



TP 13415E

**ICE NAVIGATION
TRAINING AIDS MODULE**

PREPARED BY: SICOM SYSTEMS LTD.

DATE: March 1999

PREPARED FOR: TRANSPORTATION DEVELOPMENT CENTRE
SAFETY AND SECURITY
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TRAINING AIDS MODULE**

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16. Abstract <p>The purpose of this project was to develop a stand-alone training aids module (TAM) that provides computer-based training (CBT) on ice recognition, ice climatology, and the Arctic Ice Regime Shipping System (AIRSS) for entry level ice navigators. The TAM is also a valuable tool for ice observers. It is an autonomous, interactive help system that can be run independently on any Windows 95 or Windows NT system. It was developed using the WinHelp32 help engine, and is designed to run as a stand-alone tool, easily integrated into other packages.</p> <p>The TAM contains a vast array of ice photography, charts, video clips, marine radar images, synthetic aperture radar images, optical images, and drawings. The extensive textual content can be accessed in a structured format or through search facilities for online reference.</p> <p>The ice recognition course teaches the trainee how to recognize ice conditions using available ice information sources. The ice climatology module covers the pattern and range of occurrence of sea ice in particular areas. The third module describes AIRSS, the Canadian government's new shipping control regulations, intended to replace the Zone/Date Shipping Safety Control scheme in the Arctic Shipping Pollution Prevention Regulations (ASPPR).</p>					
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16. Résumé <p>Ce projet visait la mise au point d'un module autonome d'aides à l'apprentissage (MAA) en tant qu'outil d'enseignement assisté par ordinateur (EAO) destiné aux officiers novices de navigation dans les glaces. Couvrant trois grands sujets, soit la reconnaissance des glaces, la climatologie des glaces et le Système des régimes de glaces pour la navigation dans l'Arctique (SRGNA), le MAA s'avère également un outil précieux pour les spécialistes de l'observation des glaces. Développé à l'aide du moteur d'aide WinHelp32, ce système d'apprentissage interactif est conçu pour être utilisé en mode autonome sous Windows 95 ou Windows NT, mais il est facilement intégrable à divers progiciels.</p> <p>Le MAA contient une vaste collection d'images de glaces (photographies, cartes, bandes vidéo, imagerie de radar de bord, imagerie de radar à synthèse d'ouverture, images optiques, dessins) ainsi qu'un riche contenu narratif, qui peut être consulté de façon systématique et structurée ou de façon libre et aléatoire, à l'aide d'une fonction de recherche.</p> <p>Le cours de reconnaissance des glaces enseigne au futur officier à reconnaître les conditions glacielles à partir des sources d'information qui sont à sa portée. Le volet portant sur la climatologie des glaces décrit le type et la distribution des glaces de mer dans des zones données. Le troisième volet décrit le nouveau Système des régimes de glaces pour la navigation dans l'Arctique (SRGNA), qui remplacera à terme la technique de contrôle de la navigation par zones et par dates stipulée dans le <i>Règlement sur la prévention de la pollution des eaux arctiques par les navires</i> (RPPEAN).</p>					
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Executive Summary

A great deal of effort has been expended over the past 15 years to improve ice navigation techniques and technology in Canada. Various ice navigation systems have been developed, resulting in an extended Arctic navigation season formerly from June to September, now from May to mid-November in the high Arctic.

An ice navigation simulation platform is perceived as a way to improve the competence of entry level ice navigators, and reduce the amount of sea-time training. The purpose of this project was to develop a stand-alone training aids module (TAM) that provides computer-based training (CBT) on ice recognition, ice climatology, and the Arctic Ice Regime Shipping System (AIRSS).

The TAM was developed by Sicom Systems Ltd., under contract to Transport Canada's Transportation Development Centre (TDC), for insertion into the ice navigation simulator. The TAM is an autonomous, interactive help system that can be run independently on any Windows 95 or Windows NT system. It was developed using the WinHelp32 help engine, and is designed to run as a stand-alone tool easily integrated into other packages, for example, as a component that can be launched from the ice navigation simulator being developed by TDC.

The purpose of the TAM is to provide marine navigation officers with the information they require for navigating ships in Canadian ice-covered waters. The CBT system does this by educating navigators in three ice-related areas of study: ice recognition, ice climatology, and ice regime system entry rules. The training material for the courses was developed for Sicom by Robert Gorman, a leading Canadian ice expert with Enfotec Technical Services Inc. The TAM is also a valuable tool for ice observers.

The TAM contains a vast array of ice photography, charts, video clips, marine radar images, synthetic aperture radar images (e.g. Radarsat), optical images (e.g. NOAA AVHRR), and drawings.

The textual content is extensive and addresses two organizational paradigms. First, the material is structured so that the trainee always knows the desired sequence of pages to view. A detailed table of contents is a key stroke away, so the trainee is never lost. Second, with the built-in search facilities for both textual and graphical data, the TAM is a great on-line reference resource, allowing the trainee quick and random access to any material of interest.

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The ice recognition course is designed to teach the trainee how to recognize ice conditions using available ice information sources. The module is organized into four sections. The first section describes ice physics, formation, growth, aging and decay. The origins and properties of sea ice, lake ice, and icebergs are explored. The second covers ice types and concentrations. It covers WMO codes and examines sea and lake ice types and forms, iceberg types and forms, ice concentrations, openings in ice, and surface features. The third section deals with ice reporting and coding and the Egg Code and its use. The last section deals with ice navigation systems information sources. It covers the Canadian Ice Service's daily ice analysis chart, NOAA AVHRR(TIROS) imagery, marine radar, Radarsat, and CANICE-3 SLAR imagery. Several matched data sets are provided to illustrate the benefits and uses of each information source.

Ice information provided from ice navigation systems represents a snapshot of ice conditions. However, to take full advantage of this information, the trainee must understand the ice regime of the area in question. The term “ice regime” is used to describe the pattern and range of occurrence of sea ice in a particular area. With this understanding, the trainee will be more able to recognize better or worse than average ice conditions when viewing ice information received from the system. The ice climatology module provides a description of ice regimes. The ice climatology course is organized into four ice regimes: Baffin Bay, Gulf of St. Lawrence, Lancaster Sound, and “other sea ice regions of the world”. Relevant oceanography, climatology, and four-season ice regimes are presented for each region. Icebergs are also included for Baffin Bay.

The third and final module describes AIRSS. The Arctic Ice Regime Shipping System (AIRSS) comprises the new shipping control regulations of the Canadian government designed to replace the Zone/Date Shipping Safety Control scheme in the Arctic Shipping Pollution Prevention Regulations (ASPPR). The AIRSS system allows for the entry of a vessel into an area based on the actual ice conditions, not historical trends or fixed dates. This places a greater emphasis for the safety of the ship on the Master, requiring a higher level of experience for ice navigators and full use of available ice information. The module is extensive and covers AIRSS in detail.

The report summarizes the specifications used to develop the TAM. It includes a market survey of CBT development software, along with justification for selecting Microsoft's WinHelp32 to develop the TAM. One section is a user's guide describing the TAM's structure and providing user documentation. A description of the development environment is included so that the TAM can be maintained. The report concludes with a summary of the TAM's limitations, with recommendations for future work and improvements.

Sommaire

Au cours des 15 dernières années, les techniques de navigation dans les glaces et les technologies correspondantes ont été l'objet d'un développement intense au Canada. Grâce aux divers systèmes de navigation dans les glaces maintenant disponibles, la saison de navigation dans les hautes latitudes a été allongée, s'étendant maintenant de mai à la mi-novembre au lieu de juin à septembre, précédemment.

Une plate-forme de simulation de la navigation dans les glaces est considérée comme un moyen d'améliorer la compétence des officiers novices de navigation dans les glaces et de réduire la durée de la formation en mer. Ce projet visait la mise au point d'un module autonome d'aides à l'apprentissage (MAA) en tant qu'outil d'enseignement assisté par ordinateur (EAO) devant familiariser l'utilisateur avec la reconnaissance des glaces, la climatologie des glaces et le Système des régimes de glaces pour la navigation dans l'Arctique (SRGNA).

Le MAA a été développé par Sicom Systems Ltd. pour le compte du Centre de développement des transports (CDT) de Transports Canada en marge d'autres travaux entrepris par le CDT visant le développement d'un simulateur de navigation dans les glaces. Ce système d'apprentissage interactif, développé à l'aide du moteur d'aide WinHelp32, peut être utilisé séparément, sous Windows 95 ou Windows NT, ou intégré au simulateur de navigation dans les glaces développé par le CDT ou à d'autres progiciels.

Le MAA vise à mettre à la disposition des officiers de navigation dans les glaces l'information nécessaire pour naviguer en toute sécurité dans les eaux chargées de glaces du Canada. Le système EAO aborde trois grands thèmes : la reconnaissance des glaces, la climatologie des glaces et les règles d'entrée en régime de glaces. Un éminent spécialiste des glaces canadien, Robert Gorman, de Enfotec Technical Services Inc., a élaboré le matériel didactique des cours, pour le compte de Sicom. Il convient de noter que le MAA s'avère également un outil précieux pour l'observation des glaces.

Le MAA contient une vaste collection d'images de glaces – photographies, cartes, bandes vidéo, imagerie de radar de bord, imagerie de radar à synthèse d'ouverture (Radarsat), images optiques (images AVHRR de la NOAA), dessins.

Il comporte également un riche contenu narratif, organisé en fonction de deux grands modes d'utilisation, structurée ou aléatoire. Ainsi, l'utilisateur en processus d'apprentissage est constamment au fait de la séquence des pages à visualiser : il lui suffit d'appuyer sur une touche pour afficher la table des matières et connaître l'étape où il se

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situé par rapport à l'ensemble de la matière. Mais les fonctions intégrées de recherche, valables tant pour le texte que pour les images, font aussi du MAA un précieux outil de référence en ligne, renvoyant rapidement l'utilisateur à n'importe quel sujet d'intérêt.

Le cours de reconnaissance des glaces enseigne à l'officier novice à reconnaître les conditions glacielles à partir des sources d'information sur les glaces mises à sa disposition. Ce volet se subdivise en quatre parties. La première porte sur la physique, la formation, la croissance, le vieillissement et la décroissance de la glace. On y aborde la genèse et les propriétés de la glace de mer, de la glace de lac et des icebergs. La deuxième présente les codes utilisés par l'OMM et examine les types et les formes de glace de mer et de glace de lac, les types et les formes d'icebergs, les concentrations de glaces, les ouvertures dans les glaces et les caractéristiques de surface de la glace. La troisième partie présente les codes et symboles des cartes de glaces, ainsi que le code de l'oeuf et son utilisation. La dernière partie traite des sources de données qui alimentent les systèmes de navigation dans les glaces. Elle fait référence, entre autres, aux cartes journalières des glaces, produites par le Service canadien des glaces, à l'imagerie AVHRR (TIROS) de la NOAA, aux images issues des radars de bord, à l'imagerie Radarsat et à l'imagerie SLAR (radar à visée latérale) de CANICE 3. Plusieurs ensembles appariés de données sont fournis, ce qui permet d'illustrer les avantages et les cas d'utilisation optimale de chaque source de données.

Les systèmes de navigation dans les glaces fournissent un instantané des conditions glacielles dans une zone donnée. Mais pour tirer pleinement profit de cette information, l'officier de navigation doit comprendre le régime de glaces de la zone considérée. L'expression «régime de glaces» désigne le type et la distribution des glaces de mer dans une zone précise. Fort de cette compréhension, l'officier novice sera en mesure de mieux juger des conditions glacielles par rapport à la représentation des conditions moyennes affichées par le système de navigation. Le volet sur la climatologie des glaces décrit les régimes de glaces. Il s'articule autour des quatre régimes suivants : baie de Baffin, golfe du Saint-Laurent, détroit de Lancaster et «autres zones de glace de mer dans le monde». Il présente les données océanographiques et climatologiques pertinentes ainsi que le régime de glaces de chaque région tout au long de l'année. La partie sur la baie de Baffin comprend également des données sur les icebergs.

Le troisième et dernier volet décrit le SRGNA, c'est-à-dire le Système de régimes de glaces pour la navigation dans l'Arctique, qui remplacera à terme la technique de contrôle de la navigation par zones et par dates stipulée dans le Règlement sur la prévention de la pollution des eaux arctiques par les navires (RPPEAN). Le SRGNA autorise un navire à pénétrer dans une zone de navigation non pas en fonction de tendances enregistrées antérieurement ou de dates préétablies, mais selon les conditions glacielles réellement observées. Ce système, qui impute au capitaine une plus lourde responsabilité quant à la

sécurité de la navigation, exige une plus grande expérience de la part des officiers de navigation dans les glaces, lesquels doivent pouvoir tirer pleinement profit des données sur les glaces mises à leur disposition. Ce volet fait une couverture exhaustive du SRGNA.

Le rapport résume les spécifications fonctionnelles utilisées pour le développement du MAA. Il rend compte d'une étude du marché des logiciels de développement EAO et présente les motifs à la base du choix du logiciel WinHelp32. Une partie du rapport fait office de manuel d'utilisation du MAA, assorti de la documentation utile. L'environnement de développement du MAA y est décrit, pour les besoins de maintenance du module. Le rapport se termine sur un résumé des limites du MAA et sur des recommandations concernant les travaux complémentaires nécessaires et le perfectionnement du module.

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ACRONYMS

AIRSS	Arctic Ice Regime Shipping System
API	Application Program Interface
AWPPA	Arctic Waters Pollution Prevention Act
CBT	Computer-Based Training
CD	Compact Disk
CD-ROM	CD-Read Only Memory
COTS	Computer Off-the-Shelf
DLL	Data Link Library
GUI	Graphical User Interface
HTML	Hypertext Markup Language
MINS	Main Ice Navigation Simulator (platform)
PC	Personal Computer
RFP	Request for Proposal
RTF	Rich Text File
SAR	Synthetic Aperture Radar
SDK	Software Developer's Kit
TAM	Training Aids Module
TDC	Transportation Development Centre
WMO	World Meteorological Organization

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1 INTRODUCTION

1.1 BACKGROUND

A large development effort has been directed at improving ice navigation techniques and technology over the past 15 years. Various ice navigation systems have been developed, the results of which have extended the Arctic navigation season, formerly from June to September, now from May to mid-November.

An ice navigation simulation platform is perceived as a way to improve the competence of entry level ice navigators, and to reduce the amount of sea-time training. This report seeks to address specific requirements of a main ice navigation simulator (MINS). In particular, this report is concerned with the development of a computer-based training module referred to herein as the ice navigation training aids module (TAM) which provides an on-line training aid on the following subjects:

- Ice recognition
- Ice climatology
- The Arctic Ice Regime Shipping System

The next section provides a summary of the main results of this project.

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1.2 MAIN FINDINGS

The project began with an effort to define a requirement specification for the TAM that addresses both the computer-related requirements of the computer based training (CBT) tool, as well as the course content requirements. A functional specification was successfully developed that addresses both types of requirements and forms a model for other training modules.

In the next phase of work, help authoring and CBT development environments were surveyed for Windows 95 platforms, in order to select an environment that was capable of meeting the TAM's requirements. The Microsoft WinHelp32 Help Engine, combined with Robohelp V7.0, was selected as the target development environment, and has proven to be a good choice, as evidenced by the TAM. A few of the environment's benefits are listed below:

- Open development environment on Windows 95, 98 and Windows NT platforms;
- Standard help environment with familiar look and feel to all Windows users;
- Highly functional with full integration of multimedia for meeting training needs;
- Easier and less expensive to develop training systems than programming languages;
- Advanced table of contents, index, word search, and book marking features useful for on-line reference and full random access;
- Easy to build in structured sequence of screens to force the trainee through a particular training sequence;
- Easily upgradable/transportable to HTML for Web publishing;
- Easy to print;
- Able to access custom DLL libraries for additional functionality.

The TAM was successfully developed in WinHelp32 and runs on a single CD, or can run from a hard disk. It includes hundreds of pages of organized, textual information along with hundreds of high-resolution images, graphics, audio clips, and video files. The TAM exceeds the mandatory requirements of the functional specification that was developed, and is readily upgradeable. While designed for ice navigators, the TAM is also very useful for ice reporters and ice analysts (especially the ice recognition and ice climatology modules).

