PRIVATE RAPID RESPONSE FIRE AND RESCUE UNIT RESC-U COMMERCIAL VIABILITY

by

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Abstract

Resource companies in Canada operate in remote locations, often hours away from the closest municipality where emergency services such as police, fire and emergency medical services are located. People and equipment use low grade roadways to travel in and out of these locations and deal with the risks of incidents occurring. When an incident such as a motor vehicle collision does occur, the patient can be trapped in the wreckage for hours with no protection from the elements waiting for rescuers to arrive and provide critical interventions.

Similarly, tank truck leaks and wildfires that start small can grow in size and severity without quick response actions from trained responders utilizing the appropriate equipment.

We will investigate the frequency and severity of these and other incidents occurring in remote locations where resource companies are expanding into and evaluate whether the risks justify the commercial viability of a new service delivery. By analyzing the costs of these incidents to the resource companies in terms of injuries to humans and wildlife, environmental impact and also company reputation, we will see if there is a need for providing a more rapid response model.

If the service is indeed justified, at what price point does it become palatable to the resource companies as they weigh the pros and cons of taking on additional costs. Our research will ask the question of the companies and then see if that

pricing model will provide sufficient revenue to cover the costs to provide the service and provide a reasonable return on investment for the service provider.

Some of the metrics used for the financial analysis will be payback periods to recoup the capital outlay, internal rates of return on the capital investment, and the net present value of the future revenues that are projected to be generated.

At the conclusion of the study we can make an informed decision as to whether this venture is truly a wise investment of time, money and manpower or if the return on investment is not worth the effort.

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Acronyms and Abbreviations

AB	Alberta
AED	Automatic external defibrillator
BC	British Columbia
CAFS	Compressed air foam system
CANUTEC	Canadian Transport Emergency Centre
CAPP	Canadian Association of Petroleum Producers
CRA	Canada Revenue Agency
CSA	Canadian Standards Association
EMT	Emergency medical technician
EMR	Emergency medical responder
GDP	Gross domestic product
IRR	Internal rate of return
MB	Manitoba
MVC	Motor vehicle collision
NFPA	National Fire Protection Association
OGC	Oil and Gas Commission
ON	Ontario
VI	Virginia
WACC	Weighted average cost of capital
WCB	Workers' Compensation Board

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Introduction

Canada is blessed with vast areas of open spaces and uninhabited lands. Within some of these areas the Canadian earth is rich with natural resources such as minerals, metals and fossil fuels. Extracting, refining and distributing these natural resources is key to the economic health of several provinces and territories and to the entire country of Canada. In 2010, the forestry, energy, and mining and minerals sectors contributed $142.5 billion to Canada's gross domestic product (GDP). These industries are critical for the future in Canada as well, and the companies that operate in them have made substantial commitments to their long term viability. This would indicate that natural resources exploration, extraction, processing and distribution companies and those that provide services within those sectors should see long term sustainability.

As companies extend their operations deeper into uninhabited areas in search of resources to produce, the lack of essential services and infrastructure increases, and the company becomes responsible for providing many of the services we take for granted living in municipalities and more urban settings. One of the basic services that does not exist in the remote areas is emergency response, such as policing, local fire department and emergency medical services. While the population density diminishes as we travel farther into remote areas, the risk of a serious incident occurring does not diminish at the same proportion, and in fact the likelihood of minor incidents becoming more serious increases as you move away from the urban density.

Once the research has been completed and all data analyzed, resource companies select sites to be transportation and logistics hubs for their operations and establish base camps. These camps become their own small towns in many cases, and often provide amenities beyond food and accommodation for the workers that live there temporarily. Depending on the size and structure of the camp, there will be varying degrees of infrastructure and emergency services provided and access will be via road, aircraft or both.

Problems

Accessing the remote areas via roadway is the most common transportation mode, as much of the construction and extraction equipment is moved onto the sites by heavy trucks or truck and trailer combinations. The size and quality of the roads are often suspect and the risk of motor vehicle collisions (MVC) is high. Collisions can be between two or more vehicles, with unsuspecting wildlife on the roadways, or as a result of leaving the roadway and colliding with trees and rocks or rolling down embankments. In all of the MVC situations there is usually a need for specialized vehicle extrication equipment to rescue trapped drivers and passengers. This equipment is part of the standard complement on most urban fire trucks but is not readily available in the remote areas. Getting the necessary equipment to work on the wrecked vehicles often requires long response times from urban areas to reach the site of these remote incidents. Helicopters can be used to transport the victims once they are removed from the vehicles, if weather permits, but until the patient is stabilized and removed from the vehicle their condition continues to deteriorate.

As heavy trucks haul supplies in to the remote locations and haul produced resources out, many of the trucks are tankers. Currently, 60% of the freight being trucked to, and within the Northwest Territories is fuel. Tanker trucks traveling these roadways run the risk of collisions, but also the risk of a rollover, leading to the tanker spilling its contents and causing damage to the environment. These cleanups can be very costly, and may have huge environmental impacts if the product spilled reaches a watercourse and spreads downstream, contaminating fish habitat and sources of drinking water. As with specialized extrication equipment, spill containment equipment may be available to mitigate these situations but it is often located a great distance away and takes hours to arrive on the scene of the incident. By the time containment equipment arrives on the scene the majority of the fluids have often been released from the tanker, potentially causing irreparable damage. The damage to the environment may only be the tip of the iceberg. The damage to the companies' reputations may cause them to lose public and regulatory confidence, effectively forcing them out of operations.

In heavily treed areas, the impact of resource operations can be one of increased fire risk and wildfire danger. With a season that stretches from March 1st to November 1st in British Columbia, wildfires are not just a summertime concern. Forest and wildfires that start in remote areas can spread quickly and eventually threaten homes in towns and other urban centres while destroying valuable forests and harming wildlife. Some of these fires are started by natural causes, such as lightning, and may not be preventable. Others are started by humans, and some of these are started by operating hot equipment in dry, bushy areas. In these cases a quick initial attack can be sufficient to stop the spread of the fire and control or extinguish the fire before it has a chance to grow out of control.

As mentioned, some sites are accessed by fixed wing, rotary aircraft, or both and are often subjected to landing on temporary runways and helispots. In the case of incidents involving aircraft the response teams are often ill-equipped to carry out patient extrication and rescue, especially if the damaged fuselage is not in an easily accessible area. Traditional airport fire rescue trucks are very large pieces of equipment that are extremely expensive, very difficult to maneuver in uneven terrain and limited to hard surfaces due to their weight. Most remote airstrips or aerodromes do not have specialized rescue equipment and will only have a large wheeled, dry chemical fire extinguisher for fire suppression efforts.

Solutions

The aforementioned scenarios all require a timely and effective response to prevent the situation from escalating in severity and duration. The current response models have a shortfall in that they fail to get the necessary equipment to the incident site within a short enough timeframe to be optimally effective.

In this study we are going to determine the commercial viability to develop and market the vehicle that will carry the necessary equipment to respond to the incidents described above, but on a less traditional fire truck platform. Our platform will be that of a lighter, more agile vehicle that can respond quickly to a call for assistance and has off-road capability to reach more remote locations if necessary. Additionally, our vehicle and equipment are designed to withstand extreme cold weather which is often another risk factor in the areas we are operating in. If successful, the response vehicle we are proposing could be found in remote locations and provide timely responses that minimize the impact on human and animal lives, the environment, and property.

The unit we are proposing will have vehicle extrication tools that can be used on both motor vehicles and aircraft. These tools, often referred to in the media as the "jaws of life" are driven by hydraulics and powered by a gasoline engine. In the case of more remote locations where the truck cannot get close to the wreckage, such as down an embankment or in heavily treed areas, rescuers can substitute a hand pump for the gasoline engine and provide powerful hydraulic tools for cutting the vehicle open and freeing trapped victims.

For spill responses when tankers overturn or rupture, the unit will have various types of booms and dyking materials to control the flow of product and contain it or at least divert it away from watercourses. A variety of hand tools and trained responders who use their ingenuity can prevent a small event from becoming an environmental and corporate disaster.

To remain light and agile for all terrain responses the unit will carry a minimal amount of water for fire suppression. Instead we will use a compressed air foam system (CAFS) which uses air and a detergent concentrate to mix with water and expand rapidly, forming a large blanket of foam that can be used for smothering burning materials and extinguishing fires using small amounts of water. The

CAFS has been proven in the firefighting world and relies on the ability of the compressed air to expand rapidly once it reaches the end of the hose and multiply not only the volume of foam produced but also increase the velocity with which the foam leaves the nozzle, allowing firefighters to remain a safe distance away from the fires' heat.

Emergency services within an urban setting are funded through property and business taxes. In the remote rural settings we are discussing there is a need for the resource companies to fund their own emergency services or face the impacts of response delays we described previously. One of the ways that the service can be subsidized is to tie it into the ongoing costs recovered through road use agreements.

