FUTURE NAVAL TRAINING SYSTEM (FNTS) CONCEPT OF OPERATIONS (CONOPS)

FNTS CONOPS V2.1

12 Sept 2020

DISTRIBUTION LIST

Action – Internal	Action - External

Information – Internal	Information - External

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DOCUMENT CHANGE CONTROL

Revision Number	Date of Issue	Author(s)	Brief Description of Change
0.0	27 March 2020	NTST team	Preliminary Draft
1.0	29 April 2020	NTST team	Interim Draft
1.1	27 May 2020	NTST team	SEM and DPM updates
1.2	13 June 2020	NTST team	PM updates and formatting
1.3	2 July 2020	NTST team	External review and updates
1.4	4 July 2020	Cdr White	Final Draft Review Copy
2.0	6 July 2020	Cdr White	Final Draft
2.1	30 Aug 2020	Cdr White	Final

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1 EXECUTIVE SUMMARY

1.1 Purpose of the FNTS CONOPS

The purpose of the Future Naval Training System (FNTS) Concept of Operations (CONOPS) is to describe the background, existing capability deficiencies, considerations, preliminary High Level Requirements (HLRs), and system solution concepts for the FNTS and its six major systems.

The CONOPS describes how the FNTS and its six major systems will be developed and used from the viewpoints of its various stakeholders. The CONOPS is used to present and maintain a common vision of the FNTS and its six major systems through life. It provides the context and needs statements to inform and enable development of the FNTS Statement of Requirement (SOR).

1.2 Background

The NTST Program was initiated to correct significant capability deficiencies in the existing Royal Canadian Navy (RCN) Naval Training System (NTS). The NTST Program is responsible to develop and deliver a Future Naval Training System (FNTS) that provides world class training to RCN and associated Canadian Armed Forces (CAF) and Department of National Defence (DND) personnel. RCN Training Capability, enabled by the FNTS, is fundamental to effective RCN Operations.

The FNTS will provide major improvements to the existing RCN training in terms of Governance, Training Management, Training Technologies, Digital Framework, Training Facilities, and Sustainment.

The NTST Program is large and complex with a wide range of stakeholders and interdependencies. The NTST Program will engage the Director General Naval Strategic Readiness (DGNSR), Director General Naval Force development (DGNFD), Director General Maritime Equipment Program Management (DGMEPM) and Major Program Delivery (Sea) (MPD(Sea)) organizations to ensure that the Program and the delivered FNTS align, and are coherent with, DGMEPM, DGNFD and MPD objectives.

The NTST Program will involve other stakeholders who have key inputs or dependencies with the FNTS. These stakeholders will include Assistant Deputy Minister Material (ADM(Mat)), Assistant Deputy Minister Infrastructure and Environment (ADM(IE)), Assistant Deputy Minister Information Management (ADM(IM)), Vice Chief of the Defence Staff (VCDS), and Chief of Military Personnel (CMP).

The NTST Program will have the authority to direct changes across the RCN to optimize the full scope and all aspects of the FNTS. The NTST Program will work with elements and organizations outside the RCN to positively influence and leverage collaborative synergies and efficiencies.

1.3 The FNTS: A System of Systems

The FNTS will be a holistic, complex, and expansive System of Systems, comprised of six major systems:

- Governance System;
- Training Management (TM) System;
- Training Technologies (TT) System;

- Digital Framework (DF) System;
- Training Facilities (TF) System; and
- Sustainment System.

These are each described briefly below.

1.3.1 Governance System: Singular, Unified, Command and Control

The FNTS Governance System will provide singular, unified Command and Control with clear lines of authority and responsibility across the entire RCN Training Continuum which includes IT&E and CT levels 1-5. This will enable efficient coordination of strategic, operational and tactical activities, and integration of this critical RCN Capability into Force Development, and the greater RCN enterprise for the next 30+ years.

Disciplined Systems Engineering, oversight of procurement and sustainment contracts, metrics-based performance management, and a comprehensive Quality Management (QM) process will ensure maintenance of the holistic systems of systems, facilitate critical elements of Naval Material Assurance (NMA), and deliver optimum operational training outcomes and Continuous Improvement across the complete spectrum (Training Continuum) of RCN Training.

1.3.2 Training Management System: Digitally Enabled, Integrated Tools, Increased Student Production

The FNTS Training Management (TM) System will build on existing, proven TM processes of operations management, training development, and training delivery, already used in the Naval Personnel and Training Group (NPTG). However, these processes will be streamlined, integrated, and enhanced through use of effective digital tools, processes, and databases provided by a modern, Digital Framework System.

The TM System will seamlessly access a Single Trusted Data Source for technical, operational and derived data, that contains the most current information for all RCN material and capabilities, configured using modern international standards. The development and delivery of courseware and instruction will be concurrently updated to address the skills and competencies required to operate and maintain evolving naval systems and operations for all classes of ship in the RCN.

The increased number of RCN operational platforms, and technologically advanced naval systems being introduced over the next 30 years, will result in more personnel at sea and a resultant increase in training production requirement of more than 17%. This will require some increase in instructional and support personnel. Much of the additional instruction and support personnel will be provided by industry, through long term relational service contracts. This will establish and increase the overall capability and capacity of a professional training cadre, provide continuity through RCN posting cycles, and ensure that naval personnel remain dedicated to Naval operations.

1.3.3 Training Technologies System: Modern technology, 1500+ Systems, Integrated

The FNTS Training Technologies (TT) System will manage and provide all hardware, software, digital content, and associated infrastructure used to develop, deliver, and validate training and student performance across the FNTS.

The TT System will include a comprehensive suite of modern Training Technologies, curriculum, and instruction methodologies. This broad spectrum of products and services will provide training at the time and location of need. It will accelerate learning, enhance training flexibility, encourage critical thinking, and improve retention.

Initial analysis indicates that the FNTS will employ over 1500 small and large TT in the TT System. As older or irrelevant TT are replaced, new ones will be developed for increased efficiency and training value. Many new TT will be provided by supporting projects, such as STORM, and the training elements of CSC. Deliverables from these supporting Projects are expected to be compliant with the TT System interface requirements, to enable straight forward integration into the FNTS.

1.3.4 Digital Framework System: FNTS enabler, Leveraging RCN/CAF Digital Initiatives

The FNTS Digital Framework (DF) System will provide the management, networks, data, tools, standards, policies, and technologies that provide the digital capability of the FNTS. This includes data and networks, supporting information management, and derived analytics. The DF System is a key enabler for the TM System, the TT System and the Sustainment System.

The DF System will provide simple access to a source of standardized data (Single Trusted Data Source), for all technical, operational, and training information. This will be achieved through wide bandwidth, classified and unclassified network(s), which are seamlessly integrated with all levels of the DND networks. The DF System data will be configured based on verified data models and international data standards. Application of these formal, international, industry and defence standards will enable the sharing of data between the FNTS, DND, other government departments, Allies and industry.

The DF System will be heavily dependent on the digital initiatives being undertaken, and systems developed and delivered, at all levels of DND and the Government of Canada (GC).

1.3.5 Training Facilities System: Increased space, CAF Campus, 70% Secure

The FNTS Training Facilities (TF) System will provide management and provision of the infrastructure spaces and building services that will house and support all aspects of FNTS operation.

Increasing student production will require commensurate increases in infrastructure space for students, administration, Training Technologies, training development, and training delivery.

The TF System will provide secure and non-secure, networked, flexible, scalable, multi-configurable and sustainable spaces on both coasts. Facilities will be consistent with the CAF Campus Operational Framework. They will consolidate the highly dispersed infrastructure currently in place and be incorporated as part of the broader infrastructure recapitalization projects being undertaken by ADM (IE) for CFB Halifax and CFB Esquimalt.

There will be an increase in the complexity and security classification for systems at sea, particularly for new classes of ships. The respective Training Management activity and Training Technologies will be similarly classified. All told, approximately 70% of the infrastructure required to house Training Technologies will need to be secure (rated Secret or above) in order to conduct the required classified training.

1.3.6 Sustainment System: Performance Based, Interim and Long Term

The FNTS Sustainment System will address immediate and near-term critical gaps for sustaining the existing Naval Training System (NTS), and then evolve and expand this to implement a long-term solution for the FNTS. This will be developed through the Sustainability Business Case Analysis (SBCA) process. Ultimately, the Sustainment System will provide the RCN with value for money, flexibility, and maintenance of performance for the FNTS.

2 CONOPS PURPOSE AND CONTENT

2.1 Purpose of the FNTS Concept of Operations (CONOPS)

The Future Naval Training System (FNTS) is being developed and delivered under the Naval Training System Transformation (NTST) Program. It will provide the training Capability across the complete spectrum of RCN Training, that is essential to achieving the RCN's required level of operational effectiveness.

The purpose of the FNTS CONOPS is to communicate the overall, systems of systems vision for the FNTS, and to articulate the high-level intent and guidance for use by the organizations and stakeholders that have a role in the FNTS development, delivery, and sustainment.

Primary stakeholders include all NPTG divisions, the NTST Program Office (PGO), materiel program and equipment life-cycle material management personnel (LCMMs), Project Managers (PMs) and operational end-users. They also include supporting Minor and Major Capital Projects such as STORM, RCN Infrastructure, CSC, JSS, etc. and the RCN Digital Office, that are supporting and/or providing elements to the FNTS.

Other key stakeholders include the Director General Naval Strategic Readiness (DGNSR), Director General Naval Force development (DGNFD), Director General Maritime Equipment Program Management (DGMEPM), and Major Program Delivery (Sea) (MPD(Sea)) organizations to ensure that the delivered FNTS aligns, and is coherent with, DGMEPM, DGNFD and MPD objectives.

Top level stakeholders include Assistant Deputy Minister Material (ADM(Mat)), Assistant Deputy Minister Infrastructure and Environment (ADM(IE)), Assistant Deputy Minister Information Management (ADM(IM)), Vice Chief of the Defence Staff (VCDS), and Chief of Military Personnel (CMP) to ensure that the FNTS is consistent with DND and Government of Canada doctrine and objectives.

The FNTS CONOPS provides the context and constraints, and the FNTS High Level Mandatory Requirements (HLMRs), which are the basis for defining the overall FNTS capability and capacity in terms of functions, products, infrastructure and services, through life.

It also provides the derived preliminary High Level Requirements (HLRs) for each of the six major FNTS Systems. The HLRs will be further refined for the FNTS Statement of Requirement (SOR) which will be developed as a separate document.

The FNTS Strategy document (Reference A), RCN Concept of Training (Reference B), RCN Digital Navy Strategy (Reference C), RCN Digital Navy Action Plan (Reference D), and the approved NTST Program Charter (Ref E) provide further context and should be read in conjunction with this CONOPS.

2.2 Content

The FNTS CONOPS starts with a top-level description of the FNTS, including the vision, goals, and considerations that provide the basis for the FNTS high level design concept. This includes those factors of technology, physical environment and location, human resources, safety, security, and privacy that exert influence on the operation or operational environment of the FNTS.

These factors are reflected in the FNTS High Level Mandatory Requirements (HLMRs). The FNTS HLMRs have been derived and evolved from the NTST Program HLMRs, that were presented and approved in the NTST Program Charter (Reference E).

This is followed by a brief introduction to the six major systems that comprise the FNTS. Though brief, this provides an initial perspective on the breadth and depth of the FNTS as a complex, System of Systems:

- Governance System;
- Training Management (TM) System;
- Training Technologies (TT) System;
- Digital Framework (DF) System;
- Training Facilities (TF) System; and
- Sustainment System.

The CONOPS then addresses each of the six major systems individually, in dedicated sections of the document. Each are described from the user's perspective, in a manner that can be understood by the user, without requiring technical knowledge beyond that required to perform normal job functions.

For each of these system sections, the situation in the existing Naval Training System (NTS) is described, including the existing NTS capability deficiencies. The future (FNTS) considerations are then discussed, followed by a listing of the preliminary System High Level Requirements (HLRs). These System HLRs are derived from, and expand on the FNTS HLMRs, to address the NTS deficiencies. System concept solutions that would meet the HLRs are then presented.

The CONOPS outline is as follows:

- Section 1 is the Executive Summary;
- Section 2 is the Introduction that explains the purpose and content of the CONOPS;
- Section 3 is a top-level description of the FNTS System of systems including the FNTS HLMRs;
- Sections 4 to 9 describe each of the six major systems in the FNTS. Each of these sections follow a general outline that includes an Introduction, the existing NTS situation and capability deficiencies, future (FNTS) considerations and System High Level Requirements (HLRs), and finally a brief description of the respective System's solution concept;
- Section 10 presents a number of Vignettes from the perspective of various FNTS users and stakeholders;
- Section 11 is the References Table that identifies all documents referred to in this CONOPS;
- Section 12 is the Acronym Table that spells out all acronyms used in this CONOPS; and
- Section 13 is the Definitions Table that provides descriptions for all capitalized terms used in this CONOPS.

3 THE FUTURE NAVAL TRAINING SYSTEM (FNTS)

This Section provides a high-level description of the FNTS. It starts with a brief introduction, then presents the FNTS goals, FNTS considerations, FNTS High Level Mandatory Requirements (HLMRs), and a top level FNTS Systems of Systems solution concept comprised of six major systems:

- Governance System;
- Training Management (TM) System;
- Training Technologies (TT) System;
- Digital Framework (DF) System;
- Training Facilities (TF) System; and
- Sustainment System.

3.1 Introduction

RCN Training is a critical and enabling Capability, integral to the RCN's Force Generation (FG) system, and synergistic with the greater Canadian Armed Forces (CAF) training system.

The FNTS Strategy (Reference A) and RCN Concept of Training (Reference B) highlight the operational deficiencies in the RCN's existing training Capability and describe a coordinated approach to solving these through the development and sustainment of a technologically enabled, and integrated FNTS.

As described at ref E, this approach is aligned and responsive to Canada's most recent Defence policy Strong, Secure, Engaged (Reference (F), the RCN Strategic Plan 2017-2022 (Reference G), CAF Individual Training and Education (IT&E) Manuals (CFITES) (Reference H), RCN Digital Navy Strategy (Reference C), and the CAF Campus Operational Framework (Reference I).

The NTST Program was approved and initiated per the NTST Program Charter (Reference E) to develop and deliver the FNTS. The NTST Program will leverage available resources in NPTG to manage the Program and collaborate and coordinate with other GC, CAF and RCN Minor and Capital Projects that are supporting and providing elements of the overall FNTS solution.

3.2 FNTS Goals

The FNTS goals are an extension of the NTST Program goals that are documented in the NTST Program Charter. These have been modified for application to the FNTS and are shown in Table 3-1:

Table 3-1: FNTS Goals

No.	Goals	
1	Interoperable	• The FNTS will provide information and services, accept information and services from other systems and effectively use the information and services so exchanged. • The TM System, TT System, and Sustainment System will use the DF System to access and seamlessly share/integrate information and data: internally within the FNTS, amongst materiel, financial, and logistics systems at the RCN and CAF level, amongst industry partners as required to support materiel, and externally with other key stakeholders.

No.	Goals	
2	Sustainable	• The FNTS will meet the needs of the present without compromising the needs of the future. • Integrated support principles within a system engineering framework will be applied to achieve the design of an optimized and coherent through-life support solution. • The FNTS is a Capability that will be enabled through full life-cycle management.
3	Agile	• The FNTS will be able to react and reconfigure swiftly. It will be capable of adapting efficiently and effectively to a multitude of changes in technology, security, demographics, structure, policies and government mandates. • FNTS changes will enhance, not compromise, the output – properly qualified sailors and support personnel.
4	Integrated	• The FNTS will work closely with, and respond to, activities, operations and organizations in which military and non-military elements combine to achieve a common goal through coordinated and complementary efforts. • The FNTS will employ a full spectrum of HR resources (Reg/Res Military personnel, DND civilian employees and contractors), financial resources (such as Operational & Maintenance, National Procurement, and Project funding) and training and management systems (such as Navy systems, CAF systems and Commercial-off-the-Shelf (COTS) systems).
5	Scalable	• The FNTS will be able to expand or contract, to meet increased or reduced demand; responding to training surges as effectively as training reductions.
6	Convergent	• The FNTS will utilize a common information management strategy for doctrine, content, training events and supporting material. • FNTS participants will be able to access training information anywhere, anytime and through a range of methodologies (operations and communications infrastructure permitting).
7	Professional	• The FNTS will represent the ideals, values and standards demanded of the Profession of Arms. This will be reflected in adherence to doctrine, regulations, orders, and include both the Regular and Reserve Force. The FNTS will also be developed and implemented through rigorous application of proven Program Management, Systems Engineering, Quality Management processes. The FNTS will be staffed by a professional cadre of training managers, developers and instructors.
8	Retention	• The FNTS will employ methodologies, processes, and procedures that are appealing and interesting to current and future trainees and thereby support Recruiting and Retention.

3.3 FNTS Considerations

The NTST Program is using the PRICIEG capability development schema. The following aspects are needed in the correct proportion to deliver an effective, operational FNTS capability:

- P – personnel, leadership, individual training;
- R – research and development, operational research;
- I – infrastructure and environment;
- C – concepts, doctrine, collective training;

- I – information management and information technology;
- E – equipment, support and sustainability; and
- G – Gender-Based Analysis Plus (GBA+).

3.3.1 Personnel and Leadership

Advancements in technology have had a significant effect on personnel and training (TM System). Increased automation of equipment and technologies such as weapon and propulsion systems have significantly changed the structure of occupations and crew complements in the RCN. New platforms will be equipped with smart technologies and data driven artificial intelligence applications. These will automate system functions and diagnostics, thus transforming the role of maintainers and operators.

Increasingly, Navy personnel will be freed from transactional activities and called upon to exercise advanced critical thinking and problem-solving skills. These higher order skills will drive training well beyond procedural and rote learning. They will require technologies and instructional strategies that develop and reinforce advanced cognitive skills.

3.3.2 Research and Development, Operational

The FNTS must leverage the capabilities and opportunities afforded by CAF, Allies, industry, and academia research and development into learning, human factors, and modeling and simulation. Training technologies and methodologies evolve at a rapid rate, and often require a significant upfront investment. Awareness and Subject Matter Expertise (SME) in the state of the art for training, will ensure that practical and optimum choices are made in acquisition and application.

The FNTS must include a concept development and experimentation capability to ensure that SME is also available to effectively exploit the enhanced capabilities and instructional strategies that new technologies (TT System) enable. This will ensure that the FNTS remains current with advances in training science, and aligned with modern approaches used in industry and civilian education institutions.

3.3.3 Infrastructure and Environment

The FNTS infrastructure (TF System) must include flexible and reconfigurable instructional spaces, as well as collaborative and independent learning environments. The infrastructure must enable increased classified training, support personnel health and well-being, adopt modern building standards, and ensure cost-effective facility sustainment.

3.3.4 Concepts, Doctrine, Collective Training

Ensuring a solid link between concept development and doctrine changes is essential to the smooth functioning of the FNTS. To enable continuity and relevance in training, there must be a shared data repository that links doctrine, logistics, engineering, and training, ensuring changes in one are automatically reflected in the others (DF System). The adoption of data models and international industry and defence standards will enable core information to be drawn directly from the authoritative data source(s), which means that sailors will get the learning they need, when they need it, to perform their jobs concurrent with naval systems' changes and upgrades.

3.3.5 Information Management and Information Technology

The success of FNTS lies in the successful exploitation of information management. Integrated, accessible networks and knowledge repositories are the cornerstone to achieving this (DF System). Information networks that enable the integration of compatible simulators within a common synthetic battlespace, are necessary to ensure compatibility with Allies and partners. Again, consistent data models and international industry and defence standards will be key.

3.3.6 Equipment, Support and Sustainability

The FNTS will include a large number (several hundred) of Training Technologies and require sustainment for all products and services (Sustainment System). The sustainment approach must ensure that the FNTS remains current and consistent with operational requirements.

While many sustainment aspects of the FNTS can be delivered through In-Service Support Contracts (ISSCs), it is not desired that all functions be delivered this way. Careful analysis must occur to define those areas that will remain under control of the RCN and those areas that can be best delivered by contractors. This analysis will be based on guidance and direction that defines where it is essential for the RCN to maintain ownership of training functions. To be beneficial, ISSCs should normally be long-term, performance-based, incentivized, and structured to ensure clear Contractor responsibility, motivation for improvement and accountability for results.

3.3.7 Gender Based Analysis Plus (GBA+)

Gender-based analysis plus (GBA+): is "a type of analysis that assesses how diverse groups of women, men and gender-diverse people may experience policies, programs and initiatives differently. The "plus" in GBA+ acknowledges that GBA goes beyond biological (sex) and socio-cultural (gender) differences, and looks at how sex and gender intersect with other identity factors, including race, religion, ethnicity, age, and mental or physical disability, among others

A core component of GBA+ is examining and challenging assumptions about an issue, population group, or system to ensure that inequality for a particular group of people is not inadvertently perpetuated"[1]

The FNTS will demonstrate leadership in reflecting diversity, respect, and inclusion in alignment with SSE Initiative 12 to integrate Gender-Based Analysis Plus (GBA+) in all defence activities across the CAF and DND. This reflects the broader commitment to diversity, including leveraging the talents and skill-sets of Canadians, regardless of their gender, race or other identity factor. Each system within the FNTS will utilize GBA+ to address the potential for unequal access and impact in the design and delivery of policies, programs and initiatives.

3.4 FNTS High Level Mandatory Requirements (HLMRs)

The FNTS HLMRs are listed below in Table 3-2. These have been derived, refined and expanded from the NTST Program HLMRs that are documented in the NTST Program Charter (Reference E).

Each FNTS HLMR has been allocated to one or more of the six main FNTS Systems. The preliminary High Level Requirements (HLRs) for each of the six FNTS major systems have been derived from the FNTS HLMRs and are listed in Sections 4-9.

[1] Treasury Board of Canada Secretariat Integrating Gender-Based Analysis Plus into Evaluation: A Primer (2019) Appendix B - Glossary of terms https://www.canada.ca/en/treasury-board-secretariat/services/audit-evaluation/evaluation-government-canada/gba-primer.html#App-B

Table 3-2: FNTS High Level Mandatory Requirements

Topic	FNTS HLMR	Context and Rationale	FNTS System Allocation
FNTS Governance	The ability to establish a top-level governance structure and apply robust governance processes for timely and clear decisions and direction.	A singular Training Commander, notionally called the Commander Naval System of Training (CNST) and holding the rank of Commodore, is needed to provide leadership, and command and control of RCN training Capability. This will ensure the required focus, visibility, and level of authority to effectively oversee the FNTS and coordinate and communicate with Executive stakeholders critical to FNTS effectiveness across the Training Continuum.	Governance System
Training as an RCN Capability	The ability to operate the FNTS as a fully-invested Capability within the RCN Enterprise.	The FNTS must be treated as a critical RCN Capability: Force Developed as such and fully supported through life similar to what is provided for in a ship class desk. Without a forward-leaning and sustained investment plan, the FNTS will not be effective and enable RCN operational excellence.	Governance System Sustainment System
System of Systems	The ability to function as a holistic System of Systems that designs, develops, delivers, verifies, and manages the FNTS across the entire Training Continuum.	The current Naval Training System has grown organically over several decades of successive and progressive upgrades to the Fleet. It is a collection of individual, often bespoke training solutions developed independently and in isolation. The FNTS must have greater organizational and systems coherence, effectiveness and flexibility, enabling synergies to be leveraged across the FNTS, and with other parts of DND, the Canadian government, academia, and industry.	Governance System TM System TT System
Influence	The ability to influence the development of training solutions (infrastructure, products and services), as part of the procurement process, to meet FNTS requirements.	The execution of the training FG model is complex, not only due to the nature of the training content and quantity control processes used to design and deliver training, but also because of the number of stakeholders involved. The FNTS must provide clear and effective training governance to ensure the smooth management of training at the seams of responsibility between stakeholders.	Governance System
FNTS Systems Engineering	The ability to apply robust Systems Engineering processes.	A SEBoK based Systems Engineering framework with a skilled SE team will reduce risk and enable effective requirements management, contractor oversight, configuration, test, verification and change management through life.	Governance System TM System TT System DF System Sustainment System
FNTS Quality Management	The ability to apply robust Quality Management processes so that all products, services and functions are effectively and efficiently developed, delivered, executed, managed and sustained.	A comprehensive and mature Quality Management process must be established to effectively verify, track, report day-to-day performance, and enable correction, lessons learned and a Continuous Improvement framework for all aspects of the FNTS.	Governance System TM System TT System DF System Sustainment System
FNTS Operations Management	The ability to develop and establish an optimized FNTS organization structure with robust operations management processes.	An FNTS organization with clear lines of responsibility and appropriate authority will enable efficiency and synergies across geographically separated Campuses.	Governance System TM System
Comprehensive training design,	The ability to develop all required training	The FNTS must be developed using the Core/Platform approach. All tasks, skills and knowledge common to	TM System

content and curriculum	across the Training Continuum (IT&E, CT levels 1-5),	everyone in the target group, at a particular qualification level, will be trained first, followed by Platform-specific (class of ship) skills and knowledge on an as-and-when required basis. The FNTS must provide individuals with the individual knowledge and skills such that they can be integrated into teams, which are then integrated into operational units.	
Distributed Training	The ability to deliver and practicably distribute training at the Time of Need and at the Point of Need.	The FNTS must deliver and distribute training at the point and time of need and in a member's geographic location to the greatest extent possible, using modern technology-enabled methods and media, to a Regular Force and Naval Reserve audience.	TM System DF System Sustainment System
Human Capital	The ability to leverage the best available human capital, whether military, civilian or contractor to develop, deliver and manage RCN training.	The FNTS will employ a blended mix of Military, DND Civilian, and Contract Personnel, and In-Service Support (ISS) solutions for training management, training development, training delivery, and associated systems and service sustainment. Fleet recapitalization will significantly increase the number of sea-going billets that need to be filled with RCN military personnel. This is an RCN priority to enable effective operations at sea. Some FNTS roles need to be filled by military personnel (see Professionalism), but contractors and/or DND employees will be used for FNTS staffing as much as possible.	Governance System TM System Sustainment System
Professionalism	The ability to foster the professional ideals, values and standards of the Royal Canadian Navy.	The RCN's training and educational institutions play a key role in transforming civilians into fighting sailors. This includes the inculcation of naval culture, ethos, code of conduct and physical fitness that are essential in producing a highly disciplined seagoing combatant force. The FNTS must maintain and reinforce these core qualities of the RCN institution. The FNTS must provide training that recognizes the importance of face-to-face mentoring and supervision by uniformed members to draw new Canadians into the naval culture.	TM System
Flexible	The ability to adapt training in a flexible and timely fashion.	The FNTS must have the flexibility to adapt to a multitude of changes in technology, security, demographics, structure, policies and government mandates, efficiently and effectively, without compromising output. Training changes could be driven by: • new and evolving Platforms and Systems; • changes to doctrine, technology, security, operations, organization, demographics, policies and government mandate; and • application of lessons learned from joint and RCN operations to adjust training and doctrine to remain strategically agile and adaptive.	TM System TT System Sustainment System
Scalable	The ability to scale training to respond effectively to fluctuations in training production requirements.	The FNTS must be able to respond to training surges effectively as training reductions.	TM System TT System
Concurrent NTS Operation	The ability to continue to operate the NTS at full capability, concurrently, while the Future Naval Training System (FNTS) is being developed and implemented.	The NTST Program must not interfere with the NTPG's current and ongoing activities. It must concurrently develop and deliver the FNTS, and then merge the NTS and FNTS to achieve steady state.	TM System TT System Sustainment System

Modern	The ability to exploit modern techniques, ideas, equipment and technology.	There is unprecedented potential with the advent of modern learning science and more economical learning technology enablers, including information management to provide much more effective training than the existing NTS. The FNTS must exploit this technological potential by balancing training needs with optimized through life costs. The FNTS must be able to assess, analyze, and where appropriate, incorporate new and evolving technologies into the FNTS. Modern, integrated, COTS-based, multi-purpose, digitally enabled Training Technologies will be developed and procured, largely through supporting Projects.	TM System TT System Sustainment System
Networks, Data and Information	The ability to exploit modern digital data systems at the enterprise level, that employs a common Digital Framework, comprising networks, a common data model, linked open data, exposed data, and information.	This will set the conditions for an integrated training system that enables responsive and operationally relevant instruction, technology enabled learning, integration with life-cycle management, integration with operations, and integration with Allies and partners. FNTS will be a modern, technology-enabled system. Key to this is establishing an industry standard data model, interfaces and standards, and using proven tools to securely manage, develop, access and distribute this data and associated training information. The FNTS will store, configuration manage, access, change and distribute all Training Governance, Training Management, Training Technologies, Training Facilities, and Sustainment data in/from a Single Trusted Data Source, using a common set of business, process, and information management tools. Note that the FNTS DF System will be a subset of and closely integrated with the larger RCN Digital Framework, including leveraging many common tools and networks.	DF System
Interoperable	The ability to interface, integrate and interoperate with: • Canadian Armed Forces; • Allies; • other government departments and agencies; • academia; • industry; and • other strategic partners.	The FNTS must seamlessly integrate with the various elements of the FG systems and exploit the broader CAF training, personnel, and materiel readiness systems as well as academia and industry capabilities. The FNTS must be able to share information, internally within the FNTS, and externally with all the key stakeholders.	DF System
Infrastructure	The ability to provide modern, scalable, flexible, reconfigurable, and networked FNTS infrastructure on both coasts, capable of housing and processing Unclassified, Protected and Classified (up to Level III Top Secret) material and systems and all operations of the FNTS.	Much of the existing NTS infrastructure and support systems were built during or shortly after World War II and are quickly reaching the end of their useful life. The design and construction parameters of this era prohibit or limit the full use of new instructional methodologies and technologies. The FNTS infrastructure must include significant capacity to house and train classified data, material and systems consistent with CSC and future naval systems. The FNTS infrastructure must support the expectations of learners and future training technologies. The FNTS infrastructure must enable greater flexibility in the delivery of modern training methodologies that use agile configurability to reduce footprints and promote efficiency. It must support the FNTS mandate to Force Develop and Force Generate personnel for the RCN in support to CAF tasking's and missions.	TF System
Life-Cycle Sustainment	The ability to provide full lifecycle sustainment for all	Proven SBCA process will be applied to develop the FNTS sustainment solution	Sustainment System

infrastructure,
products and services
of the FNTS

3.5 FNTS Top Level System of Systems Solution Concept

The FNTS will be a holistic, integrated, System of Systems that provides the full breadth of training to address the RCN's Force Development (FD), Force Generation (FG) and Force Employment (FE) requirements. It will be based on sustainable, capable, and flexible system design principles, rooted in the RCN's naval ethos and leadership philosophy, and enabled by technology. It will cover the full Training Continuum; Individual Training and Education (IT&E) and Collective training (CT) levels 1-5.[2]

The FNTS will correct the deficiencies in the existing Naval Training System (NTS), and provide enhanced training technologies and methodologies to address the training requirements for RCN operations and maintenance for the next 30+ years. The FNTS will provide the Capability to enable RCN operational excellence.

The FNTS will be the embodiment of the RCN training Capability that trains individuals, teams and units to produce maritime effect. The FNTS will be developed and managed in the same manner as any other Capability in the RCN in accordance with Force Development processes.

The FNTS will encompass all governance, personnel, products, services, facilities and sustainment associated with training across the entire RCN Enterprise. This includes training for the current, evolving, and future fleets as well as supporting services.

The FNTS will include a broad range of changes to the existing NTS:

- Updated governance, internal organization and training management processes;
- New Training Technologies and training methodologies;
- Modern information management, digital models, and network frameworks;
- Highly functional and flexible facilities;
- Interim and Long-term sustainment; and
- Increased collaboration with academia, commercial training organizations and other Canadian government training organizations.

The FNTS will be modern, adaptive, scalable and flexible and will provide individuals with the knowledge and skills to deliver optimum operational effectiveness in a complex and uncertain global threat environment, concomitant with rapidly evolving defence system technologies and operating environments. Cost effectiveness, metrics-based performance management, and continuous improvement will be important components, as will support to Naval Material Assurance (NMA) across the RCN.

The FNTS System of Systems solution concept will comprise six major systems:

- Governance System;
- Training Management (TM) System;
- Training Technologies (TT) System;

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[2] Refresher training, specialty training, conversion training, and initial cadre training are components of Military Training and the aforementioned IT&E and CT, CFITES vol 1(1) A-P9-050-000/PT-Z01

- Digital Framework (DF) System;
- Training Facilities (TF) System; and
- Sustainment System.

These as shown conceptually in Figure 3-1 below. The Governance System provides overarching Command and Control of the complete FNTS. The Training Management System, Training Facilities System and Training Technologies System are closely inter-connected, providing the core training development and delivery functions. The Digital Framework System is a key enabler providing digital interconnectivity, data, networks and associated systems integration across the complete FNTS. The Sustainment System provides full life-cycle support for all products and services in the FNTS.

