

**EVALUATING COSTS, BENEFITS, AND FUNDING STRATEGIES FOR THE
ACQUISITION OF NEW AIRCRAFT:**

**A REPORT FOR
THE NORTH CAROLINA STATE HIGHWAY PATROL**

May 10, 2004

*Prepared by: Elizabeth Ku, Neelakshi Mann, Neetika Prabhakar,
Jodie Sandel, Danielle Sass, Erin Shively*

Table of Contents

Acknowledgements.....	iii
Executive Summary.....	iv
Chapter One: Introduction	1
Problem Statement.....	1
Background.....	1
Criteria	2
Research Strategy & Report Structure.....	3
Chapter Two: Practices in Other States	4
Overview.....	4
Personnel.....	4
Designated Missions	5
Types of Aircraft Used.....	6
Funding and Revenue Sources.....	7
Chapter Three: Cost-Effectiveness Evaluation.....	8
Overview.....	8
Approach.....	8
Cost-Effectiveness Results.....	9
Discussion.....	10
Chapter Four: Benefit Evaluation & Cost-Benefit Analysis	11
Overview.....	11
Approach.....	11
Benefit Evaluation Results.....	12
Discussion.....	13
Recommendations.....	14
Chapter Five: Funding Strategy	15
Overview.....	15
NC General Assembly Budget Appropriations.....	15
US Department of Homeland Security (DHS) Grant	17
Other Federal Grants.....	19
Legislative Proposal for Permanent Revenue Source.....	21
Chapter Six: Recommendations	22

Works Cited	24
Appendix A—Questionnaire Used for Telephone Interviews of California, Florida, Georgia, Maryland, Ohio, Virginia, and Washington State Highway Patrols	30
Appendix B—Designated Missions for California, Florida, Georgia, Maryland, Ohio, Virginia, and Washington	32
Appendix C—Funding and Revenue Sources for California, Florida, Georgia, Maryland, Ohio, Virginia, and Washington	35
Appendix D—Cost-Effectiveness Assumptions	38
Appendix E—Evaluation of Costs.....	44
Appendix F—Benefit Evaluation Assumptions	45
Appendix G—Evaluation of Benefits.....	52
Appendix H—Expansion Budget Request Strategy	62

Acknowledgements

We would like to extend our thanks to Captain Norman Goering, Captain Steven Briggs, Sergeant Timothy Baldwin, Sergeant W.B. Thaxton, Trooper M.A. Tribula, Sergeant D. Andrews, and Thomas Caves of the North Carolina State Highway Patrol for their invaluable assistance with the production of this report. Without their guidance, resources, and cooperation, such an extensive evaluation would not have been possible. We would also like to thank both Dr. Ken Taylor of North Carolina Emergency Management and NC Senator Martin Nesbit for their insights and Dr. Charles Clotfelter, Dr. Robert Conrad, and Army Capt. Michael Yankovich for their expertise in quantifying costs and benefits for our economic analysis.

Executive Summary

Policy Question: Should the North Carolina State Highway Patrol (SHP) acquire new helicopters, and what funding strategies should it pursue in doing so?

Recommendation: SHP should seek funding to acquire two Bell 407 helicopters through an expansion budget request from the North Carolina General Assembly. SHP should also study the long-range goals of the aviation division and develop a strategy for securing permanent funding.

Background

The mission of the North Carolina State Highway Patrol (SHP) Aircraft Operations Section (AOS) is to ensure safe, efficient transportation on the state's streets and highways, to reduce crime, to protect against terrorism, and to respond to natural and man-made disasters¹ by providing aerial support to SHP and other state and local public safety agencies. To complete these missions, AOS currently uses a fleet of eight military surplus Bell OH-58A (OH-58) helicopters and one Bell 206B Jet Ranger.

In November 2003, the NC State Auditor's office issued a performance audit of state aircraft operations,² which noted that AOS's outdated helicopter fleet limits its ability to perform assigned missions. The primary shortcoming in AOS's capabilities is insufficient seating and load bearing capacity, which makes it impossible to undertake rescue missions. The US Marine Corps, Coast Guard, and National Guard aid AOS by conducting rescue operations; however, these agencies provide assistance on a geographically limited, case-by-case basis. The military's current budget constraints and increased mission requirements are also likely to limit their assistance in the future.

This report assesses whether the cost of acquiring new helicopters would be offset by benefits to the state of North Carolina in increasing AOS's ability to accomplish its mission. It also explores possible revenue sources to finance the purchase of new aircraft.

Research Strategy

We employed a three-part research strategy to answer our policy question. First, we examined other states' aviation division practices. Second, we conducted cost-effectiveness and cost-benefit analyses for the OH-58 and three models of new helicopters. Third, we

¹ North Carolina State Highway Patrol. 2004 Strategic Plan. January 2004.

² Office of North Carolina State Auditor Ralph Campbell, Jr. Performance Audit: State Aircraft Operations. Raleigh, NC: November 2003.

compared different strategies to determine the most promising funding options for financing new aircraft.

Criteria

In assessing whether SHP should acquire new helicopters, we sought to outline aircraft and funding recommendations that would be:

- Cost effective
- Successful in enabling SHP to better accomplish missions
- Politically feasible

Practices in Other States

We obtained information about seven states' highway patrol/state police aviation divisions to determine what types of helicopters might be appropriate for SHP to purchase and what funding systems are typical for aviation units. We chose to examine the aviation divisions in California, Georgia, Florida, Ohio, Maryland, Virginia, and Washington because of their structural similarity to SHP and/or because, like SHP, they are nationally accredited.

Cost-Effectiveness and Cost-Benefit Analyses

Our cost-effectiveness and cost-benefit analyses compare the current Bell OH-58 (a single-engine, 2-seat aircraft) to three new helicopter models: the Bell 407 (a single-engine, 7-seat aircraft), the Bell 427 (a dual-engine, 8-seat aircraft), and the Bell 412 (a dual-engine, 15-seat aircraft). We selected the new helicopter models on the basis of practices in other states and SHP's mission objectives. We considered only Bell helicopters to keep costs comparable for this analysis.

We conducted a 10-year projection of costs for each type of aircraft, adding initial purchase price and annual operating costs, and then subtracting the liquidation value of the aircraft at the end of the time period. Without factoring in changes to capabilities, we estimate the following total 10-year costs for each aircraft:

- OH-58: \$1.3 million
- Bell 407: \$2.2 million
- Bell 427: \$3.3 million
- Bell 412: \$5.0 million

Because the cost effectiveness analysis does not account for differences in mission capabilities across aircraft, we conducted a cost-benefit analysis. To quantify benefits for each aircraft, we examined the time and resources required to conduct the following missions: evacuation/rescue of persons, flying in inclement weather, and transportation of emergency aid/supplies in the event of a natural or man-made disaster. We then weighted these benefits according to the annual proportions of each mission type. After subtracting the costs to operate each aircraft from these benefits, we ranked the aircraft in the following

order, from the greatest to least additional benefit:

- Bell 407: \$5.3 million
- Bell 427: \$3.4 million
- Bell 412: \$1.7 million
- OH-58: \$0

To ensure that benefits provided by new helicopters are available to all North Carolinians, SHP should purchase two helicopters and station one in the eastern portion of the state while stationing the other in the western portion of the state. Our findings show that SHP could successfully perform their state-assigned missions with the greatest benefit to North Carolina if they obtained two new Bell 407 aircraft.

Funding Avenues

We investigated four potential funding options for the purchase of two Bell 407 helicopters.

- Budget appropriations from the NC General Assembly
- US Department of Homeland Security (DHS) grant money through North Carolina Emergency Management (NCEM)
- Other federal grants
- A legislative proposal to secure a permanent AOS revenue source

Recommendations

1. SHP should seek funding to acquire two Bell 407 helicopters.

2. SHP should request funding from NC General Assembly expansion budget appropriations.
SHP should request legislative appropriations in its November 2004 expansion budget request for the Governor's FY2006-2008 budget proposal.

3. SHP should conduct a study examining the long-range goals of AOS to determine the feasibility of securing a designated funding source.

Based on our analysis of other states' aviation divisions, it would be beneficial for AOS to secure permanent funding for its programs. This study should examine AOS resources to determine the need for a designated funding stream.

Chapter One: Introduction

Problem Statement

This report seeks to answer the following two-part policy question: Should the North Carolina State Highway Patrol (SHP) acquire new helicopters, and what funding strategies should it pursue in doing so?

Background

SHP's mission is to ensure safe, efficient transportation on the state's streets and highways, to reduce crime, to protect against terrorism, and to respond to natural and man-made disasters. The SHP Aircraft Operations Section (AOS) provides aerial support to SHP and other state and local public safety agencies for traffic control, drug eradication, surveillance, airborne speed enforcement and response to natural and man-made disasters. AOS is officially accredited by the Commission of Accreditation for Law Enforcement Agencies (CALEA).

AOS does not bill any of North Carolina's public safety agencies for performing operations; SHP's operating budget covers AOS annual expenses. While SHP is controlled by the Department of Crime Control and Public Safety, SHP's annual operating budget is funded by the NC General Assembly out of the NC Highway Fund.

To complete its missions, AOS employs a fleet of eight 32- to 36-year old military surplus Bell OH-58A (OH-58) helicopters and one Bell 206B Jet Ranger.³ AOS obtained its current fleet of OH-58s through the US Military Surplus program, which is being phased out in 2006.⁴

To assess the efficiency of aircraft use among North Carolina's state agencies, the State Audit Office conducted a study of aircraft operations in North Carolina during 2003. The resulting report noted that AOS's outdated helicopter fleet limits its ability to perform its full range of state-designated missions.⁵ The report recommended:

Crime Control and Public Safety management should give consideration to purchasing larger aircraft for use by the Highway Patrol. A study should be

³ Office of North Carolina State Auditor Ralph Campbell Jr. Performance Audit: State Aircraft Operations. Raleigh, NC: November 2003.

⁴ The OH-58s were provided through surplus aircraft inventory under the Federal 1208 program. The OH-58A is a military version of Bell Jet Ranger aircraft used extensively by commercial helicopter operators.

⁵ Office of North Carolina State Auditor Ralph Campbell Jr. Performance Audit: State Aircraft Operations. Raleigh, NC: November 2003: 24.

conducted to identify the appropriate type and number of aircraft to allow the Patrol to execute rescues as well as conduct its primary law enforcement missions.⁶

The primary shortcoming in AOS's current capabilities is insufficient seating and load-bearing capacity, which make it impossible to undertake rescue missions. Historically, the military has aided AOS in conducting rescue operations when requested. The US Marine Corps Air Station at Cherry Point, NC, (MCASCP) operates an HH-46 Sea Stallion Search and Rescue helicopter known as PEDRO. Local law enforcement and emergency service agencies call on PEDRO three to four times per month to transport medical patients and to search for lost or missing persons.⁷ The PEDRO crew only agrees to perform these services on a case-by-case basis. The Department of Defense has called for a review of its local search-and-rescue units after a Navy study found that its units were seldom used for their principle purpose of assisting downed military pilots.⁸ MCASCP was included in the December 2003 Department of Defense Base Realignment and Closure recommended base closings report.⁹ The military's current budget constraints and increased mission requirements are likely to influence the Defense Department's decision regarding whether or not to continue funding PEDRO.

In addition to the Marine Corps, the Coast Guard and National Guard can also provide assistance to local and state agencies in the event of a rescue. However, the Coast Guard's range is limited to the eastern-most portion of the state, and the National Guard is frequently unable to provide assistance.¹⁰

In addition to the State Auditor's report, both North Carolina's State Homeland Security Strategy (SHSS) and the SHP's 2004 Strategic Plan single out the need to examine AOS resources and mission capabilities. In its discussion of preparations to ensure that North Carolina is equipped to respond to a weapon of mass destruction (WMD) or domestic terrorism incident, the SHSS outlines the goal of securing funding for long-term support of AOS by June 2005.¹¹ Similarly, SHP's Strategic Plan recommends that SHP conduct a long-range study of SHP aviation requirements by December 31, 2004.¹²

Criteria

Through conversations with SHP, review of the State Auditor's Report, and our understanding of state budgeting, we outlined three criteria upon which to base our recommendations about SHP's acquisition of new helicopters. Any aircraft or funding

⁶ Ibid: 24.

⁷ North Carolina State Highway Patrol. 2004 Strategic Plan. 31. December 2003: 11.

⁸ Ibid.

⁹ Department of Defense. "Report Required by Section 2912 of the Defense Base Closure and Realignment Act of 1990, as amended through the National Defense Authorization Act for Fiscal Year 2003." Washington, DC: March 2004.

¹⁰ North Carolina Department of Emergency Management. Tim Miller, Western Branch Manager. Phone interview. 19 April 2004.

¹¹ State of North Carolina. State Homeland Security Strategy. 30 January 2004: 28.

¹² North Carolina State Highway Patrol. 2004 Strategic Plan. 31 December 2003: 30 (Goal 3.5.10).

recommendations should (1) be based on the most cost effective means for enabling the highway patrol to perform its missions at the lowest cost, (2) address concerns identified through the State Auditor's Report by enabling SHP to better accomplish its state-designated missions, and (3) be realistic in identification of funding amounts and the political feasibility of fund acquisition.

Research Strategy & Report Structure

To fulfill the recommendations of the State Auditor's Report, the SHSS, and SHP's 2004 Strategic Plan, we employed a three-part research strategy.

First, we examined seven other states' aviation division practices. This preliminary research guided our examination of possible helicopter models to replace SHP's existing OH-58s. We also spoke with members of each states' aviation division to learn more about the variety of missions performed, operating costs, and funding and revenue sources used in the acquisition of aircraft and annual operations of these divisions. We present a detailed account of these findings in Chapter Two.

Second, we conducted cost-effectiveness and cost-benefit analyses that compared the OH-58 and three new helicopter alternatives: the Bell 407, the Bell 427, and the Bell 412. This analysis provided the basis for our recommendation of whether or not SHP should acquire additional aircraft. The cost-effectiveness analysis allowed us to compare the operating costs for SHP's current fleet of helicopters and the three new aircraft models for existing SHP missions.¹³ Recognizing that the acquisition of new aircraft will provide additional benefits to the State of North Carolina, we also undertook a cost-benefit analysis in order to quantify the projected benefits that would be gained by purchasing each of the three new aircraft. We outline details of these two analyses and our results in Chapters Three and Four.

Third, we compared the advantages and disadvantages of alternative funding strategies to determine the most promising options for the acquisition of new aircraft. Based on the findings of our research of other states' aviation divisions, we chose to examine four main funding strategies: a North Carolina General Assembly budget request, Department of Homeland Security grants, other federal grants, and the establishment of a permanent funding source. We describe these strategies in Chapter Five.

Based on a combination of our findings during each of these three critical steps, we present a detailed list of recommendations in Chapter Six.

¹³ "Primer on Cost-Effectiveness Analysis." *Effective Clinical Practice*. September/October 2000. American College of Physicians website. <http://www.acponline.org/journals/ecp/sepoct00/primer.htm>. Last accessed 27 March 2004.

Chapter Two: Practices in Other States

Overview

North Carolina is not alone in requiring funding to support its aerial law enforcement programs. Throughout the United States, 39 states have aviation units within their state highway patrol or state police departments.¹⁴ In order to form preliminary ideas about what type of helicopters would be appropriate for SHP to purchase and what funding strategies SHP might pursue to acquire new helicopters, we examined seven state highway patrol/state police aviation divisions.

The seven states we examined are: California, Florida, Georgia, Maryland, Ohio, Virginia, and Washington. Florida, Maryland, and Ohio are officially accredited by the Commission of Accreditation for Law Enforcement Agencies (CALEA) and are comparable to SHP in that regard. We chose to study Georgia and Virginia for their structural similarity to SHP, and we examined California due to its noted success in receiving money for helicopter acquisition for homeland security purposes.

For each state, we requested information regarding its:

- Number of committed personnel (pilots and mechanics)
- Designated mission
- Types of aircraft
- Funding and revenue sources
- Operating costs

We spoke with commissioned personnel from each state's aviation unit (see Appendix A for interview questionnaire) and reviewed each aviation unit's Web site to obtain this information. Following our research, we determined that operating costs were calculated differently across departments and were therefore not sufficiently comparable to be used in our analysis. Information about other states' personnel, missions, aircraft, and funding sources are presented below.

Personnel

Though chosen because they were comparable to SHP in important respects, the seven states we examined vary in their missions and equipment partly due to their size. To provide perspective on the equipment and missions conducted by the aviation divisions, we requested

¹⁴ Maryland State Police Aviation Division website. <http://www.mspaviation.org/statepolicelinks.html>. Last accessed 20 March 2004. The 11 states without aviation units are Hawaii, Idaho, Maine, New Mexico, North Dakota, Oregon, Rhode Island, Tennessee, Vermont, West Virginia, and Wyoming.

information about the number of committed air operations personnel within each state (see Table 2.1).

Table 2.1. Number of Committed Personnel in the Aviation Units of Other States

State	Pilots	Mechanics
California	82	0*
Georgia	13	6
Florida	9	0*
Maryland	50	40
Ohio	13	0**
Virginia	24	2
Washington	10	4
<i>North Carolina</i>	<i>18</i>	<i>2</i>

Source: Cheney (2004), Smith (2004), Walker (2004), Lehman (2004), Stein (2004), Saunders (2004), Atkins (2004).

* California and Florida contract for all aircraft maintenance.

** Aircraft maintenance in Ohio is completed by personnel from the Department of Transportation.

Designated Missions

The seven states we examined perform a variety of missions. The following chart presents an overview of primary designated missions. For a more detailed description of mission capabilities for each state, see Appendix B.

Table 2.2. Types of Missions Completed by Aviation Units of Other States

State	Traffic	Search & Rescue	Surveillance	Drug Interdiction	Transport		
					Emerg. Personnel	Medical	Exec.
California	✓	✓	✓				
Georgia	✓	✓*	✓	✓			
Florida	✓	✓	✓	✓			
Maryland	✓	✓	✓		✓	✓	
Ohio	✓	✓	✓	✓	✓		✓
Virginia	✓	✓	✓	✓		✓	
Washington	✓	✓	✓		✓		
<i>North Carolina</i>	✓	✓*	✓	✓	✓		

Source: Cheney (2004), Smith (2004), Walker (2004), Lehman (2004), Stein (2004), Saunders (2004), Atkins (2004).