Private roads, built by resource companies, are used by multiple companies to access remote areas. The company who builds and owns the road attempts to recoup the construction and ongoing maintenance costs through pay per use agreements. The users pay based on how many kilometers of roadway they use and how often they use the roads, similar to highway tolls. These are calculated out and each user is charged annually for their percentage of the road used. There are two components of the user fees. One is a percentage of the initial capital investment to build the road, based on a straight line depreciation formula over a number of years. The other component is for ongoing maintenance of the road, including grading, bridge and culvert upkeep, addition of gravel and snow clearing in winter. An additional surcharge could be added which takes the annual operating costs of the rescue unit we are proposing and divides them using the same formulae as above to spread the costs across multiple companies. This would greatly lower the cost to the individual companies and provide a shared resource that is available to all users of the road, lowering the risk levels of all of the companies involved.

There are two primary questions that need to be answered when assessing the viability for introducing a new service delivery model to the market and making the capital outlay to fund this service. It would seem that if the risks we have identified exist at a high level then the outstanding issue is whether the service is economically viable from both the supplier and consumer standpoint. We propose to investigate the level of risk that currently exists based on incidents described above to date and their impact. What cost would a resource company see as reasonable to accept in order to mitigate the risk to a degree. Next we will then examine whether the costs that industry would pay to receive the services make it a commercially viable business opportunity for the supplier.

Chapter One

The Resource Industry

Canada's vast northern lands are rich with natural resources. These areas are not highly populated and are very undeveloped in terms of access and infrastructure. Companies wishing to extract, produce and market these resources face huge financial and logistical hurdles with high capital costs up front and ongoing challenges due to the extreme climates and remote locations. Once the upfront costs have been funded, however, resource extraction can provide lucrative long term incomes for the companies who manage to get their products to the markets. For our purposes, when we are referring to the resource industries, we include forestry, mining and minerals, and energy, predominantly fossil fuels. These three sectors combined contributed more than 142 billion dollars to the national gross domestic product (GDP) for Canada in 2010, more than 11% as seen in Figure 1 below.

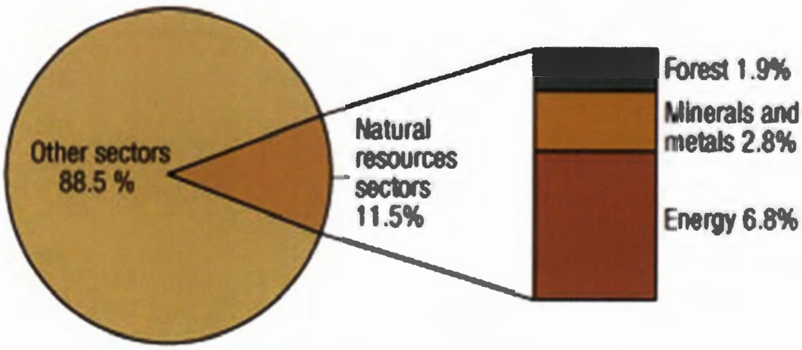

Figure 1 Natural resources sectors vs. total GDP in Canada 2010

Source: Statistics Canada

Resource extraction generates royalty and taxation dollars for all levels of governments involved and remains a critical industry for Canada's economic stability. Transportation and technology have opened world markets to Canada's resources and while the demand for these resources follows peaks and valleys, it has seen historic growth over the long term. Companies continue to invest in the future of these industries as well. As mentioned, the capital costs required to finance these projects can be huge, with little or no payback for several years while infrastructure to extract and develop the resource is constructed. Future continued growth of the industry seems certain, as resource companies invested more than $94 billion in capital projects in Canada 2010 alone. These large investments could take several years to produce any returns and even longer to reach their point of payback.

Table 1. Natural resources facts

Facts for 2010	Forest	Minerals and metals	Energy	Total natural resources	Canada
Gross domestic product (GDP)	$23.5 B (1.9%)	$34.7 B (2.8%)	$84.3 B (6.8%)	$142.5 B (11.5%)	$1 234.9 B (100.0%)
Direct employment (thousands of people)	191 (1.3%)	308 (2.1%)	264 (1.8%)	763 (5.2%)	14 701 (100.0%)
New capital investments	$1.6 B (0.5%)	$12.6 B (3.7%)	$80.3 B (23.8%)	$94.5 B (27.9%)	$338.1 B (100.0%)
Trade					
Total exports	$26.1 B (6.5%)	$84.5 B (21.2%)	$90.0 B (22.5%)	$200.6 B (50.2%)	$399.4 B (100.0%)
Domestic exports (excluding re-exports)	$26.0 B (6.9%)	$81.4 B (21.8%)	$89.7 B (24.0%)	$197.1 B (52.6%)	$374.3 B (100.0%)
Imports	$9.5 B (2.3%)	$66.6 B (16.5%)	$40.3 B (10.0%)	$116.4 B (28.8%)	$403.7 B (100.0%)
Balance of trade	+$16.6 B	+$18.0 B	+$49.7 B	+$84.3 B	-$4.3 B

Source: Statistics Canada

Transport Canada contracted PROLOG Canada to conduct a Northern Transportation Systems Assessment and their research also indicates a trend toward an increase in activity in resource extraction in Canada's north. PROLOG data shows additional inbound and outbound traffic as a result of the active and planned resource development projects over the next twenty years.

As companies extend farther and farther away from populated and developed regions in search of these resources, transportation becomes more and more important. Initial explorations are often carried out solely by helicopter and all terrain vehicles as no roadways exist. Primitive, seasonal trails and roads may follow if the project seems probable, and may expand into more developed dirt or gravel roads of varying sizes and grades as the preliminary project work begins to increase in scope and complexity.

Resources produced need to get to markets. Minerals, metals, and forestry products are transported from point of extraction by either truck or railway. Gas or liquid energy products can be transported by pipeline once a suitable pipeline has been constructed, but initial produced quantities are transported by truck or rail until the output justifies the need for a pipeline.

Forest products are hauled from the site of extraction by truck and trailer combinations to mills for processing. These 'forestry roads', as they are called, often begin as summer use only, when the logging crews are most active. Eventually the energy companies may begin to use the forestry roads and extend them or develop them further for their winter usage as well. Mining companies also build their own roads into sites and these may be shared by forestry or energy companies as well. These resource roads can be classified as forest service roads, petroleum development roads, mineral exploration roads and special use permit roads. In British Columbia alone there are more than 450 thousand kilometers of these types of roads, crisscrossing the northern parts of the province. When roads are shared by several resource companies, there are use agreements in place that allow the company that built the road to recoup some of their initial investment as well as recover annual maintenance costs.

The resource sectors directly employed more than 760 thousand people in Canada in 2010. Established resource development sites often contain large camps to provide room and board for workers who rotate in and out of camp on a regular work schedule, most often for at least a week at a time. Regular crew changes are carried out by bus, helicopter or airplane if the site has an airstrip or aerodrome. The safety of employees is one of the primary concerns for most resource companies. Legislation requires companies to take reasonable measures to ensure worker safety and penalties for negligence in this area are severe. Unfortunately, many workers are injured travelling to and from the camps and work sites, and this risk remains high.

Motor Vehicle Collisions (MVC)

There are risks inherent with transportation on roads and these risks increase when road conditions deteriorate. First, there are the costs and risks with moving people and equipment into undeveloped regions that lack suitable roadways.

The danger of driving on remote roadways with no lighting and extreme weather conditions escalates when moving large pieces of equipment using tractor trailer units. Loads such as construction equipment, temporary office facilities and living quarters are moved into the locations predominantly by truck. These heavy units have longer braking distances and cannot navigate sharp turns, raising the risk of incidents on narrow, poorly maintained roadways and those susceptible to slippery conditions due to snow or rain. Workers are transported to and from the work site in large numbers by bus, and individually by pickup truck. This mix of light and heavy vehicles makes the risk of incidents occurring climb even further as you consider the issues with passing slower moving vehicles, reduced lighting and visibility, lack of guardrails and warning signage, inexperience driving in these conditions, and driver fatigue.

Table 3. Types of Vehicles in Casualty Collisions in Alberta - 2010

Vehicle type	**Vehicles in fatal collisions**	**% of all fatal collisions**
Car	134	28
Mini van	62	12.9
Pickup truck	*150*	*31.3*
Truck > 4500 kg	*46*	*9.6*
Tractor Trailer	*32*	*6.7*
Motorcycle	31	6.5
Off highway vehicle	6	1.3
Construction equipment	*3*	*0.6*
Total	**479**	**100**

Source: Alberta Traffic Collision Statistics

Looking at Transportation Alberta's other 2010 statistics, we see that more fatal MVC occur on rural roadways than urban and that 14.6% of casualty collisions are from running off the roadway. The most likely vehicle to run off of the road is a tractor trailer combination.

According to Enform, the safety association for the upstream oil and gas industry, 187 oil and gas workers were killed in motor vehicle collisions in the period from 1994 to 2005. These statistics are based on reports to the Workers' Compensation Board (WCB) in Alberta, British Columbia and Saskatchewan over that time period. Enform estimates that for every one reported to the WCB, as many as 20 more are not reported since the roadways to and from the camps and worksites are not considered part of the workplace so the fatalities are often considered 'off the job'. Despite the inherent risks of the worksites with rotating machinery, sour gas, et cetera, motor vehicle collisions remain the leading cause of death for workers in the oil and gas industry.

