SURVIVABILITY ON THE ISLAND OF SPICE: THE DEVELOPMENT OF THE UH-60 BLACKHAWK AND ITS BAPTISM OF FIRE IN OPERATION URGENT FURY

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In 1983 the UH-60 Blackhawk faced its baptism of fire during Operation Urgent Fury in Grenada. Ten Blackhawks sustained battle damage during the assault, and four were destroyed. This helicopter was the culmination of fourteen years of work that started in 1965. As survivability was one of the design criteria for the Blackhawk, this thesis looked at survivability in context of Operation Urgent Fury. In the end the Blackhawk's performance in Grenada was successful and the Blackhawk was a survivable aircraft in the materiel sense. That being said, the Blackhawk was not survivable when the Army operated outside its own doctrine, tactics, and procedures. Operation Urgent Fury exposed serious shortcomings with the concept of survivability as incorporated into the design of the Blackhawk. The issues of poor intelligence, poor planning, and poor execution contributed to the numerous hits from small arms and anti-aircraft fire that the Blackhawks received, and yet they continued to fly. However it is impossible for any aircraft to repeatedly fly into enemy fire and not take casualties or damage. This is why it is impossible and misleading to separate an aircraft's design for survivability from the doctrine, tactics, techniques, and situations in which it is used.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

SURVIVABILITY ON THE ISLAND OF SPICE: THE DEVELOPMENT OF THE UH-60 BLACKHAWK AND ITS BAPTISM OF FIRE IN OPERATION URGENT FURY, by Major Matthew G. Easley, 93 pages.

In 1983 the UH-60 Blackhawk faced its baptism of fire during Operation Urgent Fury in Grenada. Ten Blackhawks sustained battle damage during the assault, and four were destroyed. This helicopter was the culmination of fourteen years of work that started in 1965. As survivability was one of the design criteria for the Blackhawk, this thesis looked at survivability in context of Operation Urgent Fury. In the end the Blackhawk's performance in Grenada was successful and the Blackhawk was a survivable aircraft in the materiel sense. That being said, the Blackhawk was not survivable when the Army operated outside its own doctrine, tactics, and procedures. Operation Urgent Fury exposed serious shortcomings with the concept of survivability as incorporated into the design of the Blackhawk. The issues of poor intelligence, poor planning, and poor execution contributed to the numerous hits from small arms and anti-aircraft fire that the Blackhawks received, and yet they continued to fly. However it is impossible for any aircraft to repeatedly fly into enemy fire and not take casualties or damage. This is why it is impossible and misleading to separate an aircraft's design for survivability from the doctrine, tactics, techniques, and situations in which it is used.

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ACRONYMS

ADM	Admiral
CPT	Captain
DOTLMPF	Doctrine, Organization, Training, Leadership and Experience, Materiel, Personnel, and Facilities
GEN	General
MG	Major General
RFP	Request for Proposal
SEAD	Suppression of Enemy Air Defense
SEAL	Sea, Air, Land
TF	Task Force
USLANTCOM	United States Atlantic Command
UTTAS	Utility Tactical Trasnport Aircraft System
VADM	Vice Admiral

CHAPTER 1

INTRODUCTION

The sound of rotor blades shattered the quiet morning of October 25, 1983 in Grenada as nine UH-60 Blackhawk helicopters spread across the island, delivering Special Forces operators to their objectives. After a power struggle led to the killing of Maurice Bishop, the revolutionary leader of the last four years, the United States military intervened in the tiny island nation. In its first major operation since the end of the Vietnam War, the President of the United States sent the military to rescue American medical students at the St. Georges University. Although significant combat operations were over in the first three days, American forces remained on the island until the middle of December. The operation was a success. All of the American medical students returned safely to the United States, and the pre-revolutionary government of Grenada regained power.

Just as the U.S. military was in its first major operation since Vietnam, the Blackhawk helicopter, born directly out of the Army's helicopter experience in Vietnam, saw its first combat in support of Operation Urgent Fury.[1] In 1965 the Army approved the requirements for the Utility Tactical Transport Aircraft System (UTTAS), intending it to replace the UH-1 Iroquois (better known as the Huey). Due to the war in Vietnam the Army delayed the UTTAS until the 1970s, and in 1972 issued a request for proposal to the aviation industry.[2] The proposal for the UTTAS called for increased payload and improved maintainability, reliability, survivability, and performance over the UH-1 it was going to replace.[3] After evaluating the initial entries, the Army awarded contracts to Boeing-Vertol and Sikorsky to develop a UTTAS prototype, and in December 1976 the

Army selected the Sikorsky design. Three years later Sikorsky delivered the first UH-60 Blackhawk to the Army.

By October 1983, the Army had accepted over 400 Blackhawks from Sikorsky for operational use.[4] The Army assigned the new Blackhawk to the units most likely to use it, rapid response and air mobile units including the 101st Air Assault Division, the 82nd Airborne Division, and Task Force (TF) 160th, the Army's Special Operations Aviation Regiment. Blackhawks from two of these units took part in Operation Urgent Fury, TF 160th on the first day and the 82nd Airborne starting on the third day. TF 160th was an elite unit whose mission was to transport Special Forces in secret operations.[5] The TF 160th pilots were "the Army's best."[6]

In Grenada, nine Blackhawks operated as part of TF 160th. Although they were supporting three different missions, all nine of the TF 160th Blackhawks suffered damage from enemy small-arms fire on the first day of the operation.[7] One pilot perished from the small-arms fire, while several passengers died from either the enemy fire or the crash of one of the Blackhawks. The crash completely destroyed the helicopter as it struck a hilltop, igniting the fuel and starting a fire.[8] Due to the extensive damage they received, all eight of the remaining aircraft were unavailable for missions by the second day of the operations.

The 82nd Combat Aviation Battalion brought additional Blackhawks, eight of which were part of the Ranger air assault on the Calivigny Barracks on October 27.[9] In the assault, three of the four Blackhawks in the first flight crashed during the initial assault as a result of small arms fire, even after an intensive artillery preparatory bombardment and close air support.[10] Despite the crashes, only one Blackhawk

crewmember died, although four Rangers died from the spinning rotor blades of one of the Blackhawks as it crashed. The remaining four Blackhawks safely landed without incident and accomplished the mission. Three days of fighting saw four Blackhawks completely destroyed while ten others received varying amounts of damage.

Shortly after the operation concluded, William Lind, a defense aid to Senator Gary Hart (D-CO), criticized the military invasion and published several written allegations about the operation. He focused on the high number of helicopters damaged and destroyed as well as questioning the usage and survivability of helicopters in a war where there is no neat front line. The Joint Chiefs of Staff (JCS) responded in writing to all of Mr. Lind's allegations. The JCS wrote, "All combat damaged Black Hawks completed their missions" and that helicopters have limitations on the battlefield but "provide essential firepower and mobility."[11]

After Congress initiated hearings on the operations, the senior military leaders testified before the House Committee on Armed Services in January 1984. During his testimony, Vice Admiral (VADM) Joseph Metcalf, the on scene commander of the overall Combinted Joint Task Force (CJTF), called the Blackhawk a "superb airplane."[12] When Represenative Duncan Hunter (R-CA) directly asked Major General (MG) Edward Trobaugh, the 82nd Airborne Division commander, how the Blackhawk compared to the UH-1, he responded that the Blackhawk was a "much more survivable aircraft."[13] According to the senior leadership testimony before the House Committee, the Blackhawk had performed well in an operation that was a "complete success."[14]

As of April 2015, Sikorsky has produced over 2,300 Blackhawks for the United States and twenty-four other nations.[15] Blackhawks have flown missions in support of

every major U.S. military operation since 1983 to include, Operation Just Cause in Panama, Operations Desert Shield and Desert Storm, Operation Enduring Freedom, Operation Iraqi Freedom, and many more in between. However the questions raised by the House Armed Services Committee still hold; was the Blackhawk a "superb airplane" that "completed their missions" or were the loss of nine helicopters, including four Blackhawks, a high number in an operation that lasted only three days?

To answer these questions one must first look at the criteria developed for selection of the Blackhawk. The areas stated in the request for proposals (RFP) were maintainability, reliability, survivability, and performance. Three of these criteria are relatively easy to measure with quantifiable data in terms such as man hours for maintenance tasks, operational readiness rates, cruise speeds, payload, etc. The goal of this thesis is to examine the criterion that is harder to quantify: survivability.

The problems of helicopter survivability design are simple while the solutions are bewilderingly complex. One design expert describes a basic problem of helicopters, "The reality which cannot be avoided is that any slow moving, noisy and relatively soft vehicle operating in close proximity to the ground and hostile ground forces is an inviting target for a wide range of weapons, be they man portable or carried by vehicles or other aircraft."[16] The Vietnam War dramatically highlighted this fact when approximately 5,000 aircraft were lost to enemy ground fire from 1963 to 1973 in Southeast Asia.[17] A study of helicopter losses indicated that 94 percent of the combat losses were due to small arms and automatic weapons fire.[18] These 5,000 lost aircraft does not include the impact of the number of crewmembers and passengers killed or wounded, the number of missions aborted or degraded, or the number of missions conducted to recover a downed

aircraft. The true impact of an aircraft being shot down is hard to measure when considering the second and third order effects. However the number of aircraft lost indicates how important incorporating survivability into aircraft design can be.

As both the UTTAS Material Needs Statement and Development Concept Paper discuss survivability and the subordinate concept, vulnerability, one needs to understand what that means in terms of helicopter design. Helicopter design is part of the materiel aspect of the Defense Department's system for addressing any gaps in capabilities, known as DOTMLPF. This stands for doctrine, organization, training, materiel, leadership and education, personnel, and facilities. Once the Department of Defense identifies a capability gap in the existing military, it will determine where a solution falls in the DOTMLPF framework.[19] The design of a new helicopter is a materiel solution.

Army Regulation 70-75: Survivability of Army Personnel and Materiel, defines combat survivability as "the capability of a system to avoid (susceptibility) or withstand (vulnerability) man-made hostile environments."[20] When discussing something as complex as a helicopter and crew, the regulation defines it as a system of systems and divides survivability into four areas: mission, functional, platform, and personnel.[21] Mission survivability is simply being able to accomplish the mission while functional is the ability to contribute to the mission even if unable to complete it.[22]

Platform and personnel survivability deserve greater examination. Platform survivability, in this case the platform is the UTTAS, is the aforementioned ability to avoid or withstand man-made hostile environments or crucially for this study, "the ability to contribute again after repair or reconstitution."[23] This ability to contribute again is a key factor. The regulation does not specify the level of repair or the amount of time

needed. A helicopter that is easily damaged to the extent it requires evacuation to a depot or months of repair cannot be thought of as very survivable.

Finally, personnel survivability is the integration of the individual soldier and how the system affects the soldier's survivability. The UTTAS should enhance the survivability of the crewmembers and passengers in the context of accomplishing its combat mission. Although combat is inherently unsafe, the features of the UTTAS should make the helicopter safer, not more dangerous.

Beyond the Army's idea of survivability, how does helicopter design address survivability? Just like AR 70-75, survivability for aircraft design is typically divided into two areas; susceptibility, the likelihood an aircraft gets hit, and vulnerability, the likelihood the aircraft is killed by the hit.[24] The ability to fly undetected and the ability to take effective evasive action if detected, deal with susceptibility and are covered under the Army's definition in the sense to avoid man-made hostile environments.[25] This can be accomplished through some design aspects and performance characteristics such as speed, maneuverability, or low radar signature. Beyond design and engineering factors, another way to decrease an aircraft's susceptibility is through tactics such as nap of the earth flying or degrading enemy detection systems.

Vulnerability, the other aspect of survivability, is also seen as the ability to absorb punishment and protect the crew, and it is the one aspect most clearly related to helicopter design.[26] The damage most likely to lead to the loss of a helicopter "involves primarily damage to the flight critical systems and airframe components. Heavy damage to engines, gearboxes, rotor heads and blades, flight controls and hydraulics are most prominent."[27] To compensate for damage to a critical system, a helicopter can have

redundant systems, “fully independent of the other” so “that each system be capable of performing all essential system functions whenever the counterpart system is incapacitated for any reason.”[28] Accordingly helicopters often have redundant flight controls, hydraulic systems, and electrical systems which do not of themselves increase performance, but do increase survivability.

For components where redundancy is not feasible, the component can be built to survive a certain amount of damage while still allowing the aircraft to exit the area and land safely. A transmission can be designed to survive the loss of lubrication for periods of time and continue to operate. Fuel tanks can be built to be self-sealing. Armor can be provided to protect crew members and critical components. Parts can be built to withstand bullet strikes. However each one of these design features comes with a tradeoff, generally in the form of increased weight which affects performance and payload. A helicopter could be built with triple redundant systems, be heavily armored, and be composed of very dense materials. However the resulting helicopter would be so heavy as to not be able to carry any passengers or equipment.

Although crashworthiness is not always considered in the definition of survivability, it is closely related and deserves discussion because crashworthiness speaks directly to personal survivability as outlined in AR 70-75. Typically crashworthiness comes up in the discussion of accidents. It is “imperative that [a helicopter] be engineered to minimize damage and enhance occupant survival in crashes.”[29] This concept closely relates to the personnel component of the AR 70-75 definition of survivability, which looks at the integration of the individual’s survivability and how the system affects it.

Whether an aircraft crashes due to an accident away from combat or due to enemy fire, the principles of crashworthiness remain, to enhance occupant survival.

