Implementing defence documentation standards in fully controlled engineering management environments

An overview of the implementation of configuration management and the S1000D technical document standards into the technical data & content management system of the M113 Upgrade Project.

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  - **Working on establishing cross-divisional communities of practice in the area of logistics documentation**
  - **Working towards developing common business solutions across our divisions**

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  - **Systems Analyst, Tenix Marine Division.**
  - **Working on implementation of similar system within Marine Division.**

- **Mr Carl Sarelius**
  - **Technical Publications Team Leader, Land Division.**
 - **Working with the system on M113 Upgrade.**

Scope of presentation

◆ **Some introductory comments about Tenix**

- **History & experience with large, complex projects.**

◆ **Critical issues relating to management of project data, information and knowledge.**

◆ **A new project allowed us to embody our understanding with the latest product lifecycle management technology.**

◆ **Focus on how we have extended the core technology to encompass content management.**

Tenix Group structure
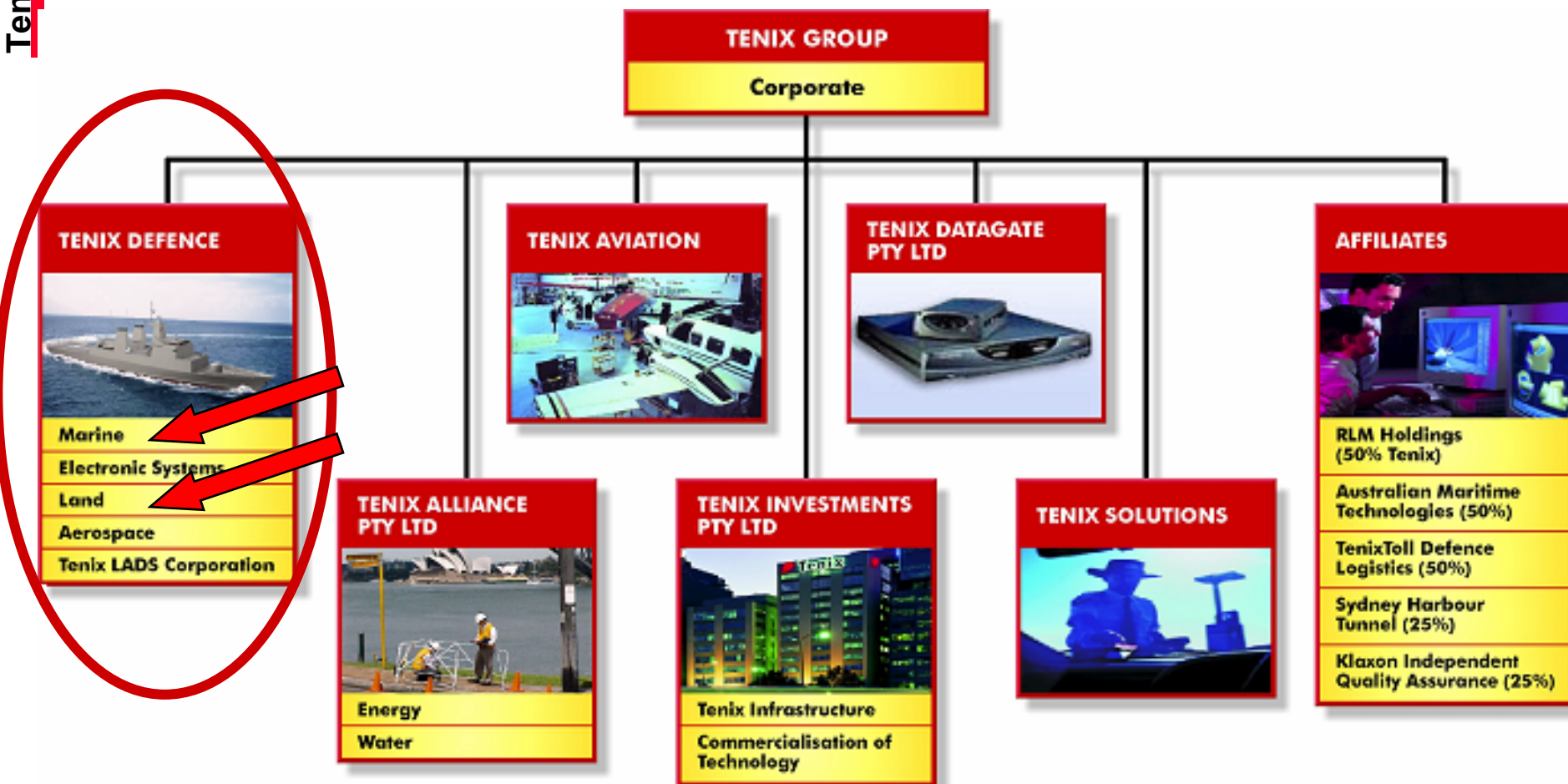
Brief background

- ◆ **Tenix Defence:**
  - ✷ **Marine Division: ANZAC, Oiler, Protector,...Amphibious?**
  - ✷ **Land Division: ASLAV Upgrade, M113 Upgrade**
  - • **Aerospace Division: P3-C Upgrade & maintenance**
  - • **Electronic Systems Divisions: mostly small projects**
- ◆ **Several projects/products have 20+ year lifecycles:**
  - • **ANZAC-01 1990 to ANZAC-10 2005 = 15 years + 27 years support**
  - • **M113 1965 to M113 upgrade extends to 2020 = 55 years**
- ◆ **Critical issues relating to management of project data, information and knowledge over lifecycle**
- ◆ **Silo solutions for CM, CAD, MRP, Tech Doc, etc.**
- ◆ **Focus on configuration management as the core technology and how we have extended it to encompass content management - WHY ?**

Major issues for Tenix's clients

- ◆ **Capability when it is needed**
  - • **Reliably** does what it is supposed to
  - • **Available** for service when needed
  - • **Maintainable** - problems can be fixed when they arise
  - • **Supportable** - critical needs available in supply chain
  - • **Operable** within limits of human knowledge & capacity
- ◆ **Health, safety and operational knowledge issues**
  - • *Heavy/complex engineered products can kill!*
- ◆ **Life-cycle cost**
  - • **Minimise acquisition cost**
  - • **Minimise documentation, support & maintenance costs**
  - • **Implement "lean maintenance" philosophy**

Adequate performance on all issues depends on the quality of authoring, management and transfer of technical knowledge from supplier to operators and maintainers

Object lessons: what happens when configuration isn't managed or content isn't available

- **Common NATO wisdom is that 5-9% of fatal accidents in military trace to documentation errors**
  - I can't confirm this from an authoritative source
- RAN supply ship Westralia
  - HMAS Westralia Tragedy Board of Inquiry 1998
  - WA Coroner's Report 2003
  - Broken high pressure fuel hose caused engine room fire
  - Published configuration change procedures not followed
  - **Four died, ship disabled for four years**
- ESSO Longford Gas Plant
  - Longford Royal Commission 1999
  - Hot oil supply lost, gas separator froze, became brittle, broke and caused explosion when hot oil supply returned
  - Appropriate documentation did not exist/was not available to plant operators
  - **Two died, Victorian gas supply interrupted for three weeks causing $ 1 BN disruption to business**

Major quality issues in delivering product/system support knowledge

◆ **Client's delivery goals for operational/maintenance docs**

- **Correct**
  - **Correct information**
  - **Consistent across the fleet**

- **Applicable/Effective**
  - **Applicable to the configuration of the individual ship/vehicle**
  - **Effective for the point in time re engineering changes, etc.**

- **Available**
  - **To who needs it, when and where it is needed**

- **Useable**
  - **Readily understandable by humans**
  - **Readily managed & processed in computer systems**

◆ **Supplier's knowledge production and usage goals**

- **Fast**

- **High quality**

- **Low cost**

Leveraging Our Knowledge Management

- **1st Generation: Marine – ANZAC**
  - **WordPerfect merge & macros to validate against bespoke ILS database**

- **2nd Generation: Marine**
  - **PM SIM (Planned Maintenance Data)**
    - **Using SIM (early version TeraText to manage PMD as SGML docs**
  - **Validate to SherpaWorks (Product Data Management)**

- **3rd Generation: Land – M113 Upgrade**
  - **Configuration Management Information System (CMIS)**
    - **Matrix10 (PDM) full integration with TeraText (Docs)**
    - **S1000D concepts**

- **Working on 4th Generation shared solution across divisions**
  - **Current S1000D version covers**
  - **Other document models**
  - **Develop in TeraText and apply in same way to both TeamCenter (Marine/Aerospace and Matrix (Land)**

