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Grade Level: 10
June 11th

The Thunder Chicken

Introduction


MV-22B Osprey

The importance of aircraft in civil, military and humanitarian operations around the world is great, and the need for more efficient vehicles in this field will only grow in the coming years.

While current airplanes are the assumed first choice concerning cargo and larger amounts of passengers, it is the helicopter whose agility and adaptability will soon be transformed into the reliable working and high class aircraft of the future. Through the innovation and hard work of many devoted people, the rotorcraft known to the public at large will become the tilt rotor, giving birth to a new era of flight.

Currently, the United States Marine Corps and Air Force operate MV-22B Ospreys. These tilt rotors are the result of over ninety years of theory[1] and twenty years of engineering, but the drawbacks are numerous. The opinion regarding this craft is varied. According to reports, the instability paired with the costly maintenance and unexpectedly short lifetime of specific parts is a nightmare for the dozen or so of the Ospreys in service[2].

NASA's Fundamental Aeronautics program has, in recent years, begun research and development on a new era of tilt rotors. These projects have stated that their intent is to investigate and design ways of making more efficient and safe rotary aircraft. In layman's terms, the goals are to modify the current tilt rotors to be reliable in three areas[3]: productivity, structural performance and environmental quality. Chief among these is the improvement of the aerodynamics, higher speeds, larger payload, longer range, better maneuverability and the added capability of amphibious landings.

It is my goal with this report to accurately outline the events of two devastating seismic disasters and to describe the impact a tilt rotor fitting the description above could have

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[1] In September of 1930, George Lehberger patented a design for the so-called "Flying Machine, the first proposed tilt rotor design Patent number: 1775861

[2] *Assessments Needed to Address V-22 Aircraft Operational and Cost Concerns to Define Future Investments*. United States Government Accountability Office (GAO) May 2009 p. 20

[3] Fundamental Aeronautics Program. *Subsonic - Rotary Wind Reference Document.* NASA (May 2006) p. 3.

made in the relief and subsequent aid operations. In addition, I will theorize possible civil and military purposes for such a vehicle, focusing on emergency and transport capabilities.

In order to simplify the addressing of a tilt rotor of the specified design, I have christened the theoretical aircraft the “Thunder Chicken 13-37A” in honor of one of the Marine units currently operating Ospreys.

2004 Indian Ocean Earthquake and Tsunamis

On December 26, 2004, at 7:56 local time, a magnitude 9.3 earthquake occurred approximately 100 km off the West coast of the Indonesian island of Sumatra[4]. This, the largest quake in a hundred years unleashed a massive amount of seismic energy. It triggered a series of tsunami waves that spread across the Bay of Bengal and onwards, ultimately affecting a dozen countries on two continents.

Indian Ocean quake and affected countries.

In all of recorded history, only three quakes have surpassed the Sumatra earthquake and the resulting tsunamis in terms of loss of life. All told, it is estimated that nearly 250,000 lives were claimed by the disaster and according to the most recent estimates, some 20,000 are still unaccounted for. Ten million people were affected either by quakes or tsunamis or both. In the geographical area of the disaster, many of the survivors were displaced and their livelihoods lost. Nearly 7 billion US dollars was reported in property damages.

News of what had transpired in the Indian Ocean spread quickly throughout the world. Local branches of many international humanitarian societies were put to action within hours, working with what assets they had on hand. The movement by the rest of the world followed close behind as pleas for donations were met with astounding goodwill. Despite the pledged support of many nations - fifty around the globe - monetary amounts were slow to arrive[5].

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[4] United States Geographical Survey (USGS) *Sumatra Earthquake Details.*

[5] Herson, Maurice. *Asia Earthquakes and Tsunamis: real time evaluation report, first round.* International Federation of Red Cross and Red Crescent Societies. (March 2005) p. 10

The challenges facing relief workers were many, ranging from inability at first to reach rural areas due to the destruction of roadways and the fear of widespread infection and disease related to the climate and amount of corpses.

US Aid workers unloading food.

The arrival of military vessels carrying aircraft turned the tide for the operations. It was days after the actual disaster that the first flight of a US military helicopter made it inland with relief supplies. In time, however, the movement gained speed, resulting in an end that was far better than most could have projected - the fear that many hundreds of thousands more would die due to lack of aid was abolished.

Though enough emergency aid was given to safely assume that the operations in the aftermath were a success, the effort was not completely accepted as the best possible outcome of events. In March of 2005, it was reported that several billion in pledged funds were not delivered as promised.[6] By that time rebuilding was slow, leaving many people still in camps with substandard qualities of life, including some with inadequate water supplies and insufficient sanitation.

