

AGREEMENT BETWEEN THE  
DEPARTMENT OF DEFENSE OF THE UNITED STATES OF AMERICA  
AND  
THE MINISTRY OF DEFENCE OF THE REPUBLIC OF SINGAPORE  
RELATING TO A COOPERATIVE RESEARCH PROJECT FOR HARBOR DEFENSE II

**ARTICLE I**  
**INTRODUCTION**

The Department of Defense of the United States of America (in this Agreement called "U.S. DoD") and the Ministry of Defense of the Republic of Singapore (in this Agreement called "MINDEF"), pursuant to the Strategic Framework Agreement Between the United States of America and the Republic of Singapore for a Closer Cooperation Partnership in Defense and Security, done at Washington, DC, on 12 July 2005, agree to establish "Harbor Defense II" as a cooperative medical research project. The terms of the Strategic Framework Agreement Between the United States of America and the Republic of Singapore for a Closer Cooperation Partnership in Defense and Security Agreement shall govern the execution of this Agreement.

**ARTICLE II**  
**DEFINITION OF ABBREVIATIONS**

DMERI	Defence Medical and Environmental Research Institute, a research entity of DSO National Laboratories
DoD	Department of Defense, USA
DSO	DSO National Laboratories, Singapore
DSTA	Defence Science and Technology Agency, a statutory board of MINDEF, Singapore
SES	Swimmer Engagement System
IRB	Institutional Review Board
HQMC	Headquarters Medical Corps, Singapore Armed Forces
MINDEF	Ministry of Defence, Singapore
NSMRL	Naval Submarine Medical Research Laboratory, USN
RDT&E	Research, Development, Testing and Evaluation Project
SAF	Singapore Armed Forces
UWL	Underwater Sensors Laboratory, Sensors Division, a research entity of DSO National Laboratories

**ARTICLE III**  
**OBJECTIVES**

1. The objectives of this Agreement are:
  - a. To determine the propagation of acoustic energy underwater within selected Singapore harbor(s).
  - b. To measure the response of divers to underwater impulsive sound sources.
  - c. To determine effective acoustic signals for diver deterrence.

**ARTICLE IV**  
**SCOPE OF WORK**

1. The following work shall be undertaken under this Agreement:
  - a. Phase 1 - Determine the propagation of acoustic energy within selected Singapore harbor(s).
    - (1) Harbor location(s) to be selected.
    - (2) At least 2 impulse sources will be set up within the harbor(s) and acoustic measurements of the output taken from several points within the harbor(s). The acoustic measurements will include waveform capture at the locations of interest utilizing a computerized measurement system.
  - b. Phase 2 – Determine the response of divers to the impulse sources.
    - (1) The harbor(s) location(s) will be the same as for Phase 1.
    - (2) Divers will be exposed to the impulse sound at various locations relative to the source. The response of the diver will be recorded. The responses can include both psychological and physiological measurements. The same measurement system as that used for Phase 1 will be used to measure the sound received by the diver. The protocol will be governed by IRB protocol approved by both nations.

**ARTICLE V**  
**SHARING OF TASKS**

1. MINDEF will perform the following tasks in support of the project:
  - a. Phase 1:
    - (1) Select test site.

- (2) Provide logistics support.
- (3) Participate in acoustic data collection.
- (4) Participate in acoustic data analysis.

b. Phase 2:

- (1) Provide dive team, dive supervision and diving medical supervision.
- (2) Review and submit protocol for IRB approval.
- (3) Provide in-country logistics support.
- (4) Propose and execute physiological measurement technique.
- (5) Participate in data collection.
- (6) Participate in data analysis.
- (7) Collaborate on technical reports.

2. The NSMRL will participate in all phases of the project and will perform the following tasks in support of the program:

a. Phase 1:

- (1) Consult with MINDEF on the design of the study proposal.
- (2) Conduct acoustic measurements.
- (3) Provide acoustic sources.
- (4) Lead data analysis.
- (5) Develop IRB protocol based on acoustic measurements.

b. Phase 2:

- (1) Obtain IRB approval.
- (2) Support Singapore IRB approval process.
- (3) Collect human response data.
- (4) Provide dive team supervision and diving medical supervision.

3. The DoD and MINDEF will collaborate and jointly undertake research activities to accomplish the objectives of this Agreement. In support of the project, the following tasks will be performed jointly during Phase 1 and Phase 2:

- (1) Finalize study proposal.
- (2) Identify final protocols for acoustic measurement.
- (3) Prepare report.

