaluation, 30 August - 3 September; both meetings were held in Vienna.

The intention of the Fission Spectrum Meeting was in particular to review the status of differential fission spectrum measurements for the main fissile and spontaneously fissioning isotopes for thermal and fast neutrons and to work versus a conclusion of the well-known discrepancy between differential and integral spectrum determinations.

The objective of the Evaluation Panel was to review the methods, quality and present status of neutron nuclear data evaluation, and to examine the basic requirements and programmes associated with establishing and exchanging computer based evaluated neutron data libraries.

5. INDC SECRETARIAT

The INDC Secretariat, as part of the IAEA NDS, performs the secretarial functions of the INDC. These comprise in particular the maintenance and regular publication of a list of INDC correspondents, the maintenance of contacts with a network of INDC liaison officers particularly in countries within the NDS service area, the distribution of INDC documents and the occasional translation of documents.

Requests for →	Experimental Data		Evaluated Data		Documents		Cinda Retrievals		TOTALS	
Request origin ↓	Cumulat. totals	1 Jul 70 -15 Oct 71	Cumulat. totals	1 Jul 70 -15 Oct 71	Cumulat. totals	1 Jul 70 -15 Oct 71	Cumulat. totals	1 Jul 70 -15 Oct 71	Cumulat. totals	1 Jul 70 -15 Oct 71
Incoming from area 1	22	2	1	0	20	9	0	0	43	11
" " " 2	32	3	1	1	37	17	1	1	71	22
" " " 3	59	20	30	18	43	23	15	7	147	68
" " " 4	34	5	12	7	8	1	7	0	61	13
Incoming: Subtotal	147	30	44	26	108	50	23	8	322	114
Follow-up to area 1	54	16	1	1	0	0	0	0	56	17
" " " 2	49	17	9	7	2	1	15	3	75	28
" " " 3	46	1	0	0	0	0	0	0	46	1
" " " 4	28	5	1	1	2	0	0	0	31	6
Follow-up: Subtotal	177	39	11	9	4	1	15	3	208	52
NDS origin:										
sent to area 1	24	12	1	1	1	0	0	0	26	13
" " " " 2	30	18	3	1	3	2	4	0	40	21
" " " " 3	100	12	0	0	0	0	0	0	100	12
" " " " 4	11	2	0	0	0	0	0	0	11	2
NDS origin: Subtotal	165	54	4	2	4	2	4	0	177	48
TOTALS	489	123	59	37	116	53	42	11	706	224

Appendix 1. NDS request statistics.

Appendix 2

Experimental Data Dissemination *

(as of October 15, 1971)

	Number of data sets		Number of data lines	
	Cumulative total	1 July 70-15 Oct.71 period	Cumulative total	1 July 70-15 Oct.71 period
To Area 1	531	0	34.921	0
" " 2	253	4	15.639	4
" " 3	673	346	177.075	59.094
" " 4	146	31	94.808	14.376
Total	1.603	381	322.443	73.474

Evaluated Data Dissemination

(as of October 15, 19971)

	Number of data sets		Number of data lines	
	Cumulative total	1 July 70-15 Oct.71 period	Cumulative total	1 July 70-15 Oct.71 period
To Area 1	217 (Cook data)	192	89.620	89.620
" " 2	232	193	89.787	89.787
" " 3	1596	804	1.170.668	710.320
" " 4	414	141	464.966	318.669
Total	2459	1330	1.814.941	1.208.296

*Excluding EXFOR transmissions

CJD Progress Report for year ending October 1971

During the period in question, the Centre has published Bulletin of the CJD No. 6 and also Collection of Abstracts No. 10. Number 11 of this series is now being prepared. A total of 51 sets of CINDA cards, involving 665 lines of bibliographic information, were sent to Vienna. The number of requests for information that were met was 57; 9 of these were from abroad. The first CJD EXFOR tape has been revised and a second one has been prepared; both are on their way to Vienna. The second tape contains 8 major entries, one of which is from the recent May 1971 Kiev conference.

The most noteworthy advance in the Center has been the installation of a dedicated computer, an M-222, which is now being prepared for use. A British Plessy magnetic tape unit is being installed for use with the computer. Two programmers, in cooperation with Moscow State University and other institutes, are preparing a FORTRAN translator. Until the tape unit is in operation, our centre will have some difficulties in translating information from Western tapes into Russian and vice versa. That is why only the most vital data are being written on our transmission tapes.

NNCSC Progress Report

1. Introduction

For the past year the NNCSC has continued its work into the three major areas: compilation, evaluation and computer application.

2. Computer Applications

The NNCSC now has in operation a graphical display run on a PDP-15. A new computer room has been completed adjacent to the centre.

3. Compilation

A binary library for the CSISRS data system has been created and is in operation. A retrieval system, parts of which have already been implemented, is being developed to operate on the binary version.

The translation of SCISRS-I data to the EXFOR format has been completed. The physics checking has been completed for Z = 88 - 100.

BNL-400 Volume II has been published. The policy concerning future publication of BNL-325 is being formulated.

We have begun urging experimentalists to send us data in the CSISRS format, and have been having much success, with at least four major data producers adopting our format thus far.

Code for checking data in the EXFOR format are in operation. In the past year four EXFOR transmission tapes have been sent out.

4. Evaluation

A preliminary third version of the Evaluated Nuclear Data File (ENDF/B-III) has been distributed to the Cross Section Evaluation Working Group. It contains 50% more evaluations than ENDF/B-II largely due to the inclusion of files for individual fission product nuclides. The new library also contains photon production and interaction data for several nuclides. The neutron data has been processed through a preliminary version of PSYCHE, a physics checking code. A review of these preliminary data and the approval of data for wide distribution took place at a CSEWG meeting December 1-2, 1971.

Agenda item II.2

Recommendations to NDS relevant to the four centres from Nuclear Data Committees, Steering Committees, scientific meetings and other bodies

A. Consultants Meeting on Nuclear Data, Vienna, 14-18 December 1970

This meeting was held between the staff of the NDS and Drs Popov and Zelenkov from the USSR. The meeting discussed a wide range of topics and the results are summarized in NDS Memo 144. The main item of 4-Centre interest which was reiterated was that the EXFOR format should undergo no further modifications.

B. Meeting of the IAEA Working Group on Reactor Radiation Measurements, Vienna, 19-21 April 1971

Upon the recommendation of this working group NDS is shortly to prepare a status report on neutron cross section data commonly used in reactor radiation measurements and investigation of irradiation effects and to submit it to the next meeting of the Working Group in June 1972. The data concerned are thermal capture and fission cross sections, capture and fission resonance integrals, energy dependent and fission spectrum averaged (n,p), (n,α), (n,f) and (n,n') reactions for selected nuclei. The help of the three other centres will be asked for providing NDS with experimental and evaluated data on these reactions according to specific requests to be sent out soon.

C. IAEA Panels on Pu-Recycling and Reactor Burn-up Physics, Vienna, June and July 1971

Two IAEA Panels on Pu-Recycling and Reactor Burnup Physics took place in June and July 1971, which expressed in their recommendations certain data needs that should be compiled by the 4 Centres with high priority. These are:

1. The IAEA thermal fission data review should be continued and possibly extended to other Pu-isotopes, mainly Pu-242 and Am-isotopes.

2. Fission-yields, not only for thermal neutrons but especially for fast neutrons, and variation of fission-yields with neutron-energy.

3. Thermal cross-sections of fission-product nuclides.

4. Energy-dependent cross-sections in the thermal range are needed for Am-241, Am-243, Cm-242, Cm-244, Pu-238, Np-237, U-236.

./..

D. Fourth INDC Meeting, Bombay, 12-16 July 1971

The major responsibility for the coordination, compilation and production of the world request list (WRL) RENDA has recently passed from the EANDC Secretariat (ENEA) and CCDN to the INDC Secretariat, i.e. IAEA/NDS. Consequently, NDS submitted a proposal to the last INDC Meeting in Bombay concerning the organization of the WRL operation to come into effect after the issue of the first final WRL RENDA, i.e. after end of 1972. This proposal was discussed and, with some minor changes, approved by INDC. As it involves suggestions regarding four centre cooperation for the preparation of regional input to RENDA, this document is separately also submitted to this Four-Centre Meeting for discussion under items III.4 and VII of its agenda.

During the INDC meeting the question arose whether fission product data should be included among the data to be compiled by the four centres. In particular E. Rae agreed to investigate the possibility of including the Harwell files with fission product yield data in the four centres' data files. In view of the recent interest shown by Obninsk and, in view of the general urgent interest of reactor designers in those data it is recommended that this subject be taken up at the Four-Centre Meeting (items III.2 and IV.8a of the agenda). For this purpose NDS has prepared a preliminary proposal for the classification of fission product data submitted in a separate document to the meeting. Liskien recently met fission product specialist and compiler E.A.C. Crouch from Harwell, responsible for the above-mentioned fission product data compilation, who promised, by February 1972, to submit to the four neutron centres a more thorough classification scheme of fission product data. This will be discussed and compared with NDS' proposal and a resulting combined proposal be submitted to the centres at an appropriate time in 1972.

E. IAEA Consultants Meeting on the Status of Prompt Fission Neutron Spectra Vienna, 25-27 August 1971

The consultants meeting on prompt fission neutron spectra recommended that both the [spontaneous fission spectrum of 252Cf] and the [fission spectrum of 235U below 150 keV incident neutron energy] be regarded as standards. This was, of course, the most important one of the recommendations. Other recommendations of interest to the centres are particularly the requests for new data as follows:

- Improved absolute fission cross sections for 238U above 0.5 MeV, 235U above 100 keV and 239Pu above 100 keV, as well as inelastic scattering data on 238U above 1.5 MeV. These data are needed for the interpretation of integral measurements, as the meeting felt that existing discrepancies cannot be resolved by improvements of differential data alone.

- Integral data on fission cross sections of 235U and 238U in spectra of the two standards.

- The age of 252Cf fission neutrons to Indium resonance in H_2O from a point source.
- $^6Li(n,\alpha)T$ cross section and triton distribution.

The meeting made also these observations:

- The Maxwell distribution is not always satisfactory to represent the spectra.
- Terrell's formula for $T(\bar{\nu})$ has limited validity.
- It is desirable that in measurements the neutrons can be specifically identified as being of fission origin.
- It is also desirable that measurements cover a large energy range.

Of particular concern for the data centres are the recommendations regarding data and other information from those measurements which are still in progress. Reference was made to the data centre of the appropriate service area. Copies of all information will also be sent to the Nuclear Data Section, which is going to review all the new data again, in some near future. The importance of submitting complete information was emphasized. The following items seem to be of particular interest:

- calibrations, particularly desired is the use of a controlled monoenergetic neutron source, or of another method with equivalent accuracy, such as associated particle counting or manganese bath.
- corrections applied to the data.
- error analysis (to a considerable detail).
- "a detailed technological description" of the apparatus and its environment. Some participants put great emphasis even on a pictorial representation of the apparatus. This raises, of course, the point of the centres' possibilities to serve as depositories for graphs and similar forms of information.

F. IAEA Panel on Neutron Nuclear Data Evaluation, Vienna, 30 August - 3 September 1971

The recommendations and observations of this Panel were, in the large, directed either to the Agency or to the national Institutes which develop, maintain and/or use the major evaluated neutron data libraries. Those recommendations of direct or indirect relevance to some of the Centres essentially all emerged from the report of the Sub-Group which dealt with the "Establishment of Computer Libraries of Evaluated Data and Associated Computer Programmes". Dr. Pearlstein who was the Chairman of that Sub-Group, will report on the results of that Sub-Group when we discuss Agenda Item VI.2.