By forging a close working relationship between CBT professionals (i.e. those with the skills of assembling and building an on-line computer-based training package) and teaching professionals (i.e. ice experts in this case who have an intimate knowledge of the subject matter in question), Sicom has demonstrated an efficient model for successfully developing the TAM. This model is well suited for future upgrades to the TAM, as well as for developing completely new CBT systems.

1.3 ORGANIZATION OF REPORT

The functional specifications are provided in Section 2 of this report and include mandatory, highly desirable and optional requirements. The TAM meets all of the mandatory requirements, most of the desirable requirements, and several optional requirements.

The results of the market survey are presented in Section 3, along with justification for selecting the WinHelp32 help engine to develop the TAM. The architectural design of the TAM and a user's guide is provided in Section 4. Section 5 provides details of the TAM development environment so that the software can be maintained. Finally, Section 6 provides a summary and conclusions, with a list of future work items.

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2 FUNCTIONAL SPECIFICATIONS

2.1 INTRODUCTION

This document defines a minimum set of requirements for the general architecture of the TAM, hardware and software, and the general outline of the user interface. Interface requirements between the TAM and the main ice navigation simulator (MINS) platform are also specified.

The RFP (request for proposal) documentation provides a few requirements for the training aids module. For example, it must run stand-alone under Windows. For this section, we performed requirements analyses to come up with a set of minimum specifications upon which the TAM design is based.

2.2 SPECIFICATIONS

Sicom has combined the hardware/software/interface specifications with the training material definition (requirements) into this single functional specification so all of the TAM's requirements are located together.

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The system requirements are specified in Section 2.2.1 and stem from the requirements stated in the RFP documentation. These system level requirements are allocated to software, hardware, interface, user, and training material definition requirements, in sections 2.2.2, 2.2.3, 2.2.4, 2.2.5, 2.2.6, respectively.

Throughout this functional specification document, the following terms and corresponding definitions shall apply:

- shall** – defines a mandatory requirement;
- should** – defines a highly desirable requirement;
- may** – defines an optional requirement.

Collectively, the mandatory requirements herein represent the minimal requirements for the TAM.

2.2.1 System Requirements

2.2.1.1 The TAM shall support the following objectives:

- on-line reference and training guide for ice type recognition;
- on-line reference and training guide for ice climatology;
- on-line reference and training guide for the ice regime system.

2.2.1.2 The TAM shall be a PC computer-based application that runs under the Windows 95 operating system.

2.2.1.3 The TAM shall be capable of running stand-alone.

2.2.1.4 The TAM shall be capable of being interfaced to the MINS platform by way of an application call from the MINS platform.

2.2.1.5 The TAM shall interact with the user through the use of a graphical user interface (GUI).

2.2.1.6 The TAM shall be developed in the English language and shall be structured to facilitate translation to other languages.

2.2.1.7 The TAM shall incorporate images of ice features in support of the TAM objectives.

2.2.1.8 The TAM shall support hypertext, random browsing, and structured access suitable to a systematic learning process.

2.2.2 Software Requirements

2.2.2.1 The TAM software shall be able to provide reference information in regards to ice type recognition, ice climatology and ice regime entry Rules.

2.2.2.2 The TAM software shall run under the Windows 95 operating system.

2.2.2.3 The TAM software shall support hypertext, random browsing, and structured access to the training material.

2.2.2.4 The TAM software should have an open architecture by using computer off-the-shelf (COTS) software to the extent possible.

2.2.2.5 The TAM software shall be capable of integrating photographs, marine radar imagery, SAR imagery, illustrations, graphics, charts, and tables in support of the Training Material Definition in Section 2.2.6.

2.2.2.6 The TAM software shall be capable of providing a GUI (graphical user interface) to support the user requirements in Section 2.2.5.

2.2.2.7 Graphical data files formats should include .JPG, .BMP, and .GIF formats, as well as .AVI or equivalent formats for video clips.

2.2.3 Hardware Requirements

The minimum hardware configuration requirements for running the TAM software shall be as follows:

- IBM PC Pentium 133 MHz CPU;
- 32 meg RAM;
- 2 gig hard disk;
- 16 speed CD-ROM player;
- 14 inch SVGA monitor capable of displaying 1024 X 768 pixels and 16 million colors;
- 2 meg video accelerator card;
- Mouse and keyboard.

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2.2.4 Interface

2.2.4.1 The TAM shall be capable of being interfaced to the MINS platform by way of an application call from the MINS platform. For example, the TAM could be launched by having an integrated Windows API link that is activated when the trainee presses a reference help key from within the MINS on-line help menu.

2.2.4.2 The TAM shall be capable of running as an application on a stand-alone PC computer.

2.2.5 User Requirements

2.2.5.1 The TAM shall interact with the user through the use of a graphical user interface (GUI).

2.2.5.2 The GUI shall be based on a Windows 95 Widget Set which includes menus, scroll bars, buttons, and hyperlinks; the GUI shall also accept input from devices such as a mouse, keyboard, or other graphical pointing devices.

2.2.5.3 The TAM shall be structured into three separate courses relating to ice recognition, ice climatology, and ice regime entry rules.

2.2.5.4 The TAM shall use hyperlinks for navigation in order to provide the user with the most interactive experience.

2.2.5.5 The TAM shall assist users to learn at their own pace.

2.2.5.6 The TAM shall allow users to follow the courses sequentially or non-sequentially.

2.2.5.7 The TAM shall support random browsing.

2.2.5.8 The TAM shall include a table of contents to assist the user in finding particular topics.

2.2.5.9 The TAM should include a complete index to assist the user in finding particular topics.

2.2.5.10 The TAM should include a search engine capable of keyword searches to assist the user in finding particular topics.

2.2.5.11 The TAM may include exercises for self-testing.

2.2.5.12 The TAM may include a glossary to assist the user in finding particular definitions of keywords.

2.2.6 Training Material Definition

2.2.6.1 The TAM shall provide the following online courses:

- Ice recognition module
- Ice climatology module
- Arctic Ice Regime Shipping System module

Ice Recognition Module

The objective of this module is to train the user on the formation, aging and decay of ice to be found in the marine environment and how the various forms of ice appear both visually and on the various information sources available to the navigator.

2.2.6.2 The Ice Recognition module shall include segments on:

1. Ice physics, formation, growth, aging and decay
2. Ice types and concentration
3. Ice reporting, coding and terminology
4. Ice navigation systems information sources

The objective of the segment on ice physics, formation, growth, aging and decay is to provide the user with background information on ice as a material, such that the user will gain a better understanding the behavior of the substance in the marine environment.

2.2.6.3 The segment on ice physics, formation, growth, aging and decay shall be made up of a combination of text, photographs, and graphs and shall provide basic information succinctly expressed. It shall start with describing how ice forms and ages, and shall provide notes on the significance of this process to shipping. The emphasis shall be on the description of the unique crystal characteristic of ice. Also provided shall be a description of the difference between sea ice, lake ice, and glacial ice, all of which could be encountered by ships at sea.

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The objective of the segment on Ice Types and Concentration is to train the user on the form and recognition of each of the World Meteorological Organization's (WMO) ice type and concentration categories.

2.2.6.4 The segment on ice types shall include a description of all of the WMO types of ice, from nilas to multi-year ice, lake and river ice and icebergs. the major ice type categories to be described shall be:

- New ice (frazil, grease, nilas);
- Young ice (grey and grey white);
- First year ice (thin, medium, thick);
- Old ice (second year, multi year);
- Lake/river ice (new, medium, thick and very thick);
- Iceberg size (growler, bergy bit, small, medium, large, very large, ice island);
- Iceberg shape (tabular, domed, pinnacled, wedged, drydock, blocky).

2.2.6.5 The segment on ice concentration shall describe, with photos and graphs, what ice looks like at each increasing concentration. The concentrations to be described shall be as follows:

- Ice free;
- Open water (bergy waters and <1/10);
- Very open drift (1/10 to 3/10);
- Open drift (4/10 to 6/10);
- Close pack (7/10 to 8/10);
- Very close pack (9/10 to 9+/10);
- Consolidated (10/10).

The objective of the segment on ice reporting and coding is to train the operator on the use of the WMO ice coding procedures, both for the reading of standard ice charts as well as the use of the coding for the reporting of ice.

2.2.6.6 Much of the segment on ice reporting and coding shall be summarized from MANICE. It shall consist of a listing of the WMO code for each ice type and concentration. A table summarizing the coding shall be included. One or more examples of codes used to describe ice conditions shall be included with corresponding photographs of the ice conditions.

The objective of the segment on ice navigation systems information sources is to train the user on how to identify the ice types and concentrations on the various information sources available on the bridge of a vessel.

2.2.6.7 The segment on ice navigation systems information sources shall describe the CIS daily ice analysis chart. Examples of an ice analysis chart from Baffin Bay and Lancaster Sound shall be presented, and an example from the Gulf of St. Lawrence

should also be presented. The charts shall be in both black and white as well as an Enfotec coloured chart. A table of the HF broadcast frequencies used to transmit these charts for each region of Canada shall also be provided. In addition, a description of alternate means of acquiring these data, such as with an ice navigation system, should also be presented.

2.2.6.8 The segment on ice navigation systems information sources shall describe the NOAA AVHRR satellite and sensor along with the strengths and weaknesses for ice detection. This shall be followed by a description of how to access these data on board a ship. Images of Baffin Bay and Lancaster Sound shall be used, and an image from the Gulf of St. Lawrence should also be used. The ice types contained in the images shall be described. All NOAA imagery shall be the full 1.1 km (nominal) resolution HRPT Channel 2 data.

2.2.6.9 The segment on ice navigation systems information sources shall describe RADARSAT along with a discussion of the strengths and weaknesses of the sensor for ice detection. This shall be followed by a description of how a navigator could get ready access to the imagery at sea via the “imagette”. The beam modes most commonly used for ice reconnaissance and navigation are Wide, ScanSar Narrow, and ScanSar Wide and these shall be the beam modes from which images shall be selected for this module. RADARSAT images shall be included that are appropriate for this section.

2.2.6.10 The segment on ice navigation systems information sources shall describe the physics of how and why ice appears the way it does on a standard marine radar. This shall be followed by examples of digitally recorded marine radar images of ice with overlay descriptions of ice conditions. Cross-polarized marine radar imagery shall also be provided.

2.2.6.11 The segment on ice navigation systems information sources should also describe the airborne SAR sensors (for example, the STAR-1 system) and imagery of ice conditions.

Ice Climatology Module

The objective of the ice climatology module is to train the user on the geographic distribution of ice to be found in specific regions of ice-covered waters in Canada.

2.2.6.12 The ice climatology module shall include descriptions of the ice conditions of Baffin Bay and Lancaster Sound. It should also include similar descriptions of the Gulf of St. Lawrence. Sample photographs, satellite images, and ice charts shall be provided as necessary, to provide a description of the ice conditions as they develop throughout the year.

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2.2.6.13 The Baffin Bay ice regime description shall be divided into six sections:

1. Oceanography and climatology;
2. Spring melt;
3. Summer transition;
4. Fall freeze-up;
5. Winter;
6. Icebergs.

2.2.6.14 The oceanography and climatology section shall briefly describe the water masses, tides, ocean currents, wind and temperature conditions of Baffin Bay.

2.2.6.15 The spring melt section shall describe the transition period from the maximum winter ice condition, achieved in early May, to the advanced ice melt, achieved in mid July.

2.2.6.16 The summer transition section shall describe the summer transition period between the end of the spring melt in mid July to the onset of freeze-up in early October. This is the most important section as this is the period of time when most ships transit through Baffin Bay.

2.2.6.17 The fall freeze-up section shall describe the freeze-up condition for Baffin Bay, which occurs from early October to mid-December.

2.2.6.18 The winter section shall describe the winter condition for Baffin Bay, which extends from mid-December to early May. Since ship traffic is non-existent in this region during this period, this section shall be brief.

2.2.6.19 A special section shall be created to describe the icebergs of Baffin Bay, which are the most distinctive ice features of the region.

2.2.6.20 The Lancaster Sound and Barrow Strait ice regime description shall be included. It shall cover the water bodies of Lancaster Sound and Barrow Strait leading to the community of Resolute Bay and the Polaris Mine. This regional description shall be divided into five sections:

1. Oceanography and climatology;
2. Spring melt;
3. Summer transition;
4. Fall freeze-up;
5. Winter.

2.2.6.21 The oceanography and climatology section shall present a description of the oceanography and climatology.

2.2.6.22 The spring break-up section shall describe the spring melt condition, which spans from late May to the end of July.

2.2.6.23 The summer transition section shall describe the summer transition in the region from the end of the spring break-up at the end of July to the start of the fall freeze-up in late September. This is the period when the most ships visit the region.

2.2.6.24 The fall freeze-up section shall describe the fall freeze-up period, which spans from late September to early November.

2.2.6.25 The winter section shall describe the winter condition. Since ship traffic is non-existent in this region during this period, this section shall be brief.

2.2.6.26 The Gulf of St. Lawrence ice regime description should be included. It should describe the seasonal ice regime of the Gulf of St. Lawrence in the following four sections:

1. Oceanography and climatology;
2. Early winter freeze-up;
3. Mid-winter;
4. Spring melt.

2.2.6.27 The oceanography and climatology section should provide a brief description of the oceanography and climatology of the Gulf of St. Lawrence.

2.2.6.28 The early winter freeze-up section should describe the ice climatology of a seasonal ice regime starting with the ice formation in early December and spanning to late January.

2.2.6.29 The mid-winter section should describe the ice conditions which occur through the mid-winter period in the Gulf of St. Lawrence from late January to late March.

2.2.6.30 The spring melt section should describe the pattern of ice melt and disappearance in the region spanning from late March to late May.

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Arctic Ice Regime Shipping System Module

The objective of the Arctic Ice Regime Shipping System module is to provide the user with information to allow for an understanding of the rationale and operational use of the new Canadian Government regulations governing shipping in the Canadian Arctic, called the Arctic Ice Regime Shipping System (AIRSS).

2.2.6.31 The AIRSS module shall include a description of the system, calculation of the ice numeral, and regulation details, organized in the following manner:

1. Description of the system;
2. Ice navigator;
3. Ice multipliers and calculation of the ice numeral;
4. Reporting requirements.

2.2.6.32 The description of system section shall start with a description of the system and the rationale for its use.

2.2.6.33 The ice navigator section shall provide a description of what the term “Ice Navigator” means in the context of the regulations.

2.2.6.34 The ice multipliers and calculation of the ice numeral section shall describe the ice multipliers and the method to calculate the ice numeral. The terminology used in the regulations shall be described. One or two examples, with photographs, should be used to show how the ice multipliers are used to calculate the ice numeral. A table of ice multipliers shall be provided with the formula to calculate the ice numeral. The ice multiplier table shows the ice class of the ship versus the WMO ice types.

2.2.6.35 The reporting requirements section shall describe the two reports that must be produced. The AIRSS requires that two reports be produced by the Masters or Ice Navigator of a vessel; the first being the routing message, produced just prior to the vessel entering the traffic control zone, and the after action report, produced within 30 days of completing the voyage. Outlined forms for these reports should be included along with one completed example of each.

2.2.6.36 The portion of the Arctic Waters Pollution Prevention Act (AWPPA) that contains the AIRSS regulations is available in digital format. This may be supplied as an appendix or attachment.

2.2.6.37 The TAM may include a data source catalog to assist the user in finding particular type of file, such as graphic, video, audio, SAR imagery, and so on.

2.2.6.38 The TAM shall be developed in English.

3 MARKET SURVEY

3.1 INTRODUCTION

Conducting a market survey of available developer's software was an integral step in selecting the software environment for developing the TAM. In this section, the results of the survey of authoring tools are presented.

Since this particular project involves the development of a CBT program to provide an on-line reference and training guide for ice type recognition, ice climatology, and the ice regime system, only those development tools that are capable of combining text, hyperlinks, and various graphic formats into a suitable, final training package were examined.