Prior to the Army's examination of combat losses in Vietnam, crashworthiness was not integrated into the design of helicopters used by the military. Crashworthiness was only integrated in the design of certain civilian helicopters used in agricultural.[30] However crashworthiness, to be most effective, should not be an afterthought whose features are only added on after the aircraft was designed and built. It must take a whole system approach and receive the same amount of consideration of other design factors such as performance factors to be effective.[31]

As part of this whole system approach to crashworthiness and the larger concept of survivability, in 1967 the U.S. Military, in partnership with the aviation industry, conducted a review of light fixed-wing and rotary-wing aircraft crash data. This resulted in the publication of the first crash survival design guide in 1967, which eventually became a military standard known as MIL-STD-1290 in 1974.[32] Although MIL-STD-1290 was published after the UTTAS Request For Proposal (RFP), the crash survival design guide it was based off of was already in its second revision in 1971. The aviation industry in 1972 was well aware of the design suggestions and criteria found in the guide. The UTTAS RFP required adherence to the crash survival design guide to emphasize the importance of survivability in the design phase.[33] Focusing on crashworthiness, the guide addresses five key areas: the structure, tie-down chain strength, occupant acceleration environment, occupant environment hazards, and postcrash hazards.[34] This guide successfully influenced the design of the UTTAS prototypes precisely because the RFP

required adherence to it, and crashworthiness was considered during the initial design of the aircraft, not as an afterthought.

This inclusion of crash performance and survivability design features is a direct result of the Army decision to include survivability in its RFP. Before the UTTAS, aircraft designers did not focus on crashworthiness or survivability because features that improved crash and survival characteristics usually had a negative impact on performance. Thus improved crashworthiness came at a cost, "expressed in increased base price, decreased performance, or increased weight."[35]

The addition of survivability in the UTTAS criteria changed the calculations. Improved survival performance still came at a price, but as it was a component of the RFP just as performance was, aircraft designers had to take it into consideration. Conscious decisions must be made as to the trade-off between the different components of the RFP. Consequently design is always a balance between different characteristics. As evidence of the complexity of this problem, the contract the Army signed with Sikorsky for a prototype had 437 pages describing aircraft specifications on everything from payload capacity to air transportability to the ability to withstand hits from weapons up to 23-mm caliber. Earlier helicopter acquisition RFPs made no mention of specific caliber weapons to withstand or even survivability at all.[36] This balance of survival versus performance was the dilemma that faced the companies which proposed to build the UTTAS. This balance was what the pilots of Blackhawks in Grenada would encounter in combat.

Based on the performance of these Blackhawks in Operation Urgent Fury and these definitions of survivability, was the Blackhawk a survivable aircraft as testimony to

the House Armed Services indicated? To answer that, this thesis will seek to answer the following questions. Did the Black Hawk accomplish all of its assigned missions? Were the aircraft readily available for follow on missions? Additionally this thesis will touch on the following question. Is the current definition of survivability in Army Regulation 70-75 adequate?

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CHAPTER 2

UTTAS AND THE UH-60 BLACKHAWK INITIAL FIELDING

To understand the performance of the Blackhawk in Grenada, it is first necessary to look at the history of the UH-60 Blackhawk, its development and fielding. To understand survivability and how it was incorporated into the Blackhawk design, one must first look at the development of Army Aviation, and in particular the driving requirements for the utility transport helicopter.

These requirements start with the Marine Corps. In 1946 Marine Lieutenant General Roy Geiger witnessed the atomic bomb tests at Bikini Atoll. Concerned that the atomic bomb meant large scale amphibious invasions were obsolete, he wrote a letter to the Commandant of the Marine Corps, General Alexander Vandergrift, and requested that the Marine Corps "use its most competent officers in finding a solution to develop the technique of conducting amphibious operations in the Atomic Age."[1] In response to this note, General Vandergrift immediately convened a board headed by Major General Lemuel Shepherd to study the future of amphibious assault.[2] After several months of study the board recommended that the helicopter was the future of the Marine Corps.[3] In December 1946 the General Vandergrift endorsed the recommendation and established the first Marine Corps helicopter squadron.[4]

At the time of the Commandant's decision, only seven years had elapsed from Igor Sikorsky's first free flight in a helicopter and only four years from the inaugural flight of the R-4, the first mass produced helicopter.[5] In 1946, the helicopter was small and underpowered. Yet the Marine Corps board under MG Shepherd recommended specifications for helicopters to execute assaults with a 5,000 pound payload for 200-300

miles at 100 knots and altitudes from 4,000 to 15,000 feet.[6] This was far beyond the capabilities of existing helicopters, but aviation industry experts believed they could meet these requirements with current technology.[7] Initial operational tests and experiences proved this belief to be well founded and were very successful.

In 1948, two years after the creation of the first Marine Corps helicopter squadron, Marine helicopters took part in an amphibious exercise in North Carolina and simply bypassed enemy beach defenses to land Marines behind enemy lines to accomplish their mission. This success led to the publication of the Marine Corps Manual PHIB-31, *Amphibious Operations: Employment of Helicopters* in November 1948.[8] Some of the benefits of the helicopter extolled by the manual include greatly enhancing the speed and flexibility of the assault as well as the ability to land assault forces accurately, a problem for amphibious assaults.[9] The manual did recognize one of the most important drawbacks of a helicopter assault, the "vulnerability of the helicopter in landing."[10]

With its helicopter squadron and doctrine, the Marine Corps led the innovation of using helicopters at the start of the Korean War. Immediately upon the invasion of South Korea in 1950, the Marines sent four helicopters to support operations within the Pusan Perimeter. This was the first of many helicopters which saw extensive use in the Korean War as air ambulances and reconnaissance aircraft. The efforts of these Marine helicopters and follow on units provided the true impetus leading to the expansion of Army aviation. After observing the overall war effort in Korea, then Major General James Gavin published an article in *Harper's* magazine in April 1954 titled, "Cavalry, and I Don't Mean Horses."[11] MG Gavin focused on cavalry as the arm of mobility

because of the speed of cavalry units compared to other land forces. Further he believed that the helicopter was one of the major innovations that would lead to this mobility.[12] Gavin was an early proponent of helicopters as part of the future of the Army and his position of authority and efforts led to the placement of like-minded people in positions of authority.

Although Gavin focused on the Army's experience in Korea and his suggestions emphasized the cavalry branch within the Army, the Marine Corps again led the way in innovation. In 1956, the Fleet Marine Force Organization and Composition Board, headed by Major General Robert Hogaboom, who had helped write the original PHIB-31 manual on using helicopters in amphibious assaults, recommended that Marine divisions should possess the capability to do all-helicopter assaults.[13] This recommendation was approved by the Commandant of the Marine Corps, and the Corps enthusiastically tackled the problems of implementation. By 1961, just five years later and after reorganizing the structure of the Marine division to make it smaller and air transportable, Marines were able to execute multiple battalion level air assaults from ships.[14]

In 1960, four years after the Hogaboom Board, the Army Aircraft Requirements Review Board, known after its chairman Lieutenant General Gordon B. Rogers as the Rogers Board, continued the trend of helicopter innovation and evaluated 119 helicopter design concepts.[15] The board selected several for Army aviation purposes, including the UH-1 Iroquois (better known as the Huey) of Vietnam fame. The UH-1's original purpose was as an aerial ambulance, but later models such as the UH-1D and later UH-1H were the true precursors to the Blackhawk.[16] The UH-1D and UH-1H were utility

helicopters used extensively in Vietnam in every role from transport to air assault to attack helicopter.

Despite the efforts of the Marines and the Army's Rogers Board, Secretary of Defense Robert McNamara was not satisfied with the efforts of the military, and in particular the Army, in pursuing new helicopter capabilities. In 1962 he wrote two memoranda to then Secretary of the Army Elvis Stahr, Jr., directing the Army to "completely reexamine its quantitative and qualitative requirements for aviation."[17] Secretary McNamara even suggested Lieutenant General Hamilton Howze be one of the members of a board that would oversee the Army's review of its aviation structure.

LTG Howze was one of Major General Gavin's disciples and already appreciated the importance of helicopters and mobility for the military. Secretary of the Army Stahr selected LTG Howze as the chairman of the 1962 U.S. Army Tactical Mobility Requirements Board, which became known as the Howze Board. This board was the culmination of several years of debate over the future of helicopters in the military and army aviation. In LTG Howze's brief of the primary proposals of the board, he listed all of the benefits of greater mobility and concluded that incorporating more helicopter assets would have an "enormously vitalizing effect" on the entire Army and would "strengthen our national reaction to whatever challenge the future may hold."[18] In short the Howze Board found that air mobile units equipped with helicopters had the advantage of "mobility, utility in delay operations, ability to ambush, and direct firepower capability."[19]

Less than a year later these ideas found their way into policy. Army Field Manual 57-35, Airmobile Operations, stated airmobile forces "permit the commander to take

advantage of the speed and flexibility of Army aircraft in accomplishing a wide variety of tasks."[20] This idea mirrored the Marine Corps manual PHIB-31 published fifteen years earlier. With the publication of FM 57-35, the Army caught up with the Marine Corps, and the role of helicopters was finally codified in Army doctrine.[21]

The most significant recommendation from the Howze Board was for the formation of five air assault divisions for the active duty Army. During the Vietnam War, the Army only formed one air assault division, the 1st Cavalry Division. This division demonstrated the benefits of helicopter mobility during battles such as the Ia Drang, made famous by the book and subsequent movie, "*We Were Soldiers Once…And Young*." Utility helicopters with armed escorts were "the single most important means of fighting" in Vietnam, as evidenced by the rapid growth of Army helicopters from 2,489 at the end of the 1950s to 9,528 at the end of the 1960s.[22] However as losses among helicopters and aircrews mounted in Vietnam, questions were raised about the vulnerability of helicopters and their place in future operations.[23] Of the 7,000 UH-1s to serve in Vietnam, the war saw the destruction of over 3,300.[24]

The issue of vulnerability was not new. The Marines in 1948 had already raised the issue of helicopter vulnerability in their PHIB-31. The Army also recognized the problem prior to experience in Vietnam. Although not as prominent in the Howze Board's final report but more relevant to the experience of helicopter losses in Vietnam and the development of the Blackhawk was the Howze Board's observation "vulnerability of an aircraft was…a continuing consideration."[25] A helicopter had to stay airborne to accomplish its mission and damage the enemy. An aircraft easily shot down

by enemy fire is worthless for air assault missions or missions likely to see enemy contact.

Despite their reservations on helicopter vulnerability, the Howze Board remarked that helicopters were "less vulnerable than most previous estimates indicated" due to newly developed techniques and tactics.[26] For further development the Board recommended looking at lightweight armor protection for crew and critical aircraft parts as well as self-sealing fuel tanks, claiming that design improvements can reduce the helicopter's vulnerability.[27] Although too late to effect the development of the UH-1, which was already in service, the idea of design improvements to increase survivability would bear fruit in the Utility Transport Tactical Aircraft System (UTTAS).

The history and experience of helicopter innovation in the military in the 1940s, 1950s, and 1960s, from the Marines to the UH-1, were the basis for the UTTAS design and Blackhawk fielding. Although the Howze Board's report came out in 1962 and stated, "The UH-1 is a fine family of helicopters, good enough in general performance to do excellent service over the next several years," a new aircraft was quickly sought.[28] The experience of high aircraft losses and limitations of the UH-1 in Vietnam challenged the Howze Board's assessment that the UH-1 would last for several years. In 1965, although the UH-1 had only been in operational service for three years and was still proving itself in Vietnam, the Department of the Army staff recognized the UH-1 "possess serious operational shortcomings, especially in troop assault operations."[29] Additionally the UH-1 proved to be very vulnerable to ground fire, which led to high losses among aircrews and aircraft.[30] Of the 7,000 UH-1s to serve in Vietnam, over 3,300 were destroyed with the loss of the lives of over 2,100 pilots and crewmembers.[31] This

vulnerability to ground fire stemmed from the simple fact the UH-1 was not originally designed for the air-mobility mission, but was rather originally designed for the air-ambulance role.[32]

In 1965, the Department of the Army staff directed the U.S. Army Combat Developments Command to develop a Qualitative Material Development Objective for the Utility Transport Tactical Aircraft System (UTTAS). The UTTAS's major requirements were "increased payload and substantially improved maintainability, reliability, survivability, and performance."[33] Despite this initial effort at developing the UTTAS, as the war in Vietnam expanded and the number of UH-1s produced increased, the decision to develop the UTTAS was delayed but not cancelled.

During this delay, Bell Helicopter, maker of the UH-1, recognized they would lose a major share of their government business if the UH-1 was replaced. They submitted a formal Engineering Change Proposal on March 10, 1970, advocating an upgraded UH-1H instead of a UTTAS.[34] In response the Army conducted cost effectiveness studies and determined that it would be cheaper to field the UTTAS rather than the upgraded UH-1.[35] Even so the upgraded Bell aircraft, the UH-1H+ as it became designated, was eventually considered in the competitive testing stage of the program in 1976.

Before the testing of the UH-1H+ or any UTTAS prototype, the Army had to renew the development of the UTTAS, which was still on hold. In February 1971 General Bruce Plamer, the Vice Chief of the Staff of the Army approved the recommendation to continue the development of the UTTAS, and on June 22 Deputy Secretary of Defense David Packard officially announced the decision to the aviation industry. The projected

program was for over 1,000 aircraft worth over $1 billion in 1971, with the potential for more if the other services chose the UTTAS for their purposes. At the time it was the second largest helicopter program after the UH-1, which it was replacing.[36]

Although the decision to develop the UTTAS was made, the first step was the development of a new engine which would have superior performance characteristics to existing engines, allowing the UTTAS to have a greater payload and performance over the UH-1. Greater performance to include speed and maneuverability would allow the UTTAS to avoid enemy fire, which came under the idea of susceptibility. An aircraft that is less likely to be hit is more survivable. The request for proposal for the engine went out in July 1971 and eventually General Electric was selected to develop an engine to power the UTTAS. In January 1972 the request for proposal was sent out for the UTTAS airframe. The summary of the requirement was clear:

> The Utility Tactical Transport Aircraft System is being developed to replace the Army's current utility helicopter, the UH-1, in air assault, air cavalry, and medical support units. It is a twin-engine helicopter that will provide the Army with increased operational capability because of its greater internal size and lift capability. Design improvements and increased performance make the aircraft less vulnerable to enemy fire. Improved reliability, maintainability, availability, survivability, and performance were primary factors in the justification for this development.[37]

The UTTAS would be the first true squad assault helicopter as one of its requirements was to transport 11 fully-equipped combat troops, the size of a full infantry squad.