G. Second IAEA Panel on Neutron Standard Reference Data, Vienna, 20-24 November 1972

This panel will lay particular emphasis on a discussion of the discrepant fast fission data of 235U. For this purpose, and as a basis for the discussions, NDS will prepare a review document on 235U fission data, and the help of the three other centres will be asked in due time to provide, upon specific request, 235U fission and e.g. related ratio data.

H. IAEA Symposium on Collection, Compilation, Evaluation, Indexing and Dissemination of Applied Nuclear Data, early 1973

This Symposium was recommended by INDC and found the approval of the Agency's Scientific Advisory Committee at its meeting in December last year. Because of budgetary reasons and in order to hold the Symposium close in time to the meeting of the International Working Group on Nuclear Structure and Reaction Data, which is supposed to meet in about annual intervals, a date early in 1973 seems to be favourable. So far no arrangements have been made for the symposium. Time, place, agenda topics, invited speakers, etc., will be discussed at the INDC Meeting and at the first meeting of the Working Group.

In addition to the Working Group's annual meetings, which obviously can only convene a restricted number of selected experts, the Symposium could fulfill the very important function of bringing together the various nuclear data groups from all over the world for an extensive exchange of experience, giving each of these groups the opportunity to describe its programmes, aims, services, and achievements to the other groups, and helping to bridge the (anyhow artificial) gap between neutron and non-neutron data groups.

The programme committee for this symposium is still in the stage of formation: Havens and Schmidt from INDC will take part in it, a Soviet participant will soon be nominated, and it is expected that the IAEA Working Group on Nuclear Structure and Reaction Data at its first meeting, 13-17 March 1972, in Vienna will nominate one or two additional members. The committee is then expected to meet and to develop in detail the programme of the Symposium, so that invitations to Governments for participation in the Symposium can be sent out soon afterwards, say around May 1972.

*
* *

Agenda item II 3

Who requests what? (NDS)

Requestor	No. of Requests	Request Subject
ARG	2	NDS eval. Lib., documents
AUL	11	Many, C retr., UK file, Fiss
BZL	9	UK & BCL, documents
CHF	1	doc = Cinda & Renda
CSR	4	docs, UK file: Be009
3GER	5	docs, FProd with TØT, ACT, RIR
HUN	17	docs, NDS eval.Lib., FProd with many, All with NT, NH, Na, Ng, Abs, SIN, SEL etc... Cinda retrievals (Csikai). FProd with NG (Feher)
IAE	3	Dragnev = AUL ev. Lib. Houtermans = V & X = 49 In & 13Al.
IND	32	Cinda retr., many X with many, Fiss (Garg, Metha, Nadkarni, Hattangadi, Srikantiah, Satyaprakash, Iyer) Documents, Kedak & UK.
ISL	10	003Li - 5B with ABS, SEL, SIN, DEL, DIN, TOT for Ben-David. 062-064 with NA (Cheifetz) Dastar eval. for Yiftah. Cinda retr. Pu for Caner. documents 094 Pu eval. for Yiftah.
KOR	6	many UK & Kedak files (Chung) documents 040Zr - 049 In with NG, N2N, NP, Na (Bak)
NZL	6	020 Ca with NP, NNG, NA, DEL (Robinson) 009F, 053I with DEL, SEL (Bartle) 015P, 023V with DEL, DIN (Callaghan) 063 Eu-066Dy with ALL (Tindle). Documents.
PAK	12	016S, 026Fe, 059Pr, 064Gd with TØT (Hussain) 011 Na, 023V, 026Fe, 031Ga, 053I, 064Gd with SCT, Na (Islam). Fiss with NF & FRS 023V - 064 Gd with TOT & DEL (Hussain) documents
POL	5	034Se, 040Zr, 042Mo with N2N (Decowsky) Cinda, Cindu books
RUM	4	all Kedak (Rapeanu) 040 Zr with TSL, FVL, SEL, RES, SIN, ABS, STF (Rapeanu)

Requestor	No. of Requests	Request Subject
SAF	6	Documents 025Mn with SEL,DEL,TØT (Barnard) 092U " DIN, SIN " 090Th " DEL,SEL,TOT +UK evl." all BOL,UK,Kdk (Grosskopf,(Pel)).
*) SF	3	Compounds TSL.(Sefidvash) Documents (Palmgren) all Kdk & UK (Saastamoinen)
TAI	1	document
YUG	4	Cinda, Cindu books 016Ø with all (Raisič) all Kdk documents

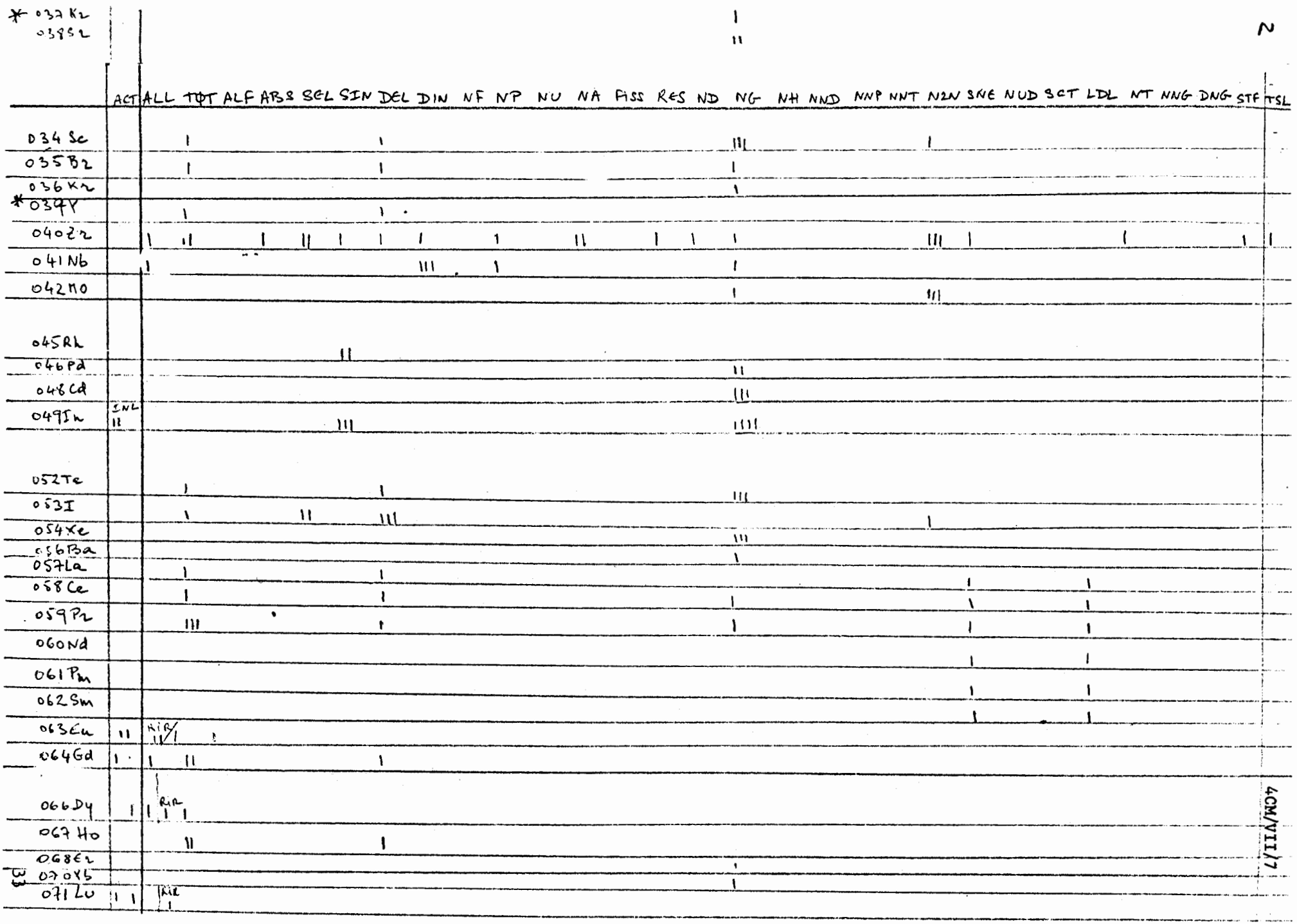
*) requests made when SF was in area 3 (now in area 2).