In Section 3.2, the high-level differences between the various hypertext development environments are explored. In Section 3.3, the evolution and trends that hypertext development tools are undergoing are described, as they can influence the future usability of the TAM. In Section 3.4, the minimum software requirements, as obtained from the Functional Specification Document (Section 2), are re-stated. In Section 3.5, a table is presented that compares the features of the most popular CBT multimedia development packages, WinHelp/HTML-Based Help development packages, and graphical development languages. Finally, Section 3.6 recommends the ideal package to be used for the development of the TAM. Appendix A contains a fairly comprehensive listing of

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available Windows Computer-Off-The-Shelf (COTS) development packages, including both WinHelp/HTML-Based Help and CBT multimedia development.

3.2 HYPERTEXT DEVELOPMENT ENVIRONMENTS

It is important to understand the differences between help development tools, CBT development tools, and graphical programming languages.

3.2.1 Help Development Tools

Help development tools are used to create on-line interactive help files that can be accessed on the Windows operating platform from within a program's help menu. When Microsoft developed and released Windows to consumers in the 1980s, bundled with it was the WinHelp engine. Since its first release, the WinHelp engine has gone through several updates.

3.2.1.1. WinHelp Development Tools

WinHelp development tools are used to create rich text format (.RTF) files, which in turn are compiled with a Windows compiler (WinHelp) into (.HLP) files. These help files are the current Windows standard for on-line help. Because Windows has a built-in interpreter for the .HLP files, these help files will run on all Windows computers. No other files are needed.

HLP files normally contain a table of contents and an index. The current version of WinHelp 4.0 (for Windows 95) was upgraded significantly from the WinHelp 3.0 version for Windows 3.1. WinHelp 4.0 includes more versatile search capabilities, enabling users to search using an index, a keyword search feature, and a table of contents. Though the primary focus of these on-line help systems is to provide hypertext information, designers can also add color images, audio and video or animation (using a Windows provided Media Player).

There are many help authoring tools available for simplifying the creation of these .RTF and .HLP files. These tools permit the designer to create the help system in a Microsoft Word environment instead of having to code everything directly into .RTF files. This greatly reduces the time it takes to create the help system, which saves money. Examples of WinHelp authoring tools include WinHelp Office Suite (which includes RoboHelp), and Documentation Studio (which includes Doc-To-Help). For a more complete listing, refer to Table A-1 in Appendix A.

3.2.1.2. Microsoft HTML Help Development Tools

In 1996 Microsoft announced its future direction for the Windows Help system—the Microsoft HTML Help system. HTML Help, as Microsoft has named its new product, is a software development kit for creating context-sensitive, HTML-based help for 32-bit Windows applications (and down the line, we are told, for Windows 3.1, Macintosh, and UNIX applications).

Microsoft's first release version of the HTML Help standard is due any day. A beta version was released in early 1997. Many software companies have already embraced the latest standard, and are developing utilities to assist developers in creating HTML Help files.

The HTML Help system will ultimately include all of WinHelp's features and more. Instead of using the WinHelp engine, which interprets .RTF files, the new HTML-Based Help Engine will interpret a pseudo-HTML file. Microsoft has extended the functionality of standard HTML with the multipurpose HTML Help Active-X Control. Instead of WinHelp's pop-up window, HTML Help will use a browser like Microsoft Explorer 3.0 to display the Help file. Since HTML Help requires support for ActiveX controls, only browsers that support ActiveX controls will correctly display HTML Help.

By using a browser like Explorer 3.0 to view a help file, the designer will also be able to provide links and references to documents residing on the internet. This feature alone will provide endless opportunities for creativity. By using a compliant browser, designers will also have the added functionality of Java, Javascript, ActiveX and VBScript. This dramatically increases the possibilities available to Help File developers.

Those tools which previously assisted in the development of WinHelp files are now being updated and equipped for creating HTML Help files. Tools like WinHelp Suite and Documentation Studio have fully embraced this up and coming standard. They continue to allow the user to easily create these help files in the Microsoft Word environment.

Although WinHelp files can only be used for the Windows environment, an added benefit of HTML Help files is that they can be used on all platforms that support the Internet Explorer Browser.

Generally speaking, developing an interactive on-line reference program using a help authoring tool is a less costly alternative than multimedia development using a graphical development language like Visual Basic. This is because help authoring tools such as WinHelp Suite require less programming or scripting. Many of them also have a short learning curve since they use the Microsoft Word environment to create the help file.

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3.2.2 Computer-Based Training Developer Packages

CBT developer packages are a specialized form of multimedia development tools. They contain tools for implementing and customizing GUIs, and are generally much more graphically capable than Windows Help authoring tools.

Some CBT developer packages can only be created and executed for a single operating environment. Others can be created and/or played in additional operating environments. All the packages that we consider in Section 3.5 are Windows applications capable of being developed and executed in at least the Windows 95 operating environment.

CBT developer packages have a wide array of tools and pre-defined content including wizards, templates, and a catalog of multimedia objects. Macromedia Director, for instance, features extensive support for all popular media types, supports OLE objects, possesses powerful animation tools, has a built-in paint editor, has the Shockwave tool for internet conversion, and supports MMX Technology. Applications are developed using Director's own menus, dialog boxes, toolbars and pre-programmed widget sets. Competitive CBT developer packages, like Asymetrix ToolBook II Instructor, also possess similar functionality.

Because CBT developer packages have all of these predefined functions and object tools, they are simpler to use than programming languages, but more complex than a Windows Help authoring tool. Most of these CBT developer packages have their own authoring language that must be learned in order to customize a program. They generally have more functionality than current versions of WinHelp. They also require a run-time program (often provided with purchase) to operate. Their main value is in the flexibility of design, intense graphical support, high level of user interactivity features, and relative speed of creating applications compared to a general purpose programming language.

Examples of multimedia development tools are Asymetrix's Multimedia Toolbook II Instructor, Macromedia Director, and AimTech's Icon Author. For a more complete listing, refer to Table A-2 in Appendix A.

3.2.3 Graphical Programming Languages

Graphical programming languages such as Visual Basic and Visual C++ are high level languages that allow software developers maximum control and flexibility in designing an application. These programming tools are general purpose and support the development of any application. Visual Basic and Visual C++ come with their own GUI development tools.

While programming with such tools offers the widest possible set of features, it is more costly for applications such as the TAM because object toolbars, widgets, and hypertext

tools that come standard with CBT and WinHelp packages must be programmed with a programming language.

3.3 HYPertext SOFTWARE TRENDS

3.3.1 WinHelp Moves to Internet with New HTML Help Standard

Microsoft announced last year that they were departing from WinHelp and creating a new HTML standard for the Windows 95 and NT help system. This change to HTML Help will add significantly more functionality to the Windows Help system. Microsoft has already released a pre-beta version of HTML Help. The full version should be released any day.

Excerpt from 'Work Write User Assistance for WinHelp and the Web' -- based on an interview with Microsoft held on 10/16/96.

What is different about HTML Help is not only the obvious -- it is based on HTML -- but also that it appears to have a rather considerable development commitment from Microsoft. First, HTML Help doesn't just replace WinHelp, the previous industry-standard help system for Windows 3.1 and Windows 95/NT 3.51+. It also has replaced MediaView, the Microsoft development environment for multimedia titles...

Even Bill Gates, Microsoft CEO, has made statements in speeches and to the press that suggest that help (and that now means HTML Help) figures centrally into Microsoft's new Internet content-providing strategy...

Rather than setting out to make standards of its own and forcing its users to comply with them, Microsoft is working with the World Wide Web Consortium (W3C) on standardization. It is not, as many feared it might, developing its own brand of HTML to simply recreate the capabilities of RTF, or to further a self-serving vision of HTML à la Internet Explorer. At least for now, by proposing its compiled format, sitemap format, and so forth to W3C, Microsoft is following the same standardization path that all organizations must follow to make changes to Web standards...

As with WinHelp, HTML Help will be available with every new Windows installation (at least, every 32-bit installation) once it ships. The Software Developer's Kit (SDK), including the software needed to

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view HTML Help, will be free of charge. (You do not need an entire installation of Explorer, by the way -- just some key components.) ...

HTML Help will include a conversion tool that will convert RTF-based WinHelp documents to HTML Help format. This tool is meant for authors who don't use a help authoring tool to do a one-time conversion...

The tool vendors, as one might expect, have for the most part jumped wholeheartedly onto the HTML Help bandwagon. Blue Sky, WexTech, SolutionSoft, and HyperAct have all come out with support for HTML Help in their conversion utilities and authoring tools -- even though they cannot yet ship the components of HTML Help that you need to actually create these documents.

3.3.2 CBT Developer Packages Adding Internet Conversion Capability

CBT developer packages and web site developer packages used to be two distinct product categories. Consumers have come to demand more integrated packages that reduce duplication costs and conversion expenses. As a result, today's CBT developer package will also contain conversion tools that will let an application run from a web site. Shockwave is Macromedia's solution to the internet conversion question. Developers like Asymetrix have also placed great effort into adding internet functionality. Users are sure to see this trend continue.

3.4 MINIMUM REQUIREMENTS

The minimum system and software requirements are described in the functional specification in Section 2. Not all of the requirements listed in the functional specification are relevant in the selection of the software development environment. The features examined in the Section 3.5 include both the mandatory requirements (from Section 2) as well as optional (non-required) features. These features are summarized below. Mandatory features include the paragraph number of the associated requirement(s) for traceability.

Mandatory Features

PC Based Application - 2.2.1.2. & 2.2.4.2. - Does the software support the creation of a PC computer-based application?

Runs under Windows 95 - 2.2.1.2. & 2.2.2.2. - Do the software and applications created with the software run under the Windows 95 environment?

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Can run stand-alone - 2.2.1.3. & 2.2.4.2. - Does the software support the creation of an application capable of running as a stand-alone application on a stand-alone PC?

Can be called from MINS - 2.2.1.4. & 2.2.4.1.- Can the software's resulting application be interfaced to the MINS platform by way of an application call from the MINS platform?

Graphical User Interface - 2.2.1.5. & 2.2.5.1 & 2.2.5.2 & 2.2.5.8. - Does the software support the creation of an application that can interact with the user through the use of a graphical user interface (GUI) ?

Supports Hypertext - 2.2.1.8. & 2.2.2.3. & 2.2.5.4. - Does the software support the creation of an application that supports hypertext?

Random Browsing Capable - 2.2.1.8. & 2.2.2.3. & 2.2.5.7. - Does the software support the creation of an application that is capable of random browsing?

Structured Access Capable - 2.2.1.8. & 2.2.2.3. & 2.2.5.6. - Does the software support the creation of an application that has structured access suitable to a systematic learning process?

Provide Reference Info - 2.2.2.1. - Does the software support the creation of an application that can provide reference information in regards to ice type recognition, ice climatology and ice regime entry rules?

Supports .JPG, .GIF, .BMP – 2.2.2.5 & 2.2.2.7. - Does the software support creation of an application that contains these file types (or other equivalent graphic file types) ?

Runs on Pen 133, 32 Meg, 2Gig – 2.2.3.1. - Can the TAM application created by the software run using the minimum hardware configuration requirements stated in the functional specification document?

Optional Features

Primary Usage – What are the main applications that this software is used for?

Open Architecture (COTS) - 2.2.2.4. - Is the software COTS software and does it use a non-proprietary open architecture?

Runtime Platforms Supported - On what operating platforms does this CBT software provide runtime players for?

Runtime Player Cost - What is the cost of this CBT software's runtime players?

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Database Facility - Does the software have a database frontend?

Search Engine - 2.2.5.10 - Does the software provide a search engine capability in the created application?

Internet Conversion Capability - Does this CBT software support conversion of its generated files into HTML format?

Audio Importing Formats - Does the software support popular audio formats?

Video Importing Formats - Does the software support popular video formats?

Graphic Importing Formats - Does the software support popular graphic formats?

HTML Help Support - Does the software support Microsoft HTML Help standard format?

Java Support - Does the software support the use of Java programming?

Active-X Support - Does the software support Active-X?

Technical Support - How do we rate the software company's technical support facility?

Popularity - How do we rate the market reception of the software product?

Ease of creating topics - How do we rate the ease of creating topics with the software?

Ease of creating indexes - 2.2.5.9 & 2.2.5.12 - How do we rate the ease of creating indexes with the software?

Ease of creating glossaries - How do we rate the ability to create a glossary with software?

Upward Compatibility - How do we rate the future usefulness and upgradability of the software?

Microsoft Word Base - Does the software use Microsoft Word as its base?

3.5 PRODUCT SURVEY

As can be seen in the tables in Appendix A, a multitude of development products are available. Rather than provide an extensive description of each product, those Windows

products that are most specialized in developing multimedia, CBT applications have been selected for further consideration.

In Section 3.5.1, the following help development packages are compared:

- Blue Sky's WinHelp Office Suite;
- Wextech's Documentation Studio;
- ForeFront's ForeHTMLPro;
- Solutionsoft's HelpBreeze 2.0;
- Virtualmedia's HDK.

In Section 3.5.2, the following CBT Multimedia Development Packages are compared:

- Macromedia's Director Multimedia Studio;
- Asymetrix's Toolbook II Instructor;
- AimTech's IconAuthor;
- AimTech's CBT Express;
- Allen Communication's Quest.

3.5.1 Windows Help Development Software Comparison

In Table 3-1, a comparison of five leading Windows Help Development Software packages is provided. The five packages are compared against the Mandatory Features and relevant Optional Features listed in Section 3.4.

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Table 3-1: Windows Help Development Software Comparison

	WinHelp Office	Documentation Studio	ForeHelp Premiere Suite	HelpBreeze 2.0	HDK
Estimated price and shipping (U.S. dollars)	\$749	\$799	\$699	\$399	\$595
Mandatory Features					
PC-based application	Yes	Yes	Yes	Yes	Yes
Runs under Windows 95	Yes	Yes	Yes	Yes	Yes
Can run stand-alone	Yes	Yes	Yes	Yes	Yes
Can be called from MINS	Yes	Yes	Yes	Yes	Yes
Graphical user interface	Yes	Yes	Yes	Yes	Yes
Supports hypertext	Yes	Yes	Yes	Yes	Yes
Random browsing capable	Yes	Yes	Yes	Yes	Yes
Structured access capable	Yes	Yes	Yes	Yes	Yes
Provide reference info	Yes	Yes	Yes	Yes	Yes
Supports .JPG, .GIF, .BMP	Yes	Yes	Yes	Yes	Yes
Runs on Pen133, 32meg, 2gig	Yes	Yes	Yes	Yes	Yes
Optional Features					
Primary usage	Help/Training	Help/Training	Help/Training	Help/Training	Help/Training
Open architecture (COTS)	Yes	Yes	Yes	Yes	Yes
Audio importing formats	Yes	Yes	Yes	Yes	Yes
Video importing formats	Yes	Yes	Yes	Yes	Yes
Graphic importing formats	Yes	Yes	Yes	Yes	Yes
Search engine	Yes	Yes	Yes	Yes	Yes
Htmlhelp support	Yes	Yes	Yes	Yes	Yes
Java support	Yes, Using RoboHTML or WinHelp 2000 add-on	Not currently	Yes	Not currently	Not currently
Active-X support	Yes, Using RoboHTML or WinHelp 2000 add-on	Not currently	Yes	Not currently	Not currently
Technical support	Excellent	Good	Good	Good	Good
Popularity	Excellent	Excellent	Good	Good	Good
Ease of creating topics	Excellent	Excellent	Excellent	Excellent	Excellent
Ease of creating indexes	Excellent	Excellent	Excellent	Excellent	Excellent
Ease of creating glossaries	Excellent	Excellent	Excellent	Excellent	Excellent
Upward compatibility	Excellent	Excellent	Good	Good	Good
Microsoft Word base	Yes	Yes	Yes	Yes	Yes

As the table demonstrates, all of these packages support the mandatory features. It is in the optional features that they differ somewhat. The deciding factor is the industry reputation of the software manufacturer in terms of technical support, popularity and upward compatibility, as well as the extent to which they currently support advanced, HTML-based features such as Java and Active-X. The cost differential between the least expensive and most expensive package is relatively small (a few hundred dollars).

Only Blue Sky's WinHelp Office and Forefront's ForeHelp Suite currently allow developers to author in Microsoft's HTML-Help proposed standard. WinHelp Office 5.0, which was released in October 1997, includes RoboHTML which is designed to

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develop native HTML-Help help applications. In addition, an add-on product called WinHelp 2000 (\$99 U.S.) allows WinHelp Office to develop hybrid help applications that include both native Windows Help and native HTML-Help code.