Emerg: Emergency; Exec: Executive

* While they do have search equipment (Forward Looking Infrared [FLIR] systems), North Carolina and Georgia do not have rescue capabilities at present (see Appendix B).

Types of Aircraft Used

The seven states we examined use nine types of helicopters and nine types of fixed-winged aircraft to complete their missions, as shown in Table 2.3.

Table 2.3. Type and Number of Aircraft Used by Aviation Units in Other States

State	Number	Helicopters	Number	Fixed-Winged Aircraft
California	1 2 11 Total 14	Bell OH-58 Bell Longranger L4 Eurocopter Astar (AS350 B2)	14 1 1 Total 16	Cessna 206 King Air Cessna 182
Georgia	5 6 2 1 Total 14	Bell OH-58 Bell Jet Ranger Bell 407 UH1 Huey	Total 0	
Florida*	Total 0		7 1 Total 8	7 Cessna 1 Navajo twin engine
Maryland	12 Total 12	Eurocopter Dauphin	1 1 1 Total 3	Cessna Kingair C90 Kingair 350
Ohio	3 Total 3	Eurocopter Astar	10 2 Total 12	10 Cessna 182 2 Cessna 172
Virginia	4 2 1 Total 7	Bell 407 Bell 105 BK 117	4 Total 4	Cessna 182
Washington	Total 0		5 1 1 Total 7	Cessna 182 King Air 200 BeechJet 400A
North Carolina	8 1 Total 9	OH-58 Bell Jetranger	Total 0	

Source: Cheney (2004), Smith (2004), Walker (2004), Lehman (2004), Stein (2004), Saunders (2004), Atkins (2004).

* Prior to 2000, the Florida Highway Patrol Aviation Section used 5 OH-58, 12 Cessna, and 1 Navajo Twin Engine aircraft.

Funding and Revenue Sources

Of the seven aviation units analyzed, no state charges other law enforcement agencies, patients, or any other entity for any of its services. Aviation division funding is provided through seven different types of sources, as shown in Table 2.4. For specific information regarding individual state's funding and revenue sources, refer to Appendix C.

Table 2.4. Funding and Revenue Sources for Aircraft Acquisition, Usage, and Maintenance

State	State Budget (general highway patrol)	State Budget (designated for aviation division)	NHTSA Grant	DHS Grant	Vehicle Registration or Licensing Fees	Traffic Citation Revenue	Drug Interdiction Funds
California		✓	✓	✓			
Georgia	✓			✓			✓
Florida	✓					✓	
Maryland	✓	✓			✓		
Ohio	✓						✓
Virginia	✓				✓		
Washington	✓				✓		
<i>North Carolina</i>	✓						✓

Source: Cheney (2004), Smith (2004), Walker (2004), Lehman (2004), Stein (2004), Saunders (2004), Atkins (2004).

NHTSA: National Highway Traffic Safety Administration; DHS: Department of Homeland Security

Chapter Three: Cost-Effectiveness Evaluation

Overview

We compared the costs associated with operating an OH-58 helicopter with those of three alternative helicopter models over a 10-year time period. If current mission capabilities and operating hours are held constant across the various aircraft types, an OH-58 is less expensive to operate for the next 10 years than the three Bell helicopters we examined. However, once owned, a Bell 407 helicopter would be less costly to operate per hour than an OH-58. This chapter discusses the purchase price, operating costs, and liquidation value of each helicopter if aircraft were to perform only the missions for which an OH-58 is equipped. We discuss differences in the actual capabilities of the evaluated aircraft in Chapter Four: Benefit Evaluation and Cost-Benefit Analysis.

Approach

In order to determine whether SHP should acquire additional helicopters, we began our study with a cost-effectiveness evaluation to compare SHP's current helicopter costs with those that would be incurred with three alternative helicopters. In choosing which aircraft to include in our analysis, we examined the different sizes of aircraft that would assist SHP in fulfilling its missions. We evaluated four helicopter models in our analysis. To comparably evaluate a range of aerial law-enforcement aircraft available, we chose to examine helicopters from only one manufacturer—Bell Helicopter.

- **OH-58.** To establish a constant baseline for comparison, we examined SHP's current OH-58 (a single engine, 2-seat aircraft).
- **Bell 407.** Virginia currently uses the Bell 407 (a single engine, 7-seat aircraft) to perform a range of law-enforcement and public safety tasks, including hoist rescue missions. Georgia is in the process of equipping its Bell 407 to perform rescue missions.
- **Bell 427.** The Bell 427 (a dual-engine, 8-seat aircraft) offers the same capabilities as the Bell 407, but SHP believes it may provide a safety advantage in having an extra engine. The extra engine also allows for slightly increased load capacity.
- **Bell 412.** SHP identified the Bell 412 (a dual engine, 15-seat aircraft) as their preferred aircraft, which would enable SHP to expand its current mission capabilities. The Bell 412 is equivalent to the Eurocopter Dauphin helicopters used by the Maryland State Police Aviation Division.

We conducted our cost-effectiveness analysis to determine which aircraft is the least costly for SHP to operate without considering benefits gained from the acquisition of a new aircraft. We used the current level of average annual OH-58 operations (166.75 flight hours per year) as a constant baseline for assessing operations for each of the four helicopter models. In order to consistently evaluate costs across aircraft, we developed a set of uniformly applied assumptions (see Appendix D for all assumptions). Critical assumptions are presented below:

1. Costs are based on a 10-year projection of initial costs and operating costs, minus liquidation value.
2. SHP will purchase new aircraft outright.
3. New aircraft will not require overhauls or retirement of component parts for at least the first 2,500 flight hours.
4. Maintenance costs for OH-58s will vary according to scheduled component replacement costs.
5. Maintenance hour projections for the Bell helicopters can be derived by averaging manufacturer's estimates and the National Business Aviation Association's (NBAA) industry standard.
6. Only annual training costs are relevant to operating cost projections, as initial training is included and/or negotiable with the purchase of a new aircraft.
7. Helicopters will depreciate at a rate of 10 percent per year for the first five years, then appreciate at a rate of 10 percent per year.
8. A capital discount rate of three percent is appropriate for determining the present value of operating costs and liquidation values.

We calculated total costs for each aircraft by adding the initial purchase price for each helicopter to its 10-year operating costs and subtracting the liquidation value of the aircraft at the end of the 10-year time period. All costs were adjusted to constant 2004 dollars. The specifics of our cost calculations can be found in Appendix E.

Cost-Effectiveness Results

The results of our cost-effectiveness analysis allowed us to rank the four helicopter options from least- to most-costly to operate for conducting current missions (see Table 3.1). Over a 10-year time period, the total operating costs for an OH-58 are projected to be approximately \$1.3 million, followed by \$2.2 million for a Bell 407, \$3.3 million for a Bell 427, and \$5 million for a Bell 412. We also calculated the operational cost per flight hour per aircraft to facilitate comparison across these new aircraft under normal conditions of use. The costs per hour for each aircraft are somewhat different from total costs (largely due to fuel requirements and training costs). Per hour, the Bell 407 is projected to be the least expensive

aircraft to operate (\$649 per hour), with the OH-58 a close second (\$748). The Bell 427 and Bell 412 cost between \$1,100 and \$1,200 per hour to operate.

Table 3.1. Summary of Cost-Effectiveness across Four Aircraft Types

	OH-58^a	Bell 407^b	Bell 427^b	Bell 412^b
Current Value				
Price in year 2004	\$ 100,000	\$ 2,700,000	\$ 3,400,000	\$ 7,200,000
Flight hours per year ^c	166.75	166.75	166.75	166.75
Annual Operating Cost				
Fuel cost (166.75 hrs)	\$ 5,887	\$ 12,982	\$ 19,473	\$ 31,891
Parts ^d	\$ 25,675	\$ 10,942	\$ 13,107	\$ 28,353
Mechanic labor	\$ 19,176	\$ 10,697	\$ 10,978	\$ 11,625
Annual training (10 pilots)	\$ 68,860	\$ 68,500	\$ 150,000	\$ 113,000
Liability insurance	\$ 5,137	\$ 5,137	\$ 5,137	\$ 5,137
<i>Cost per hour</i>	<i>\$ 748</i>	<i>\$ 649</i>	<i>\$ 1,192</i>	<i>\$ 1,139</i>
Liquidation Value				
Price in year 2014	\$ 53,103	\$ 1,433,775	\$ 1,805,495	\$ 3,823,400

Total Costs (10 years)^e	OH-58	Bell 407	Bell 427	Bell 412
<i>In 2004 dollars</i>	<i>\$ 1,338,400</i>	<i>\$ 2,189,700</i>	<i>\$ 3,289,400</i>	<i>\$ 4,997,400</i>

Notes

- a. All costs are based on average actual operating costs for SHP's eight OH-58 helicopters from 2000 to 2003.
- b. Costs are based on information provided by the manufacturer, Bell.
- c. Hours flown per year are held constant across all aircraft types. SHP actually anticipates flying any new aircraft more than the current average flight time of an OH-58.
- d. Parts costs are assumed to be constant on all new aircraft each year for routine maintenance. Projections of part costs for OH-58s are based on SHP's scheduled component replacement parts needs plus parts required for routine maintenance.
- e. Total 10-year costs are calculated by adding the current value of each aircraft to operating costs each year for 10 years and subtracting the liquidation value at the end of the period.

Discussion

Based on our cost-effectiveness analysis, we conclude that all three new Bell helicopters would be more costly to purchase and operate over 10 years than a currently-held and maintained OH-58. If SHP is not interested in expanding its capabilities beyond what is currently possible, the department should keep the OH-58s. A critical component of this project is to examine the merits of equipping SHP with the ability to perform rescue missions, which are beyond its current level of ability. Therefore, in Chapter Four, we value the benefits North Carolina would receive from the enhanced capacity of new aircraft.

Chapter Four: Benefit Evaluation & Cost-Benefit Analysis

Overview

We quantified the benefits associated with using each of the Bell helicopters to perform three mission scenarios that an OH-58 cannot complete. For each of the three mission types—rescue, searches in inclement weather, and emergency aid/supply transport—we compared projected operations using a Bell helicopter to a specific operation performed by SHP’s OH-58 with assistance from other ground or aerial agencies. We calculated the monetary benefit of time saved by all involved agencies in completing the operation and compared these results across aircraft types. We subtracted the additional operating cost required to operate a Bell helicopter (compared to an OH-58) for current missions. Our results show that the benefits of using any of the Bell helicopters for the three specified mission types outweigh the costs of purchasing and operating new aircraft. The Bell 407 would provide the greatest monetary benefit to NC over the other aircraft, saving approximately \$5 million over 10 years.

Approach

Following our estimation of the 10-year operating costs for each of four aircraft (the OH-58, Bell 407, Bell 427, Bell 412), we attempted to estimate the benefits gained by purchasing each new aircraft type. To evaluate the benefits gained by acquisition of a new helicopter as part of this benefit evaluation, we allowed the operating hours for each new aircraft to vary according to our research and SHP’s projected usage of each helicopter type.

Rather than calculating minor changes among all routine missions, we compared operational efficiency and enhanced mission capabilities for each helicopter type for the three mission scenarios that are likely to change the most with the addition of new aircraft. These three capabilities are: (1) ability to conduct evacuation/rescue missions, (2) ability to perform missions in inclement weather, and (3) ability to transport emergency aid/supplies in the event of a natural or man-made disaster.

1. *Evacuation/rescue of North Carolinians.* With a two-person crew and a three-hour allotment of fuel, SHP’s OH-58s operate at maximum payload and cannot perform aerial rescues. In the past, the SHP has relied on federal military agencies such as the National Guard, the Marine Corps, and the Coast Guard to assist with rescue operations, but such assistance is not consistently available. A new aircraft with increased maximum payload would allow SHP to use hoist equipment to conduct rescues after locating persons in need.
2. *Flying through inclement weather.* The current fleet of OH-58s is not only ill equipped for instrument flying, it is also too unstable to fly during inclement weather conditions. Currently, when OH-58 pilots encounter poor weather, they must abort their mission and return to the SHP hangar. New helicopters

would boost SHP's capabilities by enabling the aircraft to continue critical law enforcement missions despite encountering poor weather or low visibility.

3. *Transportation of emergency aid/supplies in the event of natural or man-made disasters.* The OH-58s' payload restrictions preclude transporting emergency aid and supplies to natural or man-made disaster areas. A larger helicopter would allow for transportation of emergency aid/supplies to victims in these affected areas.

To determine the benefits of SHP being able to conduct each mission type, we identified several scenarios in which local agencies requested SHP's assistance, but SHP could not accomplish the task. We then reconstructed these scenarios using records from various state and county agencies. To determine the benefits of each type of Bell aircraft under the mission scenarios, we calculated the time required to complete each mission using the four types of helicopters and quantified the differences in costs to NC under each scenario. We developed a consistent set of assumptions to comparably evaluate the time required to complete each mission (see Appendix F). We also estimated how representative each of the three mission types would be of projected future missions/capabilities (see Appendix G). The specifics of our benefit calculations and case study scenarios can be found in Appendix G.

Because of North Carolina's size and diverse geography, we assume that SHP would have to acquire two new helicopters if all North Carolinians are going to benefit from any aircraft-related mission enhancements. Given the purchase of two helicopters, SHP would station one helicopter in the eastern portion of the state (e.g. Raleigh) while stationing the other helicopter in the western portion of the state (e.g. Asheville). In addition to the benefits in mission capabilities, because two new Bell helicopters would be night capable, SHP would have less of a need to regularly transfer SHP's aircraft to different locations around the state, thereby reducing operational costs of SHP's helicopter fleet.

Benefit Evaluation Results

After we quantified total benefits, we subtracted the projected 10-year costs from calculated 10-year benefits to determine the net benefit for each aircraft compared to an OH-58 (see Table 4.1). The benefits of acquiring any of the new Bell helicopters outweighs the costs associated with their purchase and operation. If SHP were to acquire two Bell 407 helicopters, rather than solely maintain their fleet of OH-58 helicopters, the net benefit for the state would be approximately \$5.3 million per helicopter over 10 years. A Bell 412 would provide approximately \$1.7 million in benefits per helicopter over 10 years.

Table 4.1. Summary of Net Benefits across Three Aircraft Types^a

	Bell 407^b	Bell 427^b	Bell 412^b
Annual Flight Hours			
Per Bell aircraft	234.71	219.58	210.97
Enhanced missions			
Rescue ^c	\$5,832,680	\$5,037,155	\$4,770,983
Emergency supplies ^d	\$1,057	-\$57,293	\$24,420
Inclement weather ^e	\$94,359	\$26,394	-\$53,282
Traditional missions^f			
Maintenance	-\$35,228	-\$79,256	-\$147,822
Photo	-\$57,201	-\$128,692	-\$240,025
Training	-\$163,528	-\$367,909	-\$686,190
Demonstration	-\$15,088	-\$33,946	-\$63,314
Transport missions	\$52,926	-\$75,480	-\$275,447
Total surveillance	-\$73,415	-\$165,172	-\$308,063
Total searches	-\$315,570	-\$709,977	-\$1,324,186

Total Net Benefits (10 years)			
Per helicopter (in 2004 dollars)	\$5,320,991	\$3,445,823	\$1,697,075
For two helicopters (in 2004 dollars)	\$10,641,982	\$6,891,646	\$3,394,150

Notes

- a. The net benefits (benefits minus costs) of operating are relative to the costs of operating an OH-58.
- b. Unless otherwise noted, all data are per (one) helicopter.
- c. Total benefits from conducting rescue missions are based on the rescue cases presented in Appendix H.
- d. Total benefits from conducting emergency aid/supply transport missions are based on the case study presented in Appendix H.
- e. Total benefits from conducting weather search missions are based on the case study presented in Appendix H.
- f. Benefits for conducting these missions were held at zero because an OH-58 can conduct these missions comparably to a Bell helicopter. Only the changes in costs associated with operating the different aircraft are included.

Discussion

Based on our benefit analysis, we conclude that operating any of the three Bell helicopters would provide North Carolina with more benefits than if SHP continued to use a currently owned and maintained OH-58. In addition, these benefits outweigh the costs associated with purchasing and operating a new Bell helicopter.

This result implies that if public officials are interested in equipping SHP to perform its assigned missions of conducting rescues and responding quickly in the event of a disaster, purchasing two new Bell 407 helicopters would be a cost-effective method of achieving these outcomes. If the state is only interested in maintaining SHP's current capabilities, our cost-effectiveness study shows that continued maintenance of the OH-58 helicopters is the least costly option.

Though we are confident in the conclusions of our analyses, a number of limitations in the available data may have restricted our precision. These limitations are generally related to: the absence of documented data, limited data collected in the state of North Carolina, and assumptions used to estimate the representativeness of the case studies. In all cases, we chose conservative estimates that erred on the side of under-representing the benefits of using a new Bell helicopter over an OH-58 (see Appendix F).

Recommendations

Based on the combination of our cost-effectiveness and cost-benefit analyses, we believe SHP should acquire two Bell 407 helicopters. In order to ensure that these benefits are available to all North Carolinians, SHP should station one new helicopter in the eastern portion of the state and the other in the western portion.

Chapter Five: Funding Strategy

Overview

To determine the most feasible method for acquiring two Bell 407 helicopters, we examined funding strategies employed in other states to narrow the range of options to four possibilities: state budget appropriations, US Department of Homeland Security grants, other federal grants, and a designated funding source. We interviewed a range of NC public officials to determine the political and procedural feasibility of pursuing funding through each of these options before concluding that an expansion budget request would be the best option for SHP.

