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A Systems Approach to Selecting and Outfitting a Helicopter for Airborne Law Enforcement

Francesco J. Lombardi

To the Graduate Council:

I am submitting herewith a thesis written by Francesco J. Lombardi entitled "A Systems Approach to Selecting and Outfitting a Helicopter for Airborne Law Enforcement." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Aviation Systems.

John F. Muratore, Major Professor

We have read this thesis and recommend its acceptance:

Richard Ranaudo, George W. Garrison

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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A SYSTEMS APPROACH TO SELECTING AND OUTFITTING A HELICOPTER FOR AIRBORNE LAW ENFORCEMENT

A Thesis Presented for
the Master of Science
Degree
The University of Tennessee, Knoxville

Francesco J. Lombardi
December 2008

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Abstract

A modern day airborne law enforcement helicopter is an exercise in compromise. Applying a Systems Engineering approach to selecting and outfitting a helicopter for airborne law enforcement can bring order to the process. The Suffolk County Police Aviation Section of New York was used as an example agency profile in analyzing mission requirements, establishing constraints, and analyzing alternatives. A benchmark survey was established for use in comparison.

Benchmark trends indicated power margin and useful load as the primary performance requirements of an airborne platform with a primary mission of Emergency Medical Service (EMS) and a secondary mission of patrol. EMS requirements indicated the optimal airframe was a twin engine, while optimal for the patrol mission was single engine. Lack of mission systems integration with the airframe was the largest deficiency cited with reference to equipment. Thorough analysis of interfaces identified areas of systems integration that required special consideration.

Current fleet deficiencies in power margin and useful load may be the result of over-laden aircraft, as opposed to underpowered airframes. Distinctions were made between goals and requirements. Analysis of subsystems resulted in suggestions of reduced mission profile weights for performance gains. Alternatives were examined by developing a grid analysis tool. A need was established for professional training of local-level airborne law enforcement personnel in systems test and evaluation.

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CHAPTER I

INTRODUCTION

Background

In 1948, the New York City Police Department placed a Bell 47D helicopter into service to supplement its duties of law enforcement. The department was using fixed-wing aircraft in its aviation unit since 1929, yet phased them out and began using helicopters exclusively by 1955. Today, over 3000 helicopters are in use by more than 400 agencies throughout the United States [1].

Helicopters aiding in public safety began with the use of early piston-powered models capable of little more than providing an aerial observation platform, and have evolved into a complex integration of high-tech electronics and flight control systems that can supplement a variety of public safety tasks with the addition of speed, agility, efficiency, and vantage point (Figure 1). As the reliability and capabilities of the helicopter increased, the diversity of its missions increased as well (Figure 2). The design and specification of an aircraft that could accomplish such multiple missions became an exercise in compromise more than ever.

Figure 1: Suffolk County Police EC-145 Helicopter

Figure 2: Suffolk County Police MD902 Helicopter completing a medical evacuation

Requirement

Present day homeland security requirements and advancements in technology have driven the evolution of the multi-role police helicopter (Figure 3). The civilian world acquires and outfits helicopters for aerial law enforcement differently than the military, yet certain aspects of their missions and mission equipment are becoming increasingly similar.

In the U.S. military, each aircraft acquisition has a detailed specification that spells out mission requirements, along with the performance and handling qualities required for that particular aircraft [2]. The aircraft are designed to spec, then test-flown to assess mission suitability. MIL-SPEC is not law. It can be waived if an aircraft meets its mission. There numerous other general specifications the military can use to show equivalent levels of safety.

Equipment is certificated in the civil world according to regulations set by regulating agencies such as the Federal Aviation Administration in the United States [3]. Obtaining FAA certification means an aircraft has been flight tested, showing it to be airworthy with regards to safety of flight, but this has no bearing on an aircraft's ability to accomplish the intended mission in its true operational environment.

Local law enforcement agencies that operate helicopters are in the unique position of having to choose from off-the-shelf civilian or military surplus aircraft certified for "civil-use" and outfit it with the proper equipment to accomplish required mission tasks.

Figure 3: Cockpit view - Suffolk County EC-145

Additionally, missions are sometimes conducted under "public-use" guidelines that are neither civil nor military. Most local agencies have little or no dedicated aviation budget, and get funding from the general departmental funds. Without the money or resources allocated to conduct mission suitability evaluation flights comparable to the military, there exists the need for a logical, efficient, and thorough method for selecting and equipping an aircraft for the law enforcement mission.

The objective of this thesis is to examine the mission profiles of an example law enforcement agency using a systems engineering approach, and in doing so, develop a basic decision-making template to use as a generic aid in aircraft selection for any agency.

CHAPTER II

SYSTEMS ENGINEERING

Introduction

The Systems Engineering process is a top-down approach to the design of any system under consideration. The International Committee on Systems Engineering (INCOSE) defines a system as an integrated set of elements that accomplish a defined objective. The premise of Systems Engineering is to begin with an identified need for a particular system, usually identified by the customer, and to determine the requirements of the overall system. Systems Engineering is an interdisciplinary approach and means to enable the realization of successful systems. It focuses on defining customer needs and required functionality early in the development cycle, documenting requirements, then proceeding with design synthesis and system validation while considering the complete problem:

- Operations
- Cost & Schedule
- Performance
- Training & Support
- Test
- Disposal
- Manufacturing

A fully equipped law enforcement helicopter is a complex integration of many systems and subsystems working together to accomplish a mission. Systems Engineering can bring discipline and order to the process of selecting and equipping it so that it adequately satisfies mission requirements, providing maximum platform effectiveness.

Functional Decomposition

Systems Engineering involves dissecting a large system or concept into smaller, more manageable pieces. This is done through a process of functional decomposition (Figure 4). In choosing a helicopter for aerial law enforcement, mission objectives are defined, analyzed, and translated into requirements. The requirements dictate certain specifications, or desired system characteristics, which are further allocated into necessary subsystems.

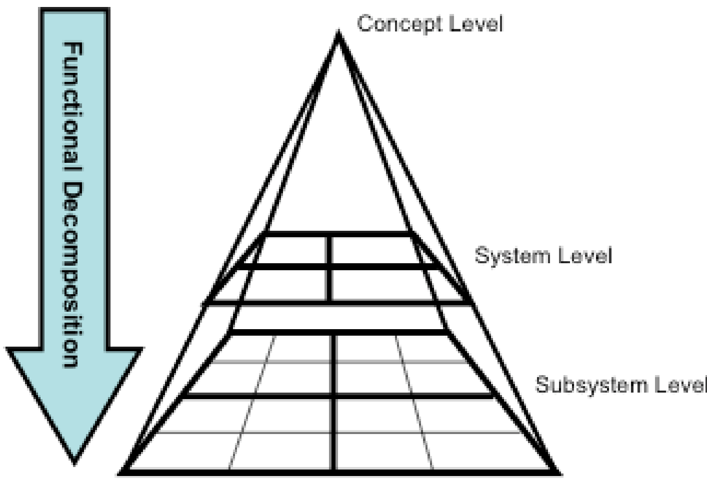

Figure 4. Functional Decomposition

Interfaces

Each subsystem is related to its parent system and various adjoining systems through a series of interfaces. Identifying each stand-alone system and subsystem and analyzing their interfaces, ensures their interoperability in the system as a whole. Continuity of the entire design is critical for maximum system effectiveness, and requires sub-optimizing the pieces to ensure the optimum total system performance.

An effective way to analyze system interfaces is through the use of SHEL modeling (Figure 5). The SHEL model involves defining any process as an interaction between combinations of Software (S), Hardware (H), Environment (E), and Liveware (L). Software refers to objectives, rules, procedures, etc. Hardware refers to any necessary equipment, tools, devices, etc. Environment refers to climate, terrain, location, etc. Liveware refers to crew, passengers, etc.

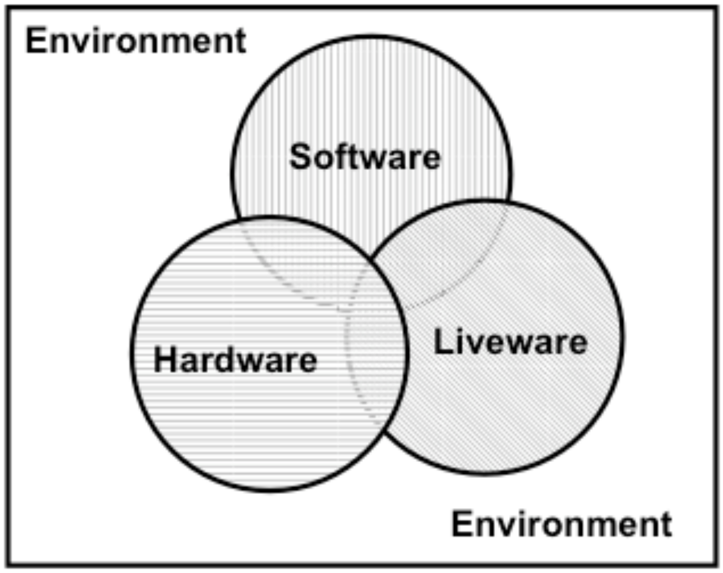

Figure 5. SHEL Model

Five major system interfaces are identified as influencing airborne law enforcement platform selection and function (Figure 6). They are the airframe (H), the crew (L), the mission equipment (H), the mission objective (S), and the geographic location of operation (E). Each of these systems is examined in order to assess the requirements of each, establish constraints, and find viable alternatives.

Constraints

The portions of a project that have limited alternatives become constraints on the system. The specific mission requirements of each agency depends on many factors, including (in no particular order) budget, demographics, available personnel, rules, policies and departmental needs, as well as the physical or geographical

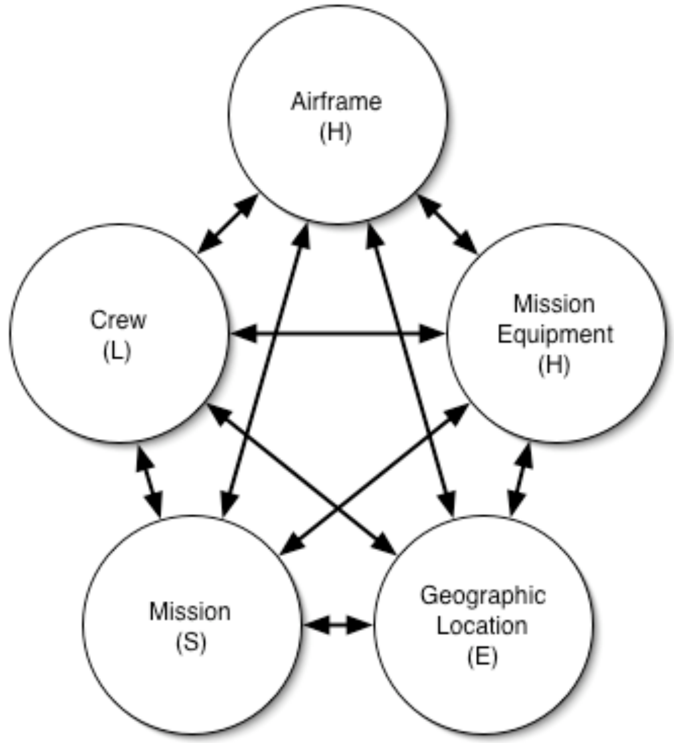

Figure 6. Airborne Law Enforcement Platform Interfaces

environment they are required to operate in. Because of this, it is impossible to compare every possible mission profile that falls under each major mission description, and decide upon airframe and equipment that will best suit all agencies. Therefore, one example agency was used throughout this project in order to set constraints on system requirements. In order to remain within the scope of this thesis and various academic deadlines, the impact of cost on airframe and mission equipment selection was not included as part of the system requirements research, and a comparative cost analysis should be accounted for in further studies.

With an example agency chosen, a whole subset of constraints was then identified. Since it was not feasible to conduct test flights or evaluate most airframe and mission equipment first hand within the scope of this research, data collection was restricted to agency and personnel polling, manufacturer technical publication referral, limited mathematical calculation, and personal operational experience.

Alternatives

For the purpose of this study, current fleet aircraft of the example agency were used to demonstrate the decision making process. Specific airframe and equipment alternatives that satisfy requirements for possible future purchase must be evaluated to determine the best course of action in a future study. To aid in evaluation, an organized method of decision-making will be developed to ensure that the best alternatives are selected and implemented. This guideline can be used for problem solving during the selection process:

- Define the need
- Identify the objectives
- Generate alternatives
- Analyze alternatives
- Select best course of action
- Implement and integrate

CHAPTER III

EXAMPLE POLICE AGENCY

Background

The Suffolk County Police Department (SCPD), located in Long Island, New York, is responsible for patrolling an area of 911 square miles through the use of motor patrol, marine, and aviation. The area ranges from suburban residential to the west, and gradually increases to a mixture of residential and farmland to the east. The climate is hot and humid in the summer months, and cold and crisp in the winter months.

The Suffolk County Police Aviation Section currently operates four aircraft: Two single-engine AS-350 A-stars, manufactured by American Eurocopter, one twin-engine MD-902 Explorer manufactured by MD Helicopters Inc., and one twin-engine American Eurocopter EC-145. These aircraft provide service out of two bases of operation. There is one primary west-end base, and one satellite east–end base. It is anticipated that by the year 2011, the Suffolk County Police Department may be replacing their one existing MD-902 Explorer, due to less than desirable (although improving) customer support by the manufacturer.

Interfaces

Analyzing a SHEL model of the five mentioned interfaced systems as they pertain to the mission of the SCPD gave a clearer understanding of the specifications required in platform selection. As the thoroughness of the analysis was increased, the more stringent the specification became.

Crew – Mission Objective

The SCPD Aviation Section operates under the guidelines set forth in the unit's Standard Operating Procedure [4]. The primary mission of the unit is to provide Emergency Medical helicopter services (EMS) to the residents of Suffolk County. Transports can occur either due to the necessity of a scene medevac, or are a coordinated inter-facility transport between hospitals. When a request for a medevac is received, the flight crew responds to, and lands at the scene, which has been secured by the ground units, to await the patient. Patients are normally flown to the area's "level 1" trauma center, Stony Brook University Hospital, located in Stony Brook, NY.

The secondary mission of the unit is support of the law enforcement ground and marine units. This includes, but is not limited to, vehicle and foot pursuits of fleeing subjects, searches for wanted and missing subjects, patrol of vulnerable entities, aerial observation, and photo missions in support of court cases. Ancillary missions include assisting in search and rescue of the surrounding bodies of water, not more than five miles offshore.

Crew – Geographic Location

Long Island is a busy suburb of New York. There are numerous cell phone towers and radio antennas in the area. Aircrews must always be cognizant of these hazards so as to avoid them. Local airports are operated within Class C and D airspace. Class B airspace surrounds the New York City area. Crews must be aware of these airspace restrictions so as to conduct their operations within and around them safely and legally. In the future, SCPD would like to train crews in the use of Night Vision Goggles (NVGs), due to the featureless terrain, numerous radio towers, and surrounding waterways of Long Island.

Crew – Equipment

In order to be effective, mission equipment must be user-friendly. If equipment is too complex it is not easy for crews to become adept at using it. If the workload involved in using it is excessive, this could even detract from safety of flight. Various equipment sub-systems must have good inter-operability to function properly as a whole system, with the crewmember as the integral part. SCPD crews require interfacing with ground personnel. This is done through both radio communication and equipment such as the searchlight and Forward-Looking Infra-Red (FLIR) camera.

Crew – Airframe

Due to the rapidly evolving missions of airborne law enforcement, the ideal airframe must be quick interfacing with the crew during startup. It must have good handling qualities with minimal workload for accomplishment of mission tasks.

Airframe – Equipment

It is not enough for mission equipment to demonstrate usefulness as a standalone platform. Mission equipment must integrate with the airframe in a fashion that maximizes the equipment's use. Poor systems integration can result in ineffective mission equipment (Figure 7), performance losses, and can even compromise safety. Strict attention must be paid to the amount, location, and weight of equipment that is installed on the aircraft

Figure 7: Example of poor systems integration. Searchlight has been restricted in allowable azimuth and elevation due to the possibility of its intense heat burning the emergency floats. This renders the light virtually useless for any practical application, especially during landing.

throughout its buildup. Too much electrical load can tax generators, impose usage restrictions, and cause excessive equipment wear. Thought should be given to mission priorities when selecting equipment in order to keep aircraft empty weights down and maximize useful load.

Airframe – Geographic Location

The terrain elevation on Long Island ranges from sea level on the south shore where the land meets the Atlantic Ocean, to approximately two hundred feet above mean sea level on the north shore where the bluffs meet the Long Island Sound. The airframe will need to be able to withstand the corrosive effects of the salt air. While physical terrain height is not a factor to be dealt with, the hot, humid summer temperatures can create density altitudes of 2000 feet or more. Airframe performance should be able to tolerate such hot humid conditions with ample power reserves, specifically during EMS work, where maximum performance vertical takeoffs are standard practice. Scene medevac landing zones are often off-airport, in unimproved parking lots or schoolyards. This creates the requirement for an airframe that occupies a small footprint. The distances involved in medical transports are relatively short, making range less of a priority.