Forefront's ForeHelp Suite includes ForeHTML (released in August 1997), which offers the same functionality as WinHelp Office + WinHelp 2000. Native Windows Help, native HTML-Help and hybrid help applications can be created.

Based on ease-of-use, reasonable cost, exceptional functionality, marketshare and product support, Blue Sky Software is the most reputable company with the most exceptional Help Development Software – WinHelp Office Suite. This comprehensive package supports the development of both .RTF and Microsoft HTML Help. Sicom has direct experience working with their products and their technical support staff, which is an added benefit. Blue Sky is usually in the forefront when it comes to amending their products to meet technology changes (eg. HTML-Help). Their products are extensively supported.

3.5.2 CBT Multimedia Development Software Comparison

In Table 3-2, five leading CBT Multimedia Development Software packages are compared. These five packages are compared against the Mandatory Features and the relevant Optional Features listed in Section 3.4.

All five packages support the Mandatory Features. The cost differential between the least expensive and most expensive package is relatively large (a few thousand dollars). The more expensive packages are better suited to the development of CBT applications. The optional features differ among the packages in terms of database, internet and operating system support.

Based on the requirements for this project, Toolbook II Instructor is the best tool in terms of price and performance. It is the least expensive of the CBT-focused tools, and offers equivalent or better features than any of the more expensive tools. Its only drawback is that it is currently available solely for Windows platforms, but this is not a concern for this contract, as a Windows platform was mandated. Because it is designed specifically for CBT applications and because of its exceptional functionality and product support, it is a popular choice for instructors and training developers. Of all of the CBT development tools, Toolbook II is Sicom's top selection. As an added benefit, Sicom has direct experience with its manufacturer Asymetrix, as well as with its products and support.

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Table 3-2: CBT Multimedia Development Software Comparison

	Director	Toolbook II	IconAuthor	CBT Express	Quest
Estimated price (U.S. dollars)	\$995	\$1795	\$4995	\$2995	\$3995
Mandatory Features					
PC-based application	Yes	Yes	Yes	Yes	Yes
Runs under Windows 95	Yes	Yes	Yes	Yes	Yes
Can run stand-alone	Yes	Yes	Yes	Yes	Yes
Can be called from MINS	Yes	Yes	Yes	Yes	Yes
Graphical user interface	Yes	Yes	Yes	Yes	Yes
Supports hypertext	Yes	Yes	Yes	Yes	Yes
Random browsing capable	Yes	Yes	Yes	Yes	Yes
Structured access capable	Yes	Yes	Yes	Yes	Yes
Provide reference Info	Yes	Yes	Yes	Yes	Yes
Supports .JPG, .GIF, .BMP	Yes	Yes	Yes	Yes	Yes
Runs on Pen133, 32meg,2gig	Yes	Yes	Yes	Yes	Yes
Optional Features					
Primary usage	Games, Kiosks	CBT, CD-ROMs	CBT, CD-ROMs	CBT, Corporate	CBT, kiosks, corporate
Open architecture (COTS)	Yes	Yes	Yes	Yes	Yes
Runtime platforms supported	Win, Mac	Windows	Win, OS/2, Unix	Windows	Win, PowerMac
Runtime player cost	Free	Free	Free	Free	Free
Database facility	No	Yes	Yes	No	Yes
Search engine	Yes	Yes	Yes	Yes	Yes
Internet conversion capability	Yes	Yes	No	No	No
Audio importing formats	Yes	Yes	Yes	Yes	Yes
Video importing formats	Yes	Yes	Yes	Yes	Yes
Graphic importing formats	Yes	Yes	Yes	Yes	Yes
Java support	In HTML Help mode only	In HTML Help mode only	In HTML Help mode only	In HTML Help mode only	In HTML Help mode only
Active-X support	In HTML Help mode only	In HTML Help mode only	In HTML Help mode only	In HTML Help mode only	In HTML Help mode only
Technical support	Excellent	Excellent	Excellent	Good	Good
Popularity	Excellent	Excellent	Good	Good	Good
Ease of creating topics	Good	Excellent	Good	Good	Good
Ease of creating indexes	Good	Good	Good	Good	Good
Ease of creating glossaries	Good	Good	Good	Good	Good
Upward compatibility	Excellent	Excellent	Good	Good	Good

3.5.3 Graphical Programming Languages

With graphical programming languages such as Visual C++ or Visual Basic, all of the features listed in Sections 3.5.1 and 3.5.2 can be implemented. Because languages such as these are the building blocks of all Windows software, they have the most potential functionality. They do, however, require significantly more development (programming) effort for the TAM application than the Help or CBT tools. At the same time, the more specialized Help and CBT tools are not deficient in any way to meet the needs of the TAM.

3.6 TRADE-OFFS AND RECOMMENDATIONS

After examining the capabilities of Help development tools in Section 3.5.1, CBT Development Tools in Section 3.5.2, and graphical programming languages in Section 3.5.3, it is clear that any one of these types of tools could be used to satisfy the minimum requirements for the TAM.

What essentially differentiates each of these types of tools is the following: the cost to purchase, the cost to develop, and the optional features (cross-platform availability, ease of use, support for future developments, upward compatibility, internet/intranet usability).

Since a Help development tool like WinHelp Office Suite or a CBT development tool like Toolbook II Instructor contain more than enough features to meet the requirements of this project, it is not necessary to further consider programming in Visual Basic or Visual C++. The added functionality of these languages is not required, and hence, does not justify the extra development cost associated with them. Therefore, the only trade-offs remaining concern WinHelp Office Suite versus Toolbook II Instructor.

3.6.1 WinHelp Office Suite versus Toolbook II Instructor

Mandatory Features: Both developer packages meet the minimum mandatory TAM software requirements stated in Section 3.4.

Optional Features: Both developer packages meet the optional software requirements stated in Section 3.4. Toolbook II Instructor supports more import file types (but this extra support is beyond that required for the TAM). WinHelp, on the other hand, is simpler to use for creating topics, indices, and glossaries. They are both extremely popular packages within the Help and CBT industry. They are also the main, star products of their respective companies. Technical support and upward compatibility are heavily addressed by their respective companies.

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Flexibility: Toolbook II .TBK files have greater graphical and layout flexibility over WinHelp's .RTF files. However, this advantage is significantly reduced if the end product is converted into .HTML files. This is due to the fact that HTML Help files will be able to tap into Java, JavaScript, and ActiveX features that are not available in the .RTF format.

Time to Develop: Both development packages are efficient at creating content. In meeting the specified requirements of this project, however, it is believed that WinHelp Suite would require less time to develop the TAM. It is also believed that future amendments or changes to the TAM would be more speedily implemented with WinHelp Office Suite, because of its simplified structure. This in turn should translate into lower development and maintenance costs.

Cross-Platform Capability: Both of these development packages are designed especially for use on the Windows 95 platform. Both also have utilities that allow them to be converted into HTML, where they can be accessed by any platforms that run compliant browsers.

The following conclusions can be made in terms of the trade-offs associated with WinHelp Office Suite and Toolbook II Instructor:

- WinHelp Office Suite is more than capable of meeting the requirements of the TAM;
- Toolbook II Instructor is more than capable of meeting the requirements of the TAM;
- While Toolbook II contains more graphical features than WinHelp Suite, these additional features are in excess of those required by the TAM;
- The additional graphical features offered by Toolbook II are reduced if the final TAM is internet-bound (i.e. ultimately converted to HTML so that it can be accessible across an intranet or internet);
- Developing the TAM with WinHelp Suite is easier and less costly for current and future development.

3.6.2 Recommendations

Based on the foregoing, Sicom recommended the following course of action:

- Develop the TAM using the WinHelp Office Suite's .RTF file creation facility, which creates a standard WinHelp Help system that can be easily integrated with the MINS or run stand-alone. The current .RTF / WinHelp Engine offers all of the functionality currently needed by the TAM.
- Should extended features such as Java, JavaScript, Active X and VBScript be desired in future upgrades to the TAM, WinHelp 2000, which is an add-on to WinHelp Office Suite, can be used to provide that additional functionality. WinHelp 2000 allows HTML-Help features to be included in Microsoft WinHelp applications.

WinHelp Office Suite (version 7) supports Microsoft's current WinHelp standard as well as its HTML-Help standard. Although HTML-Help offers advanced features over WinHelp (e.g. Java, JavaScript, Active X and VBScript), both standards are more than adequate to meet the requirements of the TAM. HTML-Help has the added benefit of cross-platform compatibility and Internet/Intranet compatibility (however, these are not current requirements of the TAM). Sicom recommends not to adopt the HTML-Help standard at this time for the following reasons:

- HTML-Help is very new and is not a standard yet. As a result, any development in HTML-Help is risky because it may not be seamlessly compatible/convertible with/to the resulting standard.
- HTML-Help development tools such as RoboHTML (included in WinHelp Office Suite) are very new and hence are likely not to be very stable. This fact poses development risk.
- HTML-Help (at the time of selection) did not include all of the help features available with WinHelp (e.g. context sensitive help, and existing WinHelp macro support (although any unsupported macro could be programmed in HTML-Help by the developer)).

When HTML-Help becomes the standard in the future, it will be a straightforward process to convert the WinHelp-based TAM into an HTML-Help-based TAM, using WinHelp Office Suite's conversion utility. Blue Sky already provides WinHelp to HTML-Help converters with their software. Once HTML-Help matures, these converters will allow application developers to convert their applications to the new HTML-Help standard, and then continue help system development using native HTML-Help authoring tools.

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Furthermore, conversion to HTML Help in the future will allow the TAM to be accessed on all platforms and operating systems, over the Internet and through Intranets. Since HTML appears to be the current and future standard of information on the Internet, selection of Blue Sky's WinHelp Office Suite is wise because it will continue to be supported and should be upward compatible with future releases.

As a final note, many existing help systems developed for Microsoft's WinHelp Engine are highly textual, with few or no graphical features. Often, the purpose of these help systems is to provide on-line instructions for a particular software package, which, by nature, is textual. The lack of more graphical WinHelp-based help systems should not be understood to mean that WinHelp is incapable of developing graphical help systems, such as that required by the TAM. On the contrary, it is, and the TAM uses these features. Wallpaper, buttons, images, video, and hot spots are all readily supported. The architectural design and user's guide of the TAM are presented in Section 4.

4 TAM DESIGN AND USER'S GUIDE

4.1 INTRODUCTION

This section describes the architectural design of, and provides a user's guide for the TAM developed by Sicom Systems Ltd., under contract to Transport Canada's Transportation Development Centre (TDC) for insertion into the ice navigation simulator. The TAM is an autonomous, interactive help system that can be run independently on any Windows 95 system. It is designed as a stand-alone tool; and can also be easily integrated into other packages.

The purpose of this tool is to teach marine navigation officers the necessary information for navigating ships in Canadian ice-covered waters. The help system does this by educating navigators in three ice-related areas of study: ice recognition, ice climatology, and ice regime system entry rules.

4.1.1 For Best Performance

As the WinHelp 4.0 Help engine forms the backbone of this tool, the user will appreciate that the TAM has the same look and feel associated with all Windows 95 help systems.

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For best results, the TAM should be run on a Pentium or faster computer system that runs the Windows 95 operating platform with the Microsoft WinHelp 4.0 help engine. Installation requires a CD-ROM player, as well as 600 MB of free hard disk space if the tool is to be run from the hard disk. The user may also choose to run the TAM software directly from the CD-ROM; however, a 16-speed CD-ROM player or faster is recommended for smooth operation.

For best graphical performance, a 17 inch SVGA monitor that displays 16 million colors at a screen resolution of 1024 X 768 pixels is recommended.

In order to hear the audio tracks and view the digitally captured video contained within the TAM, the user's system must have installed at least a 16-bit sound card as well as a minimum 2 MB Video Card. In addition, the following video compression CODECs (which are standard with Windows 95) must also be installed: Intel Indeo Video 3.2, and Cinepak CODEC by Radius Inc. To determine which CODECs are installed on your system, go to the Multimedia settings found in the Win95 Control Panel. Click on the Advanced tab and view the various CODECs.

4.1.2 Who Should Use the TAM

The information within this TAM was designed for use by ship navigator trainees, advanced navigators, and instructors alike. The information within the TAM is accessible in several different ways.

Novice ice navigators will find it helpful to go through the course contents from beginning to end. Ice analysts will find the sections on ice reporting & coding and ice navigation systems information sources particularly useful. The sections covering information sensors are also quite useful for those interested in remote sensing. Ice service specialists will find the ice climatology course and its accompanying imagery useful in comparing the different ice features of the Gulf of St. Lawrence, Baffin Bay, and Lancaster Sound.

The ice recognition and ice climatology course modules are useful references for ice experts and non-experts alike.

4.2 TAM STRUCTURE

When the TAM is launched, the user is prompted with the screen shown in Figure 4-1.

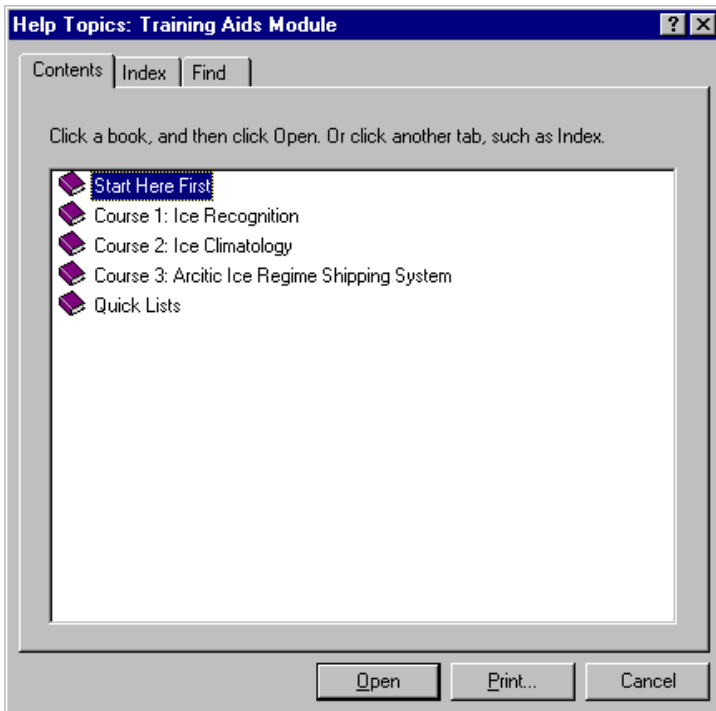


Figure 4-1: TAM Contents Menu

This is the Help Topics window. Like a table of contents, it is a primary instrument used to take the user to any selected part of the TAM. The user will find several books listed in the Help Topics window. By double clicking on a particular book, its structure will expand to reveal other books or topic pages that are contained within it, as shown in Figure 4-2.

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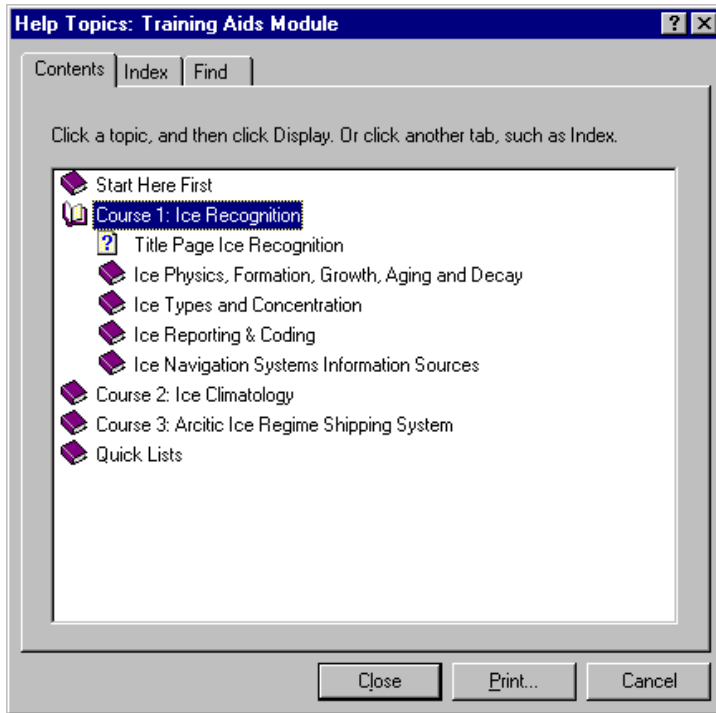


Figure 4-2: TAM Table of Contents Expanded

New users should begin by double clicking the first book Start Here First, and then proceed to the Start Here First topic. This sequence launches the TAM main window and provides audio instructions for opening the remaining TAM windows.