**ARTICLE VI**  
**BREAKDOWN AND SCHEDULE OF TASKS**

1. The project shall proceed according to the following concurrent phases and schedule:

2.	<u>Phase I</u>	<u>Duration</u>
	a. Discussion and planning	5 months
	(1) Formulate study proposals.	
	(2) Identify job functions for NSMRL, DSO and SAF.	
	(3) Identify size and site of study.	
	(4) Identify protocols for acoustic measurement.	
	(5) Exchange laboratory visits.	
	(6) Finalize study proposals and confirm job functions for all parties.	
	b. Execution	7 months
	(1) Acquire Sources.	
	(2) Conduct acoustic measurements.	
	(3) Analyze data.	
	(4) Prepare report.	
	(5) Prepare IRB protocol.	

3. Phase 2
  - a. Prepare for study 3 Months
    - (1) Obtain IRB approval.
    - (2) Recruit subjects.
    - (3) Conduct site and logistics preparation.
  - b. Collection of data 3 months
    - (1) Coordinate and assign all job tasks to execute protocol.
    - (2) Coordinate and execute the collection of data.
  - c. Data analysis 6 months
    - (1) Collation and analysis of data.
    - (2) Report and manuscript writing.
4. The project is expected to be completed 24 months from the date of commencement.

**ARTICLE VII**  
**MANAGEMENT**

1. This Agreement shall be directed and administered on behalf of the Parties by the Project Officers (PO) from each Party named below:

US PO: Dr. Edward Cudahy  
 Title/Position: Department Head, Diving and Environmental Simulation  
 Organization: Naval Submarine Medical Research Laboratory  
 Address: Bldg 148 Trout Avenue  
 Box 900, Naval Submarine Base, New London  
 Groton, CT 06349-5900

Singapore PO: Dr. Shabbir Moochhala  
 Title/Position: Programme Director, Combat Care and Performance  
 Organization: DMERI, DSO National Laboratories  
 Address: 27 Medical Drive, #09-01  
 Singapore 117570

Singapore PO: MAJ Tan Hong Teck  
 Title/Position: Hd, Special Warfare Branch, Naval Surface Warfare Centre  
 Organization: Republic of Singapore Navy

Address: Blk 302, Pioneer Sector 2, #02-18  
Singapore 628405

**ARTICLE VIII**  
**FINANCIAL PROVISIONS**

Each Party will pay for its own expenses incurred pursuant to this Agreement.

**ARTICLE IX**  
**CLASSIFICATION**

The existence of this Agreement and its contents is UNCLASSIFIED. Results from Phase 1 testing will generate critical acoustic data for impulse sources and as such will be classified "FOR OFFICIAL USE ONLY". Results from Phase 2 testing will generate critical human data for impulse acoustic waveform and bio-effects matrix model and provide input data for prototype system engineering and will be classified "SECRET".

**ARTICLE X**  
**PRINCIPAL ORGANIZATIONS INVOLVED**

1. The United States of America: Naval Submarine Medical Research Laboratory, USN
2. Republic of Singapore:
  - a. Defence Medical and Environmental Research Institute, DSO National Laboratories.
  - b. Underwater Sensors Laboratory, Sensors Division, DSO National Laboratories.
  - c. Naval Underwater Warfare Centre, Republic of Singapore Navy.
  - d. Naval Medicine and Hyperbaric Centre, Republic of Singapore Navy.

**ARTICLE XI**  
**ENTRY INTO FORCE, DURATION**  
**AND TERMINATION**

1. This Agreement shall enter into force upon signature by the Agreement Management Agents, and shall remain in force for three years unless terminated by either Party. It may be extended by written agreement of the Parties.

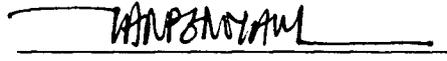
2. IN WITNESS WHEREOF the undersigned, duly authorized by their respective Governments, have signed this Agreement.

Done, at Washington, DC, in duplicate, this 21<sup>st</sup> day of March 2007.

For the U. S.

For the Singapore MA

  
Signature

  
Signature

D.C. ARTHUR, VADM, MC, USN

TAN PENG YAM

Surgeon General of the Navy  
Title

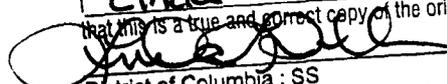
Deputy Chief Executive (Technology)  
Defence Science & Technology Agency  
Title

3-21-07  
Date

13th March 2007  
Date

United States of America  
Location

Republic of Singapore  
Location

Linda L. Tiler, hereby certify  
that this is a true and correct copy of the original document.  
 Signatory  
District of Columbia : SS  
Subscribed and Sworn to before me  
this 23 day of March, 2007  
Notary Public, D.C.  
My commission expires 11-14-08