

**Call up #6 against Standing Offer W7711-037898
CR 2008-017**

**Re-assembly and Systems Calibration of DRDC
Toronto's Acoustics Laboratories and Software
Development in Support of New Protocols for Auditory
Perception in Noise**

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Contract #W7711-037898/001/TOR

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April 17, 2008

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Abstract

This report describes work performed by Trellis Consulting on Callup #6 of Standing Offer #W771-037898 during the 2007 Calendar year at DRDC Toronto. The acoustics laboratories were re-established following the building upgrade. Numerous technical support issues were resolved. Noise recordings held in the Noise Simulation facility were recreated as DVDs. Amendments were also made to the software used to run the Vigilance experiment.

Résumé

Le présent rapport décrit les travaux effectués en 2007 à RDDC Toronto par Trellis Consulting, dans le cadre de la commande n° 6 subséquente à l'offre à commandes W771-037898. Les laboratoires d'acoustique ont été réétablis après la rénovation du bâtiment. Plusieurs problèmes de soutien technique ont été résolus. Des enregistrements de bruit conservés à l'installation de simulation de bruit ont été recréés sur DVD. Des modifications ont également été apportées au logiciel utilisé pour l'expérience Vigilance.

Executive Summary

During this sixth call up against Standing Offer W7711-037898 two important additions were made to software used to run the Vigilance experiment in the Noise Simulation Facility at DRDC Toronto. First, the output of the program was amended to provide the experimenter with additional analyses of the results generated by each subject. Secondly, the method for random generation of the non-critical signals among a series of presentations of critical and non-critical signals was amended to prevent back-to-back duplicates. As well, the computer used for the visual tracking component was reloaded with programs after a hard drive failure.

The acoustics laboratories were re-established following the building upgrade. Numerous technical support issues were resolved. The B&K2133 software was converted to a PC friendly program. Documentation was maintained. Problems with cabling were debugged and solved. DVD noise loops were created from the library of audio tape recordings of military operational ambients.

Sommaire

Dans le cadre de la sixième commande subséquente à l'offre à commandes W7711-037898, deux ajouts importants ont été faits au logiciel utilisé pour l'expérience Vigilance à l'installation de simulation de bruit de RDDC Toronto. Premièrement, la sortie du programme a été modifiée afin de fournir à l'expérimentateur des analyses supplémentaires des résultats générés par chaque sujet. Deuxièmement, la méthode de génération aléatoire des signaux non pertinents dans une série de signaux pertinents et non pertinents a été modifiée afin d'éliminer les doubles consécutifs. De plus, des programmes ont été réinstallés sur l'ordinateur utilisé pour la visualisation après une défaillance du disque dur.

Les laboratoires d'acoustique ont été réétablis après la rénovation du bâtiment. Plusieurs problèmes de soutien technique ont été résolus. Le logiciel du 2133 de B&K a été remplacé par un logiciel compatible PC. La documentation a été mise à jour. Des problèmes de câblage ont été dépistés et corrigés. Des boucles de bruit sur DVD ont été créées à partir de la bandothèque d'ambiance sonore d'opérations militaires.

1 Introduction

This document describes the work carried out by Trellis Consulting while working on Call up #6 against Contract # W7711-017898/001/TOR. Originally, this call up covered the 6-month period from 1 January 2007 to 30 June 2007. The call up was extended until December 31, 2007.

The Statement of Work called for:

- a) assistance with the unpacking, re-assembly and systems calibration of three acoustics laboratories
- b) cross checking of acoustics devices against DA's
- c) validation and expansion of currently available software for running experiments in the Noise Simulation Laboratory, as required, with particular emphasis on speech understanding in noise
- d) assistance with the analysis and interpretation of noise dosimetry data previously collected during field trials
- e) consultation on the purchase of equipment for the measurement of noise and vibration, and computer hardware/software in support of psychoacoustic experimentation and signal processing.

The objective of the work items was to provide technical support and to help expand the noise system software used to run experiments in the Noise Simulation Facility (NSF) to give the experimenters more control over variation in experimental parameters.

2 Tasks Performed

This section deals with the main areas of work on this call up.

3 NSF Software Additions

The software written under the terms of a previous call up to run a vigilance experiment required changes to handling of subjects' responses and printout of results. It was determined that more information was required by the experimenters with respect to both accuracy in detection and response time for each vigil. The required information was added to the output from the program to assist with the analysis of the data.

A small change was also made to ensure no two identical random signals were played consecutively.

4 Miscellaneous Technical Support

B&K 2133 Software

DRDC Toronto has, for years, had a Macintosh based software program which allows the extraction of data directly from files generated by the B&K 2133 signal analyzer. This software has always been of great benefit to the users for a number of reasons:

- it eliminates the possibility for errors in transcribing the readings
- it greatly speeds up the process of graphing the output of the analyzer.

This program has become difficult to maintain since fewer and fewer Macintosh computers are being used at DRDC. For this reason, a conversion of the program to the PC was undertaken. This solution will give the users the above two benefits. In addition, the software package will be more maintainable since the PC appears to be the computer of choice at DRDC Toronto.