NC General Assembly Budget Appropriations

There are two types of budget requests in the NC General Assembly: expansion budget requests and continuation budget requests. Continuation budget requests finance existing programs and help state agencies adjust for unanticipated costs associated with such programs. Expansion budget requests are for expenditures not previously included in an agency's operating budget.¹⁵

We believe an expansion budget request from the North Carolina General Assembly is the most viable option for aircraft acquisition (see Appendix H for important aspects of an expansion budget strategy). SHP should include its request for \$5.4 million¹⁶ in its November 2004 request. Because such a request is a one-time petition for major equipment purposes, it will be considered an expansion, rather than continuation, budget request.¹⁷ An expansion budget request must include a thorough justification of the funding request as well as detailed expenditure information.¹⁸ We believe this report can serve both of these purposes.

¹⁵ SHP begins preparing budget requests in the fall of each year. When AOS's budget request is endorsed by the State Highway Patrol and the Department of Crime Control and Public Safety, it is sent to the governor. Legislative review of the *Governor's Recommended Budget* begins when it has been formally presented to the General Assembly, during odd-numbered years. When the budget is submitted to the legislature, it is divided among appropriation subcommittees.

¹⁶ The estimated purchase price of two fully-equipped Bell 407 helicopters.

¹⁷ According to the State Budget Manual, one-time major equipment purchases are considered as expansion, rather than continuation budget requests. Capital improvement projects are limited to renovations, major repairs, new construction, and land purchases. Following approval by the NC General Assembly, capital improvement projects can be funded through debt financing, but there is no precedent in North Carolina for the use of debt financing to fund major equipment purchases.

State of North Carolina. Office of State Budget and Management. Budget Manual. Updated 12 Jan 2004: 59-62. Romocki, Tim. Director, Debt Management. North Carolina Department of State Treasurer. Telephone interview with authors. 14 April 2004.

¹⁸ McCoy, David. "Instructions for FY 2004-05 Budget Preparation." Memorandum to Department Heads and Chief Fiscal Officers, All State Departments, Institutions, and Agencies. 12 February 2004: 2.

Our recommendation for pursuing budget appropriations is based on the fact that Highway Patrols and State Police agencies in Georgia, Ohio, Virginia, California, Maryland, and Washington have succeeded in securing a portion of or all of their funding for helicopter purchases from their respective state legislatures. Both North Carolina's State Homeland Security Strategy (SHSS) and SHP's 2004 Strategic Plan provide support for such a request by highlighting the need to examine AOS resources and mission capabilities.¹⁹

The results of our cost-benefit analysis show that the long-term budgetary impact of the purchase of two new helicopters will result in lower costs to the state as a whole—a 10-year cost savings of \$10.6 million with two Bell 407 helicopters. SHP can improve its chances of gaining legislative approval by presenting its acquisition proposal as one for replacement aircraft. While it is unlikely that SHP will be able to sell their current aircraft prior to completing training on the new Bell 407 helicopters, it is reasonable to assume that the state will be able to sell the two OH-58s within one to two years to generate “offset” revenue.²⁰

To bolster political feasibility, we believe SHP should present the merits of its budget request to Secretary Beatty, Governor Easley, and the General Assembly by highlighting each of the following four key factors:

- *Current Legislative Priorities*

AOS's inability to perform its stated rescue mission in an era marked by growing awareness of homeland security threats should be a major concern in North Carolina. Governor Easley has established homeland security and public safety as top budget priorities for the 2004 Legislative Session.²¹ SHP plays an integral role in both those tasks. We believe the findings of our cost-benefit analysis, coupled with our analysis of the funding options available, will help illustrate to the Governor and the General Assembly why the purchase of additional helicopters will greatly enhance the safety and security of the state.

- *Improved Operations Efficiency*

By improving its speed and mission effectiveness, SHP will reduce response times for all state and local agencies that rely on AOS for aerial support. As a result, there is the potential for lives to be saved and serious injuries to be avoided. We believe legislators will be interested in supporting a cost-effective proposal that responds to citizens' concerns regarding their state's emergency preparedness capabilities.

According to Cassandra Skinner, Crime Control and Public Safety legislative liaison, the Transportation Oversight Committee has been very interested in SHP's use of performance measures to determine its progress in improving

¹⁹ North Carolina State Highway Patrol. 2004 Strategic Plan. December 2003: 30.

²⁰ The liquidation value of two OH-58's in two years will be \$198,000.

²¹ McCoy, David. “Instructions for FY 2004-05 Budget Preparation.”

public safety on the highways.²² The Committee has looked at these measures to determine whether the Patrol has made the best use of its resources and to justify any decision to fund additional budget proposals. We believe that by examining this cost-benefit analysis, the Transportation Oversight Committee will be persuaded that, from the point of view of the State of North Carolina, the purchase of additional helicopters is a sound fiscal investment.

- *Enhanced Mission Capabilities*

By approving an expansion budget request, the Governor and the General Assembly will enhance the SHP's ability to perform search and rescue, inclement weather, and emergency aid transport missions for both natural disasters and homeland security missions. Our research of recent field missions illustrates that the patrol's ability to handle certain situations is severely limited. NC Senator Martin Nesbitt of Asheville stressed that all of western North Carolina would benefit tremendously from having a more modern helicopter stationed in Asheville.²³ We believe that Secretary Beatty's ability to convey that message clearly to both Governor Easley and the General Assembly will provide the momentum required to approve such an essential appropriation.

- *Adherence to Expansion Budget Requirements*

According to State Budget regulations, expansion budget requests cannot exceed five percent of any agency's FY 2004-05 certified appropriations.²⁴ Because five percent of SHP's 2004-05 budget is \$7,005,756, the expansion budget request of \$5.4 million needed to purchase two Bell 407 helicopters meets these constraints.²⁵ Because SHP will be recouping approximately \$198,000 by selling two OH-58s, the patrol's expansion request carries a net value of \$5.2 million. Additionally, because the General Assembly may choose to use both General Fund and Highway Fund monies, there is flexibility within the 5% stipulation.

US Department of Homeland Security (DHS) Grant

The DHS Grant program was designed to distribute money to eligible "First Responders" within individual states.²⁶ Governor Easley has designated North Carolina Emergency

²² Skinner, Cassandra Skinner. CC&PS, Special Assistant to the Secretary. Interview with authors. 15 March 2004.

²³ Nesbitt, Martin. NC Senator. Telephone interview with authors. 19 April 2004.

²⁴ McCoy, David. "Instructions for FY 2004-05 Budget Preparation.": 3.

²⁵ The SHP's certified budget for FY 2004-05 was \$140,115,120. Source: Office of State Budget and Management. Certified Budget. http://sdc.state.nc.us/budget_narratives/certified_budget.html. Crime Control and Public Safety- Highway Fund Budget (Budget Code 24960): <http://scca.its.state.nc.us:1200/neon/BI14>. Last accessed 10 April 2004.

²⁶ Forward. DHS FY2004 Grant Instructions.

Management (NCEM) as North Carolina's State Administering Agency, thereby charging NCEM with distributing DHS grant money. Within North Carolina, 35 state-level agencies are eligible for state-level funding based on their status as "First Responder" agencies.²⁷ The federal grant guidelines require that a minimum of 80% of all state grants go directly to local first responders, leaving a maximum of 20% of the total federal grant available to North Carolina's 35 state agencies (see Appendix I for a full description of the DHS grant program in NC).

While the DHS grant program appears, on the surface, to be a very strong option for purchasing helicopters, our research has uncovered a series of problems with relying upon DHS funding alone. Our recommendation not to pursue DHS grants to fund the purchase of two Bell 407 is based on the following three factors:

- *Shortage of Funds*

Federal funds for FY02 and FY03 are committed to state and local agencies across NC, leaving only FY04 monies available. Applications for this money were delayed while North Carolina updated its State Homeland Security Strategy (SHSS) to meet federal requirements.²⁸ With the new SHSS in place, \$34 million is slated for local governments; only \$9 million will be available for state agencies. While there has been some leeway in the past in distinguishing between local and state spending, new federal guidelines require that local governments explicitly approve any state withholding of monies originally slated to local governments, making it unlikely that NC will be able to withhold monies slated for its 100 counties.

- *Interpretation of Guidelines*

In addition to the limitations imposed by the 80 percent-20 percent breakdown between local and state-level first responder agencies, North Carolina currently employs a strict interpretation of the federal guidelines for equipment grants. The guidelines state that any equipment purchased using DHS grant money must be reserved for use solely in the event of terrorist incidents.²⁹ Therefore, helicopters purchased using DHS funding can only be used to respond to a suspected terrorist or WMD event. Approval of training grants, however, is somewhat more flexible and such grants might be available to AOS in the future.

²⁷ Taylor, Dr. Ken. Director, North Carolina Emergency Management. Personal interview with authors. NCEM Administrative Offices. 1 March 2004.

²⁸ Ibid.

²⁹ U.S. Department of Homeland Security. FY 2004 ODP Homeland Security Grant Program. <http://www.ncem.org/HomelandSecurity/library/FY%202004%20ODP%20Homeland%20Security%20Grant%20Program%20-%2097.004.pdf>. Last accessed 20 March 2004.

- *Political Factors*

While the application process and program guidelines do not rule out the possibility of applying for DHS funding, there are three key political factors that steered our recommendation away from this option.

1. North Carolina's current philosophy for distributing DHS funds is to be certain that as many people as possible benefit from the program by broadly distributing the monies. In essence, NCEM prefers to fund many smaller equipment and programming grants, rather than use significant portions of money for single equipment purchases. While part of this philosophy is linked to the fact that previous grant amounts were much smaller, it may be difficult to reverse this trend.
2. The Department of Crime Control and Public Safety has currently established interoperable communications as its foremost homeland security priority.³⁰ Dr. Taylor, NCEM director, indicated that cyber-terrorism, physical security, and communications are NC's top homeland security priorities, indicating that such projects will be given priority over other public safety spending in NC for DHS funding.³¹
3. The Department of Defense recently announced that North Carolina will receive one of 12 new Weapons of Mass Destruction -- Civil Support Teams (CST) as a unit of the NC National Guard.³² The Unit will have 22 full-time National Guardsmen who will assist local and state emergency responders in the event of a terrorist attack or serious incident. The rapid deployment mission of the CST alleviates some of the burden that would fall to SHP in the event of a terrorist attack and may further diminish AOS's case for securing DHS funding for response to terrorism and WMD incidents.

Other Federal Grants

We investigated a range of federal grant programs in addition to the DHS program. The Department of Transportation, Department of Health and Human Services' Office of Public Health Preparedness, and the Hazardous Materials Emergency Preparedness Grant Program each administer grants for various homeland security and highway safety programs. The details of each of these grant options are outlined below.

³⁰ State of North Carolina. State Homeland Security Strategy (SHSS). January 30, 2004.

³¹ We also consulted with US Representative David Price (4th-NC), who reiterated the fact that the shortage of funds and the establishment of interoperable communications as a top priority limited the chance of obtaining further DHS funding for a major equipment purchase. Price, David. Personal interview with authors. 6 April 2004.

³² Hoffman, Renee. Director of Public Affairs. North Carolina Crime Control and Public Safety. "State Gets Full-time Weapons of Mass Destruction Team." 9 March 2004.

- *Department of Transportation (DOT)—National Highway Traffic Safety Administration*³³

All federal DOT grants are funded by the Transportation Equity Act: A Legacy for Users (TEALU) which has only recently received funding authorization. The Governor's Highway Safety Commission manages highway safety and transportation grants in North Carolina. The National Highway Traffic Safety Administration (NHTSA) offers a State and Community Highway Safety grant program to support state highway safety programs designed to reduce traffic accidents and resulting deaths, injuries, and property damage. A state may use these grant funds only for highway safety purposes, and at least 40 percent of these funds must be used to address local traffic safety problems. California was successful in procuring helicopters with NHSTA grants.³⁴ In 2003, North Carolina received \$4,127,066 in grants. Should an expansion budget request fail, this might be an avenue for SHP to investigate further in the future.³⁵

- *Department of Health and Human Services Office of Public Health Preparedness*³⁶ (*Center for Disease Control and Prevention [CDC]*)

In the past, the CDC offered grants relating to bio-terrorism agents. SHP is responsible for responding to man-made disasters in its mission; however, because such response activities are only a very small subset of current AOS operations, it may be difficult to justify such a grant request.

- *Hazardous Materials Emergency Preparedness*³⁷

The Hazardous Materials Emergency Preparedness (HMEP) grant program is intended to provide financial and technical assistance, as well as national direction and guidance, to enhance state, territorial, tribal, and local hazardous materials emergency planning and training. In 2003, North Carolina received \$316,260 in HMEP grants. HMEP grants fall under the jurisdiction of NCEM. Because these grants are used for planning and training, they are not available for large capital equipment purchases.

³³ Transportation Equity Act for the 21st Century. State Highway Safety Programs. <http://www.nhtsa.dot.gov/nhtsa/whatsup/tea21/tea21programs/index.html>; <http://www.nhtsa.dot.gov/nhtsa/whatsup/TEA21/tea21programs/FY2004StateComm.html>. Last accessed 20 March 2004.

³⁴ Cheney, Sgt. Kirk and Sgt. Marc Nalley. California Highway Patrol Air Operations Section. Telephone interview. 23 February 2004.

³⁵ While DOT grants are a potential financial resource, we were limited in the degree to which we could consider such funds for helicopter acquisition because federal funding was not approved until late March 2004.

³⁶ Continuation Guidance for Cooperative Agreement on Public Health Preparedness and Response for Bioterrorism. http://www.bt.cdc.gov/planning/continuationguidance/pdf/guidance_intro.pdf

³⁷ Hazardous Materials Emergency Preparedness Grants Program Fact Sheet. <http://hazmat.dot.gov/hmep/hmepfact.htm>.

Legislative Proposal for Permanent Revenue Source

We conducted a cursory investigation of whether SHP should pursue a legislative request to secure a designated funding source for AOS. Such a proposal is a more controversial legislative request, and would require extensive debate both within the SHP and the Department of Crime Control and Public Safety. Should an expansion budget request for two new Bell 407s fail, however, we believe the SHP has a strong case for acquiring a permanent funding source for its operations.

Our preliminary findings indicate that Maryland, Virginia, and Washington each finance their aviation operations through motor vehicle licensing fees (see Appendix C). Tag fees in these states are added to annual vehicle registration fees and go directly to financing the aviation division. Approximately two-thirds of the Maryland Aviation Division's \$18 million annual operating budget is financed through an annual five dollar vehicle registration fee, proving a strong model for comparison.³⁸

Although SHP does not currently receive revenues directly from Department of Motor Vehicles motor vehicle registration fees, SHP budget allocations are granted from North Carolina's Highway Fund, the same source that funds the Department of Transportation budget. Therefore, the establishment of a designated funding source for AOS is a logistically feasible option. The state would be able to generate \$6 million in 2004 alone if NC were to increase motor vehicle tag fees by one dollar for the purposes of funding AOS.³⁹

³⁸ Lehman, Donny and Lance Shank. Maryland State Police Aviation Division. Telephone interview. 20 February 2004.

MD State Police Aviation Division Frequently asked Questions. <http://www.mspaviation.org/frames.html>. Last accessed 20 March 2004.

³⁹ This estimate is based on NC registration figures for 2003 which state that 4,862,646 passenger cars 1,770,235 trucks were registered. Annual registration fees in NC vary according to the weight of the vehicle and the county in which it is registered. Typical renewal registration for a car is \$20 annually, and typical registration for a 4,000 pound pickup truck is \$21.50. North Carolina Department of Motor Vehicles. Telephone interview with Capt. Goering. 16 April 2004.

Chapter Six: Recommendations

To assess whether SHP should acquire new helicopters and what funding strategies it should employ in doing so, we examined practices in other states, conducted a cost-effectiveness evaluation, completed a cost-benefit analysis, and reviewed state and federal funding options. In arriving at the following recommendations we aimed to determine whether the purchase of each of the three aircraft we considered would be cost effective, successful in enabling SHP to better accomplish its missions, and politically feasible. After judging each of the aircraft options by these criteria, we offer three recommendations:

1. SHP should seek funding to acquire two Bell 407 helicopters.

Our cost-effectiveness and cost-benefit analyses demonstrate that the Bell 407 helicopter will bring a greater increase in benefits to the state of North Carolina than if the state were to continue operating the OH-58. The additional costs of purchase and operation of the new aircraft will be more than offset by savings in time and efficiency across the state. SHP would gain such efficiencies in their ability to conduct rescues, operate in inclement weather, and provide emergency aid/supply transport. This acquisition meets our established criterion of being a cost effective purchase. To ensure that the benefits of these helicopters are shared by all North Carolinians, SHP should locate one Bell 407 helicopter in the eastern portion of the state and one in the western portion of the state.

2. SHP should request funding from NC General Assembly expansion budget appropriations.

SHP should request legislative appropriations in its November 2004 expansion budget request for the Governor's FY2006-2008 budget proposal. Governor Easley's current budget priorities, anticipated improvements to SHP operations efficiency, the enhancement of AOS's current mission capabilities, and the qualification of such a request within state budgeting guidelines provide sound justification for an expansion budget request. Coupling this justification with the detailed results of this cost-benefit analysis, we believe SHP has a strong case for acquiring this funding from the General Assembly. SHP should also inform county and local law enforcement agencies of the merits of such a request.

3. SHP should conduct a study examining the long-range goals of AOS to determine the feasibility of securing a designated funding source.

Based on our analysis of other states' aviation divisions, it would be beneficial and not unprecedented for AOS to attempt to secure a permanent funding source for its programs. An analysis of SHP's current resource capacity for

maintaining AOS will help SHP highlight the need for a designated funding stream. While such a proposal will require extensive debate within SHP, within the Department of Crime Control and Public Safety, with the Governor, and ultimately within the NC General Assembly, we believe further study of this issue may help SHP outline its strong case for acquiring a designated funding source for AOS operations.