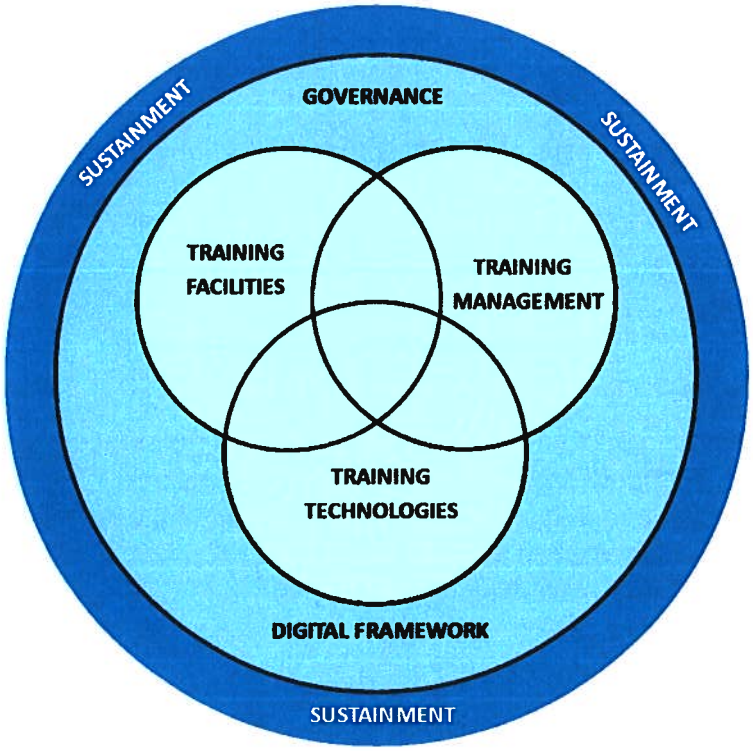

Figure 3-1: FNTS System of Systems

A brief description of the six major FNTS Systems is provided here, with more detail provided in Sections 4 through 9 that follow:

a. Governance System. The Governance system is the means by which authority is exercised and direction provided to undertake, coordinate and regulate the activities of the rest of the FNTS in order to achieve its desired outcomes. It includes how management expectations and accountabilities are defined, how authorities and responsibilities are granted and how the hierarchy and leadership of the FNTS are organized and identified. It also includes the top level application of disciplined Program Management, Systems Engineering and Quality Management processes.

b. Training Management (TM) System. This comprises the personnel, processes, tools, and resources needed to design, develop, implement, evaluate, and conduct adaptive and performance-based training. It also includes the establishment and maintenance

of a highly qualified professional training cadre. All of these elements are tracked, analyzed and managed to enhance the learner experience and support training decisions.

c. Training Technologies (TT) System. This includes all hardware, software, and digital content needed to develop, conduct, support or verify the complete spectrum (Training Continuum) of RCN Training. This includes overarching management, integration, and acceptance of the Training Technologies needed to conduct, verify or support the training. TT encompass a wide array of devices, systems, methods, and media. TT can be as simple as using a mock-up of a piece of equipment to explain operating principles, or as detailed as a constructive simulation that replicates a complex joint or combined engagement[3];

d. Digital Framework (DF) System. This includes all the data and data models, networks, integrated software applications, digital technologies and tools, interoperability standards, and common Graphical User Interfaces (GUIs). The DF leverages data models and international industry and defence standards to enable a Single Trusted Data Source. It provides secure integration, sharing, analytic reporting and exchange, through the entire life cycle from analysis, design, development, management, procurement, delivery, and sustainment of products and services. The DF also includes all the networks, connectivity, servers, backup power and storage, distribution, etc. required to deliver the full digital capability, and overall FNTS functionality to and within the Training Facilities, remotely to ships, while alongside, and to places of residence.

e. Training Facilities (TF) System. This includes all the facilities and building services in which the FNTS will operate. Most of these will be DND facilities built in compliance with the CAF Campus Operational Framework. However, some facilities may be provided by industry or in collaboration with other government departments, or civilian colleges and universities.

f. Sustainment System. This includes the In-Service Support (ISS) functions required to maintain, and configuration and material manage all products and services in the FNTS throughout its lifecycle.

[3] Examples of TT include mock-ups, part-task trainers, simulators at all levels of complexity, real equipment, cutaways, courseware, digital content, and any others that contribute to the mastery of training requirements.

4 FNTS GOVERNANCE SYSTEM

4.1 Introduction

The Governance System provides the "...authority to provide direction and to undertake, coordinate, and regulate activities in support of achieving this direction and the desired outcomes."[4] Governance also explains how authority and responsibility are granted, emphasizes management expectations, and defines accountabilities.[5]

This Section of the CONOPS presents the existing situation with respect to Governance in the NTS, lists the associated capability deficiencies, covers other considerations, and then presents the preliminary FNTS Governance System HLRs. It concludes with a description of a FNTS Governance System concept.

4.2 NTS Existing Governance

Governance of the existing NTS is spread across three different L2's with actual responsibility for training functions exercised by designated commanders at the L3 level:

- Commander Naval Personnel and Training Group (CNPTG) reports to Commander Maritime Forces Pacific (Comd MARPAC) who is also referred to as the Assistant Chief of Naval Staff Personnel and Training (A/CNS P&T);
- Commander Sea Training Group (CSTG) reports to Commander Maritime Forces Atlantic (Comd MARLANT) who is also referred to as the A/CNS Afloat Training and Readiness (A/CNS AT&R); and
- Many personnel related authorities are assigned to Director Naval Personnel and Training (D Nav P&T).

The boundaries of L2 and L3 roles and responsibilities in some cases are grey. For example, some resources assigned to CNPTG are actually employed by CSTG in order for the NTS to work efficiently. Of particular note: there is no single entity in the RCN that has a complete view of, or responsibility for, RCN training below the CRCN.

The execution of the training FG model is complex due to the variety and nature of the processes used to manage, design and deliver training, and because of the number of stakeholders involved. D Nav P&T is responsible for identification of strategic occupational specifications and identifying strategic occupation production requirements. CNPTG is responsible for the development and delivery of IT&E and the operational management of RCN personnel. CSTG assures Collective Training (CT) requirements are met.

Almost all of the RCN's training requirements are managed, analyzed, identified, designed, developed, and delivered with these three stakeholders' involvement. However, control and management of training at the seams of responsibility between these three offices is not

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[4] Auditor General of Canada, 2009 Spring Report of the Auditor General of Canada, Chapter 5 – Financial Management and Control, National Defence (Ottawa: 2009), paras 5.59 and 5.60.

[5] Auditor General of Canada, 2009 Spring Report of the Auditor General of Canada, Chapter 5 – Financial Management and Control, National Defence (Ottawa: 2009), paras 5.59 and 5.60. in Daniel Gosselin, MGen (ret'd), Report on Governance Structure and Thoughts, Naval Training System Transformation (NTST) Program, 15 January 2020.

sufficiently clear. This has resulted in gaps, overlaps and inefficiencies in the execution of training in the NTS.

RCN training is partially governed by NAVORD 4500, which outlines the Authorities, Responsibilities, and Accountabilities (ARA)(s) for training and professional development, but there is a host of other orders which form part of NTS Governance.

IT&E and CT are managed by two separate authorities, but share aspects of training including production, development, and delivery as well as infrastructure (facilities) and Training Technologies. IT&E is governed by CAF and RCN policy, whereas CT is largely governed by RCN policy. The multiple lines of authority across the complete spectrum of RCN Training reduces clarity of ARAs, leading to confusion and inefficiencies.

Further, various NAVORDs subordinate to 4500 describe specific processes and procedures pertaining to training. RCN personnel policy is found in the 5000 series of NAVORDs and broadly describes the occupational, personnel establishment, and processes used to supply trainees to the NTS and to employ them. There are numerous inconsistencies in these documents that introduce conflicting direction. Further, many other supporting documents such as NPTORDS are still in early draft stage or missing. Hence, the state of governance documentation and direction across the NTS, is at best inconsistent and at worst absent.

4.2.1 Individual Training and Education (IT&E)

IT&E for the RCN is governed through a formal arrangement whereby CMP acts as the Functional Authority (FA) for IT&E in the CAF, setting broad, binding and non-binding IT&E policy, such as that which dictates the use of a System Approach to Training (SAT), as well as monitoring compliance.[6]

The authority to train members beyond basic training, and the burden to manage resources, production, and quality, falls upon environmental commanders, who in the case of CRCN, is deemed a Training Authority (TA). In the NTS, this means authority for IT&E is vested in CRCN and then delegated, through Comd MARPAC (A/CNS P&T), to CNPTG. However, the authority to manage occupations, and therefore the high-level requirements for training that emerge from occupational needs, rests with D Nav P&T, who reports to CRCN.

CMP's authority is limited largely to policy and instructions, many of which are non-binding. The exception is that CMP is the authority for setting curriculum standards for CAF leadership courses that the RCN is responsible and accountable for to deliver.

Naval professional development and leadership training pertaining to Command, Charge, and Control for naval operations falls under CRCN. In other words, CRCN retains the burden of managing training resources, production, and quality for the NTS, regardless of who sets the policy or who creates the curriculum.

In many cases, CAF joint training, and training common to other operational areas such as communications, joint targeting, etc., is shared among the environmental commanders and subject matter experts under other agreements.

Initial Cadre Training (ICT) for new vessel and equipment acquisitions is the responsibility of individual Project Management Offices (PMOs), who report to ADM (Mat). ICT generally trains only the first few crews, or personnel needed to initially maintain and operate equipment, and

[6] DAOD 5031-2

does not normally satisfy the more stringent IT&E and CT requirements for Steady State Training (SST) that is required for through-life operation and maintenance.

4.2.2 Collective Training (CT)

Naval CT policy is under the authority of CRCN in support of the Canadian Joint Operations Command (CJOC). CRCN delegates the authority to conduct, and manage resources, production, and set standards for CT to Comd MARLANT (A/CNS AT&R). Comd MARLANT (A/CNS AT&R) then assigns setting requirements for readiness to Naval Force Readiness (NFR), and delivery of CT to CSTG.

CSTG and NPTG, reporting to two different coastal commanders, share responsibility for managing resources and subdivide some responsibilities. For instance, Training Facilities and Training Technologies fall under NPTG, so that economy, efficiency, and simplicity can be optimized. In the past, these components were treated separately, which led to inefficiencies and duplication. Although there have been some improvements, residual inefficiencies persist. Also, in contrast to the wider CAF where Refresher Training (RT) is part of IT&E, RCN RT is part of CT, since it pertains more directly to collective readiness.

CRCN executes authority over IT&E and CT via various working groups and steering groups. However, decision making is split and often oriented to meeting the *bona fide* goals of the subordinate group, vice the best interests of the NTS. Without a clear training champion in these groups, when difficult decisions must be made regarding naval resources allocations, training demands are unlikely to be appropriately considered in the debate. Perceived tactical operational demands can easily outbid more strategic long-term training ones, when no one speaks for them.

While decisions are made by A/CNS P&T and A/CSN AT&R within their areas of authority, the bulk of major issue resolution and complex decisions or recommendations are managed through a series of sub working groups, working groups, and steering committees, leading to Naval Strategic Management Board (NSMB), and above that, Naval Board (NB) and Admiral's Council. These are depicted in Figure 4-1

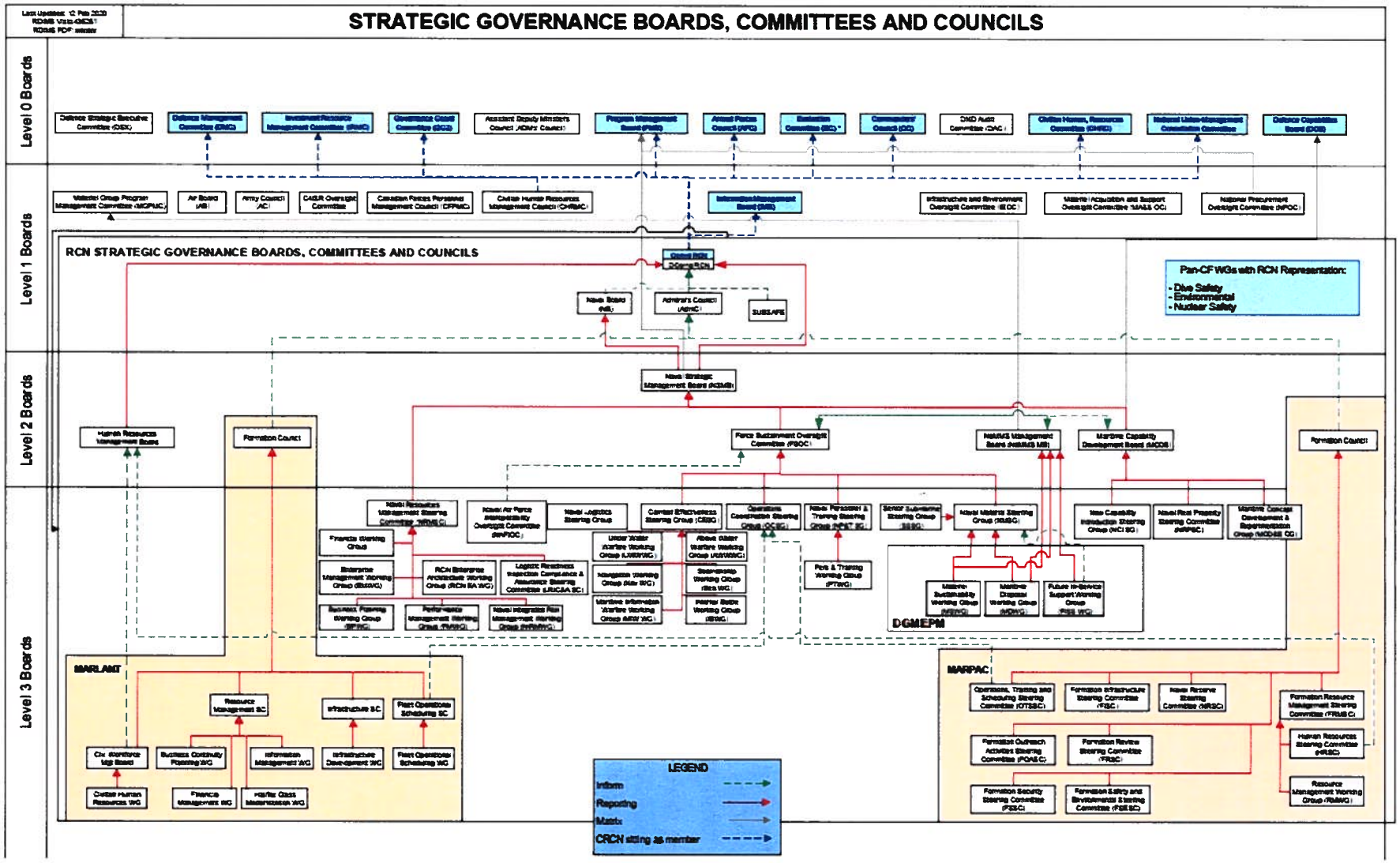

Figure 4-1: Strategic Governance Boards, Committees and Councils

4.3 NTS Governance Capability Deficiencies

The NTS is evolving through grassroots efforts faster than Governance policies and plans can be updated. For example, the application of advanced training concepts such as Distributed Mission Training (DMT), has seen increasing levels of coordination and crossover between IT&E and CT that current directives do not support and/or recognize.

The manner in which NPTG and STG work together, and with other internal and external stakeholders to form a viable NTS, is not reflected in the governance structure. NPTG has been increasing its involvement in acquisition Projects to ensure that steady state training requirements are addressed in procurement plans. This has led to Integrated Project Teams (IPTs) being established between NPTG and organizations within ADM (Mat) and ADM(IE). At present these arrangements are not part of any existing governance processes.

Generally speaking, ARAs are confused, unclear and/or absent at many levels and for many positions. Often the responsibilities and professed authorities of key officers or officials have evolved incrementally over time and have become associated with personal vice positional Terms of Reference (TOR). This combined with a lack of committees, or a lack of understanding of the role of committees, has compounded confusion.

Several key governance instruments, such as those policies which define the ARAs governing Naval IT&E and CT are outdated, lack clarity, and/or conflict with one another. Individuals in positions of authority have created their own ad hoc ARAs, and are able to support their positions by referring to the policies and directives that suit their objectives and preferences. This has resulted in governance friction.[7]

The following Governance system capability deficiencies have been identified in the existing NTS which have precluded effective operation, and/or have resulted in confusion and ineffective command and control:

a. The NTS has not been regarded as an RCN Capability. This applies to all parts of the NTS and precludes a holistic approach and effective overall governance, coordination, and sustainment of this critical Force Development element.
b. Significant underfunding. The NTS is routinely funded to one third of its requirement. The funding baseline was established before the *Halifax* class was modernized. The current budget does not address current needs, let alone the needs of the impending, technology-enabled "Digital Navy" and FNTS. This historic and continuing lack of funding has precluded renewal of infrastructure, tools and systems resulting in significant cost and performance inefficiencies. Performance oriented training that produces job-ready operational and support personnel is a critical RCN Capability that requires sustained financial commitment.
c. Insufficient staffing to existing establishment. The NTS establishment is unfilled, with only one third of the total required (over 400 personnel short). This gap is partially filled annually by hundreds of temporary CFTPO support taskings, however this precludes establishing a stable, profession cadre of instructors and support staff, which results in diminished training production.
d. The NTS was not conceived or established as a System of Systems. It is highly fractured, and isolated from Force Development (FD), with conflicting and/or overlapping training

[7] Daniel Gosselin, MGen (ret'd), Report on Governance Structure and Thoughts, Naval Training System Transformation (NTST) Program, 15 January 2020.

and management responsibilities across the Training Continuum. This includes a lack of overarching Systems Engineering process.

e. The NTS does not fully leverage synergies and lessons from DND, industry and international military training organizations. This is particularly evident in areas of integrated information management and modern Training Technologies and methodologies.
f. The NTS' workforce, expertise, and capacity are insufficient to effectively deliver the required training functions. This includes command, development, delivery, sustainment, and Quality Management. For example, critical functions such as evaluation, validation, correction, and continuous improvement are missing or only conducted ad hoc.
g. Lack of awareness. The existing NTS has a linear, residential approach to training, where limitations on the availability of equipment, remote location of training, limited access to instructors or mentors, and restrictions on travel create a great deal of inefficiency in the method and sequence of training for students. Often, those conducting training are aware of how inefficient this is yet due to pace and workload are unable to change. Some training personnel are comfortable with the out-dated methodologies in the existing NTS, and without firm direction to the contrary, have actively or passively resisted the needed changes.
h. Performance management of the NTS is fractured or non-existent. There is an inability to report in a timely, accurate, metrics-based manner across the enterprise.
i. Lack of Quality Management. The NTS is unable to assure, via a systematic institutional approach, that the overall quality of training is adequate and sustainable. A disciplined QM process, supported by a Quality Management System (QMS), including established quality standards, procedures and responsibilities, is needed to assure the quality of the training product, enable continuous improvement, and provide the Admiralty with confidence of a fully prepared RCN.
j. The Naval Reserve is not well integrated into the NTS. Naval Reserve occupational progression, employment and the resultant qualitative and quantitative training requirements that stem from these, are unclear and not aligned to Regular Force programs that utilize the bulk of NTS resources.
k. Inadequate clarity and maturity of NTS ARAs. While NAVORD 4500 lays out the ARAs at a very high level for IT&E and CT, much of the framework for executing those ARAs and subordinated ARAs is not articulated.
l. Formal NTS governance between key training stakeholders is missing. This includes confused and overlapping ARAs amongst different parts of the Naval Staff, and the organizations which form the NTS.
m. Lack of formal DGMEPM-NTS governance body. The result is a significant disconnect between integrated product support/product life-cycle management for Training Technologies (TT) and the training required to operate and sustain the legacy TT and future TT.
n. Lack of formal DGNFD-NTS governance body. RCN training has not been considered or handled as an RCN Capability, and therefore has not been subject to, or enjoyed formal Force Development (FD) process. This is in part a consequence of lack of unity of command of the NTS. Improvements in RCN training capabilities, supporting materials, sustainability, and doctrine, are done almost entirely independently within NPTG. Continuous improvement is informal and collateral to other Force Development (FD)

activities, rather than aligned with them. In sum, the RCN training is a Capability this is not being effectively Force Developed.

o. Lack of formal ADM Mat DGMPD and DGMEPM-NTS governance body. Training for Major Capital Projects is rarely considered in light of the needs of the RCN training capability, and therefore training emerging in the form of Initial Cadre Training (ICT) is often out of step technologically and methodologically. This is a consequence of a lack of appreciation of the complexities of NTS technology, instructional methods, and sustainment challenges. Often, training solutions in projects are afforded slim fractions of available funding resulting in the NTS having to invest annual budgets into training that should be provided by projects. NTS requirements are not being effectively integrated into project requirements.

p. Lack of formal governance body between the NPTG and other CAF level stakeholders that exert influence over NTS activities. Examples include ADM IE through NIR, or ADM IM. The result is an environment of uncertainty and reactiveness to decisions related to infrastructure and IM/IT rather than a collaborative command-intent driven decision cycle.

q. Lack of formal training committee policy/TORs/ARAs. The structure of training committees (working groups, steering committees, etc.) is clear only at the highest level leading to NB and Admiral's Council. Sub committees remain the responsibility of delegated authorities, which are pressed to allocate time and resources to ensure broad transparency with other sub working groups. In terms of CAG IT&E governance, the structure of committees at the CAF level and leading to the CAF functional authority is clear (i.e. this is prescribed by DAOD 5031-2). However, since the burden of responsibility and accountability for IT&E is at the Training Authority (TA) level, these committees have very limited relevance except for policy creation. Committees leading to higher level steering committees do not have clear mandates. Often, committee time is spent reporting information, with little discussion on risk, consequences or action follow-up.

r. Lack of command accountability and coordination inside the NTS. Due to a lack of appreciation of the NTS as a System of Systems, and a paucity of sound RCN-specific training doctrine and policy, there are allowances for NTS commanders to operate counter to the requirements of a complex System of Systems. Mission Command has been applied broadly, but often contrary to efficiencies and effectiveness that would be attained through a more coordinated and systematic approach. Decision making in what is a dispersed distributed system is not codified in policy; it is largely ad hoc. This results in decisions and direction being implemented inconsistently, or not at all.

s. Lack of control and direction for use of training tools. The Functional Authority (FA) role pertaining to the management of some IT&E tools (such as distributed digital learning systems like DLN 3.0) and TT is clear. However, as the conduct of the bulk of IT&E and all CT in the RCN is largely independent of FA influence, the mandate to use, and how to use tools and TT is not uniform nor prescriptive. This has resulted in cased where tools and TT have been procured, but never used.

t. Lack of full spectrum business planning. Business planning is primarily financial planning, and not performed in a manner that is oriented to mature and clear overall business or organizational goals. As a result, Business Planning is performed based on resources available or allocated, rather than on prioritized Command objectives and outcomes.

u. Financial management is both dispersed and centralized. As a result of organizational change in the NTS from 2015 to 2017, some financial accountabilities were centralized under CNPTG and CSTG. However, in some cases, management of such things as

contracts for Training Technologies remained distributed as a result of legacy/historical precedence rather than by design. This results in uncertain accountabilities and management practices.

v. NPTG internal directives and policies are not managed effectively. These are uncoordinated, take too much time to put in place, are often overtaken by changes in other policies before they can be enacted, or have been disregarded in favour of historical practice.

w. IM/IT policy is largely centrally controlled but not consistently applied. Due to the dispersed geographical footprint of NPTG, IM/IT in delivery and development centres is interpreted and applied differently from base to base. IM/IT policy is not applied according to a single CNPTG intent.

x. Channels of communication are unclear. Communication amongst the different NPTG units and the personnel in those units is hampered by unclear reporting pathways, which often follow indistinct lines and are often different between the coastal campuses. There is little governance direction regarding reporting responsibilities which confuses accountability.

y. Decision making effectiveness is difficult if not impossible to assess. The existing NTS governance practices do not enable transparency, speed, timeliness, or a feedback loop associated with implementation of decisions. In other words, important decisions are often made and passed on, but there is no way to know how, how well, or if they were implemented.

4.4 FNTS Governance System Considerations

a. Governance of NTS is currently split between three organizations. Decisions spanning the RCN training spectrum require two separate coastal organizations. Is the FNTS better served under a single Flag ranking commander able to agitate among like-ranking DGs and Fleet Commanders?

b. Before reaching higher level decision makers, there are several consultative and authoritative committees that get involved, with varying degrees of influence. Timely decision making is not happening. What are their TORs? Is this going to work as services become much more contractor supplied? Are the current committees necessary, or is there a more effective alternative approach?

c. What organizations and committees will have what authority? Is there a more streamlined approach that would provide better clarity, control and direction?

d. How will business planning, financial control, resources, Systems Engineering, Quality Management and Continuous Improvement be managed coherently and holistically across the entire FNTS?

e. How will accurate and timely metrics of cost, resource allocation, and performance be assigned, tracked, managed and reported across the entire FNTS, as part of the broader RCN analytics approach?

f. What will be the channels of communication between the different parts of the FNTS and outside the FNTS? How will information, data and decisions flow through the FNTS? How will this be documented, tracked and evaluated?

4.5 FNTS Governance System Preliminary High Level Requirements

The Governance System preliminary High Level Requirements (HLRs) are as follows:

a. The Governance System must be treated as a Capability; force developed as a Capability with specific lifecycle managed components from initial procurement, through operations, through disposal, as if it were a class of ship;
b. The Governance System must maintain a holistic, System of Systems vision and approach;
c. The Governance System must ensure that FNTS baseline funding addresses the needs of a modern, technology-enabled RCN and FNTS. A sustained financial commitment will ensure that performance-oriented training that produces job-ready officers, sailors, and support personnel for RCN operations is maintained as an RCN Capability. This sustained financial commitment will be applied optimally across FNTS activities including those require for Force Development, Training Delivery, Training Development, and Resource Management including for ISS solutions and life-cycling;
d. The Governance System must be considered as an investment and be managed through the RCN FD mechanisms;
e. The Governance System must have a singular, unified, top-down governance and management organization that provides clear lines of command, control and coordination across the Training Continuum, for all functional areas of the FNTS;
f. The Governance System must ensure the smooth management of training at the seams of responsibility between stakeholder organizations;
g. The Governance System must have high organizational and systems coherence, effectiveness, and flexibility;
h. The Governance System must clearly define the FNTS organization, and provide direction of levels at which decisions can be made;
i. The Governance System must provide organizational continuity and consistency, regardless of changes in personnel;
j. The Governance System must ensure congruence of vision and alignment of goals in the FNTS, of values that underpin decision making for IT&E and CT;
k. The Governance System must provide coherence and consistency of policies and management;
l. The Governance System must apply formal operations management and systems engineering processes to achieve and maintain optimized, and coherent through-life performance of the FNTS;
m. The Governance System must apply a holistic PRICIEG approach and analysis to ensure a comprehensive solution, while minimizing total cost of ownership;
n. The Governance System must address integration of the Reserves under the "One Navy" approach;
o. The Governance System must work closely with CAF and non-military elements combine to achieve a common training goal through coordinated and complementary efforts;
p. The Governance System must apply robust Quality Management, utilizing effective metrics to track all important elements, providing triggers for corrective action where necessary and supporting continuous improvement;

q. The Governance System must provide formal and effective coordination mechanisms between the FNTS and the FA, recognizing that the burden of training in resources, responsibility and accountability is at the level of the TA;
r. The Governance System must have formal and effective coordination mechanisms, particularly between the FNTS and ADM (Mat) and subordinate organizations, as well as other key ADMs, recognizing the critical role of the FNTS as the primary source of requirements for training products and services. TT must be lifecycle managed with the same systems engineering and material management processes that are applied to ship systems[8];
s. The Governance System must have formal and effective coordination mechanisms between the RCN, Canadian Army (CA), Royal Canadian Air Force (RCAF), Canadian Special Operations Forces (CANSOFCOM), CMP, and delegated TAs, to support integration of training and ensure that IT& E and CT delivers operational effectiveness within domains and across the joint environment; and
t. The Governance System must ensure successful collaboration in Training Technologies (TT) areas of support, maintenance, information warfare, etc.;
u. The Governance System must have formal and effective coordination mechanisms, particularly between FNTS and the allied navies, to support advanced joint, combined, and coalition operations;
v. The Governance System must have formal and effective coordination mechanisms, particularly between the FNTS and other government departments at the federal and provincial levels, to exploit synergies and efficiencies and optimize effectiveness;
w. The Governance System must have formal and effective coordination mechanisms, particularly between FNTS and providers of similar training in the tertiary/post-secondary systems, considerate of economies and efficiencies to be gained by providing training of a similar nature;
x. The Governance System must have clear, well designed, ARAs;
y. The Governance System must have a clear strategically driven policy framework;
z. The Governance System must have clear processes, prescribed in policy, of coordination and decision making internal to the FNTS;
aa. The Governance System must prescribe formal business planning processes to which those in command are accountable;
bb. The Governance System must prescribe formal Training Development, Training Delivery, Resource Management processes to which those in command are accountable;
cc. The Governance System must possess control and oversight mechanisms, particularly if public-private partnerships and outsourcing (contracted) solutions with industry are used in Training Development, Training Delivery, and Resource Management;
dd. The Governance System must have a Quality Management process and mechanisms to enable verification, oversight, and Continuous Improvement;
ee. The Governance System must have formal established internal and external communications channels;

[8] Ideally this is a function that would be provided by DGMEPM under ADM (Mat), but with close FNTS coordination.

ff. The Governance System must prescribe formal FNTS-specific IM/IT processes, practices, and procedures, that comply with CAF/DND or higher policy but that are tailored specifically to the FNTS; and

gg. The Governance System must ensure that data and information exploited by and created in the FNTS can be easily integrated and follows a data-model driven standard.

4.6 FNTS Governance System Solution Concept

Operational readiness will be the primary goal of the FNTS. Individual readiness is assured through quality training at the right time and place, and collective readiness is assured through quality and timely training in teams, ship's companies, and larger formations. These, combined with technical readiness, will deliver operational readiness for effective naval operations at sea. Readiness is unachievable without a well governed FNTS.

As stated above, governance is the exercise of the "...authority to provide direction and to undertake, coordinate, and regulate activities in support of achieving this direction and the desired outcomes."[9] Governance also explains how authority and responsibility are granted, emphasize management expectations, and define accountabilities.[10]

A single Training Commander, called the Commander Naval System of Training (CNST), could be established at the rank of Commodore, providing leadership, command and consistent decision making, for an integrated FNTS, covering the full breadth of IT&E and CT. In this concept, CNPTG and CSTG both report to the CNST. This is shown in Figure 4-2.

A variation on this concept, one that aligns better with CAF Command, Formation Level 1 and Formation Level 2 structures, would have CNST report to CRCN directly. This uniquely modernized RCN command structure would blend current organizational structures with optimized training related functions. The rank of Commodore ensures that the FNTS is provided the appropriate level of command and influence required to influence leadership and hold power at key stakeholder committees and in governance bodies.

Given that RCN training is a Capability to be force developed, it must be provided with appropriate authority and structure. Figure 4-2 also shows, by indicated Formation levels, the relationship resulting with other stakeholders. The establishment of a fully functioning CNST would include the reassignment of the small portion of training responsibilities resident in D Nav P&T, resulting in the re-establishment of D Nav Pers.

This FNTS Governance System would provide clear, defined, singular, unified command, enabled to provide the authoritative direction required to achieve the outcomes mandated by the RCN. This means a governance framework that will support sustained, timely, and effective execution.

The Governance System would include formal and effective coordination with internal RCN stakeholders, and external stakeholders, such that RCN readiness is achieved in an optimally

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[9] Auditor General of Canada, 2009 Spring Report of the Auditor General of Canada, Chapter 5 – Financial Management and Control, National Defence (Ottawa: 2009), paras 5.59 and 5.60.

[10] Auditor General of Canada, 2009 Spring Report of the Auditor General of Canada, Chapter 5 – Financial Management and Control, National Defence (Ottawa: 2009), paras 5.59 and 5.60. in Daniel Gosselin, MGen (ret'd), Report on Governance Structure and Thoughts, Naval Training System Transformation (NTST) Program, 15 January 2020.

efficient manner. Personnel would be supplied and trained according to occupational needs and operational needs.

Materiel and services would be provided, supported, and maintained efficiently in support of IT&E and CT. Combat tasks must be trained to individuals in the same way they are expected to execute them. There will be integration of intent and execution, providing synergy of individual and collective training.

The TM System and TT System, would be developed, procured, and implemented exploiting modern force development and procurement techniques, processes and tools in the same manner as all other RCN materiel.

The TM System and TT System would be sustained through life by exploiting modern product life-cycle management techniques, processes and tools in the same manner as all other RCN services and materiel.

Committees would be coordinated and simplified by ensuring one training authority is held to account for decision and action, consistent with CNST direction.

