E-Reader Implementation Feasibility Study

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E-READER IMPLEMENTATION FEASIBILITY STUDY

EMBA PROJECT REPORT

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E-Reader Implementation Feasibility Study

EXECUTIVE SUMMARY

This project was completed by Corpus Christi One, on behalf of Chief of Naval Air Training’s Deputy Assistant Chief of Staff for Training and Standardization (CNATRA N7), and facilitated through the Naval Postgraduate School Executive MBA program. The purpose is to analyze CNATRA’s current model of producing and distributing flight training-related publications to student military aviators (SMAs) in hard-copy format, and to compare that model with a program instead using electronic book readers (e-readers) and digitized versions of these same publications to determine whether or not such a model would be technically feasible, and whether or not such a course of action might allow cost savings to be realized over the current practice.

This study focuses on a single flight training squadron: Training Squadron TWO EIGHT (VT-28) based at NAS Corpus Christi. In addition to historical data obtained from VT-28 with regard to SMAs trained annually, interview data was obtained from subject matter experts involved in the ordering, production, inventory, and issuance of flight training publications, as well as the manufacture of e-readers and digital conversion of documents. Our analysis compares and contrasts three possible courses of action:

- **COA 1**: Purchase e-readers to support the total number of SMAs trained each year. SMAs will then keep the e-reader they have been issued.
- **COA 2**: Purchase e-readers to support only the maximum number of SMAs in training at any given time. E-readers will be returned for re-issue.
- **COA 3**: Continue to produce and distribute flight training publications in hard-copy format.

While all three COAs would meet the instructional needs of both CNATRA and the SMA, we believe that COA 3 provides the best, most economical solution within the constraints of this project. In order to realize cost savings through e-reader use, it must be implemented far more comprehensively than merely in a single unit or phase of flight training.
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I. INTRODUCTION AND BACKGROUND

A. INTRODUCTION

Naval Air Training Command’s (NATRACOM) mission to provide trained aviators to the fleet is one of critical importance to national security, especially during a time when our nation is involved in two ongoing wars in addition to global intelligence collection and power projection efforts. This mission must continue to be successfully executed, producing aviators in numbers sufficient to support the national interest, even as NATRACOM is increasingly forced to operate within a more restrictive fiscal environment. As it is unlikely that any cost savings can be realized through reducing or diluting the actual flight training of student military aviators (SMAs) without incurring unacceptable reductions in SMA performance, NATRACOM will have to look increasingly to its administrative functions and responsibilities in order to identify possible cost savings. Corpus Christi One (CC1), in cooperation with Chief of Naval Air Training’s Training and Standardization Department (CNATRA N7), has identified the distribution of flight training instructions (FTIs) to SMAs as an area in which CNATRA might be able to realize cost savings if the instructions were delivered electronically instead of physically, taking advantage of the increasing maturity and capability of commercially available electronic book readers (e-readers). This report summarizes our findings and lays out our recommendations with regard to this potential course of action.

B. BACKGROUND

NATRACOM’s mission is to train the world’s finest combat quality aviation professionals, delivering them at the right time, in the right numbers, and at the right cost.1 It accomplishes this through several multi-stage, platform-specific syllabi, combining academic and practical instruction during each stage – preflight indoctrination, primary, intermediate, and advanced. NATRACOM implements this training through one academic school and seventeen training squadrons based at six separate Naval Air Stations (NASs) and employing seven separate airframes. Following

1 “Chief of Naval Air Training,” https://www.cnatra.navy.mil (Jan 2011)
preflight indoctrination and primary training, which every SMA receives, each student is assigned a service- and mission-specific training pipeline based on their performance, desires, and the overarching needs of the Navy. Depending on pipeline selection, the total time required to train a newly-winged Naval Aviator is anywhere from one-and-a-half to two years. During any given year, more than 1500 Naval Aviators and Naval Flight Officers will complete their flight training and earn their “Wings of Gold.”

VT-28, whose SMAs were used as a sample by CC1 during the course of this study, is a primary training squadron employing the T-34C Turbo Mentor based at NAS Corpus Christi. When an SMA reports to VT-28, he is issued, in addition to wing- and squadron-specific administrative publications, eight CNATRA academic and flight training publications that encompass his ground and flight training curricula. Approximately 250 SMAs begin their training at VT-28 each fiscal year. To support this number, 2000 individual publications must be printed and stored each year to be distributed to VT-28 SMAs alone, with associated printing and inventory costs borne by CNATRA or their subordinate training wings. When these costs are multiplied by the number of SMAs in training at each squadron, as well as the number of squadrons each student will pass through during his training, assuming a similar number of publications required per stage, the overall cost to CNATRA is considerable.