Works Cited

- Allen, Jacob. "Leasing vs. Purchase. Getting the Aircraft You Need." Air Beat Magazine: 2004 Buyer's Guide.
http://www.alea.org/public/airbeat/back_issues/airbeat_back_issue_toc.htm.
- Andrews, D.W. Pilot. North Carolina State Highway Patrol. Summary of Interviews with Western Emergency Management Coordinators. 2 April 2004.
- Atkins, Lieutenant Tristan. Section Commander, Washington State Patrol Aviation Section. Email to the authors. 20 February 2004.
- Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Numerous emails to authors. 18 February 2004 through 17 April 2004.
- Bass, Ronald. Sampson County Emergency Management. Email to authors. 7 April 2004.
- Beechcraft Raytheon Aircraft Company.
http://www.raytheonaircraft.com/beechnair/king_air_40th/timeline.pdf. Last accessed 15 April 2004.
- Bell Helicopter. Production Specifications: Bell 407, Bell 427, Bell 412.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/407_TS_2004jan.pdf. Last accessed 6 April 2004.
- Briggs, Captain S.M. Line Sgt. T.I. Baldwin, Line Sgt W.B. Thaxton, and Trooper M.A. Tribula. State Highway Patrol Aircraft Operations: Aircraft Acquisition Proposal. January 2004.
- Briggs, Capt. S.M, Chief Special Operations. North Carolina State Highway Patrol. Email to authors. 26 February, 2004.
- California Highway Patrol Air Operations Section website. <http://www.chp.ca.gov/html/aos.html>. Last accessed 20 March 2004.
- California Highway Patrol, Office of Public Affairs. "Governor Increases CHP Budget to Ensure State Security." Press Release. 11 January 2002.
- Cheney, Sgt. Kirk and Sgt. Marc Nalley. California Highway Patrol Air Operations Section. Telephone interview. 23 February 2004.
- City of Newport Beach Cost-Effectiveness Study. <http://www.city.newport-beach.ca.us/CouncilAgendas/1996/i09-0906.htm>.

Department of Defense. "Report Required by Section 2912 of the Defense Base Closure and Realignment Act of 1990, as amended through the National Defense Authorization Act for Fiscal Year 2003." Washington, DC: March 2004.

Farmer, Pete. North Carolina Emergency Management. Phone interview. 15 April 2004.

Florida Highway Patrol Aviation Section website.

<http://www.fhp.state.fl.us/html/photogallery/copter.html> &
<http://www.fhp.state.fl.us/html/photogallery/plane.html>. Last accessed 20 March 2004.

Fox, R.G. Measuring Safety in Single and Twin Engine Helicopters. *Flight Safety Digest, Flight Safety Foundation*, August 1991.

http://www.flightsafety.org/members/serveme.cfm?path=fsd/fsd_aug91.pdf. Last accessed 30 March 2004.

Garner, Dennis. North Carolina State Highway Patrol. Aircraft Dispatch Flight Report for missions not completed of total missions. 25 March 2004.

Gearhart, Peter A; Wuerz, Richard MD, FACEP; Localio, A Russell MPH, MS Cost-effectiveness analysis of helicopter EMS for trauma patients. From the College of Medicine, the Center for Emergency Medical Services, and the Center for Biostatistics and Epidemiology, Pennsylvania State University College of Medicine, Hershey, PA. Received for publication September 30, 1996. Revisions received January 29 and April 2, 1997. Accepted for publication April 8, 1997. Presented in part at the American College of Emergency Physicians Research Forum, Cincinnati, OH, February 1996.

Georgia Governor's Budget Report, Fiscal Year 2005. <http://www.opb.state.ga.us/Budget/FY05BR.pdf>. Last accessed 8 April 2004.

Georgia State Patrol Aviation Unit website. http://dps.georgia.gov/00/channel_modifieddate/0,2410,5635600_7398707,00.html. Last accessed 20 March 2004.

Goering, Norman and Thomas Caves. NCSHP. Personal interview with authors. 20 February 2004.

Griffin, Larna. Assistant Controller North Carolina Office of Statewide Accounting. Email to authors. 9 March, 2004.

Harris, J.S. Data Show Same U.S Fatal Accident Rate for Single and Twin Turbine Helicopters. *Helicopter Safety, Flight Safety Foundation*, Vol 25, No. 1. January-February 1999.

Helicopter Accident Review. *Helicopter Loss Control and Litigation Newsletter*. Vol 1, No. 3. November 2000. <http://www.aigaviation.com/pdf/Nov%202000%20-%20Heli.pdf>. Last accessed 30 March 2004.

Hoffman, Renee. Director of Public Affairs. North Carolina Crime Control and Public Safety. "State Gets Full-time Weapons of Mass Destruction Team." 9 March 2004.

Lehman, Donny and Lance Shank. Maryland State Police Aviation Division. Telephone interview. 20 February 2004.

Maryland State Police Aviation Division website. <http://www.mspaviation.org/>. Last accessed 20 March 2004.

Maryland State Transportation Budget. http://www.mdot.state.md.us/Trans_Revenue_Expenses/Documents/Internet%20Copy%20FY%202004%20Session.ppt. Last accessed 20 March 2004.

McCoy, David. "Instructions for FY 2004-05 Budget Preparation." Memorandum to Department Heads and Chief Fiscal Officers, All State Departments, Institutions, and Agencies. 12 February 2004.

Miller, Tim. Western Branch Manager. North Carolina Department of Emergency Management. Phone interview. 19 April 2004.

National Business Aviation Association (NBAA) Management Guide 1.15 Administration. 1998.

Nesbitt, Martin. North Carolina General Assembly. Telephone interview with authors. 19 April 2004.

North Carolina Department of Crime Control and Public Safety. "Highway Patrol Stations Helicopter in Asheville." News Release. 5 November 1997.

North Carolina General Assembly 2003-2004 Session Senate Committee Listing http://www.ncga.state.nc.us/gascripts/committee_lists/committee_lists.pl?Senate Last accessed 8 April 2004.

North Carolina State Highway Patrol. 2004 Strategic Plan. January 2004.

North Carolina State Highway Patrol. Mission Logs. Obtained from Baldwin, Sgt. T.I., Pilot/Maintenance Supervisor.

Office of North Carolina State Auditor Ralph Campbell, Jr. Performance Audit: State Aircraft Operations. Raleigh, NC: November 2003.

- Ohio Department of Public Safety Budget for FY 2005.
http://www.obm.ohio.gov/information/budget/Bluebook0405/pdf/e_dhs.pdf. Last accessed 8 April 2004.
- Ohio State Highway Patrol Aviation Section website.
<http://www.dw.ohio.gov/ohiostatepatrol/operationalunits/fieldops/aviation.html>. Last accessed 20 March 2004.
- Peterson, Dave. Email forwarded to authors by SHP. Capt. Briggs. 25 February 2004.
- Price, David. Personal interview with authors. 6 April 2004.
- “Primer on Cost-Effectiveness Analysis.” *Effective Clinical Practice*. September/October 2000. American College of Physicians website.
<http://www.acponline.org/journals/ecp/sepoct00/primer.htm>. Last accessed 27 March 2004.
- Production Specifications: Bell Helicopter, Bell 407.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/407_TS_2004jan.pdf. Last accessed 6 April 2004.
- Production Specifications: Bell Helicopter, Bell 412.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/412_TS_2004jan.pdf. Last accessed 6 April 2004.
- Production Specifications: Bell Helicopter, Bell 427.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/427VFR_TS_2004jan.pdf. Last accessed 6 April 2004.
- Roby, Captain Don. “What it takes to Manage a Law Enforcement Aviation Unit.” *Air Beat Magazine* January/February 2003.
http://www.alea.org/public/airbeat/back_issues/airbeat_back_issue_toc.htm.
- Romocki, Tim. Director, Debt Management. North Carolina Department of State Treasurer. Telephone interview with authors. 14 April 2004.
- Saunders, Lieutenant Nick. Virginia State Police Aviation Unit. Telephone interview. 18 February 2004.
- Shinnamon, Donald L. How Safe is Airborne Law Enforcement, *Rotor and Wing Magazine*, May 2002.
http://www.aviationtoday.com/cgi/rw/show_mag.cgi?pub=rw&mon=0502.
- Skinner, Cassandra. Crime Control & Public Safety. Personal interview with authors. 15 March 2004.
- Smith, Larry. Georgia State Patrol Aviation Unit. Telephone interview. 18 February 2004.

- State Climate Office of North Carolina. Aspects of NC Climate, History of Hurricanes in North Carolina. <http://www.nc-climate.ncsu.edu/climate/hurricanes.html>. Last accessed 20 May 2004.
- State of North Carolina. Office of State Budget and Management. Budget Manual. Updated 12 Jan 2004.
- State of North Carolina. State Homeland Security Strategy_(SHSS). January 30, 2004.
- Stein, Mike. Ohio State Highway Patrol Aviation Section. Telephone interview. 18 February 2004.
- Taylor, Dr. Ken. Director, North Carolina Emergency Management. Personal interview with authors. NCEM Administrative Offices. 1 March 2004.
- Transportation Budget of California. <http://www.documents.dgs.ca.gov/osp/GovernorsBudget05/pdf/bth.pdf>. Last accessed 8 April 2004.
- Tribula, M.A. Pilot, North Carolina State Highway Patrol. Personal interview. 24 March 2004.
- Tucker, Tony. Director, Chatham County Emergency Management. Phone interview. 6 April 2004.
- US Department of Homeland Security. Homeland Security Evaluation and Exercise Program (HSEEP) Volume 1. Office of Domestic Preparedness Homepage <http://www.ojp.usdoj.gov/odp>.
- US Department of Homeland Security. FY 2004 Homeland Security Grant Program. <http://www.ncem.org/HomelandSecurity/library/FY%202004%20ODP%20Homeland%20Security%20Grant%20Program%20-%2097.004.pdf>. Last accessed 20 March 2004.
- US Department of Transportation. "NC Motor Vehicle Registrations 1986-87 through 1997-1998." http://www.osbm.state.nc.us/files/pdf_files/charts/General_Government/DOT/mvregs.PDF. Last accessed 6 May 1999.
- Virginia Office of Public Safety Budget. <http://www.dpb.state.va.us/Budget/04-06/buddoc04/pubsafe.pdf>. Last accessed 8 April 2004.
- Virginia State Police Aviation Unit website. http://www.vsp.state.va.us/bfo_aviation.htm. Last accessed 20 March 2004.
- Walker, Captain Matt. Florida Highway Patrol Aviation Section. Telephone interview. 18 February 2004.

Washington State Patrol Aviation Section website. <http://www.wsp.wa.gov/about/sod.htm>.
Last accessed 20 March 2004.

Washington State Highway Patrol Highway Account.
<http://lrc.leg.wa.gov/manual97/resour36.htm>. Last accessed 20 March 2004.

**Appendix A—Questionnaire Used for Telephone Interviews of California,
Florida, Georgia, Maryland, Ohio, Virginia, and Washington State
Highway Patrols**

Questionnaire

How many aircraft do you have?

What types of aircraft?

How long have you had these aircraft?

Why did you choose to use these aircraft over other options?

What are the designated missions/uses for these aircraft?

How did you obtain funding for these aircraft?

What other avenues for funding did you pursue?

Are you planning to upgrade your fleet in the near future?

If so, how do you plan to obtain funding to upgrade your fleet?

How many pilots do you have?

How many dedicated maintenance people do you have?

Do you contract for repairs?

Do you have any estimate of operating costs?

How are the daily operations funded? Do you bill for use, or are operations funded through existing budgets?

If you bill for use, how does that process work?

Have you received any funds from the Department of Homeland Security since its inception?

Contacted Personnel

California Highway Patrol Air Operations Section, Sgt. Kirk Cheney, Chief Pilot of Fixed-wing Division and Sgt. Marc Nalley, Chief Pilot of Helicopter Division.
(916) 262-1777

Florida Highway Patrol Aviation Section, Captain Matt Walker. (850) 487-4364

Georgia State Patrol Aviation Unit, Larry Smith. (770) 528-5439

Maryland State Police Aviation Division, Donny Lehman and Lance Shank. (301) 663-5743

Ohio State Highway Patrol Aviation Section, Mike Stein. (614) 466-2660

Virginia State Police Aviation Unit, Lieutenant Nick Saunders. (804) 743-2230

Washington State Patrol Aviation Section, Tristan Atkins, Section Commander.
(360) 753-6173

Appendix B—Designated Missions for California, Florida, Georgia, Maryland, Ohio, Virginia, and Washington

We researched the designated mission of the seven examined aviation units to determine if they were comparable to SHP and what equipment they used to complete their missions.

*California*⁴⁰

The California Highway Patrol (CHP) Air Operations Section undertakes two main missions. CHP uses its helicopters primarily for search and rescue purposes, as well as law enforcement assistance on pursuit calls. Fixed-wing missions are primarily traffic safety missions, ranging from speed enforcement to congestion monitoring to routine surveillance. CHP also assists in pursuit calls and photo missions, and performs cargo and transport missions on a select, as-needed basis.

The Air Operations Section includes six designated programs:

1. *Aviation Safety*: coordinates and oversees all aspects of safety.
2. *Paramedic*: coordinates Advanced Life Support within the department.
3. *Pilot Testing*: administers tests to eligible candidates within the department.
4. *Peace Officers Standards and Training Air Crew Course*: coordinates basic flight crew training for CHP and allied agencies.
5. *Aircraft Parts Purchasing*: oversees the purchasing of parts for departmental aircraft.
6. *Aircraft Maintenance*: ensures that all maintenance performed on department aircraft complies with Federal Aviation Administration guidelines.

*Florida*⁴¹

In 2000, the Florida Highway Patrol (FHP) Aviation Section was down-sized from five helicopters and twelve fixed-winged aircraft to eight fixed winged aircraft. Since then, traffic enforcement has become the main mission of the FHP. Missions flown by the aircraft on a daily basis include: traffic enforcement, routine patrol of interstates for disabled vehicles, crashes and any crimes spotted by the pilot, as well as marijuana eradication, Lo-Jack stolen vehicle recovery, search, and surveillance flights.

Prior to 2000, with the larger Aviation Section, FHP's mission was much broader. The Bell OH-58 helicopters were fully equipped to perform day and night law enforcement operations. The helicopters provided support for Florida's counter-narcotic efforts, for locating suspects, for hurricane victims, and for down-aircraft recovery. FHP helicopters were available 24 hours per day for patrol assignments and to assist other law enforcement agencies. Various

⁴⁰ California Highway Patrol Air Operations Section website. <http://www.chp.ca.gov/html/aos.html>. Last accessed 20 March 2004.

⁴¹ Florida Highway Patrol Aviation Section website. <http://www.fhp.state.fl.us/html/photogallery/copter.html> & <http://www.fhp.state.fl.us/html/photogallery/plane.html>. Last accessed 20 March 2004.

state and local agencies called upon FHP helicopters to assist in special enforcement details and assignments throughout the state. However, due to budget cuts, legislators decided to downsize the aviation section due to the high costs of maintaining aircraft. The Florida Drug Enforcement Agency now controls counter-narcotic efforts from the air. If necessary, Florida seeks aid from the Coast Guard to carry out the rescue missions previously conducted by the FHP.

*Georgia*⁴²

The Georgia State Patrol (GSP) Aviation Unit provides air support to the Georgia State Police and other state, federal, and local agencies. GSP is involved in search missions for fugitives, missing children, and elderly, as well as manhunts, transportation of state officials, aerial photography, aerial surveillance, natural disasters, SWAT missions, and forest fires. GSP has purchased hoist equipment to make its Bell 407s rescue capable; at present, when a rescue is needed, the Aviation Unit will call in the local ground force. The Aviation Unit is also the lead agency for the Governor's Task Force on Drug Suppression.

*Maryland*⁴³

The mission of the Maryland State Police (MSP) Aviation Division is to protect and improve the quality of life of the citizens of the State of Maryland and its neighbors through the airborne delivery of emergency medical, law enforcement, and search and rescue services 24 hours per day. Specifically, MSP carries out routine traffic patrol, monitors special events, surveys criminal activity, tracks escapees or suspects, and searches for missing children. In addition, the Aviation Division conducts medical evacuation missions, which involve rescuing and transporting critically injured individuals.

*Ohio*⁴⁴

The primary missions of the Ohio State Highway Patrol (OSHP) Aviation Section are enforcement of traffic safety laws and provision of assistance to motorists. The Aviation Section also conducts aerial surveillance, search missions for missing people, and marijuana eradication. The OSHP's mission also includes transporting emergency personnel to the scene of an accident or crime investigation. Although OSHP has never transported an injured person, it is capable of doing so. The Aviation Section's mission also includes the security of the Governor; OSHP transports him as needed.

*Virginia*⁴⁵

The primary mission of the Virginia State Police (VSP) Aviation Unit is to provide aircraft

⁴² Georgia State Patrol Aviation Unit website. http://dps.georgia.gov/00/channel_modifieddate/0,2410,5635600_7398707,00.html. Last accessed 20 March 2004.

⁴³ Maryland State Police Aviation Division website. <http://www.mspaviation.org/>. Last accessed 20 March 2004.

⁴⁴ Ohio State Highway Patrol Aviation Section website. <http://www.dw.ohio.gov/ohiostatepatrol//operationalunits/fieldops/aviation.html>. Last accessed 20 March 2004.

for search, rescue, law enforcement, and medical evacuation. VSP operates three helicopter medical evacuation programs that provide rapid response, advanced medical procedures, and transport of critically injured patients to level one trauma centers. The Aviation Unit also conducts drug and narcotic surveillance. Additional flights include photographing crime scenes, providing support for presidential motorcades, participating in multi-agency task force efforts, and demonstrations of the capabilities of the Aviation Unit's aircraft.

*Washington State*⁴⁶

The Washington State Patrol (WSP) Aviation Section provides aerial traffic enforcement, traffic congestion management, and other aerial law enforcement services in support of the Patrol's public safety mission. WSP aids in detecting traffic violations from the air as well as providing assistance to agency staff and local jurisdictions with drug enforcement, aerial surveillance, and transporting donor organs and blood supplies in medical emergencies.

⁴⁵ Virginia State Police Aviation Unit website. http://www.vsp.state.va.us/bfo_aviation.htm.
Last accessed 20 March 2004.

⁴⁶ Washington State Patrol Aviation Section website. <http://www.wsp.wa.gov/about/sod.htm#aviation>.
Last accessed 20 March 2004.