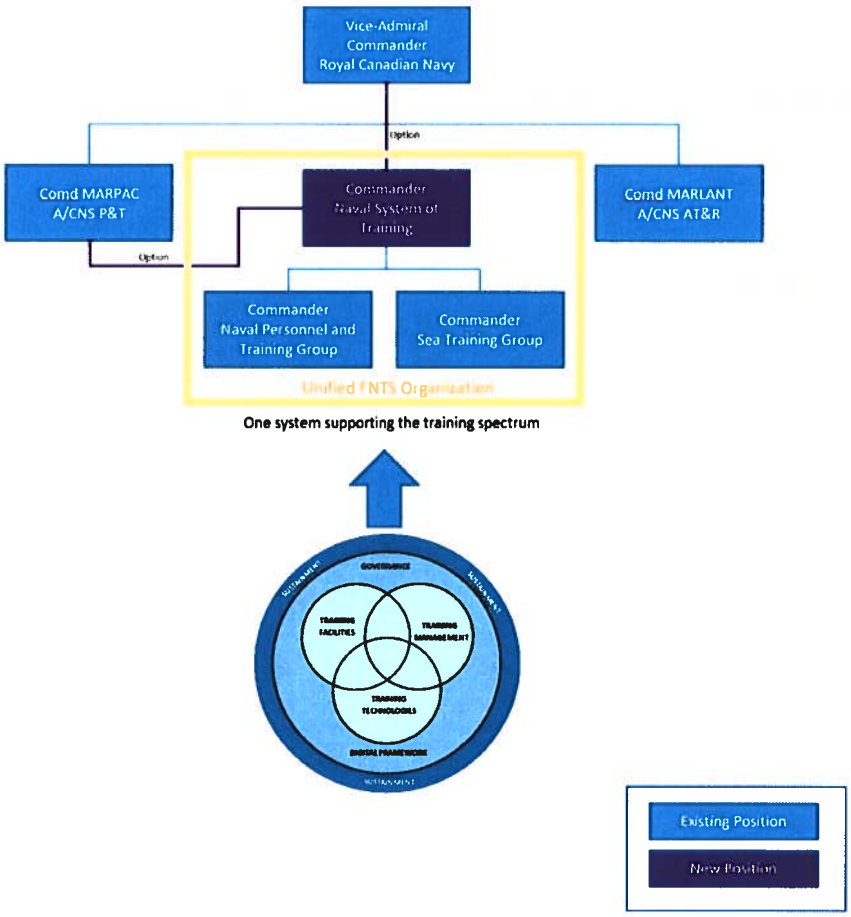


Figure 4-2: FNTS Organization within the RCN Structure

5 FNTS TRAINING MANAGEMENT (TM) SYSTEM

5.1 Introduction

The purpose of the Training Management (TM) System is to produce the right number of officers, sailors, and support personnel with the right qualifications at the right time; efficiently and at an acceptable cost. TM System optimization is dependent on operational requirements, material, services, facilities, and broader CAF management and support systems.

This Section of the CONOPS presents the existing situation with respect to TM in the NTS. It lists the associated capability deficiencies, and preliminary FNTS TM System HLRs. It concludes with a description of a FNTS TM System concept.

5.2 NTS Existing TM

The existing TM System comprises four primary functions:

- Operations Management;
- Training Development;
- Training Delivery; and
- Resource Management.

This is shown in Figure 5-1 below.

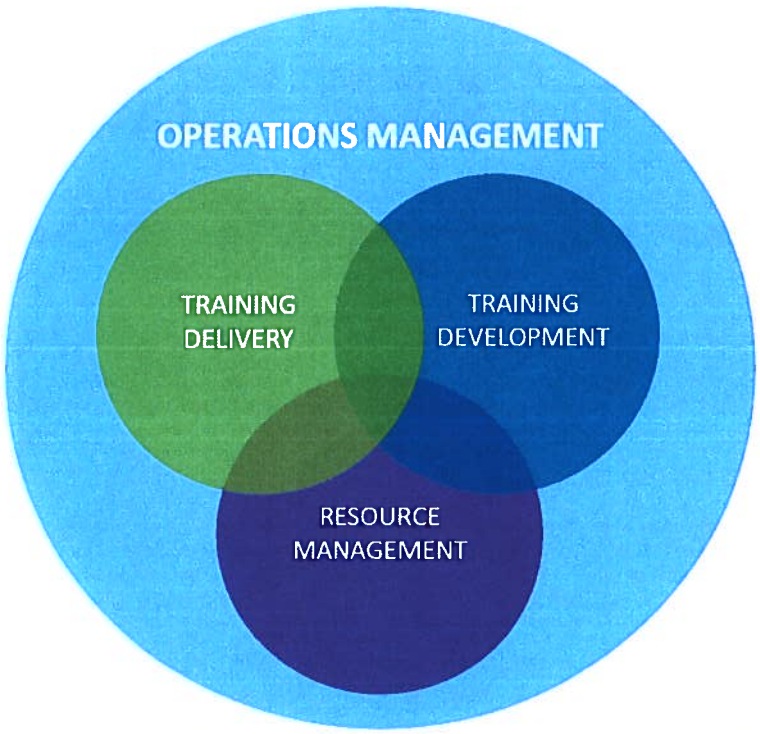


Figure 5-1: The Training Management System

5.2.1 Operations Management

The Operations Management function provides the following overarching management and control for the TM System:

a. Future Planning for capabilities, capacity, major capital projects, minor projects, occupational changes;
b. New Capability Introduction into the FNTS, this includes support to DNR and ADM (Mat) in the policy for and execution of Training Needs Analysis (TNA) and Training Media Analysis (TMA);
c. Training Technologies functionality requirements;
d. Validation of training programs; and
e. Administration and management of the Campuses.

5.2.1.1 Demand on the FNTS and Staff Establishment

Operations will be deeply impacted by the expected increase in required training production over the next 20 years. Figure 5-2 shows the yearly anticipated peak daily number of demand over time reaching as many as 3644 personnel in 2040, or a 17% increase over current (2020) figures. This demand considers not only IT&E production requirements but also demand on the system from the conduct of CT (including Refresher Training (RT)), demand from ships' companies using FNTS systems and spaces for informal instruction, and future management of other professional training for all RCN personnel. The IT&E and CT production requirements are based on the increasing number of new vessels, expected retirement of legacy ones, and an associated overall increase in the numbers of required trained personnel. This analysis addresses daily demand on the system from all of the above.

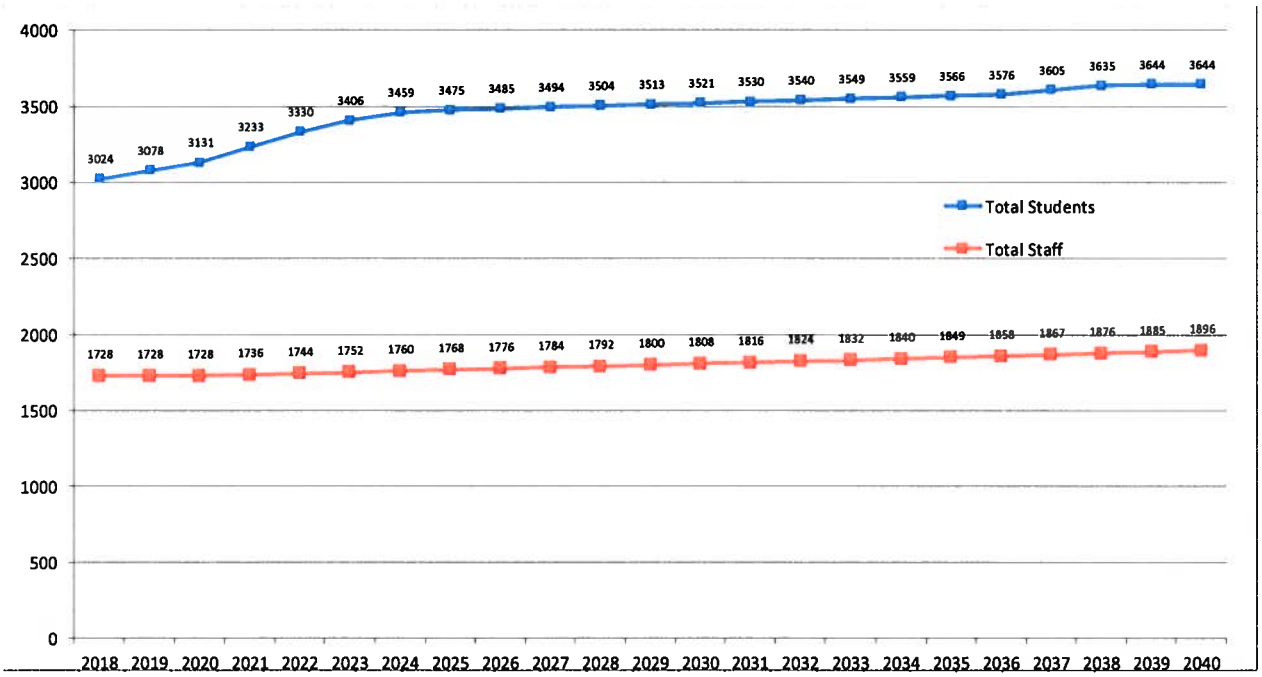
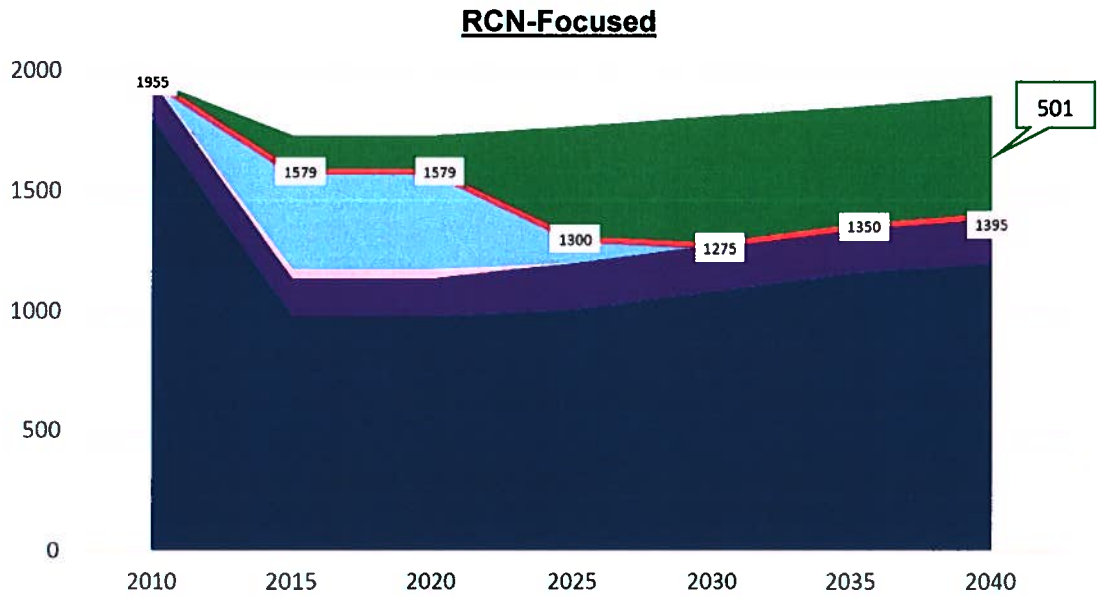
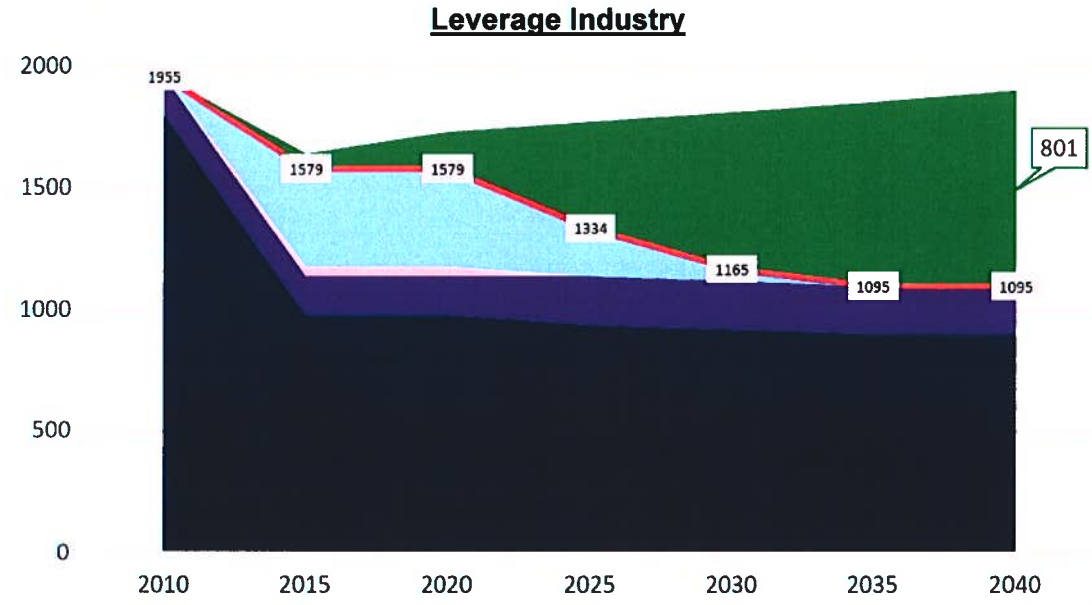


Figure 5-2: Projected Maximum Daily Production and Supporting Staff Estimates

The number of personnel conducting operations functions to support and sustain this demand must also increase as shown in Figure 5-2. Total staff (instructors, developers, supporting staff)

are aggregated in Figure 5-3 which shows the potential mix of RCN, DND Civilians, and contractors. The composition of FNTS staff is guided by the principle that uniformed personnel will be employed in the FNTS only when and where necessary. It must be noted that the staff requirement for a naval training system that employs learning-science based methods that focus on an optimal blend of hands-on, digital, and performance focussed, technology enabled approaches and processes typically requires supporting personnel, technical experts, game masters, control room personnel, mentors, and instructors that are normally greater in capability and number than what one may observe in a typical civilian public school or post-secondary establishment. The requirement to train highly ready and capable sailors results in a staff requirement that is both as small as possible and as robust as possible to ensure a capable RCN. The composition of this staff will be informed by the results of the SBCA process and further analysis. Two primary options are depicted in Figure 5-3, one showing an option that favours uniformed personnel and the other showing an option that depicts a greater contribution by industry.





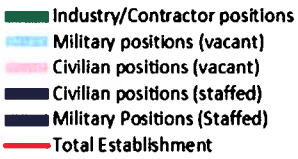


Figure 5-3: Potential Staff Composition Over Time

5.2.2 Training Development

The Training Development (Trg Dev) function provides the naval application of the CAF Individual Training and Education System (CFITES) Quality Management process through the Analysis, Design, Development, and Evaluation phases. Trg Dev in the existing NTS is largely executed by Naval Training and Development Centres (NTDCs) that support both IT&E and CT development.

CFITES is the CAF interpretation of the broad internationally accepted term Systems Approach to Training (SAT) which refers to a systematic approach to producing instruction. The Trg Dev function is expected to apply the SAT in an efficient, cost effective, and operationally relevant manner.

The Trg Dev function also ensures that supporting Training Technologies (TT) are developed and validated according to training requirements. Note that most existing TT were developed and delivered via separate contracts through DNR and ADM (Mat) and sustained through MEPM Life-cycle Configuration Managers (LCMMs).

In summary, the Training Development function provides the following:

a. Training curriculum development based on the application of Analysis and Design, for NTDC and NPTG Projects;
b. Training Technologies functionality requirements;
c. Courseware content and media development based on the application of Development for NPTG Projects;
d. Staffing the development work, interaction with the projects, procurement coordination, integration with the NFSs and coordination with respect to requirements and validation of the TS; and
e. Evaluation of training program effectiveness.

5.2.3 Training Delivery

The Training Delivery (Trg Del) function provides scheduling and conduct of instruction. This is done at the Naval Fleet Schools and Naval Reserve Divisions. Schedules are developed based on production requirements, courseware content, and TT delivered by external Projects and validated by Trg Dev. Successful Training Delivery is also critically dependent on professional, well supported instructors that provide continuity for continuous improvement.

Note that the TT are operated and maintained via separate contracts through DNR and ADM (Mat) and sustained through DGMEPM. Trg Del features the operation of many TT by contracted human resources who also deliver instruction as required.

In summary, the Training Delivery function provides the following:

a. Scheduling;
b. Instruction;
c. Evaluation of trainees and instructors;

d. Staffing the delivery of instruction including the staffing of complex TT operators and technical support personnel;
e. Training Technology operation; and
f. Training Technology first level and some second level maintenance.

5.2.4 Resource Management

The Resource Management function provides management of financial, materiel and human resources at the NTS strategic, operational and tactical levels. Personnel are managed strategically via CAF personnel management and occupational management systems, largely directed by CMP policy. Operationally and tactically, personnel are managed under the policies created by D Nav P&T. These policies are executed under CNPTG by regional Personnel Coordination Centres. CSTG resource management is conducted similar to typical naval unit management.

Management of personnel includes the identification of requirements (numbers and skill levels), tasking and scheduling as well as the management of Students and Staff in the NTS.

Materiel is managed using various systems and processes mandated by CAF/DND (e.g. the Defence Resource Management Information System (DRMIS)), ADM IM and local Service Management Centres (SMCs), and Real Property Operations (RP Ops) detachments (regional Infrastructure). Some TT are lifecycle managed through MEPM MSC 6, in a cost-sharing model with CNPTG.

In summary, Resource Management provides the following:

a. Financial planning and management;
b. Human resources management;
c. Materiel and Services procurement; and
d. Materiel and Services sustainment.

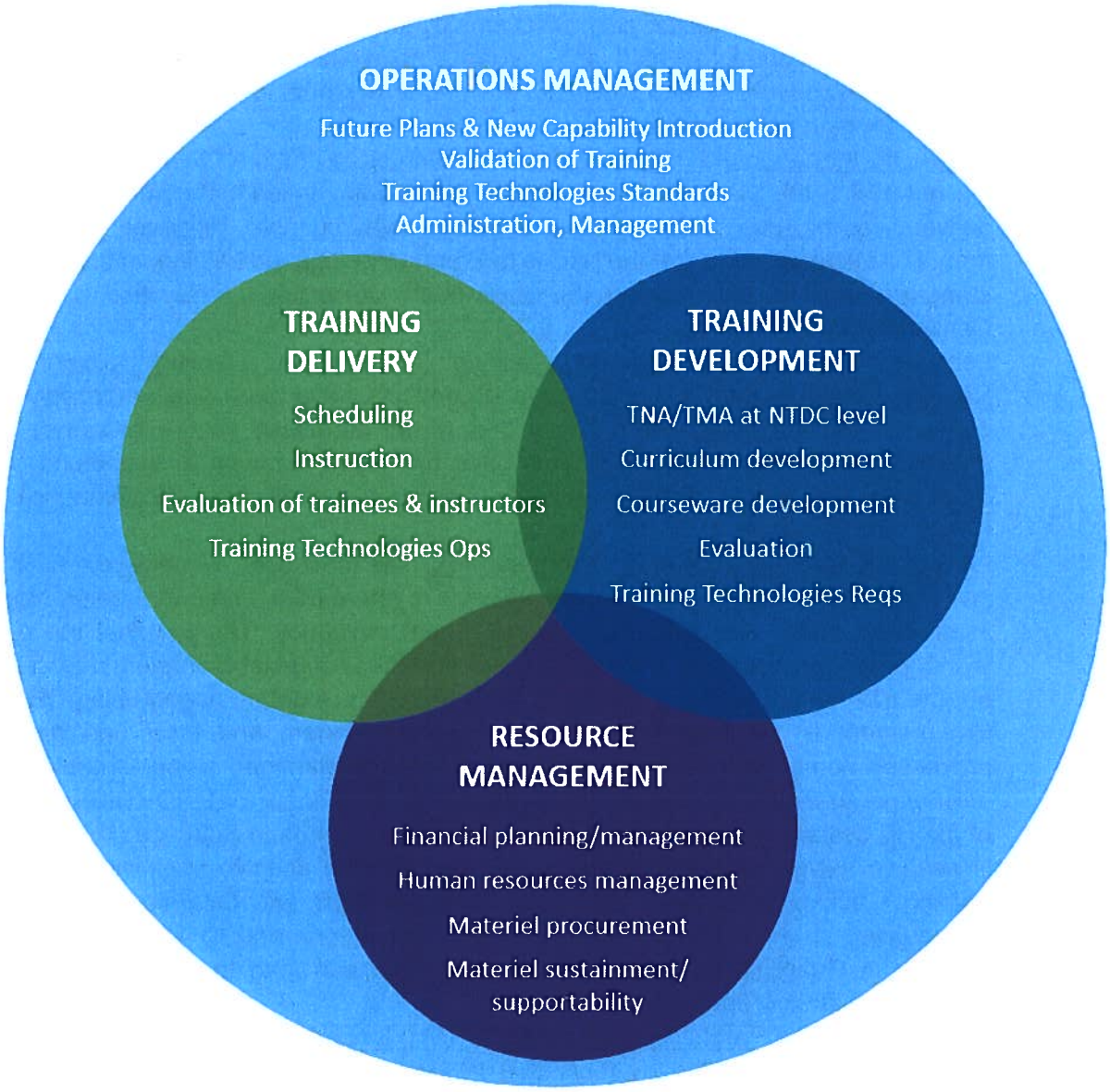


Figure 5-4: Four Training Management Functions

5.3 NTS TM Capability Deficiencies

The existing TM System has the following capability deficiencies:

a. The NTS is not flexible or adaptable. It cannot respond effectively to changing production demands, skill evolution, system technology, or training methodologies;
b. Lack of timely procurement. The existing procurement processes and constraints mean that the NTS cannot respond to changes in technologies or opportunities that leverage innovations presented by industry in a timely manner;

c. Significant underfunding for DND Civilian and Contractor staff. NTDCs are dependent on instructional design SMEs (normally contractors), working in concert with naval system SMEs (uniform and civilian DND employees). However, there is a chronic lack of funding for contracted staff and civilian employees which significantly impacts stability and productivity, and precludes the long-term planning and effective execution needed for high performance;
d. No Quality Management (QM) process. The restructure of the NTS in 2015-2016 saw the removal of the Standards organization. Standards verified that content was being delivered as per curriculum and that instruction was suitable. However, there is no formal QM used to verify that the NTS is delivering the required training, to the required standards, and if not, making the appropriate corrections. This also precludes Continuous Improvement;
e. Lack of Operations Management, Training Development, Training Delivery, and Resource Management policy. Command concepts have been applied broadly and generously to the point where policy that would otherwise ensure efficiency and effectiveness across the entire NTS is often bypassed in favour of expediency and quick wins. The culture of quick wins precludes optimal quality and effectiveness over time;
f. Lack of integrated resource management tools. The tools used to manage resources and materiel in the NTS are separate, not able to share data, and often are employed in processes that are stove-piped and prevent efficiency. The materiel life cycle management process relies on DRMIS, as does the financial management system, but the two are not linked. In addition, RCN trainers are not managed using DRMIS. Procurement is accomplished using a separate system and local and national processes sometimes differ. Human resources are managed using Guardian (for military personnel) but using HRMS Peoplesoft and Phoenix for DND civilians. None of the HR systems interact seamlessly with Military Command Software (MCS) which is used to assign people to taskings and can also be used to track and schedule training. Lack of a two-way data trust between MCS and Guardian means that manipulated student data such as student qualifications and CFTPOs need to be updated in Guardian by a separate process, that can lead to delays in pay and inconsistent status reporting;
g. Lack of Integrated Production Management (IPM) tools. Production management and control are not supported by tools that leverage available data or operate in an integrated manner. The enterprise personnel management system is not linked to local management or scheduling systems nor is it linked to the CAF distributed learning system, the DLN. This makes the exchange of information difficult and status reporting inaccurate. Neither the CAF-level personnel management system (Guardian) nor Training Technologies can harness data from systems being used to manage fleet workforce (through the PCCs). Therefore, they cannot respond to dynamic changes, nor can they react quickly to surge requirements. They are also impeded in making decisions based on current and complete information regarding personnel availability and qualifications. Naval Fleet Schools are not able to use higher level data and are not employing a standard schedule management tool. This also leads to the inability to report performance metrics on the system as a whole;
h. Lack of exploitation of data through integration with materiel and operational sources. The NTS cannot readily access data from PLM systems or from operational sources.

This results in an inability to respond to changes to maintenance or operational processes, procedures, or equipment. In other words, TT are separated from disciplined life-cycle management, from change management and from operational lessons learned: the curriculum is not directly linked to the systems and processes it supports. This includes doctrinal changes, technical manuals and engineering changes, creating delays and omissions in the accuracy of relevant training content across the TT System;

i. No common toolset or data sharing environment for courseware development. There are no IT/IM systems being employed in a systemic way across the existing NTS that would enable common use and sharing of data in curriculum design or development. Existing tools do not integrate easily with the systems used for content delivery;
j. Lack of effective course loading process. There are major variations in production demand through the year, which result in corresponding large variations for instructors and facilities. Courses that require advanced trainers and simulators, also require personnel to run them. Conducting courses and trainer sessions without a full load of students, or with large production demand variations is very inefficient, particularly when unplanned;
k. Lack of ability to Develop and Share Secure Content. There are no consistent IT/IM systems being employed which allow for the secure development and delivery of classified courseware. Courseware and content that is developed is unable to be transferred to delivery settings through a networked environment which heavily constrains DL;
l. Lack of Secure Learning Spaces. The NTS DLN does not meet the requirements to deliver Protected B or above courseware. This results in students needing to travel to locations where this content can be delivered securely, often at some distance from their normal training location. This is not time or cost-effective;
m. Lack of courseware configuration management. The NTS DLN acts as a content repository and distribution system, but it is not a relational database, meaning there are often multiples of similar yet different courseware content available. Because much of the content is either from a proprietary LCMS or not controlled at all, the content is limited to only particular courses or subcomponents of courses, which precludes effective re-use and common development. This leads to the delivery of different versions of training thus affecting the currency and consistency of training and the credibility of the NTS;
n. Poor student record tracking. There is no system to record or track student performance over time. For example, should a student complete training in an alternate manner through experience at sea or via civilian college, the system must employ a highly inefficient paper-based or email-based mechanism that often fails to represent the situation correctly;
o. Lack of accounting for Refresher Training (CT level 1 training) and Career Training. There are currently no supporting processes to account for some aspects of Refresher Training (RT) and Career Training, resulting in unforecasted staff/schedule demands and conflicts;
p. Challenged instructor competency. There are no formalized instructor development programs for the NTS. Because the bulk of delivery staff are uniformed members, they tend to be skilled in operations, have technical subject matter expertise in particular systems, and have solid leadership and mentorship skills. However, most do not have

any formal instructional capability, cannot provide continuity to reduce ramp-up and exploit lessons learned, and do not have an appreciation of how the NTS must work as an integrated System of Systems. There is no instructor credentialing process in use that would otherwise accredit for competency and match competency to instructional duties and responsibilities;

q. Challenged development competency. There are no staff development programs for the NTS. Like instructors the bulk of development staff are uniformed members and, while skilled in operations and maintenance, and while superior leaders, they have no formal instructional design or development competency and are not software engineers of programmers. Due to scarcity in human resources, the NTS tends not to invest time and effort to develop them appropriately. Some exploit available opportunities to improve on their own. There is no developer credentialing process in use that would otherwise accredit for competency and match competency to assigned duties and responsibilities; and
r. Lack of comprehensive change management process. A lack of oversight over change in the NTS results in unrealized value, unaddressed gaps, undocumented solutions, un-prioritized initiatives, unauthorized expenditures, and a general lack of accountability and support for systems that the NTS inherits and operates.

5.4 FNTS TM System Preliminary High Level Requirements

The performance of the TM System is ultimately measured by having efficiently produced the right number of naval operations and support personnel, with the right qualifications at the right time and at an acceptable cost. The following are the preliminary High Level Requirements (HLRs) for the TM System:

a. The TM System must train students along the entire Training Continuum, such that students have the competencies to work independently and to be integrated into teams and operational units;
b. The TM System must deliver to students the ideals, values and standards demanded of the Profession of Arms. This must be reflected in adherence to doctrine, regulations, orders and include both the Regular and Reserve Force;
c. The TM System must provide training that recognizes the importance of face-to-face mentoring and supervision by uniformed members, to draw new recruits into the naval culture, while developing training which makes use of subject matter and instructional expertise that may be resident in non-uniformed resources;
d. The TM System must deliver training at the point and time of need, and in a member's, or a group of members' geographic location to the greatest extent possible, using modern technology-enabled methods and media (operations and communications infrastructure permitting);
e. The TM System must develop and deliver training by use of modern technology TT and methodologies;
f. The TM System must be developed using the Core/Platform approach. In this model, all tasks, skills and knowledge common to everyone in the target group, at a qualification level, will be trained first, followed by Platform-specific (class of ship) skills and knowledge on an as-and-when required basis;
g. The TM System must develop and deliver training using a blended mix of Military, DND Civilian, and Contract Personnel, using uniformed personnel only when and where absolutely necessary;

h. The TM System must develop and deliver training using methodologies, processes and procedures that meet RCN objectives, while also ensuring they are aligned to the learning schemas with which current and future students are familiar;
i. The TM System must leverage capability and capacity from industry, academia, other government departments and Allies in the development and delivery of training;
j. The TM System must not interfere with the Naval Personnel and Training Group (NPTG) current and ongoing activities;
k. The TM System must adapt and reconfigure swiftly to a multitude of changes in technology, security, demographics, structure, policies and government mandates, efficiently and effectively, without compromising output;
l. The TM System must rapidly incorporate lessons learned from operations to adjust training and doctrine to remain operationally agile and adaptive;
m. The TM System must rapidly incorporate lessons learned from operations and materiel product life-cycle management to adjust training and doctrine to remain technologically agile and adaptive;
n. The TM System capacity must be able to expand or contract as necessary to meet increased or reduced demand; responding to training surges as effectively as training reductions;
o. The TM System quantity control process must be fully integrated with external CAF processes, with internal RCN occupation management processes, and with fleet workforce and operational requirements. The quantity control process will be enabled by CAF or RCN enterprise systems developed to RCN requirements;
p. The TM System must employ a data model (see Fig. 5-5) which ensures all data used for all functions is captured, stored, consumed, and employed in a standard format and manner. Data within one function must be linked seamlessly with all other functions, as well as with higher level enterprise systems in a single digital framework;
q. The TM System must use a common data model, linked open data, exposed data, in order to ensure vertical and horizontal integration. Data used in Trg Dev must be compliant with industry leading standards[11];
r. The TM System must exploit data from a Single Trusted Data Source, within a digital and data-rich environment, to generate the Training Production Requirement (TPR). The TPR must be generated by data inputs from Canadian Forces Recruiting Group (CFRG) and D Nav P&T occupational managers, per policy generated by Military Personnel Generation (MPG) and RCN operational doctrine and policy for CT. CAF level (non-RCN) training production requirements for training such as career leadership courses must also be driven by similar data and policy;
s. The TM System must document, track, integrate and utilize students' training data throughout their careers. In sync with CAF enterprise personnel systems, the Quantity Control process systems must access and integrate data such that records on training and competency accomplishment will follow the student from induction into the CAF until release. Data managed in this manner will enable efficiencies in Quantity Control. Competency attainment via means other than formal training must be tracked (and verified through Quality Management) to reduce overall training burden;

[11] The current most likely international industry and defence standards for technical, operation, and training data and processes are: S1000D, S3000D, GEIA STD 0007, and S6000T.

t. The TM System must exploit personnel availability data. Operational needs enabling the availability of officers, sailors, and support personnel for training must be integrated seamlessly making training scheduling more responsive to immediate change;
u. The TM System must exploit fleet scheduling data and operational needs to inform Quantity Control. This data must be used for effective scheduling of CT and Refresher training, alignment with IT&E scheduling, Training Technologies usage and maintenance, and staff allocation;
v. The TM System must ensure that FNTS requirements for TT and services are correct, and the related products and services are properly delivered by their respective procurement Projects;
w. The TM System must be able to adjust staff levels to accommodate an expected overall increase of 17% in steady-state training demand, as well as occasional demand surges;
x. The TM System must utilize industry support as much as sensible, to ensure uniformed personnel remain available for operational roles, and to facilitate a stable and professional training cadre;
y. The TM System must employ TT that are optimally configured and relevant to on the job performance requirement, with content and instruction that ensures the optimal amount of cognitive load on the student to produce the highest quality graduate. Effective training is dependent on the quality of content used to instruct or support the instruction of students;
z. The TM System must employ SAT to exploit integrated data through a data model-based system. The data derived from an occupational specification and used in the production of the Job Task Analysis Report must be equally accessible by the design process that results in a Qualification Standard Plan (QSP). Equally, this data must be accessible and available in the development process, during delivery, and in evaluation and validation;
aa. The TM System must employ a standard data model concept that can accept data input from operational lessons learned processes and operational technical and warfighting data, in a manner that enables rapid curriculum changes and thereby relevant training;
bb. The TM System must employ the System Approach to Training (SAT) process to all forms of training: IT&E, and CT levels 1-5. This assures quality and efficiency and removes the tendency to design for nice versus need;
cc. The TM System must employ a robust Quality Management (QM) process. This must include the functions of the former Standards organization but fashioned after industry standard QM models. The goal of this QM system is to enable commanders at the unit level to develop and deliver within the scope of their control, and ensure that the product of their efforts is measured and trusted to be of best operational effect for the RCN;
dd. The TM System must consider fleet readiness requirements and operational needs so that real time feedback is incorporated into the Training Continuum;
ee. The TM System must be able to update data-rich digital content, and trainer and simulator capability, in short timelines, using operationally relevant data, to ensure currency and effectiveness of training content and curricula;
ff. The TM System must make use of personnel who are competent in instructional and support competencies. This includes instructors and all those required for delivery of

training as well as those responsible for maintaining and operating TT. Formal recognized competencies in instruction will provide continuity and increase quality in training. Personnel making up the instructional cadre must be RCN members, DND civilian employees, or contracted staff as determined by the exigencies of the subject matter, operational experience needed, or technical or academic competencies required;

gg. The TM System must be supported to the extent that there is sufficient time between serials for instructors to receive development training as needed to improve competency;

hh. The TM System must ensure that resources are made available such that all functions operate efficiently. Efficiency is not simply lowest cost. For instance, success in making content reusable reduces cost in terms of overall investment. Successful life-cycle management of materiel resources means that trainers, simulators, and even lower technology job-aids are maintained and aligned to what is required of them in terms of operational effectiveness. In this way, sustainment and supportability of the FNTS is successful when all resources are managed at all levels;

ii. The TM System must employ mature CAF/DND force development and life-cycle management processes;

jj. The TM System must ensure that FNTS is sufficiently staffed to ensure consistency in quality and quantity of instruction and support. This workforce must be comprised of RCN uniformed members, DND civilians, and industry. RCN uniformed and civilian establishment must be stable to ensure sufficient subject matter expertise and continuity; and

kk. The TM System must use enterprise solutions and tools to manage resources. Data integration is critical to success, therefore, tools used to conduct resource management must be ones that manage data utilizing standards that ensure it is transferable between and among systems. Resource Management must be conducted in a data-rich, digital environment that ensures technical, human, financial and other data is employed and employable.