C. PROJECT OBJECTIVES

The focus of this study is to evaluate the cost and feasibility of utilizing NATRACOM-issued, commercially available e-readers and electronically distributed ground training publications, rather than hard-copy publications, for SMAs during flight training. In conducting the research and analysis to support our recommendations with regard to this potential course of action, Corpus Christi One focused on answering the following key questions:

1. Would NATRACOM realize cost savings through issuing e-readers utilizing electronically distributed publications to SMAs rather than hard-copy publications?

2. Would the electronic distribution of CNATRA ground training publications be in compliance with existing instructions and directives?

3. Would it be possible for NATRACOM to sufficiently manage the e-readers’ configuration to ensure the security and viability of this distribution model?

4. Would SMAs prefer such a distribution method?

During the course of this report, we will answer each question separately.

D. PROJECT SCOPE

This is a study of NATRACOM’s present method of FTI distribution and one alternative. While we and our client are interested primarily in this alternative for the purposes of this report, there may be other alternatives that we did not consider, with associated costs that were not factored into our analysis.

In conducting our research and analysis, we limited the scope of our project to only include the SMAs currently in training at VT-28 for interview purposes, and only considered SMAs that trained at VT-28 during FY 2008, and took into account only the ground training publications required by those SMAs, to arrive at cost estimates. We placed this limitation upon our efforts to avoid having to consider the different ground training and academic requirements of different squadrons, or of different syllabi conducted within the same squadron, as is the case with advanced flight training. We limited the scope of our research to the ground training publications due to the complexity and difficulty of including in-flight publications, such as navigation charts, in our study, which would have necessitated considering the cost of in-flight testing and evaluation of e-readers and restrictions on the in-flight use of e-readers that might emanate from the Federal Aviation Administration (FAA). We also did not consider the electronic distribution of wing- and squadron-specific publications received by such SMAs in order to limit the number of stakeholders involved to a single client. However, while our findings were based on information gathered through the study of this limited pool of SMAs and publications, the recommendations presented should be applicable or adaptable to other NATRACOM units conducting flight training, or to publications produced by NATRACOM units other than CNATRA for use by SMAs.
Corpus Christi One will not be responsible for the implementation of any recommendations that result from this study.

E. METHODOLOGY

We conducted this project along several parallel paths that allowed our group to develop holistic recommendations. First, we evaluated the potential for cost savings. Chief of Naval Air Training’s Training and Standardization Department (CNATRA N7) provided us data for ordering costs to CNATRA for the FTIs considered by our project. Defense Logistics Agency (DLA) San Antonio, the organization responsible for printing the publications, also provided us cost data for producing the FTIs ordered by CNATRA. Multiplying these costs by the number of SMAs we used as a sample allowed us to determine the total cost to CNATRA of the current model for FTI distribution. To compare the costs of this model with those of our proposed alternative, we liaised with a company, Books and Research, Inc. based in Dobbs Ferry, NY, which specializes in electronic document conversion to estimate what the cost to CNATRA of digitizing the FTIs in question would be. We also looked at commercial off-the-shelf e-readers, analyzing four different models for unit cost, capability, and suitability. We relied on readily available technical information via open sources to inform our comparison, and augmented this by liaising with the specific manufacturers to obtain additional data when necessary.

Second, CC1 assessed the current state of regulation concerning the use of digitally-distributed publications and e-readers. Primarily, we worked with CNATRA’s Administrative Department (N1) on this aspect of the project.

Third, we evaluated NATRACOM’s ability to manage e-reader configuration within such a model through network/hardware restrictions and terms of use agreements. The data we gathered concerning e-reader configuration and capability, as well as current practice within NATRACOM regarding terms of use agreements, formed the basis for this aspect of the project.

Lastly, we conducted interviews of 49 VT-28 SMAs to gauge their receptiveness to the hypothetical issue and use of e-readers as envisioned by our project and to determine to what extent students currently use personal e-readers, or other electronic
means, to study during primary flight training. While unrelated to the cost-benefit analysis that is the thrust of this project, the data obtained from these interviews provides insight into the ultimate efficacy of this proposed course of action by capturing the receptiveness of the target audience to such a distribution model.