Tenix Defence

Darwin

Cairns

Brisbane
Henderson &
Rockingham
Sydney
Williamstown
Whangarei

Also in:

Fiji

Manila
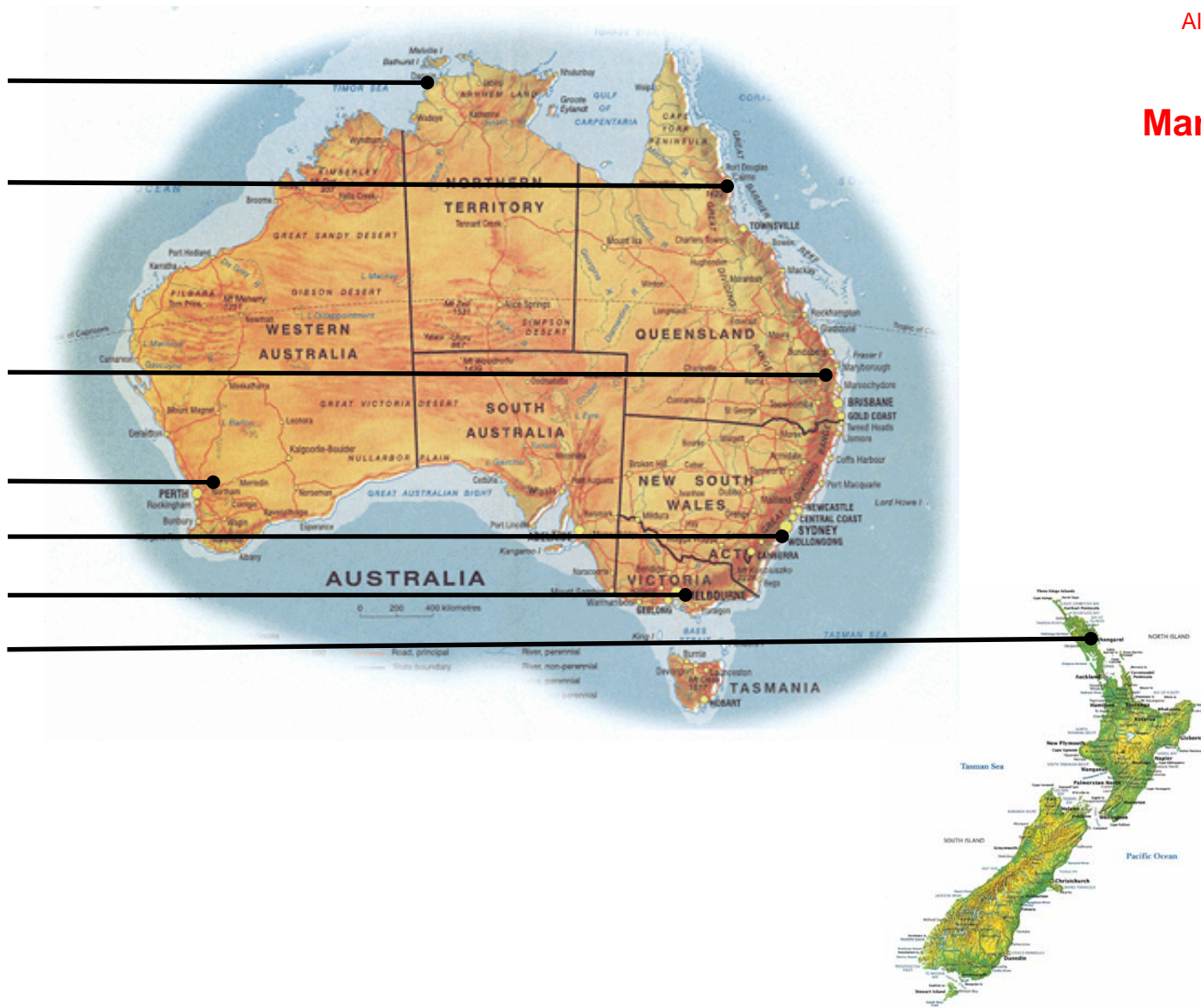
Shipbuilding record

NAVAL VESSELS	ANZAC Class Frigates **10**	FFG Class Frigates **2**	Patrol Boats **32**	Landing Craft **2**	Search & Rescue **8**

COMMERCIAL

Trawlers	146
Tugs	16
Fishing Vessels	4
Offshore Support Vessels	3
Container Vessels	3
Ferries	3
Long Line Fishing	3
Barges	3
Research Vessels	3
Motorflats	2
Safety Vessels	2
Supply Vessels	2
Workboats	2
Dredge Pontoons	1
Line Runners	1
Paddle Steamers	1
Pilot Boats	1
Sailing Ships	1
Survey Vessels	1
Navigational Aids Vessels	1
Navigational Training Vessels	1

Map locations: HONG KONG, THAILAND, PHILIPPINES, KUWAIT, BRUNEI DARUSSALAM, PALAU, FSM, MARSHALL IS., KIRIBATI, TUVALU, PAPUA NEW GUINEA, SOLOMON IS., WESTERN SAMOA, VANUATU, TONGA, FIJI, COOK IS., AUSTRALIA, NEW ZEALAND
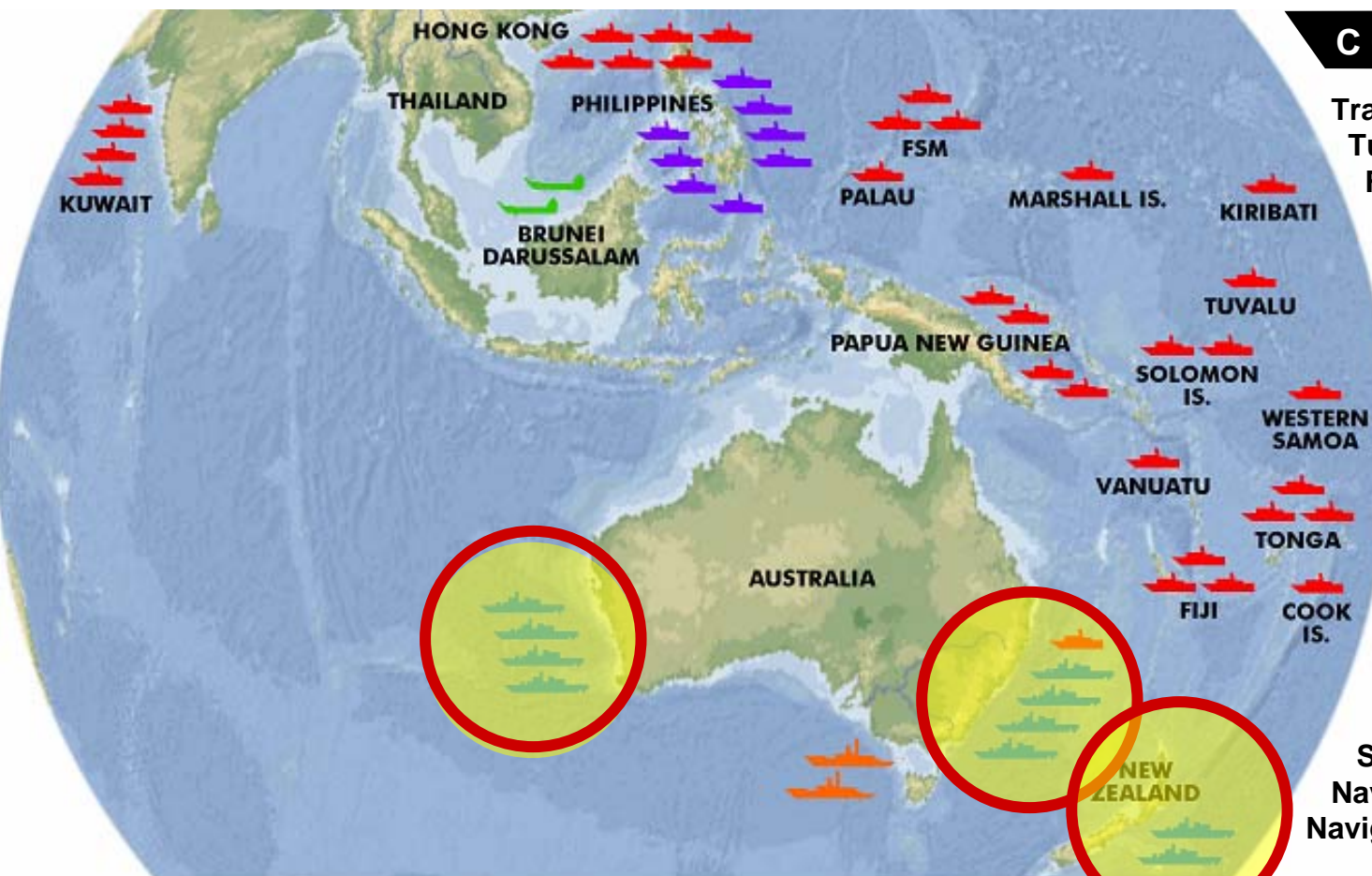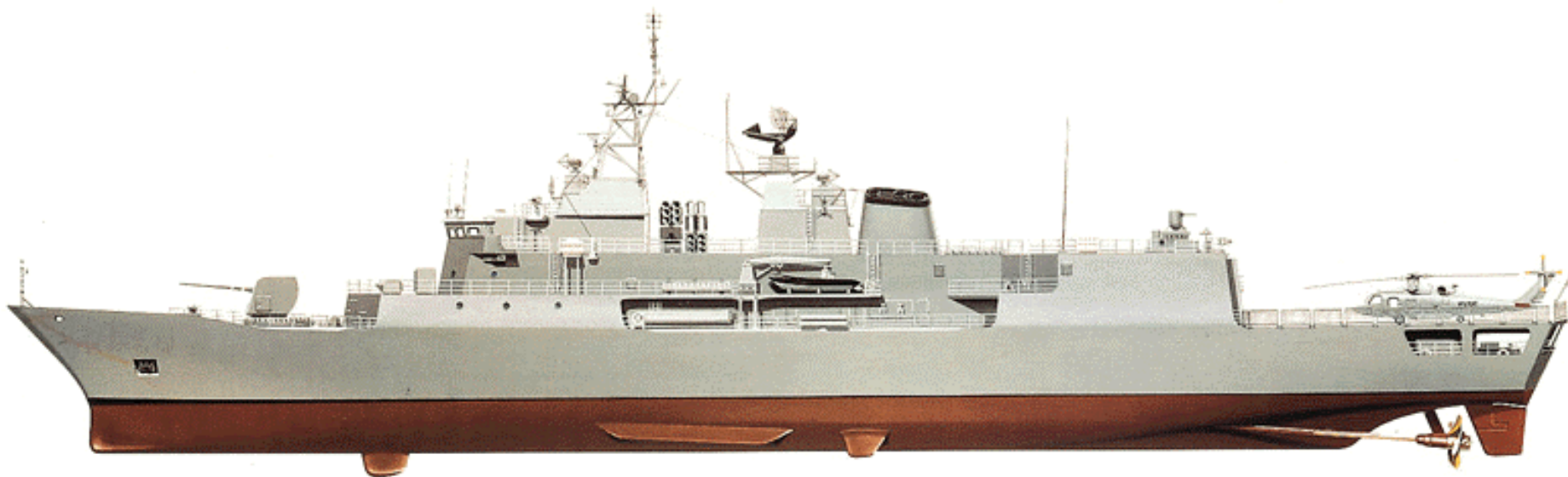
1989 to 2006