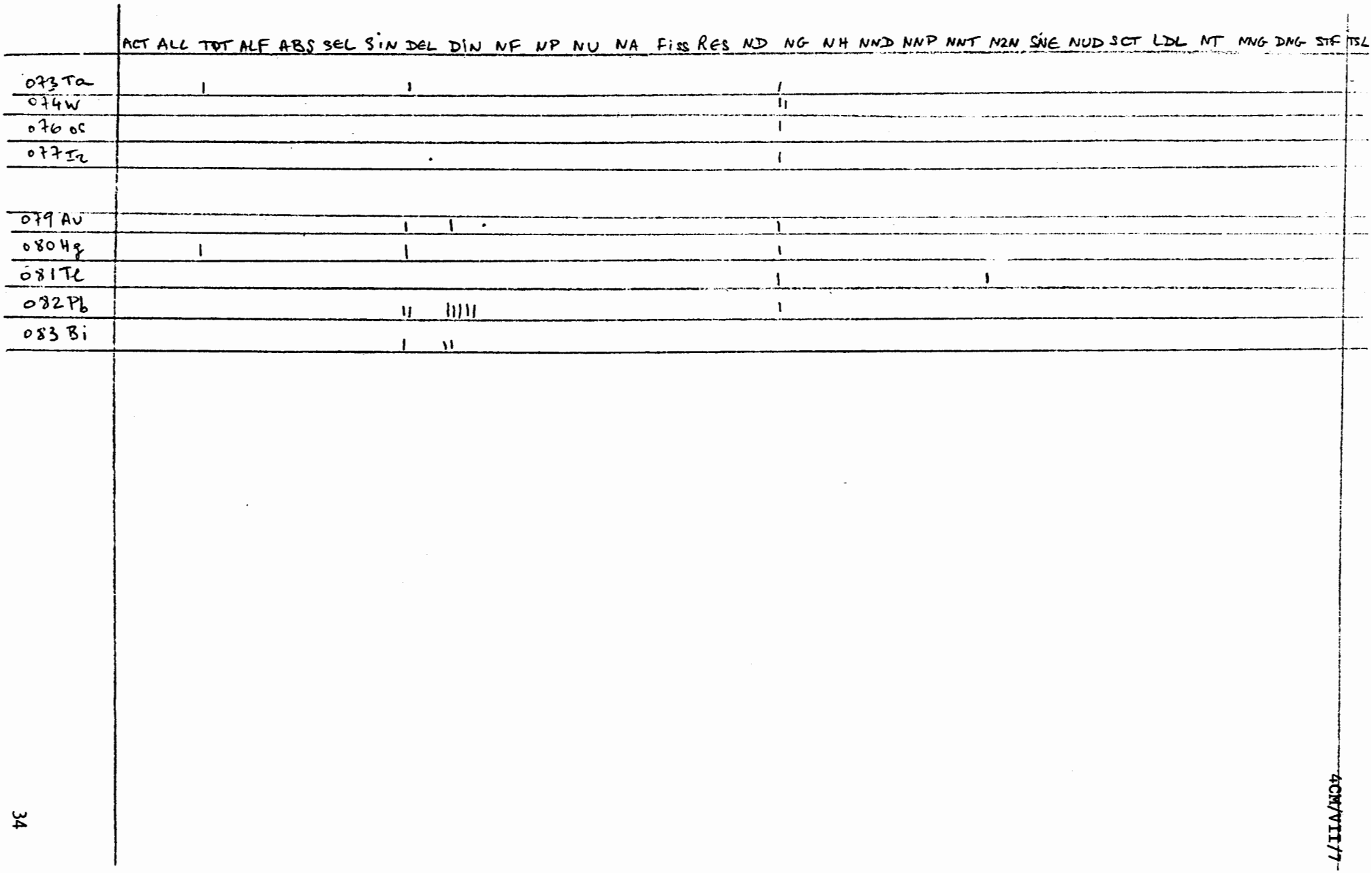
4C/VII/7

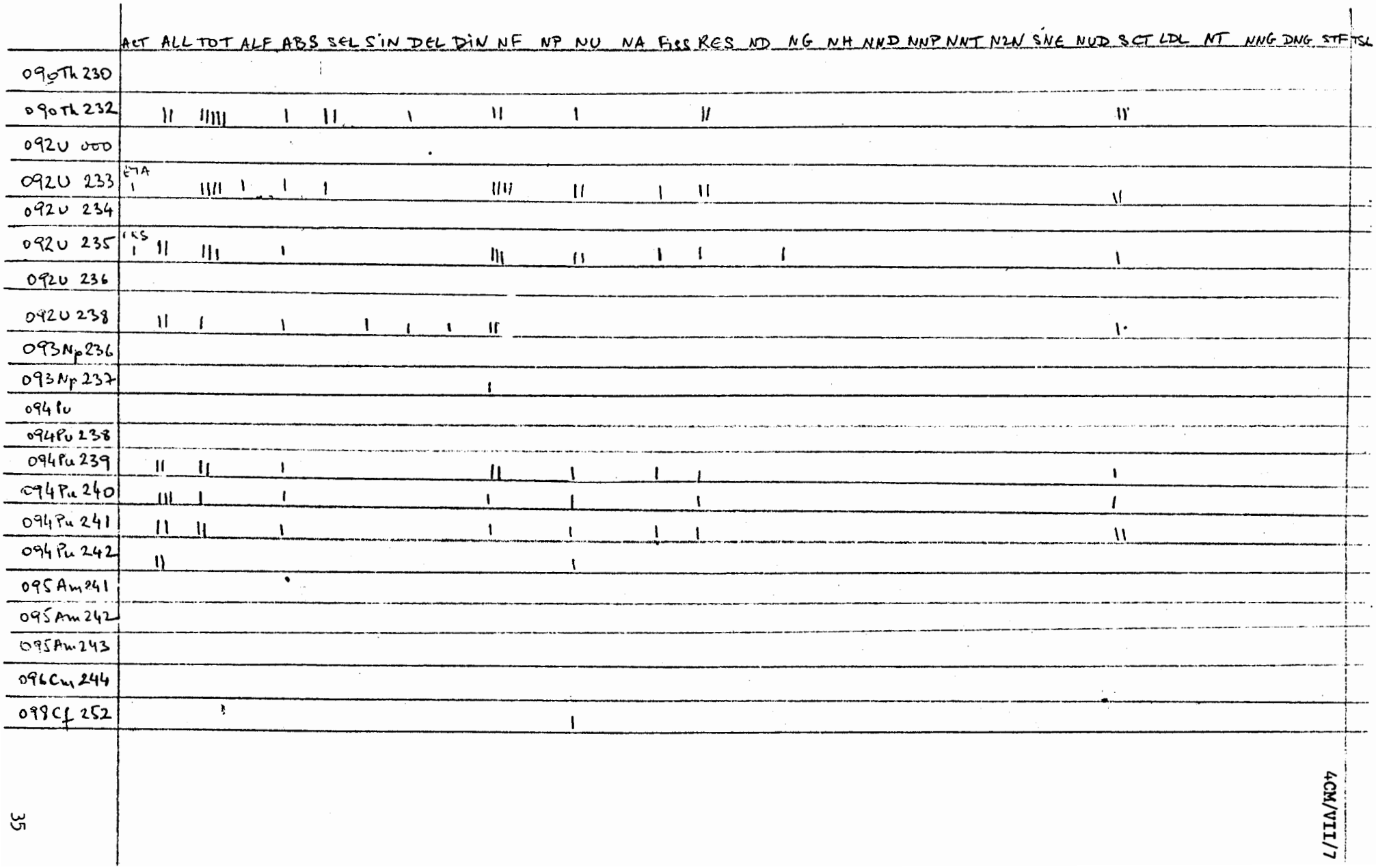
Agenda item II 3

Nuclides and Data Requested / NDS

	ALL	TOT	ALF	ABS	SEL	SIN	DEL	DIN	NF	NP	NU	NA	FISS	RES	ND	NG	NH	NND	NNP	NNT	N2N	SNE	NUD	SCT	LDL	NT	NNG	DNG	TSL
ALL																							+		I				
MANY				I																									
028 Ni 061																									I				
- - 4																									I				
026 Fe 058																									I				
001 H 001																													
003 Li		I		I	I	I	I	I													I					I			
004 Be	I	I		II	II	II	I	I		I		II			I	I					II	I				I			
005 B	II	II		II	II	II	II	II													II								
006 C							I																						
007 N				I	I	I				I		I			I	I					I	I				II			
008 O	I						I																						
011 Na							I									II													
012 Mg										II																			
013 AL	I									II		IIII																	
014 Si		III																											
015 P							I	I				I																	
016 S		III								IIII		I																	
020 Ca							I			II		I				I											I		
022 Ti										II																			
023 V		I					II	I																					
024 Cr																													
025 Mn		I			I		I																						
026 Fe		III					I	I		IIII																			
027 Co																													
028 Ni								II		III											II				I				
029 Cu																I													
030 Zn										I						I													
031 Ga																I													
032 Ge																II													


ACT ALL TOT ALF ABS SEL SIN DEL DIN NF NP NU NA FISS RES ND NG NH NND NNP NNT N2N SNE NUD SCT LDL NT NNG DNG STF TSL
032 Kr
038 Sr
034 Se
035 Br
036 Kr
037 Y
040 Zr
041 Nb
042 Mo
045 Rh
046 Pd
048 Cd
049 In
SNL
052 Te
053 I
054 Xe
056 Ba
057 La
058 Ce
059 Pr
060 Nd
061 Pm
062 Sm
063 Eu
RIR
064 Gd
066 Dy
RIR
067 Ho
068 Er
070 Yb
071 Lu
RIR
4CM/VII/7


ACT ALL TOT ALF ABS SEL SIN DEL DIN NF NP NU NA Fiss RES ND NG NH NND NNP NNT N2N SNE NUD SCT LDL NT NNG DNG STF TSL
073 Ta
074 W
076 Os
077 Ir
079 Au
080 Hg
081 Tl
082 Pb
083 Bi


ACT ALL TOT ALF ABS SEL SIN DEL DIN NF NP NU NA FISS RES ND NG NH NND NNP NNT N2N SNE NUD SCT LDL NT NNG DNG STF TSL
090Th 230
090Th 232
092U 000
092U 233
ETA
092U 234
092U 235
FRS
092U 236
092U 238
093Np 236
093Np 237
094Pu
094Pu 238
094Pu 239
094Pu 240
094Pu 241
094Pu 242
095Am 241
095Am 242
095Am 243
096Cm 244
098Cf 252

REQUESTS RECEIVED BY CCDN DURING THE PERIOD 1.10.70 - 30.9.71

During the period under review the CCDN answered 254 requests: 43 of these were forwarded by NDS (Vienna) on behalf of its service area and of Russia, and 10 by NNCSC (Brookhaven).

Types of request

Experimental data	.....	162
Evaluated data	.....	77
References	.....	15

Origin of the requests

Austria	4	
Belgium	18	(17 from Euratom centres)
Denmark	-	
Finland	1	
France	72	
Germany	31	
Italy	9	(3 from Euratom centre)
Japan	14	
Netherlands	8	
Norway	1	
Spain	-	
Sweden	5	
Switzerland	4	
United Kingdom	34	

Explanatory Notes

Comments on II.c, II.e,

II.c

(a) Experimental data requests
~2 requests/3 working days (average over a year). See statistics.

(b) What data asked:

1) Reactor material (all kind) (fast region).

2) Threshold reactions (n,p), (n,2n), (n,α), (n,3n)....
(Standards, detectors).

3) Exotic (scattering length, level density parameter).

(c) By whom:

Evaluator, Experimenter, Industry, Chemist, Research.

(d) For what purpose: (see (c)).

(e) How often: (see (b)) 1) ~50%
2) ~45%

(f) Standing requests:

For data not yet released.

II.e

Austria, Finland, Sweden, Denmark, Norway plus some big data sets in connection with recent data (Cierjacks, Geel).

Requests received by NNCSC

Nine Month Summary of CSISRS Requests - 1/1/71 - 9/30/71

The number of requests for data received in the first three quarters of the year here at the Center are summarized below. Both the SCISRS-I and CSISRS-II libraries were queried, and output was sent to users in the form of either tape and/or printouts, and, in one case, plots.

REQUEST SUMMARY-1971

Month	Received From NNCSC	IAEA	Other	Total	Year-to-Date Total
Jan.	2	0	6	8	8
Feb.	2	2	6	10	18
Mar.	1	1	8	10	28
Apr.	4	3	4	11	39
May	5	3	16	24	63
June	3	3	11	17	80
July	0	3	4	7	87
Aug.	2	4	10	16	103
Sept.	0	0	7	7	110

Data requests in this time period have averaged 4 ISO-QUANTS per request, supplied on tape and/or printouts.

In addition all data transmissions have been sent to Livermore.

Requests* for ENDF data for the period July 1970 to July 1971 are summarized as follows:

Request Summary - July 1970-June 1971

1970 Month	No. of Requests	1971 Month	No. of Requests
July	9	Jan.	14
Aug.	19	Feb.	4
Sept.	14	Mar.	17
Oct.	16	Apr.	18
Nov.	9	May	12
Dec.	10	June	18
	77		83

Form of Request

Written - 81
Verbal - 79

Origin of Requests

	Requests	%
U. S. Government Laboratories	53	33
U. S. Industrial Laboratories	63	39
U. S. Universities	22	14
Foreign	22	14

*Data requests in this period included 121 transmissions of full ENDF tapes and 39 transmissions of selected materials.

CSEWG Recommendation on Compilation of Nuclear Structure Data

M. K. Drake

June 7, 1971

The Cross Section Evaluation Working Group recommends that a unified data system be established for the computerized storage and retrieval of nuclear structure data (sometimes known as non-neutron nuclear data). CSEWG further recommends that agreements be established for the free and rapid exchange of these data on an international basis. CSEWG endorses the leadership role taken by the Nuclear Data Section of the International Atomic Energy Agency for the promotion of exchange of non-neutron nuclear data. CSEWG also endorses a proposed effort by the American Physical Society's Ad Hoc Panel on Nuclear Data Compilations to bring nuclear data files up-to-date.

CSEWG wishes to point out that there are many applied areas where nuclear structure data are important. These areas include evaluated nuclear data for nuclear reactor design, radiation shielding, dosimetry, reactor safeguards, and controlled thermo-nuclear reactor design among others. Some of the important data types are given below along with their area of use.

