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Initial Analysis of
Problems and Opportunities

Emergency Low Visibility Approach - Instruction for Coast Guard Helicopter Controllers

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Introduction

Many Coast Guard cutters have flight decks, and operate helicopters. Sometimes the weather is unpredictably bad, and the cutter must operate their helicopter in poor visibility. During periods of low visibility, helicopters must complete an Emergency Low Visibility Approach (ELVA), directed by an air traffic controller aboard the cutter. Unfortunately, cutter air traffic controllers receive no formal ELVA training. Even a basic ELVA lesson would greatly increase controller knowledge, thereby improving safety during a demanding evolution.

Analysis of Problems and Opportunities

Description of Learners

The ELVA instructional program targets cutter-based helicopter controllers. Cutter helicopter controllers are normally members of either the Operations Specialist (OS) or Fire Control Technician (FT) rates. They are highly skilled at operating complicated radar equipment, can talk on the radio, and are adept at prioritizing threats in real time. Most have completed Air Direction Controller (ADC) school, and have basic air traffic control skills directly applicable to ELVA performance. Controllers receive 30 minutes of refresher training every two years during a bi-annual Standardization (STAN) inspection.

Each of forty cutters has between one and five controllers, with a potential audience of 117 individuals. In addition, controllers have a high turnover, with between 45 and 55 new students learning control tasks every calendar year. All helicopter controllers are English-speaking high school graduates who have completed advanced technical training, and have a high aptitude for instruction.

Description of the Educational Context

Controllers must successfully interpret random real-world information and integrate it with theoretical aircraft control knowledge to safely maneuver a helicopter.

Evidence that Instruction is Appropriate as a Potential Strategy

First, Ship Helicopter Standardization (STAN) instructors have identified the ELVA as one of the least-successful evolutions during their inspections. They have tried increasing the profile of information with newsletter articles (Mankin, 2006), and distributed a PowerPoint, with little effect. Enhancing ELVA knowledge would have immediate impact on safety during a demanding low-visibility approach to a cutter at sea. Face-to-face instructional intervention happens only every-other year, but an instructional product would be constantly available.

Second, directing an ELVA is a highly technical skill, which includes melding procedure with judgment in real time. Regular review of fundamental knowledge is necessary for proficiency.

Justification for Using an Instructional Product

The proposed product has several major points in its favor:

- With only seven Standardization Instructors to teach over 100 controllers aboard forty cutters, face-to-face instruction is impractical, especially when the ship is out to sea. Increasing instructor-led training is cost prohibitive.
- Helicopter control and ELVA training have been ignored in favor of more frequent tasks. This does not change the fact that an unsuccessful evolution could have catastrophic results. With real helicopter time costing up to $3000 per hour, an electronic product would be a low cost, high impact way to fill this instructional gap.
- A computer-based lesson would increase motivation to review procedures. The product would also be valuable as a just-in-time refresher before conducting a practice or actual ELVA.
- Coast Guard personnel move between cutters on a bi-annual basis. Standardized training is critical for knowledge transfer between cutters. Instructor-led training introduces variability of technique, but a training product would be the same for any controller on any cutter.

Sources and Methods of Data Collection

Sources of Data

To triangulate sources, I first contacted the Ship-Helicopter Standardization (STAN) team, who are Coast Guard subject matter experts. Three members of the STAN team provided interviews, the Ship-Helicopter manual (Commandant, 2001) and several existing text-based lessons. Finally, I interviewed three Operations Specialists (OSes) who serve as helicopter controllers, including a control supervisor, a qualified controller, and a prospective controller.

To begin all interviews I summarized the concept. I then asked each interviewee to describe ELVA training materials. I asked them to paint a picture of the perfect ELVA training environment. Finally, I asked them to consider some possible problems with an instructional product in the shipboard environment. Interview notes are provided in Appendix A.

To analyze extant data, I asked for recent STAN inspection test scores to verify that the CIC knowledge level was the lowest (see Appendix B). I reviewed the Ship-Helicopter manual, the Air Operations Manual (Commandant, 2002), and the Ship-Helicopter Personal Qualifications Manual (Commandant, 1993) to verify lack of examples and diagrams. I also collected existing training materials with an eye for ELVA-specific information, and considered whether the material could be converted into a computer-based training product. Appendix C is the best example, and has a good breakdown of instructional objectives for an ELVA.

