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Development & Implementation of a New Technology known as the "AEROS System"® (Airborne Robotic Oil Spill Recovery System) - Improving the State-of-the-Art of Offshore Oil Spill Emergency Response

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Abstract

Our world is increasingly prone to environmental disasters with the public and governments worldwide demanding more effective solutions. Global Response Group "GRG" has proprietary technology that will contribute immensely to solving two serious global problems: large marine oil spills and global warming. GRG provides industry and governments the ability to quickly and effectively respond to large marine oil spills and to control destructive forest fires, (both on a global scale) using fleets of Lockheed L-100 and C-130 Hercules aircraft and crews integrated with GRG patented technology using satellite remote sensing/GPS/remote control/ telemetry systems.

The AEROS® Airborne Robotic Oil Spill Recovery System

Large offshore marine oil spills have never been effectively controlled and oil spill pollution remains a serious global problem. The ever-growing public concern for the environment will only escalate the costs and penalties of future spills. Therefore, GRG developed the AEROS® Robotic Oil Spill Recovery System, a truly effective and extremely rapid, robotic, satellite controlled oil spill containment and recovery system. AEROS© is demonstrated on the GRG web site: www.globalresponsegroup.com

Global Response Group (GRG) has invested approximately $10 Million to date in the development of GRG's AEROS Technology.

The AEROS system, as shown on the GRG web site and CD ROM presentation, demonstrates GRG's ability to rapidly contain, recover and recycle a marine oil spill of any size with much higher recovery efficiencies than ever achieved by other systems currently on the market.

Potential customers for AEROS include: all oil companies and tanker fleet owners; the governments of all oil producing and consuming countries with a shoreline; and, all offshore drilling and production rigs. Other customers include: the insurance underwriters industry; the entire merchant marine shipping industry; and, all private and public oil spill response organizations. GRG'S ***AEROS System*** *combines proven technology that has already demonstrated its durability and effectiveness with a unique robotic oil spill recovery vehicle (patented). Another unique feature of the system is GRG's ability to rapidly deploy AEROS using Lockheed L-100 and C-130 Hercules aircraft and to control* ***AEROS*** *oil spill recovery operations with satellites.*

Another significant operational capability of the AEROS System is its potential to fight malaria and dengue fever on a very large scale. GRG has developed a scientific business plan, called the "MEP" = Malaria Eradication Program. GRG's "MEP" has received indications of serious interest from the U.N. World Health Organization ("WHO"). Upon request, GRG can provide a detailed business plan for the "MEP"

Malaria Eradication Program, as well as the credentials of the scientists who back this program.

1) Introduction

The basic objective of this paper is to identify, evaluate, and propose technological solutions, leadership strategies, and implementation plans that will facilitate the development and effective commercialization on a global scale of the technology of the chosen organization, namely: the company ***Global Response Group Corporation ("GRG")***.
Specifically, this paper will identify technological innovations that will enable the company to respond quickly to stakeholder needs, to achieve the main objectives of the company's strategic business plan, and to develop and maintain a competitive advantage or competitive superiority in the global market for ***environmental disaster response services related to offshore marine oil spill pollution***, and also in the global market for forest fire fighting technologies and related services (a major initiative that will help to reduce the effects of global warming).

2) Business Requirements Analysis for Global Response Group (GRG)

Definition of Selected Business Requirements
Project #1:
Develop and implement a new intranet-based system that has the capability to monitor the Earth's surface 24/7 in real-time using satellite remote sensing technologies to identify and locate with precise coordinates (latitude & longitude) offshore marine oil spills as well as forest and jungle fires on a global scale. The system must also include a global communications command and control center where all data obtained from the satellites is to be centralized and processed in such a manner as to enable the command center personnel to effectively direct the emergency response ("ER") operations of "GRG" on a global scale and control operations of the GRG Airborne Robotic Oil Spill Recovery System "AEROS" once AEROS has been deployed by parachute from C-130 Hercules aircraft and immediately subsequent to "splashdown". The system must also have the capability to measure and map oil spills and to measure and report the basic parameters of oil spills and GRG recovery operations.