If one is to introduce the theoretical capabilities of an amphibious tilt rotor such as the Thunder Chicken to the equation of relief operations on this scale, the result is obvious: although the helicopters and airplanes involved in the response did an excellent job ferrying supplies to the areas that desperately needed them, and rescued numerous people from flooded locations, a tilt rotor aircraft could easily have doubled the results. The increases in speed and payload capabilities would have made an enormous difference for aid, allowing military personnel to move supplies quicker and take more people to safety per flight.

In conclusion, the disaster that struck the Indian Ocean was calamitous. The human suffering amounted to a terrible sum, and the generosity with which people gave to ease that suffering was inspiring. Though the work done by the thousands of volunteers and soldiers was almost unimaginable, I force myself to look now at what might have been: with the help of such a feat of future flight, through models like the Chicken, many people might still be alive today, or at least in better comfort and care.

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[6] Staff Writer. "*Tsunami aid shortfall over $4bn"* BBC News (March 2005) Extracted January 16, 2010.

7.0 Earthquake southwest of Port-au-Prince, Haiti.

2010 Haitian Earthquake

Hours before the sun dropped below the horizon on Tuesday, January 12, 2010, a magnitude 7.0 earthquake struck 25 km southwest of Port-au-Prince, Haiti[7]. Already the poorest country in the western hemisphere and severely affected by multiple hurricanes two years prior, as well as civil unrest, the small nation on the island of Hispaniola was devastated. Within hours, the city and surrounding area was dark, with citizens fleeing the capital as night wore on. Those that did not flee sat in the broken and rubble-strewn streets, fearful of aftershocks.

Local aid workers were scarcely able to make it through the city that night. Even before the quake, at least 60% of the buildings in Port-au-Prince were shoddily built, as there are no building codes enforced. Afterward, almost every building was completely unstable, if not in complete ruins. The entire nation was nearly leveled by the quake which claimed hundreds of thousands of lives and inflicted massive amounts of damage to infrastructure and property.

As of this date, it is estimated anywhere between 220,000 and 230,000[8] people were killed, some 300,000 injured and well over a million Haitians left homeless.

Given the poor infrastructure of the country in general and the devastation of the quake, aid was slow to move into the affected areas. Complicating the matter further was the destruction of the main port, making it all but impossible for large ships to deliver aid. As time passed, humanitarian organizations were able to gain entrance to the city and bolster the efforts made by local branches. Many were forced in by land from the Dominican Republic, others by the Port-au-Prince airport, which became and still is heavily congested[9].

The amount of damage done to such an urban area is particularly devastating in nature for inhabitants. The timing and size of the quake left many people stranded beneath rubble for hours, if not days, and the inability to move hampered search and rescue considerably. There were many cases of survivors being taken from the ruins of hotels

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[7] United States Geological Survey (USGS) *Magnitude 7.0 - Haiti Region* January 12 2010

[8] Haiti Earthquake: One Month Report American Red Cross Society January 2010

[9] “Logistical nightmare hampers Haiti aid effort” BBC News January 22 2010

and houses a week or more after the actual event, though many, many more people perished. The scale of the razing of the city is enormous.

Among the ships, planes and helicopters sent in with supplies and personnel, the 24th Marine Expeditionary Unit took flight in MV-22B Ospreys from the deck of a Marine ship, carrying out orders to perform aerial surveys of the northern Haiti population centers and roadways. The 24th MEU also helped with evacuation of injured civilians alongside helicopters. This is the first role the tilt rotor has played in humanitarian or relief efforts.

The number of people rescued from the rubble by the relief workers stands at 211, though many more were pulled out by friends or family. The slow pace and congestion of relief cost many people their lives as they lay buried beneath the rubble of what had been their homes. It is impossible to say exactly how many died this way.

The more tragic fact is that many children are still malnourished, many families without shelter, many people without basic sanitation needs. The role the Thunder Chicken could have played in this instance is beyond words in terms of importance. The ability to land help faster, as well as in greater quantity, whether medical personnel, food, water, or other relief goods, virtually anywhere, is greatly needed.

It is my estimate that, for example, the Red Cross's goal to reach and distribute shelter to Haitians without it by May 1 would already be met. In comparison to the 2004 quake in Indonesia, where the aid efforts were successful in terms of delivering goods, the Haiti quake was a catastrophe of terrible and epic proportions.

Civil Uses

The use of helicopters today ranges from emergency services to tourism, touching in nearly all aspects of life in between. We see footage shot by cameramen in helicopters on the news, hear reports of businesses using them to fly into the city, and scientists surveying remote locations from within one.