The payload capacity was not the only unique aspect of the UTTAS. For the first time in history, the request for a new military helicopter included stringent requirements on ballistic and crash survivability.[38] The 1967 Army and aviation industry study on fixed and rotary wing combat losses in Vietnam was in preparation for the release of the UTTAS request. The study focused on reducing the vulnerability of the next generation

of helicopters to small arms and machine gun fire.[39] The UTTAS Materiel Needs Statement listed the priority of characteristics for the UTTAS with vulnerability fourth behind performance, maintenance and reliability, and air transportability.[40] The fact it was included at all in the major characteristics is a significant change, as vulnerability was now a criteria to be considered in selecting the UTTAS.

Survivability was even one of the factors in the cost analysis which determined developing the UTTAS was more effective than an upgraded UH-1H. One of the major considerations comparing the UH-1H+ to the UTTAS was that fewer UTTAS would be needed to transport the same number of troops than UH-1H+'s. A typical air assault company would require fifteen Blackhawks, whereas it would need twenty-three UH-1H+'s to accomplish the mission.[41] Although this payload increase was a key performance threshold described in the Development Concept Paper for the UTTAS, a Government Accounting Office study of the UTTAS program cited the additional capabilities of the UTTAS with "respect to speed, maneuverability, safety, and survivability" which would make it more cost effective than a UH-1H+.[42] The fewer UTTAS that were shot down and destroyed, the fewer the Army would have to buy to maintain the same capability.

After the request came out, three companies submitted proposals, Bell Helicopter, makers of the UH-1, Sikorsky, with no current helicopters under contract with the Army, and Boeing-Vertol, makers of the CH-47 Chinook. In August 1972, contracts were awarded to Sikorsky and Boeing-Vertol to design and develop prototypes designated as the YUH-60A and the YUH-61A respectively. The Army contracts called for five prototypes from each competitor, three flying and the other two for ground testing. Both

Sikorsky and Boeing-Vertol decided to build a company owned prototype for further research and design. Also during this time period the Army decision to include upgraded UH-1H in the flight testing phase increased the level of competition, as the Army reconsidered developing a new aircraft versus fielding the UH-1H+. The companies delivered the flying prototypes to the Army for testing in March 1976. Because the UTTAS was so important to the future of Army Aviation, the evaluation program developed was extremely thorough.[43] The Army conducted eight months of flight testing, 611 total flight hours on three UH-1H+ aircraft, and 650 flight hours each for the Sikorsky and Boeing-Vertol designs.[44] On December 23, 1976, the Army notified Sikorsky that it had won the production program.

In designing the aircraft that became the Blackhawk, Sikorsky incorporated many design features to increase survivability. The Blackhawk was the first helicopter built according to the Crash Survival Design Guide borne of the 1967 joint government and aviation industry study of crash data.[45] Designing an aircraft to be survivable in a crash has the side benefit of being more survivable in combat. An aircraft that comes through a crash relatively intact is easier to repair and return to combat. Some of the features in the Blackhawk include self-sealing, crashworthy fuel tanks, ballistically tolerant tail rotor blades, controls, and drive shafts, including up to 23mm for main rotor blades and structure, and armored cockpit.[46] Additionally, where feasible the Blackhawk included redundant systems to include flight controls, hydraulics, and electrical systems. Of course all of these features had a tradeoff in performance data, but as survivability was a design criteria, Sikorsky decided that the compromises were worth it to produce the best overall aircraft.

Although the UTTAS evaluation considered survivability features, the testing primarily focused on performance characteristics such as engine power, hover power required, and cruise airspeed. Evaluations could also assess maintenance and reliability, the other characteristics found in the RFP, through calculating factors such as maintenance man hours required for flight hour and number of flight hours between failures of a component. However one of the Sikorsky prototypes crashed during testing, providing an opportunity for a real life demonstration of the survivability characteristics built into the airframe as recounted below.

During a night mission on August 9, 1976, a Sikorsky prototype, with a crew of three and eleven passengers, experienced a severe vibration. The pilot decided to make a precautionary landing into what he believed was a cornfield near Fort Campbell, KY. The corn field was actually a dense forest of mature pine trees. As the rotor blades made contact with the tops of the pine trees, they severed over forty trees, including some as large as five inches in diameter. Nevertheless the pilots were able to make a controlled landing and the only injury occurred when a soldier jumped out and bumped his head against one of the pine trees. The only major damage to the aircraft was to the four main rotor blades and the four tail rotor blades. No damage to any of the flight critical components of the aircraft, including fuel or oil leakage from the hard landing was noted.[47] Only three days later, after replacing the rotor blades, the aircraft took off and returned to Fort Campbell.

In earlier helicopter designs, crashes similar to this resulted in severe injuries to the crew and significant damage to the aircraft.[48] However the Sikorsky design succeeded admirably in protecting the crew and passengers as well as having a durable design that

withstood damage. Afterward the UTTAS project manager sent a letter to the president of Sikorsky and stated, "I must say it was an excellent demonstration of the ruggedness of your aircraft to have it flown back to the test site…This speaks extremely well of its structural integrity."[49] What could have been a disaster for the Sikorsky prototype turned out to be an excellent demonstration of the survivability features built into the aircraft.

Despite the experience of the UTTAS prototype crash, the Blackhawk's survivability could only be truly tested on a battlefield. The four aspects of the Army's definition of survivability, mission, functional, platform, and individual were only indirectly evident during testing. Beyond the Army definition, the ideas of susceptibility and vulnerability in aircraft design are important aspects of survivability to consider in assessing the Blackhawk. The Army's definition and these two concepts of susceptibility and vulnerability are the focus of the next three chapters in the context of Operation Urgent Fury.

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CHAPTER 3

OPERATION URGENT FURY: THE BAPTISM OF FIRE

The Coup

The origins of Operation Urgent Fury, the American operation on the island country of Grenada, lies with the 1979 coup which saw the Marxist-Leninist New Jewel Movement seize power. Only five years earlier in 1974 Grenada had acquired independence from the United Kingdom. During the elections in 1976, various political parties accused each other of voter fraud, leading to the New Jewel Movement launching a paramilitary attack on the government.[1] In 1979, Maurice Bishop, the leader of the New Jewel Movement, successfully seized power, suspended the constitution, and invited Cuban experts to assist in developing Grenada's health, literacy, and agriculture.[2] Cuban advisors also helped train the People's Revolutionary Army and People's Revolutionary Militia using Soviet weaponry while a 650 man workforce worked on the construction of an international airport at Point Salinas.[3] Bishop intended to keep developing the Grenadian military as Grenada was planning on receiving fifty armored personnel carriers, sixty anti-tank guns, fifty rocket launchers, sixty mortars, and 2,000 AK-47 rifles from 1983-1985.[4] Despite this Cuban and Soviet assistance, Bishop kept Grenada as a non-aligned country, and was in many ways a moderate socialist leader.

Although Grenada was a tiny island country of 133 square miles with a population of only 91,000 people, the United States did not ignore the events on the tiny nation. Bishop's moderation and refusal to align publically with the Soviet Union or Cuba enabled the United States to remain passive through the four years of Bishop's rule.

However the Cold War meant the United States believed it could not ignore Grenada even if they did not intervene initially at Bishop's seizure of power.

Grenada, as the southernmost Windward Island in the Caribbean Islands, was very close to the sea lanes through which 56 percent of American imported oil sailed.[5] The United States Department of Defense was concerned with a communist country having such easy access to disrupt American oil.[6] Additionally piquing the American interest and concern was the international airport the Cubans were constructing at Port Salinas. According to Bishop, the main runway was going to be over 9,000 feet long to support tourism.[7] However the United States could find no evidence that Grenada was building any hotels or resorts to bring in these tourists.[8] Instead President Ronald Reagn talked of the "Soviet-Cuban militarization" of Grenada and hinted that the airfield was for the Cubans to support their efforts in Africa and the rest of the Caribbean, while the Soviets would have the use of an additional forward base.[9]

The final major strategic concern for the United States was Grenada's physical location in the Caribbean, which ensured that the United States would remain interested. With a Communist Cuba to the north and Communist Nicaragua to the west, a Communist Grenada encompassed the Caribbean in a strategic triangle. In the event of the Cold War turning hot in Europe, half of American reinforcements would travel through this triangle, which was becoming more dangerous as Communism spread.[10] Despite all of this interest, the United States stayed out of Grenada and simply watched events unfold. In fact the United States had no CIA or other intelligence representation on the island, a fact which led to the dearth of intelligence affecting planning and execution of operations in the future.[11]

Although Bishop's moderation kept Grenada from becoming a battleground of the Cold War, it also led to disagreements with senior members of his government, including Bernard Coard, the Deputy Prime Minister. Coard believed Bishop lacked a true revolutionary spirit and orchestrated a coup against him at midnight on October 12, 1983. The plotters, with Coard as their head, placed Bishop under house arrest, but when a street demonstration freed Bishop, the plotters recaptured him and executed him on October 19. In many ways this was a serious miscalculation on the part of the coup plotters. Although the coup leaders feared Bishop's popularity, Fidel Castro considered Bishop to be a personal friend and refused to support the coup or provide additional help for Grenada, even publically announcing the policy of Cuban non-intervention in Grenada's affairs.[12]

After the Cuban refusal, Coard turned to the Soviet Union for assistance. However the Soviet Union also declined to assist Coard's government because they did not believe that Grenada had any strategic value and intervention in Grenada was not worth the risk of confronting America in its backyard.[13] In response to his failure to garner any international support, Coard resigned after only twenty-four hours in charge.[14] Into this vacuum stepped the People's Revolutionary Army, which formed a military government with Defense Minister General Hudson Austin as the chairman.

At this point the United States and Great Britain became much more interested in the happenings of the tiny nation. For Great Britain, Grenada was still a constitutional monarchy with the Queen of England the head of state. The Governor-General of Grenada, Sir Paul Scoon, was the Queen's agent on the island, but he was also responsible to the Grenadian Prime Minister. Governor-General Scoon had held the

position under Grenada's first Prime Minister, Eric Gairy, who Bishop overthrew in his 1979 coup. However Bishop and Coard decided to keep Sir Paul Scoon as the Governor-General "because [they] valued his concepts of patriotism and duty."[15] During the 1983 coup, the military placed him under house arrest. In addition to being the representative of the Queen of England, Governor-General Scoon also played a part in justifying the United States intervention. He signed a letter asking for assistance from the United States, Barbados, Jamaica, and the Organization of Eastern Caribbean States.[16]

In contrast to the British constitutional interest in Grenada, the United States interest was more strategic. Whereas Bishop was a moderate socialist who did not completely align with the Soviet Union or Cuba, the United States saw Coard and the military as much more anti-US and an "immediate threat" to foreigners in Grenada.[17] Almost immediately the United States started planning to evacuate over 1,000 American citizens from Grenada. To complicate this process, over 650 of the Americans were students who attended the St. George's University School of Medicine on the island. The American government feared these students and other Americans could become hostages of a hard line communist government. The Iran hostage crisis had only ended two and a half years previously, and the memories were still fresh.[18]

On October 19, the day the military executed Bishop, Milan Bish, U.S. Ambassador to Barbados who had responsibility for Grenada, reported to Washington that the United States should "now be prepared to conduct an emergency evacuation of U.S. citizens in Grenada."[19] In fact on the same night, the Joint Chiefs of Staff issued a warning order for a possible non-combatant evacuation operation to the commander of US Atlantic Command (USLANTCOM).[20] Thus, although a truck bomb in Lebanon

killed 241 American servicemen on October 23, the next night President Ronald Reagan gave final approval for a military operation to rescue the American students and citizens on Grenada, and not an operation in Lebanon.

At the time of President Reagan's order and despite Bishop's efforts to further equip the military, the Grenadian Army was still smaller than three hundred men with only ten armored personnel carriers, light machine guns, four 23mm anti-aircraft guns, and a militia of fewer than one-thousand men.[21] However the Cuban presence on the island greatly enhanced the capabilities of the Grenadian forces. Although Castro pledged non-interference on the island, he gave orders to the Cuban airport workers, many of whom were military, to defend the facility while other Cuban soldiers supported the Grenadian military's pro-Communists units.[22] Although the forces the American military could bring greatly outnumbered these forces, the defenders did have the advantage of defending an island, and the United States had limited intelligence. The American military would have to determine how best to land their forces on the island to rescue the American students. This set the stage for the use of Special Forces, Marines, and airborne units. To get onto the island these forces would assault a beach, jump from airplanes, and, for the first time in combat, conduct an air assault with the Blackhawk helicopter.

The Plan

The rescue of the American students on Grenada was an opportunity for the United States military to restore its reputation. In the previous decade, the military had watched as South Vietnam fell to Communists two years after the United States withdrawal following the Paris Peace Accords. In 1975 the United States military demonstrated several shortcomings in the Mayaguez Incident, which saw Cambodian

Khmer Rouge forces seize an American merchant ship. In an attempt to rescue the crew, thirteen American servicemen died while three Marines were left behind during the withdrawal and later executed by the Khmer Rouge. To make matters worse, the Khmer Rouge had released the crew so when the Marines retook the ship, it was empty. Furthermore, of the fifteen helicopters used in the operation, only three were still serviceable by the end of the operation. Enemy small-arms fire destroyed or significantly damaged the other twelve helicopters during the daylong operation.