In attempting to prevent casualties and fatalities on roadways, governments have carried out studies and looked for ways to improve road safety and quicker response times. The Government of Alberta commissioned an investigation into why so many collisions were occurring on a particular stretch of Highway 63, near Fort McMurray, Alberta, which is currently the heart of the oilsands extraction and refining industry in Canada. This highway, used predominantly by the oilsands companies and their employees has seen numerous fatal collisions due to the mix of heavy and light vehicle traffic, extreme winter driving conditions, and driver fatigue. These are all of the same reasons we see for the collisions on the remote roadways.

The aforementioned study of Highway 63 had many recommendations to improve the safety of travelers and ways to increase their chances of survival should a collision occur. One recommendation was to provide a quicker response to collisions and ensure that critical, life saving interventions could occur. There is a premise of emergency medicine called the "golden hour" that was developed in the Vietnam War. It stated that the chances of a seriously injured soldier had a much higher chance of survival if they received advanced medical care within an hour of their injury. Today, a hospital in Central Florida has data that suggests patients have a 15-20% higher chance of survival if they receive care at a trauma centre within the golden hour.

Air ambulance, or Medivac helicopters can shorten transport times for victims when weather allows the helicopter to fly, but the trapped patient still relies on extrication efforts and equipment to free them from the wreckage and package them for transport to hospital. Here is where the golden hour evaporates.

In May of 2012, two pickup trucks collided head- on while traveling on Highway 63. The first person to provide assistance was driving immediately behind the crashing vehicles and stopped to offer assistance. He could not extinguish the fire that engulfed one of the trucks and those two occupants perished. He was able to pull three people from the other pickup but four more were trapped inside. It took 55 minutes for the first rescue crews to arrive and provide patient care. All four of the trapped occupants died.

In response to this problem, Alberta's Athabasca County, which has Highway 63 running through it, has received provincial funding to provide a "Road Rescue Service". The request for proposal for this service stated that the biggest concerns in providing effective response to motor vehicle collisions "is the potential distances required by the first response agency to get to the scene" using up the golden hour. They were looking for a rapid response vehicle that could arrive on scene and be supported by air ambulance to get patients to advanced life support in a timely manner.

Spills

When transporting liquids either required or produced by the resource industry the risk of spills is ever present. Whether being transported by road, rail or pipeline a liquid spill can be dangerous to human, animal and plant life. Tanker trucks are used extensively on the remote roadways to transport fuel required by heavy construction equipment and as a heat source. PROLOG's Northern Transportation Systems Assessment estimates that fuel hauling comprises 60% of the highway traffic in the Northwest Territories. Other liquids such as fracturing fluids and solvents are hauled into oil and gas sites to be used as part of the extraction process.

It is very common that tanker trucks hauling liquids may have multiple pick up and delivery points along their route. This heightens the risk of rollover, as any tanks less than three quarters full of liquid are subject to the load sloshing and causing instability.

CANUTEC is the federal government's emergency centre for transportation of dangerous goods, a division of Transport Canada. They provide technical support through their emergency line and website to spill responders. Their statistics for the period from January 1, 2011 through August 31, 2011 show 729 transportation emergencies across Canada, with 214 of those in Alberta and British Columbia. Of note is that 157 incidents nationally involved compressed gases, such as propane, butane, ethane, commonly hauled energy products. Additionally, another 192 involved flammable liquids and 206 incidents involved corrosives.

Tanker trucks can haul 20,000 to 50,000 litres of product at one time. In a rollover or spill situation the size of the hole causing the leak will determine how long it takes for the spill to grow, so there is no set 'golden hour' per se. It is important to initiate a response as soon as possible to not necessarily stop the spill but rather to divert it away from sensitive areas such rivers and streams and contain the product within a designated area.

In April of 2011 a tanker truck driving near Victoria, BC crashed into a rock wall and tipped over, spilling more than 40,000 litres of fuel. The fuel leaked into the drainage ditch and flowed into the Goldstream River. Hundreds of fish died and soils have been contaminated. Fuel also seeped into rock and some hydrocarbons are released each time it rains and rainwater pushes the lighter fuel to the surface of the rocks. Cleanup efforts continue today and have cost the trucking company more $2 million. The company's reputation has been severely damaged and their business has suffered.

Wildfires

Canada is blessed with vast amounts of boreal forest and our softwood lumber is a valuable resource that is transported to national and international markets. Thousands of hectares of forest are destroyed each year by wildfires that burn out of control before being extinguished or running out of adequate dry organic matter for fuel. Wildfires are started by naturally occurring events such as lightning strikes, and also through human activity. The human activity category can include the results of recreational activities like unattended campfires and careless discarding of cigarettes. It can also include more commercial activities such as hot vehicle exhausts on dry grass/brush, hot ash and particulates from industry operations, and setting hot tools down on dry grass/brush.

Table 5. Wildfires in British Columbia

Year	Total Fires	Total Hectares	Total Cost (millions)	Average Hectares per Fire	People-Caused		Lightning-Caused	
2010	1673	331,108	$212.2	197.9	693	(41.4%)	975	(58.3%)
2009	3064	247,419	$382.1	80.8	881	(28.8%)	2183	(71.2%)
2008	2023	13,240	$82.1	6.5	847	(41.9%)	1175	(58.1%)
2007	1606	29,440	$98.8	18.3	687	(42.8%)	919	(57.2%)
2006	2570	139,265	$159.0	54.2	1034	(40.2%)	1536	(59.8%)
2005	976	34,588	$47.2	35.4	591	(60.6%)	385	(39.4%)
2004	2394	220,518	$164.6	92.1	681	(28.4%)	1713	(71.6%)
2003	2473	265,053	$371.2	107.2	959	(38.8%)	1514	(61.2%)
2002	1783	8,539	$37.8	4.8	911	(51.1%)	872	(48.9%)
2001	1266	9,677	$53.8	7.6	787	(62.2%)	479	(37.8%)
2000	1539	17,673	$51.5	11.5	697	(45.3%)	842	(54.7%)
Average*	1969	98,541	$144.8	41.8	807.1	41.0%	1175.1	59.0%

Source: British Columbia Wildfire Management Branch

Wildfires are similar to spills in that the problem cannot always be eliminated by a quick response but the quicker the response is the more likely that it will be handled in a controlled manner and less likely to get out of control. Once the wildfire gets out of control it can spread from forests to urban areas and destroy homes and businesses. The true cost of a wildfire includes:

1. firefighting manpower and equipment
2. damaged property costs
3. lost revenues from businesses destroyed by fire
4. revenue lost from the forest products that are burned and not suitable for lumber.

As previously mentioned, many resource development roads began as forestry roads, and weave through trees and brush. Human activity in these areas may take place year round while fire protection efforts are focused on the summer months, especially when student labor is available. Unfortunately, once the students have returned to school the manpower has diminished but the risk has not disappeared. According to BC Forestry, fire season continues until the areas have three consecutive days of snow cover, and this is normally after a large percentage of the available firefighters are back in school.

The reality is that the forest service cannot be everywhere that the wildfire risk exists. Resource companies with remote operations in forested areas have to assist with fire prevention and fire suppression. The BC Wildfire Regulation mandates that between March 1 and November 1 (unless there is snow cover) those carrying out operations 'on or within 300m of forest or grass land' must have fire suppression equipment at the site. This includes hand tools such as shovels and axes, but also a system for delivering water or foam under pressure.

Aircraft Crashes

Remote landing facilities for aircraft lack full time maintenance and are not manned facilities. Some resource companies build airstrips or aerodromes near their facilities to allow for air transportation of work crews into remote areas with much shorter travel times than driving. Established sites can have regularly scheduled crew change flights several times per week using anything from smaller chartered aircraft with 4 to 8 people up to Boeing 737 holding more than 100 passengers, depending on the size of the facility. Canadian Natural Resources Limited (CNRL) has eight Boeing 727 charter flights between Calgary and their Horizon facility near Fort McMurray, AB every Monday and Tuesday for major crew change days and flies at least one flight in and out of the site every other day of the week, seven days a week. Most other sites will fly crews in and out 2 to 3 times per week on smaller Dash 8 or King Air aircraft.

When crashes occur, they are often short of the landing facility in grassed or wooded areas, making rescue equipment scarce and access to crash sites difficult. Victims can remain trapped and/or exposed to extreme cold weather as they wait for response efforts to reach them and provide assistance.

In October of 2010, a Beechcraft King Air 100 was on its weekly flight carrying a crew of workers to a BP Canada work site in Northern Alberta when it crashed into muskeg short of the targeted private runway. The pilot was trapped in the wrecked fuselage and succumbed to his injuries. The other passengers were eventually transported by ground ambulance to area hospitals. One person on the scene stated that fire and EMS crews were slow to arrive and struggled at the scene as there was "two and a half inches of snow on the ground, which made the roads muddy for rescue workers" and the crash site not accessible in their traditional fire apparatus.