Project #2:
Enhance the GRG existing web site with an internet-based system to enable the general public to view in real-time the emergency response operations of GRG wherever the company is attacking, containing, recovering, and recycling offshore oil spills and also to be able to view GRG forest fire fighting ("FFF") operations to control forest and jungle fires on a global scale. The system must also have the capability to demonstrate in real-time the oil spill recovery efficiencies of the GRG "AEROS System" for each "ER" oil spill response mission and also demonstrate the effectiveness of GRG forest fire control operations worldwide in terms of numerous key parameters regarding the dynamics & mission response effectiveness measurements of fire control operations at any site where the GRG system is deployed. The system must also demonstrate the calculated volumes of CO2 emissions into the atmosphere (tons of CO2) that were avoided due to GRG fire control operations for each ER FFF mission and for all GRG ER FFF operations for the year-to-date on an on-going cumulative basis, worldwide.

Rationale for Selection of Projects:
Reference is made to the GRG web site: www.globalresponsegroup,com

To put these two projects into perspective, it is appropriate to state GRG's mission statement: "**To become the world's foremost organization in the fields of anti-global warming initiatives and environmental disaster response technologies and related turnkey services by the year 2015**"

GRG's long-term objectives:

a) Develop a global network of GRG AEROS Bases to provide turnkey services for environmental protection for oil spills, and for forest and jungle fire control;
b) Develop full-scale global operations for forest fire fighting (including jungle fires), and measure scientifically GRG contributions to reduce CO2 emissions and global warming.

Rationale for Project #1:
In accordance with the long-term objectives of GRG, it is necessary for the company to develop an IT system with the capabilities to detect and locate in real-time all offshore oil spills worldwide as soon as they occur. The system must also have the capability to identify and precisely locate all potentially dangerous forest and jungle fires on a global scale. This information can only be provided by global satellite environmental remote sensing technologies. The system must be able to provide this information in real-time to the GRG global command and control center to enable the company to initiate in a timely fashion the GRG emergency response missions to effectively control such disasters.

The proposed IT system must also enable GRG to communicate with governmental authorities in all the countries affected by such disasters, and with shipping companies and the maritime insurance industry. The system must also enable immediate, fail-safe communications with GRG emergency response air bases and the mission response commander to assist with critical decisions pertaining to the disaster response mission as it evolves.

Rationale for Project #2:
For GRG to be truly successful, it is important that the company be totally transparent and universally visible in all GRG operations because environmental disasters are of global concern and because major environmental disasters affect not only the region where they occur but they have a cumulative effect on the ecosystems of the planet. Therefore, everyone should have the right to see what companies like GRG are doing to protect the Earth's environment.

In addition, there are obvious "PR" benefits to GRG by providing the world immediate, unedited information and real-time audio-visual reports on GRG emergency response missions. The global availability of instant real-time access to monitor what GRG is doing will energize the world community to support GRG and will also motivate countries to support GRG operations. It will also motivate multi-national organizations to support GRG to establish a global network of GRG emergency response bases, including the International Maritime Organization (IMO), the World Bank, the IADB, the United Nations, the International Tanker Owners Pollution Federation ("ITOPF"), the Protection and Indemnity (P&I) Clubs, and others.

It is not difficult to imagine the excitement of children and adults around the world who will be able to see in real-time that organizations like GRG are making a real difference to protect the Earth's environment. The dynamics of this proposed IT system will motivate many young people to get involved in other worthwhile projects to protect the Earth's environment.

Regarding Project #2, and with specific reference to the proposed ability for GRG to be able to demonstrate the effectiveness measurements of success of GRG forest fire fighting missions, and the ability of the system to demonstrate in a scientific and objective manner how much GRG is contributing to slowing down global warming, this would seem to be a very positive and motivating factor for universal support of the proposed IT system.
As a result of recent reports in the global media and recent television and film documentaries by such dignitaries as Al Gore ("An Inconvenient Truth") and Leonardo di Caprio ("The 11th Hour"), there is increased awareness worldwide of the negative effects of global warming that will inevitably affect mankind, according to the majority of the world's scientists. (GRG Business Plan, 2007)

