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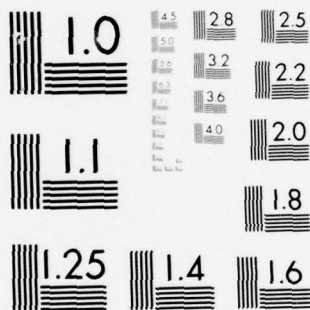
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Feasibility Study of Technical Translation
by a Technologist/Translator (T/T) Team

Don E. Harrison, Jr., Ph.D.
Professor of Physics
Naval Postgraduate School
Monterey, California

and

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NAVAL POSTGRADUATE SCHOOL

Monterey, California

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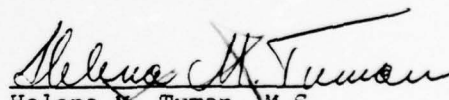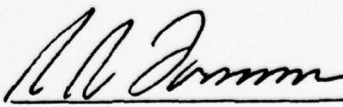| REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
NPS-61Hx76101		

4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED
Feasibility Study of Technical Translation by a Technologist/Translator (T/T) Team	
	6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
Don E. Harrison, Jr. Helena Eugenia Tuman	

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
Naval Postgraduate School Monterey, California 93940	

11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
Naval Postgraduate School Foundation Naval Postgraduate School Monterey, California 93940	01 October 1976
	13. NUMBER OF PAGES
	16

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
	UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Technical Translation, Translation Training

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The authors formed a research team which undertook the team translation of a selection of technical documents supplied by the sponsor. Neither author had previously engaged in technical translation from Russian into English. The study established that, after an initial orientation period, the team can produce useful products of the following forms: (1) Key word surveys of tables of contents, abstracts, introductions, etc.; (2) Article survey for pre-specified topics such as device characteristics; (3) Complete translations of (cont on p1v)

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articles of all lengths; and (4) Survey or complete translation of long articles and books. The team approach is also an excellent way to train technical translators. Conditions for success are discussed in detail, and potential sources of difficulty are identified.

Feasibility Study of Technical Translation by a Technologist/Translator (T/T) Team

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ABSTRACT

The authors formed a research team which undertook the team translation of a selection of technical documents supplied by the sponsor. Neither author had previously engaged in technical translation from Russian into English. The study established that, after an initial orientation period, the team can produce useful products of the following forms: 1) Key word surveys of tables of contents, abstracts, introductions, etc.; 2) Article survey for pre-specified topics such as device characteristics; 3) Complete translation of articles of all lengths; and 4) Survey or complete translation of long articles and books. The team approach is also an excellent way to train technical translators. Conditions for success are discussed in detail, and potential sources of difficulty are identified.

I. Introduction

The authors constituted a research team which studies the feasibility of
team translation of technical material. Because of their personal involve-
ment there is inevitably a loss of objectivity in a study of this type.
Hopefully the accessibility of subjective impressions and individual feelings
is sufficient compensation for that loss.

The scientist (DEH) had had almost no previous contact with the Russian
language. The translator (HET) has completed all course requirements for a
doctorate from Georgetown University in Russian Area Studies and has worked
for almost five years as a translator, language training supervisor and as
an editor for open source Russian to English translated material dealing
with social services, economics, political science and agriculture in the
USSR.

In addition to his experience as teacher, researcher and consultant in
physics, the scientist has worked and taught in the Operations Research
field. He also has experience in computer programming, computer based physics
research, and the interpretation of technical material for non-technical
students. He had had no direct experience as an electrical engineer, but
was able to consult with electrical engineers from the faculty of the Naval
Postgraduate School (NPS).

The translator has had direct classroom experience in the teaching of
Russian, has hired and trained Russian teachers, and has had supervisory
and administrative responsibility in Russian language programs. Resumes of
the authors are appended; see Appendix A.

The open source material in Russian was supplied by the sponsor. They
range from highly technical studies through conference reports to textbooks
and popular semi-technical books for general audiences.

The team met for a total of 68 hours over a two month period. During this time the translator did an additional 119 hours of independent work. The team produced complete translations of approximately 15,000 words of material, and surveyed two or three times that many words.