The TAM is comprised of three windows: the Training Aids Module main window, the Quick View window and the Media Viewer window. Each of these windows occupies its own place on the screen desktop. When all three windows are opened simultaneously, the full screen is utilized as shown in Figure 4-3. See how the TAM main window, when launched, opens up in the left half of the screen. The default location for the Quick View window is the bottom right side of the desktop. The Quick View menus allow the user to quickly scan relevant images and photos contained within a given section. The Media Viewer window is located above the Quick View window, on the top right side of the desktop. It is there, that all graphic images are displayed.

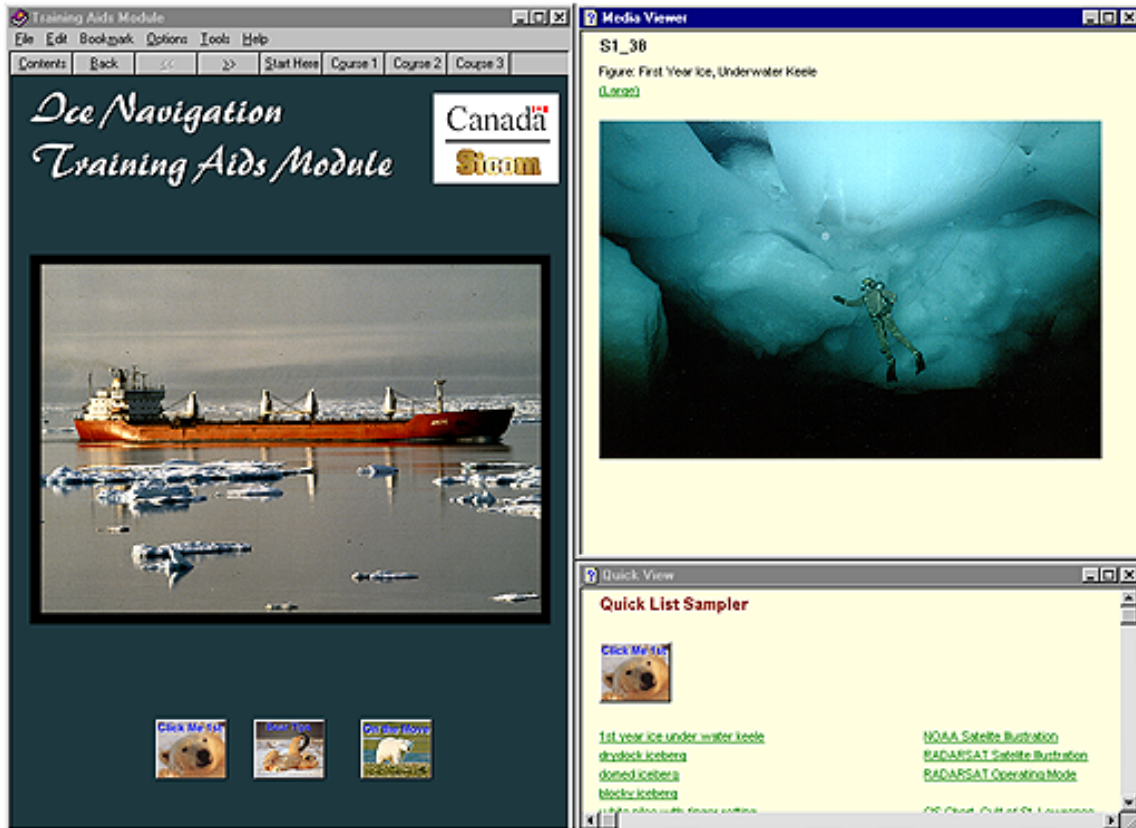


Figure 4-3: TAM Window Structure

The TAM main window, Quick View window, and Media Viewer window can be individually minimized or maximized. Should the user close the main window, however, the other two windows (if they are open) will also be closed.

The TAM main window contains the following menus: File, Edit, Bookmark, Options, Tools and Help. In addition, the main window also has a button bar at the top that contains the following button links: Contents button, Back button, << (previous page) button, >> (next page) button, Start Here button, Course 1 button, Course 2 button and Course 3 button. Each of these GUI controls is described in the sequel.

4.2.1 TAM HELP TOPICS WINDOW

The TAM Help Topics window is an efficient means to navigate throughout the entire course. The Help Topics window is accessed by pressing the Contents button on the TAM main window. The Help Topics window contains a Contents tab, an Index tab, and a Find tab as shown in Figure 4-4.

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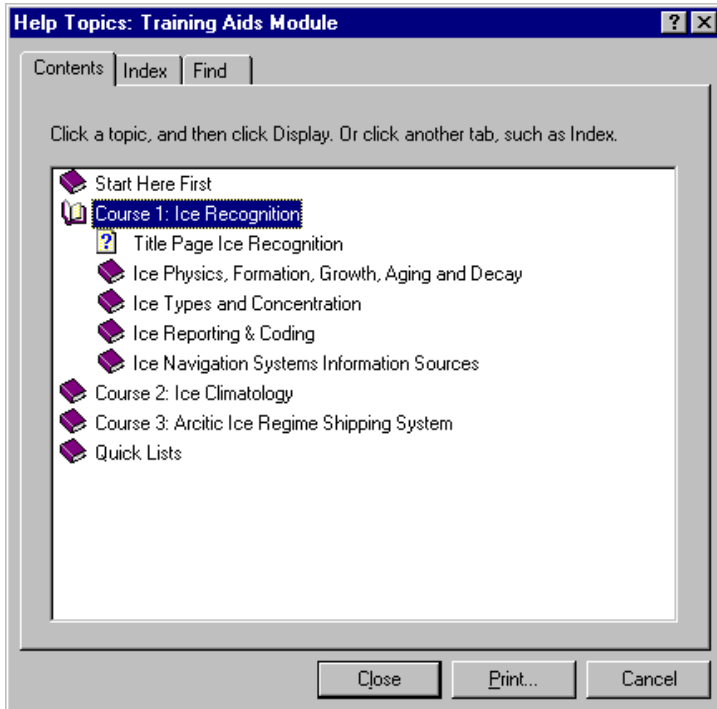


Figure 4-4: TAM Table of Contents Expanded

The Contents Tab

Notice how the Contents tab of the Help Topics window displays five books (see Figure 4-4).

Start Here First

Course 1: Ice Recognition

Course 2: Ice Climatology

Course 3: Arctic Ice Regime Shipping System, and

Quick Lists.

By clicking on one of them, the Table of Contents expands to show the highest-level section headings contained within it. A book may comprise one or more sections (and sections may contain additional sub-sections). The lowest-level section (or sub-section) contains one or more topics (also called pages or topic pages). The first section in the Ice Recognition Module is 'Ice Physics, Formation, Growth, Aging and Decay'. By clicking on that section, the index is further expanded to show three sub-sections: Ice Properties, The Origin and Properties of Sea Ice and Lake Ice, and The Origin and Properties of Icebergs. Notice the page symbol to the left of these names. That symbol indicates that there are no further lower-level sub-sections. By clicking on one of the page symbols, you will be taken to that page. Figure 4-5 is an example of such a page.

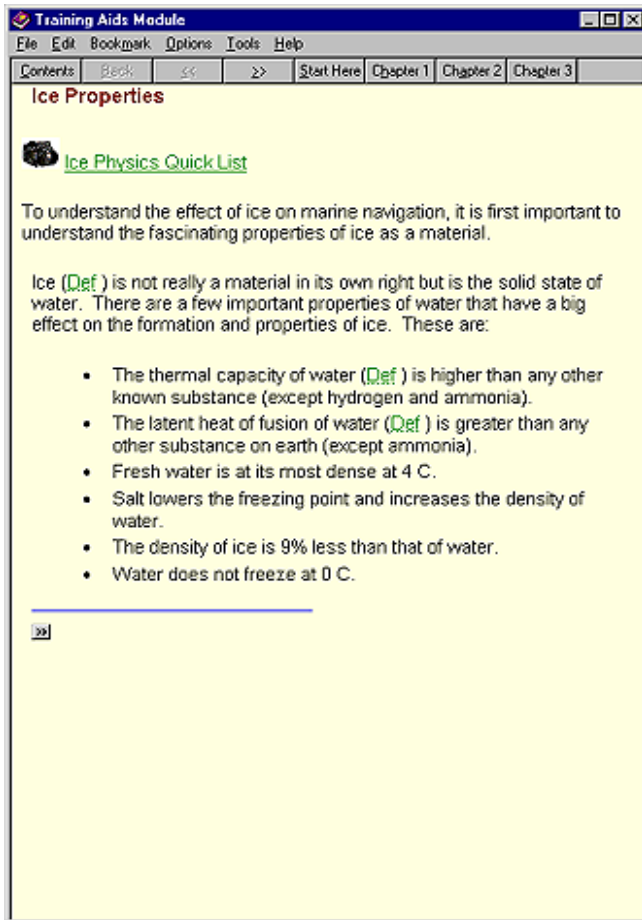


Figure 4-5: Typical TAM Topic Page

The Index Tab

Notice the Index tab located at the top of the Help Contents window. By clicking on this tab, the user is presented with a list of grouped search terms (like those found in an index at the back of a textbook) that can be used to jump the user to those topics which contain the selected term. The TAM Index resembles Figure 4-6.

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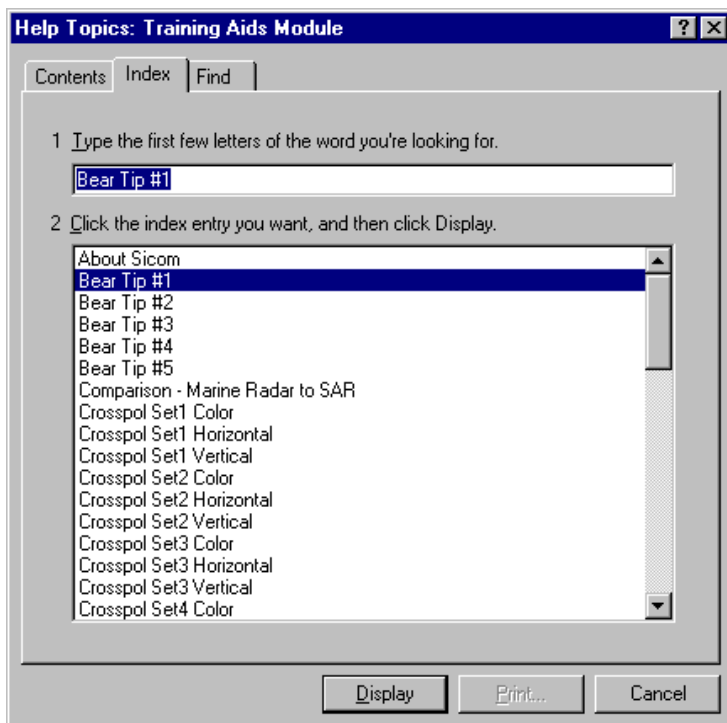


Figure 4-6: TAM Index

By selecting one of the available terms (in this example, Bear Tip #1), the page (topic) containing the selected term is instantly accessed by pressing the Display button.

The Find Tab

Notice the Find tab located at the top of the Help Topics window. By clicking on it, a search query option will appear, that allows the user to search the entire TAM for any word or phrase – another great method for finding relevant information. The search query looks like the image in Figure 4-7.

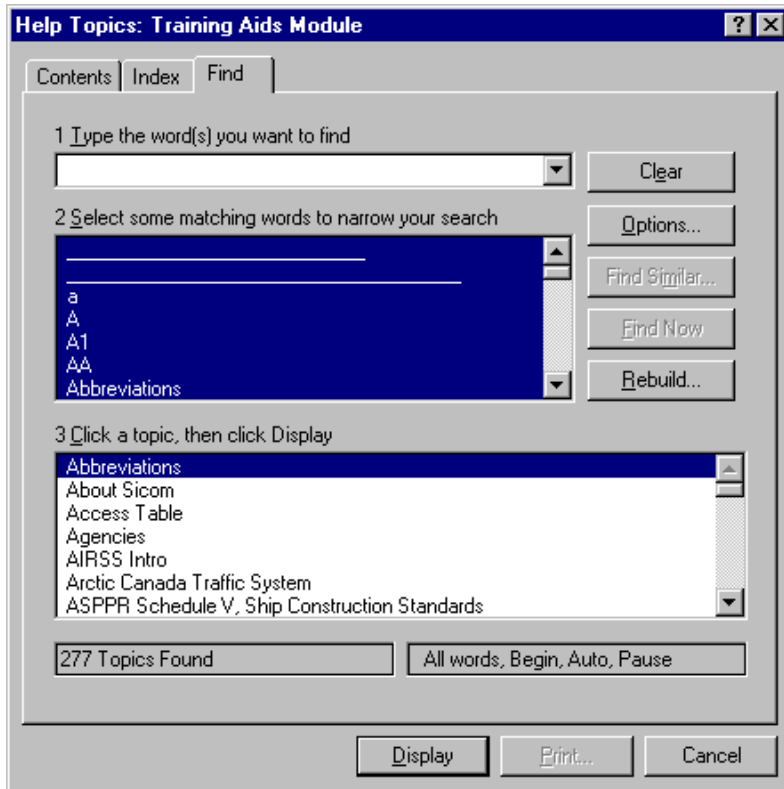


Figure 4-7: TAM Find

The search query is used as follows:

1. In the first text box, type the word(s) you want to find. Matching words appear in the list below it.
2. In the list of matching words, click the word(s) you want to look for.
3. In the bottom list box, double-click a title (or single-click and press the Display button) to display the topic.

Note that the text of each topic found contains the word(s) you looked for, even if the word(s) are not in the topic title.

If you want to look for more than one word, separate them with spaces in the first text box. When you look for hyphenated words, be sure to type the hyphen. To set specific search criteria, click on the Options button.

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4.2.2 MOVING AROUND THE TAM

Like other Windows 95 software, the best method of moving about the TAM is through the use of the system mouse. By moving the mouse, the user will notice the cursor moving in a similar direction. When the cursor is on top of a hyperlink button or hyperlink text (indicated by underlined text that is green in color), clicking the left mouse button will execute a command. This may result in a number of possible actions, such as jumping to another location or loading of an ice image.