Requirements For Nuclear Data Evaluation

Data Type	Use	Most Important Isotopes
Nuclear level schemes (energies, spins, parities, isotopic spins, deformation parameters)	Neutron cross section evaluations, optical model and Hauser-Feshbach. Calc. of σ_{total}, $\sigma_{e\ell}$, σ_{non}, $\sigma_{n,n'}$, $d\sigma_{e\ell}/d\Omega$, $d\sigma_{n,n'}/d\Omega$	Isotopes of structural materials (Al, Si, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zr, Nb, Mo, Ta, W, and Pb) Heavy isotopes (Th-232, Pa-233, U-233, U-234, U-235, U-236, U-238, Pu-238, Pu-239, Pu-240, Pu-241, and Pu-242, Am-241, Am-243, and Cm-244)
Nuclear masses, reaction Q values, neutron binding energies, level density parameters, plus nuclear level scheme data (Above)	Statistical model calculations of $\sigma_{n,\gamma}$, $\sigma_{n,2n}$, $\sigma_{n,p}$, $\sigma_{n,\alpha}$, etc.	Isotopes of structural materials (see above) Isotopes produced by neutron induced fission
Nuclear level schemes (above) plus decay modes of levels, branching ratios, multipolarity of photons, mixing ratios, level widths or half-lives, internal conversion coefficients for electrons, secondary gamma ray spectra (from neutron induced reactions)	Evaluated data on gamma rays produced by neutron interactions, $\sigma_{n,x\gamma}$, $d\sigma_{n,x\gamma}(E_\gamma)/d\Omega$, and spectra of secondary gamma rays. (Some nuclear model calculations of above cross section types)	Isotopes of light elements (He, Li, Be, B, C, N, O, Na, and Mg) Isotopes of structural materials (see above) Heavy isotopes (U-235, U-238, Pu-239, Pu-240, Pu-241, and Pu-242)

Requirements (con't)

Data Type	Use	Most Important Isotopes
Nuclear masses, reactions Q-values, isotope (or level) decay particle energies, decay branching ratios vs excitation energies.	Evaluated activation cross section data sets.	Isotopes used in dosimetry detectors or foils.
	Establishing decay chain data sets.	Isotopes produced by neutron induced fission.
Certain charged particle and γ,n cross sections	Evaluated neutron cross section sets when inverse reaction or charge-conjugate systematics can be used.	Certain common light and medium mass isotopes.
Natural abundance of isotopes plus most data types listed above.	Used as basic data for physics checking of the ENDF/B library.	All materials in the ENDF/B library.

Excerpts from INDC(NDS)-30

Re: Nuclear Structure and Reaction Data

In response to a number of proposals on the topic of non-neutron nuclear data that have been received in the course of the last few years, the IAEA convened a group of consultants, from the USA, France, the Netherlands and Euratom (Geel), in Vienna, 23-25 November 1970. The task of these consultants was to review the status of nuclear structure and reaction data with regard to its compilation, evaluation and dissemination. The conclusions and recommendations of this Consultants Meeting are contained in the report INDC(NDS)-30, distributed March 1971.

In summary, the status reports presented at the meeting demonstrated a severe shortage of manpower, funding and coordination in the existing dispersed activities which has contributed to a delay of data coverage of the order of five years. The principal recommendation of this consultants group was for the IAEA to take the necessary initiative steps to form an "International Working Group on the Compilation, Evaluation and Dissemination of Nuclear Structure and Reaction Data". The suggested Terms of Reference for this Working Group are included in the Consultants Meeting report INDC(NDS)-30.

In accord with its fundamental objective, which is to work for peaceful application of nuclear energy, the IAEA can deal only with those data which are of important applied interest. Consequently, the first most important task of the Working Group will be to determine the important needs and priorities in "non-neutron nuclear data" in various applied nuclear fields. So far definite needs can be seen for fission and fusion reactors. There seems to be a rather vast, but still mostly rather vaguely determined need in the field of safeguards. A more precise definition of the real needs will be necessary for the various applications of radioisotopes, activation analysis, etc.

*
* *

First Meeting of the International Working Group
on the Compilation, Evaluation and Dissemination
of Nuclear Structure and Reaction Data

13 - 17 March 1972

PROVISIONAL AGENDA

1. Opening and announcements

2. Organization, general data scope, title of the Working Group, etc.

3. Needs in the user communities
   a) Status of surveys of needs; kind, depth and form of the needed information; first results and conclusions
   b) Priorities; particularly high priority needs.

4. Compilation of experimental data
   a) Current status of compilation activities including scope and depth of compiled data and related information; level of computer use, available staff and funds, etc.
   b) Feasibility of extending the collaboration on the collection of data and related information from experimentalists
   c) Needs for agreements on formats for exchange of compiled data and related information and possible ways of implementation

5. Evaluation
   a) Current status of evaluation work, including manpower, equipment and funds available for the purpose. Special attention should be given to those phases of the evaluation works, which are the greatest "mechanical" obstacles, and which are potential fields of improvements in a cooperative effort.
   b) Evaluation methods, criteria and documentation.
   c) Feasibility of compatible computer formats and files for evaluated data.

6. Recommendation to authors, editors and journal reviewers regarding requirements on content of publications on nuclear physics experiments.

7. Dissemination; optimization of information transfer between nuclear data centres and users.

8. Feasibility of a "Non-neutron CINDA".

9. A program for longer-term (meaning at least a couple of years) activities of the Working Group, to take full account of the recommendations of the Nov. 1970 Consultants Meeting as revised at this meeting.

10. Summary of actions and recommendations

It is recommended to the Director General of the IAEA that an International Working Group on the Compilation, Evaluation and Dissemination of Nuclear Structure and Reaction Data be formed. The general terms of reference of this group are suggested to be:

- To establish guidelines for the compilation, evaluation and dissemination of nuclear structure and reaction data.

- To review comprehensively the status of, and needs for, nuclear structure and reaction data and to establish guidelines for international coordination of compilation and evaluation work and to investigate means for providing dissemination of data that will adequately serve the users.

Specific long-term objectives of the Working Group were suggested as follows:

A. Compilation

- To review the current status of, and needs for, compilation activities.

- To prepare recommendations for the scope and depth of data to be compiled (including errors, experiment detail, etc.).

- To try to subdivide the compilation tasks among centres according to physical or geographical criteria.

- To seek to find optimum ways of transferring information (feasibility of making compatible data files, formats and index terms).

- To prepare recommendations to authors, editors and journal referees, regarding appropriate documentation of published or otherwise disseminated data.

- To investigate the question of the level of manpower and funding necessary for comprehensive implementation of the compilation tasks.

B. Evaluation

- To review the current status of, and needs for, evaluations.

- To discuss experience in and guidelines for evaluation.

- To investigate the feasibility of compatible computer formats and files for evaluated data.

- To study the feasibility of making available to users computer programs for data handling.

C. Dissemination

- To investigate the relative usefulness of different information media such as monographs, primary journals, review journals, laboratory reports, and magnetic tapes and other computer media.

Symposium on the Collection, Compilation, Evaluation and Distribution of Applied Nuclear Data

I. Nuclear Data Needs for Applied Programs.

A. Fission Nuclear Reactors
B. Thermonuclear Energy Systems
C. Nuclear Safeguards
D. Geophysical Applications
E. Medical Applications
F. Activation Analysis
G. Tracer Studies

II. Collection and Compilation of Nuclear Data.

A. Collection and Compilation of Nuclear Data for Fission Reactors
B. Collection and Compilation of Nuclear Data on Light Nuclei
C. Collection and Compilation of the Data for the Nuclear Data Sheets

III. Evaluation of Nuclear Data.

A. For Fission Reactors
B. Nuclear Reaction Data
C. Decay Schemes
D. Computer Aids for Nuclear Data Evaluation
E. Arranging the Data in a usable, convenient machine recoverable format
F. Bottle necks in Nuclear Data Evaluation

IV. Cooperative Efforts in Nuclear Data Compilation and Evaluation.

A. The International Nuclear Data System
B. The Regional Neutron Cross Section Centers
C. Similarities and Differences between Neutron Data Compilation and Level and Decay Scheme Data
D. Possible Formats for Compilation of all types of Nuclear Data

V. Dissemination of Nuclear Data.

A. Research Journal Publications
B. Nuclear Data Reviews
C. Nuclear Data Center Services
D. Possible Improvements in Dissemination of Nuclear Data
E. CINDA and the Need for a Comparable Index for Non-Neutron Nuclear Data

Check of CINDA against CCDN data index

Nigel Tubbs, January 1971

The check was undertaken in order to restore the data tags in the 1971 CINDA edition and to provide some evidence of the usefulness of CINDA as a cumulative data index. However, the results of this check should be useful to data centres as well as (hopefully) to their customers, and the purpose of this note is to explain exactly what the output sent out to the other centres means, to show how it was obtained in order to make clear the limitations of the check and to quell any doubts about the validity of the results within these limits. The result of the comparison exists on tape as a merged library of CINDA experimental entries and data index lines plus link information, so that it may be possible with only small modifications to the data retrieval programme (FEEDIN) to make extracts from the matching information in some other form which would better fit the working patterns of each data centre.

The comparison has also yielded a number of statistics about the state of the data files relative to CINDA, which are extracted by a subroutine of FEEDIN. For the present, until an appreciable number of data have been exchanged under EXFOR, these statistics give a reasonable first picture of the data which have been compiled and of what remains to be done. As with the presentation of the matching information, it should not be too difficult to change the programme to answer more specific questions from the other centres.