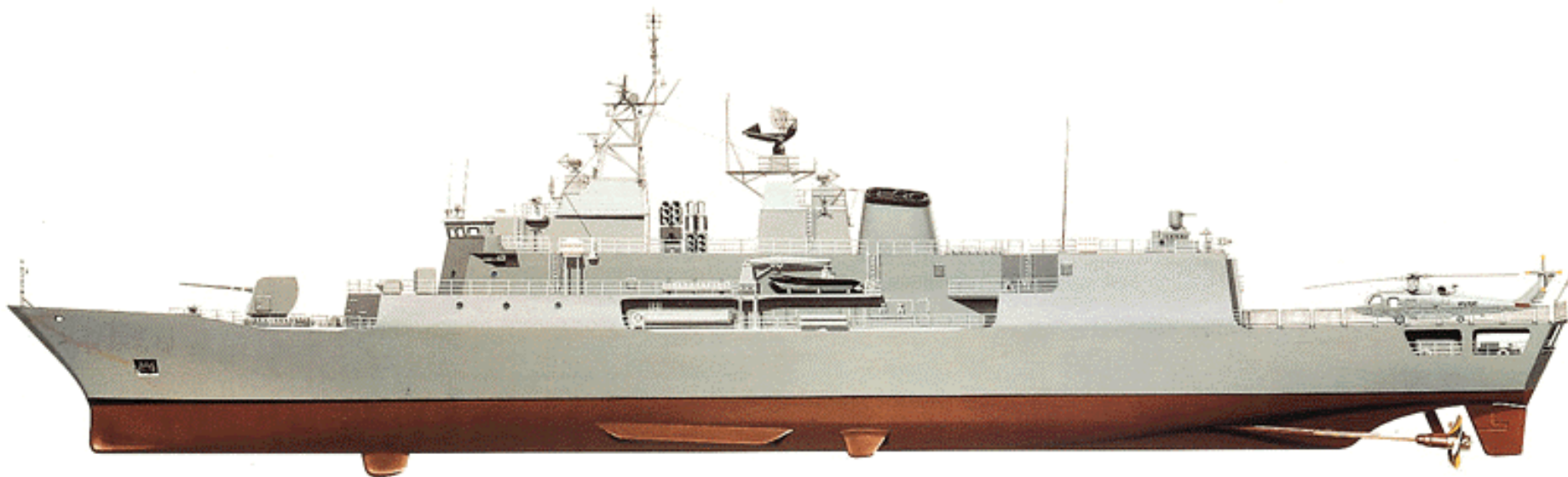## 10 Ships - Fixed Price Contract

In-service for another 27 years!

ANZAC Ship Project

- **8 ships RAN (+ 2 for RNZN)**
- **2 Shore facilities (+1 for RNZN)**
- **Design & systems integration**
- **Procurement - 80% competitively bid**

- **Integrated Logistic Support**
- **Warranty**
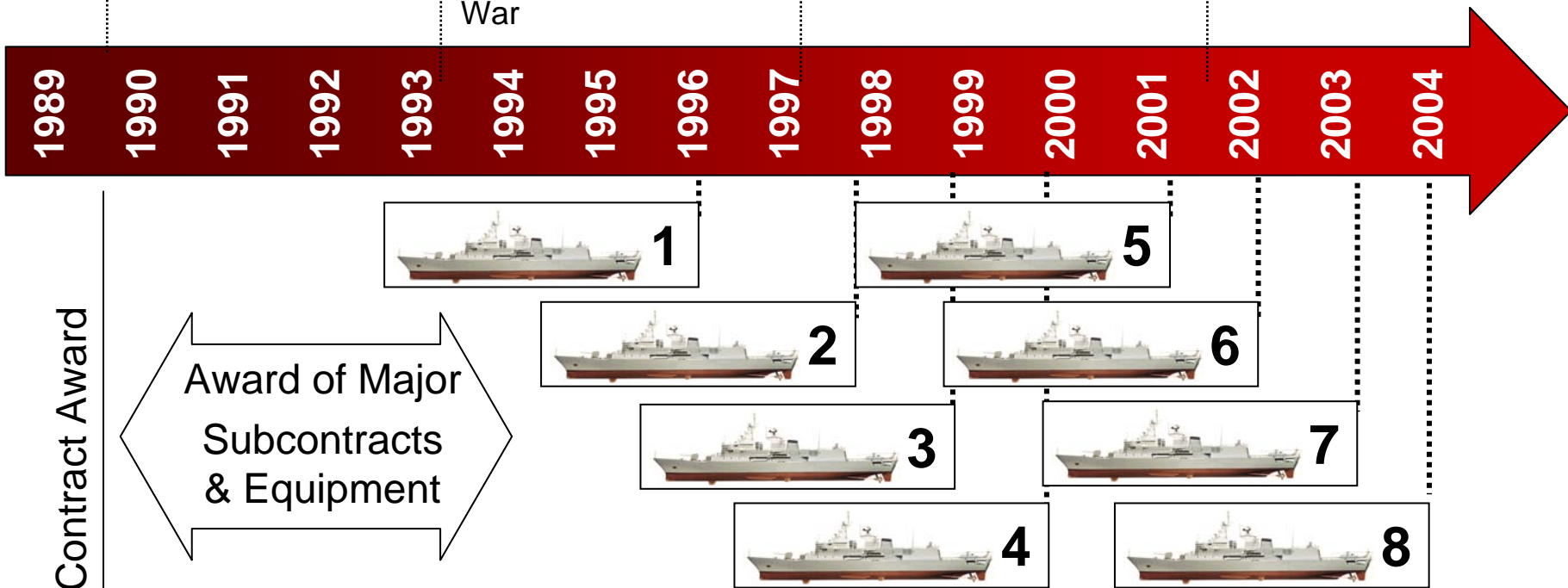 - **12 months for each ship**
  - **2 year latent defects period**

- **80% Australian & New Zealand Industry Participation**
- **10 ship years of Operational Availability Assessment Period**

Historical Business Focus: Build & Deliver

Tenix Defence

- 486 Chipset Built
- Windows 3.0 GUI Released
- TCP/IP Introduced
- HTTP Invented
- Paper based deliverables

- Adobe Acrobat Released
- Pentium I Chipset First Built
- First Web Browser (Mosaic) Released
- Yahoo Released
- End of WP Feature War

- CD-RW Released
- First Web Shops
- PDAs & Digital Cameras Sold to Consumers
- Yahoo Goes Public
- Integration & Warehousing of Data

- Millennium Bug
- Windows XP
- Viruses
- SPAM
- Privacy Legislation
- PLM Maturing

| 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |

Contract Award

Award of Major Subcontracts & Equipment

1 2 3 4 5 6 7 8

- Tanks, Ships, Aircraft, Buildings, etc…

- A system is a system is a system…

- They are all systems!