Table 4. 2011 Aircraft Incidents

Aircraft type	Aircraft in fatal incidents	% of all fatal collisions
Airplane	23	66
Helicopter	8	34
Total crashes		257
Total fatalities		70
2011 Average of 5.7 crashes per 100,000 flying hours		

Source: Canadian Transportation Safety Board

Mining and oil and gas companies continue to develop new airstrips at their larger remote sites to expedite crew changes and minimize travel time. New exploration is often carried out by helicopter as there is no road access and no cleared areas large enough to land fixed wing aircraft. As the number of flights increase the number of incidents will also increase and it is not feasible to staff all airstrips with full time crash rescue tools and manpower. Accessing the crash sites to provide rescue efforts will continue to be an issue as aircraft land in more remote locations.

Chapter Two

The RESC-U

Traditional, structural firefighting apparatus are large custom built vehicles, based on a full size truck tractor platform. These are found in most urban centres throughout North America. Oil and gas sites have historically used similar sized vehicles with fire suppression capability as well as emergency showers inside them in case a worker on site is contaminated with the spray of a hazardous chemical on site. Both of these trucks have specialized uses and are limited to more developed roadways due to their large size and weight. For the varied, rapid responses we have outlined so far, a smaller, more agile vehicle is required.

Figure 2: Typical urban fire engine (left) and oilfield fire/shower combo unit

Our vehicle has off road capability and four wheel drive to maneuver on rough terrain, in muddy conditions, and on icy and snow covered roads. In addition, the vehicle we are proposing is based on providing many different services, and will utilize new technology and lightweight materials to maximize the amount of equipment carried while minimizing vehicle weight.

The acronym RESC-U represents the different capabilities that the vehicle provides.

- **R** is for rapid, and the ability to provide a quick and timely response to incidents.
- **E** stands for extrication, which is the term used to describe the removal of victims from trapped or enclosed situations.
- **S** represents suppression, the process of controlling and extinguishing fires.
- **C** is for containment, and speaks to the ability to control spills.
- **U** stands for unit, and how all the capabilities are housed in one piece of apparatus that can handle a multitude of different events.

Built on a Ford F-450 or F-550 platform, the RESC-U will be a diesel powered, four wheel drive truck. The front cab portion will be the crew cab configuration with four doors. The front seat will have the driver and second responder while the back seat will be used to store equipment, specifically those items which are used frequently, those that require battery charging and those that are sensitive to cold temperatures. Medical equipment, including the automatic external defibrillator (AED) will be in the back seat of the cab to remain fully charged and as clean as possible at all times.

The rear of the truck will contain the specialized equipment required to respond to incidents. An onboard generator will supply electrical power to a number of cord reels and 110 volt outlets for smaller electric hand tools as well as for auxiliary scene lighting.

Figure 3: Example of a fire truck body on 2012 Ford F-550 diesel chassis

In the previous section we outlined the existing conditions in the resource industry and how they currently put lives, the environment, property and the companies' reputations at risk. Using the same general categories of motor vehicle collisions, spills, wildfires and aircraft crashes we will demonstrate how the RESC-U, the trained responders, and the specialized equipment on board can help to mitigate those risks.

Motor Vehicle Collisions

A rapid response is the first step in providing life saving interventions at a motor vehicle collision. The remote locations that the resource companies operate in are not conducive to rapid responses by traditional, urban fire trucks. By staging the RESC-U at the camp, mine or worksite the response time will be much shorter than it would be for a local fire department to travel from the nearest municipality. This will help keep the victims' golden hour intact.

Once the RESC-U arrives on scene it will set up traffic control devices such as flares and barricades to establish a safe working zone and prevent additional vehicles from colliding with the initial crashed vehicle. Flashing lights and reflective striping will make the RESC-U highly visible to oncoming traffic. Telescoping poles will support LED light fixtures that provide bright white scene lighting on the incident scene and allow responders to see clearly while working. The rescue crew will don the appropriate protective clothing and ensure the scene is safe for them to proceed with their efforts.

The unit will have all of the necessary tools to extricate the patients from wrecked vehicles and prepare them for transport by air or ground ambulance. The RESC-U will carry hydraulic extrication tools, similar to the familiar "jaws of life", which can be used to cut vehicles' body panels to allow access to people trapped inside the tangled metal and plastic. Of note, the RESC-U's extrication tools will also have the option to be powered by a manual hydraulic pump that can be carried in to locations that cannot be accessed by vehicles, such as down steep embankments, if that is where the crash site is.

In the event that the vehicles involved in the collision are on fire, the CAFS system and dry chemical extinguishers on the RESC-U can be deployed to put out any fires and make the scene safe for the patients and allow the ongoing rescue efforts to continue.

Victims of serious MVC require stabilization and immobilization as there is the risk of spinal damage. The RESC-U will carry spineboards, splints and cervical collars for immobilizing patients during extrication and for packaging prior to transport. When the air or ground ambulance arrive they will merely need to load the patient and be on their way to the hospital for advanced life saving.

Canada's north presents other unique challenges for responding to MVC, extreme cold weather and the risks of hypothermia and frostbite. To protect extracted patients from the elements, the RESC-U will carry an inflatable tent that can be easily set up and provide shelter from the wind and cold. The tent deploys in minutes and is large enough to cover six patients as they await transport to hospital by ambulance.

Spill Response

As with the MVC responses, the strategic locations of the RESC-U will greatly aid in a timely response to spills and minimizing their severity. The first priority will be the safety of the responders and the public so the site will be isolated, like the MVC scenario, to prevent additional vehicles from crashing into the leaking tanker. Using the RESC-U's barricades and emergency lighting, crews will ensure the site is visible to approaching traffic. RESC-U crews will don the appropriate protective clothing and utilize personal monitors to check the air quality in the area.

When a tanker is leaking, it can be from different sizes of cracks and/or holes in the tank. Smaller holes can be plugged by the RESC-U crews using a variety of hand tools and other small equipment carried on board. The larger leaks may have their flow slowed, but are more likely to continue to leak.

When large leaks spill the tankers' contents the RESC-U crews will turn their efforts towards containing the spill and keeping it from entering sensitive environmental areas such as creeks, streams, rivers and lakes. This can be done using the absorbent pads and diversion booms carried on the RESC-U, applied: 1. directly to the spilled material to absorb it, 2. and around the perimeter of pooling areas to contain it. Crews can also provide containment by using the shovels and rakes on board to create channels for the liquid to flow in and also to create earth and snow/ice berms to create a perimeter for containment.

A release from a pipeline leak can also be handled by the RESC-U crews. The four wheel drive vehicle can provide access to remote leak locations and allow responders to begin control and containment efforts.

A rapid initial response by trained responders using the proper equipment can make a huge difference in the severity of a spill. While it is recognized that not all spills can be prevented, the timely response will lessen the impact of the spill. By keeping the materials away from sensitive areas the RESC-U can help companies protect wildlife, the environment and the companies' reputation.

Wildfires

Fires can start small and grow rapidly when left to burn. Winds and dry conditions only exacerbate the problem of wildfire spread and increase the risk. As with the MVC and spill responses we have previously discussed, the timeliness of a fire response can make a world of difference. The RESC-U will again be available for off road travel to reach the seat of the fire and provide a quick initial knockdown. If the fire has already grown too large for the RESC-U then the strategy will be to use the fire suppression capability to create fire breaks and protect key infrastructure.

Our RESC-U will utilize technology to provide fire suppression capability without carrying an abundance of water, keeping the vehicle's weight down. This is done by using the compressed air foam system (CAFS) on board the RESC-U. The CAFS strength is in the ability to use a small amount of water and combine it with foam concentrate and compressed air to produce a large amount of firefighting foam. This foam can be laid on top of brush, grass, trees and structures to prevent them from burning. In this way the RESC-U can provide a fire break to stop the spread of the fire into certain areas. The foam is completely bio-degradable and has no harmful effects on the environment from its runoff water when used for firefighting.

Similar to spill control where earth berms were an option, the RESC-U crews can also use hand tools such as rakes and shovels to create fire breaks. By digging rows in the earth where dry brush is threatened by fire, crews can remove the combustible plants and form a barrier to the fire spread. All of these efforts can be handled with tools and equipment on board the RESC-U.

Aircraft Incidents

Resource companies that build their own airstrips are not required to have full time rescue personnel on site. Most airstrips and aerodromes will have dry chemical fire extinguishers on site but no dedicated manpower and no ability to transport the extinguishers to the site of a crash if it is not directly on the airstrip.

When the RESC-U is deployed to a site with an airstrip, it would be available to standby when aircraft were taking off or landing. The multi-functional unit would not have to be dedicated solely to the airstrip, but would be available for aircraft take offs and landings, making it a much more economical way to have the services available when required only.

Aircraft crash rescues are a combination of the previous three hazards we discussed. First of all, there is the potential for trapped patients requiring rescue, medical aid and transport to hospital, similar to a motor vehicle collision. In this case the specialized tools and equipment on the RESC-U that we described for MVC previously will also apply to aircraft. Additionally, since aircraft often crash due to severe weather, any patients requiring shelter from the elements as they await transport to hospital will benefit from the RESC-U's inflatable tent.