Summary of "Use Cases" to assist the GRG IT Division to analyze and design the technology solutions proposed:
Woolridge claims that use cases are used to define business processes and system requirements which leads to a natural mapping between the business processes and the requirements. (Woolridge, 1999)

Larman states the use cases are stories about the use of an IT system. He further says: "Use cases are not exactly requirements or functional specifications, but they illustrate and imply requirements in the stories they tell." (Larman,1998)

Here is another useful definition: "You apply use cases to capture the intended behaviour of the system you are developing, without having to specify how that behaviour is implemented. Use cases provide a way for your developers to come to a common understanding with your system's end users and domain experts." (Booch, 1999)

Use Case #1:
Goal: The system monitors the Earth's oceans in real-time by means of satellite remote sensing technologies and detects all offshore marine oil spills when they reach a surface area of 10,000 square meters (representing an estimated average minimum spill volume of 1,000 gallons after a dispersion (spreading) time of approximately 20-30 minutes. A GRG airborne emergency response is considered justified when an oil spill volume reaches an estimated 50,000 gallons, depending on location, environmental sensitivity, sea state and weather conditions, and other factors.

Steps:

1. An oil spill occurs (example) in the Straits of Malacca (Southeast Asia) due to the grounding of a super tanker.
2. GRG satellite service provider ("SSP") (Lockheed Martin/Raytheon) detects the spill within minutes, obtains the initial data as to the precise coordinates, size of the spill, and identity of the vessel and its owner.
3. GRG SSP simultaneously transmits all satellite data received regarding the oil spill via satellite (and internet) to GRG Command and Control Center ("CCC"). There is no intervention or subjective selection or filtering of data by the SSP. Once the oil spill disaster

becomes large enough to meet the GRG detection criteria of a specified minimum spill size on the ocean's surface (M2) to warrant monitoring and a possible GRG emergency response, then the oil spill is automatically tagged for monitoring by the GRG CCC.

4. CCC analyzes the data, quantifies the spill parameters, assesses the environmental sensitivity of the immediate marine and coastal areas, calculates the potential environmental damage, determines the status or level of emergency, determines the type and degree of GRG response to be taken.
5. GRG's CCC determines if the vessel is registered with GRG and if it is covered under the GRG regional Oil Spill Contingency Contract.
6. GRG's CCC then communicates with the owners of the vessel (Chief of Maritime Ops) and informs the company of the basic information and parameters of the spill according to GRG satellite intelligence.
7. GRG's CCC then communicates the basic spill parameter data to the underwriters insurance industry and gets a confirmation to ensure coverage if applicable.
8. CCC then communicates via internet (using a back-up communications system via satellite) with the nearest regional GRG Emergency Response Base ("ERB") and gives instructions to the Base Commander ("BC") regarding the degree of response (number AEROS Systems to be deployed), support aircraft, and coordinates of the disaster site.
9. GRG's local BC communicates oil spill basic data to the governmental environmental authorities (and local Coast Guard authorities) of the countries affected by the oil spill and provides the essential information about the GRG response, requesting ground support as may be necessary.
10. The Mission Flight Commander ("MFC") is in constant communication via satellite with the GRG CCC and with the BC of the regional GRG ERB. The MFC advises the CCC and BC the moment that the AEROS System is parachuted to the site of the spill.
11. Then the CCC takes over direct control of the spill containment and recovery operations by virtue of satellite remote sensing / GPS / telemetry systems that provide all relevant data between the vehicles on the water and the satellite system and the GRG CCC.
12. The system is also designed to permit the MFC to intervene if necessary to control the containment and recovery operations in cases where the MFC receives better signals or when visibility conditions allow better control from the command and control aircraft vis-a-vis the GRG CCC.

Use Case #2:
Goal: The system monitors the Earth's land mass surface in real-time by means of satellite remote sensing technologies and detects all forest and jungle fires (including large brush fires) in the very early stages of each fire and enables the GRG CCC to effectively quantify the basic data of the fire size and location, and to monitor the evolution of the fire over time. The system is capable of measuring the ambient conditions (temperature, dryness, and wind conditions) at the site of the fire and also to determine the degree of potential danger of each fire (the size of adjacent forests where the fire may spread to). The system also enables the CCC to effectively direct the GRG airborne forest fire fighting missions to mitigate damage, preserve life, and minimize the release of CO2 emissions into the atmosphere. Also the system must be able to estimate the volume of CO2 emissions avoided by the GRG emergency response mission.