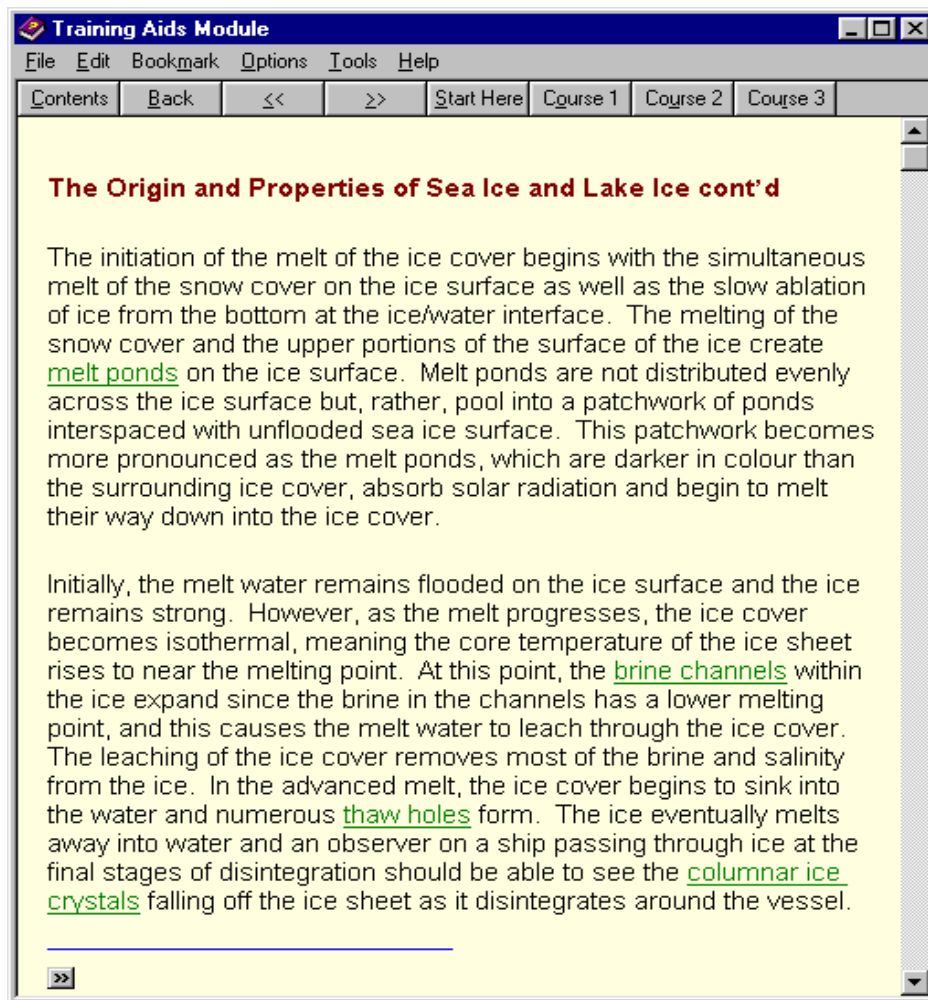


Figure 4-8: TAM Topic Page

Observe the topic page layout in Figure 4-8. Notice the Contents button in the top left. Clicking on this button (or alternatively typing the letter 'c') always brings the user back to the Help Topics window.

Notice the Back button on the TAM main window. This button functions as a session history. As the user moves from page to page, the TAM remembers the sequence, so that

if the user desires to see the last page s/he was on, or the second to last page s/he was on, s/he simply clicks on this button successively. It will remember up to 40 previous sequences. To actually view a list of topics already seen, click Options, and then click Display History Window.

Notice the forward (>>) and backward (<<) arrow keys. These are called browse buttons. Clicking on these buttons (or alternatively pressing the period '.' and comma ',' key respectively) will move the user sequentially through all of the pages within a given section, much like turning the pages of a book. The user is encouraged to follow the course content by starting at the first topic page of the first section of a course, and then clicking on the browse buttons or built-in links at the bottom of a page. These links are programmed to take the user through a recommended learning sequence.

Notice the Start Here button. Clicking on this button will take the user to the very first page of the TAM. This page will lead the user through the introduction, and explain various TAM features. It is recommended that all first-time users begin here.

Notice the Course 1 button. When clicked, this button will take the user to the title page of the first TAM course, Ice Recognition.

Notice the Course 2 button. When clicked, this button will take the user to the title page of the second TAM course, Ice Climatology.

Notice the Course 3 button. When clicked, this button will take the user to the title page of the third course, Arctic Ice Regime Shipping System.

If there is more text than a given window size allows to be displayed at once, then the user will notice horizontal and/or vertical scroll bars that appear on the right or bottom side of a window. By clicking on and dragging the small rectangular marker located within the scroll bar, the user can move within the window. Alternatively, the user can press the PageUp or PageDown keys on the keyboard.

The user is free to re-arrange or re-size the TAM main window. The TAM will preserve the window changes as long as the TAM remains open. Once the TAM is shut down, the window resorts back to its default setting. The Media Viewer window and Quick View window, in contrast, resort back to default settings each time their respective windows are updated or selected.

The user will notice an Options menu item on the top menu bar of the TAM main window. There are various visual options, such as font size, that the user can customize while using the TAM. The user is encouraged to explore these various options. Again, settings will not be saved when the TAM is shut down. These options are described in more detail in the following section.

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4.3 OTHER TAM BUILT-IN FUNCTIONS

Defining and Using Bookmarks

Just as one can place bookmarks in a book to mark specific references, the user can place bookmarks in TAM topics that are viewed frequently. After having placed a bookmark in a topic, the user can access that topic quickly from the Bookmark menu.

To place a bookmark in the current topic:

1. From the Bookmark menu on the TAM main window, choose Define.
2. In the Bookmark Name box, the topic title appears. If you want to use a different name to identify the bookmark, type a name in this box.
3. Choose the OK button. The bookmark name now appears on the Bookmark menu in Help.

To view a topic that has a bookmark:

From the Bookmark menu, choose the bookmark name for the topic you want to view. Underlined numbers precede the first nine bookmark titles. You can type the corresponding number to go quickly to a marked topic. If more than nine bookmarks have been defined, choose More from the Bookmark menu in Help. Select a bookmark in the Go To Bookmark box, and then choose the OK button.

To remove a bookmark:

1. From the Bookmark menu, choose Define.
2. Select the bookmark you want to remove.
3. Choose the Delete button.

The bookmark name is removed from the Bookmark menu on the TAM main window.

Choosing a Jump

TAM topics may include graphics and text that link to other TAM topics or to more information about the current topic. These are called jumps. Jumps are usually identified by a green color and an underline (unless the jump is a graphic). When the user points to a jump, the pointer changes to a hand shape.

To choose a jump:

Point to the text or graphic and click with the mouse button.
Or press TAB to select the jump, and then press ENTER.

You can press SHIFT+TAB to move backward and select a jump.

If the jump you choose is linked to another topic, that topic appears in the TAM window. Sometimes a jump is linked to information that appears in a pop-up window or a secondary window.

To display all jumps in a topic:

press CTRL+TAB.

To specify whether the TAM main window stays in front of other windows

1. In the TAM main window, click Options. You can also use the right mouse button to click inside a TAM topic.
2. Point to Keep Help On Top, and then click the setting you want.

If you choose On Top, all TAM windows in the current TAM file will stay on top. If you choose Not On Top, none of the TAM windows in the current TAM file will stay on top.

To change the font or color of a TAM topic

1. In the TAM main window, click Options. You can also use the right mouse button to click inside a TAM main window topic.
2. To change the font size, point to Font, and then click Small, Normal, or Large.

To change the color, click Use System Colors.
When prompted to close the TAM, click Yes.

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When you open the TAM again, the background color and text will match your system colors.

Note: When you change the font or the color, it affects only the current TAM file.

Annotating a TAM Topic

You can add your own comments and notes to a TAM topic and view this information later. When you annotate a TAM topic, the TAM places a paper-clip icon to the left of the topic title to remind you that you have added text to this topic.

To add text to the current TAM topic:

1. From the Edit menu in the TAM main window, choose Annotate.
2. In the Annotate dialog box, type the text you want to add. If you make a mistake, press BACKSPACE to remove any unwanted characters, and continue typing. Text wraps automatically, but you can end a line before it wraps by pressing ENTER.
3. Choose the Save button.

Removing an Annotation

If you no longer need your comments about a TAM topic, you can remove the annotation.

1. Click the paper-clip icon to the left of the topic title; Or press TAB to select the paper-clip icon, and then press ENTER.
2. Choose the Delete button.

Viewing an Annotation

If you have added comments to a TAM topic, you can view them at any time.

1. Click the paper-clip icon to the left of the topic title; Or press TAB to select the paper-clip icon, and then press ENTER.
2. When you finish viewing the annotation, choose the Cancel button.

Copying a TAM Topic onto the Clipboard

You can copy some or all of the text in a TAM topic onto the Clipboard. From the Clipboard, you can paste the text into another document.

Note: You cannot copy the graphics in a TAM topic onto the Clipboard.

To copy text in the current TAM topic onto the Clipboard:

1. From the Edit menu on the TAM main window, choose Copy.
2. To copy all the text onto the Clipboard, choose the Copy button; Or select the text you want to copy onto the Clipboard, and then choose the Copy button.

You can paste the text that is on the Clipboard into a Help annotation or into a document from another application.

To copy the entire topic directly onto the Clipboard:

Press CTRL+INS.

Printing a TAM Topic Page

You can print any TAM topic. A topic prints on the default printer. If you have installed more than one printer, you can make any of them the default printer. You can also change the options for the default printer.

To print the current TAM topic:

From the File menu in Help, choose Print Topic.

To change printers and printer options:

1. From the File menu in Help, choose Print Setup.
2. Select the printer you want to use. To change the default printer options, choose the Setup button. The options vary, depending on the printer you select.

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3. Select the options you want.
4. Choose the OK button to close the printer's Setup dialog box.
5. Choose the OK button.

To print information that is in a pop-up window, use your right mouse button to click inside the pop-up window, and then click Print Topic.

You can print a group of related topics by clicking on a book in the Help Contents window, and then clicking Print.

4.4 CONVENTIONS

Several conventions have been used to facilitate ease of use of this TAM. One feature that serves as a useful tool for a digital course such as this TAM is the usage of hyperlinks. Hyperlinks can be in the form of push buttons, or text links. The user will notice that textual hyperlinks throughout this TAM are underlined and green in color.

Some links will take the user to a different placement within the course, whereas other links will open graphical images in the Media Viewer window. Other links might open a popup window with a glossary definition contained within it. To show that a link is for a definition, the acronym (Def:) will be found beside the word of interest e.g. first year ice (Def:). By clicking on this link, a popup window with the glossary definition of first year ice will appear. Generally speaking, green links found within paragraph text will open up relevant images in the Media Viewer window. Button links found at the bottom of a given topic page will jump the user the next topic page, or to a related topic.

The user will also notice that Topic headings are burgundy colored. Relevant titles or words may be colored in blue. Remaining text is plain black. The default font size is 11 points. Should the user wish to have the text slightly larger or smaller, simply go to the Options menu at the top of the TAM main window and change your font setting for that session.

Several buttons have been designed for specific purposes. For example:



When encountering the above Click Me 1st button, the user is encouraged to press this particular button before performing any other actions, or moving to another topic page. Often, the Click Me 1st button will lead the user to various topic pages in a pedagogical manner.



When encountering and clicking on a button that resembles the above Bear Tips button, a popup window or audio file with useful tips or information will appear.



When encountering and clicking on a button that resembles the above On the Move button, the user will be taken to the next logical topic page or course section.



When encountering and clicking on a button that resembles the above Related Topics button, the user will be taken to a topic that relates to the user's current topic.



The above camera icon is a button that will open the Quick View window and display image/media links related to the user's current topic.

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5 TAM MAINTENANCE GUIDE

5.1 DEVELOPMENT ENVIRONMENT

The TAM is a custom-authored application that was developed as a Microsoft Windows[®] 95, stand-alone, hypertext, information Help system. As a Windows[®] 95 Help system, the TAM is able to take advantage of the Help features available within the Microsoft WinHelp 4 compiler. All Windows[®] 95 users are able to run the TAM because the WinHelp 4 compiler is distributed with all Windows[®] 95 operating systems.

The WinHelp 4 compiler comes with a graphical user interface called the Help Workshop (HCW.EXE). The Help Workshop is a basic Microsoft tool used by Help authors for producing contents (.CNT) files and Help project (.HPJ) files.

The Help Contents Workshop requires the following files, which can be obtained from the Microsoft web site (www.microsoft.com) if they are not already present on the user's system:

- HCW.EXE
- HCW.HLP
- HCW.CNT
- HCRTF.EXE

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- SHED.EXE
- MRBC.EXE

The contents (.CNT) file is used to specify the table of contents and index items contained within the Help system.

The Help project (.HPJ) file tells the Help compiler the following information:

- The location of the files and graphics for building the help file;
- The name of the associated contents file;
- The options to include during the build process;
- Other elements to add to the help file.

Completed Help system files, like the TAM, are recognizable by their unique .HLP filename extension (e.g. FULLCOURSE.HLP). These .HLP files are produced by the WinHelp 4 compiler having successfully compiled the Rich Text Format (.RTF) ASCII files (that contain the TAM text and multimedia references) along with the contents and Help project files.

Before the era of help authoring tools, programmers who wished to design a Windows[®] Help system, would first create .CNT and .HLP files using Microsoft Help Workshop. They would then create .RTF files containing batch commands, syntax and text content as prescribed by WinHelp. This was a time-consuming effort that required the skill of good programmers. Today, however, numerous Help authoring tools are available on the market. These tools have greatly automated and simplified the laborious coding tasks required previously.

For the purpose of designing the TAM, Sicom chose to use RoboHELP[®] Version 7.0, produced by Blue Sky[®] Software, on a Pentium 166MHz workstation (32Meg RAM, 17" monitor, 16 million colors, 1024 X 768 screen resolution, 16bit sound card, 4Meg Video RAM). RoboHELP[®] is a robust, full-featured Help authoring package for creating Windows 95 Help systems. RoboHELP[®] simplifies the process of creating and maintaining Help files and integrating those Help files with any application software. In order for RoboHELP[®] to work, however, the user must already have Microsoft Word[®] 97 (or a later version) installed on their system. RoboHELP[®] uses the word processing features of Word[®] 97 to create .DOC files, which then get converted to the .RTF format. Use the RoboHELP[®] User's Manual or online Help system that comes with the help authoring program, to learn how to use the authoring features of the RoboHELP[®] Version 7.0 software.

In creating the TAM, the following TAM files were created and can be found in the root directory of the complete development CD-ROM:

RoboHELP® Development Files

FULLCOURSE.AKW
RHPOST.BAT
AIRSS.DOC
DEFINITIONS.DOC
FULLCOURSE.DOC
FULLCOURSE_IMAGES.DOC
INFORMATION SYSTEMS.DOC
INTRODUCTION.DOC
ICE CLIMATOLOGY.DOC
ICE REPORTING & CODING.DOC
ICE TYPES & CONCENTRATION.DOC
ICENAV INFO SYSTEMS.DOC
IMAGES.DOC
TAM HELP.DOC
VIDEOS.DOC
FULLCOURSE.ERR
FULLCOURSE.HPJ
FULLCOURSE.HPR
FULLCOURSE.HPT
ICENAVTAM.HPT
FULLCOURSE.KKW
RHPOST.PIF
RHPRE.PIF
TAM HELP.PRS
AIRSS.PRS
FULLCOURSE.PRS
ICE CLIMATOLOGY.PRS
ICE REPORTING & CODING.PRS
ICE TYPES & CONCENTRATION.PRS
ICENAV INFO SYSTEMS.PRS
IMAGES.PRS
AIRSS.RBH
DEFINITIONS.RBH
FULLCOURSE.RBH
FULLCOURSE_IMAGES.RBH
ICE CLIMATOLOGY.RBH
ICE REPORTING & CODING.RBH
ICE TYPES & CONCENTRATION.RBH
ICENAV INFO SYSTEMS.RBH
IMAGES.RBH
INFORMATION SYSTEMS.RBH
INTRODUCTION.RBH
TAM HELP.RBH
VIDEOS.RBH

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AIRSS.RTA
DEFINITIONS.RTA
FULLCOURSE.RTA
FULLCOURSE_IMAGES.RTA
ICE CLIMATOLOGY.RTA
ICE REPORTING & CODING.RTA
ICE TYPES & CONCENTRATION.RTA
ICENAV INFO SYSTEMS.RTA
IMAGES.RTA
AIRSS.RTF
DEFINITIONS.RTF
FULLCOURSE.RTF
FULLCOURSE_IMAGES.RTF
INFORMATION SYSTEMS.RTF
INTRODUCTION.RTF
ICE CLIMATOLOGY.RTF
ICE REPORTING & CODING.RTF
ICE TYPES & CONCENTRATION.RTF
ICENAV INFO SYSTEMS.RTF
IMAGES.RTF
TAM HELP.RTF
VIDEOS.RTF
AIRSS.RTK
DEFINITIONS.RTK
FULLCOURSE.RTK
FULLCOURSE_IMAGES.RTK
ICE CLIMATOLOGY.RTK
ICE REPORTING & CODING.RTK
ICE TYPES & CONCENTRATION.RTK
ICENAV INFO SYSTEMS.RTK
IMAGES.RTK
AIRSS.RTS
DEFINITIONS.RTS
FULLCOURSE.RTS
FULLCOURSE_IMAGES.RTS
ICE CLIMATOLOGY.RTS
ICE REPORTING & CODING.RTS
ICE TYPES & CONCENTRATION.RTS
ICENAV INFO SYSTEMS.RTS
IMAGES.RTS