Succeeding sections of this report provide a narrative of the project; a discussion of the modes in which the team found that it could operate; working procedures comments and warnings on personalities, dictionaries, working conditions and similar considerations; conclusions about the feasibility of T/T translation; and implementation recommendations if the sponsor wishes to continue development of the technique.

II. Narrative

We can distinguish two levels of maturation in the development of the T/T team. At first there is a great deal of frustration on the part of both parties.

The technologist (tech) could not understand why the translator (trans) must familiarize herself with a totally new vocabulary. This means that a great deal of time is used in searching through dictionaries to find the proper terms, while the tech has to wait.

At this stage the work is very tiring. We worked for only an hour and a half for the first few sessions, and both were exhausted at the end of that time. Also there is a buildup of exhaustion which seems to carry over from day to day; so that you begin each working session already tired. For the first two weeks we worked only four days a week, taking Wednesday off.

We found that with practice (toughening?), we could work for a three hour session with a coffee break. Later on we probably could have added a similar period in the afternoons, but are sure that productivity would decline dramatically later in the day.

During this period the trans began the practice of doing a couple of hours of 'homework' between each session; so that much of the dictionary work could be done before the actual translation was done.

As time passed dictionary look-up began to turn into a team effort. The tech began to guess at the meaning of the word, which sometimes saved a look-up, and could also help out by finding the guess in an English-Russian dictionary.

Trans came to terms with the fact that a literal translation did not always convey the true meaning because both languages use jargon for shorthand communication of ideas. Often, once the meaning was established, tech would say 'oh! That's so and so!' which was in no sense a literal translation.

The result is a better English language document, but to the translator, without previous experience in the material, it seems like paraphrasing.

The team development really began in earnest when we began the book translation. There was no intention that we complete the book, but we wanted to work with a large block of connected material where the authors' vocabulary and style would not change. Trans continued to do some home preparation before each session, but all actual translation was done by the team. Each sentence was discussed, then written out longhand by tech while trans went on to the next sentence. This apparently inefficient procedure leads to quite readable English text, and much better use of trans' time than would have a tape recorder. For tech to be reading copy into the recorder while trans was working on the next sentence would have been most distracting.

An introductory chapter and part of the first technical chapter were done in this fashion. The rate was approximately 6000 words in 18 contact hours for the entire period, but the daily rate at the end was almost double that at the beginning. At the end we approached a rate of translation which might be feasible for a technical translator (300-400 words/hour), and produced typist ready copy in a single operation without additional editing.

At this point tech went on leave, and working alone, trans completed a document of approximately 5000 words in 50 hours. This document was then polished by an additional six hours of team effort. The polishing was necessary, but tech made minimum input to the product; so that it would remain as close as possible to trans' original effort. The resultant translation is perfectly intelligible (we have checked it with other individuals who are knowledgeable in the field), but it does not read as smoothly as the joint effort which preceded it.

It is worth noting that after approximately 100 hours of work, half of the time with tech, trans was able to produce a translation which could be worked into usable form with very little team effort. Clearly we had made great progress toward training trans to do technical translation.

Finally the team returned to its original project which was the skimming of relatively short papers for device names and characteristics, and for individuals names and jobs. One of these papers dealt with systems designed for use in satellites. It contained material on the types of orbits, and orbital parameters, which was essentially new vocabulary. The material went rapidly (it was well written Russian) and both members of the team felt that our capability had increased greatly.

Our last efforts consisted of 'skim' reading in electrical engineering again. By this time tech was taking notes on the contents of articles at a rate which exceeded 1000 Russian words per hour. In no sense were the notes actual translations of the article, but they contain the gist of the contents and it is highly unlikely that a more detailed translation would ever be required.

III. Modes of Team Operation

An experienced team can provide translation in any of four modes of use which are discussed below. Early in the team development their efforts should be restricted to the simpler modes.

A. Book Translation will be used as a general term to cover any document which exceeds approximately 5000 words in length. A new team should start with this type of translation. The work will go more easily for trans because only one author's vocabulary need be mastered and because constructions will be similar. Similarly, if the material is relatively familiar to tech, it is possible for tech to anticipate the next sentence. The team translation concept is encouraged whenever tech can make a suggestion which trans then confirms. The team may tend to be overawed by the magnitude of the endeavor confronting them, but we felt that we would have learned the translation process more quickly had we started in this way. Here the sponsor can be of great help. The chosen document should be long, but not too long, and both interesting and exciting to one team member (probably tech).

