

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

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

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## **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.

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# 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.

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(U) audio system upgrades; computer software development

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