Resulting TAM Help Files

FULLCOURSE.HLP (TAM Executable file)
FULLCOURSE.CNT (TAM Table of Contents file)
FULLCOURSE.FTS (TAM Index of Searchable terms)

FULLCOURSE.GID (TAM configuration file)

RoboHELP®.DLLs

HLP25632.DLL

RHGBTN32.DLL

3rd Party Freeware Tools

I_VIEW32.EXE (IrfanView32 Graphics Viewer)

Digital Video Files

TAM01A.AVI

TAM01B.AVI

TAM02.AVI

TAM03.AVI

TAM04.AVI

Graphic Files

ARROW.BMP

BTN1.BMP

BTN1B.BMP

BTN2.BMP

BTN2B.BMP

BTN3.BMP

BTN3B.BMP

BTN3B_SMALL.BMP

BTN3_SMALL.BMP

BTN4.BMP

BTN5.BMP

BTN5_SMALL.BMP

CHICLET.BMP

SHORTCUT.BMP

TITLE PAGE AIRSS.BMP

TITLE PAGE CLIMATOLOGY.BMP

TITLE PAGE ICE RECOGNITION.BMP

TITLE PAGE SICOM.BMP

TITLE PAGE TAM.BMP

1-IS-SET1A1.GIF

1-IS-SET2A1.GIF

1-IS-SET2A2.GIF

1-IS-SET2B1.GIF

1-IS-SET2B2.GIF

1-IS-SET4A.GIF

1-IS-SET4B.GIF

1-IS-SET4C.GIF

1-IS-SET5C.GIF

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2-BAF-01.GIF
2-BAF-02.GIF
2-BAF-03.GIF
2-BAF-04.GIF
2-BAF-05.GIF
2-BAF-06.GIF
2-BAF-07.GIF
2-BAF-08.GIF
2-BAF-09.GIF
2-BAF-10.GIF
2-BAF-11.GIF
2-BAF-12.GIF
2-BAF-13.GIF
2-BAF-14.GIF
2-BAF-15.GIF
2-GLF-01.GIF
2-GLF-02.GIF
2-GLF-03.GIF
2-GLF-04.GIF
2-GLF-05.GIF
2-GLF-06.GIF
2-GLF-07.GIF
2-LAN-01.GIF
2-LAN-02.GIF
2-LAN-03.GIF
2-LAN-04.GIF
2-LAN-05.GIF
2-LAN-06.GIF
2-LAN-07.GIF
2-LAN-08.GIF
2-LAN-09.GIF
2-LAN-10.GIF
2-LAN-11.GIF
2-LAN-12.GIF
2-LAN-13.GIF
2-LAN-14.GIF
2-LAN-15.GIF
2-LAN-16.GIF
3-ACCESS TABLE.GIF
3-SET1A1.GIF
3-SET1A2.GIF
3-SET2A1.GIF
3-SET2A2.GIF
3-SET3A1.GIF
3-SET3A2.GIF

3-ZONES.GIF
1-03.JPG
1-06.JPG
1-07.JPG
1-08.JPG
1-106CIS.JPG
1-107NOAAA.JPG
1-107NOAAB.JPG
1-11.JPG
1-110CISA.JPG
1-110CISB.JPG
1-112NOAA.JPG
1-12.JPG
1-13.JPG
1-14.JPG
1-17.JPG
1-28.JPG
1-29.JPG
1-30.JPG
1-34.JPG
1-38.JPG
1-40.JPG
1-41.JPG
1-42.JPG
1-44.JPG
1-45.JPG
1-46.JPG
1-47.JPG
1-48.JPG
1-49.JPG
1-50.JPG
1-51.JPG
1-52.JPG
1-53.JPG
1-54.JPG
1-55.JPG
1-56.JPG
1-57.JPG
1-58.JPG
1-59.JPG
1-75.JPG
1-76.JPG
1-87.JPG
1-91A.JPG
1-91B.JPG

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1-94RSATA.JPG
1-94RSATB.JPG
1-IS-SET1B1.JPG
1-IS-SET1B2.JPG
1-IS-SET1C1.JPG
1-IS-SET1C2.JPG
1-IS-SET3A1.JPG
1-IS-SET3A2.JPG
1-IS-SET3B.JPG
1-IS-SET5A1.JPG
1-IS-SET5A2.JPG
1-IS-SET5B1.JPG
1-IS-SET5B2.JPG
1-IS-SET6A.JPG
1-IS-SET6B.JPG
1-IS-SET7A.JPG
1-IS-SET7B.JPG
1-IS-SET8A.JPG
1-IS-SET8B.JPG
1-IS-SET9A.JPG
1-IS-SET9B.JPG
1-IS-SET9C.JPG
3-SET2B.JPG
PPI108.JPG
PPI110.JPG
PPI118.JPG
PPI216.JPG
PPI818.JPG

Audio Clip Files

TAM_INTRO1.WAV
TAM_INTRO2.WAV
TAM_INTRO3.WAV
TAM_INTRO4.WAV

The following .BMP graphic files are also found in the 'Graphics' subdirectory of the complete development CD-ROM:

1-01.BMP
1-03SML.BMP
1-06SML.BMP
1-07SML.BMP
1-08SML.BMP
1-100.BMP
1-101.BMP

1-102.BMP
1-106CIS.BMP
1-107NOAAA.BMP
1-107NOAAB.BMP
1-110CISA.BMP
1-110CISB.BMP
1-112NOAA.BMP
1-11SML.BMP
1-12SML.BMP
1-13.BMP
1-13SML.BMP
1-14SML.BMP
1-17SML.BMP
1-28SML.BMP
1-29SML.BMP
1-30SML.BMP
1-34SML.BMP
1-38SML.BMP
1-40SML.BMP
1-41SML.BMP
1-42SML.BMP
1-44SML.BMP
1-45SML.BMP
1-46SML.BMP
1-47SML.BMP
1-48SML.BMP
1-49SML.BMP
1-50SML.BMP
1-51SML.BMP
1-52SML.BMP
1-53SML.BMP
1-54SML.BMP
1-55SML.BMP
1-56SML.BMP
1-57SML.BMP
1-58SML.BMP
1-59SML.BMP
1-75SML.BMP
1-76SML.BMP
1-86.BMP
1-87SML.BMP
1-91A.BMP
1-91B.BMP
1-94RSATA.BMP
1-94RSATB.BMP

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1-98.BMP
1-99.BMP
1-CODING_310.BMP
1-CODING_910.BMP
1-CODING_LAKE.BMP
1-CODING_SEA.BMP
1-IS-AVHRR.BMP
1-IS-BEAMMODES.BMP
1-IS-CISCOLORCODEBAFF.BMP
1-IS-CISCOLORCODEGULF.BMP
1-IS-EMSPEC.BMP
1-IS-INTERFERENCE.BMP
1-IS-RADIOFREQ.BMP
1-IS-SET1A1.BMP
1-IS-SET1B1.BMP
1-IS-SET1B2.BMP
1-IS-SET1C1.BMP
1-IS-SET1C2.BMP
1-IS-SET2A1.BMP
1-IS-SET2A2.BMP
1-IS-SET2B1.BMP
1-IS-SET2B2.BMP
1-IS-SET3A1.BMP
1-IS-SET3A2.BMP
1-IS-SET3B.BMP
1-IS-SET4A.BMP
1-IS-SET4B.BMP
1-IS-SET4C.BMP
1-IS-SET5A.BMP
1-IS-SET5A2.BMP
1-IS-SET5B.BMP
1-IS-SET5B2.BMP
1-IS-SET5C.BMP
1-IS-SET6A.BMP
1-IS-SET6B.BMP
1-IS-SET7A.BMP
1-IS-SET7B.BMP
1-IS-SET8A.BMP
1-IS-SET8B.BMP
1-IS-SET9A.BMP
1-IS-SET9B.BMP
1-IS-SET9C.BMP
2-BAF-01.BMP
2-BAF-02.BMP
2-BAF-03.BMP

2-BAF-04.BMP
2-BAF-05.BMP
2-BAF-06.BMP
2-BAF-07.BMP
2-BAF-08.BMP
2-BAF-09.BMP
2-BAF-10.BMP
2-BAF-11.BMP
2-BAF-12.BMP
2-BAF-13.BMP
2-BAF-14.BMP
2-BAF-15.BMP
2-GLF-01.BMP
2-GLF-02.BMP
2-GLF-03.BMP
2-GLF-04.BMP
2-GLF-05.BMP
2-GLF-06.BMP
2-GLF-07.BMP
2-LAN-01.BMP
2-LAN-02.BMP
2-LAN-03.BMP
2-LAN-04.BMP
2-LAN-05.BMP
2-LAN-06.BMP
2-LAN-07.BMP
2-LAN-08.BMP
2-LAN-09.BMP
2-LAN-10.BMP
2-LAN-11.BMP
2-LAN-12.BMP
2-LAN-13.BMP
2-LAN-14.BMP
2-LAN-15.BMP
2-LAN-16.BMP
3-SET1A1.BMP
3-SET1A2.BMP
3-SET1_ICECODE.BMP
3-SET2A1.BMP
3-SET2A2.BMP
3-SET2B.BMP
3-SET2_ICECODE.BMP
3-SET3A1.BMP
3-SET3A2.BMP
3-SET3_ICECODE.BMP

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3_ICE MULTIPLIER TABLE.BMP
3_REPORTING CHART.BMP
BTN1.BMP
BTN1B.BMP
BTN1B_SMALL.BMP
BTN1_SMALL.BMP
BTN2.BMP
BTN2B.BMP
BTN3.BMP
BTN3B.BMP
BTN3B_SMALL.BMP
BTN3_SMALL.BMP
BTN4.BMP
BTN4_SMALL.BMP
BTN5.BMP
BTN5_SMALL.BMP
CAPTURE - HELP CONTENTS FIND.BMP
CAPTURE - HELP CONTENTS INDEX.BMP
CAPTURE - HELP CONTENTS1.BMP
CAPTURE - HELP CONTENTS2.BMP
CAPTURE - MEDIA VIEWER1.BMP
CAPTURE - QUICK VIEW1.BMP
CAPTURE - SAMPLE TOPIC.BMP
CAPTURE - TAM COMPLETE1.BMP
CAPTURE - TAM MAIN1.BMP
CROSSPOL1C.BMP
CROSSPOL1H.BMP
CROSSPOL1V.BMP
CROSSPOL2C.BMP
CROSSPOL2H.BMP
CROSSPOL2V.BMP
CROSSPOL3C.BMP
CROSSPOL3H.BMP
CROSSPOL3V.BMP
CROSSPOL4C.BMP
CROSSPOL4H.BMP
CROSSPOL4V.BMP
CROSSPOL5C.BMP
CROSSPOL5H.BMP
CROSSPOL5V.BMP
MANICE ICE CONCENTRATIONS.BMP
S3_SET1B.BMP
S3_SET3B.BMP
SYM01.BMP
SYM02.BMP

SYM03.BMP
SYM04.BMP
SYM05.BMP
SYM06.BMP
SYM07.BMP
SYM08.BMP
SYM09.BMP
SYM10.BMP
SYM11.BMP
SYM12.BMP
SYM13.BMP
SYM14.BMP
SYM15.BMP
SYM16.BMP
SYM17.BMP
SYM18.BMP
ZONES.BMP

All ice-related, graphic images found within the TAM were obtained in hardcopy or softcopy format from the parties credited in the TAM introduction. Many images were received in 35 mm slide format. Such images were scanned using a Polaroid SprintScan35 slide scanner. They were then cropped, edited, and/or enhanced using Adobe Photoshop[®] 3.0 image editing software, and saved in either .BMP, .GIF, or .JPG formats.

Other images were received in 4 inch by 6 inch print format. Such images were scanned by Sicom using a Hewlett Packard ScanJet 4p flatbed scanner. Again, these images may have been cropped, edited and/or enhanced using Adobe Photoshop[®] 3.0 image editing software, and saved in either .BMP, .GIF, or .JPG formats.

Some images were received in digital softcopy format. These images were also cropped, edited and/or enhanced using Adobe Photoshop[®] 3.0 image editing software, and saved in either .BMP, .GIF or .JPG formats.

Video (.AVI) clips used within the TAM were developed by Sicom from VHS-format videos using ATI Technologies Inc.'s All-in-Wonder™ Pro video capturing hardware and software. The All-in-Wonder Pro comes with a graphics card that plugs into the workstation. A VHS-format VCR was then connected to the video card for digitally capturing .AVI clips.

Audio (.WAV) clips found within the TAM were created using the Windows 95 Sound Recorder and a standard microphone.

The completed TAM and its corresponding development files were copied onto a CD-ROM using a Windows NT 3.5.1 workstation and a Yamaha CD Expert CDE100 CD-Writer.

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5.2 RUNTIME ENVIRONMENT

The Development CD-ROM, delivered by Sicom, contains all RoboHELP development files, executable files, .DLL files, and multimedia files required for running and/or developing the TAM. In contrast, the Runtime CD-ROM, delivered by Sicom, contains only those files need to launch and run the TAM. The following files will be found in this CD-ROM's root directory:

Resulting TAM Help Files

FULLCOURSE.HLP (TAM Executable file)

FULLCOURSE.CNT (TAM Table of Contents file)

FULLCOURSE.FTS (TAM Index of Searchable terms)

FULLCOURSE.GID (TAM configuration file)

RoboHELP® .DLLs

HLP25632.DLL

RHGBTN32.DLL

3rd Party Freeware Tools

I_VIEW32.EXE (IrfanView32 Graphics Viewer)

Digital Video Files

TAM01A.AVI

TAM01B.AVI

TAM02.AVI

TAM03.AVI

TAM04.AVI

Graphic Files

ARROW.BMP

BTN1.BMP

BTN1B.BMP

BTN2.BMP

BTN2B.BMP

BTN3.BMP

BTN3B.BMP

BTN3B_SMALL.BMP

BTN3_SMALL.BMP

BTN4.BMP

BTN5.BMP

BTN5_SMALL.BMP

CHICLET.BMP

SHORTCUT.BMP

TITLE PAGE AIRSS.BMP

TITLE PAGE CLIMATOLOGY.BMP
TITLE PAGE ICE RECOGNITION.BMP
TITLE PAGE SICOM.BMP
TITLE PAGE TAM.BMP
1-IS-SET1A1.GIF
1-IS-SET2A1.GIF
1-IS-SET2A2.GIF
1-IS-SET2B1.GIF
1-IS-SET2B2.GIF
1-IS-SET4A.GIF
1-IS-SET4B.GIF
1-IS-SET4C.GIF
1-IS-SET5C.GIF
2-BAF-01.GIF
2-BAF-02.GIF
2-BAF-03.GIF
2-BAF-04.GIF
2-BAF-05.GIF
2-BAF-06.GIF
2-BAF-07.GIF
2-BAF-08.GIF
2-BAF-09.GIF
2-BAF-10.GIF
2-BAF-11.GIF
2-BAF-12.GIF
2-BAF-13.GIF
2-BAF-14.GIF
2-BAF-15.GIF
2-GLF-01.GIF
2-GLF-02.GIF
2-GLF-03.GIF
2-GLF-04.GIF
2-GLF-05.GIF
2-GLF-06.GIF
2-GLF-07.GIF
2-LAN-01.GIF
2-LAN-02.GIF
2-LAN-03.GIF
2-LAN-04.GIF
2-LAN-05.GIF
2-LAN-06.GIF
2-LAN-07.GIF
2-LAN-08.GIF
2-LAN-09.GIF
2-LAN-10.GIF