Appendix C—Funding and Revenue Sources for California, Florida, Georgia, Maryland, Ohio, Virginia, and Washington

To determine precedents elsewhere regarding potential funding avenues for SHP, we researched funding and revenue sources for the seven examined states. For the purposes of this appendix, we have grouped states into two categories: those that receive funds from annual state appropriations and those that have state-designated sources of funding in addition to annual state appropriations.

States with Annual Budget Appropriation Funding

*California*⁴⁷

Within the state's \$1.2 billion budget for the California Highway Patrol (CHP), the Air Operations Section has its own budget earmark.⁴⁸ The California Highway Patrol has used federal assistance grant funding to acquire new aircraft. In 1999, CHP acquired three Astar helicopters through National Highway Transportation Safety Administration (NHTSA) grants. In 2002, CHP acquired five new helicopters through the Governor's budget allocation for the State Homeland Security Initiative (\$6.2 million). CHP's new aircraft were directed to be used primarily for anti-terrorism surveillance over potential terrorist targets in the region.⁴⁹

*Florida*⁵⁰

The \$178 million State Highway Patrol budget funds aircraft operations in Florida; Highway Patrol aircraft are operated from the same funds as Highway Patrol automobiles. The State Highway Patrol receives revenue from traffic citations (\$125/citation) to help fund the division.

*Georgia*⁵¹

Most funding for Georgia's Aviation Unit (AU) comes from the \$87 million state budget earmarked for the Department of Public Safety. Although the AU has no specific earmarked budget, the Governor has recommended a budget of \$2.8 million for the aviation unit for FY 2005.⁵² AU receives forfeiture money from marijuana eradications. However, this money

⁴⁷ Cheney, Sgt. Kirk and Sgt. Marc Nalley. California Highway Patrol Air Operations Section. Telephone interview. 23 February 2004.

⁴⁸ Transportation Budget of California. <http://www.documents.dgs.ca.gov/osp/GovernorsBudget05/pdf/bth.pdf>. 8 April 2004.

⁴⁹ California Highway Patrol, Office of Public Affairs. "Governor Increases CHP Budget to Ensure State Security." Press Release. 11 January 2002.

⁵⁰ Walker, Captain Matt. Florida Highway Patrol Aviation Section. Telephone interview. 18 February 2004.

⁵¹ Smith, Larry. Georgia State Patrol Aviation Unit. Telephone interview. 18 February 2004.

⁵² Georgia Governor's Budget Report, Fiscal Year 2005. <http://www.opb.state.ga.us/Budget/FY05BR.pdf>. 8 April 2004.

can only be used for training and equipment. AU also received a personnel hoist and a Forward Looking InfraRed (FLIR) system from Department of Homeland Security grants.

*Ohio*⁵³

The Aviation Section gets most of its money from the \$169 million state budget for the Ohio State Highway Patrol (OSHP), which is supplemented by drug interdiction money.⁵⁴ OSHP has recently purchased three new helicopters. OSHP purchased an AStar helicopter to replace one Bell Jet Ranger 206 that crashed. It purchased a second AStar by selling a Bell Jet Ranger to the Department of Transportation and requesting the remaining funds from the state budget. OSHP purchased the third AStar with funds confiscated from drug interdictions.

States with Dedicated Funding Sources

Maryland^{55,56}

Maryland's Aviation Division currently has an annual budget of approximately \$18 million. Annual vehicle registration fees fund two-thirds of the operation. For each vehicle registered in the State of Maryland, \$11 becomes part of a dedicated trust fund. The Aviation Division receives approximately \$5 from each tag fee to finance maintenance, fuel, and aircraft operating costs. The annual State Police budget, which pays for salaries, training, and other administrative costs, funds the remaining one third of operating expenses. The remaining \$6.00 from each tag fee is allocated among fire/rescue departments, EMS agencies and Shock Trauma.

Maryland's tag fee has been in place since 1986, when a non-instrument-rated helicopter flying in poor weather crashed into a hill, killing a pilot and a paramedic. The state assembly immediately shut down the aviation division, claiming that they did not want to endanger their pilots. Members of the division made a presentation to the legislature explaining the capabilities that they would need to upgrade the equipment to instrument-rated aircraft to prevent future accidents. The legislature concluded that the only way to do this would be through a fixed funding source, and implemented the tag fee, securing funding for the air operations division.⁵⁷

⁵³ Stein, Mike. Ohio State Highway Patrol Aviation Section. Telephone interview. 18 February 2004.

⁵⁴ Ohio Department of Public Safety Budget for FY 2005.

http://www.obm.ohio.gov/information/budget/Bluebook0405/pdf/e_dhs.pdf. 8 April 2004.

⁵⁵ Lehman, Donny and Lance Shank. Maryland State Police Aviation Division. Telephone interview. 20 February 2004.

⁵⁶ Maryland State Transportation Budget.

http://www.mdot.state.md.us/Trans_Revenue_Expenses/Documents/Internet%20Copy%20FY%202004%20Session.ppt

⁵⁷ Lehman, Donny and Lance Shank. Maryland State Police Aviation Division. Telephone interview. 20 February 2004.

*Virginia*⁵⁸

Virginia's Aviation Unit's costs are absorbed in the \$170 million State Police operating budget.⁵⁹ The Aviation Unit does not put money aside for overhaul and replacement of helicopter parts; it deals with these expenses when they occur. However, the associated expenses of the Aviation Unit on the hours of works completed for the Federal Emergency Management Agency (FEMA) are reimbursed.

Med-Flight helicopters in Virginia are funded through the state's Safety Funds, which include vehicle registration and inspection taxes.

Washington State^{60,61}

Washington's Aviation Section obtains the majority of its budget through dedicated funding from the State Patrol Highway Account (SPHA), which is funded through motor vehicle licensing fees. The Aviation Section receives some portion of its funding from the state's general fund and other omnibus funds to support non-traffic related flights. Revenue from the SPHA was \$219 million from 1995 through 1996 and \$221 million from 1997 through 1998.

Washington's Motor Vehicle Fund revenue comes mainly from federal grants, motor fuel taxes, and vehicle registration fees. It must be used for highway purposes as provided in the State Constitution. The SPHA is used solely to fund highway activities of the Washington State Patrol, and principle revenue sources include:

- Motor vehicle registration fee (\$20.35 from each fee)
- Combined licensing fee (25.862 percent of collections)
- Other fees and miscellaneous revenues
- Treasury deposit earnings
- Federal grants
- Local funds

⁵⁸ Saunders, Lieutenant Nick. Virginia State Police Aviation Unit. Telephone interview. 18 February 2004.

⁵⁹ Virginia Office of Public Safety Budget. <http://www.dpb.state.va.us/Budget/04-06/buddoc04/pubsafe.pdf>. 8 April 2004.

⁶⁰ Atkins, Lieutenant Tristan. Section Commander, Washington State Patrol Aviation Section. Email to the authors. 20 February 2004.

⁶¹ Washington State Patrol Highway Account. <http://lrc.leg.wa.gov/manual97/resour36.htm>; <http://lrc.leg.wa.gov/manual97/resou145.htm>.

Appendix D—Cost-Effectiveness Assumptions

In order to reasonably evaluate present and future costs and benefits for each helicopter type, as well as to maintain accuracy and consistency, we developed a consistent set of assumptions. We developed these assumptions based on standard economic procedures and experience in other states.

Calculation Assumptions

Manufacturer

We chose aircraft from the same manufacturer to hold training, maintenance, and tool costs constant across all estimates. Ultimately, SHP will have to undergo a bid process for the final purchase of any helicopter, making brand-specific recommendations somewhat irrelevant. To make the comparisons most comparable, we examined a number of different classes of aircraft from one manufacturer.

Time Period

We selected a 10-year time period for cost calculations based on our research of best practices for helicopter cost-effectiveness analysis⁶² and recommendations made by SHP. Our research indicated that depreciation schedules are typically calculated according to 10-year schedules.⁶³ Further discussion with SHP indicated that such projections are typical for costing capital acquisitions.

All estimates used for an OH-58 were calculated by averaging actual operating costs over the period 2000–2003 to identify a ‘typical’ OH-58.⁶⁴ All Bell 407,⁶⁵ Bell 427,⁶⁶ and Bell 412⁶⁷

⁶² City of Newport Beach Cost-Effectiveness Study. <http://www.city.newport-beach.ca.us/CouncilAgendas/1996/i09-0906.htm>.

⁶³ Gearhart, Peter A; Wuerz, Richard MD ; Localio, A Russell MPH, MS. Cost-effectiveness analysis of helicopter EMS for trauma patients. From the College of Medicine, the Center for Emergency Medical Services, and the Center for Biostatistics and Epidemiology, Pennsylvania State University College of Medicine, Hershey, PA. Received for publication September 30, 1996. Revisions received January 29 and April 2, 1997. Accepted for publication April 8, 1997. Presented in part at the American College of Emergency Physicians Research Forum, Cincinnati, OH, February 1996.

⁶⁴ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Cost Analysis 2000-2003. Email to authors. 18 February 2004.

⁶⁵ Production Specifications: Bell Helicopter, Bell 407.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/407_TS_2004jan.pdf.
Last accessed 6 April 2004.

⁶⁶ Production Specifications: Bell Helicopter, Bell 427.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/427VFR_TS_2004jan.pdf.
Last accessed 6 April 2004.

⁶⁷ Production Specifications: Bell Helicopter, Bell 412.
http://www.bellhelicopter.textron.com/en/aircraft/commercial/pdf/412_TS_2004jan.pdf.
Last accessed 6 April 2004.

operating costs were obtained from the manufacturer, which averages actual owner-supplied data.

Purchase method

To estimate initial costs for each Bell aircraft, we assumed SHP would use a one-time capital expenditure to purchase aircraft outright in the first year. Though leasing options are available with a variety of terms and interest rates, our funding strategies research found that both SHP and the NC General Assembly prefer to purchase equipment outright, rather than lease.⁶⁸ The use of lease options would also change our cost estimates.

Purchase Cost

The initial cost figures are the market value for each helicopter type at year 2004. The estimated present value of \$100,000 for an OH-58 was obtained from the State Auditor's Report⁶⁹ and reflects the opportunity cost of owning the helicopter, despite the fact that SHP spends nothing if the OH-58 is kept.

We obtained quotes⁷⁰ for the current price of the other three helicopter purchase options from Bell. The purchase price includes all associated equipment costs and initial training for two pilots and one mechanic.

Discount Rate

We assumed that North Carolina's current state government interest and loan rate would be an appropriate estimate of the present value of capital expenditures. We used a discount rate of 3% to determine the present value of all costs and values for each year.⁷¹

Operating Cost Assumptions

Hours flown

To estimate the hours flown for an OH-58, we averaged the number of actual hours flown⁷² by each of the eight OH-58, for the years 2000–2003. The figure, 166.75 hours per year, represents the average annual hours flown by a 'typical' OH-58. For integrity in our cost-effectiveness analysis, we held the average annual flights hours constant at 166.75, across each of the models being considered.

⁶⁸ Goering, Norman and Thomas Caves. NCSHP. Personal interview with authors. 20 February 2004.

⁶⁹ Ibid.

⁷⁰ Peterson, Dave. Email forwarded to authors by SHP. Capt. Briggs. 25 February 2004.

⁷¹ North Carolina Office of Statewide Accounting. Larna Griffin, Assistant Controller. Email to authors. 9 March, 2004.

⁷² Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Cost Analysis 2000-2003. Email to Authors. 18 February 2004.

Parts

The cost of required aircraft parts for an OH-58 includes the costs of major components plus the costs of tools, supplies, spare parts, and other minor repair items. To calculate the parts costs for a typical OH-58, we averaged the cost of parts⁷³ required for each of the eight OH-58 aircraft for the years 2000–2003 (\$25,674). Because of the age of these OH-58 aircraft (32–36 years old), component replacements are a necessary consideration in any cost projection. Therefore, the 10-year parts costs for an OH-58 were projected by averaging projected component replacements for all eight aircraft plus average routine upkeep parts.

The parts costs for a new aircraft typically include costs for inspections, retirement, overhaul, “unscheduled and on-condition” maintenance. However, overhauls and retirement parts costs were not included in the calculation because no overhauls or retirements are anticipated for at least the first 2,500 flight hours of a new aircraft—a figure that will not be reached within the 10-year time-frame under consideration.⁷⁴ Annual parts costs were estimated for the Bell helicopters by adding the inspection costs and the “unscheduled and on-condition” parts estimates for each aircraft, as provided by the manufacturer.⁷⁵ The manufacturer estimates these costs by averaging field data collected from owners/operators of the aircraft.

Fuel Price per Gallon

Fuel price per gallon was estimated by averaging the average fuel price paid by SHP for each gallon of fuel for each of the years 2000–2003.⁷⁶ For consistency in projecting costs across aircraft, we held this figure of \$1.69 per gallon constant for estimating past and future costs across each of the new aircraft. (Any deviation in actual fuel prices from this estimate will affect all helicopters equally.)

Fuel Used

We calculated the amount of fuel used by dividing SHP’s total fuel invoices for each year, 2000–2003,⁷⁷ by the average fuel price per gallon for that year to obtain the total number of gallons used. We then divided the number of gallons used by the number of hours flown in that year to obtain an estimate of the fuel economy for an OH-58.

We estimated anticipated fuel use for new aircraft by multiplying the required gallons per flight hour for operation, as reported by the manufacturer, by the anticipated flight hours.⁷⁸

⁷³ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Cost Analysis 2000-2003. Email to authors. 18 February 2004.

⁷⁴ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Personal interview with authors. 18 February 2004.

⁷⁵ Bell Helicopter. Product Specifications.

⁷⁶ Cost estimation based on SHP’s actual fuel receipts.

⁷⁷ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Additional Information. Email to authors. 20 February 2004.

⁷⁸ We obtained the Bell fuel economy figures of fuel used per hour from the manufacturer (Bell Helicopter. Product Specifications).

Insurance

We obtained insurance quotes from SHP's current insurance carrier⁷⁹ for liability coverage for each aircraft. The figure of \$5,137 per year remains constant for an OH-58 and the other new aircraft being considered.⁸⁰ However, if the aircraft is leased, rather than bought outright, SHP will incur additional "hull" insurance costs for a new aircraft.⁸¹

Mechanic Labor

For the OH-58, we estimated the cost of mechanic labor needed to maintain the aircraft by using the military's guideline rate of 4.6 maintenance hours per one hour of flight.⁸² We multiplied this number by the average number of flight hours and multiplied by an estimated mechanic wage rate of \$25 per hour to obtain the figure \$19,176.25 for mechanic labor on a 'typical' OH-58.⁸³

To be conservative in our estimates for mechanic labor for the new aircraft, we assumed that the manufacturer under-reported maintenance required for the new aircraft. Consequently, we averaged the number of maintenance hours per flight hour, as provided by the manufacturer, with the industry standard rate of 4 maintenance work hours per flight hour⁸⁴ to arrive at estimates of 2.5–2.77 maintenance hours per flight hour.⁸⁵ We multiplied this by the number of hours flown and the \$25 per hour wage rate to arrive at the mechanic labor cost for each aircraft.

Training

To compare across both the new and the old aircraft, training costs include only recurrent training in order to compare across both old and new aircraft. Training costs of \$6,886 for the OH-58 are the average of recurrent training in the years 2001–2003.⁸⁶

Any new aircraft will require some expenditure for new pilot and mechanic training; however, Bell includes initial training for at least two pilots and one mechanic in the price quote of any new aircraft. It is possible that training for additional pilots may be negotiated

⁷⁹ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Bell 412 insurance costs. Email to authors. 18 February 2004.

⁸⁰ Ibid.

⁸¹ We did not obtain hull insurance quotes for all of the new aircraft. AOS had previously obtained a hull insurance quote for the Bell 412 of \$220,000 per aircraft, per year (Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Bell 412 insurance costs. Email to authors. 18 February 2004.).

⁸² Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Cost Analysis 2000-2003.

⁸³ National Business Aviation Association (NBAA) Management Guide 1.15 Administration. 1998.

⁸⁴ Ibid.

⁸⁵ We believed Bell had little incentive not to under-report maintenance hours per flight hour and the numbers from Bell (1.13–1.58 per flight hour) seemed unreasonably low. Rather than solely use NBAA's maintenance hour estimate (which averages across all helicopter types), we did want to account for the particular helicopter and therefore averaged the Bell-reported figures with NBAA's average. We used this average only for maintenance calculations because we felt that there would be little/no incentive for Bell to under- or overestimate all other specifications because most other factors relate to purchase and safety.

⁸⁶ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Cost Analysis 2000-2003.

into the purchase price and/or that newly trained pilots will be able to train other pilots. Therefore, we feel that it is appropriate to exclude these costs from our current estimates.

Liquidation Assumptions

Depreciation/Appreciation Rate

Typically, capital expenditure items depreciate in value over time. Helicopters, however, are similar to houses in that their value can depreciate or appreciate over time. By consulting with a lender who brokers helicopter purchases,⁸⁷ we determined that a reasonable estimate of depreciation and appreciation rates would be a 10 percent depreciation rate per year for the first five years, followed by a 10 percent per year appreciation rate for the following five years. We used the same depreciation/appreciation rate calculation to determine liquidation value for all four helicopter types.⁸⁸

This assumption results in a liquidation value for the OH-58 of \$95,099, a reasonable total depreciation from the initial value of \$100,000 over 10 years.

Liquidation Value

In completing the cost-effectiveness analysis, we assumed that SHP would sell their aircraft at the end of the 10-year time period. This liquidation value (the price at which the aircraft can be sold to generate cash) was considered a reduction in costs for the purposes of the cost-effectiveness analysis.

Limitations

Cost Factors

We believe the values used in this report are reasonable and accurate, however; changes in the fixed costs and equations of operating costs (e.g. insurance premium, initial training cost, depreciation rate, discount rate) would change the operating costs estimates for the aircraft.

⁸⁷ Briggs, Capt. S.M, Chief Special Operations. North Carolina State Highway Patrol. Email to authors. 26 February, 2004.