The second issue with aircraft crashes is the risk of leaking fuel. The techniques and RESC-U equipment used to handle spills from tankers and pipelines will also apply to aircraft fuel. Absorbent materials and diverting techniques can prevent patients and responders from being exposed to fluids and becoming contaminated, and these efforts can also protect the environment from damage. Foam supplied by the CAFS is suitable for dealing with hydrocarbon fires, such as aviation fuel, or to cover a pool of hydrocarbons with a blanket of foam to prevent the vapors from igniting.

Medical Response Capability

In all of the above scenarios we have referred to patient care and how the patients would be treated and prepared for transport. The RESC-U would carry a variety of medical equipment, including an AED, splints, collars, and bandages, as well as spineboards and blankets for preparing patients for transport.

The RESC-U crew would consist of two responders, both trained in firefighting, spill response, and vehicle extrication. One member would be trained as an emergency medical rescuer (EMR) allowing them to provide basic life support in an emergency and operate the AED. The second responder would be trained to the emergency medical technician (EMT) level, allowing them to supply more advanced medical care, including starting an intravenous (IV) line on a patient and administering fluids through the IV. For comparison, in most urban centres the ambulance will be manned by two EMT.

Summary

The RESC-U is a unique piece of equipment, and requires two highly trained responders to operate it to the full capacity. While it would seem unlikely that any resource companies' risk tolerance could justify a full time MVC response crew, or a full time spill response crew, a full time airstrip standby crew or a full time fire crew, combining all of those capabilities into one unit makes the concept of the RESC-U a realistic way of managing risk.

Based on the premise of a rapid intervention minimizing or eliminating the impact of an incident, the RESC-U is an efficient way of getting the necessary response equipment to site in a hurry. By focusing the response at the root of the incident the situation does not deteriorate and escalate into a large scale emergency. The equipment on the RESC-U can keep a small incident small, minimizing damage to people, wildlife, the environment and the companies' reputations.

Chapter Three

Commercial Viability

The need to provide a different rescue and response capability to remote locations than is currently in place seems evident. The scenarios we have examined show the practicality of a different response model that is more flexible in its deployment capabilities and more agile in its ability to access remote areas than a traditional fire truck. The market is ready for a substitute to the traditional service providers and there is an opportunity to be a first mover in to this market subset. The barriers to entry are low to medium as the only real hurdles are the costs to build and equip the vehicle.

The remaining question is who will pay for such a service that can be viewed in two ways: as merely additional insurance against risk, or as a crucial part of a corporate commitment to protecting lives, the environment, property and the company's reputation.

Provinces and municipalities fund emergency services such as police, fire suppression and rescue, and emergency medical services through property and business taxes. The resource companies that are operating in remote areas do not have any tax bases to generate revenue, so emergency response becomes an expense that is rolled into the costs of health and safety, or part of the general and administrative (G&A) budgets.

Resource companies that build their own roads charge annual fees to the users of the roads. The amount of the fee is based on the initial cost to build the road plus a percentage of annual maintenance costs. Road usage is based on how many kilometers of the entire road a user uses annually to conduct their operations. For example, a company which is required to travel five kilometers down the private road to reach its operations site would pay far less than the company who needs to travel thirty kilometers down the private road to reach their site. The rescue services we are proposing could be partially funded by road user agreements with each company paying a portion of the total cost.

Typically, resource companies will contract private service companies to provide specialized support services such as security, medical and fire suppression services. These contracts can be short term for some small operations such as drilling a well or fracturing, lasting days or weeks at a time. They can also be longer term for an ongoing project such as a mine or construction of a new gas gathering system and processing plant, where the contract will normally be one to three years in length. The objectives of the resource company are to minimize overhead by only paying for services they need at the time and avoid tying up capital funds on equipment that is not part of their ongoing core business. Fire trucks are one such service that is nearly always contracted out due to the specialized equipment and personnel required to provide the service.

Pricing

Contracted services are usually based on a day rate for services and equipment provided. Most commonly a day is based on a 12 hour shift for manpower and a 24 hour period for equipment. When evaluating the viability of the RESC-U project we looked at the day rates for both the unit and the manpower and extrapolated the daily revenues over an entire year. The unknown factor in the equation, however, is what day rate would the resource companies be willing to pay for the service.

To determine a price point that industry would accept as fair for our study we consulted three parties: the Vice President of Production for an Alberta based oil company, the Director of Health, Safety and Environment for a North American gas company, and the Sales Manager for an Alberta company who supplies fire trucks and manpower to the oil and gas industry. Each of these individuals are familiar with the current fire truck model being used in the industry and were aware of the current going rates to have such equipment and manpower on a site.

Consensus among those consulted was that the pricing model should consist of a day rate for the truck and equipment, a day rate for the responders and a replacement charge for any disposable items used. The rates suggested are included in Table 8, below.

Table 8: Rate Schedule for RESC-U and Manpower

Resource	Rate/unit	Estimated Daily Cost
RESC-U	1000/day	1000
Mileage – 100km/day included	1.00/km	70
Disposable equipment used	Varies by item	30
Senior Firefighter/EMT-A	650/day	650
Firefighter/EMR	600/day	600
Total average daily cost		2350

For comparison, a fire/shower combination unit on an oil and gas site costs the resource company more than five thousand dollars per day, not including fuel surcharge. The combo unit is for fire suppression and decontamination showers only and would not respond off of the site to other incidents.

We will use the rates in Table 8 for the basis of all of our analysis and will keep this pricing in years one and two of operation. Future years will be increased by 5% as it is common in the industry to see price increases in that range.

Cost of Equipment

To purchase and equip the RESC-U would require a substantial capital expenditure. The two costs are split at roughly 60/40, as the truck chassis and box comprises sixty percent of the cost and equipment makes up the remaining forty percent.

There are minimum standards for firefighting and rescue equipment, such as the Canadian Standards Association (CSA) and National Fire Protection Association (NFPA). There are also standards for rescue vehicles' markings and emergency lighting to help ensure the safety of responders. Lastly, the resource companies have their own minimum standards for vehicles in regards to their age, capabilities and condition. All of the equipment we propose for the RESC-U will meet or exceed those standards.

The Ford F-550 chassis, fitted as shown in Figure 3 with the custom box would currently cost approximately one hundred and eighty thousand dollars. The time from order through delivery is normally 90 days but can be longer depending on the fire truck factory work load. The chassis can be shipped directly from Ford to the fire truck manufacturer and delivered from their factory to most Canadian cities. Ford offers financing on the chassis portion but the fire truck manufacturers rely on the major banks for their financing.

The equipment required to outfit the RESC-U currently costs around one hundred and twenty thousand dollars. Dealing directly with some of the manufacturers lowered the cost marginally, but for the most part the equipment is sourced through fire equipment supply companies that sell multiple lines of products and are the only suppliers of some equipment. Financing is not an option with most of these companies for one time customers. Some will give terms to repeat customer, but it is not an option for our first RESC-U.

The capital outlay for the RESC-U truck and equipment is approximately three hundred thousand dollars. A rough breakdown of costs is shown in the table below with all figures in thousands.

Table 9: December 2012 Cost to Purchase and Equip RESC-U

Asset	Unit Cost (000s)	Total Cost (000s)
Truck chassis w/custom body	180	180
Reflective badging, striping, scene lighting, as per standards	30	30
CAFS, hose, firefighting equipment	40	40
Extrication and rescue tools	20	20
Medical equipment, AED, patient transport	15	15
Protective equipment, clothing, helmets	15	15
Total initial capital cost of truck and necessary equipment		**300**

For our financial analysis, all equipment and the truck are depreciated using the diminishing balance method at the current Canada Revenue Agency (CRA) rate of thirty percent. The equipment is expected to last greater than five years, however we have also budgeted two ten thousand dollar equipment upgrades in years three and five.

Operating Costs

The costs to operate the RESC-U consist of two main budget lines: operating (including regular scheduled maintenance) cost of the vehicle and the cost of manpower.

The operating and maintenance costs of the vehicle were obtained by consulting with a company who currently provide fire and medical protection to the oil and gas industry. They operate a variety of light and heavy vehicles and have accurate data on what each vehicle costs the company in terms of operating and maintenance expenditures.

Based on the information provided to us, and given the harsh conditions that the RESC-U will be subjected to, we have set the operating and maintenance costs at $9000 per month. This includes regularly scheduled maintenance, operating costs including fluids, and annual licensing, insurance and certifications for the truck. It also includes regular maintenance and servicing of all powered equipment such as generator and hydraulic pumps.

While the truck cab and chassis would be under warranty for the first five years it is anticipated that there would be costs to replace pieces of equipment over the first five years. We have budgeted capital expenditures in years 3 and 5 to either replace failing equipment or to upgrade to new, technologically superior equipment. As advances are made in technology and techniques there is often the need to purchase new equipment to make the tasks more efficient or safer for responders.