Book translation is also good practice in the development of resistance to editing. Tech tended to want to get the translation into good English, while trans' goal was a good translation. The team must learn to live with these opposing tendencies by striking a dynamic balance between them. This is better done initially with a single writing style as in a single long document.

Team translation in this mode can work up to 400-500 words/hour. Of course a new team cannot approach this rate of production. The output of an experienced team should be ready for proof reading and final typing.

An experienced team can also handle this type of material by the procedure in which trans actually performs the translation unassisted. Then the team goes over the material together to work out difficult spots and generally smooth the

output. With experience trans will be sensitive to places in the translation which don't read properly. Although the words have little meaning to trans, an awareness of verbal patterns develops and trans can indicate phrases and sentences which 'don't sound right'. This two step procedure is undoubtedly the best way to use team translation as a means of developing technical translators. It is most effective after the mutual confidence has been developed. It fails completely until the team has worked together long enough that trans has begun to pick out the verbal patterns.

B. Article Translation can also be done either by team translation or by translation and polish. Until the team develops some expertise it goes more slowly than book translation because there is inevitably a start-up cost with each new document. This is the time required to adapt to the author's style and to learn his personal vocabulary. Obviously, as the team matures this process goes more rapidly. Furthermore, an experienced team is less burdened by a feeling of inadequacy when the start-up process on a particular article is very tedious.

At this point we should mention that articles exist for which team translation is not cost effective. We encountered an article, devoted to a specific rack of equipment which performed a selected set of functions in a telephone exchange central, written in very bad Russian (We must take trans' word for this), which absolutely defied the efforts of the team. Had tech been a specialist in telephone central equipment, translation would have been possible, but it was beyond the capability of a generalist. We encountered similar problems with other articles, but the Russian was better, and trans was able to get by with less support from tech. Having encountered similarly illegible articles in English in his technical specialty, tech is prepared to state that additional effort on the problem example would not have been worthwhile.

Although the team developed sufficient skill to do short article translation in many instances complete translations may not be cost effective. Where the consumer is only interested in the gist of the contents, comprehensive notes may be sufficient for this purpose, and are much easier for the team to prepare. The full team translation treatment will produce copy readable in English. The translation and polish procedure produces much more cumbersome English because more of the Russian construction remains. Well taken notes may actually be more legible to an non-expert user than one of the more detailed translations.

C. Article Survey is not a complete translation of the material. It may consist of a summary of the contents, or rather detailed notes on specific portions of the document. Our experience is that it is best done by the team working together. Technical judgment is required for effective note taking; so working alone, trans will simply translate the article as well as possible, and the result will be an article translation.

Book survey should be possible, but in practice it degenerates into a translation of the table of contents, abstract, preface and introduction. Beyond this point the team tends to translate individual sections completely, rather than survey.

D. Name/Key Word Survey should be entirely feasible for an experienced team. Where the Russian word(s) are given, trans can locate them in the text and the team can then place them in context.

Search for ideas is more difficult because tech must identify potentially fruitful sections in the text. This involves a preliminary survey of the type described in Section C above, followed by a closer search in selected areas.

The team did not try to perform a key word search, but did use idea search successfully.

IV. Procedures

The preceding sections give an indication of the procedures followed by the team as it translated. Here we give a general outline of procedure which will be familiar to any technical translator, but which may be of interest to the non-specialist, and some detailed procedural material for specific types of documents.

1. Begin with the bibliography in hopes that some of the references will be to English language sources. If they are, you have a hint as to the contents of the article.

2. Translate the title. Translate the author's honorifics and location.

3. Look at the Figures/Pictures, and translate the captions.

4. Look at the Tables, and translate the captions, entry units, etc.

5. Translate the abstract and table of contents, if any.

Certainly by this time, and possibly much earlier in the procedure, you should have a pretty good idea of the contents of the article. At this point a mode of translation must be selected. Alternatively, the decision may be to not precede beyond this point. The mode of translation will depend upon sponsor requirements, time available (including deadlines), and the estimated potential value of the material.

If any sort of full translation is indicated and the article is more than a few thousand words in length, tran would like at least an hour or two alone at this point to do some specific vocabulary building and develop a feel for the author's style.