F. ASSUMPTIONS

During our analysis, CC1 made the following assumptions:

• The salary of the civilian clerk employed by Training Wing FOUR (TW-4), to which VT-28 is subordinate, for the purpose of inventorying and issuing FTIs and other publications to SMAs was assumed to be a sunk cost. We made this assumption due to the likelihood that this same employee would also be employed to maintain and issue e-readers should our alternative model be implemented.

• Similarly, the salaries of Defense Logistics Agency, San Antonio (DLA-SA) employees involved in FTI production, and any acquisition or maintenance costs associated with DLA-SA’s printing process other than those related to consumables used during FTI production, were assumed to be sunk.

• To obtain a representative annual number for SMAs in training at VT-28, CC1 used the total number of SMAs that checked in to VT-28 during FY 2008. This year was the most recent year to be largely unaffected by significant shortfalls in airframe availability or shifts in the squadron’s annual SMA production target. That number was 221 SMAs.

• In estimating the number of e-readers CNATRA would need to purchase, we assumed an additional 25 e-readers (or approximately ten percent) would be a conservative estimate to account for losses due to defect or damage. None of the customer service reps we talked to was willing to quote an estimated failure rate to account for a safety stock. Interestingly, in the fall of 2009 when Reed College evaluated the possibility of using an e-reader in its classrooms, none of the 43 students enrolled in the study cited hardware or software failure during the test semester.3

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II. FINDINGS

A. COST ANALYSIS OF FTI PUBLICATION AND DISTRIBUTION

1. Cost of Publications – Current Practice

Working with CNATRA N7, CC1 was able to obtain the typical annual ordering costs to CNATRA of the eight primary FTIs for which they are the approval authority. While CNATRA retains custody of the publications with regard to content, they are not the executive agent for the actual printing of FTIs, relying instead on the printing capability of Defense Logistics Agency, San Antonio (DLA-SA) to print publications to be used in Training Air Wings FOUR (NAS Corpus Christi), under which VT-28 is subordinate, and TWO (NAS Kingsville). We were able to obtain production costs for these eight FTIs from DLA-SA, which we multiplied by the number of VT-28 SMAs requiring these FTIs to establish a baseline cost for individual FTI production and distribution. This cost was then combined with CNATRA’s ordering costs to arrive at a total annual cost for this distribution model.

For the FTIs with which this project is concerned, CNATRA places printing orders with DLA-SA approximately eight times each year. As the cost to place an order for each FTI, independent of the size of the order, is $3.00, we arrived at an annual ordering cost to CNATRA of $24.00 for each FTI. In discussions with DLA-SA, we were able to obtain the cost per copy charged to CNATRA to produce each FTI. As DLA-SA only charges CNATRA to offset the costs they incur through the use of consumables, this cost accurately summarizes the physical cost of each hard-copy FTI. When we multiplied this cost by the number of SMAs in training at VT-28, and then added to it the ordering cost, we arrived at a total annual cost to CNATRA to provide hard-copy FTIs to VT-28 SMAs of $19,204.63. This data is summarized in Exhibit 1.
Exhibit 1

**CNATRA T-34C Primary Publication Cost Analysis**

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Price/copy</th>
<th>Personnel Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Master Curriculum Guide</td>
<td>1542.140D</td>
<td>$6.33</td>
<td>$24.00</td>
</tr>
<tr>
<td>Aviation Weather Study Guide</td>
<td>P-304</td>
<td>$11.89</td>
<td>$24.00</td>
</tr>
<tr>
<td>Instrument Flight Rules</td>
<td>P-305</td>
<td>$13.60</td>
<td>$24.00</td>
</tr>
<tr>
<td>Systems</td>
<td>P-307</td>
<td>$11.51</td>
<td>$24.00</td>
</tr>
<tr>
<td>Contact Flight Training Instruction (FTI)</td>
<td>P-330</td>
<td>$12.22</td>
<td>$24.00</td>
</tr>
<tr>
<td>Instrument Flight Training Instruction (FTI)</td>
<td>P-340</td>
<td>$18.23</td>
<td>$24.00</td>
</tr>
<tr>
<td>Formation Flight Training Instruction (FTI)</td>
<td>P-357</td>
<td>$7.80</td>
<td>$24.00</td>
</tr>
<tr>
<td>Visual Navigation Flight Training Instruction (FTI)</td>
<td>P-359</td>
<td>$4.45</td>
<td>$24.00</td>
</tr>
</tbody>
</table>