5.5 FNTS TM System Solution Concept

The FNTS TM System solution will carry out very similar activities as described for the existing NTS, however, it will heavily leverage modern, integrated data model-based tools and information. This will provide much improved time and cost effectiveness, overall efficiency, and training performance. It will also enable timely identification of gaps or weaknesses in training based on student performance data, lessons learned and QM data. The result will be enhanced personnel readiness and RCN operational capability.

The TM System will generate a *training effect* through provision of individuals and teams of officers, sailors, and support personnel that is comprehensive in operations and resource management, predictable in production, and reliable and consistent in training quality.

5.5.1 Comprehensive Operations Management

The TM System will provide highly competent development and support staff and a professional cadre of instructors by using expertise and capacity from a balance of competent RCN and non-RCN sources. Where RCN personnel are needed, a data-enabled credentialing system will be used to match competencies to employment areas in the FNTS.

The TM system will be flexible and scalable and respond to fluctuations in production or surges in development as necessary to meet increased or reduced IT&E or CT requirements.

5.5.2 Resource Management

The TM System will provide comprehensive resource management for operations, finances, human resources, material, services, and facilities. It will be guided by RCN Force Development, RCN Materiel management, and RCN financial and personnel administrative processes.

Training Development and Training Delivery rely on Training Technologies and software that will be managed in accordance with materiel and IM/IT resource management processes and policies from other RCN, CAF, and Departmental organizations.

The TM system will provide operational oversight and coordination of product and service contracts to achieve the optimal value for the RCN, while ensuring worthwhile value for Canadian industry. Longer term, performance-based contracts will be favoured to provide contractor career development, expertise continuity and continuous performance improvement.

Training Facilities will be managed in collaboration with local RP Ops organizations.

The TM system will manage students such that HR requirements and student transition in and out of the FNTS is efficient. This will be achieved through integrated personnel data systems.

5.5.3 Predictable Production from Training Development

The TM System will accurately predict production through an evolved and better informed TPR. This will be done by drawing upon trusted data from personnel and occupational sources, fleet requirements, and relevant technical and operational databases. Shortened response time to variations in production requirement will be enabled through real time access to trusted integrated data, rather than relying on time consuming gathering and human driven analysis.

The TM System will be able to accurately plan Trg Dev activities through a dynamic Development Schedule (DEVSCHED). This will be achieved, in part, through alignment of training development with trusted data from Integrated Product (equipment, materiel) Support (IPS) or Product Lifecycle Management (PLM), Operations and Readiness, and Personnel and Occupational sources.

The TM System will produce smaller, more modularized competency-oriented training packages. Smaller modular packages, rather than lengthy all-encompassing programs, will enable dynamic scheduling. A data-enabled system drawing upon staff and instructor data, as well as information about infrastructure and TT, makes dynamic scheduling and continuous improvement more feasible.

The TM System will produce competent individuals and teams through traditional linear, as well as non-linear approaches. The data model-based system will enable this flexibility by aligning data from trusted IPS, Operations and Readiness, and Personnel and Occupational sources, with technical and operational tasks and competencies.

Non-traditional competency (gained through experience, outside coursing, learning on own time) will enable students to progress at their own pace. The TM System will apply intelligent analytical tools to track and predict career competency progression.

5.5.4 Reliable and Consistent Training Quality from Training Delivery

Training outcomes are based on requirements that emerge from technical and operational needs of the RCN. Training requirements will be managed and controlled by the TM System following disciplined systems and requirements engineering processes.

The TM System will produce curriculum using integrated information in a systematic way. The SAT is optimally oriented to exploit and manage data. The TM System will make use of information in a digitally relevant and data-driven manner. The data derived from a TNA, an occupational specification or a Job Task Analysis Report (JTAR) will be as accessible as operational and technical information and used by the design process to produce a Qualification Standard Plan (QSP) or a CT program.

Technical training that leads to technical competency development, will be linked to identified technical and maintenance tasks. The TM System will directly draw core competency requirements from the authoritative maintainer data source. Training tasks will be derived from technical data, Level of Repair Analysis (LORA) data, and from all aspects of IPS for the introduction of a new capability and through life. This will transform product data into training outcomes using digitally threaded unique system identifiers, in a manner that is integrated with the product lifecycle process.[12]

Similarly, operational training and competency development, will be directly linked to identified operational competencies required for operational success. For both technical and operational roles, quality training will result from exploiting relevant and integrated data within the SAT (instructional design) process. However, this data must be reliable and consistent. This is achieved through establishing a single trusted data source upstream of the TM system. This will be provided through the Digital Framework (DF) System described later in Section 7 of this CONOPS.

Training Technologies (TT) will also have significant impact on the quality of training developed in the TM System. TT will be configured for students to optimally learn their job and for TM personnel to optimally develop courseware and instruct. TT are described in much more detail later in Section 6 of this CONOPS.

[12] Acquisition Requirements for Training Transformation Overview Video, sponsored by OPNav N12, Total Force Manpower, Training and Education Requirements, 2020

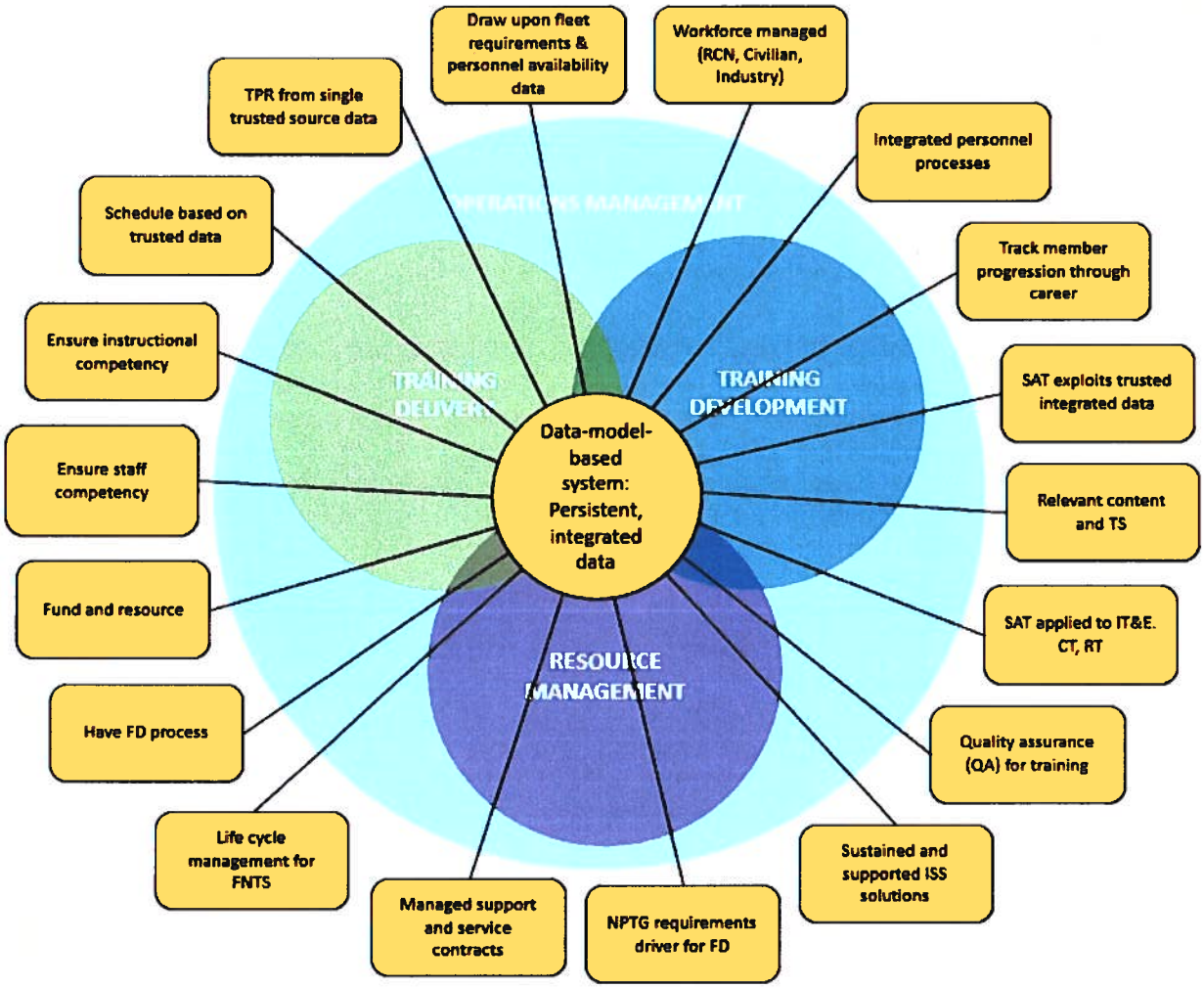


Figure 5-5: Training Data Concept

6 FNTS TRAINING TECHNOLOGIES (TT) SYSTEM

6.1 Introduction

The Training Technologies System comprises the management of, and collection of, all the tangible hardware and software assets, including all the devices and digital content needed to develop, conduct, support and verify the complete spectrum (Training Continuum) of RCN Training in the FNTS.

Training Technologies is a broad term that includes everything from the most basic, to the most integrated and complex. TT encompass a wide array of devices, systems, methods, and media with the aim of improving the efficiency of Force Generation and Force Readiness activities.

A single Training Technology will not necessarily act as a direct tool substitution, but it will enhance the teaching and learning experience by supplementing existing tools and resources, with no functional change to the lesson. Examples of TT include mock-ups, part-task trainers, simulators at all levels of complexity, real equipment, cutaways, courseware, digital content, and any others that contribute to the mastery of training requirements.

This Section of the CONOPS presents the existing situation with respect to Training Technologies in the NTS, lists the associated capability deficiencies, and then covers other considerations, and preliminary FNTS TT System HLRs. It concludes with a description of a FNTS TT System concept.

6.2 NTS Existing TT

Currently a large portion of military training and education is delivered in a linear, residential fashion – usually in a school or onboard ship. Advances in training technology now offer opportunities to train in new and innovative ways to minimize time away from home for trainees and to ensure uniformity of instruction. Naval personnel joining the RCN today are graduates of education and training institutions that employ modern learning methods and technologies. They expect the FNTS to offer similar capabilities, and the RCN needs to capitalize on improved training effectiveness by providing students with these new methods and technologies.

The existing NTS organization and TT were developed incrementally over time as the fleet evolved. The various TT (including platform and system-specific training equipment and courseware) were developed independently and in isolation (i.e. "stovepipes"), without a holistic perspective on how each device would fit into the wider NTS. This fragmented approach has led to numerous inefficiencies, with dated, overlapping and sometimes unnecessary functionality.

The TT System objective is to provide secure, reliable and integrated Training Technologies (TT) that are "guided by the selection and employment of training methods and media that optimize and enhance learning"[13]. The implementation of responsive and dynamic TT requires the use of modern, integrated educational technologies, effective content development and corresponding methodologies. The RCN will employ a wide spectrum of TT in all phases of training, including the management and delivery of material to students in all forms.

6.3 NTS TT Capability Deficiencies

Existing Training Technologies (TT) capability deficiencies include:

a. Insufficient Exploitation of Technology. The evolving fleet is becoming more technologically complex, and many existing TT have not adapted to this increase in

[13] FNTS Strategy, pg. 18

complexity. Some platform and system-specific training employ advanced TT but NTS TT in general are not being leveraged broadly. Overall, the NTS has not adequately exploited the use of networks, advanced tools or training methods, or leveraged synergies and lessons learned from internal and external stakeholders.

b. The NTS is not managed as a System of Systems. NTS TT are procured and lifecycle managed in an inconsistent manner, using annual operating budgets which are typically one third of what is required. All but the most complex TS, are managed in ad hoc and disparate ways. Some TT are left to degrade while others are supported or improved. This precludes efficiencies in procurement and sustainment across the NTS.
c. Lack of Quality Management (QM). There is no formalized process to verify NTS TT effectiveness for training. NTS TT do not integrate with, or feed student experience, student performance, or system performance data into a quality system that can exploit this data. There is no collection or application of performance metrics, deficiency identifiers or triggers for changes needed to TT maintenance or operations. Issues are raised haphazardly, arising through end course reports, or occasional reporting from instructors. No framework is in place to provide the information needed for Continuous Improvement.
d. Lack of ISS for digital content. Once digital content is developed, the NTS does not configuration manage this content in a manner that ensures correctness or currency. Content largely exist as separate entities that are used locally, but rarely shared and rarely updated using modern processes and procedures. Content is therefore not being updated concurrently in different locations, or in concert with changes to the systems being trained.
e. Lack of efficient data storage and transfer. The NTS is unable to store and use information and data that should be automatically transferred/shared. Current methods of accessing and transferring large content files requires the manual transfer of files via external hard drives or USB sticks. This data then needs to be security and cyber scrubbed prior to use. This practice is far too burdensome and does not encourage the free flow of information that is critical to the FNTS. The NTS is unable to access externally supplied or stored content from other systems without having to develop middleware to provide access through the learning architecture.
f. Lack of intra-TS integration. NTS TT are mostly standalone (stovepiped) and have a wide range of different design and interface standards. Most are not, and cannot be interconnected across the networks (secure, DWAN, Internet, or other). This limits the ability to create the integrated, interoperable TT environment for efficient, flexible, expanded sub team, team and unit collective training. It also constrains flexibility, and efficiency in numerous areas of TT data, design, application and control.
g. Lack of complete Training Continuum perspective. NTS TT are often developed and procured with only IT&E requirements in mind. FNTS TT must address the complete Training Continuum; IT&E and CT levels 1-5, for current and emerging training applications.

6.4 FNTS TT System Considerations

The implementation of an effective and efficient TT System in the FNTS relies heavily upon effective implementation of other supporting Projects, and the cooperation of agencies external to the NTST Program.

6.4.1 Procurement

Most of the TT required for the FNTS will be procured as part of training support solution work related to non-training equipment Capital and Minor Projects being managed within ADM(Mat)/MPD and MEPM, ADM(IE), ADM(IM), and the Directorate of Naval Requirements (DNR). The FNTS will be able to influence these procurement selections with the provision of NTST requirements, technology selection processes and standards.

6.4.2 Sustainment System

All existing and future capabilities in the FNTS will require Sustainment solutions as part of the procurement process. New TT will have sustainment solutions identified as part of the PRICIEG process, but there will need to be solutions identified for existing TT that are not currently covered. More detail is provided in the Sustainment System section later in this CONOPS.

6.4.3 Digital Framework System

The Digital Framework provides the robust IM/IT connectivity, data storage and data access capabilities needed to implement and deliver the capabilities and capacity of the TT System. The FNTS Digital Framework System is necessarily linked to the larger Digital Navy initiative. The Digital Navy projects will be managed by ADM(IM). More detail is provided in the Digital Framework System section later in this CONOPS.

6.4.4 Training Facilities System

Modern, multi-purpose and reconfigurable Training Facilities are essential to the success of the FNTS. The Training Facilities System must provide all the physical space and building services for the FNTS including a significant increase in classified TT. The Training Facility Projects will be managed by ADM(IE). More detail is provided in the Training Facilities System section later in this CONOPS.

6.5 FNTS TT System Preliminary High Level Requirements

The performance of the TT System is ultimately measured by efficiently and effectively ensuring that TT support the graduate's performance on the job, as an individual and as part of a team. Therefore, the following HLRs are oriented towards providing a TT System that is qualitatively and quantitatively superior, while also being optimally efficient in terms of cost, effort, and through life sustainment. FNTS TT System preliminary High Level Requirements (HLRs) have been derived from the FNTS HLMRs listed in Section 3 above.

a. The TT System must be fully operational 24/7 in order to support continuous FNTS operation. This includes training sites that operate outside of traditional work hours such as Naval Reserve Divisions and Ships at sea. The TT System must have sufficient capacity to provide this level of service while still conducting necessary planned and corrective maintenance;
b. The TT System must have the capacity to support an expected overall increase of at least 17%, and up to as much as 30% in surge, in steady-state training demand;
c. The TT System must have the functional capability to support training for the significant increase in classified and more complex systems being deployed in the RCN;
d. The TT System must be able to respond to changes in circumstances (application, function) rapidly and efficiently to support multi-purpose use;
e. The TT System must be able to reconfigure swiftly and be capable of adapting to a multitude of changes in technology, security, demographics, structure, threats,

doctrine, lessons learned, policies and government mandates, efficiently and effectively, without compromising capability or capacity;

f. The TT System must be able to exploit advances in technology such as Artificial Intelligence (AI), to respond to instructional needs as delivered by the TT, in a manner that augments and possibly exceeds human ability to do so. The use of deep learning, machine learning, and other AI embedded in TT will enable rapid and positively disruptive uses of TT in the production of ready sailors and teams;
g. The TT System must be able to expand or contract as necessary to meet changing training production demands. The number of sailors that will require training will fluctuate with operational tempos, acquisition schedules, seasons, and evolving Government of Canada priorities;
h. The TT System must use commercial-off-the-shelf (COTS) hardware (e.g., computers), COTS or open standards for software as much as practicable;
i. The TT System must maximize control of Intellectual Property (IP) as much as practicable;
j. The TT System must exploit the most up-to-date techniques, ideas, equipment and technology as much as practicable;
k. The TT System must be developed with due consideration to obsolescence management and open commercial interface standards;
l. The TT System must provide for interoperability and data sharing between TT and the DF System. Modern network technology and standards for modelling and simulation must be used. This will enable the coordinated and concurrent training of sub teams, combat teams and units. It will also allow the RCN maximize use of the Distributed Mission Operations Centre (DMOC) to connect the larger FNTS Training Technologies such as Operations Room Team Trainers with the Embedded Training Technologies aboard ships, with CAF partners and Allies. Interoperability must also exist for Business Tools on the Digital Framework to optimize administrative and control functions;
m. The TT System must protect information within each DF System network and data storage site, and between multiple security levels and zones. It must protect against intrusion, denial of service, and compromise, from all mechanisms. It must contain robust access control and audit capabilities. Training within the FNTS occurs within the full range of security classifications from Unclassified to Top Secret. Training Technologies must be safeguarded accordingly. The practices in place for document safeguarding, media storage, content development and transmission must be compliant with DND, Government of Canada and International security policies and standards;
n. The TT System must leverage new technological solutions to provide a transformative end user experience. For instance, TT must support real time collaboration, seamless mobile computing, and enhanced information management capability which provides for a superior user experience for staff and students[14];
o. The TT System must be able to share data and information, internally within the FNTS, and externally with all the key stakeholders internal and external to the RCN;

[14] This would include technologies such as Augmented Reality, Virtual Reality, Mixed Reality

p. The TT System must utilize a common information management strategy and Digital Framework for doctrine, content, training events and supporting material;
q. The TT System must interface with, and be integrated with, the various elements of the FG systems and the broader CAF training, personnel, and materiel readiness systems using common data models and tools based on international industry and defence standards; and
r. The TT System must provide information and services, accept information and services from other systems and effectively use the information and services so exchanged.

6.6 FNTS TT System Solution Concept

The TT System will be implemented and integrated into the FNTS with the same systems engineering and material management processes that are applied to integrating systems and equipment into a ship.

Lifecycle managing the TT System would ideally be a function for a dedicated TT support division within MEPM.

Data for each Training Technology item will be centrally managed to provide for consistent life-cycle management through Integrated Product Support (IPS) processes, ensuring connection to the larger FNTS data model, and integration into an enterprise database, from which TT can be tracked and scheduled as resources. This includes the implementation of formal change management processes, interface management and Quality Management to ensure that TT are integrated properly, operating correctly and meeting the requirement for which they were selected. This will also enable Continuous Improvement.

The TT System solution will leverage modern training technology and methodologies to maximize the effectiveness of training. Training falls along a continuum, and there is no single solution that meets all training requirements. A range of TT will be available and applied as needed to achieve the desired learning outcomes. This is a key enabler for FNTS multi-modality[15]. Multimodality leverages various training methodologies and modalities (traditional, digital, virtual, hands-on, combination) to produce an optimal learning experience, tailored to the learning preferences of the student.

[15] Ibid, pg. 18

Figure 6-1 shows the preferred type of TT (large circles) or acceptable TT (small circles) across the Complete Spectrum of RCN Training. In a multi-modal training environment, individuals use a variety of TT to first learn about functions, tools and the work environment that simulate working individually, then use a broader set of TT to learn how to work as part of a Sub Team, Team, and then as part of a Unit, Task Group and finally a Task Force.

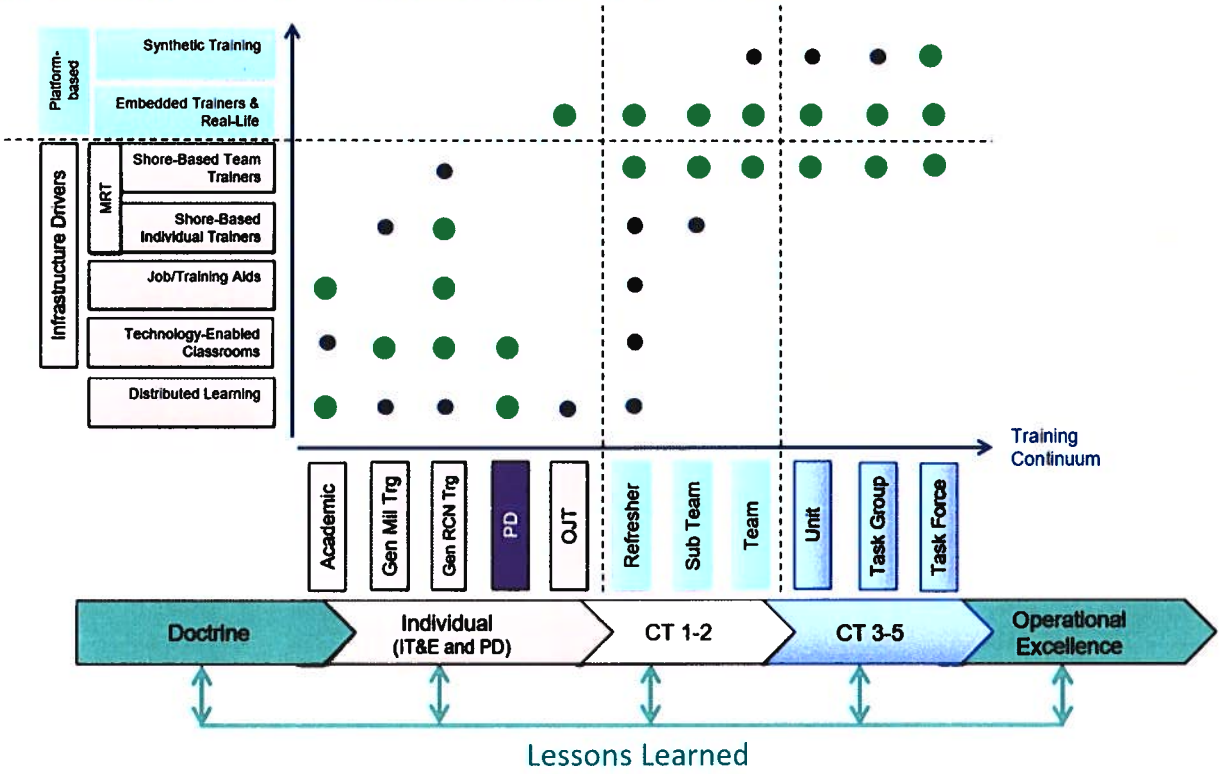


Figure 6-1: TT Distribution across the Complete Spectrum of RCN Training

The required TT will be determined as part of the Training Development function in the TM System, to effectively and efficiently close performance gaps for established training needs. Training Needs Analysis (TNA), Training Media Analysis (TMA), in conjunction with the Naval Personnel and Training Order (NPTORD) on Technology Enabled Learning (TEL) selection, will guide the selection of the most appropriate Training Technologies and functional capabilities, for the learning objectives being instructed. Considerations include security requirements, human factors, procurement costs, sustainment costs, flexibility, and scalability. Consideration of ease of supportability is also crucial. This includes the maintenance of the hardware and the upkeep of software and courseware. These considerations will be addressed through the SBCA and PRICE-G processes as noted above.

The TT System solution concept for the FNTS is based on the following three components:

a. Distributed Learning (DL) enabled by DL tools and the Digital Framework System;
b. Reconfigurable TT enabled by hardware and software that are multi-use; and
c. Networked Training enabled by the Digital Framework System.

6.6.1 Distributed Learning

Distributed Learning (DL) technology will provide the ability to offer instruction through various means and locations. DL will optimize physical instructional footprint, enable more standardized

curriculum, and increase learning opportunities at the location and time of need. DL systems will provide instructional efficiencies, effectiveness, and will reorient financial costs in order to ensure higher instructional value as compared to legacy training methods.

DL will be employed by instructors in technology enabled instructional spaces (classrooms) to enrich face to face instruction and blended instruction. DL will also be implemented remotely to enable face to face distance instruction and self-directed instruction. These methodologies are key to providing the flexibility required to support the training necessary to meet FG demands.

DL could be used for secure training within the secure learning commons (on base) using dedicated laptops and hard drives.

DL will provide for methods and media that will enable rich virtual and immersive environments, content, and functions. Student experience and progress will be tracked in real time and enabled by systems and AI applications such that instruction can be adaptive and responsive to individual learning as well as to changing maintenance and operational needs.

DL will feature a responsive and dynamic environment that will leverage modern, integrated educational technologies, effective content development, and corresponding methodologies. An integrated approach will leverage technologies such as a cloud based Learning Management System (LMS), Learning Records Store (LRS), Learning Object Repository (LOR), online collaborative spaces, and critical media development and management tools.

DL will provide for instructional content and resources that will be available when needed. This includes offline, online, while deployed, embarked upon ship, at home, and/or in a classroom. Material is presented in immediately useful interactive means and available from multiple types of devices. The DL system will be accessible, intrinsically motivating, and foster interactivity between the student and content, student and instructor, and the students themselves.

DL will provide students the ability to learn or refresh prior skills and knowledge through persistent access to learning and Training Technologies. This kind of ubiquitous instruction will be applied within the FNTS to support just-in-time[16] training, which is the capability to provide training when the transfer and absorption of this knowledge is most beneficial. Intrinsically linked to the concept of "just-in-time" training is Point of Need[17], meaning that the training material or references are available not only when they are needed, but also that the user/student can access the learning material from their physical location.

DL will provide students a seamless and meaningful instructional experience from start to graduation. It will be a logical extension of the types of instructional methodologies they will have been exposed to in public schooling, community college or university.

Successful implementation of an efficient and effective DL framework is dependent on the Digital Framework (DF) System that supports it. Together they rely on mapped data, established learning standards, and interoperability between systems and environments to support the management, delivery, analysis, and reporting of DL performance and results, regardless of where and how the training is delivered. This is shown conceptually in Figure 6-2 below. The figure represents all

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[16] Training that is divided into smaller segments that are immediately useful to the learner allowing for the timely acquisition of Knowledge, Skills and Abilities for a specific project or job.

[17] Students are given ubiquitous and asynchronous access to learning content, information and resources (e.g. in classroom, at home, in the field, on a ship, or in a theatre of operations; whether during office hours or in the quiet time between patrols; whether on a desktop, laptop, or mobile device. CAF Campus Operational Framework, p. 31

the notions of a DL concept mentioned above. The RCN DL concept is centred on creating the ready sailor who is supported by a competent instructor and, when required, by peers. Instruction is provided at the point of need, is multi-model, and when necessary, individualized. The three main delivery mechanisms of face-to-face, virtual (distance), and a blend of the two which are enabled by DL supporting systems and DL technologies in the schools, on ship, accessed via mobile devices, or other means.:

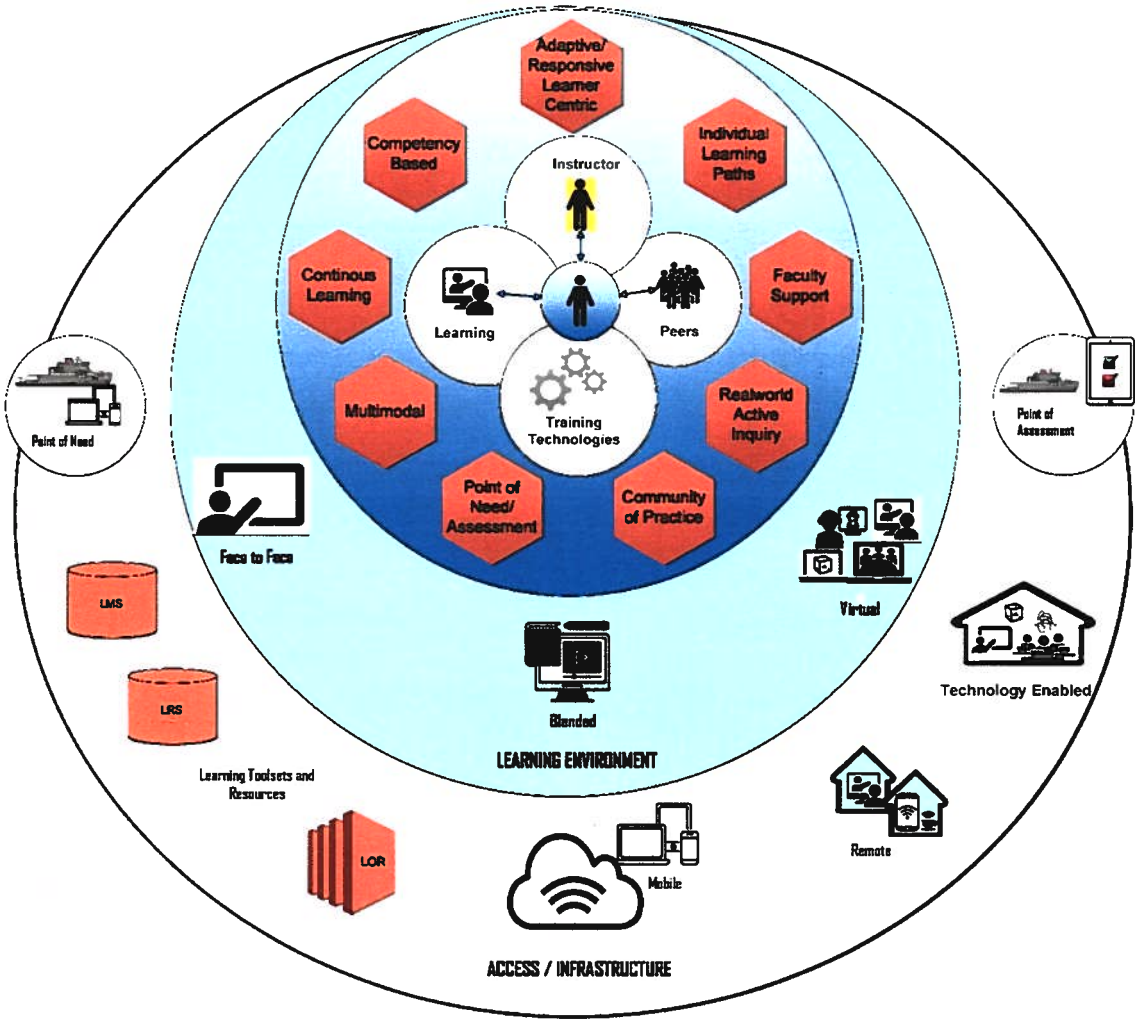

Figure 6-2: Distributed Learning Concept

The Digital Framework System will elevate the DL experience by integrating training technologies with standardized trusted data from other essential sources. This will provide opportunities for automation, efficiencies, learner analytics, innovation, and the agility to respond to a rapidly changing training and operational priorities and requirements. The DF System is integral to success of DL within the FNTS and is discussed in more detail later in this CONOPS.