Airframe – Mission Objective

For EMS work, SCPD requires twin engine aircraft as their primary platform. This configuration provides the most alternatives with respect to cockpit size, cabin volume, equipment selection, and performance. A full medical interior is desirable. However, due to the short average patient transport time of approximately ten minutes to the hospital, a full interior should considered a goal instead of a requirement, contributing to weight savings. Due to the nature of scene medevac missions and the interaction with non-aviation-oriented personnel, an anti-torque system maximized for safety is required. Another ancillary mission of the SCPD is over-water search and rescue for short distances from shore. The airframe should therefore be able to accommodate the addition of a rescue hoist. SCPD requires their single engine aircraft to have emergency floats installed in the even of an engine failure while overwater. The airframe should offer hard points and have cockpit panel space for other police mission equipment such as a FLIR, searchlight, and downlink antenna. Police and EMS missions tend to be of short distance, but an endurance of at least two hours is required for ample on-scene time during police searches, and for the longer inter-hospital transports.

Mission Equipment – Geographic Location

In order to operate in the Class B, C, and D airspace that exists locally, the aircraft must have a transponder with “mode C” capability. A Global Positioning System (GPS) has become a necessary part of any avionics package, and provides instant position information to the crew, along with obstacle information, such as cell phone and radio tower locations. The crews require radios that permit communication with Air Traffic Control (ATC), multiple police and fire agencies, and the U.S. Coast Guard. A Traffic Collision Avoidance System (TCAS) or Traffic Collision Alert Device (TCAD) is desired due to the high volume of commercial and general aviation traffic in the Long Island area, and the distracting nature of aerial police work. The water surrounding Long Island necessitates the need for over-water rescue devices. These could be in many forms, ranging from auto-inflatable life rings and rafts, to a long-line system, to a rescue hoist.

The amount of training and proficiency necessary to safely accomplish a water rescue should be considered together with the frequency of actual rescue scenarios in which extracting a survivor from the water via helicopter is an option, when deciding on what method of rescue will be part of the airborne platform. The closeness to shore of most incidents may dictate that a rescue hoist is just a possible goal, not a requirement of the final specification. This would save weight and increase aircraft performance. Additionally, due to the over-water requirement, the crew is required to wear a survival vest with floatation and auxiliary breathing device. This needs to be accounted for as part of the average crew weight when calculating weight and balance, and the crew is required to be trained in emergency water egress, use of floatation and auxiliary breathing device, and water survival.

Mission Equipment – Mission Objective

It is a high priority for both EMS and police operations that the SCPD operates with a searchlight. The light should have primary use as a landing aid to the pilot, and secondary use for illumination of ground activity. A FLIR camera with color video capability is required to aid in subject searches and suspect apprehension, and for aerial observation. A GPS-based moving map system is required for obtaining accurate incident locations and for providing accurate estimated time of arrival. A desired goal may be the integration of map and camera system, providing an overlay of address information onto a video picture. The ability to link the searchlight position to the location of the camera lens, providing a visual indication “out the window” of where the camera is looking. Systems integration is crucial for a system such as this to work properly, as is the proper training. A highly technical system such as this may not be cost-effective, and if not set up properly can even become an unsafe distraction to the crew. The ability to record or transmit a video image may also be a goal, but may be considered as the first items to cut for weight and cost savings.

CHAPTER IV

AGENCY SURVEY

Introduction

In order to substantiate the SHEL analysis as well as fill in any gaps and explore new ideas, a comparative benchmark was developed. This was done by polling numerous airborne law enforcement agencies through the use of online survey software [5]. This software allowed for the creation of an electronic database and provided a web-based location where the results could be stored, tabulated, filtered, and analyzed. The software was licensed on a monthly subscription basis for the duration of this research. The survey was posted on Internet bulletin boards that address those involved in airborne public safety.

Purpose

In addition to establishing benchmark data for requirements of various missions, additional objectives of the survey included identification of:

1) Trends in current decision-making processes

2) Alternative choices of airframe and mission equipment

3) System deficiencies currently being experienced

4) Trends in needs of future changing mission requirements

5) The need for personnel trained in test and evaluation

Background

The survey to establish benchmark data covered a wide range of areas. Questions consisted of multiple choice, fill-in, and rating-scale types. There were approximately thirty-five questions to be answered in order to fully complete the survey, however the final number could be a few more or less, due to the "skip logic" of answer-dependent questions.

The survey first established the title held by the respondent, and their overall role in the decision-making process. Each respondent was asked to categorize agency assets as well as define their primary and secondary mission profile. They were then asked to prioritize the airframe, performance, equipment, and avionics/electronics requirements from a given list, in order of importance, for both their primary and secondary missions. Respondents were then asked to categorize the nature of their aircraft's deficiencies (if any) as airframe, equipment, or both. A tally of make, model, and relative effectiveness of various mission equipment was requested. Respondents were queried about future aircraft purchases and the addition of new mission profiles to their current requirement. The methods and personnel involved in airborne platform research were then categorized and prioritized. Finally, the desire for personnel trained in aircraft and mission systems test and evaluation was assessed.

Survey Design

The design of the survey was critical to the overall success of the analysis. The survey had to be simple enough to retain the respondent's attention long enough to allow completion. However, the questions had to be specific enough to gather the pertinent data. Single-answer multiple-choice questions were the most simplistic and most effective at generating a response. Multiple-answer multiple-choice generated a similar response, and gathered slightly more information per question. “Skip-logic” allowed the respondent to bypass non-pertinent sections of the survey depending on the way certain questions were answered. This helped to keep the survey from becoming lengthy and repetitive.

Fill-in questions were used when it was less feasible to list possible answer choices, such as the make, model and quantity of aircraft an agency operated. The fill-in answers proved to be difficult to tabulate, due to the non-uniformity of the responses.

The rating questions were the most difficult to formulate. These questions established mission requirement hierarchy by forcing the respondents to prioritize the listed requirements in order of importance, separately for primary and secondary missions. The choice was made to allow respondents only single-use of each rating number. This forced them to rate each item against each other in the list. This proved too difficult or cumbersome for some. Others misunderstood the question ratings all together. Refinement of survey questions should be implemented in future studies.

CHAPTER V

RESULTS AND DISCUSSION

Benchmark Analysis

A total of 113 respondents began the poll. Sixty-four respondents (56.6%) answered the entire poll to completion. Raw data (Appendix A) was collected and then filtered in order to separate all other responses from those made by the SCPD Aviation Section.

There were twelve total respondents from the SCPD Aviation Section. 100% of the responses identified EMS as the unit's primary mission, and 90.9% identified patrol as the unit's secondary mission. One SCPD respondent felt search and rescue was the unit's secondary mission.

Forty four (51.8%) of all outside agency responses listed patrol as their primary mission, with another twelve (16.2%) responses listing EMS as their primary mission. These two respective responses were the most popular amongst all the missions, and were used as the benchmark data set for comparisons to SCPD's EMS and patrol mission requirements. The requirements were ranked in order from highest to lowest priority, as dictated by the response ratings. Standard deviations of ratings were calculated to show the relative conformity of those ratings by respondents within data groups. General observations were made using the entire data set from all respondents regardless of primary and secondary mission to study overall trends as well.

Airframe

When comparing the responses (Table 1), it can be seen that a twin engine airframe is the characteristic most desired for EMS operations by both the benchmark and SCPD, with low deviation. The desire to have an airframe certified for single-pilot instrument flight rules (IFR) is high priority as an EMS industry benchmark, but is not shared by the SCPD. The SCPD Aviation Section operates under visual flight rules (VFR) only, as per the unit's standard operating procedure. Although the two twin engine aircraft currently operated are IFR-certified, not every unit pilot is IFR rated, which may have biased the results, and the fact that the SCPD may have to operate in marginal weather under VFR may be what necessitates that dual pilots are higher priority for SCPD than they are elsewhere.

Industry-standard in EMS is to operate with two medical personnel on each flight, facilitating the desire for two-patient capability as a benchmark of greater importance. The SCPD operates with one full-time paramedic employed by the Stony Brook University Hospital onboard, and is less inclined to transport two patients on the same flight.

The need to operate with an airframe that boasts a safe anti-torque system can be attributed to the fact that Suffolk County EMS is a volunteer organization, and scene medevacs can be full of personnel inexperienced in routinely working around helicopters.

The benchmark showed that while twin engine is a priority for EMS, it is not as important to the patrol mission. However, due to their multi-role, SCPD defers any law

Table 1: Prioritized AIRFRAME Requirements for EMS and Patrol

AIRFRAME Requirements for EMS

	Benchmark		SCPD	
Std. Dev.		**Priority**		**Std. Dev.**
0.70	Twin engine	High	Twin engine	0.48
1.10	IFR certified	↓	Dual pilot	0.48
1.50	Two-patient capability		Safe/no tail rotor	0.74
1.35	Safe/no tail rotor		Two-patient capability	1.29
1.35	Low noise signature		IFR certified	1.16
0.87	Dual pilot	Low	Low noise signature	0.71

AIRFRAME Requirements for Patrol

	Benchmark		SCPD	
Std. Dev.		**Priority**		**Std. Dev.**
0.95	Good visibility	High	Twin engine	1.25
0.95	Stable hover platform	↓	Good visibility	0.53
0.99	Low noise signature		Stable hover platform	1.20
1.84	Twin engine		Safe/no tail rotor	0.71
0.94	Safe/no tail rotor	Low	Low noise signature	0.92

enforcement mission for a life-saving EMS mission, and the redundancy of two engines remains a priority.

Performance

Results indicate that power margin and payload were rated as the most important requirements for the EMS mission (Table 2). Power margin was cited as important for the patrol mission as well, albeit slightly less. Other requirements such as speed, endurance, and range varied in importance, and all had high deviations, reflecting the many varied requirements of being multi-mission. It can be seen that speed was rated as a top priority for the patrol benchmark, possibly due to the desire to arrive on the scene quickly. SCPD rated endurance as the top patrol priority, which is more in keeping with the desire for maximum loiter time. The discrepancy may be related to the relative distances involved in response.

Additionally, the largest performance factor cited as a current deficiency by all respondents was an insufficient power margin (Figure 8). The second largest performance deficiency was cited as insufficient useful load. Further filtering of the data revealed a correlation between the mission type, the desire for greater power margin and useful load, the mission gross weights, and the degree of satisfaction with mission performance.

A total of twenty-five respondents from all mission profiles stated that their current platform failed to be as effective as originally anticipated. It was seen that as mission gross weight increased, the number of reports of platform ineffectiveness increased as well (Figure 9). Furthermore, as mission gross weight increased, the number of reports of insufficient power and insufficient useful load being the primary cause of

Table 2: Prioritized PERFORMANCE Requirements for EMS and Patrol

PERFORMANCE Requirements for EMS

	Benchmark		SCPD	
Std. Dev.		**Priority**		**Std. Dev.**
1.25	Power margin	High	Power margin	1.23
0.93	Payload	↓	Payload	1.15
1.51	Range	↓	Endurance	1.26
1.35	Speed	↓	Range	1.06
0.99	Endurance	Low	Speed	0.99

PERFORMANCE Requirements for Patrol

	Benchmark		SCPD	
Std. Dev.		**Priority**		**Std. Dev.**
1.19	Speed	High	Endurance	1.41
1.51	Power margin	↓	Power margin	1.77
1.27	Endurance	↓	Speed	1.49
1.35	Payload	↓	Range	0.74
1.35	Range	Low	Payload	1.41

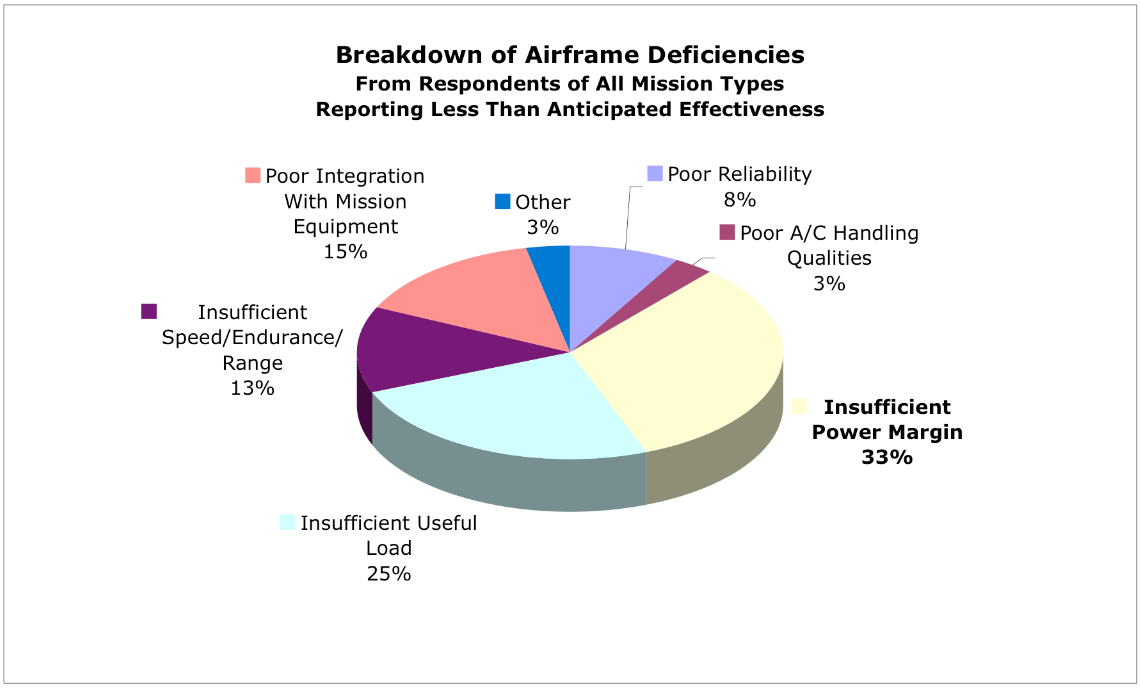

Figure 8: Breakdown of Airframe Deficiencies

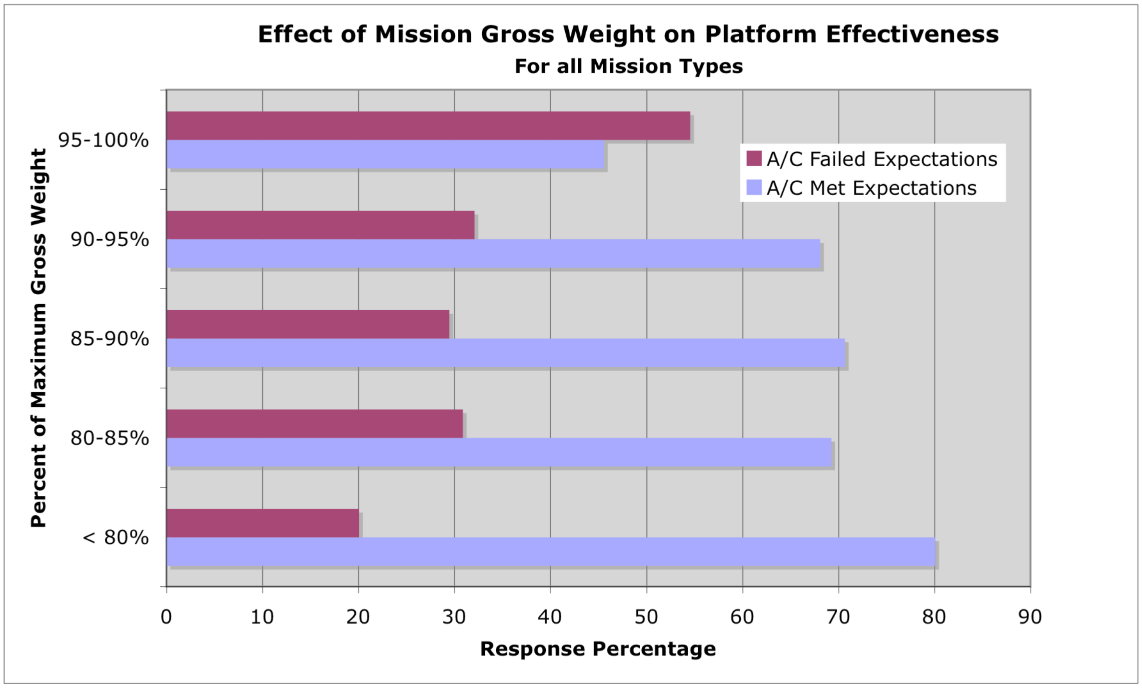

Figure 9: Effect of Mission Gross Weight on Platform Effectiveness

ineffectiveness increased as well. Reports of insufficient power and useful load arose primarily from the EMS operators, as opposed to those who primarily flew patrol (Figures 10 & 11). While this displayed that the EMS mission requirement for vertical climb performance was great, it also showed that satisfactory performance might have been more dependent on mission gross weight than on type of airframe.

Equipment

The equipment necessary to accomplish the EMS mission varied significantly from that required to accomplish the patrol mission (Table 3). Devices such as a searchlight and Night Vision Goggles (NVGs) ranked high for SCPD when compared to the EMS benchmark, consistent with the fact that SCPD does not operate in the IFR environment, and aids to vision are paramount. An unacceptably high amount of fatal EMS helicopter crashes have occurred across the nation since the National Transportation Safety Board began a study in 2002. As recent as October 15, 2008 a Chicago, Illinois EMS helicopter struck radio tower guy wires in clear weather, killing all four onboard, marking the ninth fatal accident of 2008. Since the beginning of the 2002 study, the NTSB noted some recurrent themes, including the lack of regulation requiring the use of safety-enhancing technologies such as NVGs. Less than one-third of the approximately 800 EMS helicopter operators currently use NVG technology [6].