**VT-28 Student Load (FY2008)**

| Student load x Price/copy | $19,012.63 |

| Total Cost | $19,204.63 |

Assumptions
1) FY08 Student Load Historical Data of 221 SMAs
2) Personnel cost is $3.00 per print request
3) Avg print request for each publication is 8/year

2. **E-reader Comparison**

CC1 elected to limit our analysis of commercially-available e-readers to four widely available and recognizable models: Sony’s E-reader (Pocket edition), Amazon’s Kindle, Barnes and Noble's Nook, and Kobo's (Borders) E-reader. While these e-readers differ slightly with regard to specifications and capability, each is available in a model that retails between $140 and $160.

   a. **Screen**

   All four e-readers employ screens of similar size, and all utilize E-Ink technology, which has become the industry standard in the display of text and images by e-readers. It minimizes glare, allowing users to read the screen even in full sunlight conditions, and reduces ocular fatigue. In contrast, tablet computers, such as the iPad, use various, and often proprietary, screen technologies, which are not as friendly to the user when it comes to prolonged use. Furthermore, the resolution and image quality are all identical at 800x600 and 4-bit.
b. Memory

All of the e-readers researched include 2GB of installed memory, with the exception of the Amazon Kindle, which has 4GB. The Nook and the Kobo have expandable memory, with the Nook utilizing a microSD slot allowing expansion up to 16GB and the Kobo using a standard SD slot allowing expansion up to 32 GB. Neither the Kindle nor the Sony Pocket is expandable in this regard. While the ability to increase memory capacity may be desirable should the use of these e-readers by NATRACOM be expanded to include other publications and functions, it is important to note that even the minimum memory capacity contained within the e-readers considered is well beyond that needed to implement our proposed electronic distribution model.

c. Supported File Types

The supported file types are where we begin to see distinct differences between the selected e-readers, with some enjoying a very real advantage with regard to the usability and flexibility of various file types.

Nook, Pocket, and Kobo each support the electronic publication file type (EPUB), an open e-book format developed by the International Digital Publishing Forum which is rapidly becoming the industry standard. An EPUB file is basically a package of the various types of data, such as text, tables, and images, which make up the complete document. EPUB-formatted documents allow for the use of “reflowable” content, which can be optimized for a particular display type, size, and zoom level. In effect, zooming in on an EPUB document will reflow the text so that content is not hidden from view, as would be the case for the same document in portable document format (PDF), and eliminates the need to scroll horizontally through a document in order to view the text in its entirety. This format is also unrestricted with regard to transfer between e-readers of differing manufacture and version, allowing for the file type’s continued use without change should NATRACOM choose to later upgrade to a more capable e-reader, or choose to use an e-reader from a different manufacturer.

Kindle does not support this specific file type, but rather supports Amazon’s proprietary format called AZW that is restricted by embedded digital rights management (DRM) code. This DRM prevents AZW files from being transferred between devices, and NATRACOM would likely be unable to effectively employ this
format to distribute documents electronically as a result.

All of the e-readers considered by CC1 support the PDF file format to varying degrees. Nook and Pocket both allow for single-page text reflow, which will re-wrap text within a paragraph as long as that paragraph does not extend to a second page. Kobo and Kindle will both display PDF files but do not support reflow, with the user instead having to adjust the zoom level to achieve greater detail. This added feature could allow SMAs the opportunity to download for reference more than just FTIs. Publications such as the Federal Aviation Administration’s FAR/AIM and Naval Air Systems Command’s (NAVAIR) OPNAV 3710 (series), and NATOPS flight manuals could also be easily downloaded, though their usefulness would be limited by the restrictions potentially placed upon how PDF documents are viewed by various e-readers.

d. Battery Life and Recharge Time

All four e-readers take between three and four hours to recharge. The life of the battery, however, varies greatly between the different e-readers. Nook and Kobo both estimate a battery life of approximately ten days, while Pocket’s battery life is estimated at 14 days. In distinct contrast, the Kindle boasts a 30-day battery life.

e. Conclusion

We found that, with the exception of objecting to Kindle’s inability to support the EPUB format, there was nothing to recommend one e-reader over any other, and that each would suffice with regard to the desired functionality envisioned by this project. In fact, were CNATRA to forego EPUB conversion in favor of utilizing PDF-formatted documents, we would withdraw our objection to Kindle, as well. Excepting EPUB compatibility, then, the only discriminator between the e-readers considered is unit price, with Kobo being the cheapest.