Contents

I. The logic of the check

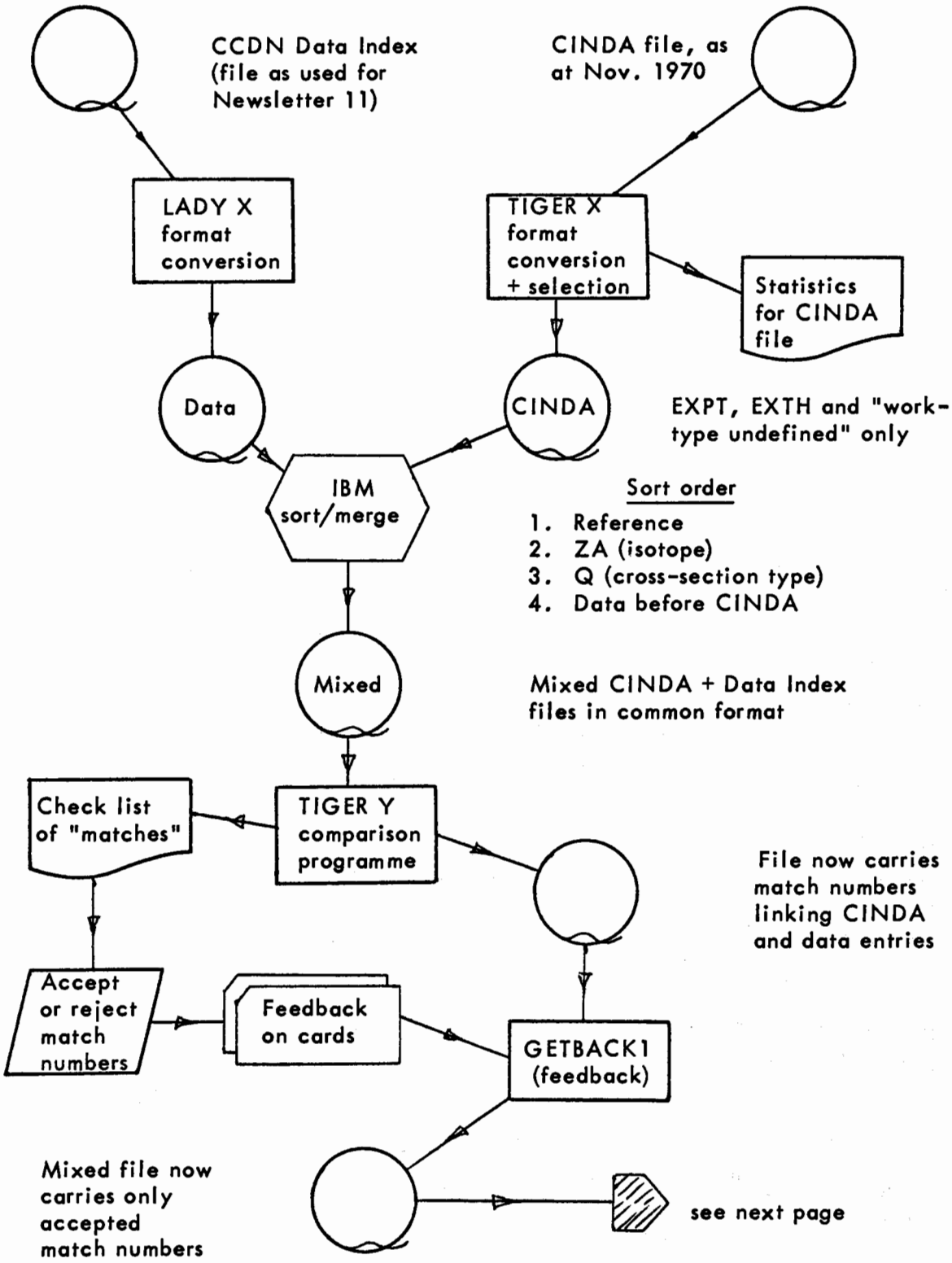
The block diagram on the next page shows how the check operation was done. The function of the programme set was to select potential pairs of equivalent CINDA entries and grouped data index lines, to accept feedback after manual checking of the lists of probable and possible CINDA/data index matches, and to present the final results as selective lists of information missing from either CINDA or the data files, plus statistics on the distribution of data/CINDA matches and information for updating the data tags in CINDA.

The basic problem in establishing equivalence between entries is to decide what information is needed uniquely to define an experiment and then to retrieve it from both CINDA and the data index. Because no strong format standards have been imposed on reference information in CINDA, the reference cannot be reliably retrieved for use in a comparison, so that we are left with ZA, Quantity, Laboratory, neutron energy and first author's name as the only easily manipulable clues to equivalence. If all these criteria agree as between entries in CINDA and the data index, there is a very high probability that the two entries correspond, and indeed very few matches selected by the programme on these criteria had to be rejected by feedback from the manual check of the list of putative matches. However, a great many entries remain which cannot be so conveniently paired, and a fairly complicated set of programmes had to be written in order to reduce the hand checking work to a reasonable level. It is probable that writing the programmes and doing the hand checking for feedback took as much effort as a hand check would have done: however, the presentation of the results is more flexible and the check can more easily be repeated if necessary in the future. About 15 physicist-days' checking work was required.

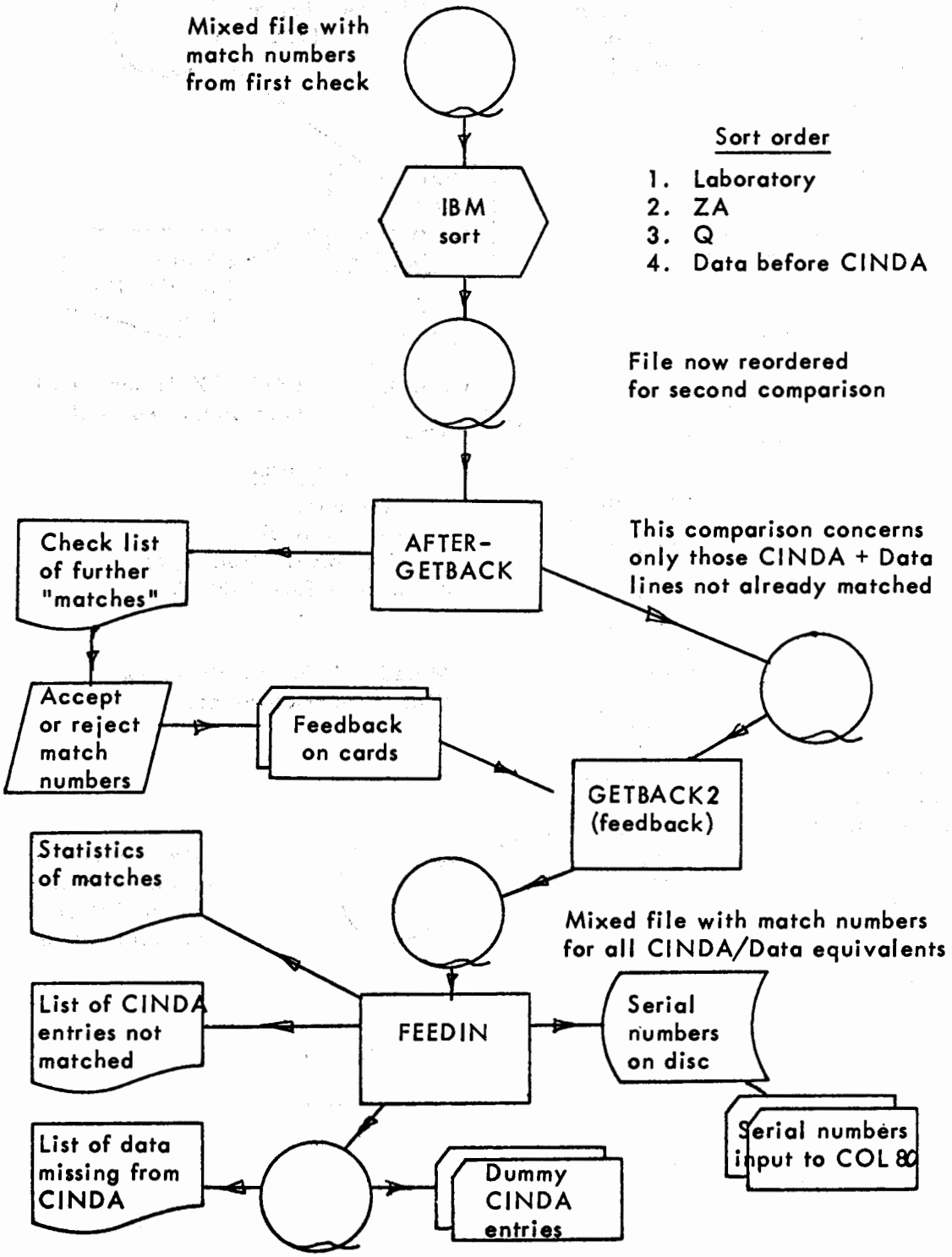
The check was in two stages, with feedback after each. In the first stage, sets of entries matching by ZA, Q, Reference and energy range were considered as probably equivalent, while pairs for which the energy range did not correspond were "possibles". In the second stage, "probables" were those pairs matching by ZA, Q, Laboratory, energy range and first author, while "possibles" failed to match by one of energy range or author. The feedback operation fails safe - only probable matches are retained on the tape unless deleted, while "possibles" must be explicitly approved to avoid deletion. Entries which have been matched in the first stage are not resubmitted for testing in the second stage. The files for checking were split (by Z) into six parts.

CINDA/Data Index Comparisons

Part 1 : by Reference, ZA, Q, Energy



Part 2 : by Laboratory, ZA, Q, Energy, Author



1. LADY X : Transposes the data index lines to the common format of the mixed CINDA/data file used in the comparison Translates the cross-section quantity to its CINDA equivalent and adds a compressed reference keyword for use in reference comparison (all blanks and non-alphameric characters are eliminated, so that the reference is "crushed" to the left).

2. TIGER X : Counts various statistics for the CINDA file; selects entries with worktype EXPT, EXTH or unspecified, and transposes them to the common format. To the CINDA entry is added a transformation of the ZAQ information, a compressed reference keyword and the neutron energy limits expressed in E format.

3. IBM sort-merge utility produces the common file ordered by

   i. Reference keyword reading from the left

   ii. ZA and CINDA equivalent cross-section quantity

   iii. Data first, then CINDA entries

4. TIGER Y : Checks for each CINDA entry whether there exist data index lines which are probable or possible matches to it.

Probable : One or more data index lines match the CINDA entry by Reference keyword, ZAQ, and energy range. The same arbitrary match number >10000 is assigned to all these records. Any possibly matching data entries in the Ref ZAQ group receive a match number $4700<M<5000$.

Possible : One or more data lines match CINDA by Reference, ZAQ only. A match number above 5000 is assigned.

Energy matching criteria

CINDA and data energies (numerical upper and lower limits for both files): $0,7<\frac{E_C}{E_D}<1,3$ for E min and E max

CINDA lower limit only given : $E_D \text{ min} = E_D \text{ max}$ and $0,7<\frac{E_C \text{ min}}{E_D \text{ min}}<1,3$

Alphabetic CINDA lower limit :

	Equivalences
E_C min	E_D min = E_D max
COLD, THR, PILE =	2.5E-02
SPON =	0.0E 00
FISS =	1.0E 06

CINDA energy blank : No energy match possible

For the hand check carried out on the possible matches in the list, a pair was considered to match if there was an overlap in the energy ranges of data and CINDA entries and if it seemed clear from other information that the entries referred to the same work.

5. GETBACK1: Compares numbers input on cards with the match numbers on the tape.

   i. Numbers >10000 remain unless matched by a number from the card input

   ii. Numbers between 5 and 10K are deleted unless matched

   iii. Numbers <5000 are deleted unless matched. If matched they are replaced by a corresponding number >10K.

6. IBM sort : Reorders the common file by Laboratory, ZAQ, Data before CINDA, and E min.

7. AFTERGETBACK : Selects all sets of data lines with common Lab, ZAQ for which one or more CINDA entries exist in the same Lab ZAQ, and writes each type into an array for pairwise comparison between all members of the two arrays (entries with match numbers >0 are excluded). Match numbers are assigned :

i. >10K for a CINDA entry and the data matching it by Lab, ZAQ, energy limits using the same criteria as TIGER Y, and the first four characters of the author name;

ii. <5K for pairs which match by Lab, ZAQ and one of the other criteria;

iii. 0 for all other numbers of the Lab, ZAQ group which contain no further matching information. These remaining entries were printed out for manual scanning.

8. GETBACK2: A variant of GETBACK1.

   i. All match numbers >5K are retained unless specifically entered on cards.

   ii. Pairs of numbers are read from cards. A first number matched on the tape is replaced by the second number of the pair, which is then kept. Numbers <5 K on the tape are erased unless matched in this way.

9. FEEDIN : Counts CINDA entries according to whether or not they are matched, and how, and prints out those which were not matched. The serial numbers of all newly matched CINDA entries are punched on cards for adding data tags via the existing COL 80 programme. The programme also counts matched and unmatched data index lines, and groups them together as "CINDA equivalent blocks" (one CINDA entry for Q=RES 3 can have many corresponding data lines). Dummy CINDA entries are prepared for those blocks which have not been matched and written on tape for later punching-out.