Manpower costs were also obtained from companies currently supplying firefighters or EMT personnel. The current day rate for an oilfield firefighter is four hundred dollars per day and an EMR is paid two hundred fifty dollars per day. To attract and maintain the specialized personnel we are proposing to use on our unit we have set the day rate at four hundred dollars for the firefighter/EMT and three hundred for the firefighter/EMR. Using a corporate burden of twenty five percent for benefits, uniforms, overhead, etc. the total manpower costs per day are:

Firefighter/EMR $375/day

Firefighter/EMT $500/day

For budgeting purposes we have based these manpower costs on a 365 day year, although the RESC-U is only forecasted with a 75% utilization rate for revenues. The extra manpower costs are left in to reflect annual training and vacation days. We have increased these costs by 5% each year to reflect inflation and market cost increases.

Detailed Financial Analysis

The feasibility of the RESC-U project is ultimately decided on its ability to generate revenues that are sufficient to justify the capital expenditures up front. We have compiled pro forma financials that predict the first five years of operations and measure revenues versus expenditures and the cash flows that result from the difference. We also calculated the net present value (NPV) of the project by discounting the future cash flows and adding them against the initial investment. These cash flows are discounted at the rate of fifteen percent to reflect the risk that exists.

The risks of future cash flows that exist are based on the industry that we are targeting and because this is a new service offering. Although the extraction projects we have spoken of are long term capital investments, the resource industry can be volatile, as it is based on commodity pricing. When market commodity prices slump, the resource companies may slow down or suspend exploration projects, laying off workers and shutting in sites. This would likely cause the RESC-U to be stood down until full operations resumed.

The fixed and variable costs that we have used are based on current data provided by industry personnel, so we feel very comfortable with them. The day rate for the unit is accurate as it was also provided by potential customers in the industry and what price they would be willing to pay for the service. The uncertainty lies in the utilization rate. We have currently set it at 70%, rising to 75% in year two and for years three, four and five. These rates are somewhat conservative for a full time service. The conservatism is based on the premise that certain resource sites may shut down during the year for holiday breaks, maintenance, labor disputes, and slumping commodity prices.

The weighted average cost of capital (WACC) we used is based on the current ratios at Caliber Planning Inc., a small privately held Alberta corporation who are interested in offering the RESC-U as a service. Caliber has a debt to equity ratio of twenty seven percent debt and seventy three percent equity, and as an Alberta corporation they are currently taxed at fourteen percent of their income.

Investors in the markets currently expect a six percent return on their investment. When calculating the cost of equity we used a risk premium of the expected six percent, less the risk free rate of 2.60%, which was derived from the current Bank of Canada long term bond rate. This set the risk premium for equity at Caliber at 8.8%.

Caliber is a privately held company so no public market data exists. To determine Caliber's beta we looked at publicly traded companies offering similar services. The closest comparison is an Alberta company called HSE Integrated. HSE offers medical and fire protection services to industrial sites, mostly in the resource sectors and specifically oil and gas. They have fire/shower combo units which we described earlier and deploy them to oil and gas sites on short and long term contracts. HSE was traded on the Toronto Stock Exchange until they were acquired by a large, private company in 2012. At the time of the acquisition, HSE's beta was 1.09.

To determine Caliber's beta we used the

The interest rate for debt was set at five and one half percent. Caliber has financing established with Canadian Western Bank at a rate of prime plus two and one half percent. The current prime rate at time of calculations was three percent, so Caliber's rate was 5.5%.

Figure 4: Calculating the WACC for Caliber Planning

Hamada equation $b = b_u [1 + (1-T)(D/S)]$

Calculating the unlevered beta using HSE Integrated's beta of 1.09 we get

$$1.09 = b_u [1 + (1-.22)(11.07/73.14)]$$

$$b_u = 0.97$$

Then, inserting the unlevered beta into the equation we calculate Caliber's levered beta

$$b = 0.97 [1 + (1-.14)(270/712)]$$

$$b = 1.29$$

Caliber's cost of equity $r_s = r_{rf} + (RP_m)\ \beta$

$$r_s = 2.6\% + (6\%)\ 1.29$$

$$r_s = 10.32\%$$

Caliber's WACC $WACC = W_d r_d\ (1-T) + W_{ce} r_s$

$$WACC = (.27)(5.5\%)(1-.14) + (.73)(10.32\%)$$

$$WACC = 8.83\%$$

From the above calculation we can see that the current WACC at Caliber is 8.83%. This means that if Caliber is going to maintain its current debt to equity ratio, any capital investments need to have a return on investment of greater than the WACC shown above to generate positive cash flows and increase the company and shareholder value.

To calculate the internal rate or return (IRR), and modified internal rate of return (MIRR) for the RESC-U project over the projected five year period we set the NPV of the project to zero and used the discounted cash flows. Our IRR calculated out to 11.77% and the MIRR is 10.75%. Both rates of return are greater than the WACC we calculated at 8.83% and indicate that the project would generate a rate of return greater than the rate of our investment.

The NPV of the project is determined by adding all of the discounted cash flows and subtracting the initial investment required to generate the revenue for the cash flows. As previously mentioned we used a discount rate of fifteen percent to reflect the uncertainty of a new project and the volatility of the resource industry in general. While conservative, it is not uncommon to use such a high discount rate for a new venture. The NPV for this project is $108,398. This indicates that the project is a sound investment of Caliber's capital as the value of the investment today, discounting the future cash flows for inflation and risk, is higher than the initial investment.

The detailed pro forma financial statements follow in Table 10 and of note are the IRR, MIRR, NPV, paybacks and profitability index numbers at the bottom of the table. These numbers form the basis of our analysis as to whether the project is predicted to be successful or not, and all indicate that the project should proceed based on our forecasts and assumptions.

Table 10: Pro Forma Income Statement and Financial Analysis – Highest Probability

Income Statement	Year 1	*Notes*
Daily revenue	2,350	Day rate including vehicle, manpower, mileage, equipment usage
Utilization rate	70%	Percentage of the year's possible 365 days (366 days in leap year 3)
Revenues	600,425	Day rate x number of days of utilization
Variable costs	319,375	Manpower cost x 365 days
Fixed Costs	108,000	Annual maintenance, certifications
Depreciation	90,000	Declining Balance method, as per CRA
EBIT	83,050	
Interest	9,228	90% of initial investment was financed
Taxes	2,399	
Net Income	$71,423	
Asset value	210,000	

Input Variables:			
Tax Rate	14.0%	WACC	8.830%
Depreciation rate	30.0%	Interest rate	5.5%
Initial Investment	300,000	Discount rate	15.0%

Proforma Income Statements						
Year	0	1	2	3	4	5
Daily revenue		2,350	2,350	2,468	2,591	2,720
Utilization rate		70%	75%	75%	75%	75%
Revenues		600,425	643,313	677,329	709,252	744,715
Variable costs		319,375	335,344	355,478	370,475	392,831
Fixed Costs		108,000	113,400	119,070	125,024	131,275
Depreciation		90,000	63,000	44,100	30,870	18,609
EBIT		83,050	131,569	158,681	182,884	202,000
Interest		9,228	9,228	9,228	9,228	9,228
Taxes		2,399	9,192	12,987	16,376	19,052
Net Income		$71,423	$113,149	$136,466	$157,280	$173,720
Asset value		210,000	147,000	102,900	62,030	43,421

Projected Operating Cash Flows						
	0	1	2	3	4	5
OCF		163,822	185,341	193,553	204,526	211,381

Changes in Net Working Capital						
Year	0	1	2	3	4	5
Loan repayment		-63,228	-63,228	-63,228	-63,228	-63,228

Net Capital Spending						
Year	0	1	2	3	4	5
Capital spending	-300,000			-10000		-10000

Putting the Cashflows Together						
Year	0	1	2	3	4	5
OCF		163,822	185,341	193,553	204,526	211,381
changes to NWC	0	-63,228	-63,228	-63,228	-63,228	-63,228
Capital spending	-300,000	0	0	-10,000	0	-10,000
Total Cashflow	-300,000	100,595	122,113	120,325	141,298	138,153
Discounted	-300,000	87,474	92,335	79,116	80,787	68,686

Project NPV	108,398	**Payback Period**	2.64 years
Project IRR	11.77%	**Discounted Payback**	3.51 years
Project MIRR	10.40%	**Profitability Index**	1.36

Managing the Financial Risks

Our previous pro forma statements are based on our most likely scenarios. That is, a 70% utilization rate in year one and rising to 75% thereafter, the current prime interest rate, and the WACC that currently exists at Caliber based on the debt equity ratio that they currently use. Prudent analysis would include some less optimistic conditions to be sure the project remains viable in other conditions. Table 12 shows the maximum variance for the input variables and when they approach an NPV of zero and a profitability index of 1.

The first variable we introduced was the revenue. There are two factors impacting the revenue: daily rate and utilization rate. By altering the utilization rate the NPV remained positive, although marginally, when we lowered the rate to 70% for the first four years and then to 71% for year five. The NPV became negative once a second year dropped to 70% utilization. As long as the RESC-U is being utilized for greater than 256 days per year, or roughly 8 and one half months, it has an NPV greater than zero.

The day rate was originally set at $2350 for years one and two and then increased by 5% in each of years 3 through 5. To maintain a positive NPV we were able to reduce the initial day rate by 4% to $2253 per day for years one and two, with the corresponding 5% increases thereafter. Alternatively, we were able to leave the initial rate at $2350, but delay any increases until year 4 and still maintain a positive NPV.