3. EPUB Conversion Costs

In order to electronically distribute FTIs in the EPUB format, the documents, which are currently saved in Microsoft Word format for editing purposes, would need to be converted to EPUB format. Although it would be possible for CNATRA to develop this ability within their organization, it is likely that it would be more cost effective and timely to contract out this function to a company specializing in such digital document
conversion. The data which follows was obtained through liaising with Books and Research, Inc. (BnR), one such company with which CNATRA’s N7 already has contact.

The digital conversion of any number of publications, not merely the eight taken into account by CC1, would entail a setup cost of $500. Following setup, documents could be converted at a cost of $2.00 per page. As the eight FTIs in question total 1,564 pages, the total cost to convert all eight would be $3,628. It is important to note that this estimate only includes conversion of text. The conversion of tables, charts, and illustrations would be done separately, and an estimate of these costs would entail a more detailed document review that could not be completed by BnR in time to allow their inclusion in this report. Once so converted, CNATRA would maintain custody of the documents, and could edit and update them as required as EPUB documents, but to do so would require the use of software, such as Adobe’s inDesign, that could edit the XHTML format contained within the EPUB file. The acquisition and implementation of this software would represent additional costs also not estimated or included in this report.

Instead of converting to EPUB format, CNATRA may instead elect to distribute documents electronically as PDF files, using functionality already contained within Microsoft Word and used to convert documents, including FTIs, for posting on CNATRA’s official website. While not perhaps as versatile or user friendly as an EPUB document would be, the use of PDF files would not entail any additional cost to CNATRA.

4. E-reader Acquisition and Implementation Costs

To approximate the annual cost to CNATRA of implementing our e-reader model, we multiplied the unit cost of the four types of e-reader by VT-28 student load data from FY 2008, assuming an additional purchase of 25 e-readers as previously discussed, to develop costs for two related courses of action (COAs), which are discussed below. We then calculated for each COA the total cost, both including and excluding the conversion of the FTIs in question to EPUB format. These total costs are summarized in Exhibit 2.
## Exhibit 2

<table>
<thead>
<tr>
<th></th>
<th>Sony</th>
<th>Kindle</th>
<th>Nook</th>
<th>Kobo</th>
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</thead>
<tbody>
<tr>
<td>Price per unit</td>
<td>$160.00</td>
<td>$140.00</td>
<td>$150.00</td>
<td>$140.00</td>
</tr>
<tr>
<td>COA 1 PDF</td>
<td>$40,000.00</td>
<td>$35,000.00</td>
<td>$37,500.00</td>
<td>$35,000.00</td>
</tr>
<tr>
<td>COA 1 EPUB</td>
<td>$43,628.00</td>
<td>N/A</td>
<td>$41,128.00</td>
<td>$38,628.00</td>
</tr>
<tr>
<td>COA 2 PDF</td>
<td>$28,800.00</td>
<td>$25,200.00</td>
<td>$27,000.00</td>
<td>$25,200.00</td>
</tr>
<tr>
<td>COA 2 EPUB</td>
<td>$32,428.00</td>
<td>N/A</td>
<td>$30,628.00</td>
<td>$28,828.00</td>
</tr>
<tr>
<td>FY08 Student Load</td>
<td>221</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity Req’d COA 1</td>
<td>250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity Req’d COA 2</td>
<td>180</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The first COA is to issue e-readers to primary SMAs that then become theirs to keep. The FY 2008 load of 221 students would require 246 e-readers, with the annual cost of this COA ranging from $35,000 to $43,628, depending on the model of e-reader purchased and conversion method employed. It is important to note that this COA involves purchasing new e-readers for issue each year, so that this expense would be an annual one. While this is expensive, it does allow this COA to avoid difficulties arising from what is likely to be the rapid obsolescence of any single iteration of e-reader.

The second COA is to issue e-readers to SMAs and have the SMAs return them upon checkout for re-issue to SMAs beginning their training at a later date. Though VT-28 trained a total of 221 SMAs during FY 2008, the maximum number of SMAs in training at any one time was 160. This would require approximately 185 e-readers to support a maximum student load during any period in a fiscal year, while also accounting not only for assumed losses but also for any short-term spikes in the SMAs in training. The annual cost of COA 2 ranges from $25,200 to $32,428, again, depending on the model of e-reader purchased and conversion method. This COA is significantly cheaper to implement than COA 1, but would tie CNATRA to a single type and version of e-reader, which could become problematic should its manufacturer no longer support that reader or become otherwise obsolete.