- Those we manage all have long lifecycles!

- They all have critical data that must be managed throughout their lifecycles!

- Most documents include critical data

- Managing critical data in separate silos is inefficient and can result in errors

- **How do you validate data in documents?**

It's a Data and Content Management Problem

- ◆ **Budgets are being reduced or stretched**

- ◆ **Resources are scarce**

- ◆ **Timelines are shortening**

- ◆ **Greater compliance is required**

- ◆ **Accurate data is essential**

- ◆ **We have to leverage technology to achieve greater efficiency and reduce the effort required to manage the data**

- ◆ **What did we do in Tenix Marine Division?…….**

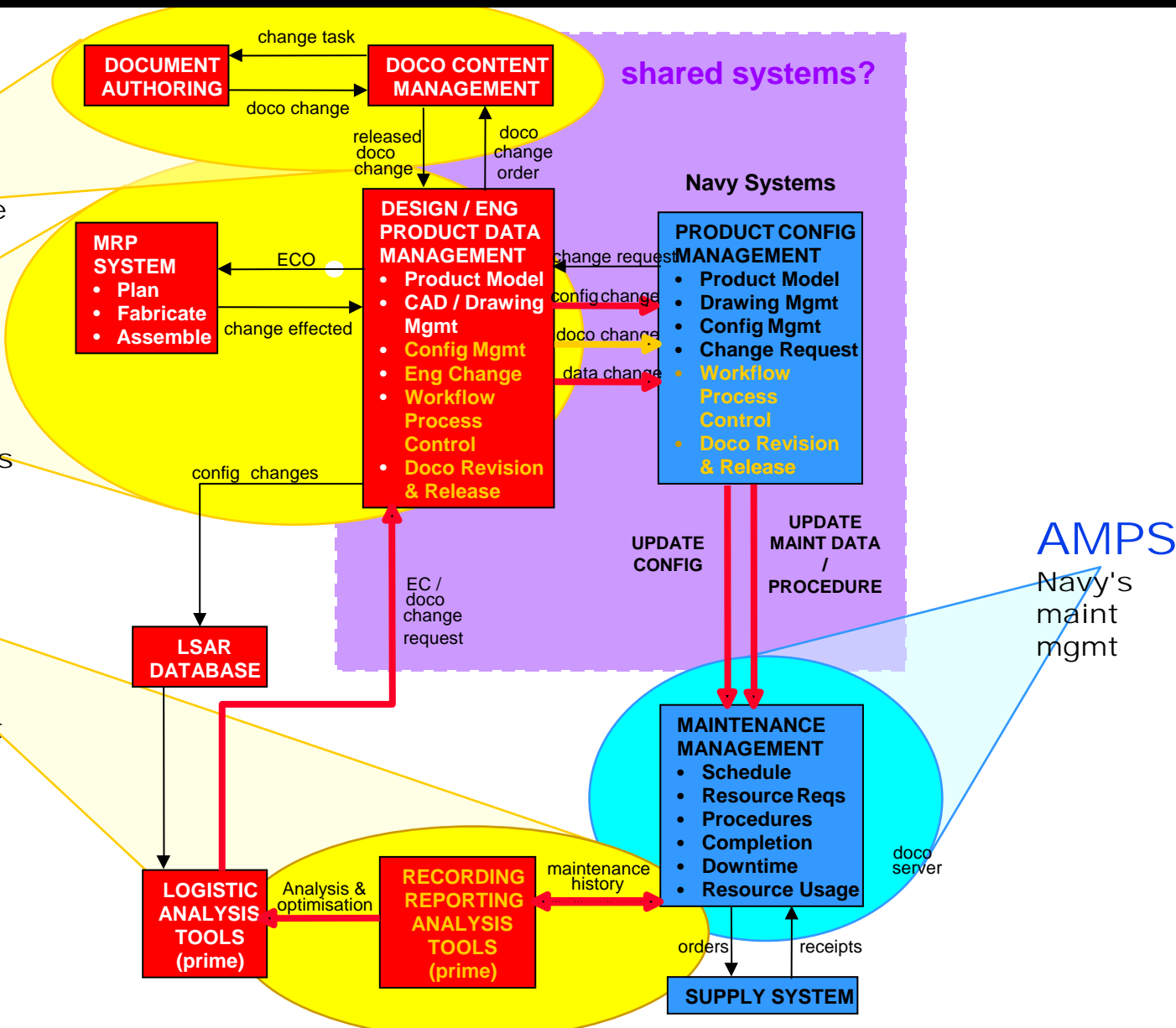Tenix/Navy architecture developed in Melbourne for managing ANZAC Ship support knowledge

Tenix's ANZAC measured improvements from structured authoring and content management

- ◆ **Tenix's Ship 05 delivery challenge in 1999-2000**
  - • **Configuration management issues maintaining data consistently across 8,000 separate document files**
  - • **Client difficulties feeding flat files into AMPS**
  - • **Client threat to not accept 05 if we couldn't solve it**
- ◆ **SGML content management and TeraText resolved issue**
  - • **Condensed 8,000 procedures for 4 ships to 2,000 class-set of 'SGML records' for 10 ships**
    - – **5 people completely reworked 2,000 routines in around 3,000 person/hours**
  - • **Major quality improvement**
  - • **Routines delivered for Ship 5 CUT 80%**
  - • **Subsequent content deliveries CUT 95%**
  - • **Keyboard time for one change CUT more than 50%**
  - • **Change cycle time CUT from 1 year to days**
- ◆ **Client is now a good reference**

Generation 3: TD Land Division

◆ ## M113A1 Upgrade

- The Australian Army M113A1's were originally brought into service during the early 1960's.

- The purpose of the M113 Upgrade Contract is to improve protection, mobility, communications and firepower.

- Tenix is turning 350 worn out hulls into new state-of-the-art vehicles with totally new technical data packs and documentation.
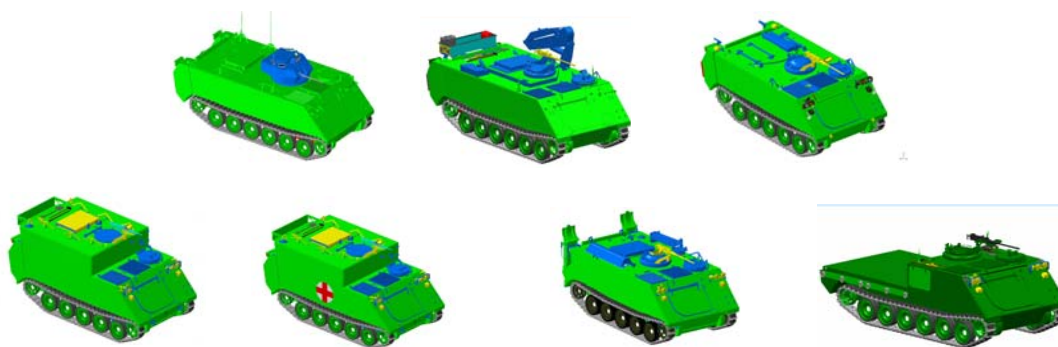
◆ **Coherently manage all data and documents required to support the M113 fleet through life**