Five years after the Mayaguez incident, the military suffered another humiliation. During the Iran hostage crisis, the military had to abort an attempted rescue mission. Of the eight helicopters involved, three became inoperateive due to dust storms and mechanical issues, while one crashed into a C-130 tanker aircraft, killing eight U.S. servicemen. Out of this failure emerged the 160th Special Operations Aviation Regiment. TF 160th pilots would fly Blackhawks into Grenada on the first day of combat. The failed military operations during the Mayaguez incident and the Iran hostage crisis provide the backdrop for American military planning for Operation Urgent Fury.

On October 12, the day the coup began, the Assistant Secretary of State for Inter-American Affairs, Langhorne Motley, alerted representatives of the Joint Chiefs of Staff (JCS) that it might be necessary to plan a military operation in support of the evacuation of U.S. citizens from Grenada.[23] Two days later, after additional conversations between the State Department and JCS, Lieutenant General Prillaman, the Director of Operations for the JCS, activated a response cell in the National Military Command Center to evaluate the situation crisis and develop possible courses of action.[24] This response cell also began discussions with USLANTCOM, which had primary responsibility for

operations in the Caribbean, to develop a list of options ranging from show of force to a non-combatant evacuation. As events continued to unfold on October 17, Secretary Motley now asked Lieutenant General Jack Merritt, the Director of the Joint Staff, to begin contingency planning for military operations. Having continued discussion with USLANTCOM since the initial warning, the JCS now sent an official warning order, signed by General John Vessey, the Chairman of the JCS, to have Admiral McDonald, the commander of USLANTCOM, submit alternative courses of actions for a non-combatant evacuation operation. These courses should include one or more of the following: plans to seize evacuation points, conduct a show of force, combat operations to defend the evacuation, and peacekeeping.[25]

One of the first issues the USLANTCOM staff identified in planning the operation was the lack of intelligence. They resorted to relying on information from the Organization of Eastern Caribbean States and broadcasts from a ham radio operator on Grenada.[26] The staff developed two primary courses of action, an evacuation with commercial aircraft in a peaceful setting or an overwhelming force of a Marine Amphibious Ready Group, an aircraft carrier battle group, and additional airborne battalions.[27] With these two options in mind, the Special Situation Group, the top crisis management committee of the National Security Council, met to discuss the crisis. They decided that the President of the United States would order intervention as the danger to Americans on the island increased, and that Grenadian forces were likely to resist. Therefore they ordered the Marine Group and the carrier battle group to move to positions closer to Grenada to prepare for possible operations.[28]

As a result of the Special Situation Group meeting, General Vessey gave additional guidance to Admiral McDonald as he oversaw planning for the operation. GEN Vessey suggested that USLANTCOM should also consider using the Army Rangers and units from the 82nd Airborne Division as a follow-on peacekeeping force, and that they should expect to rescue the American medical students in the face of hostile fire.[29] As planning continued President Reagan was brought into the Special Situation Group, which made it a National Security Planning Group, the highest level crisis group. In a meeting with President Reagan in the morning of October 22, the idea of a peaceful evacuation was dropped. The Joint Staff presented two force packages to the President, either a Ranger force or Marine force, with the 82nd Airborne as follow on peacekeepers. The first options called for the Rangers to either parachute on the Point Salinas airfield, or land if the environment permitted. The second plan called for an amphibious and helicopter assault by the Marines.

Although the United States had no intelligence presence on the island, the limited information they did receive from the Organization of Eastern Caribbean States and ham radio operator on the island showed that Grenada was mobilizing reserves.[30] Late on October 22, the JCS decided that neither option utilized enough forces. When the National Security Planning Group issued an order to ADM McDonald to execute an operation to rescue the Americans on October 25, GEN Vessey followed up with the concerns that the original plan did not have enough forces and that USLANTCOM should increase the size of forces.[31]

The next day, October 23, ADM McDonald briefed the JCS on the revised plan. It included four phases of operations. The first phase was known as transitions, and was all

the necessary movement prior to the first units arriving at Grenada. The second phase, insertion, called for a heliborne and seaborne insertion of special operations several hours before dawn, while Rangers and Marines would capture the airfields at Salinas and Pearls respectively. If Grenadians or Cubans resisted, the forces would respond appropriately. The third phase, stabilization/evacuation, was the location and protection of U.S. citizens and other foreigners, while the fourth phase, peacekeeping, was the evacuation of civilians and the disarmament of the Grenadian military. Units from the 82nd Airborne would be on alert shortly before the assault began, and then land approximately nine hours after the Rangers and Marines to take over the fourth phase of the operation. Vice Admiral (VADM) Joseph Metcalf, the Commander of the Second Fleet and the carrier battle group near Grenada, would command the invasion forces known as Combined Joint Task Force (CJTF) 120. The JCS approved the plan with minor changes, including the assignment of Major General Norman Schwarzkopf, of later Desert Storm fame, as the ground advisor to VADM Metcalf.[32]

Although the President had yet to approve the mission, on the morning of October 24, two Sea, Air and Land (SEAL) teams went ashore off of Point Salinas and Pearls to reconnoiter the area and try to fill in the intelligence gaps. The team at Pearls advised the beach did not support the proposed amphibious landing, while the team off Point Salinas disappeared in unexpectedly rough seas, the first American casualties of the operation.[33] Because of this disappearance, ADM McDonald delayed the start of the operation the next morning to allow the SEALs another chance to conduct their reconnaissance.

Preparations continued and on the evening of October 24, after meeting with the JCS and House and Senate leaders, President Reagan gave final approval for the

operation. The final plan approved by the President called for Marines to secure the Pearls Airfields on the north end of the island via a helicopter assault followed by an amphibious assault. Special Forces would use Blackhawk helicopters from the newly formed 160th Special Operations Aviation Regiment to assault and secure police and military targets around the capital of St. George's. Finally, Rangers would either parachute or land to secure the Point Salinas Airfield, the Calivigny barracks, and the True Blue campus of the medical school, where they believed all of the American students would be.[34] Later events demonstrated that the lack of basic intelligence on the location of the American students would lead to additional operations. However this was the plan CJTF 120 executed starting on the morning of October 25.

An additional noteworthy planning factor was the 82nd Aviation Battalion. Supplying aviation support to the entire 82nd Airborne Division, the Battalion included two lift companies equipped with the new Blackhawk. In the initial planning stages, planners asked the battalion commander, Lieutenant Colonel Bob Seigle, how long it would take to fly fifteen Blackhawks to Grenada. When he responded sixteen hours with eleven refueling stops, the planners made the decision to airlift the Blackhawks to Barbados, where they would be readied to fly to Grenada.[35] However the shortage of strategic airlift assets and competing requirements meant that AH-1 attack helicopters belonging to the aviation battalion would not arrive in Grenada until later in the operation. The fifteen Blackhawks that deployed expected to assist in the movement of personnel and supplies during the peacekeeping operations. They would become involved in much more.

Day One

The morning of October 25 found the SEAL team again trying to conduct reconnaissance of the Point Salinas airfield area. After the SEALs failed a second time to accomplish their mission, VADM Metcalf decided to continue the operation anyway. The Marines initially enjoyed great success as they conducted an air assault onto the Pearls airfield at 0500 with CH-46 and CH-53 helicopters. They faced minimal resistance and secured their objectives within the first couple of hours.[36] The rest of the plan was not to go so well.

At the same time as the Marines conducted their air assault, the Rangers planned to either land or parachute onto the airfield at Point Salinas. Aerial reconnaissance by AC-130 Spectre gunships showed the runways were blocked and the decision to parachute was made enroute, which meant Rangers had to rig for the jump in the C-130s. Due to complications from equipment failure, rain squalls, and miscommunication, the first aircraft arrived at the airfield at 0534. Over the next hour and a half, the 1st and 2nd Battalions, 75th Ranger Regiment dropped piecemeal on the airfield into an alerted defense during daylight. It was "a perfect example of how not to conduct an airborne operation."[37] Nevertheless with the support of the AC-130 aircraft the Rangers were able to secure a tenuous toehold on the airfield while suffering only one casualty killed in action.

While the Marines and Rangers secured the two airfields, nine Blackhawk helicopters of the 160th Special Operations Aviation Regiment carried SEALs, Delta Force Operators, and Rangers to several targets around the Point Salinas area. During an early morning briefing the impression among the helicopter crews and Special Forces

was, “We don't know much about the objectives, but don't worry; we will surprise them, and anyway it should be a walkover.”[38] However delays in preparing the helicopters at the base in Barbados meant they did not arrive over Grenada until 0615, in daylight and seventy-five minutes after the Marine attack. The plan called for surprise to overwhelm an ill-prepared force. By the time TF 160th arrived, there was no surprise.

The nine helicopters divided up three concurrent tasks among their force. The first two helicopters took SEALs to secure the Beausejour radio transmitter five kilometers to the north of St. George’s. They received small arms fire and damage enroute but were able to drop off the SEALs at their target successfully. The rest of the Blackhawks suffered much worse. Originally flying as a flight of seven, two Blackhawks split off to rescue the Governor-General at his official residence. The remaining five planned to rescue political prisoners from the Richmond Hill Prison, where the coup members executed the Grenadian leader Maurice Bishop just six days previously, and Fort Rupert, the Army headquarters. As they were flying enroute to these objectives, anti-aircraft guns, machine guns, several armored personnel carriers, and soldiers with personal weapons opened fire on the Blackhawks.[39]

Surprise had been lost. Due to the delay for the attempted SEAL mission, the Blackhawks were flying in daylight instead of night. They had no escorting attack helicopters. There was no suppressive fire from Air Force planes or naval gunfire. Despite the lack of support, the TF 160th pilots pressed on to their objectives. Two Blackhawks headed to the Government House to rescue the Governor-General but suffered from the lack of accurate intelligence, maps, and aerial photographs. They circled repeatedly until they found the house and came to a hover trying to find a suitable

landing area before small arms fire drove them away.[40] Both helicopters received numerous hits from enemy fire and flew to the U.S.S. Guam to refuel and offload wounded soldiers. They made a second attempt, this time successfully delivering their passengers, but once the Special Forces had secured Governor-General Scoon and his family, the enemy fire was too intense for the Blackhawks to return and extract the ground force. Instead the house, Special Forces, the Governor-General, and his family had to withstand a siege from Grenadian forces until the following day.[41]

Although both Blackhawks going to the Governor-General's House suffered damage, they did successfully land the force without any fatalities. The remaining five Blackhawks were less successful. They headed to targets at the Richmond Hill Prison and Fort Rupert, but they were never able to land. Heavy anti-aircraft and small arms fire turned the air assault into a "death trap," and as one observer reported, "everybody seemed to be firing from everywhere."[42] Despite the intense fire and the fact that all five aircraft were hit repeatedly, no one died and all aircraft were still flyable.[43]

The flight of five Blackhawks regrouped over the sea before orders arrived to again attempt the landing. By now it was 6:30 in the morning, and every defender had ample time to prepare for more helicopters. On the second attempt, small arms fire again hit one of the Blackhawks, with five rounds hitting the windscreen just above the armor shield and killing the pilot, Captain Keith Lucas, instantly. His co-pilot, Chief Warrant Officer 2 (CW2) Paul Price, also suffered wounds but attempted to keep the aircraft flying to the south, away from the prison and towards friendly forces near the airfield at Point Salinas. The Blackhawk was hit again. This time there was no keeping it airborne. The helicopter crashed on top of a hill, breaking in half with the rotor blades falling over

the cliff to the sea below. A photographer taking pictures of the Rangers at Point Salinas observed the crash and took several photographs. One person remarked, “It didn’t look the sort of crash anybody would walk away from.”[44] Miraculously several people did, including CW2 Price and another crewmember, Warrant Officer 1 Jon Ecker, who did not receive a single wound. At least three of the Special Forces passengers perished in the crash, although their deaths were not officially admitted.[45]

Throughout the rest of the morning the Rangers continued to secure the Point Salinas Airfield and rescued many of the American college students at the True Blue Campus near the airfield. However the Rangers received a shock when they discovered that less than half of the 650 students lived at the True Blue Campus. The others were at the Grand Anse campus, which the Rangers could not reach on the first day.

At 1405 hours the first planes carrying the 82nd Airborne Division units landed at Point Salinas. Major General Edward Troubaugh, the division commander, discovered that resistance was heavier than expected, that the Rangers had not advanced far past the airfield, and that the Special Forces missions were largely a failure. At that point he sent a message back to his headquarters at Fort Bragg stating, “Keep sending battalions until I tell you to stop.”[46] In the end six infantry battalions of the 82nd would arrive in Grenada during the next three days.

The last noteworthy action that occurred on the first day lie with the Marines. To assist the trapped Special Forces and Governor-General, VADM Metcalf ordered the Marines to conduct an air assault to the north of St. George’s so that they could move to the Government House on the morning of October 26. This helicopter assault was made out of the range of enemy forces in St. George’s and suffered no casualties. It was also

reinforced by an amphibious assault that included M-60 main battle tanks, for which the Grenadians had no firepower to match.

However while this helicopter and amphibious assault was occurring, VADM Metcalf ordered the four Cobras to leave the Marines around Pearls airfield and support the Army at Point Salinas and the Special Forces in St. George's. The Cobras operated as teams of two; while one team refueled, the other team engaged enemy targets. The Army Rangers directed one of the Cobra teams to attack the Revolution Military Council Headquarters at Fort Frederick, the same location the Blackhawks had received effective anti-aircraft fire from earlier in the day. On their fifth attack, one of the Cobras was hit, wounding both pilots and destroying both engines. The crew was able to land the aircraft and both pilots survived, although they were near enemy forces. While one of the pilots was attempting to find help, Grenadian forces shot and killed him. A Marine CH-46 helicopter eventually rescued the other pilot, with the second Cobra providing covering fire. When this second Cobra was finally leaving the area it was hit by anti-aircraft fire. The Cobra immediately crashed into the sea, killing both pilots.