These costs do not summarize the life cycle costs of maintaining the selected e-readers. In addition to the costs associated with the initial purchase, there are many life-cycle costs that must be taken into consideration before implementing a program.
predicated on using COTS e-readers in flight training. While the scope of this project does not encompass the actual purchase or logistics of issuing the e-readers, the following operational and end-life costs are just an example of future and reoccurring costs that must be researched further:

- Training of civilian staff/IT Department personnel on how to manage the e-readers’ hardware, software updates, and possible troubleshooting techniques.
- Training of students’ e-reader use and restrictions.
- If an E-Pub conversion is desired, anytime an FTI is updated additional costs will be accrued to convert the file as well as time spent updating existing e-reader configurations.
- Disposal, or replacement of absolute/damaged units.

When these cost estimates are compared with the cost of CNATRA’s current practice, it is clear that there is not a scenario where it is cheaper for NATRACOM to transition from hard-copy publications to e-pubs within a single squadron, or even within a single phase of flight training. For CNATRA to realize any cost savings through the use of e-readers to distribute FTIs, it must be an enterprise-wide endeavor, with the SMA being issued his e-reader when he begins preflight indoctrination and carrying it with him through each phase of his training. Thus, each e-reader purchased allows CNATRA to avoid printing, not just the eight FTIs used in primary flight training, but every FTI used in every phase, potentially as many as 30. Only in this manner can the money saved by no longer being required to print FTIs exceed that required to purchase and issue e-readers.

**B. COMPLIANCE WITH APPLICABLE INSTRUCTIONS**

While CC1’s primary goal was to explore the possibility of cost savings through the use of e-readers to distribute FTIs, our effort would have been wasted if such a model did not comply with applicable US Government and Navy instructions and directives. Thus, a parallel effort was made on our part, working in concert with CNATRA N1 and
reaching out to other organizations that might have cognizance over similar such efforts, to ascertain the level of governance that currently exists for such a program.

To date, neither CC1 nor any organization we contacted was able to find an instruction that purported to govern either the use of e-reader technology or the use of electronically distributed publications. Efforts were made to contact both PMA-205 and PMA-273, the program offices at NAVAIR that oversee SMA flight training, with regard to the existence of such governance, but responses were not received in time to allow their inclusion in this report. It may be that the state of governance has not kept pace with the rapid advance of such technology, or that its employment by the Navy is not yet widespread enough to have prompted overarching restrictions on use.

What we did discover, though not as persuasive perhaps as actual regulation, was anecdotal evidence that similar efforts have been made by organizations both inside and outside NATRACOM, and are in use today:

- CNATRA already makes use of digitized publications, with PDF-formatted copies of all FTIs currently in use for every phase of flight training posted on their official website.

- Conversations CC1 held with Books and Research, Inc. revealed that Naval Medical Centers Portsmouth and San Diego have digitized medical records to enable on-site and deployed medical personnel to better support expeditionary forces in remote and underdeveloped locations.

- The F-35 Training Center at Eglin Air Force Base, FL uses laptop-based flight simulators and flight training publications, rather than hard-copy training manuals, in its multi-service training curricula. It is acknowledged that the implementation costs of this have been higher than would have been the case for hard-copy manuals, but that savings are likely to be realized over the life-cycle of the program.4

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Based on the lack of restriction found, and supported by this admittedly anecdotal evidence, CC1 believes such a distribution model is allowable.

C. E-READER CONFIGURATION MANAGEMENT

Should CNATRA elect to implement the use of e-readers to distribute training material within NATRACOM, it will be vital to maintain control over the configuration and content of said readers to ensure the security of the devices and their viability as a training medium. This would ensure that the content each SMA received was identical, protecting the integrity of any testing requirements within the curriculum. It would also reduce the incidence of device losses or increased costs due to viruses or other malicious programming that SMAs might otherwise be able to download, even if unintentionally.

We explored the possibility of implementing physical restrictions during the discussions we held with manufacturers that informed section II-A-2 of this report. Each of the e-readers we investigated allowed for some form of the restricted access in which CC1 was interested. For example, a Nook user must register with a specific username and password in order to install or delete content. Thus, NATRACOM would be able to register any given pool of e-readers under a single authority, such as the civilian employee charged with maintaining and issuing FTIs at the training wing level, which would be able to control content prior to the e-readers being issued. This authority would act, in effect, in the same manner as an organization’s network administrator maintaining cognizance over user permissions at individual workstations within a computer network for the purpose of ensuring the security and viability of that network. As an adjunct to this restriction, SMAs would likely also be required to sign a terms-of-use agreement that detailed these restrictions as well as penalties to be imposed should they be violated.