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2-LAN-11.GIF
2-LAN-12.GIF
2-LAN-13.GIF
2-LAN-14.GIF
2-LAN-15.GIF
2-LAN-16.GIF
3-ACCESS TABLE.GIF
3-SET1A1.GIF
3-SET1A2.GIF
3-SET2A1.GIF
3-SET2A2.GIF
3-SET3A1.GIF
3-SET3A2.GIF
3-ZONES.GIF
1-03.JPG
1-06.JPG
1-07.JPG
1-08.JPG
1-106CIS.JPG
1-107NOAAA.JPG
1-107NOAAB.JPG
1-11.JPG
1-110CISA.JPG
1-110CISB.JPG
1-112NOAA.JPG
1-12.JPG
1-13.JPG
1-14.JPG
1-17.JPG
1-28.JPG
1-29.JPG
1-30.JPG
1-34.JPG
1-38.JPG
1-40.JPG
1-41.JPG
1-42.JPG
1-44.JPG
1-45.JPG
1-46.JPG
1-47.JPG
1-48.JPG
1-49.JPG
1-50.JPG
1-51.JPG

1-52.JPG
1-53.JPG
1-54.JPG
1-55.JPG
1-56.JPG
1-57.JPG
1-58.JPG
1-59.JPG
1-75.JPG
1-76.JPG
1-87.JPG
1-91A.JPG
1-91B.JPG
1-94RSATA.JPG
1-94RSATB.JPG
1-IS-SET1B1.JPG
1-IS-SET1B2.JPG
1-IS-SET1C1.JPG
1-IS-SET1C2.JPG
1-IS-SET3A1.JPG
1-IS-SET3A2.JPG
1-IS-SET3B.JPG
1-IS-SET5A1.JPG
1-IS-SET5A2.JPG
1-IS-SET5B1.JPG
1-IS-SET5B2.JPG
1-IS-SET6A.JPG
1-IS-SET6B.JPG
1-IS-SET7A.JPG
1-IS-SET7B.JPG
1-IS-SET8A.JPG
1-IS-SET8B.JPG
1-IS-SET9A.JPG
1-IS-SET9B.JPG
1-IS-SET9C.JPG
3-SET2B.JPG
PPI108.JPG
PPI110.JPG
PPI118.JPG
PPI216.JPG
PPI818.JPG

Audio Clip Files

TAM_INTRO1.WAV
TAM_INTRO2.WAV

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TAM_INTRO3.WAV

TAM_INTRO4.WAV

The following .BMP graphic files are also found in the Graphics subdirectory of the runtime CD-ROM:

1-01.BMP

1-03SML.BMP

1-06SML.BMP

1-07SML.BMP

1-08SML.BMP

1-100.BMP

1-101.BMP

1-102.BMP

1-106CIS.BMP

1-107NOAAA.BMP

1-107NOAAB.BMP

1-110CISA.BMP

1-110CISB.BMP

1-112NOAA.BMP

1-11SML.BMP

1-12SML.BMP

1-13.BMP

1-13SML.BMP

1-14SML.BMP

1-17SML.BMP

1-28SML.BMP

1-29SML.BMP

1-30SML.BMP

1-34SML.BMP

1-38SML.BMP

1-40SML.BMP

1-41SML.BMP

1-42SML.BMP

1-44SML.BMP

1-45SML.BMP

1-46SML.BMP

1-47SML.BMP

1-48SML.BMP

1-49SML.BMP

1-50SML.BMP

1-51SML.BMP

1-52SML.BMP

1-53SML.BMP

1-54SML.BMP

1-55SML.BMP
1-56SML.BMP
1-57SML.BMP
1-58SML.BMP
1-59SML.BMP
1-75SML.BMP
1-76SML.BMP
1-86.BMP
1-87SML.BMP
1-91A.BMP
1-91B.BMP
1-94RSATA.BMP
1-94RSATB.BMP
1-98.BMP
1-99.BMP
1-CODING_310.BMP
1-CODING_910.BMP
1-CODING_LAKE.BMP
1-CODING_SEA.BMP
1-IS-AVHRR.BMP
1-IS-BEAMMODES.BMP
1-IS-CISCOLORCODEBAFF.BMP
1-IS-CISCOLORCODEGULF.BMP
1-IS-EMSPEC.BMP
1-IS-INTERFERENCE.BMP
1-IS-RADIOFREQ.BMP
1-IS-SET1A1.BMP
1-IS-SET1B1.BMP
1-IS-SET1B2.BMP
1-IS-SET1C1.BMP
1-IS-SET1C2.BMP
1-IS-SET2A1.BMP
1-IS-SET2A2.BMP
1-IS-SET2B1.BMP
1-IS-SET2B2.BMP
1-IS-SET3A1.BMP
1-IS-SET3A2.BMP
1-IS-SET3B.BMP
1-IS-SET4A.BMP
1-IS-SET4B.BMP
1-IS-SET4C.BMP
1-IS-SET5A.BMP
1-IS-SET5A2.BMP
1-IS-SET5B.BMP
1-IS-SET5B2.BMP

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1-IS-SET5C.BMP
1-IS-SET6A.BMP
1-IS-SET6B.BMP
1-IS-SET7A.BMP
1-IS-SET7B.BMP
1-IS-SET8A.BMP
1-IS-SET8B.BMP
1-IS-SET9A.BMP
1-IS-SET9B.BMP
1-IS-SET9C.BMP
2-BAF-01.BMP
2-BAF-02.BMP
2-BAF-03.BMP
2-BAF-04.BMP
2-BAF-05.BMP
2-BAF-06.BMP
2-BAF-07.BMP
2-BAF-08.BMP
2-BAF-09.BMP
2-BAF-10.BMP
2-BAF-11.BMP
2-BAF-12.BMP
2-BAF-13.BMP
2-BAF-14.BMP
2-BAF-15.BMP
2-GLF-01.BMP
2-GLF-02.BMP
2-GLF-03.BMP
2-GLF-04.BMP
2-GLF-05.BMP
2-GLF-06.BMP
2-GLF-07.BMP
2-LAN-01.BMP
2-LAN-02.BMP
2-LAN-03.BMP
2-LAN-04.BMP
2-LAN-05.BMP
2-LAN-06.BMP
2-LAN-07.BMP
2-LAN-08.BMP
2-LAN-09.BMP
2-LAN-10.BMP
2-LAN-11.BMP
2-LAN-12.BMP
2-LAN-13.BMP

2-LAN-14.BMP
2-LAN-15.BMP
2-LAN-16.BMP
3-SET1A1.BMP
3-SET1A2.BMP
3-SET1_ICECODE.BMP
3-SET2A1.BMP
3-SET2A2.BMP
3-SET2B.BMP
3-SET2_ICECODE.BMP
3-SET3A1.BMP
3-SET3A2.BMP
3-SET3_ICECODE.BMP
3_ICE MULTIPLIER TABLE.BMP
3_REPORTING CHART.BMP
BTN1.BMP
BTN1B.BMP
BTN1B_SMALL.BMP
BTN1_SMALL.BMP
BTN2.BMP
BTN2B.BMP
BTN3.BMP
BTN3B.BMP
BTN3B_SMALL.BMP
BTN3_SMALL.BMP
BTN4.BMP
BTN4_SMALL.BMP
BTN5.BMP
BTN5_SMALL.BMP
CAPTURE - HELP CONTENTS FIND.BMP
CAPTURE - HELP CONTENTS INDEX.BMP
CAPTURE - HELP CONTENTS1.BMP
CAPTURE - HELP CONTENTS2.BMP
CAPTURE - MEDIA VIEWER1.BMP
CAPTURE - QUICK VIEW1.BMP
CAPTURE - SAMPLE TOPIC.BMP
CAPTURE - TAM COMPLETE1.BMP
CAPTURE - TAM MAIN1.BMP
CROSSPOL1C.BMP
CROSSPOL1H.BMP
CROSSPOL1V.BMP
CROSSPOL2C.BMP
CROSSPOL2H.BMP
CROSSPOL2V.BMP
CROSSPOL3C.BMP

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CROSSPOL3H.BMP
CROSSPOL3V.BMP
CROSSPOL4C.BMP
CROSSPOL4H.BMP
CROSSPOL4V.BMP
CROSSPOL5C.BMP
CROSSPOL5H.BMP
CROSSPOL5V.BMP
MANICE ICE CONCENTRATIONS.BMP
S3_SET1B.BMP
S3_SET3B.BMP
SYM01.BMP
SYM02.BMP
SYM03.BMP
SYM04.BMP
SYM05.BMP
SYM06.BMP
SYM07.BMP
SYM08.BMP
SYM09.BMP
SYM10.BMP
SYM11.BMP
SYM12.BMP
SYM13.BMP
SYM14.BMP
SYM15.BMP
SYM16.BMP
SYM17.BMP
SYM18.BMP
ZONES.BMP

5.3 UPDATING THE TAM

The following steps describe the process for maintaining and updating the TAM:

- Ensure that the development workstation has Windows[®] 95 Version 4.00.950 A (or more recent version) installed on it.
- Ensure that the development workstation has Microsoft Word[®] 97 (or more recent version) installed.
- Install RoboHELP[®] Version 7.0 (or more recent version) onto the workstation.

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- Copy the directory structure (approx. 350 Meg), found on the TAM development CD-ROM, into a work directory on the user's workstation's local hard disk.
- Using Windows Explorer, select all the files in the working directory, and unselect the read-only file attribute that was set when the development CD-ROM was created.
- Launch the RoboHELP[®] software. When it requests a file to open, choose the FULLCOURSE.HPJ file found in the root working directory. RoboHELP[®] will then open the specified project help file.
- Use RoboHELP[®]'s provided print and online documentation to learn how to create and edit RoboHELP[®] files.
- Maintain and/or edit the TAM.

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6 SUMMARY AND FUTURE WORK

6.1 SUMMARY

A large development effort has been directed at improving ice navigation techniques and technology over the last 15 years. Over the years, various ice navigation systems have been developed, the results of which have extended the Arctic navigation season, formerly from June to September, now from May to mid-November.

The project focused on the development of a computer-based training module referred to as the Ice Navigation Training Aids Module (TAM), which provides an on-line training aid on the following subjects:

- Ice recognition
- Ice climatology
- The Arctic Ice Regime Shipping System

A functional specification was developed as the basis for developing the TAM. It represents a requirements model that is useful for developing other computer-based training modules.

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Help authoring and CBT development environments were surveyed for Windows 95 platforms, in order to select an environment capable of meeting the TAM's requirements. The Microsoft WinHelp32 Help Engine combined with Robohelp V7.0 was selected as the target development environment, and has proven to be a good choice. A few of the benefits of this environment are listed below:

- Open development environment on Windows 95, 98 and Windows NT platforms;
- Standard help environment with familiar look and feel to all windows users;
- Highly functional with full integration of multimedia for meeting training needs;
- Easier and less expensive to develop training systems than programming languages;
- Advanced table of contents, index, word search, and book marking features useful for on-line reference and full random access;
- Easy to build in structured sequence of screens to force the trainee through a particular training sequence;
- Easily upgradable/transportable to HTML for Web publishing;
- Easy to print;
- Able to access custom DLL libraries for adding additional functionality.

The TAM was successfully developed in WinHelp32 and runs on a single CD, or can run from a hard disk. It includes hundreds of pages of organized, textual information along with hundreds of high-resolution images, graphics, audio clips, and video files. The TAM exceeds the mandatory requirements of the functional specification and is readily upgradeable. While designed for ice navigators, the TAM is also very useful for ice reporters and ice analysts (especially the ice recognition and ice climatology modules).

By forging a close working relationship between CBT professionals (i.e. those with the skills of assembling and building an on-line CBT package) and teaching professionals (i.e. ice experts in this case who have an intimate knowledge of the subject matter in question), Sicom has demonstrated an efficient model for successfully developing the TAM. This model is well suited for future upgrades to the TAM, as well as for developing completely new CBT systems. Due to the pedagogical richness of the training environment used by the TAM, training material on related subject matter could be prepared by the associated teaching experts (i.e. raw text and graphics assembled), and Sicom could develop and integrate the computer-based training versions of the material into the TAM (or a stand-alone application).

6.2 FUTURE WORK

The TAM is an ideal tool on which to further develop and integrate ice training components. The following list of enhancements/new developments can efficiently be added to the TAM:

- Develop/expand a glossary of ice definitions;
- Further enhance visual effects;
- Update/integrate media library;
- Develop ice reference section;
- Develop/integrate testing exercises;
- Expand ice regimes to other parts of the world;
- Integrate other third-party training components;
- Translate to French.

The TAM already incorporates a number of definitions within the training material. These definitions are available to the user by means of a pop-up box when the definition indicator (Def) is clicked. The included definitions could be easily expanded to include, for example, all MANICE ice definitions. Furthermore, an integrated glossary utility (demonstrated by Sicom in earlier versions of the TAM) could be updated to alphabetically access all contained definitions, with just a few key strokes.

The TAM is highly visual; it incorporates many graphic drawings, charts, still photographs, radar imagery, and video clips. The visual effects could be further enhanced by providing additional media. Additional section/title pages and animation would add to the visual impact.

A media library (or index) could be added (similar to that which Sicom demonstrated in an earlier version of the TAM) that provides an electronic index to all of the media contained in the TAM, in an analogous manner as the glossary (described above); it would provide instant access to all of the definitions contained in the TAM.

A reference section could be developed that points to other ice-related tools and software that have been developed and are available in Canada. The content for this section would be developed through discussion with government (e.g. TDC, Ice Centre) and industry in

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order to create a synergistic presentation of Canadian ice expertise. In this way, individual tools/programs will benefit from the integrated exposure, as well as Canada as a whole. Such a reference section could also be available on various Web sites and included/distributed with all constituent ice tools.

To complement the training material, question and answer sections could be provided to test the trainee on the subject matter. This on-line testing could be designed to address the following testing requirements:

- Trainee self-testing (i.e. the correct answer for each question is provided to trainee with a click of the mouse);
- Formal testing (i.e. trainee answers are logged for evaluation by instructor, or by automatic evaluation).

The TAM focused on the Canadian Arctic (Lancaster Sound and Baffin Bay) and the Gulf of St. Lawrence. Future upgrades can easily expand the ice climatology sections of the TAM to include other areas such as the Sea of Japan, Antarctica, and the Baltic Sea.

Other third-party ice tools can be easily integrated into the TAM environment to meet a broader set of training objectives and to target a broader audience. The TAM can imbed application calls to such tools where appropriate, to create an integrated impression.

Translation into French can be undertaken without difficulty.

APPENDIX A: AUTHORING TOOLS

Windows-based Help and Multimedia Authoring Tools are listed in this appendix in Table A-1 and Table A-2, respectively.

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Table A-1: WinHelp/HTML-Based Help Authoring Tools.

PRODUCT NAME	COMPANY
CreateHelp	CHC Software
Doc-To-Help	WexTech
Documentation Studio	WexTech
Dr. Help	Roger Hadgraft
HelpBreeze	Solutionsoft
Help Magician Pro	Software Interphase Inc.
HelpPerfect	Niceware
Help Writer's Assistant	Olson Software
Help Yourself!	Sunshine Software
HyperText Suite	Hyper Act Inc.
MasterHelp	Performance Software
ProtoView Help Builder	ProtoView
RoboHELP	Blue Sky Software
RoboHTML	Blue Sky Software
SOS Help! Info-Author	Lamaura Development
VB HelpWriter	Teletech Systems
Visual Help	Win Ware
WinHelp Office Suite	Blue Sky Software
WinHelp 2000	Blue Sky Software
WP2Help	MERC Software
WYSI-Help	UDI Software

Table A-2: Windows 95 Multimedia (CBT) Development Tools.

PRODUCT NAME	COMPANY
Authorware	Macromedia
CAST	Master Class
CBT Express	Aim Tech
CD Factory	Human Code
Challenger! 1.4	Challenger! Desktopy Training Syst.
Course Builder	Discovery Systems International
Director 6.0	Macromedia
Everest Authoring System	Intersystem Concepts
EXPO	Paul Mace Software
HyperWriter for Training	Ntergaid
Icon Author	Aim Tech
ImageQ	Image North Technologies
Innovus Multimedia 2.1	Innovus
Media Mogul	Optimage
Media Styler	The Multimedia Group
MockingBird CBT	Warren-Forthought
mTropolis	Mfactory
Multimedia Toolbook II Instructor	Asymetrix
Quest Net+ 5.1	Allen Communications
SoftBook Maker	Soft Books Inc.
Summit	Intersystem Concepts Inc.
SuperCard 2.5	Allegiant Technologies
Ten CORE Language System	Computer Teaching Corp.
TIE	Global Information Systems

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