When comparing the equipment necessary for patrol, SCPD respondents ranked a searchlight as having the highest priority. This can be linked to geographical terrain features such as foliage that make a forward-looking infra-red (FLIR) camera less effective.

The highest rated deficiency by all agencies with reference to equipment was its poor integration with the airframe (Figure 12). Second was its poor integration with other equipment. Each type of mission equipment was then rated for overall effectiveness (Figure 13). Most equipment rated better than average despite mentioned deficiencies.

Avionics/Electronics

There was complete agreement between the SCPD and benchmark responses with respect to avionics/electronics required for the patrol mission (Table 4). The slightly different order with respect to the EMS mission comparison was suggestive of the short distances involved in SCPD medevac flights, where a moving map can show more pertinent area information as opposed to a standard GPS. There is a high volume of both commercial and general aviation traffic in the SCPD's geographical area of operation, which increases their requirement for a TCAS/TCAD system.

1. Do you feel that you operate an aircraft which has proven to be NOT as effective as was originally anticipated in accomplishing its intended missions?	Response Percent	Response Count
Yes	**65.0%**	13
No	35.0%	7
answered question		**20**
skipped question		**4**

1. As a general rule, at what weight do you normally operate your aircraft during a typical mission?	Response Percent	Response Count
Less than 80% of maximum gross weight	8.3%	2
80-85% of maximum gross weight	12.5%	3
85-90% of maximum gross weight	16.7%	4
90-95% of maximum gross weight	**54.2%**	13
95-100% of maximum gross weight	8.3%	2
answered question		**24**
skipped question		**0**

1. You feel your AIRFRAME falls short in accomplishing its intended mission because of: (check all that apply)	Response Percent	Response Count
Poor reliability	27.3%	3
Poor aircraft handling qualities	0.0%	0
Insufficient power margin	**100.0%**	11
Insufficient useful load	72.7%	8
Insufficient speed/endurance/range	27.3%	3
Poor integration with mission equipment	36.4%	4
view Other (please specify)	9.1%	1
answered question		**11**
skipped question		**13**

Figure 10: Reported EMS Deficiencies

1. Do you feel that you operate an aircraft which has proven to be NOT as effective as was originally anticipated in accomplishing its intended missions?	Response Percent	Response Count
Yes	17.9%	7
No	**82.1%**	32
answered question		**39**
skipped question		**5**

1. As a general rule, at what weight do you normally operate your aircraft during a typical mission?	Response Percent	Response Count
Less than 80% of maximum gross weight	4.5%	2
80-85% of maximum gross weight	22.7%	10
85-90% of maximum gross weight	20.5%	9
90-95% of maximum gross weight	**36.4%**	16
95-100% of maximum gross weight	15.9%	7
answered question		**44**
skipped question		**0**

1. You feel your AIRFRAME falls short in accomplishing its intended mission because of: (check all that apply)	Response Percent	Response Count
Poor reliability	25.0%	1
Poor aircraft handling qualities	0.0%	0
Insufficient power margin	75.0%	3
Insufficient useful load	75.0%	3
Insufficient speed/endurance/range	75.0%	3
Poor integration with mission equipment	**100.0%**	4
Other (please specify)	0.0%	0
answered question		**4**
skipped question		**40**

Figure 11: Reported Patrol Deficiencies

Table 3: Prioritized EQUIPMENT REQUIREMENTS for EMS and Patrol

EQUIPMENT Requirements for EMS

	Benchmark		SCPD	
Std. Dev.		**Priority**		**Std. Dev.**
0.92	Full medical interior	High	Searchlight	0.42
0.52	Onboard oxygen	⇩	NVGs	0.70
1.17	NVGs		Full medical interior	0.97
0.90	Searchlight	Low	Onboard oxygen	0.42

EQUIPMENT Requirements for Patrol

	Benchmark		SCPD	
Std. Dev.		**Priority**		**Std. Dev.**
1.08	FLIR / video camera	High	Searchlight	0.74
1.13	Searchlight	⇩	FLIR / video camera	0.71
1.45	NVGs		NVGs	0.89
1.06	Digital Video Recorder		Digital Video Recorder	0.53
1.14	Microwave Downlink	Low	Microwave Downlink	0.35

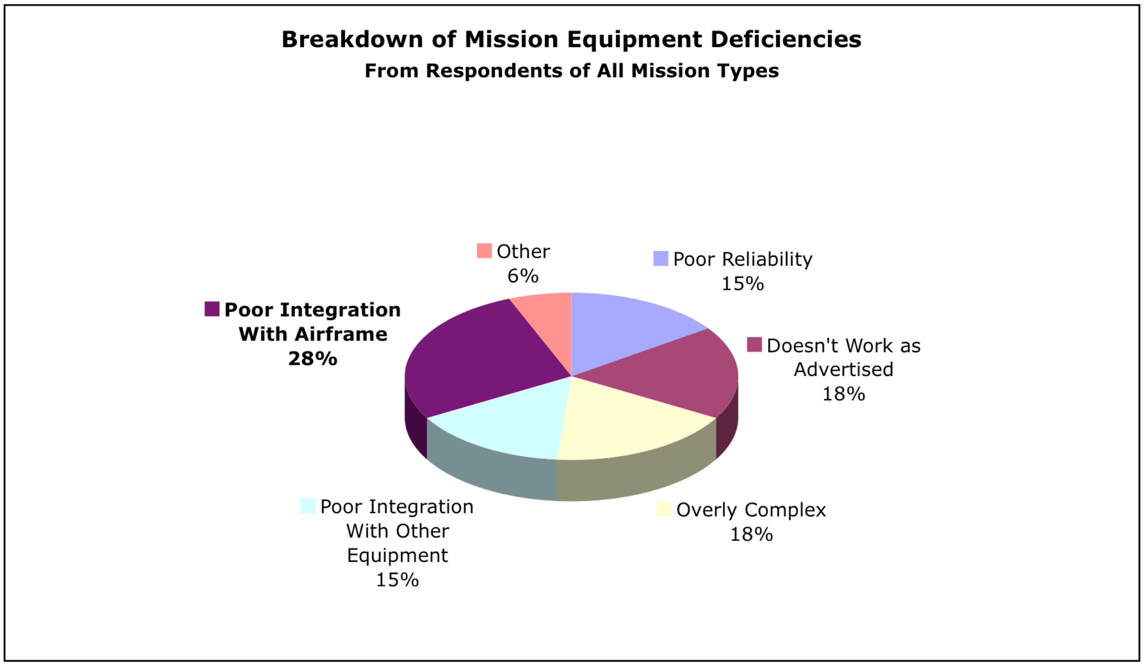

Figure 12: Breakdown of Mission Equipment Deficiencies

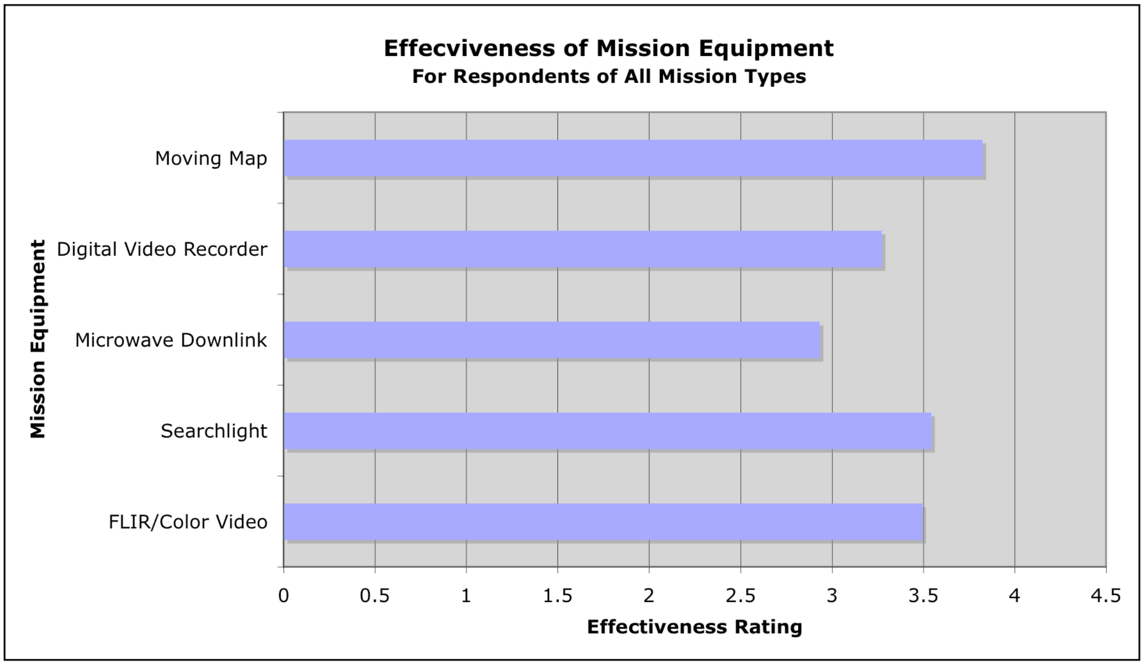

Figure 13: Mission Equipment Effectiveness

Table 4: Prioritized AVIONICS/ELECTRONICS for EMS and Patrol

AVIONICS/ELECTRONICS Requirements for EMS

	Benchmark		**SCPD**	
Std. Dev.		**Priority**		**Std. Dev.**
0.40	GPS	High	Moving Map	0.53
1.12	Moving Map	⇩	GPS	0.70
0.89	Weather Radar		TCAD / TCAS	0.57
0.75	TCAD / TCAS	Low	Weather Radar	0.42

AVIONICS/ELECTRONICS Requirements for Patrol

	Benchmark		**SCPD**	
Std. Dev.		**Priority**		**Std. Dev.**
1.02	Moving Map	High	Moving Map	0.46
0.89	GPS	⇩	GPS	0.46
0.90	TCAD / TCAS		TCAD / TCAS	0.46
0.76	Weather Radar	Low	Weather Radar	0.46

CHAPTER VI

GRID ANALYSIS

Development

With the interfaces defined and analyzed, requirements were identified, then prioritized, and compared against a benchmark. Using the data gained from the prioritized requirements, a grid analysis utilizing a weighting system was developed to explore alternative airframes and equipment. It was beyond the scope of this paper to assess alternatives for a new purchase. However, using the existing fleet of SCPD aircraft, a template was developed to facilitate completion of this project (Figures 14-17). In the future it can be expanded and further detailed to accomplish a full-scale analysis by any agency to suit their needs.

Drawing upon the results of the survey, the airframe, performance, mission equipment, and avionics/electronics factors that were prioritized were listed across the top of a grid and assigned a weighting from low = 1, to high = 3, according to their reported priority. SCPD primary mission requirements that were in conflict with either the benchmark requirements or their secondary mission requirements received an opinionated weighting. The three existing SCPD airframes were then listed vertically down the left side of the grid. For each airframe, a rating of low = 1, to high = 5 (0= N/A), according to both known fact and evaluator opinion, was assigned to each requirement criteria. The ratings were then multiplied by the weighting and scores were totaled for each airframe. The airframe with the highest score supports the best choice.

AIRFRAME

Factors	Twin	Dual Pilot	Visibility	Safe Tail	Two Patient	IFR	Stable Hover	Low Noise		Total
Weighting	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**1**		**Total**
MD902	5	5	5	5	5	4	3	5		**84**
EC-145	5	5	3	3	2	5	4	3		**70**
AS-350	0	2	5	1	0	0	4	3		**34**

Figure 14: Grid Analysis - SCPD Airframe Requirements

PERFORMANCE

Factors	Power Margin	Payload	Endurance	Speed	Range			
Weighting	**3**	**3**	**3**	**2**	**1**			**Total**
MD902	4	4	3	3	3			**42**
EC-145	2	4	4	4	4			**42**
AS-350	3	2	3	3	4			**34**

**Rate factors for each model, 1= poor - 5= excellent, 0=N/A. Multiply by the weighting, add resulting totals. Highest total supports best choice*

Figure 15: Grid Analysis - SCPD Performance Requirements

MISSION EQUIPMENT

Factors	Searchlight	FLIR/Video	Medical Interior	Floatation	DV Recorder	Downlink	Hoist	
Weighting	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**Total**
MD902	3.8	2.8	5	0	0	0	4	**38.8**
EC-145	2.8	3.4	4	0	3.2	1	3.2	**38**
AS-350	2.4	3.4	2	3.4	3.2	3.4	0	**33.4**

**Rate factors for each model, 1= poor - 5= excellent, 0= N/A. Multiply by the weighting, add resulting totals. Highest total supports best choice*

Figure 16: Grid Analysis - SCPD Mission Equipment Requirements

AVIONICS/ELECTRONICS

Factors	Moving Map	GPS	TCAD/TCAS	Weather Radar	NVG Capable			
Weighting	**3**	**3**	**2**	**1**	**2**			**Total**
MD902	4	4	0	0	3			**30**
EC-145	4	5	3	0	4			**41**
AS-350	5	4	4	0	4			**43**
**Rate factors for each model, 1= poor - 5= excellent, 0= N/A. Multiply by the weighting, add resulting totals. Highest total supports best choice*								

Figure 17: Grid Analysis – SCPD Avionics/Electronics Requirements

Similarly, a separate sheet was designed with the purpose of further evaluating various makes and models of mission equipment for workload, reliability, interoperability, airframe integration, and effect on aircraft performance (Figure 18). Each item was rated on a scale of low = 0, to high = 5, and the results are totaled and divided by 5. This allows the individual results to be used in the prior grid analysis for mission equipment scores. For completeness and accuracy of the example, a rescue hoist and emergency floatation were included as part of the SCPD equipment.

Resulting scores indicated that with a score of 195, the MD902 Explorer (as currently equipped by SCPD) is the best choice to accomplish the mission of the SCPD Aviation Section, while the EC-145 is the secondary choice with a score of 191, and the AS-350 is the weakest of the three with a score of 144.

EQUIPMENT EVALUATION BREAKDOWN

Factors	Low Workload	Reliability	Interoperability	A/F Integration	A/C Performance		Total
M12 Wescam	4	3	3	4	3		**3.4**
FLIR 7000	3	2	2	4	3		**2.8**
SX-16 (EC-145)	5	4	3	2	2		**2.8**
SX-5	5	5	3	3	3		**3.8**
Avalex DVR	2	3	3	5	5		**3.2**
BMS Downlink	4	2	3	4	4		**3.4**
Goodrich Hoist	4	4	4	3	1		**3.2**
B. E. Hoist	5	5	5	3	1		**3.8**
Emerg. Floats	5	5	2	3	2		**3.4**
SX-16 (AS-350)	5	5	0	0	2		**2.4**

**Rate factors for each model, 0= poor - 5= excellent. Add resulting totals, divide by 5. Result supports best choice.*

**Insert totals as scores on platform evaluation sheets.*

Figure 18: Grid Analysis - SCPD Equipment Evaluation Breakdown

CHAPTER VII

CONCLUSIONS AND RECOMMENDATIONS

Survey

The Suffolk County Police Aviation Section is unique to most law enforcement aviation units due to the fact that they are a police agency, yet their primary mission is EMS. This was not a common multi-mission profile among agencies. Of those respondents that listed EMS as their primary mission, 54.5% listed search and rescue as their secondary mission, whereas only 9.1% listed patrol as their secondary mission. Similarly, of those respondents who listed patrol as their primary mission, 61.9% listed tactical/non-tactical surveillance as their secondary mission, with only 2.4% listing EMS as their secondary mission. Due to this fact, the benchmarks for EMS and patrol missions were obtained from those listing those respective missions as primary. Further examination of their individual secondary missions could account for variation as well as scatter in the data. The variation in fleet size and type is also a factor affecting responses, which was not evaluated.

Accurate, representative benchmark data proved to be difficult to collect through the use of one “blanket” survey. Keeping the questions simple enough to allow for quick reply and complete survey answering made it difficult to obtain a more specified set of data. To obtain such data, follow-up surveys and/or additional querying of respondents by other methods are necessary.

The airframe, performance, equipment, and avionics/electronics rating questions proved to be the most difficult to formulate, the most difficult for respondents to understand, and in the end, proved to be the most subjective. It was decided that respondents would not be allowed repeated use of a certain rating value. This was done purposefully to force respondents to prioritize their requirements against each other in the given list. The list of choices was very subjective, and mission-dependent. This added to the difficulty of comparing the requirements of different missions. It is therefore suggested that in future studies, the same list of airframe, performance, equipment, and avionics/electronics mission task element requirements be used for all mission types, allowing more objective choices.

The data gathered through the use of fill-in style answering proved to be difficult to sort and use due to the non-uniformity in the style of replies, and the reluctance of many of the respondents to take the extra time to type out an answer. The fill-in airframe data did not provide much useful information at this level of analysis because of the lack of further mission-specific data. In responses with multiple airframe types, it was unknown what mission equipment was installed on each type, or what portion of the mission profile was accomplished by each airframe.

Within the scope of this paper, a correlation was not be found between a respondent's position in their organization, their involvement in the decision-making process, or with the methods of their data acquisition. Further study of such factors is recommended.

Airframe Selection

The resulting correlation between mission gross weight and reports of airframe deficiencies in power margin and useful load dictates that agencies such as the Suffolk County Police Department should conduct a closer weight and balance analysis of prospective airframes as part of their research, and develop a mission requirement that specifies mission gross weights be kept at not more than 85-90% of maximum gross weight of the airframe. This analysis should take into account the potential for expanded mission requirements that will involve additional equipment and associated affects on performance. After conducting the SHEL analysis, agency survey, and grid analysis, it was shown that aircraft gross weight and performance should be the major factors driving the final selection of make and model, and should be re-evaluated iteratively as mission equipment is being considered. This is an area where acceptance flight testing, no matter how limited, should be conducted under conditions that most closely represent actual mission weights and profiles, concentrating in the area of vertical climb performance.