D. VT-28 SMA INTERVIEW RESULTS

Part of our research focus was to understand the need and usefulness of e-reader technology as it relates to training SMAs. CC1 conducted interviews with SMAs currently in training at VT-28 to gather data on their level of interest in e-reader technology. We sought a diverse cross-section of the student population, and we interviewed both students who had recently checked in as well as students who had
recently completed their primary training and were awaiting pipeline assignment. This approach to gathering the data resulted from our interest in student opinion based on limited knowledge of the training syllabus versus students with full understanding of the required knowledge.

We attempted to gain insight into the students’ current use of e-reader technology. The consumer landscape offers a vast array of e-readers, and the current student population, which averages 23 years old, is in a unique position as the target market for most electronic media. Our interviews asked the basic question, “Do you currently own an e-reader?” The results were surprising given the age, monetary independence, and computer literate student population. We interviewed 49 students in total, and only twelve percent indicated that they currently owned some type of e-reader. CC1 found these results surprising because the SMAs interviewed hail from an age group that has never known a world without the Internet, cell phones, and other instant communication abilities common place in today’s society. These findings are also presented as Exhibit 3.

**Exhibit 3**

![SMA E-READER OWNERSHIP](image)

<table>
<thead>
<tr>
<th>SMA E-READER OWNERSHIP</th>
</tr>
</thead>
<tbody>
<tr>
<td>OWN</td>
</tr>
<tr>
<td>12%</td>
</tr>
</tbody>
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Sample size: 49 SMAs
In follow up to our first question, we asked if the students have downloaded CNATRA publications for personal use, as these publications are readily available for download on CNATRA’s website, as has been previously noted. As expected, 100% of students who did own an e-reader used its capability to download CNATRA publications. 72% of students who did not already own a personal e-reader still downloaded CNATRA publications for study purposes on other forms of electronic media. This clearly points out the convenience of not only electronically distributed publications, but also e-reader technology. This data also points out the fact that those with technology are eager to explore its capability. One could surmise that if all students were given e-readers, the overwhelming majority would find it useful for reading CNATRA-required training publications. We present this finding, gathered with a breakdown of the remaining SMAs, as Exhibit 4.

Exhibit 4
Next, we asked, “Would you like an e-reader containing all CNATRA ground school publications to be issued to you during your initial check-in in place of ‘hardcopy’ publications?” The answer to this question was split with 63% being in favor and 37% opposing the idea of issuing an e-reader. When we delved into why the students would like the issuance of an e-reader, the answers varied. Some enjoyed the ease of use; others liked the convenience of having one e-reader as opposed to eight distinct publications. The students that were against the plan of issuing e-readers also had varied reasons for their answers. Some had never used the e-reader technology and were concerned about its capabilities. They expressed concerns over battery life, failure rates, and what contingencies would be in place should the e-reader somehow fail. With all new forms of technology there are those who are eager to understand its capabilities, and there are others that are unsure of its usefulness or applicability. Some students were not ready to make the commitment to learning from a new media and simply preferred to have a ‘real’ book in hand.

As CNATRA’s mission is to train the aviators of tomorrow, we attempted to explore the effectiveness of the e-reader as a learning and training tool. We asked the SMA’s, “Do you feel that you could retain knowledge and prepare for events as well or better with electronic study materials versus ‘hard copy’ publications?” 73% of SMAs interviewed viewed the e-reader and ‘hard copy’ publications as being equivalent. The majority of the students held the view that as long as they had the study material they would be able to learn the information; the media by which that information was delivered was of little consequence. CC1 did not delve further into this question, as it could easily form a study in and of itself and lay well beyond both the scope of the project and the expertise of our consulting team. As stated in the data, the fact that the e-reader does not deter the students’ interest in the material proves that the e-reader will be an accepted form of knowledge delivery.