For short documents, or where only note taking is indicated, it is probably best that the team continue together. There are almost always vocabulary problems which will require teamwork, and the team is better able to resist the temptation to make a complete translation.

When a long document is to be translated tran should plan to put in
additional time roughly equivalent to the total team time in preparation
for each team session. As always, the purpose is vocabulary building, but
also to identify the sticky points. At this point the line between team
translation and translate plus polish is rather diffuse. The difference
is that in the team translation tech makes an input to every sentence,
while in translate plus polish tech's only real concern is with the tech-
nical reliability of the output. The actual choice of mode is a policy
decision which need not be made by the team.

A major concern of any professional translator or translation contrac-
tor is the reliability of the product. In this respect team translation
is clearly very much superior to any single translator who must work alone.
When the Russian is obscure tech can often give trans a choice between two
technically feasible interpretations of the construction. The specific
alternatives often pinpoint the translation problem and lead to its resolu-
tion. Alternatively, trans will not allow tech to include an English phrase
which is not consistent with the Russian. The dynamic balance is very
likely to be self-correcting. Two minds are attempting to avoid error, and
they are approaching the material from quite different viewpoints.

V. Comments on Team Formation

In this section we would like to comment on some of the problems which
may be encountered when one attempts to train translation teams. This is
an extrapolation from a single data point, but the generalization should
hold.

The team cannot function without mutual respect. The respect must exist
not only at the level of professional confidence, but also at the level of
personal integrity. Trans must honestly believe that tech knows how the idea
should be expressed in English, and tech must be sure that trans is mining out
the correct interpretation of the Russian. Both must be sure that the other
is not cutting corners to get the work done.

To a large extent the team develops by mutual instruction, so it helps if
both parties think like teachers. They will then take a minute for explanation
occasionally, which helps with the next problem. Team translation would be
deadly if tech were not interested in the material, and both individuals need
inquisitive minds. The teaching mentioned above is not effective unless both
parties are willing to learn from the other.

At the risk of stating the obvious, there is no place for a large ego, or
a prima donna, in team translation. If either partner is certain that the
other is a subordinate, the team will not function.

In addition to the personal requirements there are professional require-
ments as well. There must be a good match between tech and the material to
be translated. When tech is weak the translation can be very slow, and the
output will be low in quality. Because he is not an electrical engineer, our
tech could not carry his share of the load at times. There are advantages to
using a generalist as part of a T/T team, but a price is exacted. Our team
made interesting correlations in underwater acoustics which an electrical

engineer might well have missed, but we paid the price when we attempted to translate articles about specific devices. Ideally there should be a generalist team for survey of masses of material and a specialist team, or technical translator, to do the detailed translations when required. The value of the team depends directly upon tech understanding the sponsor's requirements.

A tech who has an interest in language and some linguistic ability is a big plus. If tech is sensitive to the author's methods of expression translation goes more smoothly. With practice, tech can help significantly by guessing. Even if the idea is bad it breaks out of the rut, and may lead to a solution of the problem. Tech needs imagination, and a good vocabulary. If tech is sensitive to language sometimes it is possible to identify the word which has been mis-interpreted, even when the correct translation is still not obvious. Here imagination and guesswork can materially aid the translator.

Similarly, there are professional requirements for tran. Tran must be an experienced professional translator who is familiar with the conventions, requirements, responsibilities and techniques of translation. Tech makes an indespensible contribution to the product, but tran must control its quality. Tran must be sufficiently experienced and self-confident to not be over-whelmed by tech's superior technical knowledge.

The sponsor also makes important contributions to the team's development. By his choice of material he can expedite or impede the team's development. The training material must be interesting and sufficiently internally consistent to facilitate the development process. The sponsor cannot be too impatient for results. An experienced team can work to deadlines, beginners should not. We would recommend a two-three month period for team development. Trans should be able to devote full time to the effort for that period, while tech must

spend between half and three quarters time. The process depends upon saturation and maturation. Professional study would lead to a more efficient team development process, but 'hurry up' is counterproductive.

The sponsor must ascertain that suitable dictionaries are available. Trans will not have them. Our team worked from dictionaries available from the NPS library. An annotated dictionary bibliography is included as Appendix B.