The second value we modified was the initial investment. The estimated cost of the RESC-U was set at 300 thousand dollars. We explored what impact a price increase would have on the NPV of the project. We gradually increased the initial capital outlay, keeping all other values constant until the NPV approached zero. We found that the NPV became zero once the initial vehicle and equipment costs reached $382,780. This represents an increase of 28% over our original estimate. We are comfortable that the costs will not exceed our estimate by more than 5%, which still gives a positive NPV, but does make the IRR and MIRR slightly less than the WACC.

Next we increased the operating costs until they reached the point where the NPV became zero. The original cost was pegged at $108,000 per year, or $9000 per month. By increasing the costs to $11,116 per month, an increase of more than 23%, the NPV gets down to $3, the IRR and MIRR dip below the WACC and the profitability index goes back to one, the breakeven point.

Finally, we increased two interest rates impacting operations. Since the intent was to finance up to 90% of the RESC-U the interest and payback amounts fluctuate with the interest rate. At time of writing Caliber's credit had been established at 5.5%. The NPV of the project remains positive and the profitability index at 1 up to and including an interest rate of 14.33%. While interest rates are currently very low, it is not expected that they would reach double digits in the near future.

The discount rate for the project was initially set at 15%, to reflect Caliber's WACC and the uncertainty of cash flow for a new project. To predict the project's viability if the rate increased we gradually raised the discount until the NPV reached zero and the profitability index neared 1. At a discount rate of 28.5% we reached the minimum NPV and PI for the project.

Table 12: Financial Risk Viability Range

Input	Value	NPV	IRR	MIRR	PI
Original revenue	2350/day	108,398	11.77	10.75	1.36
Minimum revenue MIRR	2328	87,525	9.59	9.59	1.29
Minimum revenue NPV	2253/day	750	0.08	3.99	1
Original investment	300,000	108,398	11.77	10.75	1.36
Maximum investment MIRR	316,500	91,898	9.56	9.57	1.29
Maximum investment NPV	382,780	0	0	3.97	1
Original operating cost	9000/mo	108,398	11.77	10.75	1.36
Maximum operating cost MIRR	9483/mo	87,201	9.56	9.57	1.29
Maximum operating cost NPV	11116/mo	3	0	3.93	1
Original financing interest rate	5.5%	108,398	11.77	10.75	1.36
Maximum interest rate MIRR	7.3%	87,266	9.55	9.56	1.29
Maximum interest rate NPV	14.33%	841	0.10	4.07	1
Original discount rate	15.0%	108,398	11.77	10.75	1.36
Maximum discount rate MIRR	17.3%	85,907	9.58	9.58	1.29
Maximum discount rate NPV	28.5%	200	0.02	4.53	1

Conclusion

From the outside, it would seem that the risks facing workers in the resource industry would be working around heavy machinery, rotating equipment or a release of a hazardous substance during operations. We have identified that they are more likely to be killed in a motor vehicle collision while working or traveling to work, potentially on a second or third class roadway.

The resource companies face financial and operational risks associated with the uncertainty of developing a resource that may or may not be as abundant as they predicted or as economically viable when it reaches the markets as the producer had anticipated. They have ways of mitigating these risks and increasing their chances of success, through forecasting, engineering and project controls.

To lessen the risk of workplace injuries, resource companies have safety programs and take preventative measures to ensure their workers operate in a safe environment. To lower the risk of workplace injuries escalating to a more serious, or even fatal level, paramedics are stationed on the sites to provide basic patient care and prepare patients for transport to hospitals by air or ground ambulance.

The risks of motor vehicle collisions, spills, wildfires, and aircraft crashes have not been mitigated to the same degree, however, and resource companies remain vulnerable to the threat of lost lives, damage to the environment, property damage and irreparable damage to the companies' reputation. Previous incidents have helped to quantify some of these risks, as companies can see the financial burden that follows these types of events. Cleanup and remediation costs can be millions of dollars and the tarnished corporate reputation can lead to lost contracts with customers and financiers, and a decreased investor confidence which lowers share price and the capital available for projects.

The RESC-U provides additional insurance against these risks. Having a rapid response vehicle with the capabilities we have described will probably not lower the number of incidents that the resource companies experience. It will, however, greatly reduce the impact of incidents and lessen the severity of them and their ability to escalate into major emergencies.

The oil and gas representatives we spoke with saw value in the service and provided a day rate price point that they felt represented the value received. Based on their industry experience they could relate to several times throughout their own careers where such a service would have been beneficial and could have made a difference in keeping an incident from becoming a larger emergency. They also saw efficiencies in having multiple capabilities on the same unit and having trained responders available to respond quickly to a variety of incidents.

Whether the project makes financial sense as a commercial venture is still speculative, but the forecasted numbers do indicate positive results. One criterion is the payback period. When the day rate that our experts felt was reasonable was extrapolated over a calendar year, using a conservative 75% utilization rate, or 274 days per year, the unit reaches a discounted payback point in 3.51 years. This takes into account a five percent annual increase in salaries, as well as in vehicle operations and maintenance costs.

Another criterion is whether the net present value of the project using discounted cash flows over a five year period is positive, or greater than zero. We based this calculation on an initial outlay of 300 thousand dollars and two additional ten thousand dollar outlays to replace and upgrade equipment in years three and five. Operating costs were counted against revenue and the costs were increased incrementally to account for inflation to reflect ongoing net income. Once the future cash flows were discounted to reflect uncertainty, the net present value (NPV) calculated out to over 100 thousand dollars, well above zero and therefore indicated that the project, as forecasted, is viable.

The last of the financial criteria we are using to evaluate the project are the internal rate of return (IRR) and modified internal rate of return (MIRR) on the investment. For the project to be considered, the IRR and MIRR will have to be greater than the cost of capital to fund the project. When we calculated the current weighted average cost of capital (WACC) for Caliber Planning we found it to be 9.578%. Using the same discounted cash flows that we used for our NPV calculations we found the IRR for the project to be 11.77% and the MIRR to be 10.75%, which are both greater than the WACC and indicate a positive return on the investment.

We identified a need in the market for a new response model and the potential customers agreed with our needs analysis, saying they would accept the service at a certain price point. Our financial analysis used conservative utilization rates and a high discount rate yet still showed a short payback period, an IRR and MIRR greater than our cost of capital, and a NPV of greater than 100 thousand dollars.

The market analysis and financial analysis both indicate that the project is economically feasible and would have a positive impact on the company's cash flow. My recommendation is to go ahead with the project and commence the procurement of the first RESC-U soon, to capture any of the first mover advantage that exists.

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Tables

Table 1. Natural resources facts

Facts for 2010	Forest	Minerals and metals	Energy	Total natural resources	Canada
Gross domestic product (GDP)	$23.5 B (1.9%)	$34.7 B (2.8%)	$84.3 B (6.8%)	$142.5 B (11.5%)	$1 234.9 B (100.0%)
Direct employment (thousands of people)	191 (1.3%)	308 (2.1%)	264 (1.8%)	763 (5.2%)	14 701 (100.0%)
New capital investments	$1.6 B (0.5%)	$12.6 B (3.7%)	$80.3 B (23.8%)	$94.5 B (27.9%)	$338.1 B (100.0%)
Trade					
Total exports	$26.1 B (6.5%)	$84.5 B (21.2%)	$90.0 B (22.5%)	$200.6 B (50.2%)	$399.4 B (100.0%)
Domestic exports (excluding re-exports)	$26.0 B (6.9%)	$81.4 B (21.8%)	$89.7 B (24.0%)	$197.1 B (52.6%)	$374.3 B (100.0%)
Imports	$9.5 B (2.3%)	$66.6 B (16.5%)	$40.3 B (10.0%)	$116.4 B (28.8%)	$403.7 B (100.0%)
Balance of trade	+$16.6 B	+$18.0 B	+$49.7 B	+$84.3 B	-$4.3 B

Source: Statistics Canada

Table 2. Natural resources facts: percentage change between 2009 and 2010

	Forest	Minerals and metals	Energy	Total natural resources	Canada
GDP	8.6%	8.8%	5.1%	6.5%	3.6%
Direct employment	-2.1%	0.3%	2.7%	0.5%	0.9%
New capital investments	12.7%	28.6%	29.1%	28.7%	10.3%
Trade					
Total exports	10.1%	27.7%	15.5%	19.4%	11.0%
Domestic exports (excluding re-exports)	10.0%	27.0%	15.7%	19.3%	11.9%
Imports	1.7%	21.0%	18.5%	18.1%	10.5%
Balance of trade	15.4%	57.2%	13.2%	21.3%	19.3%

Source: Statistics Canada

Table 3. Types of Vehicles in Casualty Collisions in Alberta - 2010

Vehicle type	**Vehicles in fatal collisions**	**% of all fatal collisions**
Car	134	28
Mini van	62	12.9
Pickup truck	*150*	*31.3*
Truck > 4500 kg	*46*	*9.6*
Tractor Trailer	*32*	*6.7*
Motorcycle	31	6.5
Off highway vehicle	6	1.3
Construction equipment	*3*	*0.6*
Total	**479**	**100**