Vertical climb performance is a difficult parameter to calculate and is not a parameter that is normally published with manufacturer's performance data. Investment in performance evaluation software is an option to aid in performance evaluations.

Equipment Selection

The apparent deficiencies in mission equipment integration are minimized by thorough analysis of each interface and their affect on the system as a whole. Other reported deficiencies, such as overly complex operation, or less than advertised performance can greatly affect crew workload, and need to be assessed. Proper integration of a few purposeful systems is much more important than having all the latest technology onboard the aircraft, and finding out that poor integration leaves it severely limited, unusable, or even a hindrance to safety. Various makes and models of mission equipment were gathered in the survey but were not fully individually assessed due to time constraints.

Grid Analysis

The exploration of alternatives through the use of a grid analysis can be a very useful tool, and should be developed further. However, without actual mission-specific testing, either in flight or through realistic simulation, the grid analysis remains nothing more than a subjectively weighted opinion expressed in the form of numbers. Its use as an organizational tool is still valid, but it provides no substantiating data that mission suitability testing produces.

Another disadvantage to using a grid analysis is the potential for bias when rating each requirement, especially if the evaluator is comparing products that they already use, as was the case with the given example. Familiarity with a product’s strengths and weaknesses can put a bias into the evaluation unconsciously- an inherent human factor. When evaluating the example aircraft for mission suitability, it was difficult not to evaluate how the airframes performed with respect to each other, instead of solely with respect to the mission. The four-point bias between the MD902 and EC-145 airframes in the given example may exemplify this, where having more experience in the MD902 over the EC-145 can affect the ratings. This can be mitigated by using an outside evaluator, who has not yet developed an opinion of the aircraft, and has no other aircraft to compare it to when making an evaluation.

Final Thoughts

Systems Engineering provides an interdisciplinary approach and means to enable the realization of a successful system. However, analytical Systems Engineering methods such as SHEL modeling, surveying to achieve a benchmark, and performing a grid analysis alone cannot arrive at the ideal system design. Certain aspects of the system must be validated in an operational setting to confirm the analysis and identify oversights.

In contrast to the certification method of the FAA, the military requires mission suitability evaluation of their aircraft prior to acceptance. FAA certification does not confirm mission suitability, and, with respect to the results of this thesis, could not be used to confirm such requirements as ample useful load or ample vertical climb performance, despite the fact that it deems an aircraft airworthy. Commercial manufacturers go to great lengths to sell their aircraft, and, at the customer's request, will do so with as much mission equipment attached to it as would be permissible by the weight and balance sheet as long as they can demonstrate the aircraft's continued airworthiness to the FAA through supplemental type certificating. Most mission equipment is an aftermarket item designed to be universal, for application on multiple airframes. Provisions for these aftermarket items are rarely thought of during the design phase of a new airframe. This usually restricts placement to specific mounting locations that often prevent the equipment from achieving its full potential. FAA supplemental type certification only serves to validate the continued safe integration / operation of the device and airframe. Only during simulation or operational evaluation flight tests can an accurate analysis of system effectiveness during actual tasks be properly assessed.

In contrast, military test and evaluation teams go to great lengths to evaluate mission suitability of a system that could affect the success of an aircraft as well as raise its cost substantially. They use standardized rating scales to help evaluate their aircraft when accomplishing a specific task during a mission. One such scale is the Cooper Harper Handling Qualities Rating (HQR) Scale (Figure 19) designed to evaluate the handling qualities of piloted vehicles [7]. The scale assesses how hard a pilot has to work in order to accomplish a specific task, such as a landing approach to a platform. The pilot makes an evaluation based on being able to achieve either the desired performance, or adequate performance with a certain amount of pilot compensation. The lower the HQR, the less the pilot felt compensation was necessary to achieve desired performance. This evaluation determines whether or not deficiencies exist, which require improvement. It requires training to properly understand and implement its use. A trained test pilot can use the scale to evaluate a task performed in an aircraft while filtering out the bias discussed earlier with respect to the grid analysis. This is why test pilots with very little experience in a new aircraft can give accurate, repeatable evaluations, which is the goal of ratings scales such as the Cooper Harper HQR Scale.

While the use of the Cooper Harper HQR Scale in assessment of an airborne law enforcement platform is limited to evaluation of a specific individual task, other scales, such as the NASA Task Load Index (TLX) Scale. This scale assesses workload multi-dimensionally, and provides a method by which specific sources of workload relevant to a task can be identified and considered in computing a global workload rating(Figure 20). This scale can be used by line pilots to evaluate airframes and/or mission equipment for suitability, while reducing the problems of high between-subject variability, encountered with subjective rating scales like the proposed grid analysis.

The survey showed that 70.2% of respondents saw the need for having someone professionally trained in the processes and techniques of aircraft and mission systems test and evaluation. There are currently two military and one civilian test pilot school in the United States. All these institutions offer training in acquisition testing and systems integration as well as experimental and developmental flight testing [8]. Unfortunately, at present, you must be a selected member of the military (or government-contracted civilian) to attend either U.S. Air Force or U.S. Naval Test Pilot School, and the cost to attend the civilian school is too prohibitive for an individual to pay out-of-pocket. Other less expensive alternatives include courses offered by some colleges and universities that teach human factors or systems engineering, which can greatly assist in the acquisition process. As technology advances and costs to develop new platforms increase, the integration and adaptation of present technology with new technology will push the need for more personnel qualified to evaluate such advancing systems. It is the opinion of the author that in this time of increased awareness towards Homeland Security, a provision should be made to select qualified personnel from the local law enforcement level and invite them to attend one of these highly-specialized schools or similar curriculums, thereby arming them with invaluable experience and an education that can save their agencies countless dollars, and provide them with a truly mission-specific platform for aerial law enforcement.

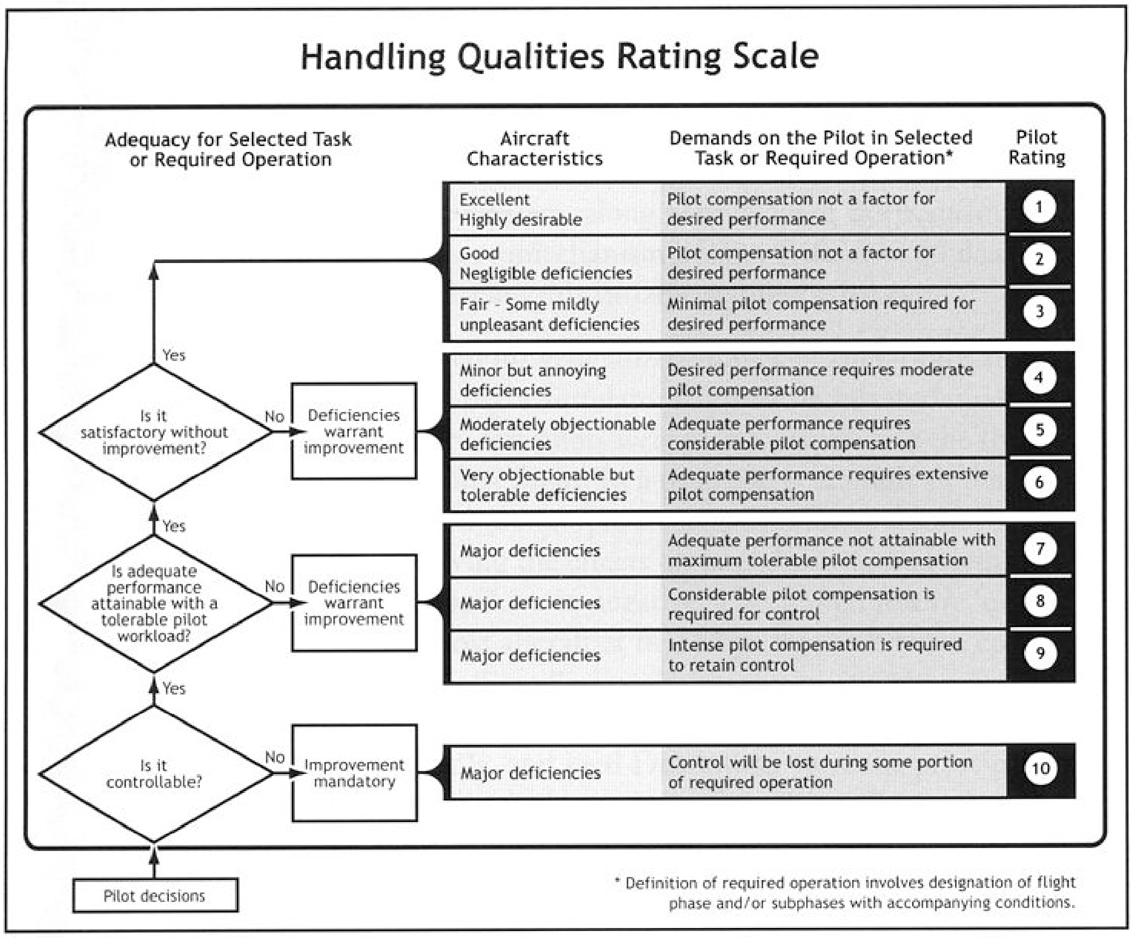

Figure 19: Cooper - Harper Handling Qualities Rating Scale

NASA Task Load Index

Hart and Staveland's NASA Task Load Index (TLX) method assesses work load on five 7-point scales. Increments of high, medium and low estimates for each point result in 21 gradations on the scales.

Name	Task	Date

Mental Demand — How mentally demanding was the task?

Very Low — Very High

Physical Demand — How physically demanding was the task?

Very Low — Very High

Temporal Demand — How hurried or rushed was the pace of the task?

Very Low — Very High

Performance — How successful were you in accomplishing what you were asked to do?

Perfect — Failure

Effort — How hard did you have to work to accomplish your level of performance?

Very Low — Very High

Frustration — How insecure, discouraged, irritated, stressed, and annoyed wereyou?

Very Low — Very High

Figure 20: NASA Task Load Index (TLX) Scale

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APPENDIX

APPENDIX A

UNFILTERED SURVEY DATA

Airborne Law Enforcement Airframe & Mission Assessment

1. What best describes your position in your organization? (check all that apply)

	Response Percent	Response Count
Line pilot	**50.0%**	55
Chief pilot	16.4%	18
Instructor pilot	13.6%	15
Supervisor/line pilot	7.3%	8
Supervisor, non-flying	5.5%	6
Aviation Maintenance Technician	7.3%	8
	answered question	**110**
	skipped question	**3**

2. When it comes to airframe, avionics, and equipment selection, how much of a part do you play in the decision-making process?

	No part	very small part	equally shared part	major part	Rating Average	Response Count
Airframe selection	**42.1% (45)**	20.6% (22)	16.8% (18)	20.6% (22)	1.00	107
Mission equipment selection	27.8% (30)	**28.7% (31)**	18.5% (20)	25.0% (27)	1.00	108
Avionics selection	**30.5% (32)**	29.5% (31)	17.1% (18)	22.9% (24)	1.00	105
					answered question	**111**
					skipped question	**2**

3. What best describes your agency's assets?			
		Response Percent	Response Count
Single aircraft		17.9%	19
Multiple aircraft, single airframe type		27.4%	29
Multiple aircraft, multiple airframe types		**54.7%**	58
		answered question	**106**
		skipped question	**7**

4. Describe how your aircraft are outfitted for mission accomplishment.			
		Response Percent	Response Count
ALL aircraft are equipped with VIRTUALLY THE SAME mission equipment		**43.3%**	42
ALL aircraft are equipped with VARIED mission equipment		30.9%	30
SAME mission equipment COMMON TO AIRFRAME TYPE ONLY, but VARIED WITHIN THE FLEET		25.8%	25
		answered question	**97**
		skipped question	**16**

5. List the quantity/make/model of the aircraft you operate.		
		Response Count
		85
	answered question	**85**
	skipped question	**28**

6. As a general rule, at what weight do you normally operate your aircraft during a typical mission?		Response Percent	Response Count
Less than 80% of maximum gross weight		5.6%	5
80-85% of maximum gross weight		20.0%	18
85-90% of maximum gross weight		22.2%	20
90-95% of maximum gross weight		**36.7%**	33
95-100% of maximum gross weight		15.6%	14
		answered question	**90**
		skipped question	**23**

7. What best describes your unit's PRIMARY mission?		Response Percent	Response Count
Search and Rescue		2.3%	2
Patrol Functions (i.e. Vehicle and Foot Pursuits, Suspect Apprehension)		**51.2%**	44
EMS		27.9%	24
Personnel / Equipment Transport		12.8%	11
Tactical / Non-tactical Surveillance, Video, Downlink		3.5%	3
Fire Suppression / Bambi Bucket		2.3%	2
		answered question	**86**
		skipped question	**27**

8. Rank AIRFRAME requirements for your SEARCH AND RESCUE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 6= LEAST important)								
	1	2	3	4	5	6	Rating Average	Response Count
Large cabin area	0.0% (0)	0.0% (0)	**33.3% (1)**	**33.3% (1)**	**33.3% (1)**	0.0% (0)	4.00	3
IFR certified	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	33.3% (1)	0.0% (0)	3.00	3
Twin engine	**66.7% (2)**	0.0% (0)	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1.67	3
Low noise signature	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	33.3% (1)	**66.7% (2)**	5.67	3
Good visibility	0.0% (0)	33.3% (1)	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	3.33	3
Stable hover platform	**33.3% (1)**	0.0% (0)	**33.3% (1)**	0.0% (0)	0.0% (0)	**33.3% (1)**	3.33	3
							answered question	**3**
							skipped question	**110**

9. Rank PERFORMANCE requirements for your SEARCH AND RESCUE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Speed	0.0% (0)	0.0% (0)	0.0% (0)	33.3% (1)	**66.7% (2)**	4.67	3
Endurance	**33.3% (1)**	**33.3% (1)**	0.0% (0)	**33.3% (1)**	0.0% (0)	2.33	3
Range	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	2.33	3
Payload	**33.3% (1)**	0.0% (0)	**33.3% (1)**	0.0% (0)	**33.3% (1)**	3.00	3
Power margin	**33.3% (1)**	0.0% (0)	**33.3% (1)**	**33.3% (1)**	0.0% (0)	2.67	3
						answered question	**3**
						skipped question	**110**

10. Rank EQUIPMENT requirements for your SEARCH AND RESCUE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 6= LEAST important)								
	1	**2**	**3**	**4**	**5**	**6**	**Rating Average**	**Response Count**
Hoist	**66.7% (2)**	0.0% (0)	0.0% (0)	33.3% (1)	0.0% (0)	0.0% (0)	2.00	3
Emergency aircraft flotation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	5.33	3
Deployable raft / life ring / rescue devices	0.0% (0)	0.0% (0)	0.0% (0)	**33.3% (1)**	**33.3% (1)**	**33.3% (1)**	5.00	3
NVGs	0.0% (0)	**33.3% (1)**	**33.3% (1)**	0.0% (0)	0.0% (0)	**33.3% (1)**	3.67	3
FLIR / color video camera	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.67	3
Searchlight	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	3.33	3
							answered question	**3**
							skipped question	**110**

11. Rank AVIONICS/ELECTRONICS requirements for your SEARCH and RESCUE mission in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)						
	1	**2**	**3**	**4**	**Rating Average**	**Response Count**
Moving Map	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	2.33	3
Weather radar	33.3% (1)	0.0% (0)	**66.7% (2)**	0.0% (0)	2.33	3
TCAD / TCAS	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (3)**	4.00	3
GPS	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	1.33	3
					answered question	**3**
					skipped question	**110**

12. Rank AIRFRAME requirements for your PATROL MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important,5= least important)							
	1	2	3	4	5	Rating Average	Response Count
Twin engine	31.7% (13)	7.3% (3)	0.0% (0)	9.8% (4)	**51.2% (21)**	3.41	41
Low noise signature	2.4% (1)	14.3% (6)	**40.5% (17)**	28.6% (12)	14.3% (6)	3.38	42
Stable hover platform	10.0% (4)	**37.5% (15)**	30.0% (12)	22.5% (9)	0.0% (0)	2.65	40
Safe/no tail rotor	0.0% (0)	7.5% (3)	27.5% (11)	**35.0% (14)**	30.0% (12)	3.88	40
Good visibility	**54.8% (23)**	33.3% (14)	4.8% (2)	4.8% (2)	2.4% (1)	1.67	42
						answered question	**42**
						skipped question	**71**

13. Rank PERFORMANCE requirements for your PATROL MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Speed	23.1% (9)	**30.8% (12)**	28.2% (11)	10.3% (4)	7.7% (3)	2.49	39
Endurance	15.0% (6)	**25.0% (10)**	**25.0% (10)**	22.5% (9)	12.5% (5)	2.93	40
Range	10.3% (4)	7.7% (3)	12.8% (5)	25.6% (10)	**43.6% (17)**	3.85	39
Payload	15.4% (6)	**28.2% (11)**	15.4% (6)	25.6% (10)	15.4% (6)	2.97	39
Power margin	**36.6% (15)**	12.2% (5)	22.0% (9)	12.2% (5)	17.1% (7)	2.61	41
						answered question	**41**
						skipped question	**72**

