

**Call up #1 against Standing Offer W7711-078111
CR 2009-140**

**Modeling of the Bison Command, Control,
Communication and Intelligence (C3I) Command Post**

**Prepared by Garry Dunn
Trellis Consulting
73 Scarlett Line
Hillsdale, Ontario
L0L 1V0
705-835-5608**

**Scientific Authority: Dr. Sharon M. Abel
Individual Readiness Section
DRDC Toronto
1133 Sheppard Avenue West
Toronto, Ontario
M3M 3B9
Tel: 416-635-2037**

25 August 2009

**© Her Majesty the Queen in Right of Canada, as represented by the Minister of
National Defence, 2009**

**© Sa Majesté la Reine (en droit du Canada), telle que représentée par le ministre de
la Défense nationale, 2009**

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE AUG 2009		2. REPORT TYPE		3. DATES COVERED	
4. TITLE AND SUBTITLE Modeling of the Bison Command, Control, Communication and Intelligence (C3I) Command Post				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Trellis Consulting,73 Scarlett Line,Hillsdale, ON L0L 1V0, ,				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 10	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Abstract

This report describes work performed by Trellis Consulting on Call up #1 against Standing Offer #W7711-078111 during the months of August 2008 to July 2009 at DRDC Toronto.

Résumé

Le présent rapport décrit les travaux effectués par Trellis Consulting Group Inc. selon la commande n° 1 subséquente à l'offre à commandes n° W7711-078111, d'août 2008 à juillet 2009, à RDDC Toronto.

Executive Summary

During this first call up against Standing Offer W7711-078111, numerous tasks were undertaken. First and foremost an interface box was built to allow easier access to different audio sources used in the Noise Simulation Facility. Technical assistance was given on a number of projects, including repairing faulty equipment, organizing equipment and creating DVDs. The Bison Simulator progressed to the point where experimenters can think about protocols to implement. Real time speech recognition software was quickly examined for its suitability in the Bison Simulator. Modifications to an existing ePrime study were undertaken.

Sommaire

Pendant la réalisation de la commande n° 1 subséquente à l'offre à commandes n° W7711-078111, plusieurs tâches ont été entreprises. Une boîte d'interface a tout d'abord été construite pour faciliter l'accès aux différentes sources audio utilisées dans l'installation de simulation de bruit. Certains projets ont bénéficié d'une assistance technique, comme la réparation d'équipement défectueux, l'organisation d'équipement et la création de DVD. Le développement du simulateur de véhicules Bison a tant progressé que les expérimentateurs peuvent désormais commencer à réfléchir sur les protocoles à mettre en place. Le logiciel de reconnaissance vocale en temps réel a été évalué sommairement pour déterminer s'il convenait au simulateur de véhicules Bison. Des modifications ont été apportées à une étude effectuée dans ePrime.

Table of Contents

1	Table of Contents.....	3
2	Introduction	5
3	Tasks Performed.....	6
3.1	Input Selector Switch Box	6
3.2	Technical Assistance	6
3.3	Bison Command Post	7
3.4	Speech Recognition Software.....	7
3.5	Eprime changes to mult-display experimental protocol.....	7
4	Recommendations for Future Technical Work.....	8

1 Introduction

This document describes the work carried out by Trellis Consulting while working on Call up #1 against Contract # W7711-078111/001TOR. This call up covered the 11-month period from August 20, 2008 to 31 July 2009.

The Statement of Work called for:

1. building upon previous studies to examine various noise environments
2. provide technical support for:
 - recording of noise environments
 - extraction of audio signals from raw sources
 - calibration of noise signals
 - development of software to study auditory perception
 - assembly of experimental apparatus
 - inventory of equipment
 - assistance with analysis of dosimetry data
 - consultation on equipment purchases
 - expansion of existing inventory management database
 - travel to military bases to conduct field trials

2 Tasks Performed

The following sections describe the work performed under this Call up.

2.1 Input Selector Switch Box

The Noise Simulation Facility (NSF) has always lacked a way to easily select the input from which to play sound. In the past, selecting a source required plugging and unplugging cables behind the unit housing the audio devices. This problem was solved by designing and implementing a selector switch box.

To properly do this, however, the differing levels from three input devices needed to be accounted for. There was also the problem of single-ended versus balanced audio inputs. The interface box required a total of 2 stereo line level converters to take the input signals and convert them to the required balanced output. Each of the inputs has it's own trim potentiometer through which the level of that input can be calibrated.