II. Output from the check

1. Entries missing from CINDA

It is expected that CINDA should be more complete than the data file. While this is certainly true, the check shows that there is more information missing from CINDA than ought to be. The lists of dummy CINDA entries are the residue of data index lines which could not be found in CINDA, and the contents can be broken down as follows :

i. Entries genuinely missing from CINDA. Some of the information may in fact be in the file, under references which are different but equivalent, or hidden by equivalences such as U = U^{238} and $\sigma act = \sigma n, \gamma$, or may have failed to match because of mistakes in either CINDA or the data (a frequent mistake in the data file is to enter data under the Z,A of the compound nucleus).

ii. Entries in CINDA as second cards. The format of secondary references is not well defined, so they could not be included in the tests.

iii. Entries which do appear as first cards in CINDA but which were not found to match because not enough information was accessible (e.g. Lab = blank in CINDA plus deviant reference format, non-standard or country abbreviation for the Lab in the data index).

For laboratories in the CCDN data service area, about 45% of the "missing" entries were in fact found in CINDA, and the remaining 55% of dummy entries should be merged. The credibility of the lists of "data-bearing CINDA entries missing from the data file" is somewhat reduced by this proportion of matches missed because of (ii) and (iii) above, but the effect of this should not be exaggerated: if the 45/55 ratio holds for other service areas, only 11% of entries in the lists sent out to data centres are already in the data file.

Note that a match is recorded if any data at all from a CINDA entry appear in the data index, so that for many CINDA entries with data tags the data may be incomplete.

2. 'EXPT' and 'EXTH' CINDA entries missing from the data index

The long lists of CINDA entries for uncoded experimental work contain four types of entry :

(a) Entries for which no laboratory is coded, and entries for which no worktype is given: in practice these two categories coincide.

From statistics covering all CINDA entries for which the worktype is given, we find that two-thirds fall in the categories EXPT and EXTH. It is reasonable to suppose that about the same ratio applies in the rest of the file. Likewise, a check on the origins of a sample of entries without laboratory information gives the result :

Sample total	U.S. + Canada	CCDN area	NDS area	USSR	Non-id.
521	378 = 73%	65 = 12%	2	38 = 7%	38 = 7%

(b) Experimental information missing from the data file. Of course, not all these references will contain useful numbers, but it does seem worthwhile to look.

Two possible causes of error exist: about 11% of these entries have been coded but were not found in the check; and some redundancy due to undetected multiple publication of the same work. Statistics from the check give the impression that redundancy in CINDA is very slightly less for matched entries than it is in the data file.

(c) Entries with an = data tag, showing that they exist in DASTAR if not in the BNC/CCDN files. Hans Lemmel expects that the = data tags will be reliable.

(d) Entries with data tags */$ not found in the match. These entries should obviously be checked to see whether they are really missing from the data file.

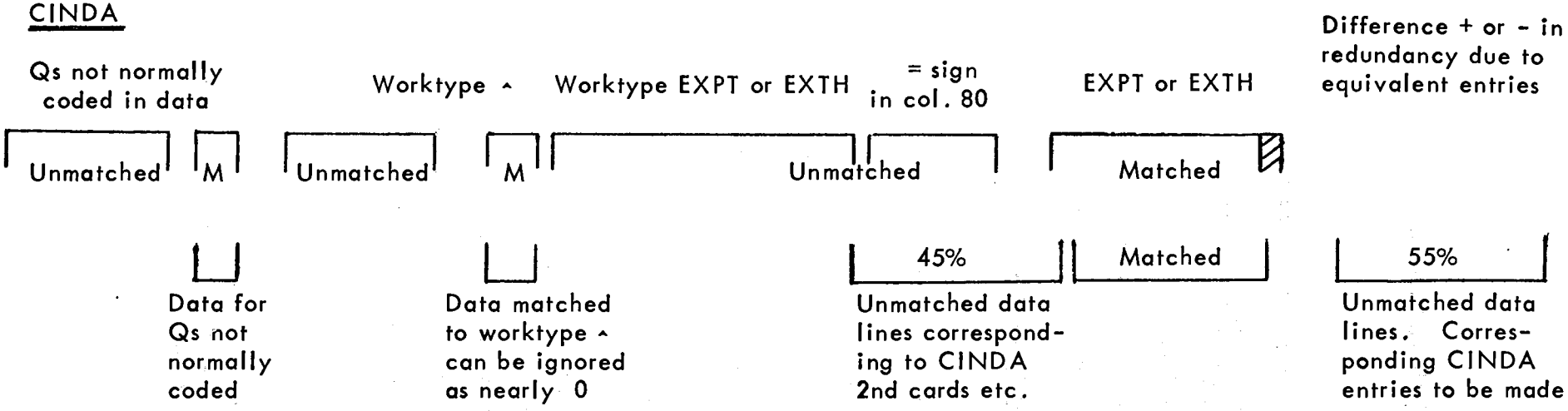
3. Other possible output forms:

It would be fairly easy to change the printout of Para. 2 so as to

- select laboratories from a single service area only;
- interleave "data missing from CINDA". This would make an instant visual check possible, thus overcoming most of the objections in Para. 2.

Whether the changes are worth making depends on how far the data centres find the present output to be useful.

CINDA



DATA INDEX (after grouping according to the CINDA/data quantity correspondence)

III. Assumptions made in calculating statistics

1. Data and CINDA entries for quantities not normally coded are ignored. Non-coded Qs are : EVL9, POL8, TSL9, SNG2, LDL3, GN5, and the fission quantities SFN7, SFG8, NFY9, FRS6, CHG5, GF7, FPG2.
2. Worktype/Lab = blank entries are taken as $\frac{2}{3}$ experimental, 73% U.S. area, 12% CCDN area, etc.
3. Differences in redundancy between CINDA and equivalent index line blocks are ignored.
4. The proportion of unmatched data lines concealed in CINDA is supposed equal for all service areas to that observed for the CCDN area (45%).
5. The '=' marks in CINDA col. 80 are assumed to indicate reliably the contents of the DASTAR data file. We suppose NDS do not have many data from OECD countries which CCDN do not have.
6. Errors in the entries (ZA, Q, etc.) are ignored, even though they produce 'unmatched' data.

Method of calculating percentages coded (allowed Qs only)

1. All experimental entries in CINDA

$$\frac{\Sigma\text{CINDA entries with = in col. 80, unmatched by data} + \Sigma\text{All CINDA equivalent data groups}}{55\%\ \Sigma\text{data groups unmatched in CINDA} + \Sigma\text{ data groups matched in CINDA}} + \Sigma\text{CINDA entries EXPT or EXTH unmatched by data} + \tfrac{2}{3}\ \Sigma\text{CINDA entries with worktype blank, unmatched}$$

2. Experimental entries from CCDN and NNCSC areas

$$\frac{\Sigma\text{ CINDA equivalent data groups for that area}}{55\%\ \Sigma\text{ data groups for area unmatched in CINDA} + \Sigma\text{ data groups for area matched in CINDA}} + \Sigma\text{ CINDA entries EXPT or EXTH for area, unmatched by data (this group is assumed to contain none with col. 80 =)} + \tfrac{2}{3} \times (12 \text{ or } 73\%) \times \Sigma\text{unmatched CINDA entries, worktype blank}$$

3. Experimental entries from USSR and NDS areas

$$\frac{\Sigma\text{CINDA entries unmatched with = in col. 80 for that area} + \Sigma\text{CINDA equivalent data groups for that area}}{\Sigma\text{ data groups for area matched in CINDA} + 55\%\ \Sigma\text{ unmatched data groups for the area}} + (\text{USSR only, } + 4.8\%\,\Sigma\text{unmatched CINDA entries, worktype blank}) + \Sigma\text{unmatched CINDA for area, col. 80 = (not included with the other unmatched CINDA entries)}$$

Statistics tables

The table on page 12 shows the geographical breakdown of the origins of data sets and experimental CINDA entries. Some comments about the meaning of these statistics are necessary :

(a) NOT ALL THE CINDA ENTRIES UNCODED WILL CONTAIN USEFUL INFORMATION. A true index of the proportion of data already coded would be approximately

$$\frac{\text{Total CINDA equivalent data groups}}{\text{CINDA entries matched in data file} + (\text{unmatched entries} \times \text{proportion containing numbers})}$$

Redundancy is not included in this expression, as to a first approximation we may suppose that redundancy is constant throughout the CINDA file and equal for CINDA entries containing numbers and the data index. Thus, for the whole file some data have been entered for 43 per cent of all CINDA equivalent entries. If we guess that a third of entries 'not in the data file' contain numbers, the proportion of available information coded becomes 69 per cent (= 43/(43 + 19)). A fortiori, these statistics say nothing about the proportion of data points or the 'proportion of useful information' still to be coded. Note, however, that quantities not usually coded have been eliminated from the comparison: these quantities form about 20 per cent of uncoded CINDA entries.

(b) The fact that data have been stored for laboratories in a certain area need not mean that they were entered by the data centre for that area, although from now on under EXFOR exchange such a division of labour can be expected. Thus, for data from the NDS and CJD areas, out of 3,218 entries

607 exist in Dastar files only

2,611 exist in the CCDN files and may also be in Dastar

Many of the data from the USSR, and a certain number of those from western Europe, were coded at BNL.

(c) The proportion of entries in the data file but not in CINDA is taken as 55 per cent of the unmatched dummy CINDA entries. Where numbers are small this estimate cannot be taken too seriously, in particular for Z = 71 up for NDS service area.

(d) The number of entries missing from CINDA is larger than it should be. For the CCDN area 700 new entries are being made as a result of the check. Estimates of what is required for other areas are :

USA + Canada	1,660 entries
NDS area	130 entries
CJD area	430 entries

This is 6.9 per cent of the total estimated main CINDA entries referring to experimental work for quantities actually coded in the data files (32,100 excluding compounds, etc.).

The only general conclusions to appear from the table concern the importance of OECD countries as a source of data and an apparent neglect of the fissionable elements relative to the rest. If a sufficient sample of the output for 'CINDA entries not in the data file' can be checked to see which references contain numbers worth coding, it will be possible to guess at the proportion of available data coded so far.

IV. THERE ARE LIES, DAMNED LIES, AND STATISTICS

Variable	Service area	Z=1-16	Z=17-34	Z=35-52	Z=53-70	Z=71-88	Z=89 up	Total
Total data groups coded	NNCSC	1467	1607	1415	863	1099	888	7339
	CCDN	809	845	440	298	307	468	3167
	NDS	230	314	322	195	151	18	1230
	CJD	256	396	481	220	283	352	1988
Total CINDA equivalent entries for experiments*	NNCSC	3290	3654	3157	2074	2503	2602	17280
	CCDN	2030	1777	1075	755	856	1193	7686
	NDS	491	606	495	342	ca. 218	ca. 100	2252
	CJD	545	1084	1080	631	609	794	4743
Percentage of these CINDA entries coded	NNCSC	45	44	45	42	44	34	42.4%
	CCDN	40	48	41	39	36	39	41.2%
	NDS	47	52	65	57	ca. 69	ca. 18	54.6%
	CJD	47	37	45	35	47	45	41.9%
	All centres	43.4%	44.3%	45.7%	41.6%	44.0%	36.6%	42.8%
Percent contribution of service area to total of data	NNCSC	53	51	53	54	59	51	53%
	CCDN	29	27	17	19	17	27	23%
	NDS	8	10	12	12	8	ca. 1	9%
	CJD	9	12	18	14	15	20	14%

.../...