⁸⁸ While it is unlikely that SHP's OH-58 helicopters are going to appreciate in the future (given their advanced age), we encountered great difficulty in determining a reasonable rate of depreciation for the aircraft. Simultaneously, we determined that an OH-58 is unlikely to depreciate much over the next 10 years. By using the above assumption, for the OH-58, we see that the projected change in value for the helicopter is from \$100,000 in 2004 to \$53,103 in 2014 (in 2004 dollars; \$95,099 in nominal dollars). After consultation with lenders and SHP, we conclude that this is a reasonable estimate.

Parts/Maintenance Assumptions

Our analysis is applicable for the first 10 years of an aircraft's costs. If SHP keeps a new Bell helicopter for a longer time period or flies many more hours than predicted, maintenance costs will rise. An increase in parts and maintenance costs would increase the projected operating costs for each helicopter.

Appendix E—Evaluation of Costs

To evaluate comparable costs across the four helicopter options, we conducted a cost-effectiveness analysis that estimates the 10-year costs associated with purchasing and operating an OH-58, Bell 407, Bell 427, and Bell 412 with the same mission capabilities. Our final cost-effectiveness calculation is based on the current price of purchasing an aircraft, plus the 10-year operating costs, minus the liquidation value at the end of 10 years.

All prices and costs are expressed in 2004 dollars (present value). The present value of total costs was calculated using the following equation.

$$PVCost = P_{2004} \sum_{t=1}^{10} \frac{OpCost}{(1 + Disc)^t} - \frac{P_{2014}}{(1 + Disc)^{10}}$$

<i>PVCost</i>	Present value for ten years of total costs
<i>P₂₀₀₄</i>	Current market value of each aircraft
<i>t</i>	Time period (2004 to 2014)
<i>OpCost</i>	Operating costs per year
<i>Disc</i>	Discount rate of 3%
<i>P₂₀₁₄</i>	Liquidation value at t=10; based on depreciation rate of 10 percent for years one through five and appreciation rate of 10 percent for years five through ten

Operating Costs

We incorporated five categories of costs in our operating cost estimates: 1) parts costs, 2) fuel costs, 3) cost of insurance, 4) mechanic labor costs, and 5) cost of annual recurrent training. Reported operating costs for the OH-58 are averages calculated from SHP's actual operating costs for the years 2000–2003. Costs for the Bell 412, Bell 407 and Bell 427 are based on the manufacturer's estimates. Assumptions made in determining how to calculate each of these costs are described in Appendix D.

Operating costs for the OH-58 vary each year because of the costs of component replacements, as projected by SHP.⁸⁹ For the Bell aircraft, we assumed that operating costs would remain constant, on average, throughout the 10-year time period.

Estimates of annual operating costs run for a 10-year time period (beginning in 2004), discounted to constant 2004 dollars. Based on the North Carolina state government's current interest and loan rates,⁹⁰ we used a discount rate of 3% to determine the present value of operating costs for each year.

⁸⁹ Baldwin, T.I. Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Cost Analysis 2000-2003.

⁹⁰ Griffin, Larna. Assistant Controller, North Carolina Office of Statewide Accounting. Email to authors. 9 March, 2004.

Appendix F—Benefit Evaluation Assumptions

To evaluate and quantify the benefits and costs of SHP procuring and operating a new helicopter, we developed a set of constant assumptions to apply for the three different scenarios we anticipate will change most with new helicopters: rescue missions, operations in inclement weather, and emergency aid and supply missions. We developed a second set of assumptions to calculate how representative each of these scenarios was of future missions. We developed these assumptions to compare capabilities across aircraft consistently in the face of different and incomplete information.

General Assumptions

Unless otherwise indicated the assumptions stated below hold true across each of the three mission types: rescue missions, operations in inclement weather, and emergency aid and supply missions.

Speed and Distance

We used the maximum cruising speed for each aircraft for all speed calculations.⁹¹ We calculated distances traveled for a mission by dividing the known time from take-off until arrival at the scene by the speed for the aircraft traveling. When a distance was established for a mission, it was held constant across each aircraft.

Operating Costs

All estimates for operating costs of the OH-58, Bell 407, Bell 412 and Bell 427 were calculated in the cost effectiveness analysis (see Appendix D). We used an average wage rate to estimate operating costs for ground patrols throughout our calculations. The hourly wage rate is the average of median annual income in Durham, NC, for a police officer, a fire fighter, and an emergency medical specialist, divided by 40 hours per week, for 52 weeks per year.⁹² Our calculated average wage rate is \$16.50/hr. We received confirmation from Sampson and Chatham Counties that this rate was reasonable.⁹³ All aerial agency cost estimates are based on the amount of flying time; the calculations do not take into account the time spent by the aircraft on the ground.

Benefits

We calculated benefits in terms of avoided costs to the state of North Carolina. We defined benefits as the difference between the costs incurred when a mission was performed with an

⁹¹ Bell Helicopter. Product Specifications.

⁹² <http://www.monster.com>. Wage estimates: fire fighter, emergency medical specialist, police officer in Durham, North Carolina. Last accessed 6 April 2004.

⁹³ Chatham County Emergency Management provided an approximate wage rate of \$15/hour for personnel. (Tony Tucker, Director. Phone interview. 6 April 2004). Sampson County Emergency Management provided an approximate wage rate of \$14-16/hour. (Ronald Bass. Email to authors. 7 April 2004).

OH-58 and associated ground and/or aerial support and the costs incurred if SHP used a Bell helicopter to conduct the mission.

Time Saved

We calculated time savings for SHP and each local ground patrol that responded to an incident. We calculated time savings for ground patrols as the difference in the time a ground patrol spends on a mission in the presence of an OH-58 or a Bell helicopter. We based time savings figures for SHP on the increased speed of the Bell helicopters (which reduces transit time) and the time saved by conducting the mission operations as soon as the helicopter arrives on scene, rather than remaining on scene to wait for or guide other agencies.

Load Capacity

We calculated the useful load for each aircraft by subtracting the standard configuration weight of the helicopter from its external gross weight. For each of the night- and rescue-capable aircraft (the Bell helicopters), we subtracted the weight of a Forward Looking Infrared (FLIR),⁹⁴ Nightsun,⁹⁵ rescue hoist,⁹⁶ 100 lbs. of miscellaneous equipment, two pilots (at 200 lbs. each for normal weight and uniform equipment), and two crew (at 200 lbs. each). We divided the resulting figure by 180 lbs. for the average weight of a rescue victim, to determine how many people the aircraft could accommodate in the event of a rescue/evacuation.

For non-rescue missions, we excluded the two crew members to determine the useful load of the aircraft.

Rescue Scenarios I & II

(refer to Appendix H for description of the scenarios)

Transit Time to Scene, Total Time on Scene, and Time to Complete Mission

We based all time calculations for the OH-58 on data gathered from SHP's mission logs.⁹⁷ We calculated *transit time to scene* as the time the pilot entered the flight plan to the time the helicopter arrived at the rescue location. The *total time on scene* refers to the time the agency spent on the rescue site—the time difference between when the patrol arrived on scene and left the scene. The *time taken to complete mission* is the sum of the response time, total time on scene, and time to return to base from the rescue site.

The travel response times for the new aircraft are based on the distance to the rescue scene and the speed of the three Bell Helicopters.

⁹⁴ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Bell 407 FYI. Email to authors. 4 March 2004.

⁹⁵ Ibid.

⁹⁶ Ibid.

⁹⁷ North Carolina State Highway Patrol. Mission logs. See each scenario in Appendix H for specific references.

We based time estimates for the ground patrol on information obtained from the county where the mission was conducted.

Total Rescue Time

We estimated that for a helicopter to accommodate all persons to be rescued (once on board), it would take a rescue crew 10 minutes to rescue each person after an initial set up time of 12 minutes to position the aircraft and prepare to lower the hoist. For the Bell 407 and Bell 427, which only have enough additional load capacity for one or two rescued victims, respectively, we assumed that it would take an additional 5 minutes of set up time to reposition after each retrieval and drop a rescued boater. For the OH-58, Bell 407, Bell 427 and Bell 412, the total rescue time is the sum of the initial set up time, reposition time, and time required to rescue each person.

For our first rescue scenario, we used the actual time the Marine Corps helicopter (PEDRO)⁹⁸ took to complete the rescue of the three boaters (42 minutes) for comparison with the rescue time required for each of the Bell helicopter options.

When examining the ground patrols in both rescue scenarios, the rescue time is calculated from the time the patrol arrived on scene to the time the patrol completed the mission. We further assume that the time savings on the mission for the ground patrol, with the SHP's procuring a new aircraft, will be categorized as time savings in their total rescue time

Operating Costs

The lead county agencies involved in each rescue mission estimated that there were approximately 30 people involved in ground operations at the rescue scenes we examined.⁹⁹ These people included fire fighters, emergency medical specialists, police officers, and rescue teams.¹⁰⁰ We calculated operating costs for the ground agencies by multiplying an average wage rate by 30.

Inclement Weather Scenario

(refer to Appendix H for description of the scenario)

Total Search Time

We defined the search time as the time from the start of the mission by the local sheriff's department to the time the missing person was located.

Operating Costs

For the purpose of calculating operating costs for the search missions, we assumed that the number of law enforcement personnel conducting a search operation would be half the

⁹⁸ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Bell 407 FYI. Email to authors. 6 April 2004

⁹⁹ Tony Tucker, Director Chatham County Emergency Management. Phone interview. 6 April 2004.

¹⁰⁰ Ibid.

number required to conduct a rescue mission (i.e. 15 people) because such operations would also include a large number of volunteers.

Emergency Aid and Supply Transport Scenario

(refer to Appendix H for description of the scenario)

Distance

We estimated the distance needed to travel for each supply delivery by multiplying the speed of a King Air C-90¹⁰¹ by the time it flew for each of the four documented trips and adding this to the distance traveled by the OH-58 on its lone trip. We then held the distance traveled for each of the five deliveries constant (assuming that each delivery was to a different location, therefore necessitating five separate trips) when calculating the amount of time needed to complete the delivery using a Bell helicopter.

Time to Complete Mission

We used the actual log time, as recorded by the State Bureau of Investigation (SBI) and SHP, as the reported time required to complete the transport mission.¹⁰²

Operating Costs

Operating costs for the King Air C-90 aircraft were obtained from SBI via SHP.¹⁰³

Weight Capacity

Based on estimates provide by SHP, we assumed that the total weight of the emergency supply cargo was 3,000 lbs.¹⁰⁴ We know that an OH-58 made one transport trip without a co-pilot and that the State Bureau of Investigation's King Air C-90 made four trips. Without a co-pilot, an OH-58 can carry a maximum weight of approximately 200 lbs. Therefore, we assumed that the King Air C-90 would carry a total weight of 2,800 lbs. spread equally among its four trips—or 700 lbs per trip.

We assumed that the Bell 407, Bell 427 and the Bell 412 will carry cargo equal to their maximum weight capacity, for each mission.

¹⁰¹ Beechcraft Raytheon Aircraft Company.

http://www.raytheonaircraft.com/beechnaircraft/king_air_40th/timeline.pdf. Last accessed 15 April 2004.

¹⁰² Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Requested Information. Email to authors. 11 March 2004.

¹⁰³ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Pedro costs. Email to authors. 6 April 2004.

¹⁰⁴ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Requested Information. Email to authors. 12 March 2004.

Representativeness of Future Missions

To determine how representative our sample missions are of future SHP tasks, we calculated the estimated number of hours SHP would fly each mission type and divided this by the total number of hours flown per year. All estimates assume that any change in the number of missions will result from a change in SHP's mission capabilities. The number of missions will change for only three mission types: rescue missions, inclement weather missions, and transport missions. SHP's ability to complete all other tasks will not result in a change in benefits, because the OH-58 is capable of successfully performing these missions. However, the costs for unchanged missions will vary with each helicopter type in accordance with their different operating costs per hour.

Time

We estimated the number of missions performed per year by averaging the number of missions for each mission type over the years 2002-2003.¹⁰⁵ All calculations are based on the average number of flight hours for the fleet of aircraft in a year, divided by eight aircraft.

Hours Flown

Any increase in the number of hours flown is due to an increase in the number of missions performed, based on the time taken to complete additional inclement weather, transport, and rescue missions.

Any additional hours flown due to performing extra missions will be divided equally between two new Bell aircraft. There will be no change in the number of flight hours for the remaining SHP fleet of OH-58 helicopters.

Rescue Missions

The increase in the number of missions is based in the average number of reported possible rescue missions for the state of North Carolina. The average annual requested rescues for North Carolina were estimated at 400.¹⁰⁶ SHP will be able to rescue individuals at its 2002-2003 searched-and-located average rate of 29 percent. This results in our estimate of 102 additional rescue missions per year.

Inclement Weather Missions

We averaged the number of missions SHP did not complete due to inclement weather in 2002-2003 to determine how many additional missions SHP would perform. We assumed that all of these missions would be for searches because routine missions would still not be flown in the event of inclement weather (for any aircraft because of pilot safety concerns).

¹⁰⁵ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. District Operating Reports 2002-2003. Email to authors. 18 February 2004.

¹⁰⁶ Miller, Tim. Western Branch Manager. North Carolina Department of Emergency Management. Phone interview. 19 April 2004.

Transport Missions

SHP will not conduct 50 percent of their current average number of transport missions with the addition of two new night-capable aircraft.¹⁰⁷

There will also be an increase in the number of transport missions SHP can conduct due to the additional weight capacity of the new aircraft. We assume that, on average, there will be one such large-scale emergency aid transport mission per year (e.g. to transport hurricane supplies). We calculated the additional flight hours required for such a mission for each aircraft type based on the estimates outlined in the emergency aid/supply transport scenario.

Limitations

Aggregate data for each of the mission types we examined were not available. Therefore, we settled on examining one specific scenario (two in the case of rescues) for each mission type, which pilots at SHP thought could provide a representative idea of the level of effort involved in carrying out the type of mission. There are clearly inherent limitations in using one specific case, rather than averages of many cases, to extrapolate general trends. The degree to which our specific case studies are actually representative of past and future missions will have a substantial effect on the accuracy of our benefit estimates. In addition, within the category of specific mission scenarios, we were limited in the information we were able to obtain.

Distance Measures

For each of our representative missions, we were unable to identify the actual nautical mileage (nm) flown by SHP to reach the scene of the mission incident. Without this information, we used the amount of time for SHP to fly to the scene and the average speed of each helicopter type to calculate the distance traveled. The actual distance flown could vary from our estimates.

Operating Costs for Ground Patrols

We were unable to obtain hourly operating cost estimates for each of the ground patrol agencies involved in responding to the scenario missions. There is tremendous inconsistency in operating cost recording practices across agencies. In order to have some measure of the costs of responding to search and/or rescue missions, we used an estimated wage rate for ground patrol agency employees. In reality, this measure is a small portion of operating expenses because we did not include the cost of operating equipment (e.g. patrol cars, fire trucks, ambulances). Because we quantified the benefit of Bell helicopters as a reduction in the time spent by ground patrols for each scenario, any increases in operating cost estimates will increase the magnitude of benefits.

¹⁰⁷ Tribula, M.A. Pilot, North Carolina State Highway Patrol. Personal interview. 24 March 2004.

Search and Rescue

North Carolina does not maintain a comprehensive database of search and rescue data across all agencies. North Carolina Emergency Management keeps records of searches and rescues that are requested through their agency, but SHP does not generally report incidents to them and their database does not contain searchable codes for search and rescue missions. We were able to obtain an estimate for the number of searches and rescues occurring in the state each year, but were not able to identify how many of these searches would have benefited from helicopter assistance. As a result, our calculation of the number of projected future rescue missions for SHP is conservative, but may be inaccurate.

Emergency Aid/Supply Transport

We were unable to locate documented evidence of the weight of the food stamps/credit cards transported by the State Bureau of Investigation and SHP in October 1999. We relied on the recollection of one of the pilots at SHP to provide an approximate estimate of the total cargo weight. Because plane transport capabilities are a function of space, rather than weight, it was difficult to obtain a weight calculation for this scenario. The number of hours we estimated for the transport of the full load of emergency aid/supplies is sensitive to the weight of the goods to be transported.

Mission Percentages

In order to determine additional flight hours that a new Bell helicopter may operate, we needed to estimate the number and hours of potential future missions for SHP. As would be expected, our benefit evaluations are sensitive to the accuracy of our predictions. For example, we assumed that half of the rescue missions conducted by SHP, if they possessed Bell helicopters, would replace Marine Corps (PEDRO) rescue responses and that half would replace ground patrol rescues. If this estimate is inaccurate, our benefit calculations will change. Regardless, the magnitude of the benefits we identified make it unlikely that our conclusions would differ if the proportional break-down were different.

Appendix G—Evaluation of Benefits

The challenge we faced in conducting our cost-benefit analysis was how to reasonably quantify benefits to the State of North Carolina that are normally understood in non-economic terms. For the purposes of this benefit evaluation, our primary focus was quantifying these types of efficiency benefits, in terms of time and money saved across operations with each type of evaluated aircraft.

Quantifiable Benefits

To quantify the benefits of the different aircraft, we considered the amount of time and costs per hour required to complete a particular mission using each aircraft. After calculating these benefits, we calculated the benefits gained by purchasing two additional helicopters. We based this decision on the assumption that, in order to ensure that these benefits are gained by all North Carolinians, SHP would have to station one new helicopter in the eastern portion of the state and the other in the west.

When quantifying the differences in costs and benefits across each individual aircraft type, we considered the amount of time SHP would fly to complete the mission, combined with the time required for any other aerial or ground agencies' mission time(s). For each of four scenarios, we calculated the benefits that included the costs saved, or avoided cost, of any time another agency would not need to be involved to complete the mission. Accordingly, benefits associated with each new aircraft would be realized as a decrease in costs to perform these missions or a positive avoided cost.

We used SHP's flight logs, interviews with the relevant state and county law enforcement and emergency management agencies, and NCEM's search and rescue database to reconstruct detailed time records of each agency's involvement and time to respond and complete each mission. We used each helicopter's operating costs per hour (as calculated in the cost effectiveness evaluation) to estimate SHP's operating costs. We used an average wage rate for law enforcement, emergency medical support, and fire department personnel to estimate costs per hour for ground agencies.