6.6.2 Reconfigurable TT that are multi-use;

The RCN has long made use of operational and maintenance simulators which allow students to practice, master and refresh skills, drills, procedures and operational simulations using equipment and in an environment that accurately represents what the student will experience on the job. The modern TT provided in the FNTS TT System will be reconfigurable and service more than one purpose. This provides flexible virtual training environments that simulate a multitude of ship systems and platforms, which provides training flexibility and scalability. Within the TT System, reconfigurable TT are referred to as Multi-purpose Reconfigurable Trainers (MRTs). MRTs can be for individuals or teams and can fit a multitude of training requirements.

MRTs can be considered the cornerstone technology and will become fundamental requirements in future TT acquisitions. MRTs will be developed such that utility and application are maximized across the full breadth of naval systems training. MRTs will be modular, flexible, with an open architecture and minimal or no Original Equipment Manufacturer (OEM) Intellectual Property (IP) or other commercial constraints wherever practicable. MRTs will execute a variety of simulator applications on an array of commercial-off-the-shelf (COTS) hardware and software components.

MRTs will enable a centralized approach to TT maintenance and infrastructure. This will reduce overall cost and physical footprint of TT.

MRTs will be reconfigurable for different simulation applications, providing high fidelity, complex, virtual training for a range of learning situations. Assets developed to support MRTs will be developed with the intention of interoperability and reuse to support multiple modalities. Figure 6-3 below is an example of an MRT used at the Canadian Coast Guard College. The configuration of the screen can be changed depending on whether instruction is occurring on a diesel engine or electric motor.

Figure 6-3: Reconfigurable Trainer

The TT System will employ MRTs as broadly as practicable. Shore Based Individual Trainers (SBIT) and Shore Based Team Trainers (SBTT) are examples of MRTs.

6.6.2.1 Shore-Based Individual Trainers

Shore-based Individual Trainers (SBITs) will provide individual task learning on component(s) of systems or equipment. They provide key elements of the specific procedures or critical tasks and skills being learned and allow learners to focus solely on a specific procedure with the opportunity for repeated practice to achieve mastery of particular skill sets. SBITs can be real equipment or simulations.

Examples of existing SBITs include the Maintenance Procedure Trainers (MPT), used today, which are virtual, part-task maintenance trainers that can simulate a wide variety of systems. Figure 6-4 and Figure 6-5 below are examples of SBITs.

Figure 6-4: Shore-Based Individual Trainer – Navigational Part Task Trainer (NPTT)

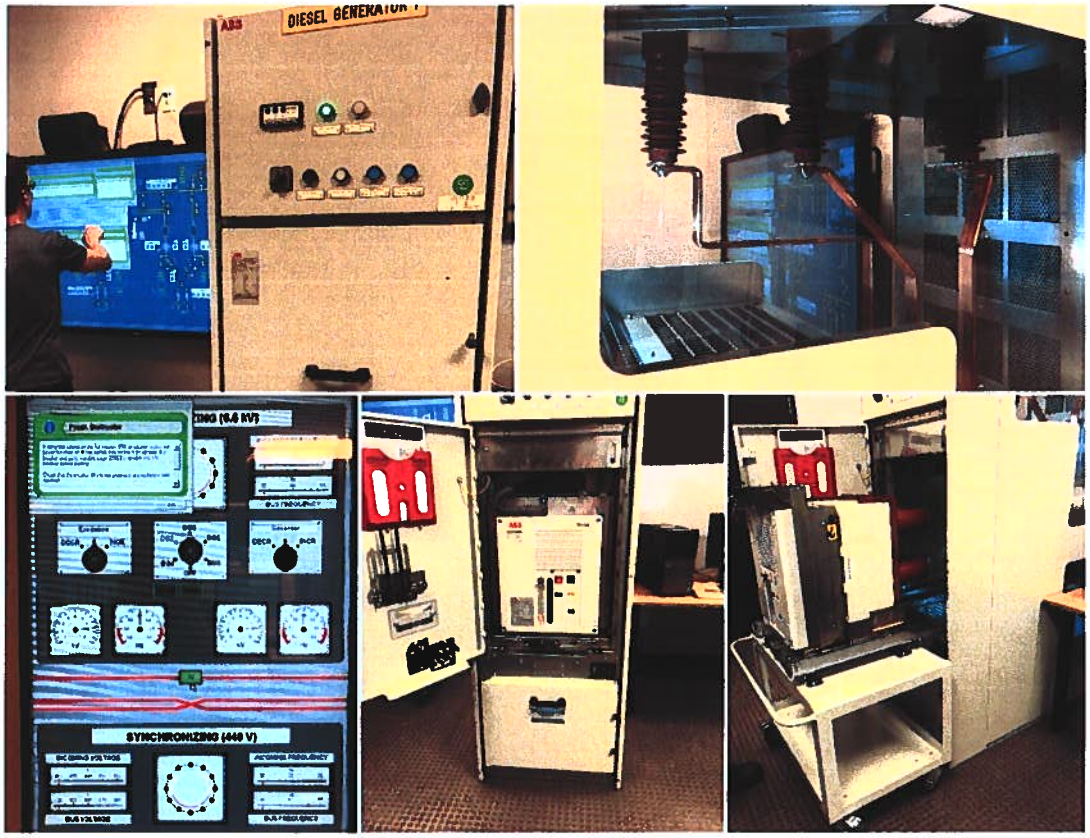

Figure 6-5: Shore-Based Individual Trainer - High Voltage Trainer

6.6.2.2 Shore-based Team Trainers

Shore-based Team trainers (SBTTs) will focus on developing the skills of teams and groups of teams.

An example of an SBTT is the Synthetic Environment Advanced Warfare Operations Leadership Facility (SEAWOLF). This is a virtual team trainer which is multi-purpose: it is used for IT&E and CT and can function as a standalone learning space or be connected through the Distributed Mission Operation Centre (DMOC) to other RCN TT and/or ships and/or Allies' TT or platforms for expanded Collective Training exercises. Figure 6-6 is an example of an SBTT in use with the Royal New Zealand Navy. It provides realistic synthetic environments that are high fidelity simulations of real-world conditions.[18]

Figure 6-6: Royal New Zealand Combat System Team Trainer

6.6.3 Networked Training

Networked Training is based on TT and instructional spaces at multiple locations being interconnected. This will be enabled in the FNTS through the Digital Framework System, using common international industry and defence standards for communication and data. Networked Training will provide shared instruction, currency of instructional material, centralized scenarios, system operation and management, and system maintenance functions.

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[18] Esprit de Corps Industry Watch Volume 24-4, June 16, 2017 (http://espritdecorps.ca/industry-watch/industry-watch-whos-who-and-whats-what-in-the-defence-sector-5) Photo used with permission of Royal New Zealand Navy.

Networked Training will provide the ability to centralize some key support functions. A central location may be used to manage scenarios, monitor networked TT usage, provide individual location troubleshooting, and remotely conduct software maintenance such as software patches or upgrades.

6.6.3.1 Distributed Mission Training (DMT)

Distributed Mission Training (DMT) is an advanced type of Networked Training that will provide tools and environments throughout the training spectrum but focussed on CT. Complex capabilities and higher-end war-fighting proficiency development will be enabled through high realism within controlled environments. DMT optimizes the Live, Virtual, and Constructive (LVC) elements of modelling and simulation.

DMT will be enabled by the FNTS Digital Framework System, and the Distributed Mission Operations Centre (DMOC). The DMOC serves as the key interoperability hub which connects the more complex TT to each other as well as with ships alongside or at sea. The DMOC also serves as the Canadian hub for participation in much larger virtual exercises with other CAF elements and NATO Allies. Ships will be capable of participating in joint and combined DMT while alongside or at sea.

6.6.3.2 Technology Enabled Instructional Spaces (Classrooms)

Technology Enabled Instructional Spaces or Classrooms (TECs) are considered a type of TT that support and exploit Networked Training. They are instruction spaces with the capability to plug and play various networked TT and will be networked with other TECs in any location, through the DF System. They will include various computers and peripherals for access to, and delivery of, digital tools and content.

TECs will be rapidly reconfigurable for different types of training activities and by a variety of delivery methods. For example, TECs can be used for traditional instructor led classes, small group facilitated discussions, large group lectures, or provide space for facilitated individual access to DL modules. Delivery methods in these instructional spaces could include anything from cutaway engine models, sewing machines or a use of augmented or virtual reality.

6.6.3.3 Embedded Trainers

The TT System includes the embedded training functions, modules, and environments that are embedded in operational ship systems. These will also support and exploit Networked Training. Embedded Trainers (sometimes referred to as Platform-Based Trainers) will provide increased frequency and depth of individual and team training onboard.

Embedded trainers will deliver increasingly realistic complex IT&E and CT in simulated operational environments. They can be networked with other ships' embedded trainers', external shore-based distributed simulation environments (a version of DMT), and other TT such as the MRTs in the schools. Networking will be done through the DF System.

Incorporating embedded trainers as part of the larger network training capability will provide real-time training within the RCN and with joint and allied forces. The use of shared training assets, performance support tools and software, common to both ship and shore-based Training Technologies, increases efficiencies and effectiveness in both learning and resources.

6.6.4 Number of Training Technologies

Table 6-1 summarizes the total number of TT needed for the FNTS, and also indicates which of these will likely be classified.

TT were grouped in Table 6-1 for ease of analysis:

a. Job Aids/Training Aids (TA1) - portable real equipment;
b. Job Aids/Training Aids (TA2) - small/medium fixed real equipment (e.g., Diesel Generator cutaway model;
c. Job Aids/Training Aids (TA3) - large fixed real equipment (e.g., Close In Weapon System (CIWS) mount, 57mm, Dynamic DG);
d. Shore based Individual Trainer (SBIT) – small/medium simulated equipment (e.g., Integrated Platform Management System (IPMS), Battle Damage Control System (BDCS), High Voltage switchboards, drivetrain);
e. Shore based Team Trainer (SBTT) – large simulated equipment (e.g., Replenishment at Sea trainer, SEAWOLF, SEACOT, Bridge), and
f. Distributed Mission Trainer (DMT) – large and complex simulated equipment (DMOC, DMOC annexes, and associated).

Table 6-1 indicates that over 1500 Training Technologies will be developed for the FNTS. Some of these 1500 will be procured as part of other major capital projects, and some will be procured as part of bespoke FNTS projects.

Table 6-1: Initial Analysis of FNTS Training Technologies Numbers, Security Requirements, and Footprint

Training Technologies (TT) by Category	Numbers of TT by Category	Footprint per TT	Total Footprint (both coasts)	Total Footprint (Secure vs Non-secure Requirements)	
		m^2	m^2	Non-secure (m^2)	Secure (m^2)
TA1 (non-secure)	440	2	880	880	
TA1 (secure)	254	2	508		508
TA2 (non-secure)	32	50	1600	1600	
TA2 (secure)	12	50	600		600
TA3 (non-secure)	50	81	4050	4050	
SBIT (non-secure)	518	6	3108	3108	
SBIT (secure)	254	6	1524		1524
SBTT (non-secure, small)	14	300	4200	4200	
SBTT (secure, small)	12	300	3600		3600
SBTT (secure, large)	24	1131	27144		27144
DMT (non-secure)	6	87	522	522	
DMT (secure)	8	87	696		696
Total	1624	2102	48432	14360	34072
				29.6%	70.4%

7 FNTS DIGITAL FRAMEWORK (DF) SYSTEM

7.1 Introduction

The FNTS DF System is defined as the management, data, networks, tools, standards, policies, and technologies that realize the digital function requirements of the FNTS.

This section of the CONOPS presents the situation with respect to the Digital Framework in the existing NTS, lists the associated capability deficiencies, and then covers other considerations and assumptions, and preliminary FNTS DF System HLRs. It concludes with a description of an FNTS DF System concept.

7.2 NTS Existing DF

A Digital Framework (DF) System in the context of a modern FNTS does not exist in the current NTS.

The CAF Data Strategy has set the goal to "Provide the tools and infrastructure to enable the Defence Team workforce to use data to create value."[19] This is to correct the current state of limited policies, standards, and a variety of disparate and disconnected data stores that preclude a Single Trusted Data Source, which results in ineffective, inefficient and sometimes incorrect decision making.

The approach and solution concept for the FNTS DF system are described below in Section 7.6.

7.3 NTS DF Capability Deficiencies

Existing DF capability deficiencies include:

a. Lack of ability to exploit data. There is no IT-based data integration capability within the NTS. There is a disconnect between doctrine, operational, and technical/maintenance procedures, and the training used to support them. This disconnect relies on lengthy practices and procedures to close which induces time and performance gaps in training. At present, data needs to be hand transferred from one enterprise system to another leading to time lags and introducing extra human errors in accuracy. In more detail, current connections are made on single purpose APIs. This means that the training resultant from new projects, Steady State Training (SST), and all associated personnel and technical processes that feed training do not benefit from an ability to use or exploit data used from other fields. This precludes the ability to train in a digital and data-rich environment.
b. Lack of Product Data Management (PDM) plan. A PDM plan reveals data pertinent to Reliability, Availability, Maintenance, Cost/Supportability Analysis. This feeds Integrated Product Support Analysis that provides amplified data concerning not only how the NTS itself is performing but the maintenance and operational tasks that are used by the DF System to steer training objectives and training content.
c. Lack of integration with or exploitation of data from operations. There is no Data Management plan and associated data standard used in higher level operational systems. Operational data would otherwise feed training curriculum in the form of changed tactics, techniques, and procedures and even doctrine. Without an accepted

[19] DND CAF Data Strategy, pg. 13

data model for operational data, and without applying international industry and defence standards to that data, integration is not possible.

d. Inadequate physical and digital networks. The Enterprise networks are limited by aging physical infrastructure. Unlike many of our Allies, the use of Cloud solutions and Wi-Fi delivery have not been widely adopted due to security concerns. This severely constrains DL.
e. Lack of capability for seamless transmission of classified data and training materials. The NTS does not provide seamless transmission of classified training materials from the training development sites, to the secure learning spaces. Current methods of accessing and transferring large content files requires the manual transfer of files via external hard drives or USB sticks that themselves must be accounted for to ensure security. This data then needs to be security and cyber scrubbed prior to use. This practice is far too burdensome and does not encourage the free flow of information that is critical to the NTS. The NTS is unable to access externally supplied or stored content from other systems without having to develop middleware to provide access through the learning architecture.
f. Lack of capability for seamless transmission of non-classified training materials. The NTS does not provide seamless transmission of classified training materials between contractors, training development sites and secure learning spaces
g. Insufficient connectivity. The NTS relies on CAF IM infrastructure, processes and procedures which provide limited bandwidth and different networks at different geographic locations. These different system capabilities reduce connectivity not only between ship to shore but between NTS sites (Naval bases and formations). This is acute during the winter months when the shore infrastructure is often affected by adverse weather conditions. Further, student accommodations have very limited Wi-Fi which precludes effective DL.
h. Insufficient bandwidth. The NTS relies on Base IT/IM infrastructure that is characterized by insufficient bandwidth capability. This precludes the delivery of modern, complex, media rich digital content and use of modern digital business tools.
i. Poor learner record management. Learner records are currently managed via stove piped systems, in various locations, that are largely based on manual data entry. This precludes accuracy and timeliness.
j. Lack of a Learning Object Repository (LOR). The NTS has gigabytes of purposed educational and training resources that are inaccessible to users. Currently there is no metadata tagging or file management policies in place. This limits the ability to present content in a relevant and contextual manner and constrains ease of access for multiple use cases and purposes.
k. Lack of collaborative content development and asset management. Without cloud based development tools and shared access to asset source files there is no ability to collaborate between internal units, industry and academic partners. This results in siloed development with little iteration and inability to transfer, reuse and purpose content across internal and external domains. This inhibits the transfer of data between internal units for development and delivery. It further inhibits the ability for personnel to collaborate with and receive data from industry and academic partners.
l. Lack of Quality Management. The NTS is unable to access consistent, reliable data to create and report performance metrics and support Continuous Improvement. Data is

often stored in individual data warehouses or not at all, and there is no QM to effectively leverage the data.

7.4 FNTS DF Considerations and Assumptions

The following considerations and assumptions will impact the DF System:

a. DND digital initiatives will provide the enterprise Digital Framework and Data Clouds. The FNTS DF System will be a subset of these;
b. The FNTS DF System will utilize and build upon networks, services, policies, and standards provided by agencies such as: SSC, ADM(IM), ADM Data, Innovations and Analytics (DIA), and Director Information Management Security (DIM Secur). This will allow the FNTS to exploit enterprise digital data systems that employ common digital frameworks, data models, linked open data, and exposed data throughout DND and the Government of Canada. This in turn will enable an integrated FNTS that enables responsive and operationally relevant instruction, technology enabled learning, integration with life-cycle management, and integration with operations;
c. The Training Facilities System will accommodate the FNTS DF System infrastructure;
d. ADM(Mat) will consistently adopt and implement modern, accepted standards and specifications for data tagging, technical publications, interoperability and usage, and evolve procurement requirements for training elements in concert with accepted standards and specification evolution;
e. The FNTS will continue to leverage industry for the creation of content with increasingly interactive media intense content; and
f. ADM(IM) and SSC, or their future incarnations, will sustain the DF System.

7.5 FNTS DF Preliminary High Level Requirements

The following are the DF System preliminary High Level Requirements (HLRs):

a. The DF System must utilize standard data models and international industry and defence standards and specifications to provide for system, data and network interoperability between and with all aspects of the FNTS;
b. The DF System must integrate with, and leverage the larger DND Digital Framework and Integrated Data Environments (IDE) to optimize use of existing data pipelines, enterprise systems, business tools, information management, and ensure a Single Trusted Data Source;
c. The DF System must enable user-friendly secure transfer of large content files and provide access for testing, piloting, and evaluation of content within the FNTS, and with academic and industry partners. A robust and scalable DF System is critical to support collaborative industry and internal development, asset management and ability to work with teams across DND and with industry;
d. The DF System must operate continuously, without interruption, with 99% availability across the FNTS, including down-time for maintenance activities. This will enable Distributed Learning anywhere the trainee can access the DLN, Canadian School Public Service (CSPS) or GC Campus and Learning Object Repositories. This includes training outside of traditional work hours such as in Naval Reserve Divisions and Ships at sea. The DF System must have the capacity and robustness to sustain this service while maintenance is being conducted;

e. The DF System must be designed to maximize cost effectiveness, both for initial implementation and recurring operation and maintenance costs. A holistic approach must be used to minimize total cost of ownership. This infers that the DF System must be managed using standard RCN materiel and IT/IM life-cycle management models and procedures;
f. The DF System must respond to changes in production requirements (surges), evolving doctrine, new maintain and operate tasks, and readiness requirements rapidly and effectively. This flexibility facilitates efficient, cost-effective operation of the FNTS. Training will be delivered via a spectrum of integrated training media and methodologies provided by the TT System;
g. The DF System must not degrade the end-user experience through the provision of any cloud-based, thin client services or other technologies;
h. The DF System must have cyber protection for all its networks and information. The DF System must provide secure connectivity between locations that manage, develop, and deliver training in both secure and non-secure environments. It must protect against intrusion, denial of service, and compromise, both through physical and logical means. It must contain robust access control and audit capabilities. The DF must have redundancy to maintain functionality in the event of a disaster in one location. DF infrastructure practices must be compliant with DND security policies;
i. The DF System must leverage new technological solutions to provide a transformative end user experience. For instance, it must support real-time collaboration, seamless mobile computing, and enhanced information management. The DF must provide a superior experience for staff and students within the FNTS; and
j. The DF System must provide the capability to easily access current, accurate performance data, to support and enable analytics, performance management, Quality Management, business planning and Continuous improvement.

7.6 FNTS DF System Solution Concept

The success of the FNTS lies in the effective exploitation of technology and information management. Integrated, accessible networks and knowledge repositories are the cornerstone of this goal.[20] Many of the goals and principles of the FNTS DF System are identical to the RCN Digital Navy Strategy (Ref C and D) and the RCN Concept of Training (Ref B). These documents emphasize the requirement of the FNTS to embrace the innovative application of modern training modalities, and an openness to new ways of doing business, with an unwavering commitment to lean forward into the digital space. Another key element will be the adoption of international industry and defence standards for processes and data, enabling each system within the FNTS to closely link together, and providing coherence through a Single Trusted Data Source.

There will be no distinct interim DF System solution for FNTS, but an evolving, agile state that will see incremental improvements. Several initiatives are already, or soon to be underway. The end goal is the ability to seamlessly manage, access and apply data where and when users need it. This will be achieved through a robust integrated network and digital model, a Single Trusted Data Source, and easy to use business tools.

[20] RCN Concept of Training, pg. 12

Prior sections in this CONOPS have highlighted the importance of the DF System with respect to the Governance System, TM System and TT System. The DF System is the functional enabler for the complete FNTS.

7.6.1 Subset of the RCN Digital Framework

The FNTS DF System will be a subset of the RCN Digital Framework as shown in Figure 7.1. The RCN Digital Framework is comprised of current and emerging technological tools that will be leveraged to feed and enhance the six major Systems of the FNTS.

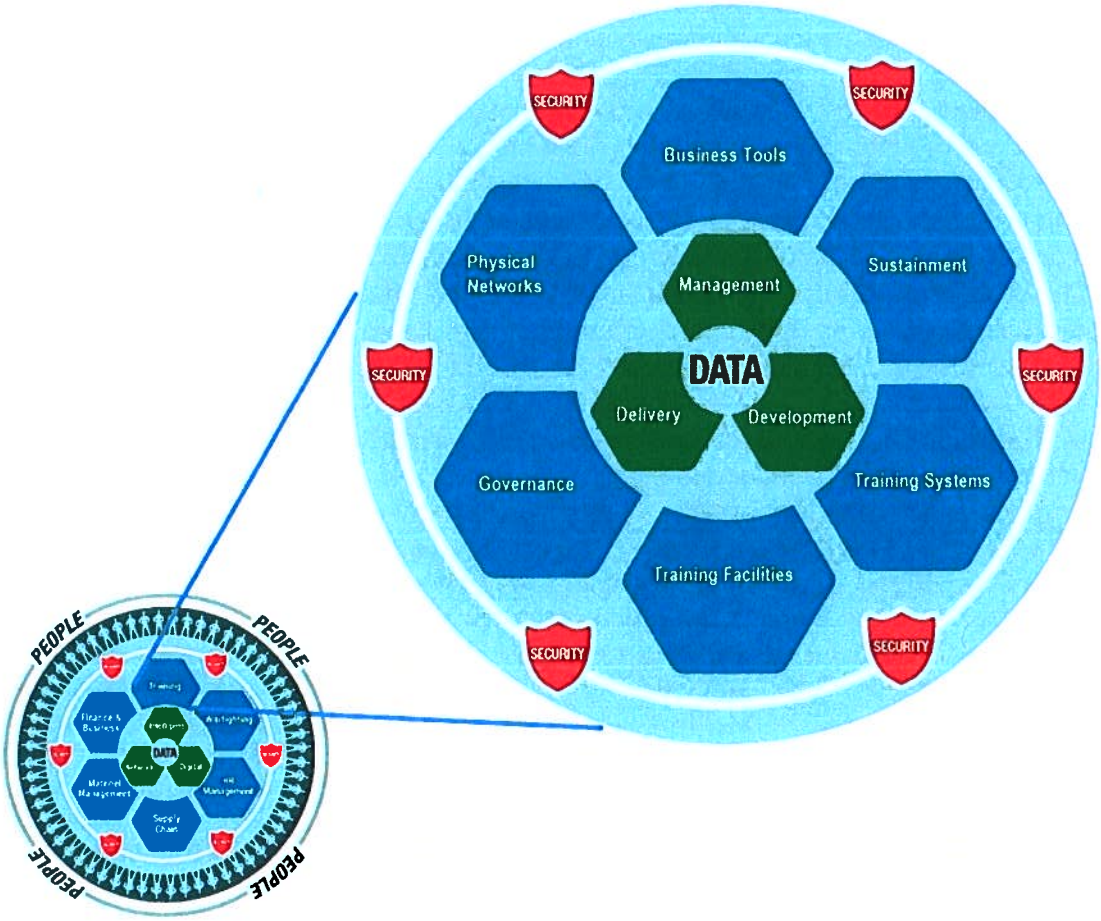

Figure 7-1: FNTS Subset of RCN Digital Framework

Data features prominently. Its role is to enable informed, timely, and evidence-based decision making. All Data in the FNTS DF System is a subset of Data in the larger RCN Digital Framework. This is the Single Trusted Data Source that has been referred to in several sections of the CONOPS.

The Training Management functions of Management, Development and Delivery (shown in green) are depicted as an inner layer within the framework. The FNTS DF System also supports the core business functions (illustrated in blue) required to deliver and sustain the FNTS.

Networks are represented in light blue. They comprise the hardware and software used to connect people to data and enable the operations and business functions to operate in both secure and non-secure settings, including the technical means used to handle information and aid communication. Networks include everything from the corporate classified and unclassified networks to the backbone for Audiovisual and Video teleconferencing networks.

Security surrounds all the inner elements of the framework, emphasizing that all aspects of the FNTS DF will consider security requirements and considerations.[21]

The DF System will be user-friendly. It will provide clear guidance and direction, interconnected data sources, and self-serve, intuitive and easy to use tools for data discovery, analysis, visualization and management. The underlying security systems, networks, functional business tools, systems and data used to accomplish tasks will be transparent to users. The DF System will provide seamless integration of, and access to, a Single Trusted Data Source, from all parts of the FNTS.

The DF System will provide the link between RCN enterprise data systems and FNTS data systems such as Learning Management Systems (LMS), Learning Record Stores that record learning experiences and results, Learning Object Repositories (LOR) that store content/metadata, and various business and administrative applications, while ensuring privacy and cybersecurity compliance.

The DF System will be a critical enabler for Distributed Learning, supporting continuous career education that is data driven, competency based, learner centric, and provided holistically across the FNTS from entry to graduation. The DF System will provide data and networks compliant with the RCN Data Framework technical specifications and data models, to enable a common language between resources, technologies and systems. As such, there will be several focus areas common to the Digital Navy initiative as shown in Figure 7-2:

[21] Adapted from RCN Digital Navy Strategy, pg. 13

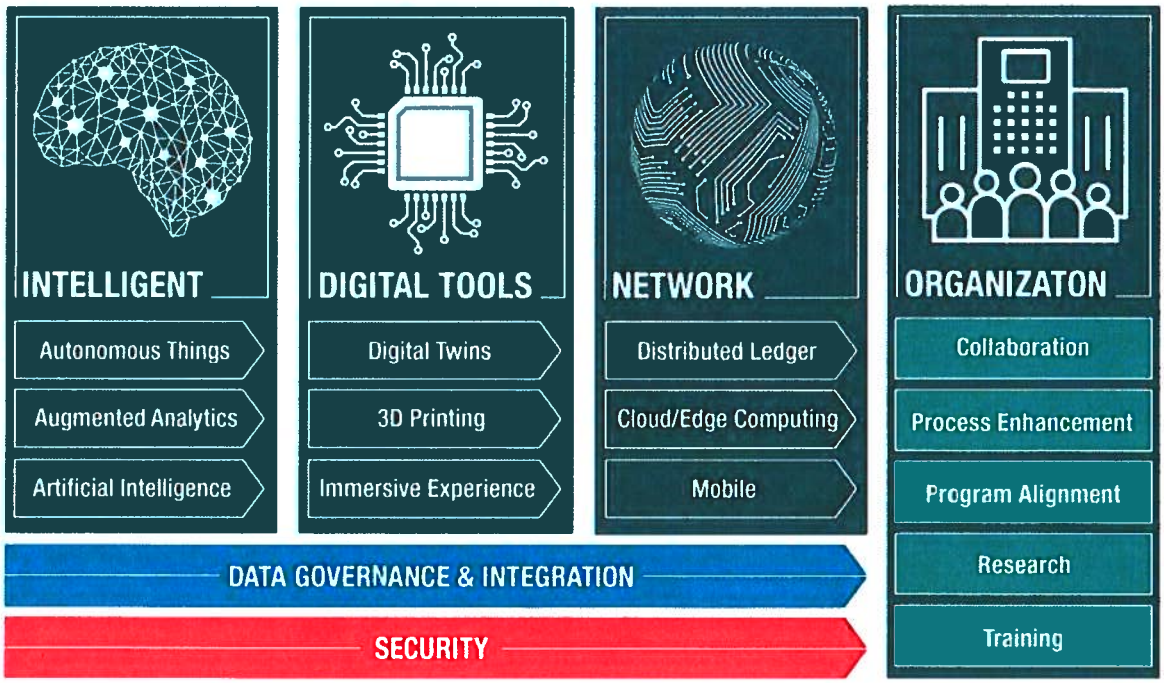

Figure 7-2: Digital Navy Focus Areas[22]

The Intelligent focus area includes those technologies that are being driven by Artificial Intelligence (AI) with a particular emphasis on machine learning.

The Digital Tools focus area encompasses a wide range of digital capabilities that have the potential to empower and augment members of the naval team. It includes technology such as Digital Twins and includes Virtual Reality (VR), Mixed Reality (MR) and Augmented Reality (AR) technologies that can enhance training and assist members of the naval team in the performance of various tasks.

The Network focus area includes various digital technologies that make it possible to connect an expanding set of people and devices across networks. It encompasses cloud-based computing capabilities, the Internet of Things (IoT), powerful mobile devices, and emerging block chain technology that present exciting possibilities to improve the way business is conducted in the FNTS.

Data governance and integration span all digital technology categories. Optimum data quality will be exploited to drive timely, informed decisions and effective TM, TT, and Sustainment functions across the FNTS.

Security will be aimed at defending naval personnel, digital equipment and systems and the sensitive data contained therein from malicious or otherwise unauthorized activity. Data control will extend to protection of personal data across cloud environments. Data Security entails close

[22] RCN Digital Navy Strategy, pg. 14

collaboration with departmental security officials and includes activities that will be pursued under various cyber security strategies and initiatives.

The organization focus area concentrates on efforts to make the FNTS a more agile, innovative System of Systems, able to rapidly identify, assess and adopt advantage-conferring digital technologies. This will involve initiatives to improve business processes and instill a culture that is more risk-tolerant and experimental.

With integration between RCN enterprise data systems and the FNTS, learner profile data and records will be promulgated seamlessly to support adaptive and predictive learning paths across continuous career progression. The harmonization of credentials across multiple data systems will ensure integrity and accuracy of information for planning.

7.6.2 DF System Functional Perspective

The DF System is complex and can be viewed from several perspectives. Figure 7-3 shows the DF System from a more functional perspective.

The outer yellow circle of the diagram contains the technical and operational standards, competency based framework, and external sources of data and systems that form the FNTS DF System. Technical and operational data is organized and tagged using Industry standards which can then be consumed and applied throughout the FNTS.