Variable	Service area	Z=1-16	Z=17-34	Z=35-52	Z=53-70	Z=71-88	Z=89 up	Total
Percent contribution of service area to total experiments in CINDA	NNCSC	52	51	54	55	60	55	54%
	CCDN	32	25	18	20	20	25	24%
	NDS	8	8	8	9	5	ca. 2	7%
	CJD	8	15	18	16	14	17	15%

* These figures contain an estimate of the proportions of "worktype blank" entries referring to experiments and the geographical distribution of the laboratory of origin. Also, except for CCDN, the proportion of unmatched data groups which are not to be found in CINDA is estimated. In the sum of these figures over all Z, the part due to these estimates is :

NNCSC 17%, CCDN 3%, NDS 6%, CJD 12% Overall 12.3%

CINDA as an EXFOR index: Notes on CINDA work at CCDN

Nigel Tubbs, 21.10.71

CCDN work on CINDA has concentrated in the last year on satisfying the preconditions for CINDA to become the "integral" index to data stored at the four centres.

Our working plan to achieve this falls into three parts :

1. (carried out in Autumn 1970). A "once-only" comparison between CINDA and the October 1969 index to data in the CCDN files. This check served to convince ourselves, and we hope the users and the other data centres, that CINDA could serve as the common published index to four-centre data files. It gave us a good idea of the usefulness of different search criteria for matching CINDA entries with the corresponding data: we were also able to produce lists for each area of experimental entries for which no data had been coded and a first, if rather rough, estimate of what proportion of the data available had been coded.

2. Reprogramming CCDN CINDA storage operations, and upgrading the file to meet the minimum information content demanded by the new system. So far we have

   (a) completed and tested our file conversion programmes. These proved more successful in extracting "hidden" information from the old file than we had hoped, so that it has been possible to correct low-grade entries individually (we had originally intended to write special programmes for this). Samples of this conversion have been sent to DTIE and NDS for checking;

   (b) for the second supplement to CINDA 71 we have replaced nearly all entries, from all service areas, which did not contain the basic parameters needed to identify an experiment: Z, A, Quantity, Laboratory. For our own service area we have replaced most of those secondary reference entries which could not be fully interpreted by our conversion programmes: we hope other CINDA centres will do likewise, but this is not essential to the initial operation of the new system.

(c) written and tested the translation and conversion programme for entry into the CCDN master file of material from the three European centres (new entries, plus commands for deletion or modification of material already on file). Input produced by CINDA readers will look very like it does now: however, given the need for a file with homogeneous information content, plus our experience of how hard it is to detect wrong entries once they are in the present file, testing will be more stringent than before;

(d) written and tested the file maintenance programmes for

- dictionary maintenance

- handling all incoming entry material, which is to be kept on disc until it is either found acceptable in form and content and applied to the main file, or corrected and recycled for application to the main file, or output in a suitable form for return to the originating centre. A first test cycle incorporates the test programme in (c) above and is ready. Hans Willars is now working on the second, "limbo", stage, in which entries are checked against the main file to see if they can sensibly be applied to it (this concerns mainly modification and deletion of entries).

Basic file maintenance will make use of the ISAM facilities provided by DOS PL/1, though independent programmes must be written to produce output for exchange and safety backup. Given the consistent quality of the file, it is hoped that basic retrieval programmes, to get data for customers, and to supply tapes for the book, will be easy to write.

3. Setting up programmes to carry out a regular, semi-automatic, comparison between CINDA and the CCDN data index, which will be supposed to contain the material sent to CCDN in EXFOR. We do not expect to get useful results from this work before the end of 1972 and have included provision in the current programmes for manual cross-referencing of data, so that the new CINDA file might carry information about data sets as they are newly included in EXFOR exchanges.

While it is anyway important that CINDA should cover the neutron physics literature as completely as possible, it is essential that there be entries in the CINDA file for all the data sets in the four centres' numerical files. A byproduct of the CINDA/data check made last year was several thousand "dummy" CINDA entries, referring to data sets apparently without correspondence in CINDA. When these entries were

checked for the CCDN service area it was found that rather over half could be identified as secondary entries in CINDA, or were in CINDA as main entries but could not be matched because of deficiencies in the entry. However, it seems reasonable to estimate that between two and three thousand new or corrected CINDA entries were required to close the gap. Accepting a certain amount of duplication of information, CCDN's approach has been to include about 700 dummy entries for which no equivalent could be identified on closer manual inspection of the file: a number of these may well be eliminated on comparison with the literature. We expect such entries will be eliminated or corrected when the new system is running and we can send retrievals from the file to individual laboratories and readers for checking.

CINDA: Publication schedule and distribution

1) Publication schedule for CINDA-71 and CINDA-72.

As a result of discussions between Dr. Liskien, CCDN, and NDS staff on 18 March 1970, the following deadlines for CINDA-71 and CINDA-72 were agreed upon.

	CCDN [1] Deadline	Estimated publication Date
CINDA-71	1 Dec 1970	20 April 1971
CINDA-71, Suppl.I	7 May 1971	30 Aug 1971 [2]
CINDA-71, Suppl.II	15 Oct 1971	15 Jan 1972 [3]
CINDA-72	1 Apr 1972	1 July 1972
CINDA-72, Suppl.[4]	1 Oct 1972	1 Dec 1972

Notes: 1) CCDN Deadline = Deadline for last entries to reach CCDN.

2) Cannot be brought forward because of printing of papers for Geneva Conference.

3) Cannot be brought forward because it is budgeted for 1972. Should not be delayed as we must avoid shipping tapes and films over Christmas/New Year holidays (experience tells us so !).

4) Only one supplement envisaged for CINDA-72.

2) Detailed schedule for CINDA-71, Supplement II.

15 Oct. 1971	CCDN deadline = deadline for last entries to reach CCDN.
12 Nov. 1971	CINDA-Supplement Master tape received at NDS.
22 Nov. 1971	Processing at NDS completed and tapes shipped to ZKD.
6 Dec. 1971	Linotron processing completed and film shipped to NDS.
15 Jan. 1972	Printing and binding completed. Ready for distribution.

Further notes:

a) The format of the publication will not change for CINDA-71 Supplements I and II.

b) As a result of reprogramming at CCDN, the internal file format will be established by the end of June 1971. As soon as possible after June 1971 decisions must be made on a new CINDA book format (if desired) so that the necessary reprogramming for the photo-typesetting can be completed by 1 April 1972.

CINDA Distribution

The total number of copies distributed of CINDA 71 Suppl. 1 was 1420.

Thereof	530	ENEA
	400	USAEC
	270	various subscribers, incl. USSR
	53	NDS service area and INDC

plus one copy per member-state, etc.

WORLD REQUEST LIST AND RENDA STATUS - PROPOSAL FOR MERGING

by

A. Lorenz

Nuclear Data Section (NDS), IAEA

As stated in the communication from the EANDC Chairman, W. W. Havens Jr., to the INDC Chairman, G. A. Kolstad, dated 10 November 1970, the EANDC Committee has recommended at its October 1970 meeting that the non-EANDC request list for neutron nuclear data measurements (which has been compiled by the NDS for the INDC) be combined with RENDA, to form one world-wide request compilation.

In addition to this major policy decision, the EANDC also recommended that:

1. The world request list be produced by the IAEA,

2. The combined request list be a joint cooperative effort between IAEA and ENEA,

3. The responsibility for the detailed review of the world request list be passed from the EANDC to the INDC.

Further recommendations with regard to scope and distribution of the world request list (WRL) were also made.

The actual implication of this recommendation is that the major responsibility for the coordination, compilation and production of the WRL passes from the EANDC Secretariat (ENEA) and CCDN to the INDC Secretariat, i.e. IAEA/NDS.

Inasmuch as both ENEA and IAEA, i.e. their respective nuclear data centres, are directly affected by this decision, the NDS, in full agreement and cooperation with the CCDN, is proposing the following to serve as the basis of the WRL operation.

In general, all efforts will be made to set up the WRL operation on the basis of the RENDA/EANDC Request List and on the past experience gained by the CCDN/ENEA operation of that system. Also, inasmuch as the operation of the WRL involves the four regional nuclear data areas as defined in the international nuclear data

exchange operation EXFOR, it would be efficient and expedient to organize the WRL operation within that same framework.

The following five points proposal of the WRL operation outlined below should be considered:

1. Input: All new submissions for the WRL would be submitted to the INDC members well in advance of their yearly meeting, through the INDC Secretariat (NDS). These new submissions, originating from the four regional nuclear data areas, should be screened by the local data committees charged with this responsibility, prior to submission to the INDC Secretariat (NDS).

2. Reviewing: The new WRL submissions together with the existing compilation of the WRL would be reviewed by INDC. After review, the INDC would submit its comments and any additional relevant information to the INDC Secretariat (NDS), who will merge the reviewed information (review reports) and distribute copies of the review reports and regional retrievals from the WRL file to the four data centres. It would then be the responsibility of the four data centres to submit these reviews to the regional local data committees charged with the WRL responsibility for final approval.

3. Channels of communication: In order to simplify this operation and to improve the flow of information, all WRL input, both new, reviewed and approved, should be channelled to and from the INDC Secretariat through the existing four data centres. The INDC Secretariat should not have to communicate with regional local data committees or individuals. All WRL information submitted from the data centres to the INDC Secretariat should be in a computerized form either in the form of punched cards or magnetic tape. These transmissions from the four data centres to the INDC Secretariat would only be needed twice between WRL publications: firstly to communicate new entries prior to the INDC meeting and secondly to communicate the revisions following the INDC review and local committee review.

4. Processing: The computer processing, that is collation, merging, retrieval, of the WRL information as well as the updating of the WRL file shall be performed by the INDC Secretariat (NDS), with any needed assistance provided by the CCDN (ENEA). In conjunction with this assignment of responsibility, the ENEA/CCDN will hand over all existing request list (RENDA) computer programmes to the IAEA/NDS.

In order to alleviate the transfer of the WRL operation from CCDN to NDS, it has been agreed between CCDN and NDS that during the first year of this system's implementation, the CCDN will perform the necessary computer operations for the WRL, performing the needed merge and sort operations, providing selected retrievals and producing the updated file on tape for publication. Full transfer of the WRL computer processing from CCDN to NDS would be effectuated in the course of 1972.

5. Publication: The INDC Secretariat (IAEA/NDS) shall be responsible for the production of a periodically updated WRL document which shall be submitted to the INDC at its yearly meeting. At the same time the INDC Secretariat shall distribute the WRL document to recipients designated by the INDC. (This would presumably correspond to the existing INDC/U distribution including the present RENDA (EANDC) distribution). As part of its responsibility, the NDS shall also provide request upon any needed retrieval from the WRL file.