14. Rank EQUIPMENT requirements for your PATROL MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 5= least important)							
	1	2	3	4	5	Rating Average	Response Count
FLIR / color video camera	**65.0% (26)**	20.0% (8)	7.5% (3)	2.5% (1)	5.0% (2)	1.63	40
Searchlight	17.9% (7)	**28.2% (11)**	25.6% (10)	25.6% (10)	2.6% (1)	2.67	39
NVGs	12.8% (5)	**33.3% (13)**	17.9% (7)	7.7% (3)	28.2% (11)	3.05	39
Microwave Downlink	2.4% (1)	9.8% (4)	19.5% (8)	22.0% (9)	**46.3% (19)**	4.00	41
Digital Video Recorder	5.0% (2)	12.5% (5)	27.5% (11)	**40.0% (16)**	15.0% (6)	3.48	40
						answered question	**41**
						skipped question	**72**

15. Rank AVIONICS/ELECTRONICS requirements for your PATROL mission in order of importance. (1= MOST important, 4= LEAST important)						
	1	2	3	4	Rating Average	Response Count
Moving Map	**63.4% (26)**	17.1% (7)	9.8% (4)	9.8% (4)	1.66	41
Weather Radar	2.6% (1)	7.7% (3)	30.8% (12)	**59.0% (23)**	3.46	39
TCAD / TCAS	7.7% (3)	30.8% (12)	**38.5% (15)**	23.1% (9)	2.77	39
GPS	29.3% (12)	**43.9% (18)**	19.5% (8)	7.3% (3)	2.05	41
					answered question	**42**
					skipped question	**71**

16. Rank AIRFRAME requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 6= least important)								
	1	2	3	4	5	6	Rating Average	Response Count
Twin engine	**71.4% (15)**	23.8% (5)	4.8% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1.33	21
Dual pilot	13.6% (3)	**36.4% (8)**	0.0% (0)	13.6% (3)	13.6% (3)	22.7% (5)	3.45	22
IFR certified	19.0% (4)	9.5% (2)	**33.3% (7)**	19.0% (4)	9.5% (2)	9.5% (2)	3.19	21
Low noise signature	0.0% (0)	4.5% (1)	13.6% (3)	13.6% (3)	31.8% (7)	**36.4% (8)**	4.82	22
Safe/no tail rotor	0.0% (0)	13.6% (3)	13.6% (3)	**40.9% (9)**	27.3% (6)	4.5% (1)	3.95	22
Two-patient capability	0.0% (0)	13.6% (3)	**36.4% (8)**	13.6% (3)	13.6% (3)	22.7% (5)	3.95	22
							answered question	**22**
							skipped question	**91**

17. Rank PERFORMANCE requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Speed	4.8% (1)	4.8% (1)	**38.1% (8)**	14.3% (3)	**38.1% (8)**	3.76	21
Endurance	4.8% (1)	9.5% (2)	9.5% (2)	**47.6% (10)**	28.6% (6)	3.86	21
Range	13.6% (3)	9.1% (2)	**36.4% (8)**	18.2% (4)	22.7% (5)	3.27	22
Payload	18.2% (4)	**54.5% (12)**	13.6% (3)	9.1% (2)	4.5% (1)	2.27	22
Power margin	**59.1% (13)**	22.7% (5)	4.5% (1)	9.1% (2)	4.5% (1)	1.77	22
						answered question	**22**
						skipped question	**91**

18. Rank EQUIPMENT requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 4= least important)

	1	2	3	4	Rating Average	Response Count
Full medical interior	**50.0% (11)**	9.1% (2)	27.3% (6)	13.6% (3)	2.05	22
Searchlight	**40.9% (9)**	22.7% (5)	9.1% (2)	27.3% (6)	2.23	22
Onboard oxygen	0.0% (0)	22.7% (5)	**40.9% (9)**	36.4% (8)	3.14	22
NVGs	9.1% (2)	**45.5% (10)**	22.7% (5)	22.7% (5)	2.59	22
					answered question	**22**
					skipped question	**91**

19. Rank AVIONICS/ELECTRONICS requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)

	1	2	3	4	Rating Average	Response Count
Moving Map	**36.4% (8)**	**36.4% (8)**	13.6% (3)	13.6% (3)	2.05	22
Weather Radar	0.0% (0)	18.2% (4)	22.7% (5)	**59.1% (13)**	3.41	22
TCAD / TCAS	0.0% (0)	13.6% (3)	**59.1% (13)**	27.3% (6)	3.14	22
GPS	**63.6% (14)**	31.8% (7)	4.5% (1)	0.0% (0)	1.41	22
					answered question	**22**
					skipped question	**91**

20. Rank AIRFRAME requirements for your PERSONNEL / EQUIPMENT TRANSPORT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 6= LEAST important)								
	1	**2**	**3**	**4**	**5**	**6**	**Rating Average**	**Response Count**
Twin engine	**50.0% (4)**	12.5% (1)	0.0% (0)	12.5% (1)	12.5% (1)	12.5% (1)	2.63	8
Large cabin area	12.5% (1)	**25.0% (2)**	**25.0% (2)**	**25.0% (2)**	0.0% (0)	12.5% (1)	3.13	8
IFR certified	0.0% (0)	**42.9% (3)**	14.3% (1)	0.0% (0)	14.3% (1)	28.6% (2)	3.71	7
Low noise signature	25.0% (2)	0.0% (0)	25.0% (2)	**37.5% (3)**	12.5% (1)	0.0% (0)	3.13	8
Safe/no tail rotor	0.0% (0)	25.0% (2)	12.5% (1)	0.0% (0)	25.0% (2)	**37.5% (3)**	4.38	8
Wheeled landing gear	0.0% (0)	0.0% (0)	25.0% (2)	25.0% (2)	**37.5% (3)**	12.5% (1)	4.38	8
							answered question	**8**
							skipped question	**105**

21. Rank PERFORMANCE requirements for your PERSONNEL / EQUIPMENT TRANSPORT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
Speed	**25.0% (2)**	**25.0% (2)**	**25.0% (2)**	**25.0% (2)**	0.0% (0)	2.50	8
Endurance	12.5% (1)	12.5% (1)	12.5% (1)	**37.5% (3)**	25.0% (2)	3.50	8
Range	0.0% (0)	12.5% (1)	**50.0% (4)**	12.5% (1)	25.0% (2)	3.50	8
Payload	25.0% (2)	**37.5% (3)**	0.0% (0)	25.0% (2)	12.5% (1)	2.63	8
Power Margin	**37.5% (3)**	12.5% (1)	12.5% (1)	0.0% (0)	**37.5% (3)**	2.88	8
						answered question	**8**
						skipped question	**105**

22. Rank EQUIPMENT requirements for your PERSONNEL / EQUIPMENT TRANSPORT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Air conditioning	**25.0% (2)**	0.0% (0)	**25.0% (2)**	**25.0% (2)**	**25.0% (2)**	3.25	8
Comfortable passenger seating	**37.5% (3)**	25.0% (2)	12.5% (1)	25.0% (2)	0.0% (0)	2.25	8
Searchlight	0.0% (0)	12.5% (1)	**37.5% (3)**	12.5% (1)	**37.5% (3)**	3.75	8
NVGs	12.5% (1)	12.5% (1)	**25.0% (2)**	**25.0% (2)**	**25.0% (2)**	3.38	8
Emergency aircraft flotation	25.0% (2)	**50.0% (4)**	0.0% (0)	12.5% (1)	12.5% (1)	2.38	8
						answered question	**8**
						skipped question	**105**

23. Rank AVIONICS/ELECTRONICS requirements for your PERSONNEL / EQUIPMENT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)						
	1	2	3	4	Rating Average	Response Count
Moving Map	12.5% (1)	25.0% (2)	25.0% (2)	**37.5% (3)**	2.88	8
Weather Radar	12.5% (1)	12.5% (1)	25.0% (2)	**50.0% (4)**	3.13	8
TCAD / TCAS	25.0% (2)	**50.0% (4)**	12.5% (1)	12.5% (1)	2.13	8
GPS	**50.0% (4)**	12.5% (1)	37.5% (3)	0.0% (0)	1.88	8
					answered question	**8**
					skipped question	**105**

24. Rank AIRFRAME requirements for your TACTICAL / NON-TACTICAL SURVEILLANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Twin engine	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.00	0
Low noise signature	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	3.00	1
Stable hover platform	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.00	0
Good visibility	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
IFR certified	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	5.00	1
						answered question	**1**
						skipped question	**112**

25. Rank PERFORMANCE requirements for your TACTICAL / NON-TACTICAL SURVEILLANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Speed	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	3.00	1
Endurance	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
Range	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	2.00	1
Payload	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
Power Margin	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	2.00	1
						answered question	**1**
						skipped question	**112**

26. Rank EQUIPMENT requirements for your TACTICAL / NON-TACTICAL SURVEILLANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
FLIR / color video camera	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	4.00	1
Searchlight	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.00	0
NVGs	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.00	0
Microwave downlink	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.00	0
Digital video recorder	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	5.00	1
						answered question	**1**
						skipped question	**112**

27. Rank AVIONICS/ELECTRONICS requirements for your TACTICAL / NON-TACTICAL SURVEILANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)

	1	2	3	4	Rating Average	Response Count
Moving Map	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	3.00	1
Weather Radar	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.00	0
TCAD / TCAS	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	4.00	1
GPS	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
					answered question	**1**
					skipped question	**112**

28. Rank AIRFRAME requirements for your FIRE SUPPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 5= least important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
Twin engine	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	2.00	1
IFR certified	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	5.00	1
Low noise signature	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	4.00	1
Safe/no tail rotor	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	3.00	1
Good visibility	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
						answered question	**1**
						skipped question	**112**

29. Rank PERFORMANCE requirements for your FIRE SUPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
Speed	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	3.00	1
Endurance	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	4.00	1
Range	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	5.00	1
Payload	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
Power Margin	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	2.00	1
						answered question	**1**
						skipped question	**112**

30. Rank EQUIPMENT requirements for your FIRE SUPPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 5= least important)

	1	2	3	4	5	Rating Average	Response Count
FLIR / color video camera	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	2.00	1
Microwave downlink	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	5.00	1
Bambi Bucket / fire retardant delivery system	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
NVGs	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	4.00	1
Digital video recorder	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	3.00	1
						answered question	**1**
						skipped question	**112**

31. Rank AVIONICS/ELECTRONICS requirements for your FIRE SUPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)

	1	2	3	4	Rating Average	Response Count
Moving Map	**100.0% (1)**	0.0% (0)	0.0% (0)	0.0% (0)	1.00	1
Weather Radar	0.0% (0)	0.0% (0)	**100.0% (1)**	0.0% (0)	3.00	1
TCAD / TCAS	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (1)**	4.00	1
GPS	0.0% (0)	**100.0% (1)**	0.0% (0)	0.0% (0)	2.00	1
					answered question	**1**
					skipped question	**112**

32. What best describes your unit's SECONDARY mission?	Response Percent	Response Count
Search and Rescue	22.1%	17
Patrol Functions (i.e. Vehicle and Foot Pursuits, Suspect Apprehension)	16.9%	13
EMS	6.5%	5
Personnel / Equipment Transport	5.2%	4
Tactical / Non-tactical Surveillance, Video, Downlink	**33.8%**	26
Fire Suppression / Bambi Bucket	6.5%	5
N/A	9.1%	7
	answered question	**77**
	skipped question	**36**

33. Rank AIRFRAME requirements for your SEARCH AND RESCUE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Large cabin area	0.0% (0)	23.1% (3)	**38.5% (5)**	7.7% (1)	30.8% (4)	3.46	13
IFR certified	20.0% (3)	**26.7% (4)**	13.3% (2)	20.0% (3)	20.0% (3)	2.93	15
Twin engine	**50.0% (7)**	14.3% (2)	7.1% (1)	14.3% (2)	14.3% (2)	2.29	14
Low noise signature	0.0% (0)	0.0% (0)	**75.0% (3)**	25.0% (1)	0.0% (0)	3.25	4
Good visibility	7.1% (1)	21.4% (3)	14.3% (2)	**35.7% (5)**	21.4% (3)	3.43	14
Stable hover platform	**26.7% (4)**	20.0% (3)	13.3% (2)	20.0% (3)	20.0% (3)	2.87	15
						answered question	**15**
						skipped question	**98**

34. Rank PERFORMANCE requirements for your SEARCH AND RESCUE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Speed	20.0% (3)	6.7% (1)	**33.3% (5)**	13.3% (2)	26.7% (4)	3.20	15
Endurance	6.7% (1)	26.7% (4)	**33.3% (5)**	13.3% (2)	20.0% (3)	3.13	15
Range	20.0% (3)	13.3% (2)	**26.7% (4)**	**26.7% (4)**	13.3% (2)	3.00	15
Payload	6.7% (1)	**40.0% (6)**	0.0% (0)	26.7% (4)	26.7% (4)	3.27	15
Power margin	**46.7% (7)**	13.3% (2)	6.7% (1)	20.0% (3)	13.3% (2)	2.40	15
						answered question	**15**
						skipped question	**98**

35. Rank EQUIPMENT requirements for your SEARCH AND RESCUE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 6= LEAST important)

	1	2	3	4	5	6	Rating Average	Response Count
Hoist	**53.3% (8)**	20.0% (3)	6.7% (1)	6.7% (1)	0.0% (0)	13.3% (2)	2.20	15
Emergency aircraft flotation	6.7% (1)	20.0% (3)	13.3% (2)	0.0% (0)	20.0% (3)	**40.0% (6)**	4.27	15
Deployable raft / life ring / rescue devices	13.3% (2)	6.7% (1)	6.7% (1)	**26.7% (4)**	**26.7% (4)**	20.0% (3)	4.07	15
NVGs	**21.4% (3)**	**21.4% (3)**	14.3% (2)	**21.4% (3)**	**21.4% (3)**	0.0% (0)	3.00	14
FLIR / color video camera	0.0% (0)	**28.6% (4)**	21.4% (3)	21.4% (3)	21.4% (3)	7.1% (1)	3.57	14
Searchlight	7.1% (1)	7.1% (1)	**42.9% (6)**	21.4% (3)	7.1% (1)	14.3% (2)	3.57	14
							answered question	**15**
							skipped question	**98**

36. Rank AVIONICS/ELECTRONICS requirements for your SEARCH and RESCUE mission in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)

	1	2	3	4	Rating Average	Response Count
Moving Map	20.0% (3)	**33.3% (5)**	**33.3% (5)**	13.3% (2)	2.40	15
Weather radar	14.3% (2)	21.4% (3)	**42.9% (6)**	21.4% (3)	2.71	14
TCAD / TCAS	7.1% (1)	7.1% (1)	21.4% (3)	**64.3% (9)**	3.43	14
GPS	**60.0% (9)**	40.0% (6)	0.0% (0)	0.0% (0)	1.40	15
					answered question	**15**
					skipped question	**98**

37. Rank AIRFRAME requirements for your PATROL MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important,5= least important)

	1	2	3	4	5	Rating Average	Response Count
Twin engine	**55.6% (5)**	0.0% (0)	33.3% (3)	11.1% (1)	0.0% (0)	2.00	9
Low noise signature	0.0% (0)	0.0% (0)	22.2% (2)	11.1% (1)	**66.7% (6)**	4.44	9
Stable hover platform	22.2% (2)	**33.3% (3)**	22.2% (2)	22.2% (2)	0.0% (0)	2.44	9
Safe/no tail rotor	0.0% (0)	0.0% (0)	11.1% (1)	**55.6% (5)**	33.3% (3)	4.22	9
Good visibility	22.2% (2)	**66.7% (6)**	11.1% (1)	0.0% (0)	0.0% (0)	1.89	9
						answered question	**9**
						skipped question	**104**

38. Rank PERFORMANCE requirements for your PATROL MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Speed	**33.3% (3)**	22.2% (2)	11.1% (1)	22.2% (2)	11.1% (1)	2.56	9
Endurance	22.2% (2)	**33.3% (3)**	11.1% (1)	22.2% (2)	11.1% (1)	2.67	9
Range	0.0% (0)	0.0% (0)	**55.6% (5)**	33.3% (3)	11.1% (1)	3.56	9
Payload	0.0% (0)	33.3% (3)	0.0% (0)	22.2% (2)	**44.4% (4)**	3.78	9
Power margin	**44.4% (4)**	11.1% (1)	22.2% (2)	0.0% (0)	22.2% (2)	2.44	9
						answered question	**9**
						skipped question	**104**

39. Rank EQUIPMENT requirements for your PATROL MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 5= least important)

	1	2	3	4	5	Rating Average	Response Count
FLIR / color video camera	**44.4% (4)**	**44.4% (4)**	11.1% (1)	0.0% (0)	0.0% (0)	1.67	9
Searchlight	**44.4% (4)**	**44.4% (4)**	11.1% (1)	0.0% (0)	0.0% (0)	1.67	9
NVGs	11.1% (1)	11.1% (1)	**66.7% (6)**	11.1% (1)	0.0% (0)	2.78	9
Microwave Downlink	0.0% (0)	0.0% (0)	0.0% (0)	11.1% (1)	**88.9% (8)**	4.89	9
Digital Video Recorder	0.0% (0)	0.0% (0)	11.1% (1)	**77.8% (7)**	11.1% (1)	4.00	9
						answered question	**9**
						skipped question	**104**