- **This means technical data and publication content for:**

7 variants

350 vehicles

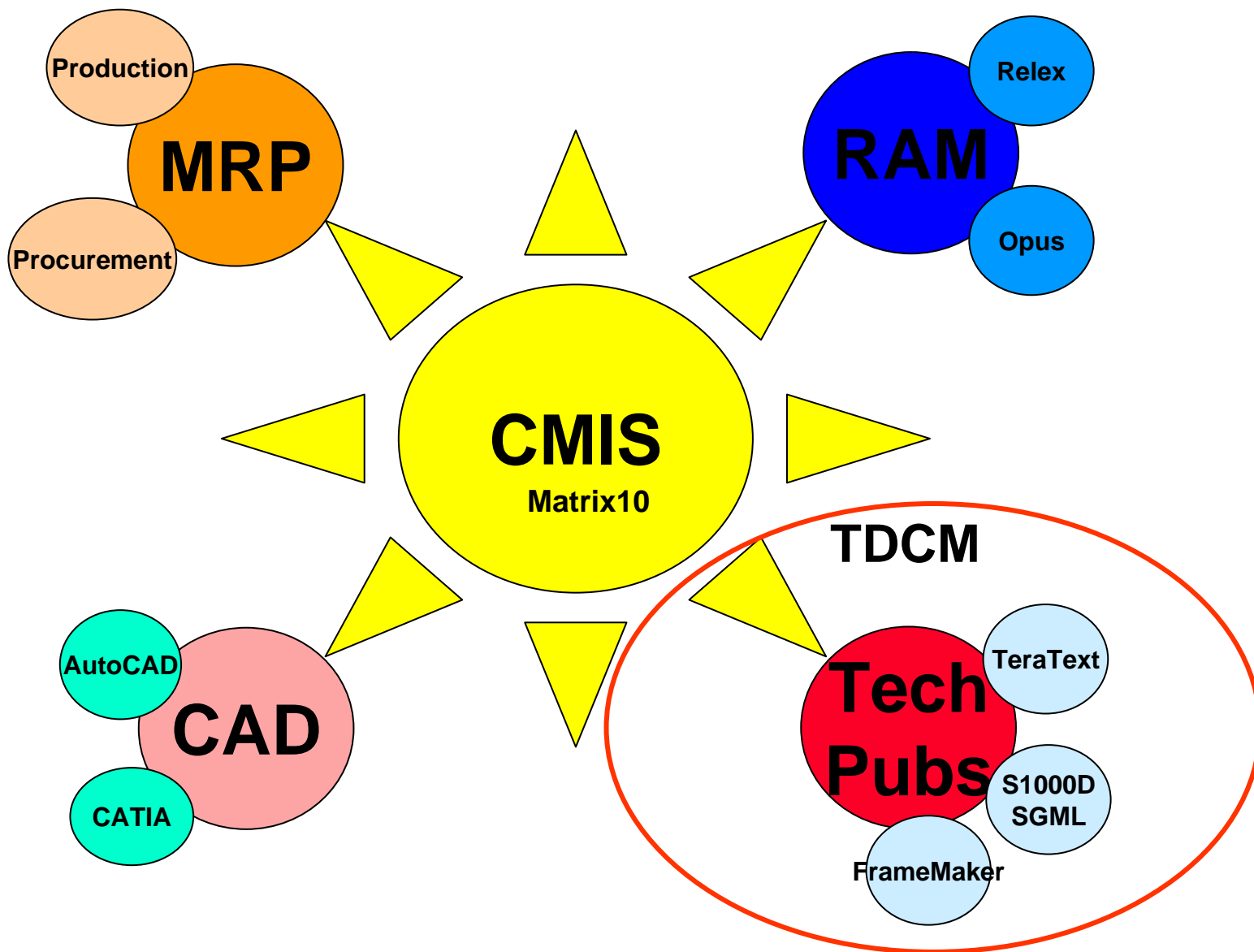- **To say nothing of other projects also managed in the same system**

The TD Land Division vision

◆ **Configuration Management Information System (CMIS)**

◆ **Conceived as an Umbrella System**

◆ **Single user interface accesses all applications**

◆ **Data normalization applies to all project data and document components from the start**

◆ **Common workflow management environment**

◆ **Single point:**

- **electronic signoff**
- **engineering change management and tracking**
- **cost and schedule control**

◆ **The umbrella covers everything!**

CMIS user interfaces (the third generation)

Production

MRP

Procurement

Relex

RAM

Opus

CMIS
Matrix10

TDCM

AutoCAD

CAD

CATIA

Tech Pubs

TeraText

S1000D
SGML

FrameMaker

The Configuration Management Problem

◆ **There are 7 M113 variants**

- **Several builds for some variants**
- **Individual vehicles will evolve independently in service**

◆ **There are 60-80% common components**

◆ **How do we reuse the common data without having 7++ copies of everything?**

◆ **How do we control the variant specific data?**

◆ **How do we manage effectivity/applicability?**

◆ **How do we let everyone know about changes without being buried in paper?**

The CM Problem

◆ **If we change a component how can we be sure we have updated all of its related technical data?**

◆ **If the component is used in multiple variants how can we reuse and then manage the related technical data?**

◆ **We need to manage the technical data related to each component as well as the technical documentation (manuals) related to the system**

The Data Management Problem

◆   So we needed to manage fragments of technical data instead of entire manuals and relate those fragments to the items in a Product.

◆   Therefore it had to be object oriented and it had to be in SGML/XML.

◆   Def(Aust) 5629A DTDs were unsuitable because of their paper based design.

◆   **The S1000D Data Module structure was a perfect fit!**

What is S1000D?

- ◆ **International specification for technical publications using a common source database (http://www.s1000d.org)**
  - • **Standard using SGML/XML and CGM for any complex system**
  - • **Derived from AECMA S1000D, first issued by European Association of Aerospace Industries in 1989**
  - • **Now adopted in North America, Europe and Australia**
- ◆ **Common Source Database (CSDB)**
  - • **Combination of data module code, information types and metadata allows information to be called by query or table of contents designed to meet a specific user's needs.**
- ◆ **Data modules (DM)**
  - • **A DM is a stand-alone info unit comprising data and content relating to a particular product, or product component**
  - • **Common structure able to be stored and retrieved from CSDB using a smart data module code as an identifier.**
  - • **Conforms to specific SGML/XML DTDs (i.e., parseable)**

TD Land's Data Management Solution

- ◆ **Matrix10 defines/knows the structure of the system (M113) and its components via the Product Breakdown Structure**

- ◆ **TeraText knows the SGML/XML structure of the S1000D Data Modules**

- ◆ **A component in Matrix10 is related to a Data Module object but the actual SGML Data Module file is stored in TeraText**

- ◆ **Authors work through the CMIS interface and check-in/out the SGML file into a text editor**

- ◆ **Authors never see or use TeraText directly**

◆ **Configuration Management (PDM - Matrix10)**

- **All components are configuration managed.**

- **Build process is controlled by workflow.**

- **Nothing happens without authorisation of an engineering change order and authorised cost codes.**

◆ **Content Management (TDCM - TeraText)**

- **Authoring in S1000D SGML Data Modules.**

- **Provides control down to element level.**

- **Library of Warning/Cautions/Notes.**

- **Library of Source Publications References.**

- **Library of Graphics.**

- **Annotations record author knowledge/sources.**

The Data Management Solution

◆ **The level of maintenance required defines the content of the technical data required by system, subsystem, assembly and component.**

◆ **There is a Technical Manual structure view showing Data Module and Graphic workflow status indicating their readiness for output:**