Source: Alberta Traffic Collision Statistics

Table 4. 2011 Aircraft Incidents

Aircraft type	**Aircraft in fatal incidents**	**% of all fatal collisions**
Airplane	23	66
Helicopter	8	34
Total crashes		257
Total fatalities		70
2011 Average of 5.7 crashes per 100,000 flying hours		

Source: Canadian Transportation Safety Board

Table 5. Wildfires in British Columbia

Year	Total Fires	Total Hectares	Total Cost (millions)	Average Hectares per Fire	People-Caused		Lightning-Caused	
2010	1673	331,108	$212.2	197.9	693	(41.4%)	975	(58.3%)
2009	3064	247,419	$382.1	80.8	881	(28.8%)	2183	(71.2%)
2008	2023	13,240	$82.1	6.5	847	(41.9%)	1175	(58.1%)
2007	1606	29,440	$98.8	18.3	687	(42.8%)	919	(57.2%)
2006	2570	139,265	$159.0	54.2	1034	(40.2%)	1536	(59.8%)
2005	976	34,588	$47.2	35.4	591	(60.6%)	385	(39.4%)
2004	2394	220,518	$164.6	92.1	681	(28.4%)	1713	(71.6%)
2003	2473	265,053	$371.2	107.2	959	(38.8%)	1514	(61.2%)
2002	1783	8,539	$37.8	4.8	911	(51.1%)	872	(48.9%)
2001	1266	9,677	$53.8	7.6	787	(62.2%)	479	(37.8%)
2000	1539	17,673	$51.5	11.5	697	(45.3%)	842	(54.7%)
Average *	1969	98,541	$144.8	41.8	807.1	41.0%	1175.1	59.0%

Source: British Columbia Wildfire Management Branch

Table 6. Emergencies Reported to CANUTEC - Transport Canada by Transport Mode

Mode of Transport	Number of Emergencies
Road – Truck/Truck & trailer	292
Rail	142
Air	19
Marine	7
Pipeline	4
Non transport	565
Multi modal	3

Source: Transport Canada

Table 7. Emergencies by Class of Dangerous Goods

Class	Description	Number of Emergencies
1	Explosives	13
2	Compressed Gas	219
3	Flammable Liquids	258
4	Flammable Solids	29
5	Oxidizers and Organic Peroxides	53
6	Poisonous and Infectious Substances	55
7	Radioactives	13
8	Corrosives	289
9	Miscellaneous	14
NR	Non-regulated	242
Mixed load		7
Unknown		27

Source: Transport Canada

Table 8: Rate Schedule for RESC-U and Manpower

Resource	Rate/unit	Estimated Daily Cost
RESC-U	1000/day	1000
Mileage – 100km/day included	1.00/km	20
Disposable equipment used	Varies by item	30
Senior Firefighter/EMT-A	650/day	650
Firefighter/EMR	600/day	600
Total average daily cost		2350

Source: Firehawk Energy Services and Caliber Protection

Table 9: December 2012 Cost to Purchase and Equip RESC-U

Asset	Unit Cost (000s)	Total Cost (000s)
Truck chassis w/custom body	180	180
Reflective badging, striping, scene lighting, as per standards	30	30
CAFS, hose, firefighting equipment	40	40
Extrication and rescue tools	20	20
Medical equipment, AED, patient transport	15	15
Protective equipment, clothing, helmets	15	15
Total initial capital cost of truck and necessary equipment		**300**

Source: Firehawk Energy Services and Caliber Protection

Table 10: Pro Forma Income Statement and Financial Analysis – Highest Probability

Income Statement	Year 1	*Notes*
Daily revenue	2,350	Day rate including vehicle, manpower, mileage, equipment usage
Utilization rate	70%	Percentage of the year's possible 365 days (366 days in leap year 3)
Revenues	600,425	Day rate x number of days of utilization
Variable costs	319,375	Manpower cost x 365 days
Fixed Costs	108,000	Annual maintenance, certifications
Depreciation	90,000	Declining Balance method, as per CRA
EBIT	83,050	
Interest	9,228	90% of initial investment was financed
Taxes	2,399	
Net Income	$71,423	
Asset value	210,000	

Input Variables:

Tax Rate	14.0%	WACC	9.578%
Depreciation rate	30.0%	Interest rate	5.5%
Initial Investment	300,000	Discount rate	15.0%

Proforma Income Statements						
Year	0	1	2	3	4	5
Daily revenue		2,350	2,350	2,468	2,591	2,720
Utilization rate		70%	75%	75%	75%	75%
Revenues		600,425	643,313	677,329	709,252	744,715
Variable costs		319,375	335,344	355,478	370,475	392,831
Fixed Costs		108,000	113,400	119,070	125,024	131,275
Depreciation		90,000	63,000	44,100	30,870	18,609
EBIT		83,050	131,569	158,681	182,884	202,000
Interest		9,228	9,228	9,228	9,228	9,228
Taxes		2,399	9,192	12,987	16,376	19,052
Net Income		$71,423	$113,149	$136,466	$157,280	$173,720
Asset value		210,000	147,000	102,900	62,030	43,421

Projected Operating Cash Flows						
	0	1	2	3	4	5
OCF		163,822	185,341	193,553	204,526	211,381

Changes in Net Working Capital						
Year	0	1	2	3	4	5
Loan repayment		-63,228	-63,228	-63,228	-63,228	-63,228

Net Capital Spending						
Year	0	1	2	3	4	5
Capital spending	-300,000			-10000		-10000

Putting the Cashflows Together						
Year	0	1	2	3	4	5
OCF		163,822	185,341	193,553	204,526	211,381
changes to NWC	0	-63,228	-63,228	-63,228	-63,228	-63,228
Capital spending	-300,000	0	0	-10,000	0	-10,000
Total Cashflow	-300,000	100,595	122,113	120,325	141,298	138,153
Discounted	-300,000	87,474	92,335	79,116	80,787	68,686

Project NPV	108,398	**Payback Period**	2.64 years
Project IRR	11.77%	**Discounted Payback**	3.51 years
Project MIRR	10.75%	**Profitability Index**	1.36

Table 11: Weighted Average Cost of Capital (WACC) Calculation Values

Name	Value	Rationale
Risk Free Rate	2.60%	Bank of Canada long term Bond Rate
Risk Premium	6%	Current expected market premium
Beta	1.29	HSE Integrated is a public company that provides similar services. We used their beta (1.09) and the Hamada equation to determine Caliber's beta.
Debt/Equity Ratio	27/73	Based on Caliber Planning 2012 Financials and projected RESC-U investment
Debt Rate	5.5%	Financing at prime +2.5%. Prime rate is 3%.
Tax Rate	14%	Current Corporate Tax Rate from CRA and Alberta for taxable incomes <$500,000

Hamada equation $b = b_u [1 + (1-T)(D/S)]$

Calculating the unlevered beta using HSE Integrated's beta of 1.09 we get

$$1.09 = b_u [1 + (1-.22)(11.07/73.14)]$$

$$b_u = 0.97$$

Then, inserting the unlevered beta into the equation we calculate Caliber's levered beta

$$b = 0.97 [1 + (1-.14)(270/712)]$$

$$b = 1.29$$

Caliber's cost of equity $r_s = r_{rf} + (RP_m)\ \beta$

$$r_s = 2.6\% + (6\%)\ 1.29$$

$$r_s = 10.32\%$$

Caliber's WACC $WACC = W_d r_d\ (1-T) + W_{ce} r_s$

$$WACC = (.27)(5.5\%)(1-.14) + (.73)(10.32\%)$$

$$WACC = 8.83\%$$

Table 12: Financial Risk Viability Range

Input	Value	NPV	IRR	MIRR	PI
Original revenue	2350/day	108,398	11.77	10.75	1.36
Minimum revenue MIRR	2321/day	80,883	8.89	8.87	1.27
Minimum revenue NPV	2253/day	750	0.08	3.99	1
Original investment	300,000	108,398	11.77	10.75	1.36
Maximum investment MIRR	321,500	86,898	8.93	8.88	1.27
Maximum investment NPV	382,780	0	0	3.97	1
Original operating cost	9000/mo	108,398	11.77	10.75	1.36
Maximum operating cost MIRR	9625/mo	80,988	8.90	8.87	1.27
Maximum operating cost NPV	11116/mo	3	0	3.93	1
Original financing interest rate	5.5%	108,398	11.77	10.75	1.36
Maximum interest rate MIRR	7.8%	81,319	8.92	8.88	1.26
Maximum interest rate NPV	14.33%	841	0.10	4.07	1
Original discount rate	15.0%	108,398	11.77	10.75	1.36
Maximum discount rate MIRR	18.1%	78,542	8.83	8.83	1.26
Maximum discount rate NPV	28.5%	200	0.02	4.53	1

$$r_s = r_{RF} + (RP_m)\beta$$
$$= 1.20\% + (10\% - 1.20\%)\, 1.09$$
$$= 10.79\%$$

$$WACC = W_d r_d (1 - T) + W_{ce} r_s$$
$$= (.2)(5.5)(1 - .14) + (.8)(10.79)$$
$$= 9.578\%$$