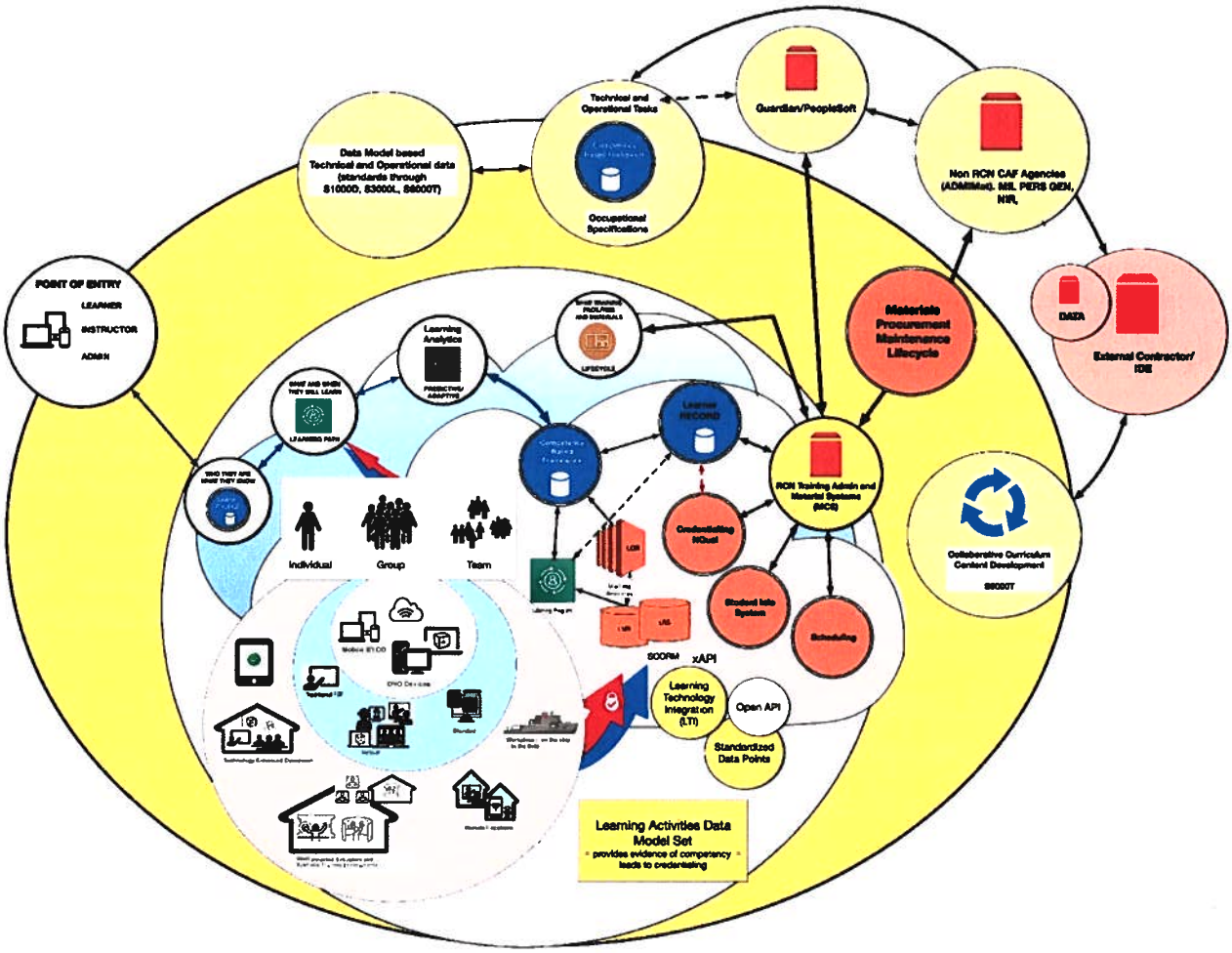

Figure 7-3: The DF System Functional Data Model

The Competency Based Framework (CBF) (central dark blue circle) collates data into technical and operational tasks, which can be sorted into jobs, that are then sorted into occupational specifications. The CBF provides an anchor point for operational and technical tasks to be assigned to occupations for curriculum and content development. The data is used for multiple purposes including tracking, credentialing, and tagging of learning content. Curriculum and content development leverages data and resources from industry and government to align learning experiences with performance based assessment. This enables competency based credentialing. The result is curriculum and content development that fully addresses the required learning elements, and describes how the training moves from simple competency based tasks, to the white circle as meaningful learning.

Technologies that are open and able to interoperate are required for the interchange of data, generation of content, and distribution within and external to the system. These connectors include Open API, learning technologies integrations, and standardized data models such as xAPI represented by the yellow bubbles at the bottom of the grey cloud. Using xAPI as the language to express the CBF against learning achievement, is key to providing learning experiences through multiple modalities, and interaction with learning opportunities inside and external to the FNTS DF.

Open APIs allow learning experiences, competencies, learner data as well as content to move between technologies and systems, enhancing opportunities for predictive analytics and reporting (the white bubbles near the top of the white circle). xAPI tracked learning experiences provide opportunities for stacked credentialing and predictive learning analytics.

Connectors represent the interoperability and exchange of data between training technologies, training admin, material systems, and tools within the large white circle such as the Learning Management System (LMS), Learning Record Store (LRS), and Learning Object Repository (LOR). This is a dynamic process that depends on Single Source of Truth. The DF System listens for changes in data and requirements from the RCN PLM systems, and the FNTS TM and TT systems which can signal a requirement for rapid updates to content and training protocols.

As a flexible and adaptive underlying network, the DF is capable of collecting, analyzing and reporting on all aspects of the learner experience, administration requirements and infrastructure elements. This is what supports the Distributed Learning elements of the system as identified in the center of the diagram and answers the questions of who the learners are, what do they know now, what do they need to know for their next job, and do they know it when doing their jobs. This also includes all the support required for future facilities/materials and lifecycle attributes. This promotes data driven decisions and planning through a central point of entry or portal capable of generating real time metrics and analytics.

7.6.3 Particular DF System Solution Concepts

There are several particular solution concepts to be considered:

a. Integrated Data Environment (IDE);
b. Data Standards;
c. Networks and Data Cloud;
d. Bandwidth; and
e. Integrated User Portal/Dashboard.

7.6.3.1 Integrated Data Environment (IDE)

With multiple projects in the RCN specifying a requirement for an IDE, the potential for the creation of multiple data stovepipes is high. To avoid this, ADM(Mat) has begun discussions to develop a single holistic Naval IDE (NIDE). The NTST Program will be a contributing stakeholder in this initiative.

As illustrated in Figure 7-44, the IDE will provide authenticated access to a collaborative environment that encompasses DRIMS, Training, Material Management, Technical Publications, and, the data from each of these sources and more that pertains to human performance, such as maintain and operate tasks, and, as a result, transforms training requirements.

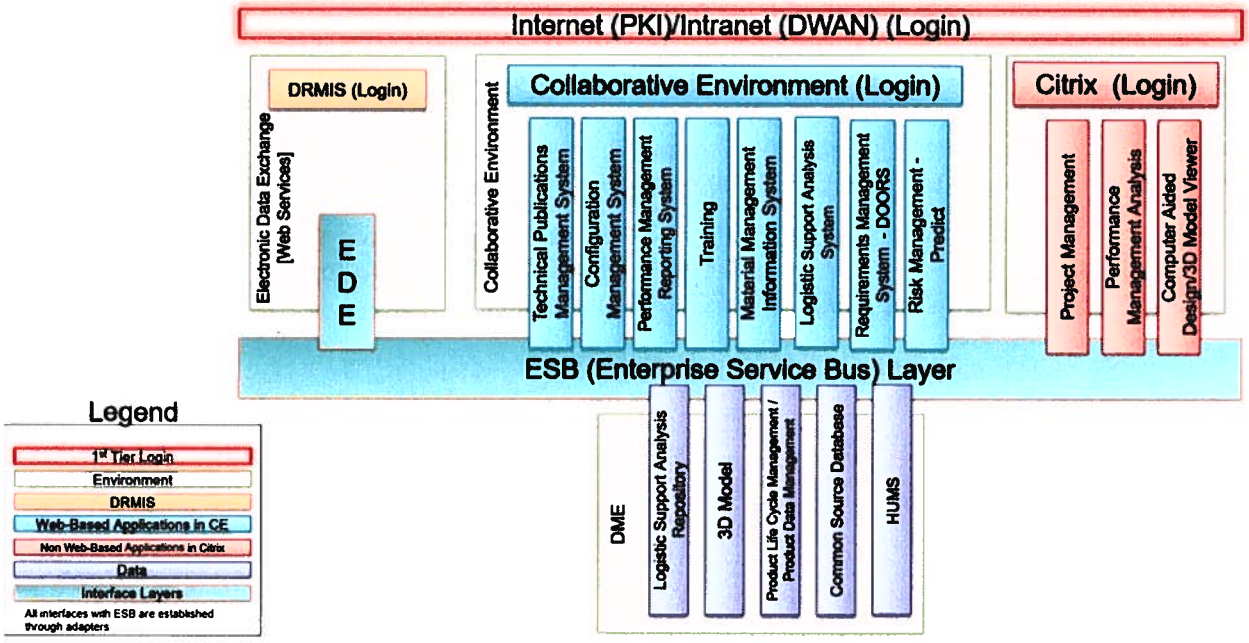

Figure 7-4: Visualization of Potential Naval Integrated Data Environment (NIDE) [23]

7.6.3.2 Data Standards

An essential enabler for data drawn from the Single Trusted Data Source is the FNTS' ability to exploit interoperability and integration of the data because it is based on common international industry and defence data standards and specifications.

In summary, data is created by separate systems, then collected, fused, and made available in/through the IDE to other systems. When the data is created and supported by metadata that complies with a standard, the exploitation of that data becomes seamless. Therefore, the DF System will apply accepted international technical standards, specifications and practices to achieve these benefits.

Standards enable an integrated data strategy that links open data, federated data, and resources necessary for enterprise-level analysis and decision support. Applying this strategy to exploit integrated enterprise digital data systems and learning environments will set the conditions for a

[23] Naval Integrated Data Environment (NIDE): A Solution for Canadian Surface Combatants (CSC) Kickoff Workshop ppt presentation, March 6, 2020

training ecosystem that is responsive and operationally relevant, integrated with life-cycle management, and will improve the quality of planning and reporting through data analytics.

The current base of these is the S Series ILS Specifications, most specifically S1000D and evolving S6000T.[24]

S1000D is already widely used in the RCAF and industry, and all new projects within ADM(Mat) are required to implement the specification[25]. This standard allows for the tagging of data enabling the consistent storage and retrieval from a Common Source Database (CSDB)[26]. In the context of the RCN Digital Framework, the CSDB is the Data Cloud.

S6000T v.1 was released in early 2020 and will be the standard international specification for training Information, with the goal to establish a global specification for training analysis and design. Integrated adoption of S6000T by ADM(Mat) and the FNTS would redirect "training's primary data sources to higher-value logistics, supportability, and engineering data for requirements. The enforcement supporting the upstream focus will be updated Contract Data Requirements Lists (CDRLs) and Data Item Descriptions (DIDs) that specify training needs analysis deliverables during supportability review gates" in any new TT acquisition.[27]

The current ADM (Mat) standard for LSA is GEIA STD 0007, which produces data regarding maintain and operate tasks in a format that is consumable within a framework that uses S1000D and S6000T. The S-series equivalent is S3000L.

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[24] S Series Integrated Logistical Support Website, https://www.aia-aerospace.org/standards/s-series-ils-specifications

[25] A-LM-505-706/JS-001

[26] Common Source Database can be defined as the "store" for the containment and management of data modules. S1000D does not define its functionality or otherwise. It just states that there is a requirement to hold and manage the data modules produced within a program. Ibid.

[27] OPNAV N12 Analysis: ARTT Support and Capabilities for PMS 339 and O7TR, Wayne Gafford, pg.10

Figure 7-1 below is a slide which shows the relationship between S6000T and how it relates to S1000D and S3000L (or data emerging from GEIA STD 0007) moving from Training Needs Analysis to Training Design and the Development of Training for delivery. The Series ILS Specifications defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

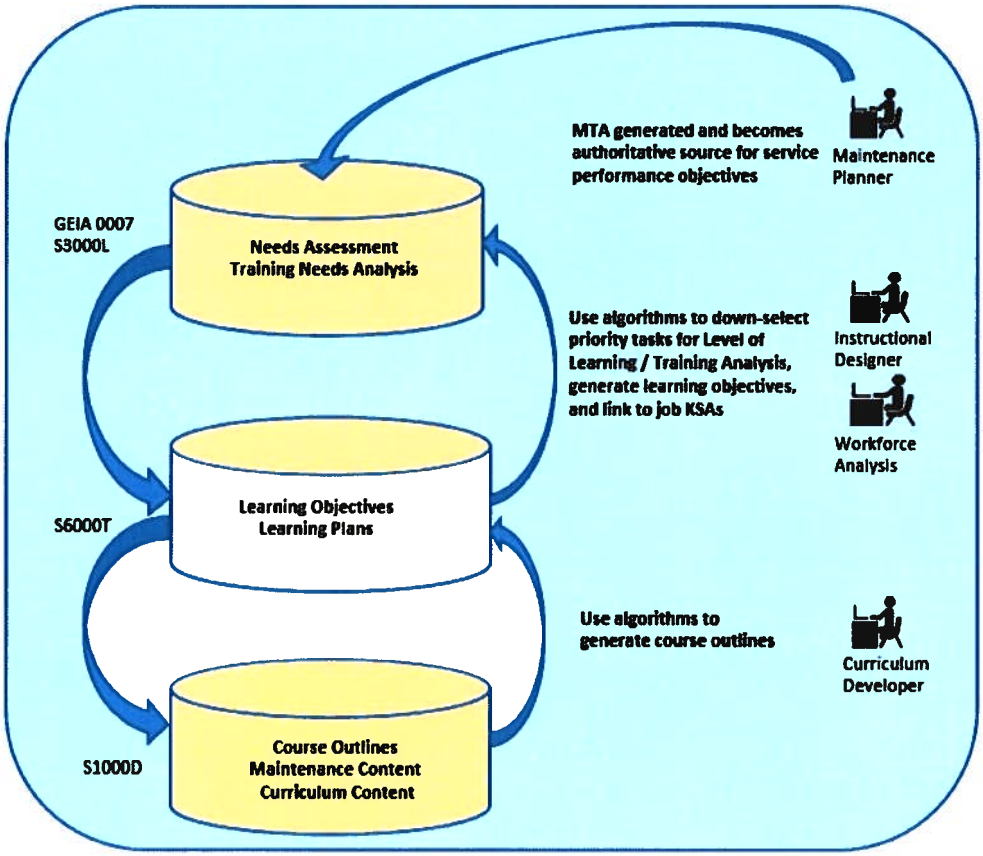

Figure 7-1: Conceptual Representation of S6000T in TNA, Development & Delivery Process[28]

7.6.3.3 Networks and Data Cloud

The FNTS will rely heavily on consistent, responsive access to a variety of networks, data clouds, strategies and international industry and defence standards provided by both Industry and Government. These networks will be the backbone of the DF System. The architecture will be determined by ADM(IM) and Shared Services Canada (SSC) as it is within the mandate of these organizations to do this but input from the primary stakeholder for training, the FNTS, must be considered.

[28] Table adapted from ARTT Concept of Operations - Phase 3, OPNAV N12, v.1.1.0

The DF System configuration in each physical location will be tailored to the specific security level and functions needed. Increased access to, and adequate bandwidth of, a secure network will be an essential component.

The long-term direction of SSC is to reduce the local server requirement and to centralize services as much as possible. The DF System will follow this approach. However, due to the geographic extent of the FNTS, it will be necessary to host "local survivability" services at local sites. These local services will provide essential services to a subset of the FNTS in case of an emergency or disaster.

"The DND and the CAF have many disparate, individually managed IT environments, networks, and platforms. As the DND and the CAF progress with the implementation of its Defence policy: Strong, Secure, Engaged, there is an increased demand to leverage innovative technology. An agile enterprise approach to cloud computing has been proven within other governments and Defence organization to significantly improve IT capabilities, strategic investments and business practices by enhancing the interoperability of IT systems to collaborate and share information."[29]

The FNTS DF System will leverage the GC/CAF data cloud.

Figure 7-2 illustrates a high-level view of the expected DF networks and data clouds. These will provide students and staff with the capability to connect with the tools and data needed to design, develop and consume content, manage training, and administer courses. The Campuses' and Naval Reserve Divisions will consume content from DLN and DWAN. The ships will connect to training exercises and consume content. NPTG HQ will coordinate training programs and initiatives.

[29] Defence CIO Communique 001/19, Joint Defence Cloud Programme, August 8, 2019

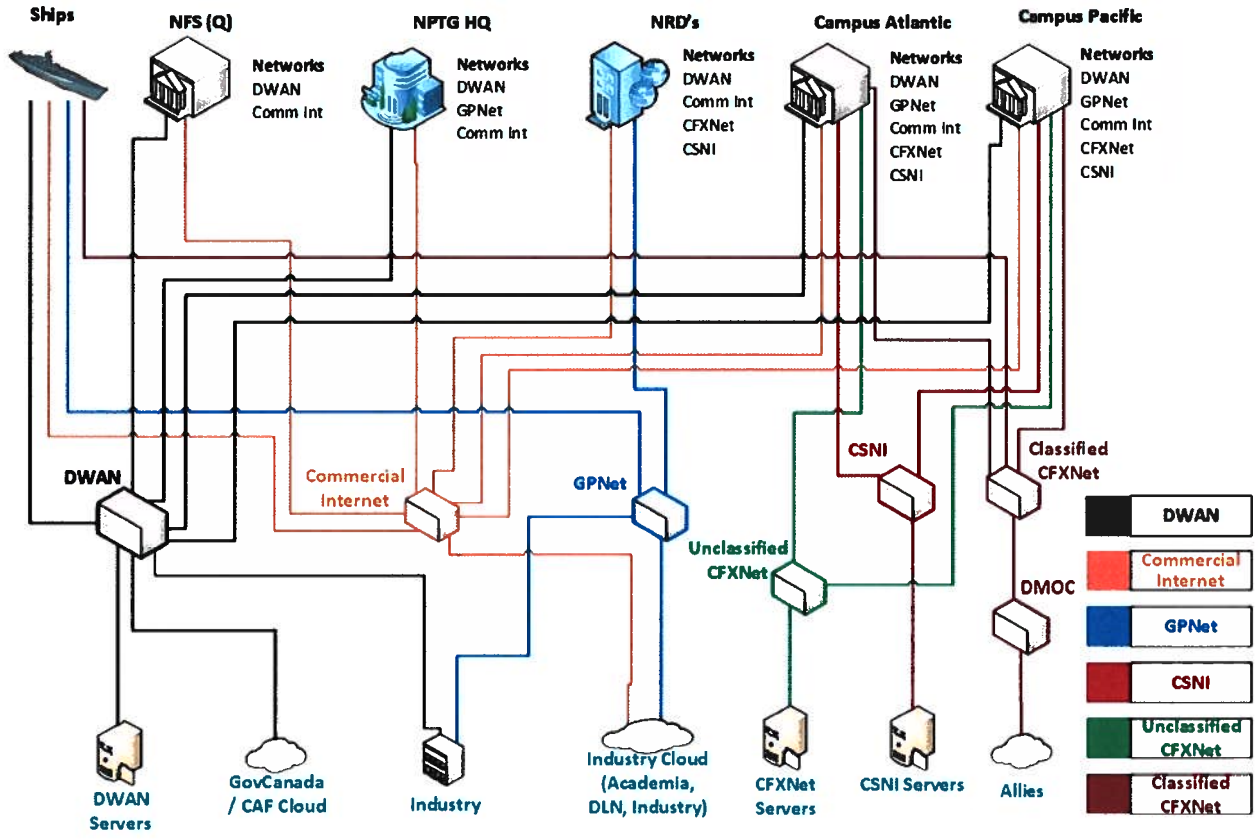

Figure 7-2: High Level Vision of FNTS DF

7.6.3.4 Bandwidth

In addition to the RCN Digital Navy Action Plan, there is an ADM(IM) initiative to improve bandwidth across DND. Formations will see expanded bandwidth from 40MB to 1GB to 10GB over the next five-ten years. This will significantly improve the digital capacity, and experience of users. Effectiveness of the FNTS DF will depend heavily on this initiative but currently remains challenged by lack of progress in at-sea WIFI networks that would increase access and bandwidth beyond the limits of at sea DWAN. This is essential so that users at sea can benefit from the content developed within the context of the FNTS: without it, they cannot. The DF System must provide for situations where connectivity is unavailable with delivery via on-board networks or downloadable, standalone content.

The DF System will provide interoperability using Open APIs, Learning Tools Interoperability (LTI)[30] standards, Experience API (xAPI) and common data models. Critical to this is the network configuration and bandwidth necessary to support interoperability between Training Technologies, and the delivery of educational resources and content to widely dispersed locations.

[30] Learning Tools Interoperability, IMS Global, http://www.imsglobal.org/activity/learning-tools-interoperability

7.6.3.5 Integrated User Portal/Dashboard

For the instructor, an integrated portal or dashboard will be provided to track performance metrics and interact effectively with students. Learning tracking through the application of Artificial Intelligence (AI) and learning analytics will support the collection and reporting of real-time learning behaviors and performance of students, which will be used for analytical purposes, Quality Management and the continuous improvement cycle.

Figure 7-3 below illustrates the concept of a learning dashboard, which could be implemented in a variety of ways such as a software application installed on a student or instructor's primary electronic device or web portal accessible from any approved device. The purpose of this dashboard is to abstract or summarize the details of the simple operations between the user and the FNTS Digital Framework. What appears on a user's dashboard would depend on the user's function. This would be the case not only for students and instructors but potentially other roles such as system maintainers, curriculum designers, and managers.

For the instructor, an integrated portal or dashboard will be provided to track performance metrics and interact effectively with students. An instructor could obtain a list of students in a particular course, assign work or interact with students. Learning tracking through the application of Artificial Intelligence (AI) and learning analytics will support the collection and reporting of real-time learning behaviors and performance of students, which will be used for analytical purposes, Quality Management and the continuous improvement cycle.

One key function of this dashboard would be to enable an instructor to access all relevant Learning Objects that are associated with a specific teaching objective. By selecting a given teaching objective, the FNTS will automatically provide students with access to the specific relevant Learning Objects and/or streaming media for the teaching objective. This will enable students to access the learning material in a variety of different formats, supporting the overall objective of multi-modality and Point of Need. Students would not only be able to access their learning material but visually see their learning journey throughout their career, access information regarding their next posting, submit leave requests and so on.

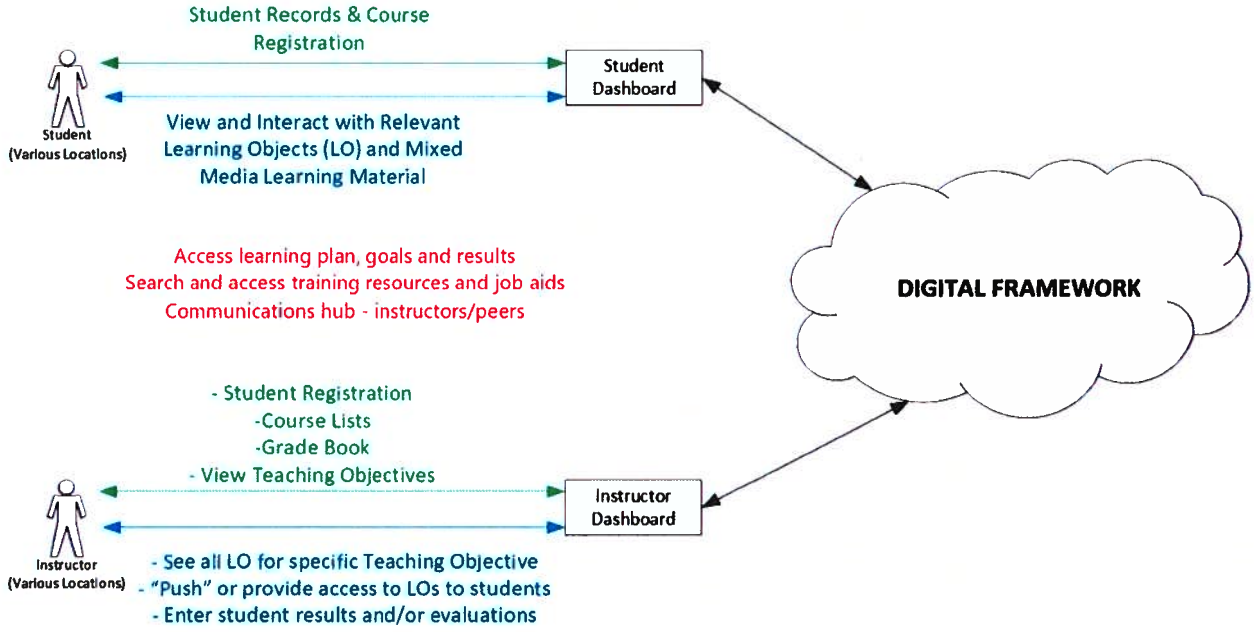

Figure 7-3: Instructor and Student Dashboard Concept

8 FNTS TRAINING FACILITIES (TF) SYSTEM

8.1 Introduction

The overall success of the FNTS depends heavily on the effectiveness and suitability of the TF System in which it will operate.

The infrastructure of the existing NTS is an eclectic, end-of-life mix of largely Cold War and some World War I (WWI) and World War II (WWII) vintage buildings, designed for a legacy training methodology that was developed well before the advent of modern information technology. The portfolio is inefficiently dispersed in multiple locations and beyond its service life. Most of its facilities were built before digital technology and lack the capability to support modern learning methodologies. Most of the existing infrastructure will not be able to adequately address FNTS needs[31] and support the FNTS requirement of a sustainable, scalable, and flexible training infrastructure that can deliver support to balanced training capacity and capabilities on both coasts.

Increasing capacity requirements are compounding the challenges facing existing NTS infrastructure age, design, and capacity. The introduction of new, modern ship platforms[32] with the simultaneous operation of legacy platforms[33] over the next 30 years, will require rapid modernization of RCN training infrastructure to meet the challenges of the Future Fleet and future global operating environment. NTST analysis indicates that maximum daily student production and support staff infrastructure capacity requirements will increase by at least 17% over the next 20 years and a modernization of the future fleet's operating systems will require FNTS infrastructure to be approximately 70% secure (Level II or above) to accommodate classified Training Technologies (trainers and simulators).

Modern, flexible, multi-purpose and easily reconfigurable Training Facilities are essential for successful Training Management, Training Development, and Training Delivery.

8.2 NTS Existing TF

The existing NTS TF mainly comprises inflexible, un-scalable Cold War era (and some WWI and WWII era), standard block buildings with an average age of 52+ years. Most of these buildings are at the end of, or well beyond, their economic service lives with large unfunded backlogs of maintenance and repairs. They are costly to operate, with many not meeting current building codes, modern accessibility requirements, Government of Canada GBA+ policies, CAF security requirements, or combinations thereof[34].

In most cases, it would be cost-prohibitive to spend recapitalization funds on repurposing, renovating and/or expanding the existing buildings to meet FNTS requirements[35]. In some cases, this may not even be an option as many are considered heritage buildings and cannot be significantly altered and will need to be repurposed to another function (not secure training). Existing information technology, information management, HVAC, and electrical limitations are

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[31] Naval Training Infrastructure Strategy Study (Reference I), FNTS CONOPS (Reference J)

[32] Including the Artic Offshore Patrol Vessels, Joint Support Ships, Canadian Surface Combatant

[33] Canadian Patrol Frigates, Coastal Defence Vessels, Patrol Class Training Vessels, and the Type 2400 Submarines

[34] Naval Training Infrastructure Strategy Study

[35] Naval Training Infrastructure Strategy Study

already impacting the NTS's ability to provide its training to the best extent possible. New Training Technologies are being delivered to the NTS but are sometimes unable to be installed or operated in current NTS infrastructure[36]. Additionally, the mandated physical infrastructure requirements for classified space cannot be accommodated within much of the current infrastructure. Furthermore, the current training infrastructure was designed to meet only the student numbers and demands for IT&E rather than the additional CT programs the infrastructure is also currently used to support. It is inadequate to meet the new demands of CT nor the increasing student capacity requirements and GBA+ requirements.

8.3 NTS TF Capability Deficiencies

The NTS TF capability deficiencies are as follows:

a. Excessively dispersed footprint. The NTS operates in over 80 different buildings across physically separated locations in Canada. This dispersed footprint is difficult to manage, expensive to maintain, and inherently inefficient. DND is maintaining dozens of buildings and building systems instead of larger, optimized collective spaces. Significant instructional time is wasted transiting staff and students to different locations for training in dispersed, under-utilized, purpose-built spaces instead of maximizing the scheduled use of fewer flexible, multi-purpose instructional spaces co-located in close proximity;

b. Prohibitive costs to repurpose, renovate, maintain, and operate. Infrastructure that is over five decades old is inefficient and expensive to maintain/operate[37]. Moreover, the majority of the existing training infrastructure does not meet current building codes, security requirements, modern accessibility or gender requirements (GBA+), contains multiple hazardous materials (such as asbestos and lead), and lacks earthquake protection. Consistent fiscal shortfalls in DND's infrastructure funding have produced tremendous maintenance backlogs in all of the NTS' infrastructure. These backlogs place the current NTS infrastructure at high risk of catastrophic failures (roof collapse, burst pipes causing flooding) leading to a high risk of injury to personnel, costly damage to multi-million-dollar Training Technologies, and lost instructional time;

c. Inability to support modern training methodologies. The limitations of the existing infrastructure significantly restrict the type of training methodologies that the Navy can utilize. The existing classrooms and educational spaces cannot be rapidly reconfigured for different training delivery, development or collaborative requirements which limits space and scheduling optimization. Most NTS infrastructure has difficulty supporting present-day information technology, information management, security, power and HVAC requirements and cannot be expanded for modern Training Technologies with higher utility support needs. It also lacks storage space for storing Training

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[36] There are numerous examples of trainers/simulators that cannot be adequately accommodated in existing NTS infrastructure. The virtual welder trainer was delivered in 2018 and suitable infrastructure cannot be found for installation. The SEACOT trainer in Esquimalt took nine years after delivery to find suitable space. The USC 63/69 Satcom trainer has been delivered but suitable infrastructure cannot be located. The SEACOT trainer in Halifax experiences over 20 failures a day during the summer months due to inadequate air conditioning. This causes significant loss to instructional time and increases trainer maintenance costs.

[37] Naval Training Infrastructure Strategy Study

Technologies when not in use and for information technology life-cycling. While the Training Technologies requirements have evolved significantly over the last 5 decades, the training infrastructure supporting the NTS has not kept pace. Cost estimates to improve the current situation do not support the investment required to recapitalize and renovate the existing infrastructure;

d. Inability to meet secure training requirements. The current training infrastructure is unable to support future fleet training in a secure environment. Existing secure training is conducted within infrastructure operating on security waivers. The predicted increases in secure training requirements (from the current 5-10% to approximately 70% in the future[38]) cannot be accommodated in the existing NTS infrastructure. Due to the reliance on local Real Property Operations (RP Ops) sections, which do not report to the RCN but, rather, to ADM IE, for repairs and modifications, there is often confusion over prioritization of work in a manner that would improve the situation. Building design limitations, infrastructure age and modern security requirements prohibit cost-effective transformation of the existing secure training infrastructure; and
e. Inability to meet increasing training capacity demands. The expected student production increases (shown in Figure 5-2) and increase in numbers of Training Technologies (outlined in Figure 6-1) cannot be accommodated within the existing NTS infrastructure.

8.4 FNTS TF System Considerations

There are several considerations for the FNTS TF System:

a. Fleet Transition;
b. IT and Building Systems;
c. Usage and Amount of Space;
d. CAF Campus Operational Framework;
e. Secure and Non-Secure;
f. Increased number of Training Technologies; and
g. Partnerships.

8.4.1 Fleet Transition

The TF System must maintain dual fleet training responsibility over the entire transition period as the Halifax class is gradually retired and the CSC becomes operational. The TF must also continue training Victoria and Kingston and other legacy classes to the end of their operational service. TF transition from old to new will be critical to maintaining overall training capabilities through this period.

8.4.2 Information Technology, Building Systems (Power, HVAC, etc.)

The baseline IT, power supply and HVAC capacity of the existing training infrastructure needs to be significantly upgraded. The existing infrastructure is unsuitable for several training devices being delivered as part of recent RCN procurements, and the number and complexity of Training Technologies in the FNTS will be much higher than what currently exists.

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[38] NTST analysis of FNTS Training Technologies and the supporting Training Development and Training Delivery requirements.

TT System and Digital Framework System requirements significantly increase the need for networked learning spaces and commons areas.

Self-paced, synchronous, and asynchronous learning will require tele-presence capabilities in most of the instruction spaces. The TF System needs to support collective simulation and exploit equipment synergies across multiple training sites, both internal and external to DND.

8.4.3 Usage and Amount of Space

The TF System will see an evolution in the usage of training spaces as well as an increase in the amount of space due to the increased production and staffing numbers. An analysis was provided above in the TM System section of this CONOPS. In summary, there will be an increase of students and staff of approximately 17% over current numbers.

The various spaces must be flexible, scalable, and multi-configurable to easily adapt to changing student production, and training methodologies.

All spaces need to support blended and remote learning and be easily reconfigurable with less reliance on purpose-built specialty spaces that are inefficient and difficult to use to their maximum capacity. A progression to flexible, reconfigurable spaces that can be readily setup with a variety of movable trainers/simulators will enable better scheduling and effective space usage. The following is a list of envisaged functions and/or space types that are required in both the secure and non-secure spaces in the TF System:

a. Individual and collective training instruction;
b. Internal and External Servers, data storage, and communication system rooms;
c. Training development and training management;
d. Research and learning commons areas;
e. Collaboration spaces;
f. Networked small and large briefing/discussion space to include small group rooms, conference rooms, classrooms, and auditoriums;
g. Doctrine, QM and lessons learned development;
h. Networked labs, workshops and technical support;
i. Networked, standardized space for trainers and simulators of various sizes with adequate power and building system HVAC provided;
j. History and Heritage;
k. Professional Development and advanced educational space;
l. Specialty training;
m. General Administration and Reception; and
n. Student/Staff habitability spaces such as lockers, change rooms, common spaces, canteens and lounges.

8.4.4 CAF Campus Operational Framework

The Canadian Armed Forces (CAF) Campus was designed as part of the IT&E Modernization Initiative launched by the Armed Forces Council in 2010. The CAF Campus was designed to close strategic gaps within the CAF IT&E system, including those pertaining to infrastructure, and move the system into the future; it is described in the *CAF Campus Operational Framework* (Reference l).

In 2015, the RCN adopted a Campus Construct[39] derived from the CAF Campus Operational Framework. The RCN Campus Construct describes the requirement for TF on each coast and in Quebec which will enable training to be managed and delivered with an optimized footprint.