Steps:
Note: The steps are basically identical to the steps described in Use Case #1, except that instead of oil spills the GRG Satellite Service Provider (SSP) follow the same 12 steps used for oil spills for forest and jungle fires.

Use Case #3:
Goal: To enable the public at large worldwide to view over the internet 24/7 all GRG emergency response missions and operations in real-time.
Steps: The system must provide in real-time the following data for each GRG oil spill response mission:

a) total amount of oil spilled;
b) amount of oil recovered during recovery operations by volume and percentage of overall recovery (efficiency measurements);
c) amount of oil remaining on the water yet to be recovered;
d) time of initial spill, time recovery operations commenced, time elapsed since recovery operations began,
e) time estimated for completion of recovery operations;
f) Location of spill indicated on world map and regional map;
g) Name of vessel;
h) Type of oil spilled;
i) Weather and sea state conditions.

3) Technology Project Plan for Global Response Group ("GRG")

Solution design: software and hardware recommendations

Based on the Business Requirements Analysis for GRG as described above, this section will develop and present a solution design consisting of both software and hardware recommendations for a "Technology Project Plan", and will establish (See 3.b) what are the roles that databases, programming, and networks would play in the use cases identified in the above mentioned Business Requirements Analysis.

Several other related issues are also covered in this paper, including: how use cases aid in the systems analysis and design process; (See 3.c) how internal and external stakeholders will be affected by the proposed "Technology Project Plan"; (See 3.d) an evaluation of business and security risks and corresponding mitigation strategies; (See 3.E) development of a financial plan, including project costs, NPV of future cash flows, sensitivity analysis, and a summary of the assumptions used to generate these projections; and finally, (See 3.f) a summary of the metrics that can be used to measure the outcomes and performance of the proposed "Technology Project Plan".

Databases

The databases required for the use cases #1 and #2 will be complex and quite extensive, summarized as follows:

Use Case #1:

This use case dictates that the first key database must include digital geographic maps of all parts of the Earth's oceans and coastal environments (including all coastlines) with sufficient pixel resolution detail to be able to superimpose and demonstrate the exact location, size, and configuration of any offshore oil spill as soon as the oil slick reaches a predetermined size. For purposes of this early planning stage, it is estimated that a practical minimum detection area will be 2,000 square meters. This would be equivalent to an oil slick (initial detection) with a surface area of, for example, 20M x 100M. Note: There are a great many oil spills smaller than this size but the AEROS System would only be deployed for oil spills greater than 50,000 gallons and a spill of this magnitude would spread to reach a surface area of 2,000 M2 in a matter of only a few minutes. These digital maps must also demonstrate political boundaries to determine what countries are affected by each oil spill disaster.

An additional database required by use case #1 will include the identification of every oil tanker and its crude oil cargo capacity. The database must also include all other military and merchant marine ships that are larger than a certain specified minimum size, provisionally set at 300 Tons.

Use Case #2:

This use case dictates that there will be a database that contains detailed digital geographic maps (including contour details) of all of the Earth's land mass surfaces with sufficient pixel resolution detail to be able to superimpose and demonstrate the exact location, size, and configuration of any forest or jungle fire as soon as the fire reaches a predetermined minimum size, provisionally set at 5,000 square meters. This would be equivalent to a fire early detection "trigger" as soon as a fire reached an area of, for example, 50M x 100M. As soon as any fire in the world reaches this size, it will come onto the GRG "radar screen" and be carefully monitored to determine if and when an emergency response fire control mission is to be launched. These digital maps must also demonstrate political boundaries to determine the countries affected by each fire. These maps must also indicate population centers including very small populations for purposes of determining where and when a fire may cause a life-threatening emergency situation.