40. Rank AVIONICS/ELECTRONICS requirements for your PATROL mission in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)						
	1	**2**	**3**	**4**	**Rating Average**	**Response Count**
Moving Map	**77.8% (7)**	22.2% (2)	0.0% (0)	0.0% (0)	1.22	9
Weather Radar	0.0% (0)	0.0% (0)	22.2% (2)	**77.8% (7)**	3.78	9
TCAD / TCAS	0.0% (0)	0.0% (0)	**77.8% (7)**	22.2% (2)	3.22	9
GPS	22.2% (2)	**77.8% (7)**	0.0% (0)	0.0% (0)	1.78	9
					answered question	**9**
					skipped question	**104**

41. Rank AIRFRAME requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 6= LEAST important)								
	1	**2**	**3**	**4**	**5**	**6**	**Rating Average**	**Response Count**
Twin engine	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.20	5
Dual litter	0.0% (0)	0.0% (0)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	20.0% (1)	4.00	5
IFR certified and/or dual pilot	0.0% (0)	**60.0% (3)**	0.0% (0)	20.0% (1)	20.0% (1)	0.0% (0)	3.00	5
Low noise signature	0.0% (0)	0.0% (0)	0.0% (0)	20.0% (1)	**40.0% (2)**	**40.0% (2)**	5.20	5
Safe/no tail rotor	0.0% (0)	0.0% (0)	20.0% (1)	0.0% (0)	**40.0% (2)**	**40.0% (2)**	5.00	5
Large cabin volume	20.0% (1)	20.0% (1)	**40.0% (2)**	20.0% (1)	0.0% (0)	0.0% (0)	2.60	5
							answered question	**5**
							skipped question	**108**

42. Rank PERFORMANCE requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Speed	**60.0% (3)**	20.0% (1)	0.0% (0)	20.0% (1)	0.0% (0)	1.80	5
Endurance	0.0% (0)	0.0% (0)	**60.0% (3)**	40.0% (2)	0.0% (0)	3.40	5
Range	0.0% (0)	**40.0% (2)**	0.0% (0)	20.0% (1)	**40.0% (2)**	3.60	5
Payload	0.0% (0)	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	3.40	5
Power margin	**40.0% (2)**	20.0% (1)	0.0% (0)	0.0% (0)	**40.0% (2)**	2.80	5
						answered question	**5**
						skipped question	**108**

43. Rank EQUIPMENT requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Full medical interior	**40.0% (2)**	20.0% (1)	0.0% (0)	20.0% (1)	20.0% (1)	2.60	5
Searchlight	0.0% (0)	**40.0% (2)**	20.0% (1)	**40.0% (2)**	0.0% (0)	3.00	5
Onboard oxygen	**40.0% (2)**	**40.0% (2)**	20.0% (1)	0.0% (0)	0.0% (0)	1.80	5
NVGs	0.0% (0)	0.0% (0)	**40.0% (2)**	20.0% (1)	**40.0% (2)**	4.00	5
FLIR / color video camera	20.0% (1)	0.0% (0)	20.0% (1)	20.0% (1)	**40.0% (2)**	3.60	5
						answered question	**5**
						skipped question	**108**

44. Rank AVIONICS/ELECTRONICS requirements for your EMS MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)

	1	2	3	4	Rating Average	Response Count
Moving Map	20.0% (1)	**40.0% (2)**	20.0% (1)	20.0% (1)	2.40	5
Weather Radar	0.0% (0)	20.0% (1)	**60.0% (3)**	20.0% (1)	3.00	5
TCAD / TCAS	0.0% (0)	20.0% (1)	20.0% (1)	**60.0% (3)**	3.40	5
GPS	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	1.20	5
					answered question	**5**
					skipped question	**108**

45. Rank AIRFRAME requirements for your PERSONNEL / EQUIPMENT TRANSPORT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 6= LEAST important)

	1	2	3	4	5	6	Rating Average	Response Count
Twin engine	**33.3% (1)**	0.0% (0)	0.0% (0)	**33.3% (1)**	**33.3% (1)**	0.0% (0)	3.33	3
Large cabin area	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.33	3
IFR certified	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	3.33	3
Low noise signature	0.0% (0)	0.0% (0)	**33.3% (1)**	**33.3% (1)**	0.0% (0)	**33.3% (1)**	4.33	3
Safe/no tail rotor	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	33.3% (1)	3.33	3
Wheeled landing gear	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	5.33	3
							answered question	**3**
							skipped question	**110**

46. Rank PERFORMANCE requirements for your PERSONNEL / EQUIPMENT TRANSPORT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Speed	33.3% (1)	**66.7% (2)**	0.0% (0)	0.0% (0)	0.0% (0)	1.67	3
Endurance	0.0% (0)	0.0% (0)	0.0% (0)	33.3% (1)	**66.7% (2)**	4.67	3
Range	0.0% (0)	0.0% (0)	**33.3% (1)**	**33.3% (1)**	**33.3% (1)**	4.00	3
Payload	**66.7% (2)**	0.0% (0)	33.3% (1)	0.0% (0)	0.0% (0)	1.67	3
Power Margin	0.0% (0)	**33.3% (1)**	**33.3% (1)**	**33.3% (1)**	0.0% (0)	3.00	3
						answered question	**3**
						skipped question	**110**

47. Rank EQUIPMENT requirements for your PERSONNEL / EQUIPMENT TRANSPORT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)

	1	2	3	4	5	Rating Average	Response Count
Air conditioning	0.0% (0)	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	2.33	3
Comfortable passenger seating	**33.3% (1)**	**33.3% (1)**	0.0% (0)	**33.3% (1)**	0.0% (0)	2.33	3
Searchlight	33.3% (1)	0.0% (0)	**66.7% (2)**	0.0% (0)	0.0% (0)	2.33	3
NVGs	33.3% (1)	0.0% (0)	0.0% (0)	**66.7% (2)**	0.0% (0)	3.00	3
Emergency aircraft flotation	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	**100.0% (3)**	5.00	3
						answered question	**3**
						skipped question	**110**

48. Rank AVIONICS/ELECTRONICS requirements for your PERSONNEL / EQUIPMENT MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)						
	1	2	3	4	Rating Average	Response Count
Moving Map	**66.7% (2)**	33.3% (1)	0.0% (0)	0.0% (0)	1.33	3
Weather Radar	0.0% (0)	0.0% (0)	**66.7% (2)**	33.3% (1)	3.33	3
TCAD / TCAS	0.0% (0)	33.3% (1)	0.0% (0)	**66.7% (2)**	3.33	3
GPS	**33.3% (1)**	**33.3% (1)**	**33.3% (1)**	0.0% (0)	2.00	3
					answered question	**3**
					skipped question	**110**

49. Rank AIRFRAME requirements for your TACTICAL / NON-TACTICAL SURVEILLANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Twin engine	16.7% (4)	12.5% (3)	4.2% (1)	**37.5% (9)**	29.2% (7)	3.50	24
Low noise signature	16.7% (4)	**29.2% (7)**	**29.2% (7)**	20.8% (5)	4.2% (1)	2.67	24
Stable hover platform	8.3% (2)	33.3% (8)	**50.0% (12)**	4.2% (1)	4.2% (1)	2.63	24
Good visibility	**45.8% (11)**	25.0% (6)	8.3% (2)	12.5% (3)	8.3% (2)	2.13	24
IFR certified	12.5% (3)	0.0% (0)	8.3% (2)	25.0% (6)	**54.2% (13)**	4.08	24
						answered question	**24**
						skipped question	**89**

50. Rank PERFORMANCE requirements for your TACTICAL / NON-TACTICAL SURVEILLANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
Speed	0.0% (0)	**33.3% (8)**	16.7% (4)	20.8% (5)	29.2% (7)	3.46	24
Endurance	**62.5% (15)**	12.5% (3)	16.7% (4)	8.3% (2)	0.0% (0)	1.71	24
Range	8.3% (2)	16.7% (4)	25.0% (6)	20.8% (5)	**29.2% (7)**	3.46	24
Payload	4.2% (1)	**29.2% (7)**	20.8% (5)	**29.2% (7)**	16.7% (4)	3.25	24
Power Margin	**25.0% (6)**	8.3% (2)	20.8% (5)	20.8% (5)	**25.0% (6)**	3.13	24
						answered question	**24**
						skipped question	**89**

51. Rank EQUIPMENT requirements for your TACTICAL / NON-TACTICAL SURVEILLANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
FLIR / color video camera	**87.0% (20)**	8.7% (2)	0.0% (0)	0.0% (0)	4.3% (1)	1.26	23
Searchlight	4.3% (1)	8.7% (2)	13.0% (3)	34.8% (8)	**39.1% (9)**	3.96	23
NVGs	4.3% (1)	**30.4% (7)**	13.0% (3)	21.7% (5)	**30.4% (7)**	3.43	23
Microwave downlink	4.3% (1)	21.7% (5)	**34.8% (8)**	17.4% (4)	21.7% (5)	3.30	23
Digital video recorder	0.0% (0)	30.4% (7)	**39.1% (9)**	26.1% (6)	4.3% (1)	3.04	23
						answered question	**23**
						skipped question	**90**

52. Rank AVIONICS/ELECTRONICS requirements for your TACTICAL / NON-TACTICAL SURVEILANCE MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)						
	1	2	3	4	Rating Average	Response Count
Moving Map	**70.8% (17)**	8.3% (2)	16.7% (4)	4.2% (1)	1.54	24
Weather Radar	0.0% (0)	4.3% (1)	30.4% (7)	**65.2% (15)**	3.61	23
TCAD / TCAS	8.7% (2)	21.7% (5)	**39.1% (9)**	30.4% (7)	2.91	23
GPS	16.7% (4)	**62.5% (15)**	16.7% (4)	4.2% (1)	2.08	24
					answered question	**24**
					skipped question	**89**

53. Rank AIRFRAME requirements for your FIRE SUPPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	2	3	4	5	Rating Average	Response Count
Twin engine	25.0% (1)	25.0% (1)	**50.0% (2)**	0.0% (0)	0.0% (0)	2.25	4
IFR certified	0.0% (0)	0.0% (0)	25.0% (1)	25.0% (1)	**50.0% (2)**	4.25	4
Low noise signature	0.0% (0)	25.0% (1)	0.0% (0)	**50.0% (2)**	25.0% (1)	3.75	4
Safe/no tail rotor	0.0% (0)	20.0% (1)	20.0% (1)	20.0% (1)	**40.0% (2)**	3.80	5
Good visibility	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1.20	5
						answered question	**5**
						skipped question	**108**

54. Rank PERFORMANCE requirements for your FIRE SUPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 5= LEAST important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
Speed	20.0% (1)	0.0% (0)	**40.0% (2)**	0.0% (0)	**40.0% (2)**	3.40	5
Endurance	20.0% (1)	20.0% (1)	0.0% (0)	**60.0% (3)**	0.0% (0)	3.00	5
Range	0.0% (0)	20.0% (1)	20.0% (1)	20.0% (1)	**40.0% (2)**	3.80	5
Payload	**80.0% (4)**	20.0% (1)	0.0% (0)	0.0% (0)	0.0% (0)	1.20	5
Power Margin	20.0% (1)	**40.0% (2)**	**40.0% (2)**	0.0% (0)	0.0% (0)	2.20	5
						answered question	**5**
						skipped question	**108**

55. Rank EQUIPMENT requirements for your FIRE SUPPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= most important, 5= least important)							
	1	**2**	**3**	**4**	**5**	**Rating Average**	**Response Count**
FLIR / color video camera	0.0% (0)	**50.0% (2)**	**50.0% (2)**	0.0% (0)	0.0% (0)	2.50	4
Microwave downlink	0.0% (0)	25.0% (1)	**50.0% (2)**	0.0% (0)	25.0% (1)	3.25	4
Bambi Bucket / fire retardant delivery system	**100.0% (5)**	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	1.00	5
NVGs	0.0% (0)	25.0% (1)	0.0% (0)	**50.0% (2)**	25.0% (1)	3.75	4
Digital video recorder	0.0% (0)	0.0% (0)	0.0% (0)	40.0% (2)	**60.0% (3)**	4.60	5
						answered question	**5**
						skipped question	**108**

56. Rank AVIONICS/ELECTRONICS requirements for your FIRE SUPRESSION MISSION in order of importance. USE EACH NUMBER ONLY ONCE. (1= MOST important, 4= LEAST important)

	1	2	3	4	Rating Average	Response Count
Moving Map	0.0% (0)	**50.0% (2)**	25.0% (1)	25.0% (1)	2.75	4
Weather Radar	0.0% (0)	0.0% (0)	**50.0% (2)**	**50.0% (2)**	3.50	4
TCAD / TCAS	**40.0% (2)**	20.0% (1)	20.0% (1)	20.0% (1)	2.20	5
GPS	**60.0% (3)**	20.0% (1)	0.0% (0)	20.0% (1)	1.80	5
					answered question	**5**
					skipped question	**108**

57. Do you feel that you operate an aircraft which has proven to be NOT as effective as was originally anticipated in accomplishing its intended missions?

		Response Percent	Response Count
Yes		34.2%	25
No		**65.8%**	48
		answered question	**73**
		skipped question	**40**

58. What do you feel is the main contributor to your aircraft's mission deficiencies?

		Response Percent	Response Count
Improper choice of airframe		24.0%	6
Improper choice of mission equipment		4.0%	1
Improper choice of BOTH mission equipment and airframe		**68.0%**	17
Other (please specify)		4.0%	1
		answered question	**25**
		skipped question	**88**

59. You feel your AIRFRAME falls short in accomplishing its intended mission because of: (check all that apply)	Response Percent	Response Count
Poor reliability	23.5%	4
Poor aircraft handling qualities	0.0%	0
Insufficient power margin	**94.1%**	16
Insufficient useful load	70.6%	12
Insufficient speed/endurance/range	41.2%	7
Poor integration with mission equipment	52.9%	9
Other (please specify)	5.9%	1
	answered question	**17**
	skipped question	**96**

60. You feel your MISSION EQUIPMENT falls short in accomplishing its intended mission because of: (check all that apply)	Response Percent	Response Count
Poor reliability	29.4%	5
Does not work as advertised or demonstrated	35.3%	6
Overly complex operation / excessive training required	35.3%	6
Poor interaction/integration with other mission equipment	29.4%	5
Poor integration with airframe	**52.9%**	9
Other (please specify)	11.8%	2
	answered question	**17**
	skipped question	**96**

61. You feel your AIRFRAME falls short in accomplishing its intended mission because of: (check all that apply)

	Response Percent	Response Count
Poor reliability	16.7%	1
Poor aircraft handling qualities	33.3%	2
Insufficient power margin	**66.7%**	4
Insufficient useful load	50.0%	3
Insufficient speed/endurance/range	16.7%	1
Poor integration with mission equipment	0.0%	0
Other (please specify)	16.7%	1
	answered question	**6**
	skipped question	**107**

62. You feel your MISSION EQUIPMENT falls short in accomplishing its intended mission because of: (check all that apply)

	Response Percent	Response Count
Poor reliability	0.0%	0
Does not work as advertised or demonstrated	0.0%	0
Overly complex operation / excessive training required	**100.0%**	1
Poor interaction/integration with other mission equipment	0.0%	0
Poor integration with airframe	0.0%	0
Other (please specify)	0.0%	0
	answered question	**1**
	skipped question	**112**

63. Use this box to provide a brief description of any other deficiencies, inadequacies, or concerns you experience during a typical mission.		
		Response Count
		42
	answered question	**42**
	skipped question	**71**

64. Please list the make/model of the various mission equipment you typically operate.			
		Response Percent	Response Count
FLIR / color video camera		83.3%	40
Searchlight		**91.7%**	44
Microwave Downlink		66.7%	32
Digital Video Recorder		66.7%	32
Moving Map		81.3%	39
	answered question		**48**
	skipped question		**65**

65. Rate the effectiveness of your mission equipment.	Poor	Fair	Good	Very Good	Excellent	N/A	Rating Average	Response Count
FLIR / color video camera	1.8% (1)	17.5% (10)	**24.6% (14)**	21.1% (12)	21.1% (12)	14.0% (8)	3.49	57
Searchlight	5.2% (3)	12.1% (7)	**29.3% (17)**	20.7% (12)	25.9% (15)	6.9% (4)	3.54	58
Microwave Downlink	12.5% (7)	16.1% (9)	19.6% (11)	10.7% (6)	12.5% (7)	**28.6% (16)**	2.93	56
Digital Video Recorder	7.3% (4)	10.9% (6)	23.6% (13)	20.0% (11)	12.7% (7)	**25.5% (14)**	3.27	55
Moving Map	7.0% (4)	7.0% (4)	17.5% (10)	21.1% (12)	**36.8% (21)**	10.5% (6)	3.82	57
							answered question	**59**
							skipped question	**54**

66. How many aircraft has your agency purchased since the events of 9/11/01 and the focus on Homeland Security?	Response Count
	62
answered question	**62**
skipped question	**51**

67. Which mission profiles has your agency added to your duties since 9/11?

	Response Percent	Response Count
None	**58.7%**	37
Airborne use of force	11.1%	7
Vulnerable entity reconaissance/surveillance	17.5%	11
Special Ops personnel deployment	17.5%	11
Other (please specify)	9.5%	6
	answered question	**63**
	skipped question	**50**

68. How soon does your agency plan on purchasing a new aircraft?

	Response Percent	Response Count
1-3 years	**50.0%**	33
3-5 years	10.6%	7
5-7 years	4.5%	3
7-10 years	1.5%	1
unknown	33.3%	22
	answered question	**66**
	skipped question	**47**

69. The research into airframe, avionics, and mission equipment selection can best be described as:						
	Primary Source	**Secondary Source**	**Minimal Source**	**N/A**	**Rating Average**	**Response Count**
Done by an outside consultant/company	5.0% (3)	18.3% (11)	26.7% (16)	**50.0% (30)**	1.57	60
Done in-house, by aviation unit line pilots	**41.7% (25)**	28.3% (17)	18.3% (11)	11.7% (7)	2.26	60
Done in-house, by aviation unit supervisors	**67.2% (41)**	26.2% (16)	3.3% (2)	3.3% (2)	2.66	61
Done in-house, by non-aviation department officials	25.4% (15)	15.3% (9)	**30.5% (18)**	28.8% (17)	1.93	59
					answered question	**67**
					skipped question	**46**

70. The information researched on airframe, avionics, and mission equipment can best be described as obtained through:						
	Primary Source	**Secondary Source**	**Minimal Source**	**N/A**	**Rating Average**	**Response Count**
Catalogs and websites	19.4% (12)	**37.1% (23)**	22.6% (14)	21.0% (13)	1.96	62
Conferences and seminars	23.0% (14)	**32.8% (20)**	23.0% (14)	21.3% (13)	2.00	61
Polling of other agencies	**31.7% (19)**	**31.7% (19)**	18.3% (11)	18.3% (11)	2.16	60
Performance of test/demo flights	28.8% (17)	**30.5% (18)**	22.0% (13)	18.6% (11)	2.08	59
Documented research and calculation	**51.6% (32)**	14.5% (9)	16.1% (10)	17.7% (11)	2.43	62
					answered question	**67**
					skipped question	**46**

71. Do you feel your agency would benefit from having someone professionally trained in the processes and techniques of aircraft and mission systems test and evaluation?