If one were seriously setting out to train T/T teams it would be advisable to have an experienced technical translator available for con- sultation by the team members. There is no way that the translator can teach, the team must develop itself. But the presence of the translator would save the team a great deal of time early in the team's development, and would help them build self-confidence.

An interesting follow-up to our experiment would be for each of us to work with a new opposite number and attempt to develop two teams. It would also be interesting to determine whether a single translator could have a 'team' relationship with a number of scientists/engineers simultan- eously. If this is feasible, a specialist tech could take over and continue the translation with the trans from the generalist team which made the document identification.

It is unlikely that any engineer/scientist would wish to make a career of T/T translation. However the work is interesting and could be attractive on a part time basis. A translator is more likely to approach the opportunity on a full time basis. Clearly the best solution is a translator who can work on a team basis with a number of scientists/engineers.

VI. Conclusions

To summarize our efforts we report the following conclusions:

1. Given reasonable care in the selection of the team, team translation is entirely feasible.

2. The quality of the product is reasonably high, but will be more variable than the material prepared by a professional technical translator.

3. Present indications are that a team translation is less likely to contain errors of substance than the product of a single translator.

4. The relative cost of team translation has not been established. In some modes of use the dollar cost may be somewhat higher than a normal technical translation, but even this is not completely certain, because the team was still improving at the time that the experiment was terminated. In the survey mode, working specialized material with a specialist tech, it should be much more cost effective than straight translation.

5. The team was relatively ineffective with highly specialized material and bad Russian in the same document. It can deal with either problem separately. This problem would not exist with a more specialized tech.

6. Team translated material can be over-edited. The resultant copy may be easier to read, but shaded in meaning by the translation. This part of the evaluation must be made by an outside expert.

7. Survey by team translation can be very rapid. The ability of tech to make judgmental decisions allows the team to skip through the material in the same way that a person works in his own language.

8. Team translation is a very effective way to train technical translators, and the training process is a by-product of the production of useful material. There may also be value in the fact that tech makes a major input to the training process. The self-training aspect of team translation is

valuable because technical translator time is not tied up in the training process.

9. <u>For some individuals the working conditions of team translation are much more attractive than straight translation</u>. It is a continuously developing learning experience with personal contact as opposed to solitary desk work.

10. <u>The development of translation groups</u>, in which a single translator can team with different techs to work on different types of material, <u>should be explored</u>. Team translation will be more attractive to techs if it is not a fulltime job, and the freedom to match the tech to the material will greatly increase the productivity of the translator.

11. If our understanding of the sponsors requirements is complete, team translation gives every indication that it can provide the capability he wishes to develop.

APPENDIX A

RESUME OF DON EDWARD HARRISON, JR.

Don Harrison was born in Detroit, Michigan, in 1927. In 1949 he received the Bachelor of Science degree from the College of William and Mary, with a major in physics and minor in mathematics. He continued in physics at Yale University and was awarded his Doctor of Philosophy in 1953.

After graduation he was employed by the University of Louisville as Assistant Professor from 1953 to 1957, and as Associate Professor at the University of Toledo from 1957 to 1961.

In June, 1961, he joined the faculty of Naval Postgraduate School, Monterey, California, where he is teaching in the Department of Physics and Chemistry.

His research interests are surface physics, radiation damage and laser interactions with solids. His current research is concerned with surface physics and radiation damage, using the IBM 360/65 Computer.

He has been a consultant in surface physics for the Oak Ridge National Laboratory, Sandia Corporation, General Dynamics Corporation and Lincoln Laboratory.

In addition to his physics research, teaching in computer applications to Operations Research in Simulation and War Gaming has led to research interests in military operations research.

His professional affiliations are with the American Physical Society and the American Association for the Advancement of Science. He is a member of the Phi Beta Kappa and Sigma Xi Societies.

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        CONVAIR Report ZPh-062 (1960) p. III 181-184

4. Table of the Debye Functions   R
        with J. R. Neighbours
        Naval Postgraduate School
        Research Paper No. 49 (1964) 72 p.

5. Ionization Potentials, Experimental and Theoretical, of the   R
   Elements Hydrogen to Krypton
        with R. L. Kelly
        Naval Postgraduate School
        NPS-61Ke70071A (1970) 29 p.

6. A Model of the CIC Operation of ASW Ships   R
        with H. M. Effron, T. Jayachandran, and C. O. Wilde
        Naval Postgraduate School
        NPS-53WM72061A (1972) 43 p.