Programming

Use Case #1:

The programming software solutions to enable the GRG worldwide Command and Control Center "CCC" to direct operations of the GRG AEROS Airborne Robotic Oil Spill Recovery System will rely on the availability of high-resolution imagery from multiple space-based and aerial systems that incorporate the most advanced satellite and airborne remote sensing and communications technologies, including:

- High resolution satellite earth surface remote sensors (infrared, ultraviolet, and other areas of the electro-magnetic spectrum);
- Microwave radiometry software;
- Airborne laser-induced fluorosensors for real-time oil spill identification and measurements of oil spill volumes with spectroscopic analysis;
- Synthetic Aperture Radar Satellite Imagery "SAR";
- Airborne maritime surveillance mission sensor suite including "SLAR" (side-looking airborne radar), flourosensor infrared (FLIR) system, video and MSS sensors;

- Satellite and airborne data image processing center with high capacity LAN server;
- Satellite communications system (HF-DF) for communications between the GRG CCC and the Mission Commander in the leader "mission control aircraft" for each emergency response mission;
- Incorporation of real-time computer simulation models of ocean currents for oil spill spreading that allow for input variables such as wind conditions and volumes of oil spilled, type of oil spilled, and exact spill location coordinates.

Use Case #2:

The programming software solutions to enable the GRG "CCC" to direct operations of GRG global forest fire and jungle fire fighting missions will include:

- Satellite imagery modeling of forest cover (available fire fuel) adjacent to the fire, including forest fragmentation and biodiversity potential impact assessments;
- Atmospheric (wind and humidity) conditions including weather forecasts and fire spreading forecasts under varying weather and wind conditions;
- Data processing capability that enables the GRG CCC to plan fire response missions;
- Satellite communications system to enable the GRG CCC to communicate in real time with the airborne Mission Commander of each fire response mission.
- Satellite imagery of all population centers in the region of each fire including proximity measurements, risk factors and time estimates of projected arrival times of the fire to any threatened communities;
- Satellite communication system to enable the GRG CCC to provide constant contact with local forest fire ground operations crews;
- A custom built model to estimate the volumes of CO2 emissions into the atmosphere that are avoided by each GRG forest fire control mission, including calculations of cumulative, worldwide CO2 emissions prevention by GRG on a year-to date basis, compared to all worldwide CO2 emissions with appropriate real-time graphs to demonstrate the difference GRG is making to worldwide efforts to slow down global warming.

3.b) Incorporation of internet, extranets, and intranets into the solution design

Use Case #3:

- Internet site to enable anyone worldwide to monitor/view in real-time GRG emergency response missions (oil spills and forest/jungle fires);
- Visual real-time reporting system linked to the GRG progress reports of all emergency response missions (tables and graphs) showing the effect of GRG missions to slow down global warming;
- Communications system for GRG and all local government authorities to be in constant contact regarding GRG operations and to coordinate with all pertinent authorities for maximum effectiveness between GRG airborne operations and local ground operations;
- Interactive capability of the site to enable anyone worldwide to communicate to GRG their comments, suggestions, and questions, and to provide an open forum for everyone to see all communications and to communicate with each other by email.

Networks

- Communications network to connect GRG directly with global organizations including the International Maritime Organization ("IMO"), the United Nations, World Bank, the Inter-American Development Bank ("IADB"), the international insurance underwriters industry [The "Protection & Indemnity (P&I) Clubs", Lloyds of London, and the International London Underwriters Group "ILU"], the International Tanker Owners Pollution Federation ("ITOPF"), Coast Guard authorities of all countries, and the Global Environmental Facility ("GEF"). The GEF is a multi-billion dollar organization of particular significance to GRG because it is a joint venture of the UN and the World Bank whose primary mandate is to support and finance private organizations that contribute to saving the world's forests and oceans and those that help reduce global warming. The GEF has expressed interest in GRG and it is considered very feasible that the GEF will help finance all developing countries who wish to subscribe to GRG environmental protection services.