The first day of fighting drew to a close. Three helicopters were destroyed, one Army Blackhawk and two Marine Cobras. Of the eight remaining Blackhawks, all of them suffered damage and were doubtful to be able to support any near term mission. MG Trobaugh had planned to use these helicopters to support his ground forces until his own helicopters arrived on October 27. Now he discovered the 160th Blackhawks could no longer support combat operations.[47] Lieutenant Colonel Bob Seigle, the commander of the 82nd Aviation Battalion, arrived at Point Salinas the night of October 25 to assess the situation prior to his unit arriving. In his view the experience of the first day did not

bode well for his unit. The TF 160th pilots were among the most experienced and combat tested pilots in the Army, averaging over 2,000 flight hours each, but now their aircraft were full of holes. In contrast, the 82nd Aviation pilots had no combat experience and averaged only 600 hours of flight time.[48] However there were some significant mistakes that did not need to be repeated. The 160th Blackhawks had "been sent in unescorted, relying on a docile, sleepy enemy."[49] This was clearly "a flawed plan."[50] When the 82nd Aviation Battalion arrived, they must not repeat the mistakes.

Day Two

The second day started off as the Marines north of St. George's moved into the city and linked up with the SEALs at Government House, finally securing the area and the Governor-General by 0730. In this operation the Marines did not suffer a single casualty as the Grenadians disappeared after only firing a shot or two after the appearance of the Marine tanks. The Marines did not want to bring a helicopter to the Government House, so the Governor-General made his way on foot with his family to the Marine headquarters. Next the Marines moved to Fort Frederick, only to find the Revolutionary Military Council had disappeared. After telling the Grenadian Army to cease resisting during the night, the Grenadian leadership had put on civilian clothes and tried to hide among the civilian populace.[51]

While the Marines advanced through St. George's, the 82nd Airborne battalions began to expand their control of the area around the airfield. The main effort was to secure the compound of the Cuban airfield workers, which was serving as the headquarters for the Cuban resistance to the Americans.[52] After a heavy bombardment of mortars, three howitzers, and attack runs by Navy aircraft, the 82nd Soldiers advanced

towards the compound. The Cubans realized the hopelessness of their position, and with the exception of a small group which headed to the Soviet embassy for sanctuary, eighty-six Cubans surrendered in the morning.[53] During this action, the 82nd suffered two casualties. Captain Michael Ritz died during an early morning reconnaissance of the Cuban positions while Staff Sergeant Gary Epps perished attempting to unload a captured recoilless rifle.[54] The final action of the 82nd on day two was to secure the Grenadian supply base at Frequente, which they accomplished without incident as the Grenadians had already withdrawn.

The most important action of the day was the rescue of the American students at the Grand Anse campus. After rescuing the students at the True Blue campus, VADM Macdonald realized the American forces needed to secure the other campus as soon as possible. However the CJTF did not have the forces or plan to do so on the first day since they did not previously know it existed. They improvised. While the Marines secured areas of St. George's and the 82nd expanded their hold on Point Salinas, it fell to the Rangers to conduct an air assault. The Rangers originally intended to return to the United States after the 82nd arrived, but they remained under MG Trobaugh's control due to the heavier than expected resistance.[55]

The next problem was getting the Rangers to the campus. The TF 160th helicopters were still too damaged to provide any support, and MG Trobaugh originally wanted to delay the rescue until October 27 so that the helicopters of the 82nd Aviation Battalion would be available.[56] However a directive from the JCS ordered him to rescue the students immediately.[57] The Army turned to the Marines for helicopters. The plan called for nine CH-46 and four CH-53 helicopters to land 150 Rangers to secure the

campus and rescue the students. A ten minute preparatory bombardment from A-7 attack aircraft and an AC-130 gunship preceded the attack and lasted until twenty seconds prior to the first helicopter landing, while the remaining two AH-1 Cobras provided supporting fire during the assault.[58] The bombardment succeeded in disrupting any defense the overmatched Grenadians could mount, as the helicopters only received sporadic small arms fire on their assault. The entire assault lasted only twenty-six minutes and succeeded at rescuing all of the American students in the area with only one Ranger slightly wounded.[59]

The helicopters fared differently as one CH-46's rotor blades struck a palm tree on the initial assault, damaging the blades and causing the crew to conduct an emergency shutdown on the beach, half in the surf. While the rescue of the students occurred, one of the crew chiefs of the CH-46 examined the damage and decided the aircraft was still flyable. The crew started the aircraft and was able to make it back to Point Salinas. However a second aircraft ended up much worse. Taking off with a group of Rangers at the end of the mission, the blades hit another palm tree, which caused the trunk to fall through one of the rotor systems, making the aircraft unflyable. Fortunately the crew and passengers survived without injury, and later used a rubber boat to paddle out to sea. They were picked up safely by a Destroyer during the night. An unknown authority ordered the CH-46 destroyed, and friendly aircraft strafed the CH-46 wreck, completely destroying it.[60] Compared to TF 160th's assaults the day before, the rescue of the Grand Anse campus went much more smoothly. Of course even this success was only a half measure as the Americans learned they still had not rescued all of the American students.

Over 200 more remained scattered throughout the island, most of them living on a peninsula two to three kilometers south of the Grand Anse campus.[61]

Day Three

Although no Blackhawks participated in action on the second day of Operation Urgent Fury, they figured prominently in the third and final day of action. The Marines and 82nd Airborne continued to expand their control over areas of St. George's and Point Salinas. Resistance was non-existent at this point as the Cubans had surrendered and the Grenadians had melted into the population. The only objective that remained from the original list was the Calivigny Barracks, the peacetime home of the Grenadian Army. The Rangers originally intended to capture the barracks on the first day, but were unable to after meeting heavy resistance at the airfield. MG Trobaugh intended to assault the barracks on October 28, but again the JCS intervened, ordering him to capture the barracks by the night of October 27.

Intelligence believed there might be up to a battalion of Grenadian Soldiers reinforced by 300-400 Cubans at the Calivigny Barracks.[62] Furthermore they believed several anti-aircraft guns were present, making a daylight air assault dangerous.[63] One of the pilots for the mission remarked afterward, "We all thought it was a suicide mission."[64] The battalion commander, Lieutenant Colonel Seigle, told his crews, "Guys, we don't know what's out there. Just remember that your primary job is to fly that aircraft until it won't fly anymore. Concentrate on that."[65] Despite any misgivings, the helicopter pilots took off.

The plan was for the Rangers to conduct an air assault using the 82nd Aviation Battalion Blackhawks after a preparatory bombardment from artillery at Point Salinas,

Navy ships, and attack aircraft. Two flights of four Blackhawks would drop the Rangers in the center of the compound, the only suitable landing area based on the available aerial photographs. The plan seemed simple, but the execution went wrong very quickly. The seventeen artillery guns at Point Salinas fired a total of 510 shells, but due to an error in plotting and no way to communicate corrections, only one shell hit the target area.[66] The rest overshot the barracks area and fell into the sea. The Navy fared slightly better as the Destroyer U.S.S. Caron provided more support from its two guns. A naval lieutenant tried to correct the fall of the destroyer's shot, but his efforts were in vain as the vast majority of the shells also missed the target. The Air Force and Navy had better luck as an AC-130 gunship and A-7 Corsair bombers attacked every building and likely enemy position prior to the assault. As events turned out this probably caused more damage than it helped.

The Blackhawks approached their target flying as low as possible at maximum speed over the water to avoid any anti-aircraft fire from suspected ZSU-23mm anti-aircraft guns on the cliff overlooking the barracks.[67] As they crossed the beach and climbed the slope onto the peninsula they quickly realized their landing zone was much closer than they thought, causing the helicopters to flare rapidly to lose speed, making them almost motionless.[68] The lead aircraft was able to land at the correct spot, but the following three overshot the landing zone. As the second and third Blackhawk began to land, the third suffered damage from ground fire, losing hydraulic power and causing it to crash into the second aircraft. The last aircraft in the flight veered to the right to avoid the two crashed Blackhawks, and the pilot unknowingly set his aircraft down hard in a ditch, causing his main rotor blades to flex down, slicing out part of the tail rotor drive shaft.[69]

When the pilot went to take off he had no tail rotor control, causing the helicopter to spin out of control and crashing into the hulks of the first two Blackhawks. Flying pieces of wreckage killed three Rangers and badly injured four who had already dismounted from the first crashed Blackhawks. The other Rangers and all of the Blackhawk crews survived without significant injury. The second flight of four aircraft did not even attempt to land and hovered at about eight feet as the Rangers jumped to the ground.[70]

When the Rangers went to clear the barracks they discovered that there were no defending Cubans or Grenadians. The defending forces had already left, most likely leaving behind a small element of eight to ten men who fired on the assault troops from the ridgeline above the barracks area.[71] However at that range, with limited training, and using AK-47s, the defending Grenadians were likely not even responsible for damaging any of the aircraft. Later investigations concluded the rounds which struck the third Blackhawk and starting the chain reaction were most likely from ammunition stores cooking off in the fires started by the preparatory bombardment.[72] Without the bombardment the Blackhawks might have accomplished the mission without incident. Furthermore the limited aerial photographs hindered the helicopters as what was believed to be a building was actually a flat concrete slab that one or two helicopters could have landed on, spreading out the assault force and limiting the chance of collision.[73]

With the assault of the Calivigny Barracks the combat action on Grenada essentially came to a close. The 82nd rescued some 200 additional American students on the 28th, and by November 2, VADM Metcalf reported that hostilities had ceased as of 1500 hours.[74] The mission transitioned to peacekeeping as the Rangers and 82nd Airborne ceded control to a Caribbean Peacekeeping Force. By December 25, all

American combat troops departed, leaving only some 250 military police, Special Forces, communication, and logistics personnel. According to official records nineteen American service members died from combat action, although an unknown number of Special Forces also perished. For the defenders, forty-five Grenadian military, twenty-five Cubans, and at least twenty-four civilians perished. The exact number was never determined. Although the military operation was over, the aftermath was just beginning.

Aftermath

News of the invasion spread around the world on the first day of operations. Reaction among most nations was decidedly negative.[75] The United Kingdom government had to explain to its people how their greatest ally, the United States, invaded an island which was a member of the commonwealth. Some information grew more confused as it spread, for example the Soviet Union reported that Americans had invaded Spain and captured the city of Granada.[76] The United Nations (UN) General Assembly passed a resolution with 108 countries in favor and only nine against condemning the invasion. The UN Security Council considered a resolution which "deeply deplores the armed intervention in Grenada, which constitutes a flagrant violation of international law."[77] The vote for the Security Council Resolution was eleven votes in favor to one against, with three abstentions. The no vote was the United States, which used its Veto power to prevent passage of the resolution. However beyond words, no country did anything to try to stop the United States or even influence it. Criticism of the operation from within the United States was much more important for the military to respond to.

In the United States, reporting from Grenada was limited at first. The United States military decided to deny media access to the operation until the third day of the

operation, which led to criticism by the media and cries of censorship and cover-up.[78] Because of the outcry from the media and Congress, GEN Vessey, the Chairman of the Joint Chiefs of Staff, later commented that the failure to take any press along was a "huge mistake."[79] The President and Joint Chiefs of Staff met with Congressional leadership on October 24 to inform them of the upcoming operation, but most Congressmen learned of the operation from the media.[80]

As the operation ended and U.S. Soldiers redeployed, Congress began asking questions. Speaker of the House Thomas O'Neill (D-MA) had accused President Reagan of practicing "gunboat diplomacy."[81] To attempt to answer some of the criticism of the United States intervention, a fourteen-person Congressional fact finding delegation arrived on Grenada on November 4. The members included Congressman Thomas Foley (D-WA), Congressman Robert Michel (R-IL), Congressmen Bill Alexander (D-AR), Congressman Michael Barnes (D-MD), Congressman Ronald Dellums (D-CA), and members of their staffs.[82] After three days the delegation agreed with the U.S. decision to intervene. One member of the delegation, Congressman Foley, stated, "a very large majority of the delegation feels that the President acted correctly to protect American lives," while Congressman Alexander said, "There was a threat to our citizens."[83] Yet not everyone was satisfied. One member of the delegation, Congressman Dellums, remained skeptical and observed that despite what the White House proclaimed, "The American students were not the primary objective of this mission."[84] However House Speaker O'Neill admitted that the delegation convinced him that the invasion of Grenada was justified.[85]

On January 24, 1984, the House Armed Services Committee held a full committee hearing on the lessons learned as a result of Operation Urgent Fury. The Undersecretary of Policy for the Department of Defense, Fred Ikle, opened the hearing with the observation that the collective action "was successful. The safety of all the American citizens was restored. The threat from extremists was removed."[86] ADM McDonald followed up with his observation, "History should reflect that the operation was a complete success."[87] However Ikle noted the operation was not without cost. After discussing the lives lost, the only other issue he discussed was helicopters. He observed that seven helicopters were destroyed and eleven damaged.[88]

As the committee members examined the operation they focused on helicopter losses. Representative G. William Whitehurst (R-VA) asked, "We lost seven helicopters, that were shot down, and eleven damaged. How do you rate that loss in terms of the resistance that you suffered? Did you expect to suffer that kind of loss?"[89] ADM McDonald responded, "I think [deleted] was a little high based on what we anticipated the resistance would be. The reason I say that is that we were not aware of the accuracy or the intensity of their antiaircraft fire."[90] Major General Trobaugh then went into detail on how the Blackhawks were lost and observed, "I would say that that was probably more lucky marksmanship than good marksmanship."[91] In responding to a different question later, Mr. Ikle also touched on the idea of luck playing a role in the loss of the helicopters and said "We had some bad luck, too."[92]

As the hearing continued, Representative Duncan Hunter (R-CA) asked even more pointed questions on the Blackhawk helicopter. VADM Metcalf responded, "I just think that airplane is a superb airplane. . . . Just seeing them come back full of holes,

pilots seriously wounded, and the way the aircraft handled is just absolutely superb."[93] MG Trobaugh went into detail on the type of damage the Blackhawks incurred such as the number of bullet holes and the systems affected. Representative Hunter then asked whether that compared favorably with the old UH-1, to which MG Trobaugh responded, "The attitude among my aviators at Fort Bragg now . . . is they believe the Blackhawk to be a much more survivable aircraft."[94] The committee moved on to other topics and did not address the loss of helicopters again.