Findings

Description of Problem and Opportunities

Controllers perform their tasks in a darkened radar room. Normally there is only space for one controller at the radar station, so each controller must be able to manipulate the radar controls while also directing aircraft over the radio. Helicopter control is an important but very small part of a technician's typical day, and there are few incentives for maintaining their ELVA knowledge.

Interviewees from the target audience consider the Ship-Helicopter Manual to be thorough but boring. The manual has few pictures or examples in the ELVA section. They stated any graphical representation of the text would be an improvement, and the use of multimedia would be especially helpful.

Learner Attitudes Towards the Problems and Opportunities

Verisimilitude with on-the-job conditions is important when learning a highly technical and complex operation such as aircraft control. The target learners agree that more practice on ELVA procedures would yield more confident and competent controllers. An interesting learning tool would likely drive increased practice, and provide an incentive for extended study.

Learner Knowledge and Skills

In their interviews, all three members of the target audience expressed enthusiasm for a deployable training product. They acknowledge bi-annual training is inadequate given the limited opportunities to practice before an inspection. Further, they were excited by the idea of a computer-based helicopter simulator. They stated such a simulator would allow them to practice ELVA knowledge and control scenarios even when their ship was in from sea.

The helicopter control supervisor stated that the Navy has disbanded the Air Direction Control (ADC school). Those controllers with ADC experience will eventually retire or be transferred ashore, and the cutters will be left with no ADC school qualified controllers. Both the experienced ADC and the prospective controller stated they were worried about the implications, and saw this tool as an excellent stopgap measure while the Coast Guard locates a suitable replacement school.

Learner/User Goals

The subject matter experts look forward to this product as another tool in their arsenal of blended interventions. They will have a standard product by which to teach ELVA fundamentals during STAN inspections. They will also have something to maintain acceptable control knowledge within the helicopter controller community while they search for a new ADC school.

The target audience has an operational goal of safe mission accomplishment. Through this tool, they will come closer to their goal. More confident and competent helicopter controllers lead to safer and more effective helicopter operations.

Conclusions and Recommendations

Summary of Findings

Coast Guard helicopter controllers would benefit from a dedicated training product to teach ELVA knowledge and procedures. Ship-Helicopters instructors could successfully incorporate the training product as part of a blended instructional program.

General Recommendations

I recommend QED pursue development of an instructional product covering the Emergency Low Visibility Approach (ELVA) for the U. S. Coast Guard.

Goals

User Goals

Potential users of the proposed training system suggested several goals, including

1. Use the tool to train new personnel,
2. Use the tool to maintain proficiency for experienced personnel between operational patrols,
3. Learn standardized procedures to take from one cutter assignment to another,
4. More effectively accomplish their operational missions,
5. Practice what-if scenarios with visiting deployed helicopter pilots, and
6. Prepare for bi-annual STAN inspections.

Instructional Goals

This instructional tool will train users to conduct a successful ELVA in accordance with standardized Coast Guard procedures. The following intermediate goals all contribute to achieving the program's overall goal.

1. A learner will be able to describe when an ELVA is the most appropriate helicopter approach procedure.
2. A learner will be able to lay out an ELVA pattern on a radar scope which minimizes helicopter orbit time.
3. A learner will be able to verbally state the best time in an ELVA to relay missed approach and lost communications instructions.
4. A learner will be able to issue control instructions to place a simulated helicopter on the final approach course at 4.5 nautical miles.
5. A learner will be able to issue control instructions to maintain a simulated helicopter on the final approach course from 4.5 nautical miles down to the missed approach point at 0.5 nautical miles.

(1494 includes title page)

References (APA Style)

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Appendix A:
Interview Questions and Data

Subject Matter Experts

Q: How many controllers are aboard the cutter fleet?
A: You can assume two for the fifteen ships of the 210 class and the 282 class, three for the thirteen ships of the 270 class, and four on the twelve ships of the 378 class. Total 117, but about half change out every year, between 45 and 55.

Q: How often do you assess cutter helicopter controllers?
A: We visit each ship every 18 to 24 months with a team of two instructors. We give a diagnostic test to help tailor our training, conduct walkthrough practice sessions of a wide range of activities, and evaluate performance under actual conditions.

Q: Where do you see the most room for improvement?
A: The CIC helicopter controllers consistently do the worst on their annual exams. Over 40% of radar teams don't achieve an average passing score of 70%, and the overall average of all shipboard teams is the lowest of the six teams we track (see Appendix B).