Rescue Scenarios

We selected two case studies to evaluate the potential benefits of increasing SHP's capabilities to include rescue missions: one rescue scenario in which another aerial agency performed the rescue (e.g. Marine Corps, National Guard) and one rescue missions conducted by a ground team only. In both cases, SHP was involved in the search portion of the mission. There are significant differences in costs incurred by the state between these two types of scenarios, but both methods are used regularly in NC.

Rescue Scenario I: Aerial Rescue

The first rescue case study was based on a mission request from the Chatham County Sheriff's Department (SD) on May 24, 2003. Three boaters were reported missing on the Cape Fear River in Chatham County. SHP assisted the department in locating the boaters, but the Marine Corps Helicopter (Pedro) needed to be called to the scene to conduct the rescue (see Table H.1).

Knowing the average speed of an OH-58 and the time it took SHP to arrive on scene, we calculated the distance traveled to complete the mission, then divided that distance by the flight speed of each Bell aircraft to calculate a new transit/response time for each helicopter type. With a rescue-capable helicopter, SHP would be able to begin rescuing the boaters as soon as they were located, rather than waiting for and watching Pedro respond. Based on Pedro's actual rescue time and each Bell helicopter's weight capacity, we estimated the total rescue time each aircraft would take to hoist the three boaters. With a Bell 407, only one boater could be rescued at a time because of weight limitations, whereas a Bell 412 could rescue up to eight victims. We calculated the total time saved by both SHP and the SD ground team by adding the travel response and rescue times to get the total time for a new aircraft to complete the mission. We then multiplied the time required to complete the mission under each helicopter scenario to determine the monetary cost of the mission (see Table H-2).

We designated the quantified benefits of enhanced rescue capacity as the reduction in operating costs of performing the same rescue with each Bell helicopter type. In addition to this time savings, we added the avoided cost of not having to operate Pedro for this scenario, as Pedro's flight would have been avoided if SHP had the ability to hoist the boaters after they were located.

Table H-1. Chronology of Events. Rescue Scenario I, March 19, 2003, Chatham County, NC.

Time	Agency	Event
19:57	Ground Patrol	Received call/opened investigation
20:08	Ground Patrol	Arrived on scene
21:17	Ground Patrol	County called National Guard*
21:23	SHP	Received call
21:45	SHP	Flight plan entered
21:45	Marine Corps/Pedro	Received call
22:00	Marine Corps/Pedro	Flight plan entered
22:48	SHP	Arrived on scene
22:52	SHP	Completed search
23:05	Marine Corps/Pedro	Arrived on scene
23:47	Marine Corps/Pedro	Completed rescue
23:47	Marine Corps/Pedro	Left scene**
23:47	SHP	Left scene
23:47	Ground Patrol	Completed rescue
00:04	Ground Patrol	Left scene

Source: North Carolina State Highway Patrol Aviation Unit. Mission Request Form. 24 May 2003.

North Carolina State Highway Patrol Aviation Unit. Mission Log 20030524. 24 May 2003.

Tucker, Tony, Director. Chatham County Emergency Management. Telephone interview. 21 March 2004.

* The National Guard was unavailable

**Estimated time

Table H-2. Summary of Times and Operating Costs to Complete Mission. Rescue Scenario I, March 19, 2003, Chatham County, NC.

Agency	Transit Time to Scene	Rescue Time	Mission Time	Operating Cost
<i>SHP (OH-58)</i>	1.05 hrs	Not equipped	4.63 hrs	\$ 3,463
Marine Corps. (Pedro)	1.08 hrs	0.7 hrs	3.11 hrs	\$ 14,541
Ground Patrol	0.18 hrs	3.65 hrs	4.12 hrs	\$ 2,038
Total				\$ 17,008
<i>SHP (Bell 407)</i>	0.63 hrs	0.87 hrs	2.13 hrs	\$ 1,383
Ground Patrol	0.18 hrs	3.12 hrs	3.58 hrs	\$ 1,775
Total				\$ 3,157
<i>SHP (Bell 427)</i>	0.61 hrs	0.78 hrs	2.00 hrs	\$ 2,384
Ground Patrol	0.18 hrs	3.01 hrs	3.48 hrs	\$ 1,722
Total				\$ 4,106
<i>SHP (Bell 412)</i>	0.69 hrs	0.70 hrs	2.08 hrs	\$ 2,367
Ground Patrol	0.18 hrs	3.01 hrs	3.48 hrs	\$ 1,720
Total				\$ 4,087

Rescue Scenario II: Ground Rescue

Our second rescue scenario was constructed based on a mission request from Sampson County Emergency Management (SCEM) on February 1, 2003. In this case, two duck hunters were lost in a dense woods/marsh area. SHP aircraft were called in to locate the hunters and to guide a ground crew to rescue them from the swamp (see Table H-3).

Comparably to the aerial rescue scenario, we calculated the time required for SHP to arrive at the scene based on the speed of the OH-58 and each Bell aircraft. We then estimated the amount of time required for SHP to rescue the two hunters, instead of guiding the ground crew to their location from the air. As with Pedro in the first rescue case, we also factored the avoided cost of the ground team not needing to march into the swamp if SHP were conducting the rescues. The total time saved if SHP were equipped with new aircraft was the total transit time, time to locate the hunters, and the total rescue time. We calculated the total benefits of SHP's rescue capability for this scenario by subtracting the total operating costs for the ground crew and each Bell aircraft from the ground and OH-58 operating costs under the original conditions (see Table H-4). The positive results showed an improvement in efficiency, as time and money saved by both agencies, in performing the same task.

Table H-3. Chronology of Events. Rescue Scenario II, February 1, 2003, Sampson County, NC.

Time	Agency	Event
19:28	Ground Patrol	Received call
19:33	Ground Patrol	Arrived on scene
20:30	SHP	Received call
20:53	SHP	Received call
22:03	SHP	Arrived on scene
22:03	SHP	Hunters located by SHP
23:08	Ground Patrol	Completed rescue
23:21	SHP	On ground
00:09	Ground Patrol	Left scene
00:09	SHP	Left scene
01:04	SHP	Returned to base
01:59	Ground Patrol	Left scene

Source: North Carolina State Highway Patrol Aviation Unit. Mission Request Form. 1 February 2003.
North Carolina State Highway Patrol Aviation Unit. Mission Log 20030201. 1 February 2003.
Bass, Ronald. Sampson County Emergency Management. Email to authors. 26 March 2004.

Table H-4. Summary of Times and Operating Costs to Complete Mission. Rescue Scenario II, February 1, 2003, Sampson County, NC.

Agency	Transit Time to Scene	Rescue Time	Mission Time	Operating Cost
SHP (OH-58)	0.88 hrs	1.08 hrs	4.19 hrs	\$ 2,476
Ground Patrol	0.08 hrs	3.58 hrs	6.52 hrs	\$ 3,183
Total				\$ 5,659
SHP (Bell 407)	0.53 hrs	0.62 hrs	1.45 hrs	\$ 944
Ground Patrol	0.08 hrs	2.76 hrs	5.70 hrs	\$ 2,778
Total				\$ 3,722
SHP (Bell 427)	0.51 hrs	0.53 hrs	1.45 hrs	\$ 1,728
Ground Patrol	0.08 hrs	2.66 hrs	5.60 hrs	\$ 2,728
Total				\$ 4,455
SHP (Bell 412)	0.58 hrs	0.53 hrs	1.45 hrs	\$ 1,652
Ground Patrol	0.08 hrs	2.73 hrs	5.66 hrs	\$ 2,761
Total				\$ 4,413

Inclement Weather Scenario

In the event of inclement weather, SHP is unable to fly critical missions that they would otherwise be capable of completing.¹⁰⁸ To estimate the benefits of SHP being able to fly in inclement weather, we compared two similar search missions—one in which SHP was involved in the search effort and one in which the department was not. We assumed that weather en route was preventing SHP from responding in the second case. The two cases involved missing children searches in Alamance and Chatham Counties that occurred at night in November and October, 2003, respectively. The incident in Alamance involved an eight year-old boy. The incident in Chatham involved an eight year-old boy and his five year-old sister. We directly compared the time required to locate the children under the two scenarios to determine the time benefit to the ground team of SHP’s involvement in the search mission (see Table H-5).

We calculated the benefits of SHP’s inclement weather search capability by multiplying each agency’s hourly operating costs by the time savings for the ground team and the time spent by SHP to complete the missions (see Table H-6).

¹⁰⁸ Though a Bell helicopter would be able to perform missions in the event of inclement weather, routine missions (e.g. training, maintenance) are never flown in inclement weather because of pilot safety concerns. Searches and rescues or other critical mission would be flown if SHP had a capable helicopter. Briggs, Capt. Stephen. North Carolina State Highway Patrol. Personal interview. 9 April 2004.

Table H-5. Chronology of Events. Inclement Weather Scenario, October & November, 2003, Sampson & Alamance Counties, NC.

Time	Agency	Event
<i>Inclement Weather Scenario (Chatham County, October 2-3, 2003)</i>		
20:00	Ground Patrol	Received call
11:15	Ground Patrol	Located child
<i>Fair Weather Scenario (Alamance County, November 25, 2003)</i>		
15:20	Ground Patrol	Ground agency received call
19:30	SHP	SHP received call
21:00	SHP	Located child

Source: North Carolina Emergency Management. Search Results for: sar. 30 March 2004.
Pete Farmer. North Carolina Emergency Management. Phone interview. 15 April 2004.
North Carolina State Highway Patrol Aviation Unit. Mission Log 20031125. 25 November 2003

Table H-6. Summary of Times and Operating Costs to Complete Mission. Inclement Weather Scenario, October & November, 2003, Sampson & Alamance Counties, NC.

Agency	Search Time	Operating Cost
SHP (OH-58)	Not equipped	
Ground Patrol	15.25 hrs	\$ 3,774
Total		\$ 3,774
SHP (Bell 407)	0.90 hrs	\$ 465
Ground Patrol	5.07 hrs	\$ 1,255
Total		\$ 1,720
SHP (Bell 427)	0.87 hrs	\$ 790
Ground Patrol	5.04 hrs	\$ 1,247
Total		\$ 2,038
SHP (Bell 412)	0.98 hrs	\$ 909
Ground Patrol	5.15 hrs	\$ 1,276
Total		\$ 2,185

Emergency Aid/Supply Transport Scenario

Due to North Carolina's geographic location, on an average the state faces at least one major hurricane event each year. In addition to these annual natural disasters, the state is concerned with the potential for man-made disasters in the event of a terrorist attack or industrial/transportation accident. The locations of victims of these disasters are frequently not conducive to using airplanes to deliver emergency aid/supplies, as airports are not always nearby or operating during a disaster. SHP is the only public safety/law enforcement agency in the state with helicopters that can reach these locations; however, its current weight limitations prevent it from being able to effectively respond with emergency aid or supplies.

In 1999, during Hurricane Floyd, the Department of Commerce requested that SHP transport food vouchers/credit cards to hurricane victims in NC. The vouchers were eventually delivered via four trips made by the State Bureau of Investigation (SBI) using their Beechcraft King Air C-90 airplane and one trip with an OH-58 (flying without a co-pilot) to different counties (see Table H-7).¹⁰⁹ When SBI's plane landed at the county regional sites, either local emergency management or local law enforcement met the aircraft to disperse the vouchers.

We used the amount of time the State Bureau of Investigation's King C-90 aircraft flew during each of the four transport missions, multiplied by the cruising speed of the aircraft, to calculate the distance traveled for each delivery (assumed to be in a different location for each trip). Because we were unable to obtain information on the specific weight of the food stamps being transported during each flight, we estimated the total weight of food stamps transported by both SHP and SBI and assumed an equal weight transported on each of SBI's flights. With the distance traveled and the weight load for each flight, we multiplied the number of trips needed (based on the weight capacity of each aircraft) by the flight hours per trip to reach each destination (based on the speed of each aircraft) to determine the total flight hours to complete the full mission.

To determine monetary benefits of a transport capable Bell helicopter, we multiplied SBI's operating cost per hour by the original number of hours flown, plus SHP's single OH-58 operating trip costs. We subtracted the operating costs of each Bell helicopter by the number of hours required to complete the mission (see Table VIII). For two of the helicopters, the Bell 407 and the Bell 427, we calculated negative figures for benefits. This result shows that there is actually an increase in costs of completing the transport missions if they were performed by a small SHP helicopter instead of using SBI's King airplane.

Table H-7. Chronology of Events. Emergency Aid/Supply Scenario, September/October, 1999.

Date	Agency	Flight Time
09-26-99	SHP (OH-58)	2.3 hrs
09-26-99	SBI (King C-90)	1.7 hrs
09-28-99	SBI (King C-90)	1.8 hrs
09-30-99	SBI (King C-90)	2.1 hrs
10-3-99	SBI (King C-90)	2.4 hrs

Source: Baldwin, Sgt T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Email to Authors. 11 March 2004.

¹⁰⁹ Baldwin, T.I, Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. Requested Information. Email to authors. 11 March 2004.

Table H-8. Summary of Times and Operating Costs to Complete Mission. Emergency Aid/Supply Scenario, September & October, 1999.

Agency	Number of Trips	Weight Capacity*	Flight Hours	Operating Cost
<i>SHP (OH-58)</i>	1*	200 lbs	2.32 hrs	\$ 1,735
SBI	4	700 lbs**	8.00 hrs	\$ 9,600
<i>Total</i>				\$ 11,335
<i>SHP (Bell 407)</i>	5	513 lbs	13.37 hrs	\$ 8,683
<i>SHP (Bell 427)</i>	5	551 lbs	12.23 hrs	\$ 14,578
<i>SHP (Bell 412)</i>	5	1927 lbs	5.40 hrs	\$ 6,148

* Weight capacity includes a pilot and co-pilot and all installed equipment. It does not include two crew members, which are only needed for rescue scenarios.

** The SHP could fly only one trip due its limited capabilities.

*** Please refer to benefit assumptions.

Projected Future Mission Percentages

After we calculated the benefits from each of the four mission scenarios using our case studies, we factored these values by an estimate of the future representativeness of each mission type. Based on the number of searches and rescues historically conducted in NC¹¹⁰ and SHP's percentage of search missions in which the desired target is located,¹¹¹ we estimated that SHP would conduct 102 rescue missions per year if they were equipped to do so. To calculate future operational hours spent on rescues, we averaged the total time spent by SHP in performing our first two rescue scenarios and multiplied this by the 102 anticipated rescue missions per year. For our inclement weather scenario, we multiplied the average time SHP spends on a search mission¹¹² by the average number of missions SHP was unable to complete due to weather in the past two years.¹¹³ For our emergency aid/supply scenario, we estimated that only one major disaster event (e.g. hurricane) would occur per year that would require the extensive level of transport capacity of the emergency aid/supply incident.¹¹⁴

¹¹⁰ Andrews, D.W. Pilot. North Carolina State Highway Patrol. Summary of Interviews with Western Emergency Management Coordinators. 2 April 2004.

¹¹¹ Baldwin, T.I. Pilot/Maintenance Supervisor. North Carolina State Highway Patrol. District Operating Reports 2002-2003.

¹¹² Ibid.

¹¹³ Garner, Dennis. North Carolina State Highway Patrol. Aircraft Dispatch Flight Report for missions not completed of total missions. 25 March 2004.

¹¹⁴ Since 1990, 12 tropical storms and hurricanes have either made landfall in NC or otherwise affected the NC coastline—just under one per year (State Climate Office of North Carolina, 2004). Five of these storm events were as severe as Hurricane Floyd or stronger. If SHP had the capability to transport aid and supplies, they might be called upon to do so for incidents other than just a hurricane (e.g. in the event of a weather emergency or man-made disaster). Therefore, we determined that a conservative estimate of the frequency of major emergency aid/supply transport missions for SHP would be an average of once per year. More routine transport missions could reasonably be expected to involve transportation of fewer supplies than those required during Hurricane Floyd. We therefore proceeded to factor the benefits and mission percentages according to this one-per-year figure.

Finally, in addition to the case study scenario benefits, SHP would decrease its flight hours dedicated to transport missions if two new Bell helicopters were purchased. Currently, almost all of SHP's transport missions involve re-positioning the department's two FLIR-capable aircraft at different locations throughout the state, so they can be called upon if needed. Acquiring two new FLIR-equipped, night-capable aircraft would allow SHP to reduce its present level of transport missions by 50 percent.¹¹⁵

Qualitative Benefits

Throughout our cost-benefit analysis, we chose to be conservative about our estimates of the dollar value of potential benefits. We quantified all benefits in terms of avoided cost as a result of time saved. However, our quantitative benefit figures should be treated as the minimum amount of the benefits that could be realized through new aircraft acquisition. For example, in the inclement weather scenario, if we had chosen to look at the benefits associated with conducting a search for a fugitive, there would be additional benefits for the general population by increasing one's sense of security. In the case of disasters or emergency responses, the weight capacity of a new aircraft would allow SHP to transport the chief commander via helicopter to establish an on-site command post quickly, increasing the efficiency of rescue or recovery efforts. Though accounting for some of the time factors implicit in a faster, more capable aircraft, we were unable to quantify all of these additional benefits in our numeric calculations. In addition, we did not quantify two specific potential benefits that warrant mention: pilot safety and the potential for saving lives.

Pilot Safety

SHP is interested in acquiring dual-engine aircraft to improve pilot safety. Adequate safety measures are crucial for both a flying operator and the efficiency of a mission. Generally, pilot safety is estimated in terms of the risk involved in flying a particular kind of helicopter. Though logically a dual-engine aircraft would provide an additional engine for a pilot to use in the event of an engine failure, there has been considerable debate over the years on the relative safety of using a two-engine helicopter over a single engine helicopter.¹¹⁶ Because of

¹¹⁵ Tribula, M.A. Pilot. North Carolina State Highway Patrol. Personal interview. 24 March 2004.

¹¹⁶ A study by R.G. Fox (1991) suggested that more complex twin turbine engines, with more moving parts, had a higher number of material failures with a higher total number of fatal injuries than a simpler single turbine engine. The twin-engine helicopters also had a higher risk of serious injury. (Fox, R.G. Measuring Safety in Single and Twin Engine Helicopters. *Flight Safety Digest, Flight Safety Foundation*, August 1991. http://www.flightsafety.org/members/serveme.cfm?path=fsd/fsd_aug91.pdf. Last accessed 30 March 2004).