The issue of helicopter losses in Grenada did not go away. An after action report sent to the JCS on February 6, 1984 by ADM McDonald included a lessons learned section with the observation, "Helicopters are highly vulnerable to well-aimed ground fire, including unsophisticated AAA. Without the Suppression of Enemy Air Defense, the risk is unacceptable."[95] Even after the hearings of the House Armed Services Committee, Congress was not done with lessons from Operation Urgent Fury either. William Lind, the defense aid to Senator Gary Hart, (D-CO) made numerous allegations that Operation Urgent Fury was a failure and highlighted signficiant shortcomings in the operation.[96] Based on the Lind Report and the JCS response, Representative James Courter (R-NJ), a member of the House Armed Services Committee and Congressional Military Reform Caucus, conducted and released a study that was very critical of the Grenada operation and singled out helicopter survivability.[97]

The Lind Report and Coulter Study alleged that out of approximately one-hundred U.S. helicopters used on Grenada; nine were destroyed, six Blackhawks, two AH-1 Cobras, and one CH-46 Sea Knights. It observed, "A loss rate of 9% in three days against an opponent with no anti-aircraft missiles, only guns (which can be highly

effective), is not easy to pass over."[98] In a question with significant implications for American defence policy in Europ, the Lind Report then asks, "What does it suggest our helicopter losses would be, for example, in war in Europe?"[99]

GEN Vessey and the JCS responded to each point brought up by the report. They provided extensive data on the number of helicopters used and the damage to the various airframes. The JCS response was clear that they believed the Blackhawk performed well and met or succeeded expectations as they wrote, "In Grenada the [Blackhawks] were able to withstand anti-aircraft fire. All combat damaged Blackhawks completed their mission. The Blackhawks met or exceeded survivability and crashworthiness design specifications."[100] In the closest the JCS came to an admission of a possible misstep was in the observation, "In Grenada, we took measures to reduce civilian casualties and therefore did not support helicopter operations with suppressive air and artillery fire to the extent we could have."[101] With these reports and the JCS response, the aftermath of Grenada finally came to a close.

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[1] Adkin, 6.

[2] Sharon T. Lacey, "Grenada 1983: Small Island, Big Lessons," *Military History* (July 2013): 46.

[3] Ibid.

[4] Richard Connaughton, "Grenada 1983," *The RUSI Journal* 153, no. 1 (February 2008): 74.

[5] Ibid., 75.

[6] Ibid.

[7] Phil Gailey and Warren Weaver Jr., "Briefing: Touching Down in Grenada," *The New York Times,* 26 March 1983, accessed December 31, 2014, http://www.nytimes.com/1983/03/26/us/briefing-058430.html.

[8] Lacey, 47.

[9] Gailey and Weaver.

[10] Lacey, 47.

[11] Connaughton, 74.

[12] Lacey, 46; Connaughton, 75.

[13] Lacey, 46.

[14] Ibid.

[15] Connaughton, 74.

[16] Adkin, 365.

[17] Ronald H. Cole, *Operation Urgent Fury, Grenada* (Washington, DC: Joint History Office, Office of the Chairman of the Joint Chiefs of Staff, 1997), 9.

[18] Ibid.

[19] Lacey, 48.

[20] Raines, *Operation Urgent Fury*, 8.

[21] Ibid., 7.

[22] Connaughton, 75.

[23] Cole, 11-12.

[24] Ibid., 20.

[25] Ibid., 22.

[26] Ibid., 23.

[27] Ibid., 24.

[28] Ibid., 26.

[29] Ibid., 28.

[30] Ibid., 23.

[31] Ibid., 35.

[32] Ibid., 36-39.

[33] Ibid., 43.

[34] Lacey, 48.

[35] Atkinson, 488.

[36] Raines, *Operation Urgent Fury*, 15.

[37] Lacey, 48.

[38] Adkin, 180.

[39] Ibid., 184.

[40] Ibid.

[41] Lacey, 52.

[42] Adkin, 188-189.

[43] Ibid., 189.

[44] Ibid.

[45] Ibid., 191.

[46] Lacey, 49.

[47] Edgar F. Raines, *The Rucksack War: US Army Operational Logistics in Grenada* (Washington, DC: U.S. Army Center for Military History, 2010), 261.

[48] Atkinson, 489.

[49] Adkin, 188.

[50] James T. Gaetjean, "Early Entry Lethality and Survivability Contingency Force Operations Using Army Aviation" (Master's thesis, Command and General Staff College, Fort Leavenworth, KS, 1993), 39.

[51] Adkin, 257.

[52] Raines, *Operation Urgent Fury*, 20.

[53] Adkin, 259.

[54] Ibid.

[55] Lacey, 49.

[56] Raines, *Operation Urgent Fury*, 21.

[57] Ibid.

[58] Adkin, 271.

[59] Peter M. Dunn and Bruce W. Watson, *American Intervention in Grenada: The Implications of Operation "Urgent Fury"* (Boulder, CO: Westview Press, 1985), 105.

[60] Adkin, 273.

[61] Raines, *Operation Urgent Fury*, 22.

[62] Lacey, 52.

[63] Raines, *Operation Urgent Fury*, 25.

[64] Adkin, 280.

[65] Atkinson, 489.

[66] Adkin, 283.

[67] Dunn and Watson, 105.

[68] Raines, *The Rucksack War*, 439.

[69] Atkinson, 489.

[70] Raines, *The Rucksack War*, 441.

[71] Rivard, 7-8.

[72] Raines, *The Rucksack War*, 25.

[73] Bernardo C. Negrete, "Grenada, Case Study in Military Operations Other Than War" (Research Project, U.S. Army War College, Carlisle Barracks, PA, 1996), 14.

[74] Raines, *Operation Urgent Fury*, 27.

[75] Connaughton, 77.

[76] Ibid.

[77] United Nations. Security Council Resolution S/16077/Rev. 1, accessed January 5, 2015, http://research.un.org/en/docs/sc/quick.

[78] Raines, *Operation Urgent Fury*, 32.

[79] Cole, 5.

[80] Ibid., 39.

[81] New York Times, "Wednesday, November 9, 1983 International," accessed Apri 18, 2015, http://www.nytimes.com/1983/11/09/nyregion/wednesday-november-9-1983-international.html.

[82] Adkin, 320.

[83] Ibid.

[84] Ibid.

[85] New York Times, "Wednesday, November 9, 1983 International."

[86] U.S. Congress House of Representatives, 2.

[87] Ibid., 15.

[88] Ibid., 2.

[89] Ibid., 31.

[90] Ibid.

[91] Ibid.

[92] Ibid., 37.

[93] Ibid., 38.

[94] Ibid., 39.

[95] Department of Defense, *Joint Overview of Operation Urgent Fury*, May 1, 1985, accessed October 8, 2014, www.dod.mil/pubs/foi/International_security_affairs/grenada/181.pdf, 38.

[96] Adkin, 343-359.

[97] Dunn and Watson, 105.

[98] Adkin, 356.

[99] Ibid.

[100] Ibid., 358.

[101] Ibid., 359.

CHAPTER 4

THE AFTERSHOCKS OF URGENT FURY

The crux of the questions raised by the House Armed Services Committee, the Lind Study and the Courter Report was if the Blackhawk was as successful and survivable as the military claimed, then how were so many shot down or damaged? The military's quick answer was there were extenuating circumstances such as limiting civilian casualties or luck while highlighting the fact that all of the helicopters accomplished the missions assigned. Additionally, the Blackhawks took damage but for the most part were able to fly back to base for repairs. During the testimony to the House Armed Services Committee VADM Metcalf summarized the idea that the helicopters always kept flying when he said, "In fact, one of those we lost had to be shut down with a firehose. The thing didn't want to stop fighting."[1] MG Trobaugh described extensive damage to a Blackhawk, and then concluded with the unequivocal statement "and had no casualties."[2] The Joint Chiefs of Staff answer to the Lind Report was clearer, "The Blackhawks met or exceeded survivability and crash-worthiness design specifications."[3]

However these answers are limited. Although minimizing casualties is an extremely laudable goal, survivability is more complex. As discussed earlier, survivability for aircraft design is typically divided into two areas; susceptibility, the likelihood an aircraft gets hit, and vulnerability, the likelihood the aircraft is killed by the hit.[4] However the experience in Grenada highlights another area of survivability, that of crashworthiness. The crashworthiness of a Blackhawk is just as important to a crew shot down in Grenada as it is to a crew suffering a mechanical failure while on a training

flight. Thus survivability "requires that the helicopter should be crashworthy."[5] Survivability is best looked at as susceptibility, vulnerability, and crashworthiness.

Of these three areas, the Blackhawk exceeded expectations and design in the area of crashworthiness.[6] In Grenada the design features of the Blackhawk, to include the energy-absorbing landing gear, the load-limiting crew and troop seats, and the self-sealing fuel tanks and lines, were critical in minimizing casualties from the damaged and destroyed Blackhawks. In CPT Lucas's Blackhawk that crashed on the first day, broke in half, and fell over a cliff, the majority of the crew survived even when the fuel did ignite in a post-crash fire. As one observer described it, "It didn't look the sort of crash anybody would walk away from."[7] Of those who lost their lives, CPT Lucas was killed directly by small arms fire, not the crash. The three other passengers who died could have been killed by small arms fire as well and not by the crash. The rest of the crew, the co-pilot, crew chief, door gunner, and other passengers all survived what seemed like a catastrophic crash. Of the three Blackhawks that crashed in the assault into the Calivigny Barracks on the third day, none of the crew suffered injuries. The casualties came from the Rangers already off the aircraft. Additionally, none of the criticism or analysis of Operation Urgent Fury ever questioned the crashworthiness of the Blackhawk.

Aside from crashworthiness, the area of vulnerability was the focus of the UTTAS Request For Proposal (RFP) and the genesis of the Blackhawk. In Grenada the Blackhawk again met its design criteria and expectation in this area. The RFP called for the aircraft to be ballistically tolerant to small arms and antiaircraft fire up to 23mm high-explosive incendiary rounds. At the time of the RFP the threat of rocket-propelled grenades (RPGs) and man-portable air defense systems (MANPADs) was not recognized

and not included in the RFP.[8] Thus Sikorsky designed the Blackhawk with numerous redundant systems, while critical components such as the main rotor head, rotor blades, drive shafts, and tail rotor controls, were made out of ballistically tolerant materials. The largest weapon the Grenadians and Cubans had on the island that hit the Blackhawks were 12.7mm and 14.5mm machine guns.[9] Analyzing the effect of 23mm rounds on the Blackhawk is impossible. Analysis of the damaged aircraft indicated that 7.62mm rounds, and possibly some 12.7mm rounds, were the primary threat to the helicopters.[10] However the basic premise that the Blackhawk should withstand damage from small caliber anti-aircraft fire remains valid.

In the respect that the aircraft could withstand hits from enemy weapons, the Blackhawk clearly succeeded. None of the official military reports appeared to minimize the damage to the helicopters. Indeed they seemed to want to clearly acknowledge the extent of the aircraft hit by small arms fire in order to demonstrate the survivability of the aircraft.

During the House Armed Service Committee Testimony, Representative Duncan Hunter (R-CA) opened a line of questioning into the Blackhawk with a request, "Could you give us a brief summary of what you think the demonstrated durability of these Blackhawks were?"[11] In response MG Trobaugh went into great detail on the damage to each and every helicopter. His statement included detailed descriptions such as, "small arms antiaircraft damage to the tail rotor drive shaft, stabilator inoperative, main rotors and tail were hit, all radios inoperative, except the frequency modulating radio, all gyros inoperative, engine control unit was inoperative, holes in the belly and the collective.[12] Another description read, "Blackhawk took two rounds in the stabilator, the thing on the

back of it, several holes in the tail boom, engine control unit was damaged, VHF radio shot out, and the rounds included both small arms and antiaircraft."[13] MG Trobaugh gave extensive information on the extant of the damage the Blackhawks suffered.

After the lengthy description of the damage Representative Hunter asked MG Trobaugh, "The ones you mentioned, those helicopters were not shot down except for the one you said that crashed?"[14] When MG Trobaugh answered in the affirmative, Representative Hunter continued, "So they managed to stay aloft or get back."[15] As the line of questioning indicated, the focus quickly shifted from how many helicopters were shot at the beginning of the hearing to the fact that they were able to continue flying and did not crash.

The JCS response to William Lind's allegations also clearly summarized the amount of damage to the various aircraft involved in the operation. The report stated, "Impacts indicated the threat was 7.62 mm in size, possible 12.7 mm . . . most of the hits were to the cockpit, cabin, aft fuselage, and tailboom. A few hits were noted on the main rotor head, none on the engine although there were several on the inlet and exhaust shrouds, none on the main rotor controls above the cabin, and relatively few on main and tail rotor blades."[16] The results of all of these bullet hits were "consistent with the results of previous ballistic testing and vulnerability analysis."[17] Again more important to the JCS was the concluding statement that, "All combat damaged Blackhawks completed their mission."[18]

This statement was the crux of the answer of the JCS to the Lind Report allegation of a loss rate of 9 percent in three days. They never disputed the idea that 9 percent was high or answered what that might imply for operations in other theaters such

as Europe. Instead the JCS focused on the fact that the Blackhawk completed its mission. It took hits and survived. As evidenced by the testimony to the House Committee and the JCS Report, the Blackhawk clearly measured up to the standards of vulnerability envisioned by the original UTTAS RFP.