The CAF Campus Operational Framework calls for CAF IT&E training establishments to:

a. Provide modern classroom learning environments equipped to support blended learning;
b. Contain learning labs to provide space for self-development and access to synchronous and asynchronous learning events;
c. Support tele-presence spaces to participate in collaborative learning events;
d. Have theatre spaces;
e. Accommodate collaborative spaces and conferences rooms to support advanced cooperation and learning;
f. Furnish access to IT&E simulation; and
g. Integrate with collective simulation to exploit equipment synergies.[40]

Infrastructure for training establishments aligning to the CAF Campus Operational Framework is a cost driver, and thus needs to be efficient.. This includes adopting innovative recapitalization and new designs. Modern campus space must take advantage of spatial and management efficiencies afforded by technology. The CAF Campus Operational Framework will optimize classroom, shop and simulator spaces to minimize travel distance, increase collaborative and distributed training, and consolidate management and administrative support. The Framework supports facility sustainment cost optimization by leveraging centralized facilities maintenance contracts.[41]

Further cost efficiencies are achievable by incorporating new green building and LEED standards which will reduce risk of damage to expensive TT and facilitate their repair and maintenance.

8.4.5 Secure and Non-secure

The security requirements of the TF System will be more demanding than what exists today. This is due to the evolving RCN operational environment, classified simulation integration with Allies, and a significant increase in the number of classified Training Technologies needed to train the advanced technologies and classified systems on future fleet platforms.

A preliminary analysis has been conducted to estimate the overall number of Training Technologies and the proportion of those systems that will be classified. Table 6-1, presented earlier in the TT System section, summarizes the projected security requirements of the FNTS Training Technologies and indicates that approximately 70% of the infrastructure required will need to be secure.

Each TT identified will be further analysed to determine the technical requirements for power, weight bearing, HVAC, IT, external and internal interfaces, etc. to further inform the TF System requirements.

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[39] NPTG has transitioned organizationally into a "campus construct" however the infrastructure has not changed leading to an inability to further evolve naval training and optimize the system.

[40] Learning without Boundaries, CAF Campus – Operational Framework, 2013

[41] Interpretation of DCC study pg 6

8.4.6 Number and Type of Training Technologies

Table 6-1 (presented earlier in the TT System section of this CONOPS) summarizes the total number and type of TT that will need to be accommodated by the TF System, and their approximate footprint. Further analysis is being conducted to develop the power, HVAC, load bearing and IT network requirements that the TF System will need to address.

8.4.7 Partnerships

The TF System must enable shared learning, partnerships and technology enabled learning environments that may include partners in academia, industry, Allies, and across the RCN/CAF. It is essential to enhance TF System development by sharing resources and closely coordinating FNTS requirements with all CAF/RCN infrastructure renewal/replacement projects to seek synergies in provision of Training Facilities.[42]

8.5 FNTS TF System Preliminary High Level Requirements

The preliminary High Level Requirements (HLRs) for the TF System, for both secure and non-secure facilities are as follows:

a. The TF System must provide modern, scalable, flexible, reconfigurable, and networked Training Facilities that will house and support all aspects of the FNTS and its mandate to Force Develop and Force Generate personnel for the RCN in support of CAF taskings and missions;
b. The TF System must provide Training Facilities consistent with the CAF Campus Operational Framework construct, in CFB Esquimalt, CFB Halifax, and Quebec City;
c. The TF System must integrate with Master Real Property Development Plans to ensure intent and vision is shared with ADM IE;
d. The TF System must provide Training Facilities that are aligned and integrated into the larger RCN infrastructure concept through the consolidation of operational and training infrastructure requirements on both coasts;
e. The TF System must provide Training Facilities capable of housing and processing Level II (Secret) and III (Top Secret) data, material and systems;
f. The TF System must provide Training Facilities that are adaptable and easily reconfigurable to adjust to changes in technology, security, demographics, structure, policies, as well as government and public health mandates;
g. The TF System must provide Training Facilities with the ability to efficiently accommodate growth of the FNTS, through design, updates/upgrades, and expansions of physical infrastructure and building and information systems in response to evolving training technologies and methodologies, changing training demand due to RCN recapitalization, training for new systems, and adjustments to coastal allocation of naval platforms over the next 30 years;
h. The TF System must provide Training Facilities with modern, agile, flexible, and rapidly reconfigurable training development and delivery spaces in order to quickly change to accommodate various class sizes, student types, instruction and briefing methods, and evolving training methodologies for doctrine, tactics, functionality and maintenance of modern ship, weapons, and supporting systems;

[42] Infrastructure Capability for the FNTS, Feb 2020, pg 3

i. The TF System must meet the expectations and experience of new sailors who are accustomed to modern learning methods, learning technologies, and learning institutions.
j. The TF System must provide dedicated space to accommodate staff and conduct all aspects of the Governance System.
k. The TF System must provide dedicated space to accommodate staff and students, and conduct all aspects of the TM System.
l. The TF System must provide dedicated space to accommodate staff and students, store and/or install, and maintain the TS, and conduct all aspects of the TT System.
m. The TF System must provide dedicated space to accommodate staff and students, install, and maintain the DF, and conduct all aspects of the DF System.
n. The TF System must provide dedicated space to accommodate staff and conduct all aspects of the Sustainment System.
o. The TF System must provide sufficient space to preclude cross-interference, and enable optimum performance during, concurrent Governance, Training Management, Training Technologies, Digital Framework and Sustainment System activities.
p. The TF System must be built in time for fleet transformation and naval establishment growth;
q. The TF System must enable current and legacy fleet training to continue effectively, while concurrently supporting transition to the future fleets;
r. The TF System must meet the necessary security standards appropriate to current and future RCN ships' systems, international agreements and/or RCN personnel individual and collective secure training needs;
s. The TF System must be fully compliant with all current and future building codes per DCC policy;
t. The TF System must recognize and accommodate for the diversity and physical requirements of all personnel in the building including staff, students, and visitors by complying with Government of Canada GBA+ policies[43];
u. The TF System must accommodate staff, student and equipment for the following organizations:
    i. Naval Personnel Training Group (NPTG) and Headquarters (Esquimalt)
    ii. Naval Training and Development Centre Atlantic - NTDC (A);
    iii. Naval Training and Development Centre Pacific - NTDC (P);
    iv. Naval Fleet School Atlantic – NFS (A);
    v. Naval Fleet School Pacific – NFS (P);
    vi. Naval Fleet School Quebec – NFS (Q)[44];
    vii. Campus Support Divisions (A, P, Q);

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[43] CDS Directive for Integrating UNSCR 1325 and Related Resolutions into CAF Planning and Operations (2016) states that "the embedding of the requirements of UNSCR 1325 and related resolutions into the CAF approach to command and control, leadership, and management, including but not limited to education, training, policy, programs, materiel acquisition and infrastructure." This was reiterated in *SSE* Initiative 12: Integrate Gender-Based Analysis Plus (GBA+) in all defence activities across the Canadian Armed Forces and the Department of National Defence, from the design and implementation of programs and services that support our personnel, to equipment procurement and operational planning.

[44] Training infrastructure for Quebec has been included in the total existing NFS area, however future training system projections are based off the size and quantity of systems and total student capacity.

viii. Language Training Centres (A, P, Q);
ix. Personnel Coordination Centres – PCC (A, P, Q).

8.6 FNTS TF System Solution Concept

The NTST Program has developed a proposed FNTS TF solution concept that outlines the infrastructure characteristics and needs, in terms of functional blocks. This is shown in Figure 8-1. This concept consists of secure and non-secure training infrastructure elements. NTST Program analysis has indicated that maximum daily student production and support staff infrastructure capacity requirements will increase by at least 17% over the next 20 years and a modernization of the future fleet's operating systems will require FNTS infrastructure to be approximately 70% secure (Level II or above) to accommodate classified Training Technologies (trainers and simulators).

The FNTS TF concept does not pre-suppose any specific building configuration or solution but provides a broad vision of the space and utilization characteristics that the infrastructure is expected to accommodate. This concept includes facility and area demands for forecast staff, students and support personnel, the functions they perform, the types of spaces they require, as well as the training products and training services that will be used to deliver the full breadth of FNTS functions.

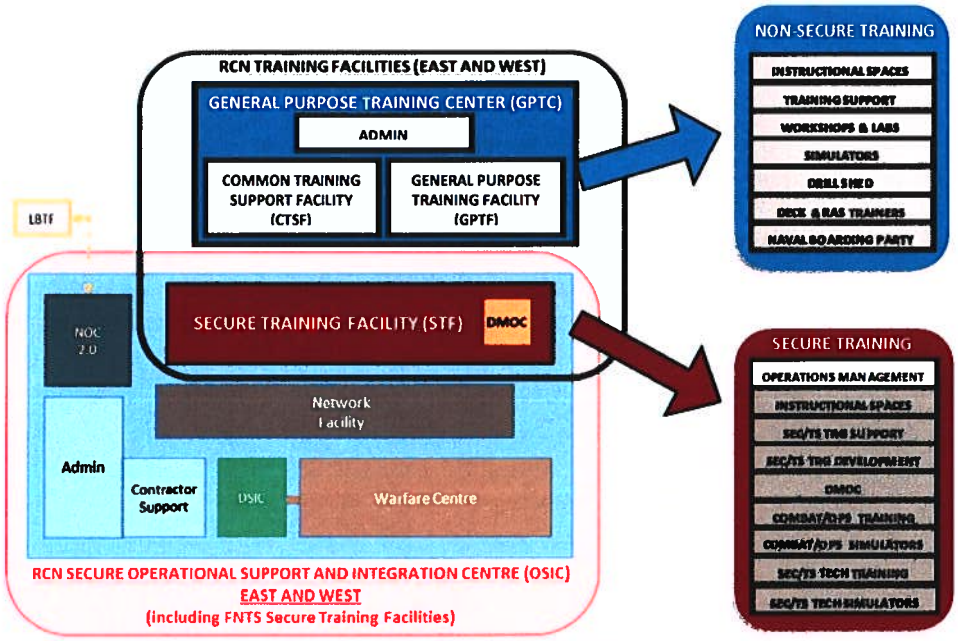

Diagram has been simplified from original source and is for discussion purposes only

Figure 8-1: FNTS Training Facilities Concept

The FNTS TF concept consists of secure and non-secure infrastructure elements. It does not specifically address secure and non-secure training infrastructure for CSC training, because these components may be supported using funding allocations through the CSC Project and/or ADM(IE).

8.6.1 Non-Secure TF

Non-secure TF is needed to enable NPTG to deliver the bulk of its unclassified courses, general naval knowledge, skills training, and professional development programs. In general, non-secure TF will provide space for:

a. Education, development, and preparation of the sailor to go to sea;
b. Training in Divisional leadership, naval heritage, individual and team skills development, and knowledge development in preparation for a career in the RCN;
c. Courses and unique facilities to provide basic seamanship, specialized seamanship skills and knowledge training, plus RCN specialty team training;
d. Occupation and professional knowledge courses required by Marine System Engineers and Combat System Engineers;
e. Specialty unclassified training activities including training for the Canadian Surface Combatant (CSC);
f. Language training;
g. PCC support resources for the students' career development;
h. Training development laboratories, including testing and experimentation space as well as sound and video editing space;
i. Collaboration spaces for staff and students;
j. Management spaces;
k. Auditorium capabilities to allow for large classes, personnel briefings, and guest lecturers; and
l. Other spaces such as drill halls, boathouses, deep dive pools, libraries and study spaces.

8.6.2 Secure TF

a. Secure TF will enable a training environment which meets the necessary security standards appropriate to the ships' systems, international agreements and/or RCN personnel individual and collective secure training needs. In general, secure TF will provide space for:
b. NPTG to review, develop, build, deliver, and manage Level II (Secret) and above IT&E and CT;
c. Classified individual and collective training development and delivery at all levels for RCN programs, and all vessel systems, including those for the CSC;
d. Secure study of modern naval tactics and strategy;
e. Training Technologies utilized to conduct classified training such as sub-system trainers (maintenance and operations) and large, integrated team and mission simulators for RCN vessels;
f. Secure external and internal communications, including the communications necessary to link with external simulators and operational units;
g. Secure auditorium capabilities to allow for large classes, personnel briefings, lectures, and collective 'lessons learned' discussions on classified topics; and
h. Other secure spaces designated for information handling, file storage, student-staff collaboration and discussions, staff office space, student study spaces, and a library.

9 FNTS SUSTAINMENT SYSTEM

9.1 Introduction

The FNTS will result in a large-scale overhaul of many aspects of the existing NTS, including the introduction of a new Training Management System, Training Technologies System, Digital Framework System, and Training Facilities System. These Systems include a broad range of products and services that must be sustained through life.

The changing and evolving requirements of the FNTS demand a complex supporting structure. The supporting roles of Personnel, Materiel and Training form the core of FNTS' ability to provide the training Capability that is essential to achieving the RCN's required level of operational effectiveness.

The Sustainment System needs to address the existing sustainment deficiencies as well as the longer-term through life needs of the FNTS.

This Section of the CONOPS lists the Sustainment stakeholders and associated capability deficiencies, and then covers other considerations, and preliminary FNTS Sustainment System HLRs. It concludes with a description of an FNTS Sustainment System concept.

9.2 NTS Sustainment Stakeholders

The primary sustainment stakeholders, and their related activities, are:

a. Members and staff of the Naval Fleet Schools (NFSs), who deliver the training to students and often perform operation and maintenance of various Training Technologies;
b. Members and staff of the Training and Development Centres (TDCs), who develop and maintain training content, courseware development tools and media;
c. Naval Personnel and Training Group (NPTG) members and staff, who manage the training organizations, students and curriculum;
d. Campus support cells, that provide day to day support to the Fleet Schools for installation and maintenance of Training Technologies;
e. Director General Maritime Equipment Program Management (DGMEPM) members and staff, who manage contracts relating to the support of Training Technologies;
f. Industry contractors, who provide services relating to the operation, maintenance and life-cycle management of Training Technologies;
g. Service Management Centre (SMC) which reside within Base Information Services (BIS), provide support for computing and classroom equipment;
h. Shared Services Canada (SSC), that provides support for internet and video conferencing capabilities;
i. Real Property Operations (RP Ops), that provides support for installation and maintenance of infrastructure elements of existing NTS buildings;
j. Naval Reserve Divisions, that provides support for regenerative training and pre-deployment training for Naval reservists;
k. Sea Training Group, who deliver CT to ensure a ready fleet;
l. ADM(IE), who provide support for the acquisition of infrastructure;
m. ADM(IM), who provide support for acquisition of Digital Framework;
n. ADM(Mat) for acquisition projects that include RCN Training Technologies and their respective Sustainment solutions.

9.3 NTS Sustainment Capability Deficiencies

The existing NTS has the following Sustainment capability deficiencies:

a. Not a System of Systems: It is highly fractured. Some products and services are reasonably well sustained, others have no support, and still others have insufficient support. It is an ad hoc and inefficient mix.
b. Orphan trainers: Over time, Training Technologies have been acquired through various means or through unique in-house development and fabrication. In many cases the personnel who were involved are no longer around, and knowledge of the design, operation and maintenance of these systems is no longer available, resulting in significant challenges in ensuring their continued availability.
c. General lack of staff: Budget constraints, centralization of support services and re-organizations have resulted in a critical shortage of personnel in the existing NTS organizations. For example, standing up the BIS organization resulted in personnel from the NTS being transferred to the new organization. These personnel often had in-depth knowledge of the operation of specialized training IT systems, which is not generally possessed by typical IT support staff. Numerous military and civilian positions are vacant and will likely remain so because of funding limits. The shortage of staff has resulted in specialized skills and knowledge being concentrated in too few individuals, which results in a lack of qualified instructors to teach some courses. The lack of skills development in specific areas, such as electronic warfare, has resulted in reduced operational capability for the fleet. Filling these positions with temporary civilian or attach-posted military personnel does not provide the required skill sets to re-establish those skill sets, nor provide continuity of knowledge.
d. General lack of funding: The largest constraint on the FNTS TF is financial as there is very limited infrastructure renewal/replacement funding available in the CAF. The existing TF on both coasts is at the end of its service life, is currently limiting training, and will not be able to address most FNTS needs. RCN Training Facilities must transform to meet the challenges of the future fleet and contemporary global operating environment. Inadequate budgets have heavily constrained key support organizations such as DGMEPM, RP Ops and BIS, from providing needed services, repairs, replacement of existing Training Technologies and installation of new training solutions. All formation BIS and RP Ops support requests (not only for Training Technologies), are ranked through a selection process. Projects are then selected based on funding availability. Training support projects have a high risk of delay due to other priorities or un-forecasted urgent projects;
e. Aging infrastructure: Much of the existing NTS infrastructure is quickly reaching, or has reached, the end of its useful life. The cost of maintaining or modifying these buildings has become prohibitive. This has resulted in delays or stoppage in deploying new instructional methodologies, technologies and training delivery. Primary factors are the increased technical requirements of modern training technology equipment such as HVAC, security, power and network communications. This has resulted in modern trainers not being able to function optimally or in some cases simply not available to conduct training;
f. Life-cycle management of equipment: The tools and equipment in training technologies workshops and laboratories have not been lifecycle managed. Maintenance is often ad hoc, and equipment reaches the end of its useful life without

replacement being planned. In some cases, the OEM no longer exists, or the technical data and spare parts are not available, with no plans in place to resolve the problem; and

g. Too many Support Contracts. The NTS has a variety of support contracts; both service and task based. The largest services contracts include the ability to issue tasks against the Combat Management System ISSC to support associated Training Technologies. There are also several single purpose ISSCs specifically oriented toward maintenance of specific trainers and simulators which cover equipment maintenance, life cycling and on-site facilitation of training. Some contracts exist which provide training delivery either on-site or at a college or industry location. There are also training development contracts normally aligned to specific occupations or even as small as course-by-course which can be established as service or task-based contracts. Managing all these disparate contracts is highly inefficient.

9.4 FNTS Sustainment System Considerations

DAOD 3000-0, Materiel Acquisition and Support, specifies that "procurement and sustainment of materiel optimizes the four foundational principles of performance, value for money, flexibility and economic benefits".

9.4.1 PERFORMANCE

The FNTS sustainment solution indicators of performance are:

a. Availability – Ensuring support services are available so that the FNTS can provide training when and where required;
b. Reliability – Optimize maintenance to maximize training time and reduce cost;
c. Suitability – Fit, form and function that addressed the full in-service environment;
d. Safety – Compliance with safety regulations; and
e. Effectiveness – Leverage internal and external resources.

9.4.2 VALUE FOR MONEY

The FNTS sustainment solution value for money includes:

a. Smart Buyer – Product knowledge, business acumen, program management expertise and visibility into cost and technical drivers;
b. Balanced Risk – Risk transfer to Contractor matches the responsibility and scope;
c. Efficiency – Contractor delivers goods and services at reduced level of effort. Requirement exists both through initial arrangement and continuous improvements;
d. Incentive targets – Contractual incentives ensure that continuous improvement will benefit all parties; and
e. Continuity – Long term contract(s).

9.4.3 FLEXIBILITY

The FNTS sustainment solution will have the flexibility to address:

a. FNTS operational changes –production and usage rates, budgetary, fleet size, system capability, fleet life-cycles changes;
b. Contract up-scoping, de-scoping, termination, and follow-on solicitation; and
c. Evolution – An ability to adapt to changes resulting from Continuous Improvement and Technological advances.

9.4.4 ECONOMIC BENEFITS

The FNTS sustainment solution must provide opportunities for Canadian companies to create economic growth, as follows:

a. Defence Sector – Supporting the economic development of Canada's defence sector;
b. Research and Development – Enhancing innovation through Research and Development;
c. Supplier Development – Promoting the growth and competitiveness of Canadian suppliers;
d. Exports – Developing export potential for Canadian firms and increasing access to export markets; and
e. Government of Canada Economic Leveraging Tools – in addition to the Industrial and Technological Benefits (ITB) Policy, there are other tools established to ensure positive economic outcomes from defence procurements, such as the Canadian Content Policy (CCP), the Buy in Canada Policy, or alternative leveraging approaches.

9.5 FNTS Sustainment System Preliminary High Level Requirements

The preliminary High Level Requirements (HLRs) for the Sustainment System are as follows:

a. The FNTS must develop and establish a comprehensive sustainment solution for the TM System, the TT System, the DF System, and the TF System.
b. The Sustainment System must be able to adapt to evolving training requirements;
c. The Sustainment System must follow the SBCA process, unconstrained by predetermined perceptions or prescribed formula;
d. The Sustainment System must be complementary with CSC, STORM and AJISS sustainment strategies;
e. The Sustainment System must ensure that the FNTS is maintained at the required material state to perform its specified functions;
f. The Sustainment System must ensure that operation and maintenance of the FNTS is conducted by competent personnel;
g. The Sustainment System must ensure that the FNTS is fit for purpose, safe and environmentally compliant;
h. The Sustainment System must ensure that availability, reliability, efficiency and effectiveness are measured and evaluated, with an aim to continually improve.
i. The Sustainment System must be able to address a significant increase in student production over the next 30 years;
j. The Sustainment System must be able to address the introduction of new Training Technologies and services associated with training for new naval platforms and systems such as AOPS, JSS, CSC, UWSU;
k. The Sustainment System must be able to address the introduction of new Training Technologies from Project STORM;
l. The Sustainment System must support continued training for legacy platforms, allowing for optimized yet graceful degradation, during the transition to new platforms;
m. The Sustainment System must be able to address the increased scope and complexity of new training technologies and methodologies;
n. The Sustainment System must be able to address the introduction of new and recapitalization of Training Facilities;

o. The Sustainment System must be able to address a shift in focus of the TDCs from development of traditional classroom training media (e.g., PowerPoint) to software-driven interactive training media, which also increases the number, types and complexity of media and courseware that must be supported;
p. The Sustainment System must be able to address the expansion and increasing complexity of collective training through the interconnection of Training Technologies and conduct of training exercises with coalition partners;
q. The Sustainment System must comply with security and cybersecurity policies in equipment life-cycle management; and
r. The Sustainment System must assess the advantages that can be achieved through the contracting of selected services to industry and academia partners, to meet increased staffing demands.

9.6 FNTS Sustainment System Solution Concept

The FNTS Sustainment System solution concept, informed by a formal Sustainment Business Case Analysis (SBCA) will move towards a more contracted solution, with the RCN retaining requirements development and key command functions. The Contractor will interact collaboratively with DND, with class ISS contracts (CSC, AJISS, MWAV) and with existing legacy contracts in each of the FNTS Sustainment System Lines of Service.

The objective is a flexible, continual improvement, long-term, relational, incentivized, performance-based approach with clear accountability for contract(s) outcomes. This will be achieved through Integrated Sustainment Teams composed of FNTS, Contractor, and stakeholder representatives. Key responsibilities for the RCN and the Contractor are listed below:

a. The RCN will be the Design Authority for the FNTS;
b. The RCN will allow access to DND facilities to Contractor and Subcontractor personnel;
c. The RCN will evaluate the Contractor's performance;
d. The Contractor will ensure Training Technologies meet the FNTS availability requirements;
e. The Contractor will address urgent support requirements to meet training commitments in a manner and time frame acceptable to the RCN;
f. The Contractor will maintain and manage the design intent baseline of the Training Technologies;
g. The Contractor will schedule and perform maintenance and trial activities within the maintenance availability schedule; and
h. The Contractor will prioritize, schedule, and coordinate the work in collaboration with FNTS and stakeholders utilizing an Integrated Sustainment Team approach.

The FNTS Sustainment System solution will incorporate digital technologies to improve the materiel sustainability of the FNTS. This will be achieved through:

a. Optimizing Training Technologies maintenance requirements through the application of smart technologies to increase availability;
b. Application of smart technology to detect impending failures, enabling corrective action to be completed while minimizing the impact on the availability of Training Technologies; and
c. Use of additive manufacturing, such as 3D printing, to produce spare parts to support preventive and corrective maintenance of Training Technologies.

9.6.1 Two Steps: Interim and Long Term

The FNTS is a very complex system that will require extensive support as described in the Sustainment Systems Functions below. A preliminary assessment of FNTS sustainment requirements has resulted in a two-step approach:

a. First, develop an **interim**, relatively short-term sustainment solution to address critical existing and near-term gaps. Consideration should be given to if and how the disparate of array of existing contracts can be re-thought or re-organized to a more holistic approach;
b. Second, develop an optimized, **long term** sustainment solution to support the FNTS that is based on the SBCA process and the four sustainment principles described above.

9.6.1.1 Interim Sustainment Solution Concept

An interim sustainment solution will address critical, existing and near-term NTS shortcomings and will be provided by DGMEPM and funded by NTS O&M lines. Identification and evaluation of the severity of gaps relative to the ability of the existing NTS to function will inform prioritization of the interim support needs, out of which the scope for interim in-service support solutions will be developed. The interim ISS solution will be formulated with consideration of thresholds that apply to the SBCA process.

The interim sustainment solution will likely be a service type contract with defined skill sets required to address the shortcomings identified. The contract would be set up on a call out basis with DND specifying work to be performed, or services to be provided, through a statement of work. There would be provisions in this contract to span multiple fiscal years to ensure continuity and avoid disruptions, provided Contractor performance objectives have been achieved.

The work to be performed could include any or all the lines of service described above, but will likely focus on key Training Technologies' maintenance, particularly for those Training Technologies that have no maintenance plans or contracts in place. The establishment of an interim support contract will also provide insight and data that will help inform the SBCA and determine requirements, practices and processes that will be applied for the Long-Term Sustainment Solution.

9.6.1.2 Long-Term Sustainment Solution Concept

The SBCA will identify the optimum Long-Term Sustainment Solution led by DGMEPM. However, for the purposes of advancing discussion and informing this CONOPS, it is anticipated that a solution will likely be comprised of a long-term industry inclusive solution. Given how rapidly technology changes, it is anticipated that the solution will leverage industry capability to rapidly adapt.

The Long-Term Sustainment Solution is expected to comprise a combination of industry and in-house resources where industry is used as much as possible to leverage their technical and training SME, continuity and capacity, while in-house RCN resources retain governance, requirements, Quality Management (QM), and RCN cultural and specialty operations instruction.

The scope of the solution will likely cover the full spectrum of lines of service described above. The contract(s) with industry would be long-term, risk and financial benefit shared, performance and relationship based, with flexibility to adjust the contract for evolving changes in the FNTS.

The Contractor would ideally be responsible for managing the training facilities, the Training Technologies, and much of the training development and delivery. The Contractor would be

responsible to ensure that the facilities and systems are ready for the students and instructors to deliver the required training on the required day.

To optimize cost efficiencies, the arrangement could be incentivized to cover actual performance to deliver, with associated penalties if the training is not available due to identified Contractor fault. There would be financial incentives to reduce overall costs, providing quality and production are maintained, with benefits shared between Canada and the Contractor.

9.6.2 Sustainment System solution functions

The interim and long-term Sustainment System solutions will support the following functions:

a. Sustainment System management;
b. Training Operations;
c. Training Development;
d. Training Delivery;
e. Training Technologies operation;
f. Training Technologies maintenance;
g. Digital Framework;
h. Training Facilities; and
i. Security management.

These are described in more detail in the paragraphs below.

9.6.2.1 Sustainment System Management

Sustainment System management services will include but not be limited to:

a. Developing and updating the maintenance plan;
b. Configuration management of Training Technologies;
c. Management of technical data;
d. Support for Training Technologies acquisition;
e. Implementing Training Technologies updates;
f. Repair assistance such as diagnostics;
g. Arranging FSR support, liaison with Subject Matter Experts (SMEs), preparation of repair instructions; calibration of equipment;
h. Engineering change management; and
i. Managing obsolescence and disposal.

9.6.2.2 Operations Management

Training Operations is the TM function that provides oversight and management of all training activities as described earlier in Section 5. Training operations support will include:

a. Course scheduling, loading and the management of the master schedule of all courses to meet the need for student production, the loading of students on courses;
b. Managing digital content (training material) distribution, backup, archiving and disposal;
c. Managing business tools: the provision of licenses, training, assistance, user access and maintenance (software updates, data configuration management, etc.) of the business tools used in the FNTS;
d. Infrastructure and classroom management: assignment and coordination of classrooms, laboratories, workshops etc. to meet the course scheduling requirements;

e. Student movement: the preparation and issuance of student joining instructions; and
f. Student accommodations: the management of student accommodations to ensure that students coming from outside the geographical area are billeted to suitable accommodations.

9.6.2.3 Training Development

Training Development is the TM function that designs and develops training solutions to address gaps caused by a lack of or an increase in skill and knowledge requirements as described earlier in Section 5. The designated training solutions are chosen to effectively and efficiently close the performance gap. They may be face to face, virtual, technology based, or any combination thereof. The Training Development support services will include:

a. Developing/updating training requirements: what training is required and at what level;
b. Developing performance objectives: what the incumbent must do (performance/learning statement), the conditions under which the performance must be completed (conditions), and the standard to which the performance must conform (how well);
c. Conducting training needs analyses: identify the gap between the current knowledge and skills and the required knowledge and skills;
d. Identifying training delivery methods: the combination of methods, media and environment used to deliver instruction;
e. Identifying training media by conducting training media analysis: the devices and technology required to achieve the training objectives;
f. Developing and updated courseware: the training material required to deliver instruction;
g. Training material configuration management: ensuring training material reflects the current fleet configuration and that superseded training material is archived; and
h. Validating training delivery: measure how effective and efficient trained personnel are at completing their assigned tasks or duties.

9.6.2.4 Training Delivery

Training Delivery is the TM function which establishes or changes individual and team behavior to achieve a defined outcome as described earlier in Section 5. Training must be delivered in such a way that essentials are taught and that RCN personnel learn and are able to transfer the content mastered to their duties and jobs. The Training Delivery support services will include:

a. Conducting courses: the delivery of training classes to students;
b. Assessing student performance: the manner in which a valid and reliable sample of learner performance is measured and evaluated, and ultimately the grading, ranking and or assignment of pass/fail to the trainees;
c. Providing administrative support to courses: such as access to the learning facilities, transportation, meals, accommodations, academic material, classroom supplies; and
d. Training instructors: ensuring that the instructors are familiar and competent with the course content and assessment of student performance.

9.6.2.5 Training Technologies Operation

Training Technologies needed for Training Delivery must be available and operated properly when needed as described earlier in Section 6. Training Technologies operation includes all the

functions needed to ensure that the equipment is running properly and functions as intended. The Training Technologies operation support services will include:

a. Moving into place (smaller TT kept in storage), setting up, powering up, and configuring Training Technologies to be available at the start of the instructional period;
b. Loading up the required simulation scenarios, and role playing as required; and
c. Operating the Training Technologies during the courses.

9.6.2.6 Training Technologies Maintenance

Maintenance of Training Technologies is required to ensure that the equipment achieves its designed reliability and availability for training, functions reliably during training delivery, and can be repaired promptly when failures occur as described earlier in Section 6. The Training Technologies maintenance support services will include:

a. Managing the Training Technologies maintenance program: allocate the resources to conduct the preventive maintenance for Training Technologies as specified FNTS in the maintenance program;
b. Conducting preventive and corrective maintenance on Training Technologies; and
c. Managing spare parts needed to support preventive and corrective maintenance.

9.6.2.7 Digital Framework

The Digital Framework is all the technical means used to handle information and aid communication as described earlier in Section 7. This includes both computer and network hardware, as well as the associated software and data. This requires support knowledge and services beyond what is normally provided by typical IT/IM support organizations such as BIS. The Digital Framework support services will include:

a. Version control of Training Technologies specific software and data;
b. Providing life cycle management of dedicated Training Technologies IT/IM equipment; and
c. Conducting Digital Capability Framework maintenance (software updates, virus protection, etc.).

9.6.2.8 Training Facilities

The Training Facilities are the buildings in which the FNTS will be housed as described earlier in Section 8. The physical integrity and functionality of these assets must be sustained. The Training Facilities support services will include:

a. Conducting inspections, calibration, and tests required to preserve;
b. Conducting preventive and corrective maintenance on the facilities;
c. Conducting general building maintenance, upkeep and cleaning; and
d. Modifying the Training Facilities as required for changes to the FNTS.

9.6.2.9 Security Management

Security Management is the process of ensuring that the appropriate application and management of security controls, solutions, tools, training, and techniques to protect assets and information. The Security Management support services will include:

a. Providing user access control (security);
b. Determining SA&A Requirements;
c. Developing and maintaining SA&A plans;

d. Continuous monitoring of security controls (backup infrastructure, malware detection, authentication services etc.);
e. Assessment of risks;
f. Risk mitigation, acceptance, avoidance/rejection, transfer/sharing;
g. Assessing/Evaluating EC impact and identify security control(s);
h. Re-verifying affected security control(s);
i. Security change management;
j. Security reporting;
k. Providing training requirements;
l. Managing secure areas; and
m. SA&A disposal process.

10 VIGNETTES

10.1 Student Vignettes

10.1.1 Sailor 1st Class Shamas – Mar Tech

It had been two and a half months since Acting Sailor 1st Class Shamas had started the Mar Tech course, and she been enjoying every minute of it. Since the beginning of the course, her learning had been challenging and was completed using a blend of Multi-Role Reconfigurable Trainers, cloud-based Distance Learning Network (DLN) modules, in the 3D Maintenance Procedures Trainer (3D MPT), and in the wonderful hands-on machinery shop. But, despite enjoying this training to date, today was the day she had been waiting for since day one.