MODIFICATIONS TO MANUALS

Paragraph in 4CM/VII/Min in Which Modification is Contained	Manual to be Updated			
	EXFOR Manual	LEXFOR	Diction	Protocol
14.				x
15.				x
24.	x			x
27.	x			
28.	x	x	x	
29.			x	
30.		x	x	
32.	x	x	x	
34		x	x	
36.		x		
37.		x	x	
39.			x	
40.		x		
41.			x	
43.	x			
44.	x	x		
45.	x			
47.	x			
49.	x			
51.	x			
52.			x	
62.	x			

List of Actions:

Paragraph in which action is recommended:	Responsible Centre	Action pertaining to:
19	NDS	Discussions with INIS.
24	NDS,NNCSC	Entering of items from 6th 4C-meeting into Protocol and EXFOR manual.
29	NDS	Sorting of journal dictionary
33	CCDN	Addition of statistical weight factor to Dictionary 10.
35	NNCSC	Coding of multilevel resonance parameters.
37	NNCSC	Dictionary 14 entries for modifiers 'PAD' and '2L2'.
42	NNCSC	Issuance of EXFOR update.
46	NNCSC	Report on use of keyword PART-DET.
53	all centres	Comments on LEXFOR-2.
53	NNCSC	Update to LEXFOR manual.
56	NDS	Coding of fission product yields.
58	NNCSC	Coding of gamma-ray spectra.
60	NDS	Coding of fission spectra data.
61	NNCSC	Coding of 'empty' EXFOR entries.
64	all centres	Reply to 4C-2/21 paragraph 3.
74	NDS	World-wide evaluation newsletter.
75	NDS	Information of evaluation panel.
75	NNCSC	ENDF/B-III.

List of Recommendations

Paragraph	Recommendations
4	New CINDA entries may be transmitted bimonthly between the centres.
7	The centres should compile statistics on requested reactions and retrieved subenties for the next 4C-meeting.
9	The fact, that occasionally experimenters refuse to give their data to the centres, should be brought to the attention of INDC.
10	All centres should enter as rapidly as possible all data that has become available since EXFOR was adopted.
19	The centres should keep abreast of the development of INIS and UNISIST.
22,23	Non-neutron nuclear data needs for reactors, fusion and safeguards should be brought to the attention of the I.A.E.A. non-neutron nuclear data working group meeting in March '72.
25	Errors found on transmission tapes should be exchanged via 4C-memos.
36	The modifier DRT should only be used in extreme cases.
59	The assistance of outside groups should be sought in the systematic compilation of capture-gamma spectra.
63	References to literature sources, rather than accession number references, should be used in free text.
78,83	All participants agreed on the usefulness of error specifications of evaluated data.
80	Modifications to the major evaluated data library formats should be well documented and made available as soon as possible.

PROTOCOL FOR COOPERATION BETWEEN NATIONAL NEUTRON CROSS SECTION CENTER, ENEA NEUTRON DATA COMPILATION CENTRE, IAEA NUCLEAR DATA SECTION AND CENTR PO JADERNYM DANNYM FOR THE SYSTEMATIC EXCHANGE OF NEUTRON DATA INFORMATION

Version of April 1972

A. DEFINITIONS

1. Neutron Data Information in the context of this protocol is defined to mean measured microscopic experimental data which have resulted from neutron physics experiments, and their associated bibliographic and physical descriptive information.

2. The Exchange Format, or EXFOR, is a computer-compatible set of agreed upon definitions and conventions, designed for the transmission of neutron data information between neutron data centres.

3. The EXFOR Manual, comprising the currently agreed set of EXFOR definitions, conventions, formats and codes, is designed to serve as the basis and guide for the description and coding of neutron data information in EXFOR and for data transmission between neutron data centres.

4. EXFOR data is defined as all neutron data information coded and exchanged in EXFOR.

5. Service Areas of the Four Centres

The responsibility for the collection, compilation and dissemination of neutron data information is shared among the four major neutron data compilation centres, each being responsible for a defined service area. The four centres and their respective service areas are:

a) The National Neutron Cross Section Center (NNCSC), at the Brookhaven National Laboratory, services the USA and Canada.

b) The ENEA Neutron Data Compilation Centre (NDCC), at Saclay (France), services the non-American member states of the OECD, that is Western Europe and Japan.

c) the USSR Centr po Jadernym Dannym (CJD) at Obninsk (USSR) services the USSR.

d) the IAEA Nuclear Data Section (NDS) in Vienna, services IAEA Member States not included in the service areas of the above three centres, that is countries in Eastern Europe, Asia, Africa, South and Central America, and Australia and New Zealand.

B. FOUR-CENTRE COMMITMENT

1. Within the scope of this protocol each centre is expected to compile the data measured in its service area as fast and as thoroughly as possible.

2. The four centres agree that "new" data should be coded in EXFOR (where new is defined as data collected by the centres at the time of, or after, formal transmission of data is initiated). This does not preclude the transformation of "old" data into EXFOR.

3. Each centre may compile data measured outside its service area. Regular transmissions of EXFOR data from anyone centre shall include data only from its own service area.

4. Each centre keeps an archival copy of the latest version of each of the EXFOR entries it originated and is ready to provide the data to any center should it be required.

C. IMPLEMENTATION OF EXFOR

1. Implementation schedule

a) The routine transmission of data tapes in the Exchange Format will start on 1 July 1970.

b) After this date EXFOR data tapes will be exchanged regularly between the four centres at a maximum interval of three months, with the possibility to transmit timely data at more frequent intervals. If deemed necessary, a stricter, or less rigid schedule could be agreed upon at any time in the future.

2. Method of data transmission

a) EXFOR data will be transmitted in accordance with the conventions laid down in the EXFOR Manual.

b) Only the character set specified in the EXFOR Manual is permitted.

c) The working language of EXFOR shall be English, and all free text comments within all EXFOR entries shall be English.

3. Scope of transmitted data

a) The general scope of EXFOR data will be all experimental microscopic neutron data.

b) Modifications to the general scope of EXFOR data can be adopted only as a result of an agreement between the four centres.

D. CORRECTIONS, REVISIONS AND DELETIONS OF TRANSMITTED EXFOR ENTRIES

1. Corrections or revisions

In the event of partial corrections or revisions of an EXFOR entry, at least the subentry containing the correction shall be transmitted by the originating centre to the other three centres, in accordance with the conventions laid down in the EXFOR Manual. Where the number of subentries within an entry is changed, the whole entry should be retransmitted. Special cases of transmitting corrections at less than a subentry level can be agreed by the Four Centres and defined in the EXFOR Manual.

2. Accession numbers use

Once transmitted, no accession or sub-accession number should be re-used for another entry or subentry. The accession number of a deleted entry (subentry) should not be used for another entry (subentry).

E. EXFOR DICTIONARIES

1. Updating of Dictionaries

a) To prevent duplications and conflicts, the NDS is responsible for the coordination and the updating of the EXFOR dictionaries.

b) Alterations (meaning additions, corrections or deletions) in EXFOR dictionaries can be consequential, which would entail changes in transmitted data, and thus require Four-Centre approval, and changes which could be termed inconsequential and would not entail changes in transmitted data or Four-Centre approval. Without exception, all changes to Dictionaries 1,2, 4,10,11,12,16 and 24 are consequential and require Four-Centre approval.

c) Consequential Dictionary Alterations

Alterations of EXFOR dictionary entries which entail changes to data already transmitted cannot be implemented without specific Four-Centre approval.

d) Inconsequential Dictionary Alterations

Proposals for alterations of EXFOR dictionary entries which do not entail changes to data already transmitted, and which do not fall in the Dictionary list given in E.1.b. above, should be submitted by the centres to NDS together with their mnemonic terms and definitions by telex or airmail. Within one week of their receipt, the NDS shall transmit the approved dictionary entries to all centres simultaneously, in the form of photocopies of the input forms used for the NDS dictionary update program.

e) In their function to update EXFOR dictionaries, the NDS is given some latitude in reformulating the definition, but must not change the meaning without the approval of the originating centre. In questionable cases NDS shall consult with the other three centres for their opinions. It is the responsibility of each Centre to update its own sets of Dictionaries.

2. Routine Transmission of Dictionaries

a) The NDS will transmit changed dictionaries to the other three centres every three months, as part of the routine EXFOR transmissions.

b) The keywords "DICTION", "ENDDICTION" and "NODICTION", will be used by the NDS for transmission of changed dictionaries whether they are part of a data transmission or not, other centres will not use these keywords.

F. COMPILERS' MANUAL

1. In addition to the EXFOR Manual, the Four Centers collaborate in the formulation of an EXFOR Compilers' Manual (LEXFOR) whose primary function is that of a collection of EXFOR compilers instructions. Specifically, it includes expansions of the definitions of physics terms, their nomenclature and interrelations, and general guidelines.

2. Changes and revisions to LEXFOR follow the same procedures as with the EXFOR Manual (see section H. below), in accordance with the conventions laid down in the EXFOR Manual.

3. The centre responsible for the updating of LEXFOR is the NNCSC. As soon as an addition or alteration to LEXFOR has been agreed, this centre shall produce and distribute updated pages in the same way as with the EXFOR Manual.

G. EXFOR COMMUNICATIONS BETWEEN CENTRES

Two forms of documents are used for the proper distribution and referencing of all documentation on EXFOR.

1. Four-Centre Memos for the communication of proposals, programming details and other general considerations which touch upon the over-all aspect of EXFOR. This series of memoranda are numbered as follows:

   Memo-4C-n/m

   (where n is the centre identification number, and m the chronological memo number within the centre).

2. Exchange Format Memos for the transmittal of updating EXFOR Manual pages. This series of memoranda is issued by the NNCSC only, to each of the other three centres, and is numbered as follows:

   Memo-X4-m

   (where m is the chronological memo number).

H. CHANGES AND REVISIONS OF EXFOR

1. No changes in the structure of EXFOR will be allowed without Four Centre agreement.

2. If any one of the four centres proposes an alteration (meaning addition, correction or deletion) in the EXFOR Manual, which would result in changes of the EXFOR structure and content, it will be the responsibility of the centre originating such proposal to obtain four centre agreement, following the procedure outlined in Paragraph H.3. below, and to submit the proposed change to the centre responsible for the updating of the EXFOR Manual.

3. The following procedure should be followed by each of the four centres in obtaining the agreement to every one of its proposals to change or revise EXFOR within the context of Paragraph H.2. above; all communications with regard to such proposal shall be in the form of Four-Centre Memos.

   a) The initial proposal should be disseminated to all four centres.
   b) The initiating centre shall then collect and digest all comments, suggestions and counter proposals.
   c) In this review, the initiating centre shall consider such facts which would affect the EXFOR data base and associated computer codes.
   d) The initiating centre shall then distribute a technical evaluation of alternatives to the other three centres.
   e) After receiving the response to this technical evaluation, the initiating centre shall:

      (i) In the case of general agreement, submit the proposed alteration to the centre responsible for the EXFOR Manual updating.
      (ii) In the case of non-agreement, either retract the proposal, or submit it for inclusion in the agenda of the next Four-Centre Meeting.

4. The centre responsible for the updating of the EXFOR Manual is the NNCSC. This centre shall be responsible for producing the updated pages in sufficient number of copies and distributing them in accordance with an established EXFOR distribution list.

5. In view of the absence of some of the centre personnel from Four-Centres Meetings, decisions taken at such meetings should be considered as generally adopted unless contradicted by telex within a fortnight of receipt of draft minutes.

6. Some reply (for example by telex) to 4C-Memos must arrive within three weeks of dispatch. By default suggestions in the memo will be taken as acceptable to the other centres.

7. Further details on changes and revisions to EXFOR are laid down in the EXFOR Manual.

I. CHANGES AND REVISIONS OF THIS PROTOCOL

1. Any change to this Protocol which is deemed necessary shall come into effect only with the expressed approval of the head of each of the four data centres.

2. The centre responsible for the updating of this Protocol is the NDS.

Note: The Protocol was updated by NDS and appended to this document. The draft dated 71/11/20 of this Protocol, which included the decisions from the meeting, was approved by the four centre heads, but paragraph D.2. was changed on account of Memo 4C-1/21 (top of page 4). - Also, NDS made a few minor corrections in this document and added pagination and some cross-references to 4C-Memos.