Students had already told CC1 they used CNATRA’s website to download information, but we also learned that they printed out select pages from the study material. This is the same study material already printed and given to them in book form. We found that 90% of students currently print copies of the same material already given
to them, and that same 90% would continue to do so if given the e-reader. The e-reader makes this process very easy for the students. They could simply scroll to the page they wanted, connect to the printer, and print the specific pages they wanted. This information further illustrates the potential for cost savings to CNATRA should the use of e-readers be implemented, not just in a single squadron, but across all squadrons and phases of training.
III. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Our first objective in this project was to evaluate the cost and feasibility of utilizing NATRACOM-issued, commercially available e-readers and electronically-distributed ground training publications, rather than hard-copy publications, for SMAs during flight training, and to analyze whether or not it might be more cost-effective for CNATRA to do so. During the course of the project it became clear that NATRACOM would not realize cost savings through issuing e-readers vice hard-copy publications as envisioned within the narrow scope of our project. When taking into account only a single squadron, or even only a single phase of training (e.g. the five NATRACOM squadrons that are responsible for primary flight training), it is far more cost-efficient for FTIs to be printed and distributed in accordance with the current practice. At best, looking at COA 2, which involves purchasing the smallest number of e-readers, and assuming the purchase of the cheapest such device, CNATRA would spend almost $6000 more than they currently do printing and distributing hard-copy FTIs. In order to realize any cost savings NATRACOM would need to implement the proposed e-reader distribution model vertically across the flight training enterprise, with a single e-reader issued to each SMA when he begins flight training which he then maintains throughout his training pipeline.

Our second objective was to determine if the electronic distribution of CNATRA ground training publications would be in compliance with current directives. As of this report’s writing, CC1 was not able to verify the existence of said governance, though the existence of similar efforts elsewhere within the Department of Defense suggests CNATRA would be in compliance if they chose to move forward with e-reader implementation.

Our third objective was to evaluate the ability of NATRACOM to sufficiently manage the e-readers’ configuration to ensure the security and viability of this distribution model. We determined that it would be possible to manage an SMA’s ability to alter the configuration of documents downloaded to any of the e-readers we compared.
through restricting permission for and ability to execute those actions to a limited number of individuals who would be responsible for maintaining and issuing e-readers to SMAs.

Finally, CC1 wanted to determine whether SMAs would prefer electronic distribution to the current hard-copy publications. The interview results show that the majority of SMAs would like to be issued an e-reader and would use it in accordance with any CNATRA governance. However, only 63% of SMAs would like their hard-copy publications replaced entirely by an e-reader. CC1 concluded that SMAs would like an e-reader as a supplement to the current method but are not quite prepared to embrace a complete transition to electronic distribution.

B. RECOMMENDATIONS

Corpus Christi One recommends that CNATRA not move forward with e-reader implementation as envisioned in this project, except as a pilot program with the expectation that it be expanded to include all phases of flight training. While the functionality and versatility of e-readers are attractive, the sheer cost of embarking upon this initiative during the present fiscally restrictive environment outweighs any benefit that might accrue from such a course of action.

C. OTHER CONSIDERATIONS

The following would require further study prior to implementation of this initiative:

- Should CNATRA wish to have individual training wings collect and re-issue e-readers for each phase of flight training, the life-cycle cost for each wing to maintain these will have to be calculated.
- Should CNATRA wish to implement the use of e-readers enterprise-wide, the production and ordering costs for all FTIs will have to be calculated.
- Should CNATRA elect to use the EPUB format for distribution of FTIs, the cost of acquiring applicable software and training CNATRA personnel in its use will have to be calculated.
INITIAL DISTRIBUTION LIST

1. Mr. James Hooper  
   Deputy ACOS for Training and Standardization  
   CNATRA  
   NAS Corpus Christi, Texas

2. CAPT William Ipock  
   ACOS for Training and Standardization  
   CNATRA  
   NAS Corpus Christi, TX

3. Professor Patrick Flanagan  
   Lecturer  
   Graduate School of Business and Public Policy  
   Naval Postgraduate School  
   Monterey, California
APPENDIX A - SMA INTERVIEW

***All information is anonymous and participation is voluntary***

1) Do you currently own an e-reader?

   a) Do you download CNATRA publications for personal use on your e-reader?

   b) For those of you that don’t own an e-reader, do you download CNATRA publications for personal use?

2) Would you like an e-reader containing all CNATRA ground school publications to be issued to you during check-in in place of “hard copy” publications?

3) Do you feel you could retain knowledge and prepare for events as well or better with electronic study materials over “hard copy” publications?

4) Do you currently print downloaded CNATRA publications or parts of downloaded publications?

   a) If issued an e-reader, would you continue to print downloaded CNATRA publications?

5) Would it affect your enthusiasm for an e-reader if its use was restricted to flight school publications only?