However, data collected by the US National Transportation Safety Board (1999) indicated that US-registered twin turbine helicopters were involved in 48 accidents in 1993 through 1997, an accident rate of 2.93 as compared to an accident rate of 6.76 for the single turbine helicopters. On the fatal accident rate comparison for 1993-1997, both airplanes averaged 1.40 per 100,000 flight hours.

Harris, J.S. Data Show Same U.S Fatal Accident Rate for Single and Twin Turbine Helicopters. *Helicopter Safety, Flight Safety Foundation*, Vol 25, No. 1. January-February 1999.

Another set of data collected by Helicopter Association International (2000) indicates that, in 1999, the single engine turbine helicopter experienced an accident rate of 5.58 as compared to the 4.08 of the twin turbine helicopter. The rate for the year 2000 followed a similar trend with an accident rate of 6.9 for the single engine and 4.6 for twin helicopters. The study also noted that over the years there had been an increase in accidents involving former military helicopters such as the OH-58, which have involved tail rotor gear box/shaft malfunction failures. While these data might be considered to confirm the higher safety rate of twin engines,

the inconclusive nature of the literature, we are only able to note that a Bell 427 or Bell 412 *might* provide additional benefits to pilots (and the state of North Carolina) in terms of additional safety.

Saving Lives

A critical mission of any first responder agency, such as SHP, is to increase the probability that lives will be saved in the event of an emergency. Implicit in the potential benefits of reducing the time required to complete rescue missions is the possibility that someone could receive treatment for their injuries sooner than otherwise. The time required to rescue someone in an emergency can have a bearing on life and death decisions.

Telephone interviews with Emergency Management Coordinators from the western portion of NC elucidated a large potential need for helicopters in rescue situations.¹¹⁷ The Coordinator in Buncombe County reported an average of 12 to 15 times a year when they could use a helicopter to lift injured people out of the mountains. Responses from Transylvania County were similar, in stating that it takes them a long time to get ground teams into and out of rural areas where injuries often occur; a helicopter could transport those in need of medical care much more quickly. Mitchell County also said that they serve many hikers who get lost and injured on the Appalachian Trail every year. Even though we did not fully account for all these details, we must acknowledge a great potential benefit of medical cost savings in reaching someone sooner rather than later when there is an emergency case involved.

Total Benefits

We added the average total hours flown in the years 2002 and 2003 to the additional hours that we project will be flown as a result of the four case studies to project the future hours spent on each type of mission SHP could fly. We calculated the percentages of each type of mission performed by dividing the number of hours spent on each of the new missions into the total future hours. We multiplied the benefits calculated through the case studies by these proportions to determine the total benefits of each type of Bell aircraft per year. After we quantified the benefits and discounted them across a 10-year timeframe (as we did with costs), we subtracted the new benefits and costs from the current OH-58 operating costs to determine the benefit margin for each type of aircraft.

Our results show that for all of the Bell helicopters evaluated, the benefits to NC outweigh the costs associated with purchase and operation over 10 years. The Bell 407 has the largest benefit margin, at more than \$5 million per aircraft. The Bell 412 has a benefit margin of almost \$2 million per aircraft.

analysts contend that data of accident and fatality rates across single engine and twin-engine helicopters is often not comparable. This concern is primarily due to variation in types of missions, number of hours flown, and incidences of pilot error.

Helicopter Accident Review. *Helicopter Loss Control and Litigation Newsletter*. Vol 1, No. 3. November 2000. <http://www.aigaviation.com/pdf/Nov%202000%20-%20Heli.pdf>. Last accessed 30 March 2004.

¹¹⁷ Andrews, D.W. Pilot. North Carolina State Highway Patrol. Summary of Interviews with Western Emergency Management Coordinators. 2 April 2004.

Appendix H—Expansion Budget Request Strategy

Average Budget Timeline

Before it reaches Governor Easley, an expansion budget request must first be approved by both SHP Colonel Holden and Crime Control and Public Safety Secretary Beatty. If approved, the November 2004 budget request would be incorporated into the Governor's FY2006-2008 proposed budget to be presented next spring. Once submitted to the General Assembly, budget requests are divided among the appropriations subcommittees, where they are debated until the ultimate approval of the complete budget at the end of June 2005.

Key Actors & Institutions

Because the current budget shortfall in North Carolina creates tremendous competition for state funds, SHP should be aware of this political climate. NC Senator Martin Nesbitt of Buncombe County stressed the importance of making members of the NC General Assembly aware that such a proposal is being considered. Based on his prior involvement in obtaining funding to locate a SHP helicopter in Asheville, Senator Nesbitt feels confident that if state legislators and local law enforcement officials are aware of such a proposal, it would receive unanimous support in the Western half of the state.¹¹⁸

Public Relations

To capitalize upon the anticipated support from county and local municipalities, we recommend that the patrol examine the possibility of utilizing an information campaign. Such constituent support, when fully mobilized and vocalized, will be crucial in making the case for aircraft acquisition. The efforts could include presenting the issue to the media and sending informational flyers to local law enforcement offices throughout the state.

Key Committees in General Assembly

There are four committees in the NC General Assembly that are likely to be most important for approving an expansion budget appropriation for new helicopters. These are: Senate Appropriations Subcommittee on Justice and Public Safety, House Appropriations Subcommittee on Justice and Public Safety, Senate Appropriations Subcommittee on Department of Transportation, and House Appropriations Subcommittee on Department of Transportation (see tables 1–4 below, for members).

¹¹⁸ Senator Nesbitt proposed a bill to be incorporated in the State budget granting funding for that project. NC Department of Crime Control and Public Safety. "Highway Patrol Stations Helicopter in Asheville." News Release. 5 November 1997.

Table H-1. Senate Appropriations Subcommittee on Justice and Public Safety (County Represented)

Chairman	Sen. Scott Thomas (<i>Carteret, Craven, Pamlico</i>)
Vice Chairman	Sen. Robert Lee Holloman (<i>Gates, Halifax, Hertford, Northampton, Vance, Warren</i>)
Vice Chairman	Sen. R. C. Soles, Jr. (<i>Brunswick, Columbus, Pender</i>)
Ranking Minority Member	Sen. Stan Bingham (<i>Davidson, Guilford</i>)
Members	Sen. Daniel G. Clodfelter (<i>Mecklenburg</i>) Sen. Eleanor Kinnaid (Chatham, Orange) Sen. Tony Rand (<i>Bladen, Cumberland</i>) Sen. R. B. Sloan, Jr. (<i>Alexander, Iredell</i>)

Source: North Carolina General Assembly 2003-2004 Session Senate Committee Listing
 <http://www.ncga.state.nc.us/gascripts/committee_lists/committee_lists.pl?Senate>

Bold denotes counties in or around Asheville and Raleigh, where new helicopters will be placed.

Table H-2. House Appropriations Subcommittee on Justice and Public Safety Members (County Represented)

Chairman	Rep. Haire (Haywood, Jackson, Macon, Swain) Rep. Kiser (<i>Lincoln</i>)
Vice Chairman	Rep. Frye (Avery, Caldwell, Mitchell)
Members	Rep. Fisher (Buncombe) Rep. Goodwin (<i>Richmond, Stanly</i>) Rep. Hall (<i>Halifax, Nash</i>) Rep. Justus (Henderson, Transylvania) Rep. Mitchell (<i>Iredell</i>) Rep. Sexton (<i>Forsyth, Rockingham</i>) Rep. Sutton (<i>Hoke, Robeson</i>)

Source: North Carolina General Assembly 2003-2004 Session House Committee Listing
 <http://www.ncga.state.nc.us/gascripts/committee_lists/committee_lists.pl?House>

Bold denotes counties in or around Asheville and Raleigh, where new helicopters will be placed.

**Table H-3: Senate Appropriations Subcommittee on Department of Transportation Members
(Counties Represented)**

Chairman	Sen. Clark Jenkins (<i>Bertie, Edgecombe, Martin, Pitt, Tyrrell, Washington</i>)
Ranking Minority Member	Sen. Robert C. Carpenter (<i>Cherokee, Clay, Graham, Haywood, Jackson, Macon, Swain, Transylvania</i>)
Members	Sen. Philip E. Berger (<i>Guilford, Rockingham</i>) Sen. Cecil Hargett (<i>Jones, Onslow</i>) Sen. Robert A. Rucho (<i>Mecklenburg</i>) Sen. Larry Shaw (<i>Cumberland</i>)

Source: North Carolina General Assembly 2003-2004 Session Senate Committee Listing
<http://www.ncga.state.nc.us/gascripts/committee_lists/committee_lists.pl?Senate

Bold denotes counties in or around Asheville and Raleigh, where new helicopters will be placed.

**Table H-4: House Appropriations Subcommittee on Department of Transportation Members
(Counties Represented)**

Chairman	Rep. Cole (<i>Caswell, Rockingham</i>) Rep. Gillespie (<i>Burke, Caldwell, McDowell</i>)
Vice Chairman	Rep. McAllister (<i>Cumberland</i>)
Vice Chairman	Rep. K. Williams (<i>Onslow</i>)
Members	Rep. L. Allen (<i>Franklin, Halifax, Warren</i>) Rep. Barbee (<i>Stanly, Union</i>), Rep. Coates (<i>Rowan</i>) Rep. Daughtride (<i>Nash</i>) Rep. Dickson (<i>Cumberland, Harnett</i>) Rep. Gulley (<i>Mecklenburg</i>) Rep. Holmes (<i>Forsyth, Yadkin</i>) Rep. Saunders (<i>Mecklenburg</i>) Rep. Stiller (<i>Brunswick, New Hanover</i>) Rep. A. Williams (<i>Beaufort, Hyde, Washington</i>)

Source: North Carolina General Assembly 2003-2004 Session House Committee Listing
http://www.ncga.state.nc.us/gascripts/committee_lists/committee_lists.pl?House

Appendix I—Department of Homeland Security Grants in NC

This appendix provides detailed information regarding the purpose, availability, administration, and authorization of US Department of Homeland Security grants in North Carolina.

Program Purpose

The US Department of Homeland Security (DHS) Office of Domestic Preparedness Grant Program (ODP) was established to provide first responders at the state and local level with the necessary resources for preventing, preparing for, and responding to terrorist and weapons of mass destruction (WMD) incidents throughout the United States.¹¹⁹ The federal program guidelines define first responders as individuals who perform and coordinate response tasks within any of the following ten disciplines:¹²⁰

- Law Enforcement
- Fire
- Rescue
- Hazmat
- Public Health
- General Health
- Government Officials
- Public Works Agencies
- Communications
- Emergency Management

Grant Availability

Under federal guidelines, each state must appoint one agency as the gateway for federal funds within that state.¹²¹ North Carolina Emergency Management (NCEM) controls the distribution of DHS funds in NC. Under federal guidelines at least 80 percent of all grant money allocated to a given state must directly benefit local governments, leaving a maximum of 20 percent of grant monies available for state level agencies. North Carolina prides itself on establishing a distribution policy that is centered on local control, with regional coordination, and state backing.¹²²

¹¹⁹ U.S. Department of Homeland Security. FY 2004 ODP Homeland Security Grant Program. <http://www.ncem.org/HomelandSecurity/library/FY%202004%20ODP%20Homeland%20Security%20Grant%20Program%20-%2097.004.pdf>. Last accessed 20 March 2004.

¹²⁰ Taylor, Dr. Ken. Director, North Carolina Emergency Management. Personal interview with authors. NCEM Administrative Offices. 1 March 2004.

¹²¹ U.S. Department of Homeland Security. FY 2004 ODP Homeland Security Grant Program.

¹²² Ibid.

State-Level Funding

In determining distribution for the initial FY2002 program, NCEM identified all state agencies that perform qualified first responder tasks and identified 35 possible agencies. Examples of such agencies include the State Highway Patrol, State Bureau of Investigation, Marine Fisheries, Butner Public Safety, State Mental Health institutions, all of the agencies under The Department of Crime Control and Public Safety, and Campus Police on the 16 State University Campuses. During the grant program's first year, NCEM sent letters explaining that the money would be held in trust for them to be distributed based on the needs of all qualified agencies.

Local Level Funding

The process for dividing state funds among North Carolina's 100 counties has evolved over the past three years. In FY02, NCEM held a meeting in each county with representatives from each of the 10 first responder disciplines, the county manager, representatives from every jurisdiction within the county, and the NCEM county coordinator. NCEM held round table discussions in every county, serving as the coordinator for the process. After talking out and establishing the county's priorities based on a principle of "informed consent," the city managers, the EM county coordinators, and each of the representatives present signed the grant acceptance letter. Once the priorities were in place, grant money was divided among programs that met DHS funding guidelines.

NCEM tried a slightly different approach to distributing monies under FY03 part I. Rather than holding meetings in each county, NCEM transferred most of the rights to the county managers. FY03 part I grant acceptance forms only required the signatures of 1) the county manager, 2) the city manager of the largest city in the county, and 3) the signature of the city manager from another city with a population of 25,000 or more. The county sheriffs also signed these forms. The forms included the names of all the individuals who were at the table in FY02, indicating their position as stakeholders, but did not require signatures of each of these individuals.

FY03 part II used a slightly more centralized process, with the county managers taking over the role of overseeing the disbursement of local funds. Politically, the NCEM's desire has been to make sure no one feels as though they have been left out of the process.¹²³

The breakdown of local funding in each of these years is as follows:¹²⁴

<u>FY02</u>	<u>FY03I</u>	<u>FY03II</u>	<u>FY04</u>
\$7mil	\$13 mil	\$23 mil	\$34 mil

There has been some discrepancy between how different states define "local." In FY02 and FY03, states did not need local approval to say that the local governments should forgo

¹²³ Taylor, Dr. Ken. Director, North Carolina Emergency Management. Personal interview with authors. NCEM Administrative Offices. 1 March 2004.

¹²⁴ Ibid.

federal money for state-implemented policies that would benefit state and local organizations. Under FY04 guidelines, however, the state has to obtain local approval before withholding money. The State must, at a minimum, implement competitive grant programs to allow everyone access to the money.

Application Process

The application process is established at the national level, and involves three steps. The first step is the initial grant announcement letter, which must be returned to NCEM within 45 calendar days indicating the agency's desire to participate. The second step is the submission of a detailed spending plan for all equipment purchases. Equipment grants can only be used to purchase equipment included in the DHS "approved equipment" lists. Lastly, after agencies submit their proposals, NCEM submits all the proposals and business plans to DHS for federal approval. When projects are approved, NCEM is allowed to disburse the money to the designated agency or local government.

Authorized Expenditures

According to federal guidelines, grant monies must be used to aid first responders in increasing their capacity to respond to terrorist incidents. In FY02, DHS grant money was given to states in pre-established categories:

- equipment grants
- exercise grants.

In FY04, DHS authorized grants in five areas:¹²⁵

- planning,
- equipment acquisitions,
- training,
- exercise, and
- management and administrative (capped at 3%)

For FY04, Authorized Program Purposes for each grant program are as follows:

Planning Grant Program. Planning funds may be used to fund a variety of prevention/deterrence, response and recovery, cyber security, cyber risk mitigation, communications, citizen preparedness, regional implementation, critical infrastructure, risk assessment, and operations enhancement plans.¹²⁶

Equipment Grant Program. These funds are to be used to enhance the capabilities of state and local first responders.¹²⁷

¹²⁵ U.S. Department of Homeland Security. FY 2004 ODP Homeland Security Grant Program: 16.

¹²⁶ Ibid: 16.

¹²⁷ Ibid: 16.

Training Grant Program. Funds from training allocation may be used to enhance the capabilities of state and local first responders through development of a state homeland security training program. Allowable training related costs include the establishment of chemical, biological, radiological, and nuclear equipment (CBRNE) training capacities within existing training academies, and overfill and backfill costs associated with attending such schools.¹²⁸

Exercise Grant Program. These funds may be used to plan for, design, develop, conduct, and evaluate exercises that train emergency responders and assess the readiness of jurisdictions to prevent and respond to a terrorist attack. Exercises must be threat-based.¹²⁹

Management and Administrative Grant Program. Funds may be used for management and meeting expenses related directly to the management of the 2004 State Homeland Security Program. These expenses are capped at 3% of the total funds allocated to the state.¹³⁰

DHS allowed states to decide their breakdown of funding between the five grant types in both FY03 programs. This flexibility will remain in FY04, and there are not pre-determined guidelines for allocating funds among these categories. Because the funds are no longer earmarked for specific spending purposes, the relative spending flexibility within states has increased substantially. NCEM delegates the decision of how to spend grant monies to counties. In identifying eligible equipment, exercise, training, and planning grants, North Carolina has simply adopted the federal approved lists.

Distribution Criteria

NCEM has used a range of distribution criteria in dividing the money among North Carolina's 100 counties. The allocation criteria used over the past three years each distribute money in slightly different ways, and there is still substantial debate across the country regarding which is the best allocation method. Some states don't give any money to rural counties, for example. But NCEM believes that all counties face different threats and that each county should be prepared. The allocation process is evolving, and the disbursement criteria are not set in stone.

At the county level, North Carolina's FY02 allocation was based on a county risk index, assigned by NCEM. Each county received a risk score based on a number of factors and was broken down as follows:

- Population density: 50 percent of index score
- Population figure itself: 10 percent of index score

¹²⁸ Ibid: 31.

¹²⁹ Ibid: 33.

¹³⁰ Ibid: 34.

- Critical facilities and infrastructure: 10 percent of index score
- Presence of other factors (e.g. nuclear power plants, large venues, capacity for response already present in the county, special operations and response teams that could serve the county): 30 percent of index score

FY03 Part I disbursements used a base amount, plus an additional population credit. The policy recognized that even the smallest county should get some assistance. Terrel County served as the base line, receiving \$10,000 in equipment grants, \$2,500 in exercise grants, and \$1,000 in training grants. Other counties received at least this amount. FY03 Part II disbursements were formulated based on \$1.07 per capita.