The three inputs come from:

- DVD player
- B&K Noise Generator
- DAT Player

One of the above signals is selected using a rotating selector switch. The selected signal is routed to the final output stage where the signal is converted to a balanced signal before continuing on to the remainder of the audio processing equipment.

This new arrangement allows each signal to be individually selected and calibrated. The calibration stage only has to be done once and has been done for the three inputs. Now experimenters simply have to set the selector switch on the front of the unit to choose the source to drive the loudspeakers/headphones.

This is a great improvement over the previous system of plugging and unplugging cables.

2.2 Technical Assistance

At various times during the call up, technical assistance was required for minor items in three acoustics research facilities located at DRDC Toronto:

- One of the pieces of audio equipment in the NSF was having problems. A sticky relay in the unit was causing the unit to malfunction. The problem relays were sourced and replaced with newer versions. Since the change, there have been no reported problems with the unit.
- Recordings of DVD samples of noises were made.

- The collection of Brüel & Kjaer audio devices listed on the DA were re-organized
- Intermittent connection problems in the audio processing unit located in the Auditory Perception Laboratory were found and fixed.

2.3 *Bison Command Post*

The creation of the Bison Command Post simulator progressed very well during this call up. Several meetings were attended at which research team members were apprised of recent developments and visits by military SMEs from Ottawa were arranged.

The simulator is very close to the stage where experimental protocols can be written and exercised in the simulator.

2.4 *Speech Recognition Software*

For the Bison simulator, it was thought that real-time speech recognition might be a requirement for some of the experiments. Some research was done on commercially available systems and how this might be integrated into an experiment. Unfortunately, none of the solutions found were particularly useful for integrating into the simulation environment. The current commercially available systems were also surprisingly inaccurate in the detection of words.

This line of research was stopped since the pros of using such a system did not outweigh the cons. It was decided that experiments could be designed without the need for speech recognition.

2.5 *Eprime changes to mult-display experimental protocol*

A new experiment pertaining to operator overload (visual and auditory) was to be implemented in the Hearing Research Laboratory using existing software developed at DRDC Atlantic. Necessary changes were required and made.

The ePrime software package was learned and the existing protocol was successfully changed to incorporate the new auditory warnings. Testing was performed to ensure the experimental protocol performed as it should. New output files were generated to include elements indicating the new auditory stimulus.

3 Recommendations for Future Technical Work

In future call ups, there are several things that can be done to continue on with the work on this call up. The most obvious work is to fully integrate the Bison simulator with the remainder of the NSF hardware. Once the Bison simulator has its communication system installed, DRDC Toronto will be able to inject signals of any quality into the simulator to create mock scenarios. This will be of prime importance to the successful implementation of experiments using the simulator.

Many of the existing protocols designed for the NSF will be able to be used in the Bison simulator. Studies like MRT, DRT, threshold tracking could all be undertaken. While the auditory channel is taxed on subjects, visual cues can also be given to further stress the subjects. The variety of studies that could be done inside the simulator are virtually endless.

UNCLASSIFIED

DOCUMENT CONTROL DATA (Security classification of the title, body of abstract and indexing annotation must be entered when the overall document is classified)		
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, ON L0L 1V0 Monitoring: Contracting: DRDC Toronto		2. SECURITY CLASSIFICATION (Overall security classification of the document including special warning terms if applicable.) 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) Modeling of the Bison Command, Control, Communication and Intelligence (C3I) Command Post (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 (Month and year of publication of document.) August 2009	6a NO. OF PAGES (Total containing information, including Annexes, Appendices, etc.) 8	6b. NO. OF REFS (Total cited in document.)
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.) 12oi	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.) W7711-078111-01	
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 2009-140	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		

UNCLASSIFIED

UNCLASSIFIED

DOCUMENT CONTROL DATA

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

13. **ABSTRACT** (A brief and factual summary of the document. It may also appear elsewhere in the body of the document itself. It is highly desirable that the abstract of classified documents be unclassified. Each paragraph of the abstract shall begin with an indication of the security classification of the information in the paragraph (unless the document itself is unclassified) represented as (S), (C), (R), or (U). It is not necessary to include here abstracts in both official languages unless the text is bilingual.)

(U) This report describes work performed by Trellis Consulting on Call up #1 against Standing Offer #W7711-078111 during the months of August 2008 to July 2009 at DRDC Toronto.

(U)

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) audio system upgrades; computer software development

UNCLASSIFIED