Q: Why do they do so poorly?
A: Most of their required competencies have to do with helicopter control, but some cutters go as many as six months without training with a helicopter. When they finally do get a helicopter, there is usually time to train only one or two controllers. New people can't even try, let alone practice. Some of the problem is lack of preparation, but we think the training materials are sub-optimal.

Q: How could you improve your existing instruction to fill the gap?
A: We have a pretty full schedule over a three-day training visit, especially for only two instructors. We typically come face to face with all 100 people on a cutter. The radar operators get only a short one-hour lecture and conduct one actual ELVA. We have no way to simulate or walk through an ELVA besides running one "live".

Q: What materials exist to help controllers maintain their skills?
A: They can review the drill card and the Ship-Helicopter manual. We also produced a review Powerpoint to help them focus on the most important information. Every so often we publish a newsletter article about control procedures.

Q: Why don't cutter controllers just practice with a real helicopter more often?
A: Helicopters cost between $1500 and $3000 per hour of flight time. Real helicopter time is expensive and controller mistakes could impact aircrew safety.

Q: If there was one area of helicopter control you could improve with a training product, what would it be?
A: The Emergency Low Visibility Approach (ELVA) combines elements of basic helicopter control knowledge with time-critical judgment based on that knowledge. An increase in ELVA knowledge would carry over to other areas we test.

Q: If you could have any type of ELVA training, what would it look like?
A: We'd have a computer-based training module that would teach the basic control information and jargon. The system would allow an experienced controller run scenarios so the student could experiment with a simulated helicopter.

Q: What are some possible problems with a training product in the shipboard environment?
A: We are always worried about distribution. The internet connection to a ship at sea is way too slow to run a web-based training module. We produce a CD-ROM about twice a year, and we could include an ELVA lesson on that. The radar room is a secure classified space, so the product would have to be made available on the secure server if the radar operators wanted to use it in their work space. The material is unclassified, so if the lesson wasn't approved, they could still use it outside the radar room.

Target Audience

Q: Are you currently qualified to control an ELVA?
A: (Supervisor) Yes. (Watchstander) Yes. (Break-in) No

Q: Have you ever had formal air traffic control training?
A: (Supervisor) Yes. (Watchstander) Yes. (Break-in) No

Q: What was that training like?
A: It's a two week Navy school held at Point Loma, CA. The school concentrated on controlling jet aircraft and had no exposure to helicopters. Unfortunately the Navy recently disbanded the school and is no longer accepting new students.

Q: For the qualified controllers, when was the last time you conducted an actual ELVA?
A: During the last operational patrol, about three weeks ago. But sometimes we can go six months or more between ELVAs.

Q: Is in normal to get plenty of training about helicopter control while in from sea?
A: No, there is no good way to practice helicopter control when not underway.

Q: How do you train new controllers?
A: Normally they are given the check-off sheet which contains all the subjects to study and tasks to complete. They finish self study, then get signed off by one of the qualified watchstanders.

Q: Since the Navy is no longer taking students, how will you train new controllers?
A: We don't know what is going to happen when existing controllers transfer away from the cutter.

Q: Are unqualified personnel allowed to practice an ELVA with an actual helicopter?
A: They are not allowed, but they are required to watch every ELVA conducted by the qualified personnel.

Q: For the unqualified controller, how would an ELVA training product help you?
A: I could practice control procedures before going to the ADC school. I could also view different examples and scenarios in multi-media, instead of relying on my supervisor's sea stories or my own imagination.

Q: What type of helicopters do you control when on operational maneuvers?
A: We control all three types of Coast Guard helicopter. The type doesn't matter.

Q: Do the helicopter pilots try to give you training opportunities for ELVA practice?
A: Yes, the pilots like flying the ELVA pattern because they can count it as a non-precision approach for their own training minimums. Most of the time operational tempo keeps us from doing more than about one ELVA per week (at the most).

Q: Do you have any way to simulate a helicopter on your radar screen for training?
A: We have a system called Provit which lets us set up ship-wide battle scenarios. Unfortunately, once the system is programmed, there is no way to change the parameters. So

if we simulate an aircraft on a particular heading, there is no way to alter the heading in "scenario time" once the program is started.