Emergency

Flying critical patients from rural settings or areas otherwise insufficient for the needs of the patient's health is a vital ability for treating those injured or sick in modern times. Helicopters and airplanes are an important tool in fighting the spread of wildfires in vast regions of highly flammable vegetation around the world.

910 tanker demonstrating fire fighting capabilities.

Emergency Field	Benefits of the Thunder Chicken
Medevac	A speedier, more efficient and safer vehicle to accomplish this daily and life-saving task could potentially do that and more when the need for evacuating multiple persons arises. Current state-of-the-art medical civilian helicopters can transport two patients at a time. Imagine being able to transport ten, or twenty, thirty even at a time, comfortably, from the scene of a rural accident to a trauma center.
Fire Rescue	Improvements to the already well developed aircraft in use could mean quicker response and dowsing of areas alight, thereby saving lives and livelihoods.

Commercial

Helicopters and airplanes are used every day for purposes of construction, transport of goods and transport of humans. A tilt rotor of the specified qualities could have an impact on all three of those areas, allowing for heavier objects to be lifted safely, more goods to be transported across greater distances and affordable, efficient transport to a more diverse range of locations.

Of the many commercial uses for rotorcraft in modern times, here are a few that would benefit from an amphibious tilt rotor:

Commercial Use for Aircraft	Benefits of the Thunder Chicken
Construction	Helicopters are already used as flying construction cranes, hoisting up to 10,000 pounds to desired heights. A tilt rotor like the Chicken might offer improvements to safety and stability.
Agriculture	The tending of crops often requires the spraying of fertilizer or pesticides. A lighter version of a tilt rotor might offer improvements in capabilities.
Logging industry	Heli-logging is a less intrusive way to extract trees from forestry projects. A more stable, lifting-efficient tilt rotor would make improvements in safety to workers.

Military

The use of aircraft in military operations span from rescue to combat. The role an amphibious tilt rotor could play is varied and diverse, including rescue, combat and everything in between.

Military Operation	Benefits of the Thunder Chicken
Combat	A fighter tilt rotor could combine the speed of a fixed wing and the versatile agility of a rotary aircraft.
Cargo/Transport	As demonstrated in Iraq already by the Osprey, tilt rotors can be remarkably effective when employed to airlift cargo missions.
Observation/ Reconnaissance	Used in Haiti to survey roads, the Chicken would be effective in this capacity in war zones as well.
Rescue	Mentioned on the previous page are the improvements that the Thunder Chicken design might offer to civilian medical emergency operations. In addition to that, an amphibious tilt rotor like the Chicken would lend itself well to rescue missions overseas and on them, especially in the Coast Guard and Navy.

In Summary:

The diversity of a craft like the Thunder Chicken could not only save lives, but make them easier in many ways. The future of aviation rests on the shoulders of those that are developing it and other aircraft like it. More importantly, the future of civil operations will benefit greatly, the prowess of military success will depend on it, and the lives of those affected by the worst nature has to offer will be saved and changed by the technology behind the amphibious tilt rotor.

Bibliography

United States Geological Survey (USGS) 2004. *Sumatra Earthquake Details.* www.earthquake.usgs.gov/earthquakes/eqinthenews/2004/usslav/

United States Pacific Command (USPACOM), Hawaii. *Operation Unified Assistance Brief. (*April 15, 2005,)

Gorton, Susan, and others. *Subsonic - Rotary Wind Reference Document.* Fundamental Aeronautics Program (NASA) May 26, 2006

2004 Indian Ocean earthquake. Wikipedia, the free encyclopedia: http://en.wikipedia.org/wiki/2004_Indian_Ocean_earthquake#

Humanitarian response to the 2004 Indian Ocean earthquake, Wikipedia, the free encyclopedia: http://en.wikipedia.org/wiki/Humanitarian_response_to_the_2004_Indian_Ocean_earthquake

United Nations Children's Fund Evaluation's Office. *2004 Indian Ocean Tsunami Disaster: UNICEF's Response. (*UNICEF) May 2006

Tsunami Evaluation Coalition. *Coordination of international humanitarian assistance in tsunami-affected countries*. (TEC) July 2006

United Nations Office for the Coordination of Humanitarian Affairs. *Haiti Earthquake Situation Report #28* (OCHA) March 11, 2010

American Red Cross Society. *Haiti Earthquake: One Month Progress Report*. February 12, 2010

2010 Haiti Earthquake. Wikipedia, the free encyclopedia: http://en.wikipedia.org/wiki/2010_Haiti_earthquake

United States Government Accountability Office. *Report to Congressional Requesters: Assessments Needed to Address V-22 Aircraft Operational and Cost Concerns to Define Future Investments.* (GOA) May 2009

Notes:

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