		Response Percent	Response Count
Yes		**69.0%**	40
No		31.0%	18
	answered question		**58**
	skipped question		**55**

72. Please provide comments regarding this survey, its content, its ease of use, etc.

		Response Count
		25
	answered question	**25**
	skipped question	**88**

73. May I contact you with further questions as I complete my research?

		Response Percent	Response Count
Yes		**68.8%**	44
No		31.3%	20
	answered question		**64**
	skipped question		**49**

74. Entering ALL this data is optional, but any information you provide will help to assess the environment in which you perform your mission. Your information will NOT be distributed or solicited. Cancel Copy

	Response Percent	Response Count
Name:	94.4%	34
Agency:	88.9%	32
City/Town:	80.6%	29
State:	75.0%	27
Country:	91.7%	33
Email Address:	**97.2%**	35
Phone Number:	66.7%	24
	answered question	36
	skipped question	77

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		Comment Text	Response Date
Find	1.	AS-350 / BK 117 C2 / MD 902	Fri, 10/10/08 10:38 PM
Find	2.	Bell 412EP x3 Bell 412SP x2 B412 x1 AB412 x1 AB412SP x1 MBB BK117B2 x1 KAW BK117B2 x1 MD500E x3 MD520N x1 AS350BA x3 AS350B2 x1 EC130 x1 B206L3 B206B3	Thu, 10/9/08 2:36 PM
Find	3.	eurocopter ec 145 md 902 eurocopter as350b2	Thu, 10/9/08 10:52 AM
Find	4.	2 AS350B2 1 MD902 1 AEC 145	Wed, 10/8/08 12:23 PM
Find	5.	1 Eurocopter EC-145 1 MD-902 2 Eurocopter AS-350B2	Tue, 10/7/08 9:19 AM
Find	6.	EC-145 AS350B2 MD-902	Mon, 10/6/08 8:45 PM
Find	7.	2 Eurocopter AS-350B2 1 MDHI MD-902 1 Eurocopter EC-145	Mon, 10/6/08 8:45 PM
Find	8.	EC-145 AS 350 B2 AS 350 BA MD 902 HH-60G	Mon, 10/6/08 7:44 PM
Find	9.	2- as350b2 1-MD 902 1-EC-145	Mon, 10/6/08 6:30 PM
Find	10.	md902, as350b2, ec145	Mon, 10/6/08 6:29 PM
Find	11.	2 AS350 B2 1 EC145 1 MD902	Mon, 10/6/08 4:55 PM
Find	12.	#2 = AS350-B2 #1 = EC145 #1 = MD902	Mon, 10/6/08 4:33 PM
Find	13.	1- EC145 , 1- MD902 , 2- AS350b2	Mon, 10/6/08 4:29 PM
Find	14.	1 R44 Robnsno	Sun, 10/5/08 10:57 AM
Find	15.	One MD 902 Explorer	Sat, 10/4/08 8:42 AM
Find	16.	R22 - 22 R44 - 4 B206 - 2	Fri, 10/3/08 7:40 PM
Find	17.	4 x 407	Fri, 10/3/08 5:17 PM
Find	18.	4 X 412 1 x 139	Thu, 10/2/08 8:00 PM
Find	19.	H300 - 3 R22 - 2 R44 - 4 B206 - 3 B206L - 1 AS350 BA - 1	Thu, 10/2/08 7:51 AM
Find	20.	AW-139	Thu, 10/2/08 6:36 AM
Find	21.	a109e x 1, bk117b2 x 1	Thu, 10/2/08 2:42 AM
Find	22.	Bell407	Wed, 10/1/08 6:55 PM
Find	23.	2 md520n	Wed, 10/1/08 6:33 PM
Find	24.	2 X ec135t2/t2+	Wed, 10/1/08 6:25 PM
Find	25.	3 Westland Sea King Mk 5	Wed, 10/1/08 5:54 PM
Find	26.	H-500 Bell 206 AS-350	Wed, 10/1/08 3:08 PM
Find	27.	3 EC145	Wed, 10/1/08 3:06 PM
Find	28.	1 EC 135 P2+	Wed, 10/1/08 2:27 PM
Find	29.	S-61N x6	Wed, 10/1/08 1:57 PM

Find	**30.**	12 AS350B2's	Tue, 9/30/08 1:16 AM
Find	**31.**	1 each: uh-60 as-350 c-206 c-550 c-12m	Mon, 9/29/08 2:26 PM
Find	**32.**	1 Bell OH-58C	Sun, 9/28/08 9:54 PM
Find	**33.**	Cessna 182, BK 117 B2, BK 117 C1, EC 155 B	Sun, 9/28/08 11:25 AM
Find	**34.**	2 EC 135s	Sun, 9/28/08 8:47 AM
Find	**35.**	B412 x 8, s76 x 6, 332 x4, S92 x 1, AW139 x 3, EC145 x 2,	Sun, 9/28/08 2:40 AM
Find	**36.**	8 AS350 Series 2 AW139 4 SA330J 12 B206 Series 6 B212 8 B412EP 2 B214ST 6 S76C++	Sun, 9/28/08 1:17 AM
Find	**37.**	2xAW139, 2xB412 EP, 2xB412 Classic.	Sat, 9/27/08 9:16 PM
Find	**38.**	One/two AS350B2 (VEMD equipped)	Sat, 9/27/08 9:07 PM
Find	**39.**	MD902 x 1	Sat, 9/27/08 7:25 PM
Find	**40.**	6xEC225, 12xAS332, 8xS76	Sat, 9/27/08 6:22 PM
Find	**41.**	EC 135T2	Sat, 9/27/08 5:23 PM
Find	**42.**	2 Agusta A109E	Sat, 9/27/08 5:13 PM
Find	**43.**	2 x AS365N	Sat, 9/27/08 4:24 PM
Find	**44.**	1 x MD Explorer	Sat, 9/27/08 3:57 PM
Find	**45.**	Eurocopter AS350 x 12 Eurocopter EC 135 x 1	Sat, 9/27/08 12:11 PM
Find	**46.**	2 x MD902	Sat, 9/27/08 12:04 PM
Find	**47.**	Eurocopter Supa Puma (1) Eurocopter EC155B1 (4) S76 (4)	Sat, 9/27/08 10:46 AM
Find	**48.**	S61 x 8 as365n x 2	Sat, 9/27/08 10:23 AM
Find	**49.**	9 EC 135 P 2	Sat, 9/27/08 9:43 AM
Find	**50.**	One MD902 Explorer	Fri, 9/26/08 2:36 PM
Find	**51.**	2 Bell 206B 4 RH 44R/RII 2 AS355 F2/FX2 1 AS350BA	Fri, 9/26/08 1:05 PM
Find	**52.**	B412 x10 (5xClassic,5xEP) EMS AS365N3 x3 Police EC135 x1 Police AW139 x3 EMS EC145 x2 EMS S76A++ x6 (Civilian contractor Military SAR contract)	Fri, 9/26/08 6:50 AM
Find	**53.**	BK117 B206 C172 A109	Mon, 9/22/08 1:52 AM
Find	**54.**	1 Bell 206 BIII 1 Bell 206 L4	Wed, 9/17/08 10:17 PM
Find	**55.**	B412EP x3 A119 x4	Sun, 9/14/08 9:17 AM
Find	**56.**	1 Cessna 182 1 Bell OH-58C 1 Bell UH-1H	Sun, 9/7/08 10:05 PM
Find	**57.**	12, Eurocopter AS365 N1/N2/N3	Wed, 9/3/08 3:51 PM
Find	**58.**	ec120 uh60 as350b3/b2 oh 6/md500 uh-1 c206/210 ce550 pc-12	Mon, 9/1/08 10:18 PM
Find	**59.**	AS350B2....2 OH58C.......2 206B3........1 Cessna 182......1 Navajo............2	Fri, 8/29/08 10:33 PM
Find	**60.**	AS-365N1, N2, N3 Dauphin, King Air B-350, Cessna C-210	Mon, 8/25/08 8:51 PM

Find	61.	206L3, OH58	Sun, 8/24/08 2:44 PM
Find	62.	One Bell 407	Sun, 8/24/08 2:03 PM
Find	63.	4/Bell/OH-58A	Sun, 8/24/08 1:22 AM
Find	64.	16 Lockheed P3s (AEW and LRT) 4 MQ-9 Predators (UAS) 26 Cessna Citation II (CE550) 5 Piper Cheyennes (PA42R) 16 UH60 Blackhawks 2 AW-139 helicopters 3 Dehavilland Dash 8s 6 Beechcraft King Air 200s 15 Beechcraft King Air C-12s 43 AS350 ASTAR helicopters 10 MD-600N helicopters 8 MD-500E helicopters 4 EC-120 helicopters 36 OH-6 helicopters 9 UH-1 Huey helicopters 3 Pilatus PC12s 23 Cessna 206/210s 15 PA-18 SuperCubs 23 Cessna 100/200 series airplanes	Fri, 8/22/08 11:32 AM
Find	65.	Md-500's	Fri, 8/22/08 2:02 AM
Find	66.	1 Bell OH-58A+, Hughes 269B, Cessna 182, SuperCub	Fri, 8/15/08 11:55 PM
Find	67.	3 MD 500 E 1 Cessna 172	Mon, 8/11/08 8:20 PM
Find	68.	(2) MD Helicopters MD520N	Wed, 8/6/08 4:52 PM
Find	69.	1 AS 350BA 1 AS 350B2 1 Cessna T210L 1 Baron BE58P	Tue, 8/5/08 8:49 AM
Find	70.	4 bell 407; 3 md 500e; 1 md520n; 1 bell 412; 1 BK-117; 2 oh-58/c; 2 cessna 404; 1 T-41; 1 kingair 200	Tue, 8/5/08 3:15 AM
Find	71.	206B3 and UH-1H	Tue, 8/5/08 12:32 AM
Find	72.	Eurocopter AS350 B3 (4) Cessna 182 R (2)	Sun, 8/3/08 4:43 PM
Find	73.	Bell OH-58, three	Sat, 8/2/08 10:12 PM
Find	74.	1 R44 Robinson Helicopter	Sat, 8/2/08 10:26 AM
Find	75.	2 OH 58 A+ 1 OH58 C	Fri, 8/1/08 11:34 PM
Find	76.	2	Wed, 7/30/08 4:38 PM
Find	77.	AS350B2 EC145 Commander 1000 twin engine turbo prop fixed wing Cessna 206/210	Wed, 7/30/08 12:31 PM
Find	78.	AS350 B2 AS350 B3	Tue, 7/29/08 4:57 PM
Find	79.	13 AS350B2 5 206BIII	Tue, 7/29/08 12:58 PM
Find	80.	2 x OH58A+ Helicopters 1 X Cessna 182T Airplane	Tue, 7/29/08 8:04 AM
Find	81.	2 AS350BA 3 AS350B2	Tue, 7/29/08 2:33 AM
Find	82.	1 bell 206B, 2 Bell OH-58	Mon, 7/28/08 9:10 AM
Find	83.	1 - AS350 B2 1 - AS350 B3	Sat, 7/26/08 7:04 PM
Find	84.	2 - OH58A+ Helicopters and 1 - C182T Fixed Wing	Sat, 7/26/08 4:51 PM
Find	85.	BHT-206B3/L MD-500E MBB-105CBS5	Sat, 7/26/08 1:11 PM

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		Comment Text	Response Date
Find	1.	aircraft is overweight	Fri, 10/10/08 10:45 PM
Find	2.	Time management, Maintenance goals and forecasts	Mon, 10/6/08 8:50 PM
Find	3.	Having multiple airframes requires pilots to be familiar with multiple normal and emergency procedures and limits. It also requires mechanics to learn multiple airframes. These requirements slow maintenance and increase training requirements.	Mon, 10/6/08 8:02 PM
Find	4.	Lack of support from government regarding technology developments.	Fri, 10/3/08 7:47 PM
Find	5.	Flying with Nigerian pilots.	Thu, 10/2/08 6:43 AM
Find	6.	requirement to after market mod the systems for NVG. The lack of auto search pattern display systems. the need to always need a bigger helicopter to do more, rather than a second machine to multiply effectiveness. we currently lack EVS and that would be ideal with our NVG	Thu, 10/2/08 2:50 AM
Find	7.	lack of endurance + pilot equipment	Wed, 10/1/08 6:28 PM
Find	8.	Flir Aircraft age and reliability Cabin Heater Mode C (no I'm not joking) IFR Suite	Wed, 10/1/08 6:02 PM
Find	9.	Weight of role equipment fit and siting of FLIR	Wed, 10/1/08 2:32 PM
Find	10.	Lack of Single Engine Performance	Wed, 10/1/08 2:01 PM
Find	11.	Available tactical radio systems are marginal.	Tue, 9/30/08 1:22 AM
Find	12.	Budget shortfall	Sun, 9/28/08 10:18 PM
Find	13.	Freezing level restrictions frequently limit capability.	Sat, 9/27/08 9:26 PM
Find	14.	Lack of NVG's, Terrain avoidance features and stability in inadvertent IFR conditions.	Sat, 9/27/08 9:11 PM
Find	15.	Speed is reduced by externally mounted role equipment. Would like high skid option for uneven ground landings. Prefer tail rotor to NOTAR system.	Sat, 9/27/08 4:05 PM
Find	16.	Everything is money driven. All constraints are money constraints. This is not a complaint. We are a for-profit EMS operator. But insufficient equipment can be directly traced back to tight budgeting to allow for a profit margin. In other words: I run out of power on a hot day coming out of a tight LZ because otherwise my company doesn't make money. Something isn't right there, really.	Sat, 9/27/08 12:27 PM
Find	17.	Adequacy of medical supplies particularly oxygen	Sat, 9/27/08 12:11 PM
Find	18.	IMPROPER 4 AXIS AUTO PILOT	Sat, 9/27/08 10:58 AM
Find	19.	It´s negative that we usually operate at MTOW in our night missions with FLIR/ Searchlight and 3 crewmembers	Sat, 9/27/08 9:52 AM
Find	20.	Problems with camera system malfunction	Fri, 9/26/08 2:41 PM
Find	21.	IFR Capabilities (FX2 in non IFR)	Fri, 9/26/08 1:09 PM
Find	22.	B412 EP great hot/high good cabin size, old technoligy, slowest of a/c used AS365N3 not as good hot/high as EP,insufficient range, good air ambulance	Fri, 9/26/08 7:04 AM