Q: How would you use a helicopter simulator if you had one for training?
A: We'd create a scenario where the helicopter was returning to the ship with a total electrical failure and only their radio to guide them in. We could start the helicopter at various points in relation to the ship, and have a trainee vector the simulated helicopter through the ELVA pattern. If the trainee gave a wrong vector, we could re-set the simulator, or if it was a minor error, give the trainee a chance to correct.

Q: How would a computer-based lesson about helicopter control and ELVA procedures be superior to your existing training materials?
A: The ideal CBT would turn dull text into a multi-media experience. Most of the ELVA information can be demonstrated through examples, but the printed manual has no examples. So a trainee who has never observed an ELVA, or a controller who hasn't done one for several months, has no frame of reference while reading the material. A multimedia lesson could show the action behind the words.

Q: What problems do you see with a training product in the shipboard environment?
A: Our biggest concern is keeping the content current. The helicopter control information doesn't change, but just tabbing through the same PowerPoint a couple times each week is going to get really boring, and we probably won't do it. If the lesson is interactive, and has a good index system for last-minute refreshers, we'll probably use it more.

Appendix B:
Coast Guard STAN Test Scores 2005-2006

Unit	HCO	LSO	Tiedowns	Fire Party	Fuel Team	CIC	Average
TAHOMA	95.0	91.7	91.5	89.4	90.0	70.8	**87.3**
MORGENTHAU	81.3	78.3	83.0	83.1	92.0	83.3	**86.1**
RESOLUTE	80.0	73.0	76.0	89.0	64.0	78.0	**85.8**
JARVIS	91.2	76.6	86.0	88.0	76.2	80.0	**85.5**
HEALY	77.5	70.0	90.0	88.7	75.0	n/a	**84.8**
DALLAS	82.5	61.7	90.0	89.5	90.0	77.9	**84.3**
MELLON	85.0	87.5	80.0	81.3	78.3	82.5	**82.4**
SENECA	82.5	83.0	84.0	85.7	71.0	87.5	**82.3**
RUSH	90.0	95.0	82.5	85.8	75.0	58.3	**82.3**
POLAR STAR	63.3	77.5	90.0	83.0	77.0		**81.1**
DILIGENCE	70.0	85.0	77.5	82.5	88.3	67.5	**81.0**
NORTHLAND	74.0	78.0	88.0	84.0	75.0	85.0	**80.9**
SPENCER	68.0	85.0	89.0	81.0	60.0	100.0	**80.7**
BOUTWELL	87.0	91.6	57.8	82.5	67.5	68.8	**80.5**
HAMILTON	72.5	72.5	87.5	81.1	81.6	75.0	**80.2**
RELIANCE	75.0	70.0	92.0	76.3	78.3	70.0	**80.0**
DAUNTLESS	70.0	78.3	80.0	82.5	83.0	60.0	**80.0**
MIDGETT	66.3	82.5	77.8	84.6	67.5	75.8	**79.5**
GALLATIN	92.5	57.0	84.0	83.6	75.0	70.0	**79.3**
VENTUROUS	82.5	78.3	84.2	84.7	70.0	75.0	**79.1**
LEGARE	76.6	71.1	81.0	86.8	78.8	75.8	**78.5**
MOHAWK	83.3	52.5	75.0	81.0	65.0	56.7	**68.9**
VIGILANT	73.3	72.5	77.5	89.2	87.5	61.3	**78.0**
CHASE	75.0	61.3	81.4	82.3	88.3	66.0	**78.0**
ACTIVE	80.0	67.5	83.8	75.0	76.7	85.0	**78.0**
POLAR SEA	75.0	80.0	84.0	73.0	77.0		**77.8**
THETIS	67.5	75.0	89.0	77.0	71.0	68.3	**77.7**
VIGOROUS	90.0	65.0	78.3	79.2	78.3	73.3	**77.4**
CONFIDENCE	76.6	72.5	74.4	90.0	86.0	65.0	**77.4**
ALERT	78.3	82.5	88.3	82.9	71.1	65.0	**77.3**
TAMPA	55.0	70.0	81.0	79.0	78.0	72.0	**77.2**
STEADFAST	75.0	87.5	72.5	73.1	56.6	77.5	**76.8**
ESCANABA	80.0	80.0	82.5	80.5	75.0	62.0	**76.3**
CAMPBELL	70.0	87.5	79.3	77.5	82.5	70.0	**76.2**
FORWARD	85.0	52.5	75.0	80.4	75.0	75.0	**76.0**
ALEX HALEY	74.5	77.3	80.0	78.5	66.3	75.0	**75.7**
BEAR	80.0	42.5	70.0	79.7	76.3	95.0	**75.1**
VALIANT	68.0	57.5	76.5	78.0	74.0	68.0	**73.1**
DECISIVE	75.0	75.0	78.0	75.0	60.0	68.0	**72.2**
MUNRO	55.0	70.0	88.0	77.5	57.0	61.3	**72.0**
SHERMAN	65.0	78.0	81.0	68.0	63.0	75.0	**71.2**
HARRIET LANE	72.5	75.0	73.0	71.0	87.0	63.0	**71.0**
DEPENDABLE	68.0	75.0	78.0	72.0	60.0	40.0	**68.5**
Fleet Average	76.4	74.4	81.4	81.2	75.0	72.1	78.5