7. Re-examination of the Carrier   R
        Aircraft Deck Operations Control; System Proposal under
        PO # 3-0075-/Amend #1; Mar 1974

8. Thesis published as a Technical Report: NPS-71Be75031

        Passive Environmental ASW Prediction Systems (PEAPS)   P
        Michael E. Beckes, Nicholas P. Burhans, and Robert E. Gump
        Thesis Advisors: A. B. Coppens and Don E. Harrison, Jr.

9. Laser Effects Handbook, Chapter 3

        Laser Absorption Wave Phenomena   R
                with J. R. Neighbours
                NPS-61-61Nb75121 (Dec 1975) 42 p.

PERSONAL RESUME

Name: Helena Eugenia Tuman (Mrs.)
Address: 255 Mar Vista Drive, Monterey, CA 93940
Telephone: (408) 375-4024

Birth Date   8 August 1946
and Place: Munich, Germany

Education: B.A.   6/68   Randolph-Macon Woman's College, Lynchburg, VA
                                Major: Russian

               M.S.   6/70   Georgetown University, Washington, D. C. 20007
                                Major: Russian   Minor: Linguistics

               Ph.D.   Georgetown University, Washington, D. C. 20007
                                Major: Russian Literature   Minor: Soviet
                                                              History & Government

                                All course work completed.

Honors: 1968   National Slavic Honor Society
               1970-1971   Dean's Scholarship

Languages: Russian - fluent
               German and French - reading knowledge

Employment: 3/75 - Date   Russian to English Translator for USSR Desk
                                Joint Publications Research Service,
                                Arlington, Virginia.

                                Translation of general open source material
                                dealing with social services, political science,
                                economics, and agriculture in the Soviet Union.

               5/76 - 9/76   Russian to English Translation
                                Naval Postgraduate School, Monterey, California

                                Position entailed working with a scientist to
                                determine if a general gield translator work-
                                ing with a scientist could as a team translate
                                technical and scientific Soviet materials.
                                The outcome was that this is possible and has
                                many advantages.

               9/72 - 12/74   Editor for USSR Desk
                                Joint Publications Research Service
                                Arlington, Virginia

                                Duties included checking Russian-to-English
                                translations primarily for substantive accuracy
                                in such fields as Soviet economics, armed
                                services, politics, agriculture, social
                                sciences, science, foreign affairs and trans-
                                portation.

9/70 - 11/70   Russian Tutor
World Instruction and Translation, Inc.
Arlington, Virginia

Preparation of student for Ph.D. language
proficiency test.

9/69 - 8/70   Linguist-Supervisor of Slavic and East
European Division
World Instruction and Translation, Inc.
Arlington, Virginia

The duties of this position included consider-
able administrative and supervisory responsibil-
ity. It entailed recruiting, interviewing and
hiring applicants whose backgrounds conformed
to Defense Language Institute requirements. I
was responsible for a staff of 15 Russian
teachers whose classroom activity I supervised
in order to guarantee that the teaching methodol-
ogy fulfilled government specifications.

7/69 - 8/69   Russian Tutor
Lacaze School of Languages, Washington, D. C.

Teaching basic language skills to members of
the Moscow diplomatic staff; USIA contract.

9/65 - 5/68   Assistant to Professor Abraham Kreusler
Randolph-Macon Woman's College
Lynchburg, Virginia

While at college I was selected to act as
assistant to the Chairman of the Russian Depart-
ment. Duties included classroom teaching,
tutoring, and test correction.

APPENDIX   B

1. Russian-English Scientific and Technical Dictionary
   M. H. T. Alford and V. L. Alford
   Pergamon Press (1970)

   This is the single most useful dictionary.

2. TM 30-545 Department of Army Technical Manual
     English-Russian; Russian-English
     Electronics Dictionary (August 1950)

   This was the second most useful dictionary source.
   Valuable for specific component names and specialized
   circuit element names.

3. Russian-English Glossary of Electronics and Physics
   Consultants Bureau, Inc. (1957)

   Some value, particularly for abbreviations, units, etc.

4. Glossary of Russian Abbreviations and Acronyms
   Library of Congress (1967)

   Useful for abbreviations and acronyms

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