	,412EP better EMS/SAR AW139, fast, modern, good cabin,over 35oC 412 has just as good range and power , EC 135 good urban police helo ,limited range and payload , but good police helo, not so EMS/SAR S76 no hot high performance, fast ,pilots like it ,least capable of all in hot climate(30oC+)	
Find	**23.** A119 vibration in LE flight regimeds example 60 kt orbit.	Sun, 9/14/08 9:26 AM
Find	**24.** overloaded ac Electronics failures uneeded equip onboard	Mon, 9/1/08 10:26 PM
Find	**25.** Comm between our LEO agency and other agencies	Fri, 8/29/08 10:37 PM
Find	**26.** Biggest problem is adequate funding for unit. This leads to all other issues like lack of training, repair or replacement of mission equipment, aircraft upgrades, etc.	Sun, 8/24/08 2:52 PM
Find	**27.** Can always use more power for mountain high altitude operations. The airframers need to start marketing more aircraft for this demand. For example MD only has the 530F which has no cargo room and no endurance. The 407 will temp out fast on a 32 degree c day at 9000ft msl. We need better motors that produce power without the temp limitations. I would rather torque out then temp out.	Sun, 8/24/08 2:14 PM
Find	**28.** None	Fri, 8/22/08 11:37 AM
Find	**29.** Visibility beneath me during vertical reference.	Sat, 8/16/08 12:03 AM
Find	**30.** low tail rotor authority in moderate winds	Mon, 8/11/08 8:26 PM
Find	**31.** Endurance. The MD520N has an endurance time of approximately 2.3 hours before getting into reserve.	Wed, 8/6/08 5:02 PM
Find	**32.** Heavy aircraft and little or no power margin in 206B aircraft	Tue, 8/5/08 12:40 AM
Find	**33.** The ASTAR has hoist limitations that are unrealistic for hoist missions.	Sun, 8/3/08 4:48 PM
Find	**34.** Instrument panel too big, blocks visibility.	Sat, 8/2/08 10:17 PM
Find	**35.** We are day only with no FLIR/light or camera, simply patrol support	Sat, 8/2/08 10:30 AM
Find	**36.** Difficulty in communications with various agencies due to the lack of common frequencies/system types/bands.	Wed, 7/30/08 12:37 PM
Find	**37.** Not enough power.	Tue, 7/29/08 5:03 PM
Find	**38.** Mission equipment not functioning properly.	Tue, 7/29/08 1:06 PM
Find	**39.** Due to budget reasons we must use part-time observers who do not fly enough to stay proficient.	Tue, 7/29/08 8:14 AM
Find	**40.** none	Tue, 7/29/08 2:38 AM
Find	**41.** The airframes we operate were adequate for our missions when we put them in service. However, as we have added equipment to the aircraft over the years, and our mission profile has changed, we are operating very close to gross weight on patrol missions. The answer is to upgrade to a larger aircraft. We are currently evaluating the Bell 206L.	Mon, 7/28/08 9:22 AM
Find	**42.** MD-500E is fast and a stable platform. >4000 msl B-206 will out perform and longer endurance. Bell is a tried and true platform, but not as flashy as the MD. Bell L models are the best bang for the buck.	Sat, 7/26/08 1:17 PM

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		Comment Text	Response Date
Find	**1.**	BMS	Wed, 10/8/08 12:29 PM
Find	**2.**	BMS	Tue, 10/7/08 9:23 AM
Find	**3.**	bms	Mon, 10/6/08 6:37 PM
Find	**4.**	BMS	Mon, 10/6/08 5:08 PM
Find	**5.**	ECS Digital	Sat, 10/4/08 8:48 AM
Find	**6.**	Nil	Wed, 10/1/08 6:03 PM
Find	**7.**	ECS	Wed, 10/1/08 2:33 PM
Find	**8.**	N/A	Wed, 10/1/08 2:02 PM
Find	**9.**	none	Tue, 9/30/08 1:23 AM
Find	**10.**	bms	Mon, 9/29/08 2:31 PM
Find	**11.**	None	Sun, 9/28/08 10:20 PM
Find	**12.**	N/A	Sat, 9/27/08 9:27 PM
Find	**13.**	Not Known	Sat, 9/27/08 5:34 PM
Find	**14.**	Analogue - unknown	Sat, 9/27/08 4:06 PM
Find	**15.**	?	Sat, 9/27/08 9:53 AM
Find	**16.**	ECS Digital	Fri, 9/26/08 2:43 PM
Find	**17.**	TROLL	Wed, 9/17/08 10:26 PM
Find	**18.**	Wescam	Sun, 9/14/08 9:38 AM
Find	**19.**	Navtech	Wed, 8/6/08 5:33 PM
Find	**20.**	GMS	Tue, 8/5/08 8:53 AM
Find	**21.**	BMS	Tue, 8/5/08 12:42 AM
Find	**22.**	Pacific Microwave	Sun, 8/3/08 4:49 PM
Find	**23.**	BMS analog	Sat, 8/2/08 10:18 PM
Find	**24.**	bms	Fri, 8/1/08 11:46 PM
Find	**25.**	Troll	Wed, 7/30/08 4:45 PM
Find	**26.**	None	Wed, 7/30/08 12:38 PM
Find	**27.**	BMS	Tue, 7/29/08 5:04 PM
Find	**28.**	Cineflex	Tue, 7/29/08 1:08 PM
Find	**29.**	Wescam	Tue, 7/29/08 8:16 AM
Find	**30.**	na	Tue, 7/29/08 2:39 AM

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		Comment Text	Response Date
Find	1.	avelex	Mon, 10/6/08 6:37 PM
Find	2.	Skyquest VRDV 4000 and 4010	Sat, 10/4/08 8:48 AM
Find	3.	Nil	Wed, 10/1/08 6:03 PM
Find	4.	SkyQuest	Wed, 10/1/08 2:33 PM
Find	5.	N/A	Wed, 10/1/08 2:02 PM
Find	6.	none	Tue, 9/30/08 1:23 AM
Find	7.	avalex	Mon, 9/29/08 2:31 PM
Find	8.	AeroComputer	Sun, 9/28/08 10:20 PM
Find	9.	N/A	Sat, 9/27/08 9:27 PM
Find	10.	brittania	Sat, 9/27/08 7:30 PM
Find	11.	Britannia 2000 Mini DV Recorder	Sat, 9/27/08 5:34 PM
Find	12.	VHS system	Sat, 9/27/08 4:06 PM
Find	13.	?	Sat, 9/27/08 9:53 AM
Find	14.	Skyquest VRDV 4000 and 3010	Fri, 9/26/08 2:43 PM
Find	15.	Sony Commercial videos	Fri, 9/26/08 7:12 AM
Find	16.	Avalex	Wed, 9/17/08 10:26 PM
Find	17.	sony	Mon, 9/1/08 10:27 PM
Find	18.	Panasonic	Sun, 8/24/08 2:15 PM
Find	19.	Neuvos digital recorder	Mon, 8/11/08 8:27 PM
Find	20.	Sony (model unknown)	Wed, 8/6/08 5:33 PM
Find	21.	Avalex AVR8000	Tue, 8/5/08 8:53 AM
Find	22.	Avalex	Tue, 8/5/08 12:42 AM
Find	23.	JVC	Sun, 8/3/08 4:49 PM
Find	24.	Avalex	Sat, 8/2/08 10:18 PM
Find	25.	Avalex	Fri, 8/1/08 11:46 PM
Find	26.	Panasonic VHS	Wed, 7/30/08 4:45 PM
Find	27.	Aerocomputers X3	Wed, 7/30/08 12:38 PM
Find	28.	Avalex	Tue, 7/29/08 5:04 PM
Find	29.	Avalex Digital Recorder	Tue, 7/29/08 8:16 AM
Find	30.	na	Tue, 7/29/08 2:39 AM

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		Comment Text	Response Date
Find	**1.**	westcam	Wed, 10/8/08 12:29 PM
Find	**2.**	westcam /flir	Mon, 10/6/08 6:37 PM
Find	**3.**	wescam	Mon, 10/6/08 6:37 PM
Find	**4.**	Wescam 12	Mon, 10/6/08 5:08 PM
Find	**5.**	wescam	Mon, 10/6/08 4:39 PM
Find	**6.**	FLR Starsaffire HD	Sat, 10/4/08 8:48 AM
Find	**7.**	Nil	Wed, 10/1/08 6:03 PM
Find	**8.**	FLIR Star safire HD	Wed, 10/1/08 2:33 PM
Find	**9.**	Leo 200	Wed, 10/1/08 2:02 PM
Find	**10.**	FLIR 7500	Tue, 9/30/08 1:23 AM
Find	**11.**	flir inc, I-3	Mon, 9/29/08 2:31 PM
Find	**12.**	FLIR	Sun, 9/28/08 10:20 PM
Find	**13.**	Wescam and FLIR systems	Sun, 9/28/08 11:30 AM
Find	**14.**	FLIR 2000 series	Sat, 9/27/08 9:27 PM
Find	**15.**	wescam mx15	Sat, 9/27/08 7:30 PM
Find	**16.**	FLIR Ultraforce II	Sat, 9/27/08 5:34 PM
Find	**17.**	FSI 4000	Sat, 9/27/08 4:06 PM
Find	**18.**	Wescam	Sat, 9/27/08 9:53 AM
Find	**19.**	FLIR Starsafire HD	Fri, 9/26/08 2:43 PM
Find	**20.**	FLIR 8000 systems on all a/c	Fri, 9/26/08 7:12 AM
Find	**21.**	FLIR 8500XR	Wed, 9/17/08 10:26 PM
Find	**22.**	Wescam MX-12 x4 MX-15 x1	Sun, 9/14/08 9:38 AM
Find	**23.**	7500	Mon, 9/1/08 10:27 PM
Find	**24.**	FLIR 8500	Fri, 8/29/08 10:39 PM
Find	**25.**	Inframetrics	Sun, 8/24/08 2:15 PM
Find	**26.**	POP 200	Mon, 8/11/08 8:27 PM
Find	**27.**	FLIR 7000	Wed, 8/6/08 5:33 PM
Find	**28.**	FLIR Systems Ultra 7500	Tue, 8/5/08 8:53 AM
Find	**29.**	FLIR 7500 and 8500	Tue, 8/5/08 12:42 AM
Find	**30.**	FLIR Systems 8500 XR	Sun, 8/3/08 4:49 PM

Find	**31.** FLIR 8000	Sat, 8/2/08 10:18 PM
Find	**32.** FLIR Ultra 7500	Fri, 8/1/08 11:46 PM
Find	**33.** FLIR 7500	Wed, 7/30/08 4:45 PM
Find	**34.** Wescam 12	Wed, 7/30/08 12:38 PM
Find	**35.** FLIR 6000	Tue, 7/29/08 5:04 PM
Find	**36.** wescam / FLIR 8500	Tue, 7/29/08 1:08 PM
Find	**37.** Wescam Model 12 Triple Sensor	Tue, 7/29/08 8:16 AM
Find	**38.** na	Tue, 7/29/08 2:39 AM
Find	**39.** FLIR8000	Mon, 7/28/08 9:24 AM
Find	**40.** n/a	Sat, 7/26/08 1:17 PM

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		Comment Text	Response Date
Find	1.	Nightsun	Wed, 10/8/08 12:29 PM
Find	2.	nightsun sx 5/16	Mon, 10/6/08 6:37 PM
Find	3.	sx16	Mon, 10/6/08 6:37 PM
Find	4.	SpectroLab	Mon, 10/6/08 5:08 PM
Find	5.	night sun	Mon, 10/6/08 4:39 PM
Find	6.	Trakkabeam A800	Sat, 10/4/08 8:48 AM
Find	7.	spectrolab sx 16 & 5 but not used now with NVG	Thu, 10/2/08 2:51 AM
Find	8.	Bright Star	Wed, 10/1/08 6:03 PM
Find	9.	Nitesun XP	Wed, 10/1/08 2:33 PM
Find	10.	SX-16	Wed, 10/1/08 2:02 PM
Find	11.	SX15	Tue, 9/30/08 1:23 AM
Find	12.	nightsun	Mon, 9/29/08 2:31 PM
Find	13.	Night Sun	Sun, 9/28/08 10:20 PM
Find	14.	SX16	Sun, 9/28/08 11:30 AM
Find	15.	SX-16 Nightsun	Sat, 9/27/08 9:27 PM
Find	16.	Night Sun	Sat, 9/27/08 9:12 PM
Find	17.	nitesun2	Sat, 9/27/08 7:30 PM
Find	18.	Nitesun 2 XP	Sat, 9/27/08 5:34 PM
Find	19.	SX 16	Sat, 9/27/08 4:06 PM
Find	20.	Spectrolab night sun	Sat, 9/27/08 12:28 PM
Find	21.	Nightsun SX15	Sat, 9/27/08 12:13 PM
Find	22.	SX 16	Sat, 9/27/08 9:53 AM
Find	23.	Trakka A800	Fri, 9/26/08 2:43 PM
Find	24.	SX16 on 412,365,139,S76 and 135	Fri, 9/26/08 7:12 AM
Find	25.	SX 15 Night Sun	Wed, 9/17/08 10:26 PM
Find	26.	Nightsun SX-16 x2 Nightsun 2 X5	Sun, 9/14/08 9:38 AM
Find	27.	nightsun	Mon, 9/1/08 10:27 PM
Find	28.	Nightsun (large)	Fri, 8/29/08 10:39 PM
Find	29.	NightSun	Sun, 8/24/08 2:15 PM
Find	30.	Carter 3 light pod approx. 10mil. candlepower	Sat, 8/16/08 12:05 AM

Find	31.	Spectrolab SX-16	Mon, 8/11/08 8:27 PM
Find	32.	SpectraLab SX16	Wed, 8/6/08 5:33 PM
Find	33.	Spectrolab SX 16	Tue, 8/5/08 8:53 AM
Find	34.	SX-5	Tue, 8/5/08 12:42 AM
Find	35.	Spectrolab SX-16	Sun, 8/3/08 4:49 PM
Find	36.	SX-5	Sat, 8/2/08 10:18 PM
Find	37.	SX15	Fri, 8/1/08 11:46 PM
Find	38.	SX-16	Wed, 7/30/08 4:45 PM
Find	39.	Nightsun SX16	Wed, 7/30/08 12:38 PM
Find	40.	Spectrolab SX16	Tue, 7/29/08 5:04 PM
Find	41.	SX-5	Tue, 7/29/08 8:16 AM
Find	42.	na	Tue, 7/29/08 2:39 AM
Find	43.	SX16	Mon, 7/28/08 9:24 AM
Find	44.	n/a	Sat, 7/26/08 1:17 PM

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		Comment Text	Response Date
Find	**1.**	Aero computers	Fri, 10/10/08 10:46 PM
Find	**2.**	Skyforce Observer 3	Sat, 10/4/08 8:48 AM
Find	**3.**	laptop based & integrated with aerial photographs/topo	Thu, 10/2/08 2:51 AM
Find	**4.**	Nil	Wed, 10/1/08 6:03 PM
Find	**5.**	Skyforce Observer + Skymap III	Wed, 10/1/08 2:33 PM
Find	**6.**	N/A	Wed, 10/1/08 2:02 PM
Find	**7.**	Aerocomputers	Tue, 9/30/08 1:23 AM
Find	**8.**	avalex	Mon, 9/29/08 2:31 PM
Find	**9.**	AeroComputer	Sun, 9/28/08 10:20 PM
Find	**10.**	Helimap	Sun, 9/28/08 11:30 AM
Find	**11.**	Eurostar	Sat, 9/27/08 9:27 PM
Find	**12.**	GMX200	Sat, 9/27/08 9:12 PM
Find	**13.**	Custom Not Definable	Sat, 9/27/08 7:34 PM
Find	**14.**	euronav	Sat, 9/27/08 7:30 PM
Find	**15.**	Euronav	Sat, 9/27/08 5:34 PM
Find	**16.**	Skyforce Observer	Sat, 9/27/08 4:06 PM
Find	**17.**	Euronav	Sat, 9/27/08 12:13 PM
Find	**18.**	DGK 4	Sat, 9/27/08 9:53 AM
Find	**19.**	Skyforce Observer 3	Fri, 9/26/08 2:43 PM
Find	**20.**	Avalex	Wed, 9/17/08 10:26 PM
Find	**21.**	Aero Computers	Sun, 9/14/08 9:38 AM
Find	**22.**	avlex	Mon, 9/1/08 10:27 PM
Find	**23.**	Avalex	Fri, 8/29/08 10:39 PM
Find	**24.**	Garmin 496	Sat, 8/16/08 12:05 AM
Find	**25.**	CAD system	Mon, 8/11/08 8:27 PM
Find	**26.**	AeroComputers LE5000	Wed, 8/6/08 5:33 PM
Find	**27.**	Avalex AMS7102	Tue, 8/5/08 8:53 AM
Find	**28.**	Garmin 496 basemap	Tue, 8/5/08 12:42 AM
Find	**29.**	Avalex	Sun, 8/3/08 4:49 PM
Find	**30.**	NA	Sat, 8/2/08 10:18 PM

Find	**31.** Avalex 7100D	Fri, 8/1/08 11:46 PM
Find	**32.** Aero Computers LE 3000	Wed, 7/30/08 4:45 PM
Find	**33.** Aerocomputers LE5000	Wed, 7/30/08 12:38 PM
Find	**34.** Aerocomputers	Tue, 7/29/08 5:04 PM
Find	**35.** Aerocomputers	Tue, 7/29/08 1:08 PM
Find	**36.** Microsoft Street & Trips	Tue, 7/29/08 8:16 AM
Find	**37.** garmin	Tue, 7/29/08 2:39 AM
Find	**38.** Aero Computer	Mon, 7/28/08 9:24 AM
Find	**39.** garmin 296	Sat, 7/26/08 1:17 PM

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VITA

Francesco J. Lombardi was born to Rose and Gennaro Lombardi in June 1969, in Bethpage, New York. He graduated Kings Park High School in 1987. His lifelong passion for aviation grew as he earned a Bachelor of Science Degree in Aerospace Engineering from Polytechnic University in 1991. He was awarded the Grumman Future Technologist Award Scholarship prior to graduation, and became an Aerodynamics / Flight Test Engineer for Grumman Aerospace Corporation in June 1990.

In March 1995, Frank became a police officer with the Suffolk County Police Department in Long Island, NY. He holds a Private Pilot rating for single engine airplanes, and a Commercial rating for helicopters. He was transferred to the Suffolk County Police Aviation Section in February 2000. He has accumulated over 1400 hours of flight time.

Frank graduated from the University of Tennessee Space Institute in December 2008 with a Master of Science Degree in Aviation Systems, Future ambitions include attendance of a formalized test pilot school and working as an experimental test pilot.