- **no release = no output**

◆ **Multiple output formats from a single source:**

- **SGML**

- **HTML**

- **PDF**

◆ **Instant impact analysis and reporting of engineering changes.**

The Data Management Solution
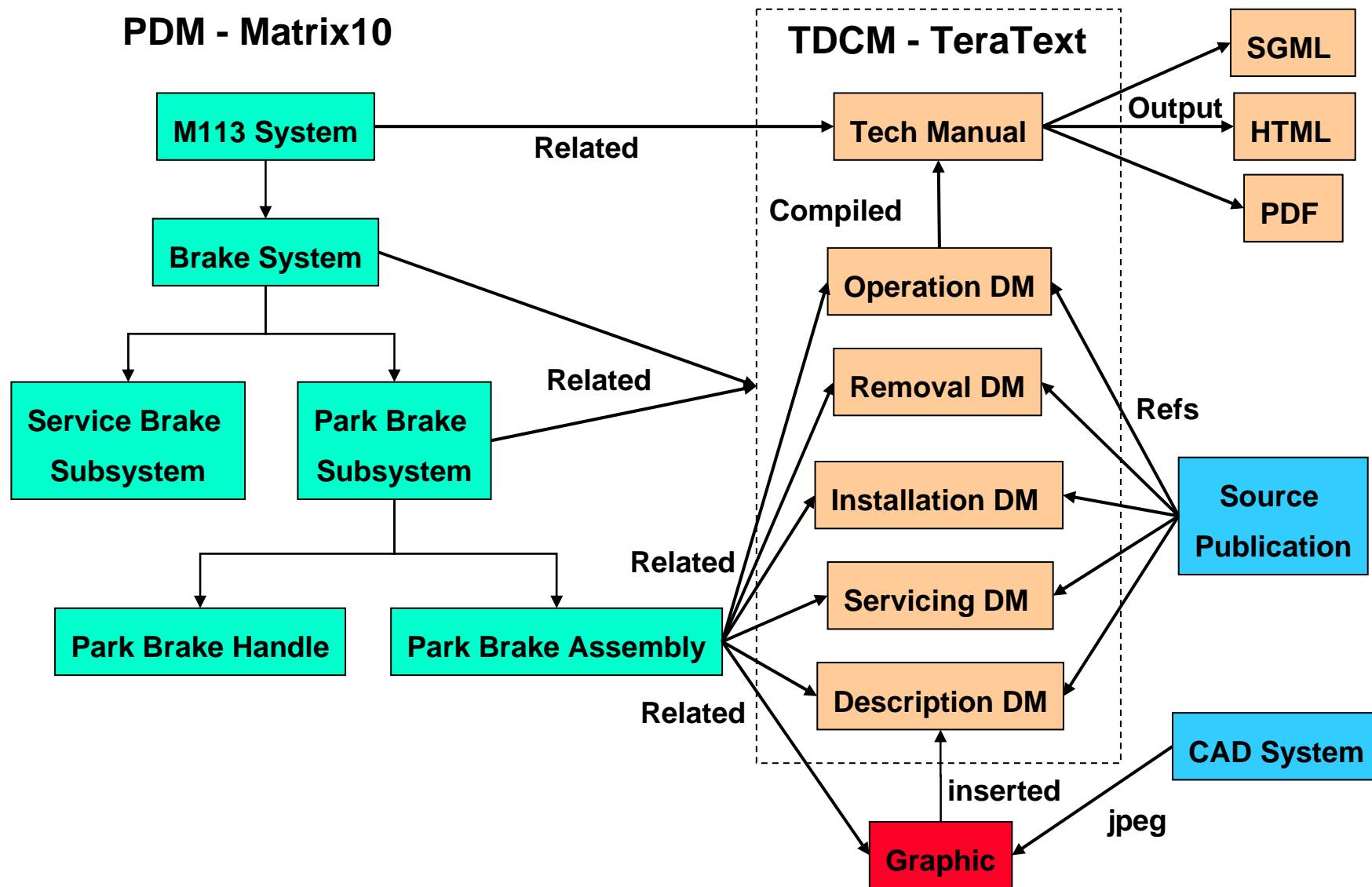
Business Issues

- ◆ **Business process analysis:**
  - **Requirements**
  - **Workflow**

- ◆ **Change management:**
  - **Business**
    - **Configuration management**
    - **Content management**
    - **Training**
  - **Authoring team**
    - **Technology:**
      - **PDM**
      - **New authoring tool**
      - **SGML**
      - **S1000D**
    - **Authoring approach**

- ◆ **Managing document technical data**
  - • **Authoring process for controlled changes to authored content**
- ◆ **About 70% of content is common to all manuals**
  - • **DMS only manages whole documents and does not know what is common to other documents**
  - • **TeraText Content Management system manages the components that make up the document**
  - • **Reuse, don't rewrite!**

◆ **Only small component may change in a document**

- **DMS or file system requires whole document to be stored again**

- **TeraText Content Management System stores common components once and tracks versions of components as well as whole documents**

- **Know "where used"**

Summary 3

We're addressing the content management challenge by…

- ◆ **Adopting a long term view of the content**
- ◆ **Ensuring the document model supports authoring at the document, component and fragment levels**
- ◆ **Truly sharing (reusing) common texts vs rekeying common texts**
- ◆ **Direct sourcing of PDM data into parts lists tables**
- ◆ **Supporting auditable review processes and version control**
- ◆ **Using tools and content model to assess impact of change**
- ◆ **Building documentation set using industry standards and tools**
- ◆ **Using COTS authoring tools**
- ◆ **Applying industry standards for long life content**

Vehicle Variants

Users Manual

Maintenance Manual

Reuse Texts

COTS authoring tools

Publishing and Review Processes
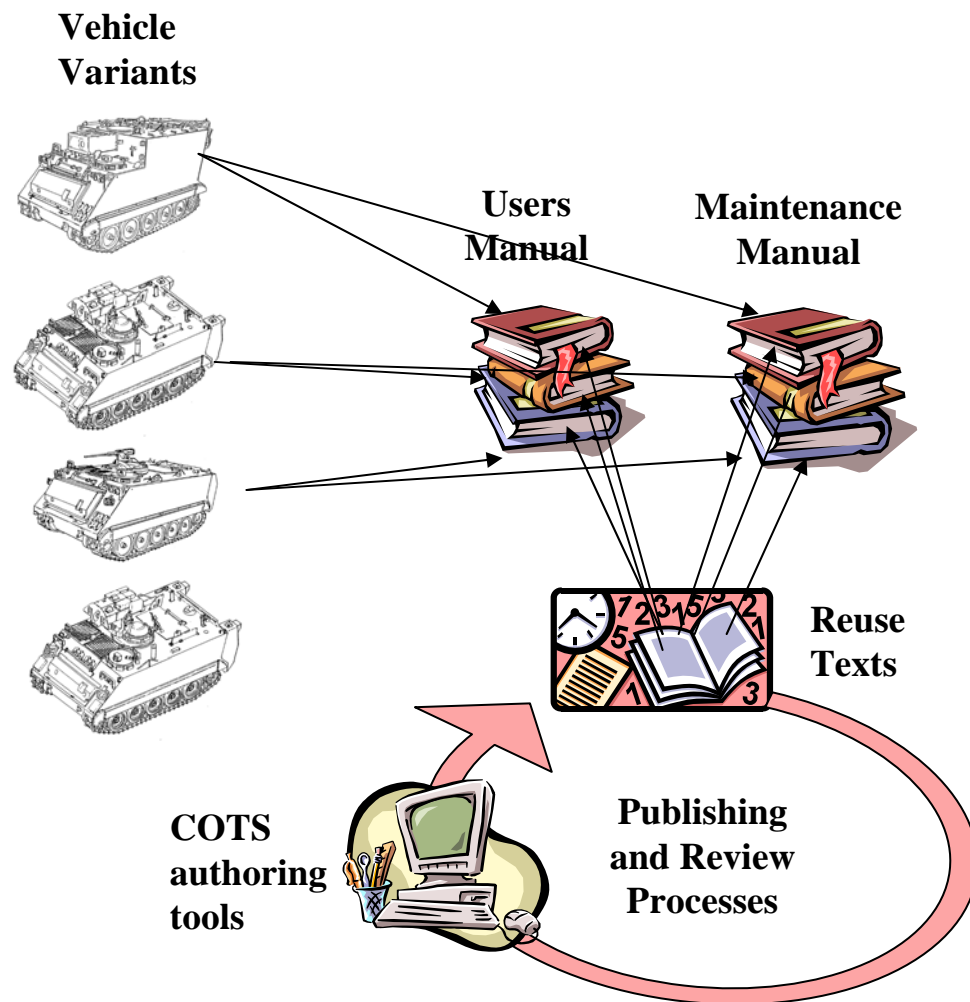
Working towards the future: Integrated fleet lifecycle knowledge management

- ◆ **PDM framework understands project and product structure**
  - • **All information products and document content relating to engineering and logistic support linked down to the lowest level units of maintenance interest to individual vehicle level**
  - • **Other information products and document content linked to project phase and work breakdown structure**
  - • **Global query and retrieval, common workflow environment**
  - • **PDM now known as Product Lifecycle Management (PLM)**
- ◆ **Integration of PDM, Maintenance Management and Supply**
  - • **Feed forward: maintenance plan, maintenance routines, schedule requirements parts & materials requirements**
  - • **Accumulation of operational data: downtimes, spares usages, labour & materials costs, maintainer observations**
  - • **Feed back: Operational data, costs, availabilities, etc.**
- ◆ **Logistic support analysis tools**
- ◆ **Engineering change management**

The Working System

An overview of the system as the technical authors see it.