Appendix C:
Positive Control Drill Card

FLIGHT FOLLOWING/POSITIVE CONTROL DRILL CARD:

Training Conducted (check one)

( ) Walk Through
( ) Proficiency Training
( ) Evaluation

Task 6.0: Plan and present a Pre-Flight Brief IAW Chapter five of COMDTINST M3710.2 (series).

Task 6.1: Collect LINT information from helicopter after it declares an emergency IAW Annex G of COMDTINST M3710.2 (series)

Task 6.2: At FLICON II provide advisory control to a helo IAW Chapter seven of COMDTINST M3710.2 (series).

Task 6.3: At FLICON II provide Positive Control to a helo IAW Chapter seven of COMDTINST M3710.2 (series). ***Level I cutters only***

Task 6.4: At FLICON II, while the helo is under positive control successfully vector the helo to a recovery point near the ship using an Emergency Low Visibility Approach IAW chapter seven of COMDTINST M3710.2 (series). ***Level I cutters only***

Discussion: While the helicopter is on a simulated sortie the pilot will call in an emergency requiring immediate return to the cutter for landing. Enroute to the cutter the pilot will report deteriorating visibility and request an ELVA.

Required Personnel: All billets required for Flight Following/Positive Control.

Required Equipment:	Billet Assignments:
radar	level II controller
radio	level I controller
	HCO

Instructor/Evaluator Debrief Comments:

FLIGHT FOLLOWING/POSITIVE CONTROL ASSESSMENT SHEET:

Preparation:	
Was CIC/CSC properly manned with: (1-2)	
(1) A sufficient number of personnel assigned	
(2) All personnel thoroughly familiar with their assignment and equipment	
Was a flight plan laid out allowing sufficient fuel reserves	
Did the flight plan keep the helicopter within radar tracking range	
During the preflight briefing: (1-4)	
(1) Was the mission described	
(2) Were communication frequencies and procedures discussed	
(3) Were navigation sources/hazards described	
(4) Were alternate landing site(s) designated	

Performance:	
During flight following: (1-5)	
(1) Did CIC/CSC properly establish control	
(2) Was the aircraft's DR position plotted every 5 minutes	
(3) Did recommended courses keep the aircraft on track	
(4) Were comms/ops checks conducted every 15 minutes	
(5) Was the bridge advised of aircraft return in a timely manner	
During positive control: (for level I) (1-5)	
(1) Did the controller demonstrate proper check in procedure	
(2) Was the aircraft properly advised of other air traffic	
(3) Was the aircraft vectored to avoid other traffic	
(4) Did the controller demonstrate knowledge of procedures used for aircraft emergencies	
(5) Did the controller demonstrate proper check out procedures	
During emergency low visibility approach (ELVA): (Level I)(1-6)	
(1) Was the flight pattern laid out on the scope	
(2) Were lost comms instructions passed	
(3) Were missed approach instructions passed	
(4) Were vectors issued to keep aircraft on track	
(5) Were course changes passed in a timely manner	
(6) Was the aircraft's position one half mile behind the ship, speed 40 knots and height 50 feet at termination of the approach	

Instructor/Evaluator Debrief Comments:

Appendix D:
List of Subject Matter Resources

Below are sources of information for further product development:

- Shipboard Helicopter Operational Procedures Manual (2001)
- Air Operations Manual (2001)
- Shipboard Helicopter Personnel Qualifications Standard (1993)
- Ship-Helo STAN prep CD (2006)
- Ship-Helo STAN Team web site (CG Intranet only)
- Ship-Helo flight following drill card (see Appendix C)
- Ship-Helo quarterly newsletters (2004, 2005, 2006)