Emergency Reload of the Tracking Computer

During the running of the vigilance study, the tracking (slave) computer experienced a hard drive failure. This rendered the experiment inoperable. The underlying operating system was reloaded and all the required software was re-established. The study was minimally impacted by the downtime.

Documentation

The NSF software is becoming a well rounded system with a great deal of flexibility. As a result, it is imperative that the documentation be kept up to date. The system documentation was visited on several occasions to ensure its accuracy. As well, with each new user on the system, new topics requiring clarification are found and added to the documentation.

General Problem Solving

There were two intermittent problems with the acoustical system used in the Hearing Research Laboratory. The first turned out to be a faulty cable. The second was related to a faulty connection. Both problems were addressed and the system is now functioning better.

Noise Loops

For studies carried out in the NSF the option of using DVD recordings of operational noise backgrounds instead of audio tape recordings has been implemented. This will allow for longer presentation times for noise samples (previously the system was limited to 2 hours). Since the new DVD player generates output signals different than those of the tape deck and the B&K Noise Generator, it will be necessary to recalibrate the existing noise loops for the DVD player. The task of performing the calibration of the signals was undertaken and is reaching completion. As well, 2-hour and 4-hour DVDs of the calibrated signals will be made.

Unpacking

After the building upgrade, equipment used in two acoustics laboratories located in the basement of DRDC Toronto had to be unpacked and setup again. After re-installing the speakers and re-connecting all the cabling, the system calibration was confirmed. Subtle changes were made to ensure proper levels in the chamber.

5 Recommendations for Future Work

In order to continue with the lines of experimentation detailed above and based on an assessment of the work completed to date, the following requirements are foreseen:

1. Expansion and validation of currently available software to run an experiment on speech communication in the Noise Simulation Facility.
2. Noise recording and calibration of levels as required.
3. Consultation on the purchase of equipment for the measurement of noise and computer hardware/software in support of psychoacoustic experimentation and signal processing.
4. Cross checking of acoustics devices against DAs
5. Assistance with the analysis and interpretation of noise dosimetry data previously collected during field trials

UNCLASSIFIED

DOCUMENT CONTROL DATA <small>(Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)</small>		
1. ORIGINATOR (The name and address of the organization preparing the document, Organizations for whom the document was prepared, e.g. Centre sponsoring a contractor's document, or tasking agency, are entered in section 8.) Publishing: DRDC Toronto Performing: Garry Dunn, Trellis Consulting, 73 Scarlett Line, Hillsdale, Ontario L0L 1V0 Monitoring: Contracting: DRDC Toronto		2. SECURITY CLASSIFICATION <small>(Overall security classification of the document including special warning terms if applicable.)</small> UNCLASSIFIED
3. TITLE (The complete document title as indicated on the title page. Its classification is indicated by the appropriate abbreviation (S, C, R, or U) in parenthesis at the end of the title) Re-assembly and systems calibration of DRDC Toronto's acoustics laboratories and software development in support of new protocols for auditory perception in noise. (U) (U)		
4. AUTHORS (First name, middle initial and last name. If military, show rank, e.g. Maj. John E. Doe.) Garry Dunn		
5. DATE OF PUBLICATION <small>(Month and year of publication of document.)</small> February 2008	6a NO. OF PAGES <small>(Total containing information, including Annexes, Appendices, etc.)</small> 7	6b. NO. OF REFS <small>(Total cited in document.)</small>
7. DESCRIPTIVE NOTES (The category of the document, e.g. technical report, technical note or memorandum. If appropriate, enter the type of document, e.g. interim, progress, summary, annual or final. Give the inclusive dates when a specific reporting period is covered.) Contract Report		
8. SPONSORING ACTIVITY (The names of the department project office or laboratory sponsoring the research and development – include address.) Sponsoring: Tasking:		
9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant under which the document was written. Please specify whether project or grant.) 16CK02	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.) W7711-037898	
10a. ORIGINATOR'S DOCUMENT NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document) DRDC Toronto CR 2008-017	10b. OTHER DOCUMENT NO(s). (Any other numbers under which may be assigned this document either by the originator or by the sponsor.)	
11. DOCUMENT AVAILABILITY (Any limitations on the dissemination of the document, other than those imposed by security classification.) Unlimited distribution		
12. DOCUMENT ANNOUNCEMENT (Any limitation to the bibliographic announcement of this document. This will normally correspond to the Document Availability (11). However, when further distribution (beyond the audience specified in (11) is possible, a wider announcement audience may be selected.) Unlimited announcement		

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(Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)

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14. **KEYWORDS, DESCRIPTORS or IDENTIFIERS** (Technically meaningful terms or short phrases that characterize a document and could be helpful in cataloguing the document. They should be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location may also be included. If possible keywords should be selected from a published thesaurus, e.g. Thesaurus of Engineering and Scientific Terms (TEST) and that thesaurus identified. If it is not possible to select indexing terms which are Unclassified, the classification of each should be indicated as with the title.)

(U) auditory perception in noise; audio recordings

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