Carl Sarelius

Background

- ◆ **Contract: All CM in M113 Project according to**
  - • **TRAMM (Technical Regulation Army Maint Mgmt)**
  - • **MIL-STD-973 (Configuration management)**
- ◆ **Documentation standards**
  - • **The Documentation Look: Def(Aust) 5629A/B**
  - • **The Documentation Structure: S1000D**

◆ **Data Module List (DML)**

◆ **Create/Author DMs**

◆ **Version Control**

◆ **Review DMs/Life Cycle**

◆ **Create Technical Manual**

◆ **Finished product/other views**

- ◆ **Data Module (DM) associated with part and/or system.**

- ◆ **Team Leader needs to determine level at which DM gets created.**

- ◆ **Allocates to team members.**

Tenix Defence

http://kenya - Matrix10 Applications - Microsoft Internet Explorer

Edit   View   Favorites   Tools   Help

Tenix   **Configuration Management Information System**   **CMIS**

My Desk ▾   Actions ▾   Tools ▾ | 🔍 Search ▾   Page History   Home   Logout   User Name: Everything, Test

- ECOs
- ECRs
- Engineering Bill of Materials
- Equivalents
- History
- Lifecycle
- Reference Documents
- Revisions
- Route
- Spare Parts
- Specifications
- Substitute Parts In
- Where Used
- Multi-Level Where Used
- Part Reports
- Engineering Base Reports
- ▶ Reports
- Serialised Parts
- Technical Manuals
- ▼ ILS Data
  - Data Modules
  - Data Module Graphics
- Derived Output

15005000 rev A: Data Modules

Actions ▸ 🌐 🔲 🖨 ❓

Name ▲	Ver	Status	Data Module Type	Subtype	Seq	
📄 15005000-datasum--001	1.0	Release	Data Summary		10	🖨
📄 15005000-equipover--001	1.0	Release	Equipment Overview		10	🖨
📄 15005000-operatinst--001	1.0	Release	Operating Instructions		10	🖨
📄 15005000-operatinst--002	0.3	Edit	Operating Instructions		20	🖨

Done   Local intranet

Create Data Modules

◆ **Creating DMs attaches DM to that part – if part changes, system notifies that DM may need changing.**

◆ **DM Creator inserts applicable meta data.**

◆ **Once created, work with through 'Operations' link from menu, and authoring tool of choice (FrameMaker, Arbortext, etc).**

DM Operations

Authoring Environment

◆ **The Tenix FrameMaker Authoring Environment has been modified to support the TeraText Interface.**

◆ **The customised CMIS option on the tool bar provides links for the authors to readily access and insert:**

- **Warnings Cautions and Notes**
- **Data Module References**
- **External Source Publication References**
- **Data Module Graphics, and**
- **to save the data modules in SGML format.**

Version Control

◆ **Provided by PDM/TeraText.**

◆ **Can check back in or leave checked out: depends on business/team rules.**

◆ **Can go back to previous versions if required.**

◆ **System manages version numbers.**

◆ **Author independent.**

Tenix Defence

Operation to Perform

View on-line

Open in external viewer

View previous version on-line

Open previous version in external viewer

Open existing check-out file

Check-in

Cancel Check-out

atinst--002 1

Microsoft Internet Explorer

⚠ Data module 15005000-operatinst--002 successfully checked in as version 0.4.

OK

eferences

Previous Versions

15005000-operatinst--002 rev 1: Operations

Operation to Perform
View on-line
Open in external viewer
View previous version on-line
Open previous version in external viewer
Check-out and Open in external editor

15005000-operatinst--002 rev 1: Previous Versions - Microsoft Internet E...

15005000-operatinst--002 rev 1: Previous Versions

Version Number ▼	User	Date Originated
0.4	Test Everything	Mon May 23 14:20:44 2005
0.3	Test Everything	Mon May 9 08:52:59 2005
0.2	Test Everything	Sat May 7 12:57:38 2005
0.1	Test Everything	Sat May 7 11:14:55 2005

Cancel

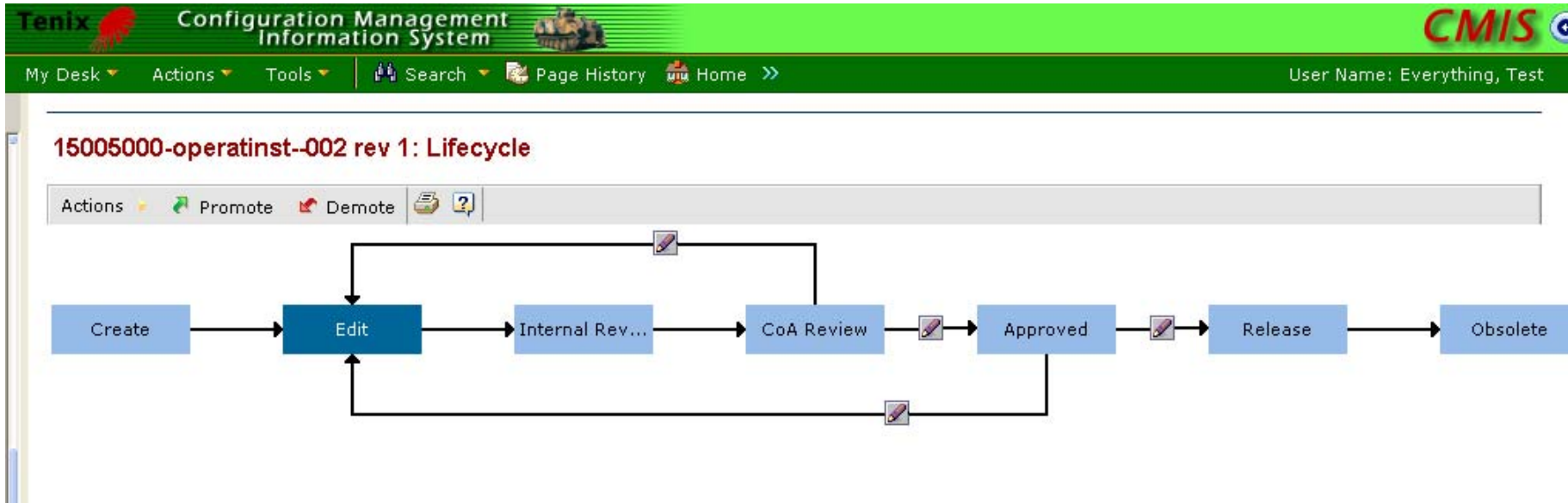# Review DMs/Life Cycle

◆ **Review process completely on-line.**

◆ **Reviewers notified via e-mail with link to DM for review.**

◆ **Reviewers can annotate but not edit text.**

◆ **Reviewers can reject DM text (and send back to edit) or accept (and promote in life cycle).**

◆ **Life cycle tracks progress of DMs.**

◆ **DMs can be demoted back to edit at any time EXCEPT if released.**

DM Life Cycle

Annotations

- ◆ **Three types:**
  - • **Author:**
    - – **Visible to other internal staff**
  - • **Internal Reviewer:**
    - – **Persist for life of major version**
    - – **Dropped from document when released, but kept in version archives for audit and change tracking purposes**
    - – **Capture reviewer comments and requests for author corrections**
    - – **Only visible to authors and internal reviewers**
  - • **Client (external) Reviewer:**
    - – **Can only see their own annotations**
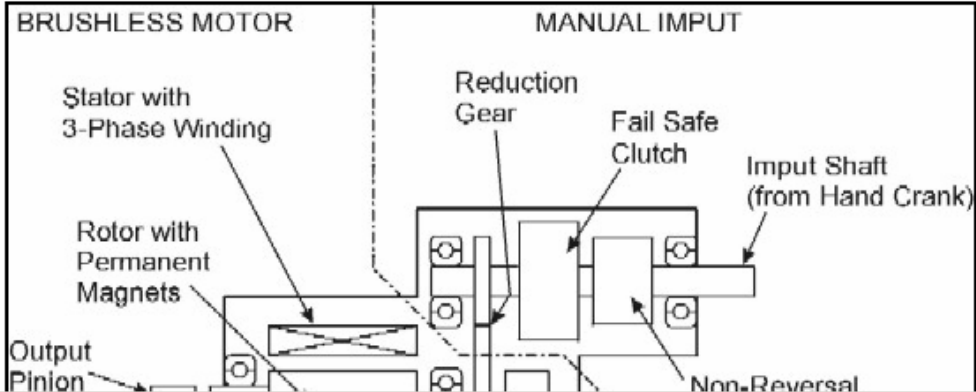   - – **Managed in the same way as internal review annotations**

Annotations

COMBAT TURRET SYSTEM - EQUIPMENT OVERVIEW - Microsoft Internet Explorer

Back | Search | Favorites | Media

COMBAT TURRET SYSTEM

EQUIPMENT OVERVIEW

1. The turret is electrically driven and electronically controlled to allow the crew commander to rotate the turret in a controlled manner. The weapon, when fitted to the turret, will traverse in the same controlled manner. Traversing the turret is controlled by a hand held controller. The hand held controller also electrically/electronically controls the elevation of the weapon. Switches on the hand held controller also fire the weapon.