Moving beyond the rosy picture painted by the official military view after Urgent Fury, the consensus is still that the Blackhawk did well in withstanding hits from small arms and antiaircraft fire. David Rivard, an experienced pilot, wrote that in Grenada the Blackhawk proved it is a "battleworthy machine" and "is a move in the right direction in building a better combat helicopter."[19] The most comprehensive account of the battle, Mark Adkin's *Urgent Fury,* observed, "The machines were standing up to the hammering better than the men were."[20] Over and over again critics remarked that the Blackhawk's performance in Grenada in terms of vulnerability was very successful. This was not a case where the military overstated the accomplishments of the Blackhawk. Instead the Blackhawk had not just improved existing standards, but as Ray Leoni, one of the Sikorsky engineers who oversaw the Blackhawk project, observed, the aircraft had set entirely new, "achievable design standards for survivability."[21]

As the testimony to the House Armed Services Committee indicated and the JCS report and critics later have observed, the Blackhawks in Urgent Fury took considerable damage but kept flying. From a crashworthy and vulnerability perspective, the Blackhawk succeeded by all measures. However the fact remains, as highlighted by the statement of the Lind Report, "A loss rate of 9% in three days . . . is not easy to pass over."[22] This is a point the official reports do not generally answer. The reason lies in the third area of survivability, that of susceptibility.

At a quick glance susceptibility does not seem to apply to the Grenada experience. Susceptibility is the ability to avoid getting hit. Generally it is the idea of avoiding surface-to-air missiles (SAMs), MANPADs, or heavy antiaircraft fire. None of these threats were present at Grenada. Thus the effectiveness of design features on the Blackhawk, such as the Infrared suppressor, designed to make it more difficult for a heat seeking missile to track the Blackhawk, is impossible to gauge from Grenada. However the Blackhawk was clearly hit multiple times so susceptibility still applies. Avoiding small-arms fire can be just as important as avoiding SAMs. To answer whether the 9 percent loss rate is higher than expected, one must look outside design criteria, outside any area envisioned in the RFP, and at how the Blackhawk was employed.

From the ground up Sikorsky engineers designed the Blackhawk to operate in hostile environments full of anti-aircraft and small arms weapons. These environments were why the RFP placed so much emphasis on survivability and specified the types of weapons the Blackhawk had to withstand.[23] Thus when TF 160th and CPT Lucas flew their Blackhawks into Grenada in the early morning they were flying an aircraft that was "specifically designed from Vietnam combat experience to go where the fighting was hot and survive."[24] However the death of CPT Lucas and the destruction of his helicopter demonstrate the fallacy of expecting to be able to design away the danger from small arms for a helicopter. The effectives of design features depend on the environment the helicopter is used in and how it is operated. The RFP mandated survivability requirements based on the way helicopters operated in Vietnam according to Army Aviation doctrine. When helicopters start operating outside standard procedures, the

effectiveness of the survivability requirements and design features can become meaningless as CPT Lucas and others found out in Grenada.

Two years after Operation Urgent Fury, the Joint Staff in Washington D.C. produced a comprehensive overview and lessons learned of the operation and indirectly highlighted the danger of helicopters operating outside expected environments and using faulty tactics. This report observed that "the level of the opposition encountered by U.S. combat forces in Grenada was relatively unsophisticated."[25] Yet this unsophisticated opposition in the morning of the first day managed to destroy three helicopters (CPT Lucas's Blackhawk and two Marine AH-1 Cobras) while damaging the other eight Blackhawks of TF 160th. A helicopter flying in daylight, over a prepared enemy, is susceptible to ground fire. There is no way around this fact, and there is no design feature as of yet to make this statement untrue.

The same Joint Staff overview that noted the unsophisticated enemy also stated that a lesson learned was that "helicopters are highly vulnerable to well-aimed ground fire, including unsophisticated [Anti-aircraft artillery]"[26] This is not a new statement. Experience in Vietnam had shown that helicopters were vulnerable, thus prompting specific design requirements for the UTTAS to include adhering to the Crash Survival Design Guide and ballistic tolerance to threats up to 23-mm high-explosive incendiary rounds.[27] The Joint Staff report indicates that an unsophisticated enemy was able to destroy several American helicopters because helicopters are vulnerable. This is not a major insight.

Nevertheless the Joint Staff overview's very next sentence following the comment that helicopters are vulnerable points to a misunderstanding of the lessons learned in

Grenada and a failure to acknowledge what it means to state helicopters are vulnerable. The comment from the Joint Overview continues:

> Rules of Engagement and concern for civilian casualties resulted in minimum suppression of enemy AAA. Without the Suppression of Enemy Air Defense (SEAD), the risk is unacceptable. RECOMMENDATION: That training exercises continue to emphasize that suppression of enemy AAA is an absolute necessity for the effective conduct of helicopter operations.[28]

This comment is misleading, especially when examining the air assault into the Calivigny Barracks. As the Joint Staff report stated earlier, helicopters are vulnerable. SEAD can mitigate threats to helicopters, but they cannot completely eliminate it, just as survivability design cannot change the fact that a helicopter is susceptible to being hit, and that a hit can destroy a helicopter, no matter how well designed.

The Joint Staff comment is correct that suppression can be vital for the success of an air assault operation, but that does not translate directly to survivability. For example, standard operating procedure for the 82nd Aviation Battalion was for artillery fire and close air support to suppress any defenders. Once this fire lifts, gunships would continue to suppress the enemy until the Blackhawks actually touch down.[29] However no gunships were available in the assault on the Calivigny Barracks. Enemy fire destroyed two of the Marine AH-1s on the first day, the other two AH-1s were in use, and the 82nd Aviation Battalions gunships would not be available for several more days. Equipment could only be brought into theater through strategic airlift, and the gunships were farther down the priority list. Therefore the air assault into Calivigny had to rely on indirect fires and bombers for support, not gunships flying just ahead or with the transport helicopters.

In the air assault on the Calivigny Barracks the Americans believed there were no civilians present so they did not hesitate to use artillery, naval gunfire, and close air

support to suppress any enemy defenders. In fact the thirty minute prepatory bombardment of the barracks area was the biggest bombardment of the entire operation with no change of civilian casualties because there were no civilians in the area.[30] The size and length of the bombardment did not matter. Its effectiviness was questionable. Most of the rounds fired by artillery and naval guns missed the target, but the close air support effectively destroyed the buildings in the barracks complex.[31] The suppressive fire did not prevent catastrophe. The beginning of the assault saw two Blackhawks completely destroyed, one other severely damaged, and the death of three Army Rangers. Helicopters are vulnerable regardless of whether SEAD is used or not, whether it is effective or not.

Although the Joint Overview focused on suppression and said the risk without it was unacceptable, this was wrong in the Calivigny Barracks assault. It is also a misleading statement for the entire concept of susceptibility. Suppression of enemy AAA is only one method that could have prevented the loss of the Blackhawks. According to the Joint Overview, concern for civilian casualties meant that Suppression of Enemy Air Defense (SEAD) was not used in Grenada to support the air operations. However the definition of SEAD is not limited to artillery or close air support. Army doctrine states, "[SEAD] operations normally involve jammers, suppressive fires, and passive measures such as camouflage or deception to degrade the effects of enemy air defenses."[32]

The Joint Overview already referred to suppressive fires, and jammers are clearly not applicable against small arms fire, but the third area, passive measures, is an important area that the Joint Staff comment left out. Suppressive fires to degrade the enemy did not matter in the assault on the Calivigny Barracks. SEAD was still available

in the form of passive measures, and the failure to use these indicate the true failure of Blackhawk survivability in Grenada; the mis-utilization of the Blackhawk.

The original planners of the operation did not leave out these passive SEAD measures. The plan for Operation Urgent Fury called for the TF 160th Blackhawks to infiltrate the special operations forces in the darkness prior to sunrise. In fact TF 160th's insignia includes the phrase "Night Stalkers," which speaks to the original intent for the task force to become experts at night flying. The 160th pilots were supposed to execute their mission at 0500 local time. Instead delays meant they did not launch from their staging base in Barbados until 0530, a half hour after they were supposed to already be on target.[33] When they arrived over Grenada at 0615, the sun was well up, and the passive SEAD measure of darkness for which the Night Stalkers trained for was gone.

Even one well-aimed burst of small arms fire can disrupt an air assault as it is landing, but aiming is extremely difficult for untrained troops in the dark. As the 160th pilots found out, aiming at a helicopter in daylight is much easier, with detrimental effects for the aircraft and aircrew. The planners knew this fact, the 160th trained for this advantage, but the late takeoff of the 160th aircraft meant all of the advantages of the night training and design of the Blackhawk were undone by the volume of fire directed against the Blackhawks in the daylight. Yet even when this fact became obvious after CPT Lucas's flight of five Blackhawks were all damaged in their first attempt to land at Richmond Hill Prison and Fort Rupert, the Blackhawks again tried to land against an alerted defense in daylight. Despite the damage received on the first attempt all of the aircrew and passengers were still alive. When they attempted again to land against a prepared enemy in the daylight, tragedy struck CPT Lucas and his Blackhawk. At least

four people perished because of the “regrettable belief . . . that unsupported helicopters could fly around St. George's or charge blindly into the attack without inviting disaster.”[34]

Flying in daylight was not the only issue in the employment of Blackhawks. Looking at the other passive measures mentioned in doctrine includes camouflage and deception. Camouflage is not really applicable, but deception certainly could have been. The tiny size of the Caribbean island limited deception operations, as did the limited number of military targets. Common deception operations such as false insertions or suggesting that another target was the primary effort and thus dispersing enemy defensive efforts might not be as effective on Grenada, but they could have helped mitigate the threat.

However there are other important passive measures that could be chosen. A good example was the air assault on the Calivigny Barracks on the third day. The Blackhawks of the 82nd Aviation Battalion were now located on the Point Salinas airfield. For the air assault into Calivigny Barracks on the third day, the two flights of helicopters took off and went out over the sea, skimming over the waves at low altitude and high speed to avoid any possible anti-aircraft fire, moving over land only when they were close to land at the objective.[35] Flying low level at high speed is a very common passive measure to minimize the effects of enemy fire. It denies line of sight tracking for defenders and makes weapon aiming difficult.[36] A defender has little time to aim and successfully lead a target that flashes by flying at one-hundred knots and only fifty feet over the ground. Contrast this low-level, high-speed flight with the circling of CPT Lucas’s Blackhawks over the city on the first day of the operation.

Of course in this instance poor intelligence, one of the other prevailing issues with Operation Urgent Fury, negated the benefit of the high-speed approach over the sea. As the Blackhawks crossed the coast at eighty knots, they spotted the landing zone a half mile short of where they expected and had to decelerate quickly. The Rangers were accustomed to flying with the TF 160th pilots and had not trained with the 82nd pilots. They thought the aircraft would rapidly decelerate when they were close to the ground so the Rangers jumped out while the aircraft were still over twenty feet in the air, not the five to eight feet they were expecting. At least two Rangers suffered broken legs from the leap and others had numerous minor injuries.[37] Additionally as the Blackhawks rapidly decelerated, they would appear to hang in the air, making themselves a much easier target for anybody on the ground. The poor intelligence, lack of experience of the 82nd pilots, and the lack of a relationship between the Rangers and 82nd pilots led to injuries among the passengers and made the helicopters more vulnerable.

The successful Marine air assault into the Pearls Airport could have suffered a similar fate. The Marine helicopters had to search for a suitable landing zone at the airport because the operation planners used old maps that showed open areas that were now covered in trees.[38] Fortunately the Marine air assault was on time and in the early morning, and the few defenders were not prepared and fled into the jungle. Intelligence, tactics, and the timing of an operation matter. Survivability measures and design features, whether active or passive, are only one component of whether an aircraft will be hit by anti-aircraft fire and damaged or destroyed. Engineers cannot design away poor intelligence preparation or poor tactics. Survivability depends on more than just design.

This entire discussion points to a simple fact that seems obvious in hindsight. As Mark Adkins points out in describing the actions of the TF 160th Blackhawks on the first day, "The chaos inside the Black Hawks circling over the prison that morning was a glimpse of what to expect when tactical principles are ignored."[39] No helicopter, no matter how well designed, no matter how survivable, can withstand misuse. Although the Blackhawk was successful in its crashworthiness and vulnerability, it was in the area of susceptibility, which is not inherent in the aircraft or its design, that failure occurred, soldiers died, and helicopters crashed. The features of the Blackhawk designed to allow it to survive cannot allow it to withstand improper use. The Special Forces and TF 160th pilots on the first day acknowledged shortcomings in the planning and intelligence but said, "Don't worry, we will surprise them, and anyway it should be a walkover."[40] Those killed on the first day would disagree.

The tactical mistakes made in using the Blackhawk countered the entire principle of survivability that was an essential part of the design of the Blackhawk. Returning to the definition of survivability, one part was platform survivability and the idea that the equipment should have "the ability to contribute again after repair or reconstitution."[41] As MG Trobaugh found out on the second day of operations, the Blackhawks of TF 160th were not able to contribute again. Wanting to use TF 160th for the air assault on the Grand Anse campus, he found that the unit "was no longer able to conduct combat operations" due to the damage the aircraft had received the day before.[42] Although eight of the nine Blackhawks were able to fly again, it was not until after Operation Urgent Fury was over. Their inability to contribute for two of the three days of major operations is a failure of the survivability concept that the platform should be able to contribute

again. The TF 160th Blackhawks were simply not available after the first day due to damage.

Without TF 160th, the Army had to find replacement helicopter support. For the second day of operations the Army coordinated for and used Marine Corps helicopters. On the third day the Army used the newly arrived 82nd Airborne Blackhawks. If there were operations on the fourth day, at least three of the 82nd's Blackhawks were unavailable and planners had to look elsewhere for more helicopters. This is why the Army's definition of survivability is that the platform must contribute again, so it does not have to be replaced after every mission. As shown above, this inability to contribute again was not a failure of the Blackhawk's survivability design features, but a failure of its use in Grenada.