With her partner, Sailor 2nd Class Sanchez, they would use the Virtual Reality training room to conduct the Diesel Generator routine maintenance they had just reviewed last week on the MPT. After donning the wireless Virtual Reality (VR) goggles and gloves, they entered the specialized classroom that was empty except for several VR sensors located on the wall. As they entered the room, the software activated and she found herself in a fully immersed environment that mimicked, with better-than-real accuracy, the engine room of a CSC. Waving at the avatar standing beside her, that she knew was Sailor 2nd Class Sanchez, they both proceeded to the Diesel Generator that needed their attention for today's training session. A smile grew on Sailor 1st Class Shamas' face; this would be a great training day.

10.1.2 Sailor 2nd Class Jones – Combat Operator

Sailor 2nd Class Jones, a Combat Operator in HMCS *Ville de Quebec* is starting a course in a Technology Enabled Classroom (TEC) with other east coast-based trainees. Across the high definition video feed, west coast trainees also await the beginning of classes. Ms. Réjane Dupuis, a contracted civilian with 25 years' experience at sea, is the main instructor and joins the class. In Halifax, Ms. Dupuis is supported by PO2 Backman, a Naval Reservist with over twenty years' experience, who was hired as an instructor on a Class B contract.

Ms. Dupuis introduces the trainees to their program that will, for the first few weeks, consist of daily modules in class using the TEC terminals, to gain the basic skills and knowledge needed to perform as a Sailor 1st Class at sea. Modules will be followed by blocks of practical skill application on individual part task trainers. This progressive system is designed to ensure the students can apply skills in highly controlled situations, simulating their future duties at sea.

They will progress in this manner for four weeks at which time they will transfer to the newly constructed Naval Combat Training System, a completely reconfigurable modular simulator. This will allow students to hone their skills in very realistic situations. Luckily for Sailor 2nd Class Jones, if he needs a refresher regarding certain procedures when he returns to VDQ, he can access all his lessons on the cloud-based Learning Management System at any time.

10.1.3 Sailor 1st Class Black – WENG Tech

Sailor 1st Class Black, a WENG TECH trainee, has recently been posted from HMCS *Vancouver* to HMCS Max Bernays. She needs to do a modularized bridging course to learn about the 25mm gun and other Harry DeWolf Class Combat Systems. Since she's already RQ qualified, all she needs is the related modular lessons and 3D MPT sessions, before proceeding to the ship. She will also need to get used to and familiar with the tablet-based technical publications she will be using on board.

She's already conducted her online self-paced pre-learning package, which taught her the basic facts, so when she arrives at her first class at Campus Pacific, she is directed to the shared

classroom spaces, where the 3D MPT modules she has to complete will be accessed. Although she will be conducting most of the 3D MPT modules herself, the classroom is full of other students taking bridging courses, so that they can have direct access to PO1 Gonzalez, the Navy's Class Combat Systems subject matter expert. PO1 Gonzalez is more of a coach and a guide for learning who assists trainees in their studies.

From day one, Sailor 1st Class Black has the tablet-based mobile technical publications (tech pubs) beside her on the desk, as she experiences various problem-based learning practical tasks on the 3D MPT. The MPT modules take about one week to complete, at which time she conducts a practical performance check, on a 3D model, before proceeding to her ship. When she arrives on ship, she uses the very same tablet tech pubs she used in the school to affect repairs. Because she used the same equipment in the schoolhouse, and had so much practice on the MPT models, there is no transition period for her before she gets to work. In other words, she is qualified on day one on board, with no lead-in time.

10.1.4 A/Slt Hamelin - NWO

A/SLt Hamelin, a member of HMCS *Radisson* was reporting tonight to his unit for the weekly parade night. Before he completed basic officer training last year, he became accustomed to the weekly regimen of blended online DLN sessions and classroom/live instruction, supported by local subject matter experts. After graduation, he had been one of the lucky ones who was selected to carry on with NWO II last summer, and his weekly training session took a new and exciting turn.

For the last few months, he had joined a small group of trainees who were preparing for NWO III and NWO IV. Like the rest of his classmates, he was training diligently to learn the basics of navigation. Of course, there was some DLN training material they needed to go through, but the more exciting part was the use of the Advanced Naval Part Task Trainer, which provided him training that simulated the bridge environment using high-definition visuals and realistic ship handling.

Even better, shortly after he arrived at the unit tonight, CPO2 Gingras, the Unit Training Chief, had a surprise for him. His request to carry on with a Class B contract on completion of NWO IV had been approved, and he was going to join the crew of HMCS Charlottetown for a three month-long OP CARRIBE deployment. Within minutes, he had registered for HAL platform-specific training he would have to complete online, using cloud-based accessible packages over the DLN. The great thing is, he could complete most of the basics concurrently with his nightly activities. Before he did that, however, he also registered for some refresher training. Tonight, he would take a break from the basic navigation, and instead, join other members from his unit in the Bluetooth-enabled Naval Small Arm Trainer to conduct Sig Sauer refresher training.

10.1.5 Lt(N) Chan - ORO

Lt(N) Chan, an Operations Room Officer (ORO) student, is in the middle of the assessment phase of the course in Esquimalt. He's already used to the Naval Combat Training System reconfigurable trainer, because he has already progressed through the initial phases of blended online learning with small controlled events in the trainer (which was, at the time, configured as an individual trainer rather than a team trainer).

As the phase advances through the second week of progressive challenges, he has the feeling of reality, because real assets (ships and helicopters) are linked into the trainer via the Distributed Mission Operations Centre (DMOC) and the RCN Integrated Data Environment. As he conducts his simulated Search and Rescue (SAR) in his simulated Canadian Surface Combatant (CSC) ops room, he does so as HMAS *Warramunga* conducts an at-sea SAR exercise and HMCS *Margaret Brooke* completes some Combat Readiness Requirements (CRRs).

The scenarios and software that power this ops trainer are CSC-specific, but the fact that it is linked through the synthetic environment allows this ORO student to complete his final assessment on the same day that the Australian ship completes their exercise and the same day that HMCS *Margaret Brooke* writes off a series of CRRs prior to proceeding to Nunavut for a summer patrol.

Fun fact: the other three ORO students were in Halifax, in a similar trainer, running through the exact same scenarios at the same time (the mission control was in Halifax as well). The cost savings in TD and less time spent training paid for the two trainers in under five years.

10.2 Governance Vignettes

10.2.1 Change in RCN Operations and Systems

With increasing tensions in the Pacific, the Canadian government recognized the possibility that the RCN might need to take a leadership role for constabulary operations in the region. The Canadian government directed the RCN to upgrade the CSC's C4ISR capability as soon as possible to enable fully integrated, real-time, Air-Sea-Land platform and drone sensor data and regional picture compilation, and overall mission coordination for potential operations in that region. This required significant changes and broadening of CT 1-5 for most C4ISR equipment operations, first level maintenance, and command functions. Changes impacted the instruction provided in schools and online, and the related Training Technologies including the MRTs and integrated mission/platform simulations used to train with the RCAF and Allies. The RCN Flag Officer, as the single point of Command for the Future Naval Training System, was a critical actor at L1 discussions and planning sessions. This provided clarity on intent and scope and associated resource constraints. Decisions, budgets, and actions were quickly established and directed across the FNTS and supporting procurement activities. Synergies were leveraged from the RCAF and Allied Navy Training Technologies, and the necessary changes to RCN software, training instruction, manuals etc. were achieved in half the time of the fragmented approach of the past.

10.2.2 Forced Surge in Collective and Individual Training to Support Mission

The RCN has been directed to accelerate production of high readiness deployers and to provide more seagoing sailors due to a developing international mission. The new Naval Training Command has a complete and integrated picture of resources devoted to training, along with metrics that identify which parts of the overall FNTS are most cost-effective in terms of trained student output. This enabled an overall and unified systems approach to the problem. It was found that by expanding use of ORCA vessels, changing some recruit training, and increased use of OGD facilities, individual production could be increased while also optimizing other trainers and operational ships for increased CT production. The unified training governance structure then directed the necessary changes across the entire FNTS and worked alongside supporting stakeholders to achieve the needed operational outcome.

10.2.3 Question for the MND

As a result of questions to the MND during parliament question period, the RCN was asked how many people are in the FNTS. Owing to the consolidation of Naval Training Functions under one Naval Flag officer, the question was directed to her. The question was in turn directed to the data analytics section of Naval Training HQ who were able to answer the question within seconds. Subsequent questions to the Minister regarding the composition of the FNTS, its costs, resources etc., were answered in a similar direct and consistent fashion. This was in direct contrast to the situation of several years earlier where it took weeks to answer similar questions, and often with inconsistent responses.

10.3 Training Facilities Vignettes

10.3.1 Sailor 2nd Class Jones Starts Marine Technician Training

Sailor 2nd Class Jones had some heavy-duty equipment maintenance education at Red River College before enrolling in the RCN. She chose Marine Technician training in the RCN over a civilian apprenticeship route to learn a trade while serving her country. While at Red River College she experienced a broad spectrum of distance learning, classroom courses, virtual and live training as part of the College's technology enhanced learning initiatives on their modern campus.

Basic military training was a challenging experience while adapting to life in the military but the adjustment to the initial naval training experiences in Esquimalt was seamless. During seamanship training, she noticed modern classrooms nestled skillfully into the large campus buildings at Naden that also housed the heavy equipment trainers. What's more, she could always get a cell signal and had constant access to training content as well as open civilian internet via Wi-Fi! She could access her online training content at the café on base as well.

Since her classrooms were built near the workshops she saw that the hands-on areas were similarly perfect. The skills labs had trainers that looked like off-the-shelf touch screens but could simulate any system at the flip of a switch. The heavy equipment trainers were the best part: a large hangar-like space full of parts of diesel generators, gas turbines, and switchboards: a dream come true for someone who was a real hands-on person.

The best part? Having a study carrel available to her in the learning commons in the secure building around the corner where she could work on Secret training content at any hour she pleased. Overall: top marks for facilities in her opinion.

10.3.2 Instruction Space Cooling

While working with technical students in one of the technology enabled instruction spaces, a large number of Training Technologies have been moved into the space and powered up. This is required for a new course about to have an initial pilot run.

The instructor notes that the HVAC system is not providing enough cooling for student comfort and the high heat is causing some of the computers to shut down. She contacts the in-house support contractor who quickly expands the size of the space by shifting a movable wall, which allows access to more air vents and better air flow. This addresses the immediate problem but does cause the adjacent instruction space to shrink. However, this is manageable as the scheduler ensures the smaller room is only used for smaller class sizes.

The in-house support contractor also contacts the technical support cell, which in turn issues a work order to RP Ops for investigation and long-term resolution of the problem. RP OPS assigns a contractor to investigate, and it is determined that an effective solution can be developed with some additional duct work. The work is completed several weeks later and both instruction spaces are reverted to their original configuration allowing better class size flexibility.

10.4 Training Management Vignettes

10.4.1 Ops Planning Brief

NPTG Training Delivery Staff are holding an operations planning brief via video conferencing from the RCN National Training Operations Centre (NTOC) to confirm scheduling and coordinate upcoming training. The Director of Operations for the RCN Integrated Training Division outlines the key elements of upcoming events for the team. She completes a virtual welcome to training operations staff from Esquimalt, Halifax, Quebec and several detachments to the meeting.

"Good morning everyone, it's looking like another busy couple weeks for training facility utilization with multi-configurable trainers at 92% scheduled utilization, universal classrooms at 86% and the learning commons spaces in Esquimalt, Halifax and Quebec fully utilized and networked to 11 Naval Reserve locations to accommodate the anticipated late year production surge."

"Please remember that two of the trainer/simulator bays in each location go offline each week starting next month for preventative maintenance cycles conducted by our Facilities Maintenance Contractor ABC Inc. This impact should be manageable as we are over the surge."

"Remember we are facilitating a Joint, Combined lessons learned session for Op SABRE in two weeks. RCN participation will be centered in the secure theatres on each coast but the secure Video Teleconferencing (VTC) comms links to the Royal Air Force in NATO Air Base Geilenkirchen and US Marine Corps in Camp Pendleton need to be tested in each location along with the smart screens. Also prepare reception in RCN Secure Facility Halifax for an influx of approximately 80 CAF DART team members driving in from Gagetown. Later that same week we will shift to Op NANOOK lessons learned and will need to confirm classified connectivity with JTFN, 1st Cdn Div HQ, and both 1 and 5 CRPG."

"My congratulations to the collaborative learning team. The training methodology trials linking the individual diesel trainers located in the Community College, with the weapons maintenance trainers on our Campus, into engineering and weapons stations in the operations centre simulators worked extremely well. Being able to simultaneously conduct multiple levels of training, in dispersed locations, and integrate them into higher level collective exercises is an outstanding achievement. Thank you everyone and have a good week."

10.5 Sustainment Vignettes

10.5.1 Updating a Simulation Module in Response to New Naval Equipment Procurement

DNR has notified NPTG HQ that a new piece of equipment is being procured. DNR-8, in collaboration with TDC(A), has done the Training Needs Analysis (TNA) and Training Media Analysis (TMA) and identified that a new simulation module for the Multi-purpose Reconfigurable Trainers is required to support the needed training for this new equipment.

DNR-8, in conjunction with the Original Equipment Manufacturer (OEM), has provided all the new system technical and maintenance data through the IDE into the Digital Framework data lake.

Using embedded contractor software developers at TDC(A), the new simulation software is developed. The simulation software is provided to an embedded technical support contractor to install and test and validate that the training requirements are being met. Once this is achieved, the data change is submitted to the data lake via the Digital Capability Framework. This new data is then electronically extracted to generate the supporting training materials and update the operation manual for the modified trainers. (Note that the same data lake and Single Trusted Data Source is being used to generate the new system maintenance manuals.)

The technical support contractor installs the software update in the MRTs, and explains the new trainer functionality to the instructors, facilitating the instructors' ability to teach and utilize any new features in the updated MRT.

After their first use of the new functionality, the instructors meet to compare notes. They concur that one feature in the simulation has an issue and should be improved upon, so they send a request to the in-house technical support contractor, knowing that the contractor will investigate the following day, and if approved, a new software version will be developed.

11 REFERENCES

Ref	Document Title	Version No.	Date	Author and Organization
A	Future Naval Training System Strategy, Royal Canadian Navy, A-PD-050-000/AG-003		July 2015	Commander RCN
B	RCN Concept of Training;	V14	May 2018	Commander NPTG
C	Digital Navy: A Strategy to Enable Canada's Naval Team for the Digital Age		2020	Commander RCN
D	Digital Navy Action Plan		2020	Commander RCN
E	Program Charter, Naval Training System Transformation (NTST) Program		Sep 2019	A/CNS P&T
F	Strong, Secure, Engaged: Canada's Defence Policy		2017	DND
G	Royal Canadian Navy, Strategic Plan, 2017-2022.		2017	DND
H	Canadian Forces Individual Training & Education System Manuals, (CFITES)			
I	Learning Without Boundaries, CAF Campus Operational Framework		June 2013	
J	Project Approval Directive (PAD)		2019	DND
K	Government of Canada Cloud Adoption Strategy		2018 update	Canada
L	Royal Canadian Navy Fleet Synthetic Collective Training Strategy Policy and Guidance Paper		2017	DND
M	Department of National Defence and Canadian Armed Forces Data Strategy		2019	Canada
N	Department of Defence and Canadian Armed Forces IT Security Standard for Cloud Computing		2019	Canada
O	Naval Training Infrastructure Strategic Study		2015	DCC
P	DAOD 3000-0, Materiel Acquisition and Support			

12 ACRONYMS

The following terms, acronyms and definitions are provided to interpret the CONOPS.

A/CNS (AT&R)	Assistant Chief of Naval Staff (Afloat Training and Readiness)
A/CNS (P&T)	Assistant Chief of Naval Staff (Personnel and Training)
ADM(DIA)	Assistant Deputy Minister Data, Innovations and Analytics
ADM(IM)	Assistant Deputy Minister Information Management
ADM(Mat)	Assistant Deputy Minister Materiel
AI	Artificial Intelligence
AJISS	Arctic Offshore Patrol Ship and Joint Support Ship In-Service Support
AOPS	Arctic Offshore Patrol Ship
API	Application Programming Interface
ARA	Authorities, Responsibilities, Accountabilities
BDCS	Battle Damage Control System
BIS	Base Information Services
BYOD	Bring Your Own Device
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CAF	Canadian Armed Forces
CCP	Canadian Content Policy
CD&E	Concept Development and Experimentation
CFBLNet	Combined Federated Battle Lab Network
CDRL	Contract Data Requirements List
CFITES	Canadian Forces Individual Training and Education System
CFMWC	Canadian Forces Maritime Warfare Centre
CFRG	Canadian Forces Recruiting Group
CFXNet	Canadian Forces Experimentation Network
CNPTG	Commander Naval Personnel and Training Group
COMMARPAC	Commander Maritime Forces Pacific
COMMARLANT	Commander Maritime Forces Atlantic
CONOPS	Concept of Operations
CORE	Common Open Architecture Reconfigurable Environment
COTS	Commercial-Off-The-Shelf
CRCN	Commander Royal Canadian Navy
CRRs	Combat Readiness Requirements
CSC	Canadian Surface Combatant
CSD	Common Source Database
CSNI	Consolidated Secret Network Infrastructure
CSTG	Commander Sea Training Group
CT	Collective Training
CIWS	Close In Weapon System

CVNF	Canadian Virtual Naval Fleet
DDN	Development of an RCN App Portal
DF	Digital Framework
DG	Director General
DGFSC	Director General Future Ship Capability
DGMEPM	Director General Maritime Equipment Program Management
DGNFD	Director General Naval Force Development
DID	Data Item Description
DIM Secure	Director Information Management Security
DL	Distributed Learning
DLN	Defence Learning Network
DME	Data Management Environment
DMOC	Distributed Mission Operations Centre
DMT	Distributed Mission Training
DNAV P&T	Director Naval Personnel and Training
DND	Department of National Defence
DNIW	Director Naval Information Warfare
DNR	Directorate of Naval Requirements
DNSM	Director Naval Strategic Management
DRMIS	Defence Resource Management Information System
DWAN	Defence Wide Area Network
EC	Engineering Change
EDE	Electronic Data Exchange
ESB	Enterprise Service Bus
FA	Functional Authority
FD	Force Development
FDU	Fleet Diving Unit
FE	Force Employment
FG	Force Generation
FNTS	Future Naval Training System
FSR	Field Service Representative
GBA	Gender Based Analysis
GC	Government of Canada
GPNet	General Purpose Network
HLMRs	High Level Mandatory Requirements
HRMS	Human Resource Management System
HUMS	Health and Usage Monitoring System
HV	High Voltage
HVAC	Heating, Ventilation and Air Conditioning
IDE	Integrated Data Environment
IM	Information Management

ILS	Integrated Logistics Support
IP	Intellectual Property
IPMS	Integrated Platform Management System
ISD	Instructional Systems Development
ISS	In-Service Support
ISSC	In-Service Support Contract
ITB	Industrial and Technological Benefits
IT	Individual Training
IT&E	Individual Training and Education
JSS	Joint Support Ship
JTAR	Job Task Analysis Record
LCMS	Learning Content Management System
LEED	Leadership in Energy and Environmental Design
LMS	Learning Management Systems
LOR	Learning Object Repository
LORA	Level of Repair Analysis
LRS	Learning Records Store
LSA	Logistics Support Analysis
LTI	Learning Technologies Interoperability
LVC	Live, Virtual, and Constructive
MCS	Military Command Software
MEPM	Maritime Equipment Project Management
MISL	Modernization and Integration of Sustainment and Logistics
MOU	Memorandum of Understanding
MPG	Military Personnel Group
MPT	Maintenance Procedure Trainer
MRT	Multi-purpose Reconfigurable Trainers
MSC	Major Surface Combatant
MWAV	Minor Warship Auxiliary Vessel
MTS	Maintenance Task Statements
NFS (A)	Naval Fleet School Atlantic
NFS (P)	Naval Fleet School Pacific
NFS (Q)	Naval Fleet School Quebec
NIDE	Naval Integrated Data Environment
NLP	Natural Languages Processing
NMA	Naval Material Assurance
NDSODs	Naval Defence Security Orders and Directives
NPTG	Naval Personnel Training Group
NPTT	Navigational Part Task Trainer
NRD	Naval Reserve Division
NTDC (A)	Naval Training and Development Centre Atlantic

NTDC (P)	Naval Training and Development Centre Pacific
NTOC	National Training Operations Centre
NTOG	Naval Tactical Operations Group
NPTG	Naval Personnel and Training Group
NTS	Naval Training System
NTST	Naval Training System Transformation
NWO	Naval Warfare Officer
OEM	Original Equipment Manufacturer
OGD	Other Government Department
ORO	Operations Room Officer
OT	Operational Training
PCC	Personnel Coordination Centre
PD	Professional Development
PDM	Product Data Management
PLM	Product Lifecycle Management
PRICIEG	Personnel, Research, Infrastructure, Concepts, Information; Equipment, Gender Based Analysis plus
QA	Quality Assurance
QMS	Quality Management System
QSP	Qualification Standard Plan
RAS	Replenishment at Sea
RCAF	Royal Canadian Air Force
RCN	Royal Canadian Navy
RM	Resource Management
RP Ops	Real Property Operations
RT	Refresher Training
SA&A	Security Assessment and Authorization
SAR	Search and Rescue
SAT	System Approach to Training
SBCA	Sustainment Business Case Analysis
SBIT	Shore-based Individual Trainer
SBTT	Shore-based Team Trainer
SCORM	Shareable Content Object Reference Model
SCTT	Submarine Class Team Trainer
SMC	Service Management Centre
SME	Subject Matter Expert
SOR	Statement of Requirement
SoS	System of Systems
SSC	Shared Services Canada
SST	Steady State Training
STG	Sea Training Group
STORM	System of Training and Operational Readiness Modernization

TA	Training Authority
TDC	Training Development Centre (properly Naval Training Development Centre)
TEC	Technology Enabled Classroom
TEL	Technology Enabled Learning
TF	Training Facilities
TM	Training Management
TMA	Training Media Analysis
TNA	Training Needs Analysis
TOR	Terms of Reference
TT	Training Technologies
USB	Universal Serial Bus
UWSU	Underwater Warfare Suite Upgrade
VCTT	Victoria Class Team Trainer
VR	Virtual Reality
VTC	Video Teleconferencing

13 DEFINITIONS

A large number of terms are used in the CONOPS that are capitalized. These terms have specific definitions. Wherever possible, these definitions are consistent with the DND Termium, the NTST Program Lexicon, and supporting Project Lexicons.

Term	Definition
CAF Campus Operational Framework	The CAF Campus Operational Framework is part of the Individual Training and Education Modernization Initiative produced by the Canadian Defense Academy 19 June 2013, designed to be a modern agile training system that will be implemented to help strengthen training.
Capability	The ability to carry out a military operation to create an effect.
Collective Training (CT)	Collective Training (CT). Activities or events that takes groups of individually trained personnel into effective teams, from the Sub-Team level all the way to the Task Force Level. CT is divided into five different levels to effectively categorize the complexity of the training, based on team size requirements. These levels are: (1) Level 1: CT Level 1 is known as Sub-Team Training. It focuses on all training activities or events that take a group of individually-trained personnel and form them into effective operational specialist sub-teams. Section training falls into this category (2) Level 2: CT Level 2 is known as Team Training. It focuses on all training activities or events that take two or more sub-teams together and train them to form a larger team within the confines of a unit. OTT 1 & 2, HAZMAT TT, DCOTT, MRIs, TRIs are examples of CT Level 2 training; (3) Level 3: CT Level 3 is known as Unit Training. It focuses on training activities or events which involve a unit as a whole. Examples of such activities includes HRT, BSSRT, ISSRT, IMSRT and AMSRT; (4) Level 4: CT Level 4 is known as Task Group (TG) Training. It focuses on training activities or events involving multiple units within a Task Group. This type of training normally involves members of TG staff and multiple Force elements; and (5) Level 5: CT Level 5 is known as Task Force (TF) Training. It focuses on training activities or events involving JTF staff and units, from two or

Term	Definition
	more elements such as JointEx, RIMPAC, Trident Juncture.
Continuous Improvement	An ongoing effort to improve an organization's products, services, and/or processes. Continuous improvement efforts can range widely in complexity, duration, execution, and subject matter. The continuous improvement approach does not stop, it is an uninterrupted flow. A continuous approach is one that will constantly look to make improvements, it is a sustained process of development.
Digital Framework (DF) System	One of the six major systems in the FNTS. The FNTS DF System is defined as the management, data, networks, tools, standards, policies, and technologies that realize the digital function requirements of the FNTS.
Digital Framework	The data, tools, standards, policies, and technologies that realize the strategic objectives within the functional areas of the FNTS. Digital Frameworks are composed of two primary pieces – Data Management and Information, and Communication Technology Infrastructure. Together they encompass the interoperability of systems, data and training content strategies
FNTS	Future Naval Training System. The FNTS is a holistic, complex, and expansive System of Systems, comprised of six major systems: • Governance System • Training Management (TM) System • Training Technologies (TT) System • Digital Framework (DF) System • Training Facilities (TF) System • Sustainment System These six major systems in combination provide, operate, and sustain the complete breadth of RCN training across the Training Continuum.
Governance	The authority to provide direction and to undertake, coordinate, and regulate activities in support of achieving this direction and the desired outcomes. Governance also explains how authority and responsibility are granted, emphasizes

Term	Definition
	management expectations, and defines accountabilities.
Governance System	One of the six major systems in the FNTS. The Governance System provides the organization, ARAs and policies needed to realize the Governance requirements of the FNTS.
Individual Training and Education (IT&E)	Individual Training includes all instructional activities provided to CF members that impart the skills, knowledge and attitudes required to perform assigned duties as well as exercise sound judgment and correctly interpret information. It includes OJT, Refresher, Initial Cadre, Conversion, Regenerative, Steady State and other training in the RCN delivered to an individual.
Mission Command	The philosophy of Command that promotes unity of effort, the duty and authority to act, and initiative to subordinate commanders
NTST Program	Naval Training System Transformation Program. The Program that will deliver the FNTS.
Resource Management	One of four NTS Training Management Functions, Resource Management is how resources including financial, materiel and human resources are acquired, allocated, monitored and controlled at the NTS strategic, operational and tactical levels.
Single Trusted Data Source	Source of standards-based, common, configuration controlled data that enables informed, timely, and evidence-based decision making. All Data in the FNTS DF System is a subset of Data in the larger RCN Digital Framework.
Sustainment System	One of the six major systems in the FNTS. The Sustainment System provides all the elements needed to realize the Sustainment requirements of the FNTS.
Sustainment	Sustainment provides for provision of personnel, training, logistics and other support required in the maintenance and repair activities necessary to keep a typical inventory of materiel and facilities in good working order over its expected service life.
System	A combination of interacting elements system elements organized to achieve one or more stated purposes. This includes any combination of

Term	Definition
	facilities, equipment, personnel, procedures, and communications intended for a specific purpose.
System of Systems	Two or more systems brought together for a task that none of the systems can accomplish on its own.
Training Continuum	The complete breadth of training comprising IT&E and CT levels 1-5
Training Delivery	One of three Training Management functions. Training Delivery is the function which establishes or changes individual and team behavior to achieve a defined outcome. Training must be delivered in such a way that essentials are taught and that RCN personnel learn and are able to transfer the content mastered to their duties and jobs.
Training Development	One of three Training Management functions. Training Development is the function which develops training solutions to address gaps caused by a lack of or an increase in skill and knowledge requirements. The designated training solutions are chosen to effectively and efficiently close the performance gap. They may be face to face, virtual, technology based, or any combination thereof.
Training Facilities (TF) System	One of the six major systems in the FNTS. The TF System provides the coordination and management and all TF needed to realize the TF requirements of the FNTS.
Training Facilities (TF)	TF are all the buildings in which the FNTS is housed.
Training Management (TM) System	One of the six major systems in the FNTS. The TM System has three functions; Training Operations Management, Training Development, Training Delivery. Combined, these functions deliver the right number of sailors, with the right capabilities and qualifications at the right time and place, effectively and efficiently and at an acceptable cost. These are the elements needed to realize the TM requirements of the FNTS.
Training Operations	One of three Training Management functions. Training Operations Management is the function that provides oversight and management of all training activities.
Training Technologies (TT) System	One of the six major systems in the FNTS. The TT System provides technologies to support three

Term	Definition
	primary functions; Resource Management, Training Development, Training Delivery. These are the elements needed to realize the TT requirements of the FNTS.
Training Technologies (TT)	Plural of Training Technology
Training Technology	A Training Technology is any tangible hardware or software asset, including all of the devices needed to conduct, support or verify the Complete Spectrum of RCN Training.

September 13, 2020 - September 19, 2020

September 2020

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27	28	29	30			

October 2020

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11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	13	14	15	16	17	18	19
	Formation Fun Day NAVRES Cmd Team Trg (V	VIC ARB	DM on Footprint VIC Level 2 Licence VIC Return to Sea			VIJHL Season Start	MAL CoC
7 AM			DM @ MARPA for SVTCs Rm 349				
8		Morning Sync N00's Off	Morning N0	Morning Sync N00's Office; Auchterlonie R	Morning Sync N00's Off	Morning Sync N00's Office; Auchterlonie R	
9		Office Call - N00 Office; A NOPQ / NW N00's Office;	HMCS VICTOR SUBSAI Licence Signing D100 A Sutherla	Placeholder: Filming - Naden Band 80th Anniversary Vid	Admiral's Op Confere		
10		MARPAC Command Council D100 Rm 329 / VTC; Berry Lt					
11		Lunch/PT	Lunch/PT	Lunch/PT	Lunch / Michael Morrison TBC Morrison, Michael	Lunch/PT	
12 PM			TC Navigation Safety	Protect	Command Intelligence Brief D-100 Room 128 N2 Confer		
1		Glasses Appt Mayfair Optometric	Travel to Chiro / Cedar C				
2		Saanich Jr Practice NADEN	Travel to Protec Saanich NAI		Protect Saanich Jr Pr Pearkes	Protect	
3						Saanich Jr vs TBC; Pearkes	
4							
5							
6							

September 20, 2020 - September 26, 2020

September 2020

Su	Mo	Tu	We	Th	Fr	Sa
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October 2020

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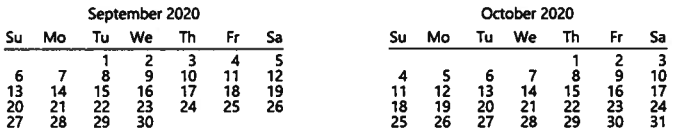
	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	20	21	22	23	24	25	26
	DM Departs AOR	SLT Window					
		House of Commons Resumes	CX - Defence Leadership		FRMB		
7 AM		Travel to Westshore	Morning Syn N00's Off	Morning Syn N00's Off	Morning Syn N00's Off	Morning Syn N00's Off	
8		Med Appt Dr Scott	SLT Virtual (Zoom)				
9		Travel to Dockyard; Morning Syn N00's Off		Placeholder: MARPAC Health, Safety and	Admiral's Op Confere	SLT Virtual (Zoom)	
10		MARPAC Command Council D100 Rm 329 / VTC; Berry Lt			FRMB L2 Business Plan Rm 349/VTC/Telecon; Aucht		
11		Lunch/PT	Lunch/PT	N8 - Pre-Bri N00's Office; Lunch/PT	Lunch/PT	Lunch/PT	
12 PM							
1			SLT Virtual (Zoom)	SLT Virtual (Zoom)	Command Tr D-100 Ro; SLT Virtual (Zoom)		Danny O's - Depart With Dignity Outdoor on the Venture Gunroom Patio Kennedy TN@NPT(
2							
3		Protect; Saanich Jr Pr NADEN	Protect; Saanich Jr Pr NADEN	Protect	Saanich Jr Pr Pearkes; Protect	Protect	
4							
5							
6						Saanich Jr vs TBC; Pearkes	

September 27, 2020 - October 3, 2020



	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	27	28	29	30	1	2	3
		SLT Window					
		OTT Commissioned (28 Sep		REG Commissioned (30 Sep			
7 AM							
8		Morning Syn N00's Off	Morning Syn N00's Off	Morning Sync N00's Office; Auchterlonie R	Morning Syn N00's Off	Morning Syn N00's Off	
8		SLT Virtual (Zoom)	SLT Virtual (Zoom)				
9					Admiral's Op Confere	SLT Virtual (Zoom)	
10		MARPAC Cor D100 Rm					
11		Lunch/PT	Lunch/PT	Lunch/PT	Placeholder: N00's Office;	Lunch/PT	
12 PM					Lunch/PT	Lunch/PT	
1		SLT Virtual (Zoom)	SLT Virtual (Zoom)	SLT Virtual (Zoom)	Command In D-100 Rio	SLT Virtual (Zoom)	
2							
3		Saanich Jr Pr NADEN	Saanich Jr Pr NADEN	Protect	Saanich Jr Pr Pearkes	Protect	
3		Protect	Protect		Protect		
4							
5							
6						Saanich Jr vs TBC; Pearkes	