2. The turret traversing and elevation motors have a manual method to traverse the turret and elevate the weapon

3. The turret has its own electrical distribution system from the Electrical Control Box for electrical services.

4. The turret contains navigational system and internal/external communications systems.

5. The turret has a choice of two weapons that can be supplied by a ammunition chute from a ready round bin and the spent rounds can be collected in a ammunition discharge bin.

6. A crew commanders sight (CCS) day/night gunnery sight is located in the turret to aid the commander in locating a target and laying accurate weapons firing.

BRUSHLESS MOTOR   MANUAL IMPUT

Stator with
3-Phase Winding

Reduction
Gear

Fail Safe
Clutch

Imput Shaft
(from Hand Crank)

Rotor with
Permanent
Magnets

Output
Pinion

Non-Reversal

Annotations

Create Technical Manual

- ◆ Prelim and post pages already defined by DTD.
- ◆ Technical manual produced for variant.
- ◆ Searches for DMs satisfying specific criteria.
- ◆ Shows release state of component modules.

Manual Generation

◆ **The Technical Manual is generated as a background process.**

◆ **When the generate manual process has been completed an email is sent to the manual owners group.**

MatrixOne - Microsoft Internet Explorer

Create Technical Manual

Fields in red italics are required

Name	ABR-33812
Title	M113AS4 APC
Subtitle	Maintenance Manual
Version Number	0.1
Technical Manual Type	Maintenance Manual
DTD Used	DEF(AUST) 5629A
ECO For Release	ECO-2011-0003 ...
Policy	Technical Manual
Vault	eService Production ...
Owner	super ... Clear

Technical Manual ABR-33812 generation complete - Message (Plain Text)

File   Edit   View   Insert   Format   Tools   Actions   Help   Type a question for help

Reply   Reply to All   Forward

From: User Agent   Sent: Thu 15/07/2004 3:05 AM
To: BRAMICH James
Cc:
Subject: Technical Manual ABR-33812 generation complete

```
Business Object: Technical Manual ABR-33812 1

The generate manual process has been completed.

http://heckle:7001/ematrix/common/emxNavigator.jsp?objectId=28055.33305.26627.1075
```

Manual Generation

15005000 rev A: Status Report - Microsoft Internet Explorer

15005000 rev A: Status Report

□ Generate Manual   □ Change View

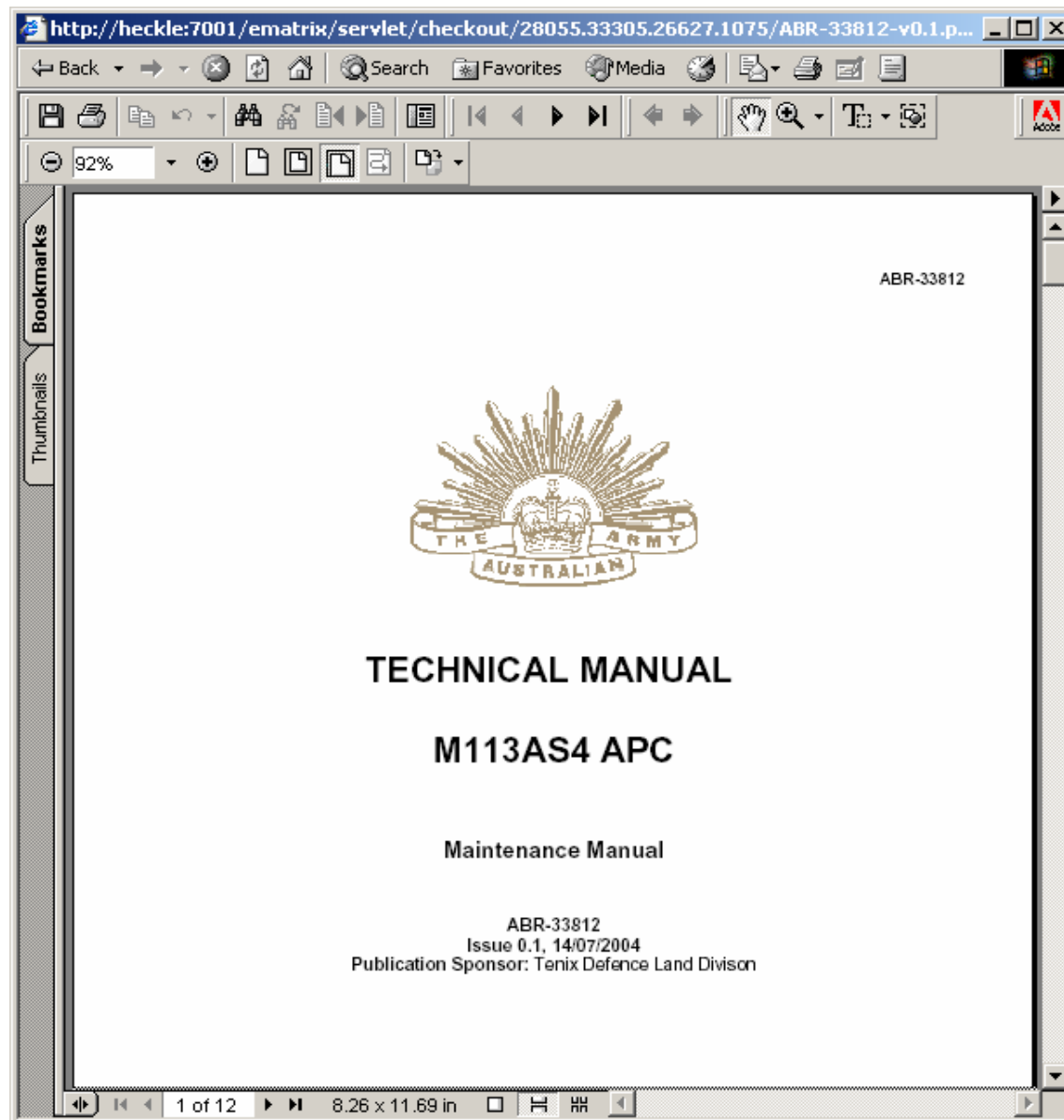| Title	Object Name	Ver	Seq	Status	Notes
Maintenance Manual					Current State
Section 1: Introduction					
Chapter 1: Equipment Overview					
Maingroup 1: DRIVE SYSTEM					
Group 1: Equipment Overview	15005060-equipover--001	7.0	10	Release	OK
Graphic: Another test for Joyce's insert DM graphic	G15005060-001	2		Release	OK
Graphic: A test for Joyce's insert DM graphic	G15005060-001	1		Release	OK
Chapter 2: Data Summary					
Maingroup 1: VEHICLE SYSTEM, APC					
Group 1: VEHICLE ELECTRICAL SYSTEM					
Subgroup 1: DATA SUMMARY	15005062-datasum--001	0.1	10	Edit	⚠ Can't include
Section 2: Equipment Description					
Chapter 1: DRIVE SYSTEM					
Maingroup 1: Equipment Description	15005060-equipdesc--001	0.2	10	Internal Review	⚠ Can't include
Graphic: A test for Joyce's insert DM graphic	G15005060-001	1		Release	OK
Chapter 2: VEHICLE ELECTRICAL SYSTEM					
Maingroup 1: BATTERY BOX INSTALLATION					
Group 1: TECHNICAL DESCRIPTION	15004575-equipdesc--001	0.1	10	Edit	⚠ Can't include
Maingroup 2: VEHICLE HARNESS INSTALLATION					
Group 1: TECHNICAL DESCRIPTION	15004585-equipdesc--001	0.1	10	Edit	⚠ Can't include
Maingroup 3: FAN INSTALLATION					
Group 1: TECHNICAL DESCRIPTION	15004574-equipdesc--001	0.1	10	Edit	⚠ Can't include
Maingroup 4: POWER CONTROL BOX INSTALLATION					
Group 1: TECHNICAL DESCRIPTION	15004514-equipdesc--001	0.1	10	Edit	⚠ Can't include
Maingroup 5: AUXILIARY DISTRIBUTION BOX INSTALLATION					

Page 1 of 1   ✖ Cancel

Other views

◆   **Portable Document Format**

◆   **HTML**

Acrobat PDF view

Browser HTML view