Survivability cannot be just a materiel design feature. Instead it must be an aspect of every stage of an operation from planning to tactical employment. Often operational planning will address risk, especially for air assaults, but the focus is usually on what the enemy can or will do. The focus should also be on how friendly forces are using the aircraft. The best aircraft survivability design features in the world and the courage of the pilots are thrown away when they are told to "fly into concentrated AA fire at low levels," which the aircrews in Grenada did "time after time without wavering."[43] Despite all of these issues, the Blackhawks and the aviators who flew them contributed to the success of Operation Urgent Fury.

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[1] U.S. Congress House of Representatives, 38.

[2] Ibid., 39.

[3] Adkin, 358.

[4] Ball and Atkinson, 75.

[5] Kenneally, “Should the United States Army Procure the Total Quantity of Blackhawk Helicopters it Requires,” 52.

[6] Dennis F. Shanahan, “Crash Experience of the U.S. Army Blackhawk Helicopter” (Research Project, Advisory Group for Aerospace Research and Development, Neuilly Sur Seine, France, 1992), 40-1.

[7] Adkin, 189.

[8] Leoni, *Blackhawk*, 103.

[9] Raines, *Operation Urgent Fury*, 7.

[10] Adkin, 357.

[11] U.S. Congress House of Representatives, 38.

[12] Ibid., 38-39.

[13] Ibid.

[14] Ibid., 39.

[15] Ibid.

[16] Adkin, 357.

[17] Ibid.

[18] Ibid., 358.

[19] David T. Rivard, “An Analysis of Operation Urgent Fury” (Research Project, Air Command and Staff College, Maxwell Air Force Base, AL, 1985), 23.

[20] Adkin, 188-189.

[21] Leoni, *Blackhawk*, 117.

[22] Adkin, 356.

[23] Leoni, 103.

[24] Adkin, 177.

[25] Department of Defense, *Joint Overview of Operation Urgent Fury*, 19

[26] Ibid., 38.

[27] Leoni, *Blackhawk*, 103.

[28] Department of Defense, *Joint Overview of Operation Urgent Fury*, 38.

[29] Raines, *The Rucksack War*, 436.

[30] Adkin, 282.

[31] Ibid., 283.

[32] Headquarters, Department of the Army, Field Manual (FM) 100-5, *Operations* (Washington, DC: Government Printing Office, 1982), 7-12.

[33] Raines, *Operation Urgent Fury*, 15.

[34] Adkin, 254.

[35] Raines, *The Rucksack War*, 439.

[36] Kopp, 61.

[37] Atkinson, 489.

[38] Briley W. Howell, "Air Assault–Rapid Response at the Operational Level" (Research Project, U.S. Army War College, Carlisle Barracks, PA, 1988), 23.

[39] Adkin, 344.

[40] Ibid., 180.

[41] Headquarters, Department of the Army, AR 70-75, *Survivability*, 7-8.

[42] Raines, *The Rucksack War*, 261.

[43] Adkin, 338.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Shortly after Operation Urgent Fury concluded, and separate from all of the Congressional hearings, two organizations began detailed, in-depth studies of the operation. General John Wickham, the Army Chief of Staff, ordered the Training and Doctrine Command to analyze Urgent Fury, which did so under the newly formed Combat Studies Institute.[1] Meanwhile the Army Forces Command directed the 44th Military History Detachment to conduct a similar study. These two organizations combined their effort, and their report focused on issues with joint operations and joint doctrine. Their overall conclusion is very valid in looking at the Blackhawk. Their finding was that, "Grenada generally validated existing Army doctrine, but that difficulties arose when individuals ignored it and tried to operate outside of established practices and procedures."[2] As discussed previously in this thesis, the Blackhawk met the design criteria in the original Request for Proposal, and yet suffered numerous casualties and damage in its first combat action in Grenada due to poor planning, poor intelligence, and misuse.

Returning to the thesis questions introduced in chapter 1, did the Blackhawk accomplish all of its assigned missions? The answer is no, but with a caveat. Of the three groups of TF 160th helicopters, one of them, the one with CPT Lucas attempting to insert Special Forces at the Richmond Hill Prison and Fort Rupert, was never able to land. The small-arms fire from the defenders was too great despite two attempts to land. The second attempt ended with the death of CPT Lucas and the destruction of his Blackhawk.

The other two TF 160th insertions and the air assault on the third day into Calivigny Barrack all succeeded, despite the damage suffered by the Blackhawks.

Accomplishing three of four major objectives is clearly not 100 percent success. However rarely will a complex operation have a 100 percent success rate in every subordinate operation. The Blackhawk's 75 percent success rate in these four major operations should be seen in the context of the whole operation where many objectives were not achieved on the first several days. A short-notice operation to seize a foothold on a defended island is bound to have failures, and the missions the Blackhawks were involved in had their share, but nothing substantial. Of course the Blackhawks accomplished numerous other resupply and troop movement operations throughout the U.S. occupation of the island, but as these did not face enemy opposition, are not relevant when looking at the Blackhawk's survivability and performance in a combat situation.

After accomplishing their primary missions, were the helicopters readily available for follow on missions? This is where the Blackhawk was not successful. Resulting from the damage they suffered on the first day, the eight remaining TF 160th aircraft were not able to participate in operations on day two. The Army had to coordinate with the Marines to use CH-46 and CH-53 helicopters to air assault the Rangers to the Grand Anse campus. This mission was successful, but it was fortunate that the Marine helicopters were available and not required for other missions. Rescuing the students would obviously take priority, but pulling Marine helicopters from their mission supporting the Marine ground forces because the Army Blackhawks were too damaged too fly is not a positive indicator of the Blackhawk's survivability.

Furthermore as the JCS's answer to the Lind Report acknowledged, a loss rate of 9 percent of the helicopters involved in three days is high. The JCS were misleading in their answer that all combat damaged helicopters accomplished their mission, because the TF 160th mission to Fort Rupert and Richmond Hill was not accomplished. Yet the more important failure of the JCS's response is the lack of an answer to the 9 percent rate. That loss rate would be unsustainable for a longer term operation of weeks and months versus the three days of combat on Grenada. This is why it is essential for a helicopter to be ready to assume follow on missions. In a short operation such as Operation Urgent Fury, if a helicopter cannot be repaired and returned to service, it is as good as lost.

If a helicopter is lost, then the use of helicopters becomes a simple equation of whether more helicopters can be brought into an operation than are destroyed or damaged. Losing three helicopters a day in Grenada would require three new helicopters each day to maintain the same capability. At the loss rate of 9 percent in three days, every single helicopter would need a replacement by the end of thirty-three days. In a larger operation utilizing more aircraft, it would be very difficult for any military to sustain that rate of replacement. That is why a helicopter must be able to fly again after a mission, which the Blackhawks on Grenada too often were not able to do due to damage suffered from small-arms fire. The design of an aircraft to allow the rapid repair of battle damage is an indirect contributor to survivability, not because it increased the survivability of the individual aircraft, but because it enhances force reconstitution and, consequently, force survivability.[3]

To blame the fact that the loss rate was too high because the Blackhawks did not perform as well as expected or were not as survivable as designed would be duplicitous.

The Blackhawk did what it was conceived to do. It took hits from small arms fire and kept flying. It protected most of the occupants of the aircraft. However it is highly unlikely for any aircraft to repeatedly fly into enemy fire and not receive damage or for the people on it not to take casualties. The testimony to the House Armed Services Committee and the JCS response to the Lind Report show a military quick to point out how survivable the Blackhawk was. MG Trobaugh and the JCS gave an extensive list of damage the Blackhawks suffered and kept flying.[4]

However both MG Trobaugh and the JCS failed to acknowledge that the most survivable helicopter in the world is still susceptible to enemy fire. The JCS never answered whether a loss rate of 9 percent is high because to do so would admit that helicopters, no matter how many design and engineering features are incorporated to decrease a helicopters vulnerability and minimize susceptibility, a helicopter can and will be shot down. The Blackhawk is more survivable than the UH-1 Iroquis as MG Trobaugh observed to the House Committee, but Blackhawks can and will be shot down when used in combat.[5] MG Trobaugh and the JCS left Congress with the impression that the Blackhawk is very survivable, was successful, and the damage suffered was more due to bad luck then anything else. The real lesson should have been that the Blackhawks can withstand damage, but helicopters are susceptible to enemy fire in any operation, especially when mis-used in a manner such as Grenada.

The fact that so many Blackhawks were damaged lies with the usage of the aircraft and the inherent danger of ground fire to a helicopter flying low and slow. The danger of flying unescorted troop transport helicopter in daylight over an alerted enemy was not new, but TF 160th did it anyway. Conducting an air assault with poor

intelligence and little planning is dangerous, but the 82nd Aviation Battalion conducted the air assault into the Calivigny Barracks anyway. The fault was not the aircraft, but the way it was used. This is why it is inadvisable and misleading to separate an aircraft's design for survivability from the doctrine, tactics, techniques, and situations in which it is used. This is why the Defense Department's system for addressing gaps in capabilities in doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTLMPF) is incomplete. The design of a new helicopter is a materiel solution, but DOTMLPF cannot be completely separated into its components, but must be looked at as an integrated whole.

This conclusion leads to the next thesis question, is the current definition of survivability in Army Regulations adequate? The regulation does divide survivability into its two most common subcomponents, vulnerability and susceptibility. Additionally the regulation divides survivability for a system like the Blackhawk into four subcomponents, and one of these subcomponents is personal survivability which for a system like a helicopter translates into crashworthiness. When taken as a whole the answer is yes, the Army definition is adequate and does encompasses all the relevant aspects related to design implications. The shortcoming of this definition lies in the fact that Army Regulation 70-75 is for Research, Design, and Acquisition. Just as materiel is only one part of DOTMLPF, thinking of survivability only in terms of the design features and mission accomplishment, while necessary in writing RFPs, is narrow when not linked with crew capability, tactical employment, and operational employment.

Failing to link survivability design in the materiel part of DOTMLPF with the other areas is not limited to military acquisition programs. In addition to being a poorly

understood aspect of the larger system, survivability at the design level is further complicated when issues extending beyond design of the technical system are internalized, such as operational behavior, human factors, and supporting infrastructures.[6] Although survivability arises from interactions among components and between systems and their environments, conventional engineering approaches to survivability often focus only on selected properties of subsystems or modules in isolation.[7] In the case of the Blackhawk, Sikorsky made the rotor blades, including the tail rotor, ballistically tolerant. Furthermore the tail rotor had redundant controls and the tail rotor drive shaft was ballistically tolerant. Each of these design features is an improvement over previous helicopter design. These design features and materiel survivability improvements were critical in Operation Urgent Fury for several Blackhawks taking damage and continuing the mission.[8]

Despite this success, the survivability features surrounding the tail rotor and its control had a significant flaw. There was no method for a pilot to know he lost tail rotor control while sitting on the ground. Recall that at the Calivigny Barracks, chalk four of the first wave of Blackhawks made a hard landing to avoid two other crashed aircraft. The pilot was unaware that when he hit the ground, his main rotor blade had flexed so far downward that it sliced into the tail rotor driveshaft.[9] When he took off again, he realized he had no control as the aircraft spun rapidly. The Blackhawk crashed and the spinning main rotor blades killed three Rangers.[10] Although the designers had looked at each component of the tail rotor control system and developed redundancies and used ballistically tolerant materials when possible, they never looked at the system as a whole.

A tail rotor that is survivable is worthless if the entire system is not designed to the same level, or at least some mechanism or sensor to notify the crew of a problem.

With the answers to the secondary questions posed in chapter one, the overall question remains, was the Blackhawk a survivable aircraft as testimony to the House Armed Services Committee indicated? Again the answer is a qualified yes. The Blackhawk was a survivable aircraft, but only in the materiel sense. The Blackhawks in Grenada survived numerous hits from small-arms fire while still accomplishing the majority of the missions assigned to it in Grenada. The one mission it did not accomplish was likely unfeasible once surprise was lost and the sun came up.

That being said, the Blackhawk was not survivable when the Army operated outside its own doctrine, tactics, and procedures. Operation Urgent Fury exposed serious shortcomings with the concept of survivability as incorporated into the design of the Blackhawk. The issues of poor intelligence, poor planning, and poor execution contributed to the numerous hits from small arms and anti-aircraft fire that the Blackhawks received, and yet they continued to fly. Although even one is too many, aircrews suffered few casualties due to the survivability features designed and built into the Blackhawk. The Blackhawk and other helicopters "contributed much to the overall success of Operation Urgent Fury."[11]

Recommendations

As with any study, this look into the Blackhawk's survivability in Operation Urgent Fury raises many questions which cannot be answered in this examination. How do the different levels of training, the different tactics, and the different doctrine between the various aviation units on the island affect their survivability? The Marines, TF 160th,

and the 82nd Aviation Battalion all train and operate differently. All suffered casualties on Grenada. How did they operate differently and how did that affect the outcome of their operations on Grenada?

A third question is how well has Army doctrine and tactical use of aviation improved since Operation Urgent Fury? Much of the damage caused to Blackhawks in Grenada was a result of poor use of aviation assets. After action reviews identified some of these issues.[12] However have these lessons become true lessons learned or just lessons identified?

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[1] Raines, *Operation Urgent Fury*, 29.

[2] Ibid., 30.

[3] Ball and Atkinson, 76.

[4] U.S. Congress House of Representatives, 31; Adkin, 358.

[5] U.S. Congress House of Representatives, 39.

[6] Richards et al., 2.

[7] Ibid.

[8] U.S. Congress House of Representatives, 39.

[9] Atkinson, 489-490.

[10] Raines, *Operation Urgent Fury*, 26.

[11] Gaetjean, 72.

[12] Department of Defense, *Joint Overview of Operation Urgent Fury*; Adkin, 343-359.

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