How Use Cases Aid in the Systems Analysis and Design Process

Larman states that use cases are stories about the use of an IT system. He further says: "Use cases are not exactly requirements or functional specifications, but they illustrate and imply requirements in the stories they tell." (Larman,1998)

Booch gave a different but useful description by saying that use cases "capture the intended behaviour" of the system(s) to be developed, without need to specify how that behaviour might be implemented. He also stated the use cases provide a means for developers to better understand the "system's end users and domain experts." (Booch, 1999)

Woolridge claims that use cases are used to define business processes and system requirements that lead to a natural mapping between the business processes and the system requirements. (Woolridge, 1999)

In the case of GRG, it is this writer's opinion that the use cases summarized above (Pages 8 – 11) will clearly indicate to the GRG systems developers exactly what software and hardware solutions will produce the maximum benefits to enable GRG to achieve the goals described in Project #1 and Project #2 of the Business Requirements Analysis (Section 2, above) upon which this Technology Project Plan is based.

The software and hardware solutions recommended in this paper must only be considered as a preliminary general guide and action plan for an eventual, more thorough and definitive GRG Technology Project Plan. (Refer to *Conclusions and Recommendations*, below).

3.c) Effects on Internal and External Stakeholders

This technology project plan will have a profound effect on internal and external stakeholders. Internally, all company directors and managers will benefit greatly from the proposed technology solutions by improving every managers ability to perform more effectively his/her management functions and responsibilities and to enable every level of management to contribute effectively to the achievement of the long-term corporate goals of GRG and also to enable them to measure the effectiveness of their individual and joint efforts towards attaining established GRG goals.

3.d) Business and Security Risks and Suggested Mitigation Strategies

There are obvious business and corporate security risks inherent in the proposed, totally transparent, GRG global communication systems recommended in this technology project plan. In theory, these IT systems would allow other organizations to imitate the GRG global environmental emergency response solution to world environmental problems related to oil spills and forest/jungle fires. However, GRG is not overly concerned with these risks. First of all, for any organization to directly compete with GRG, it would be necessary to secure strategic alliances with several of the worlds most advanced companies involved in the GRG business plan and this is not very feasible, because GRG has cemented relationships with all the world's best companies in these fields, and it is extremely unlikely that any of them would "jump ship" to support any would-be imposters. IN addition, with regards to the AEROS System, GRG has recently filed new patent applications with the USA Patent & trademark Office and also with the Patent Cooperation Treaty (PCT) in Brussels.

Furthermore, GRG has recently introduced to the US Patent and Trademark Office a "Patent Improvement Application" for the *AEROS System*, and this application will provide international protection to GRG for an additional 17 years.

3.e) Financial plan, including NPV of future cash flows, sensitivity analysis, and assumptions underlying the financial forecasts.

Introduction: Oil Price Forecasts

The GRG business plan 10-Year financial forecasts are based on a long-term crude oil planning price of US$84 per Barrel. This is considered to be consistent with industry forecasts, as substantiated by the following recent news releases:

Quote from "Money Morning", internet daily newsletter, published June 18, 2009:

Quote: "Enjoy oil prices now while they're cheap, because a cadre of analysts is calling for oil to rise as much as 113% in 2009. Among the many reasons oil producers, importers and exporters are bracing for a serious oil price hike:

- The "easy" oil has already been found.
- The world's largest fields are declining - from the Persian Gulf, to the North Sea, to the Gulf of Mexico, to Alaska.
- Two major oil exporters - Indonesia and China - have begun importing oil.
- New growth in Asia is demanding nearly 10 billion barrels every year while…

There hasn't been an "elephant oil field" discovery (one that yields at least 1 billion barrels) in 40 years." Unquote.

3.e.1) Projected Costs

Estimated Costs of the Proposed GRG Technology Project Plan

Description	Average Cost*
Human Resources (employees and consultants)	**$1,200,000**
Hardware Costs	**7,500,000**
Software Costs	**6,000,000**
Training Costs	**1,500,000**
Marketing Costs	**3,500,000**
Total Costs	**18,500,000**

*Average Cost computed as average between minimum costs and maximum costs.

3.e.2) Net present value of future cash flows

The net present value NPV of GRG projected future cash flows over the next 10 years, calculated at a discount rate or 10% per year is equal to US$4.61 Billion (Ref: GRG NPV Calculations, Excel File, GRG Business Plan Appendix, Dr. Eli Konorti, 2007). (Sullivan 2008)

Sensitivity Analysis

A good sensitivity analysis for an oil spill pollution environmental protection system such as GRG/AEROS is provided by the GIS model developed by Kankara to identify the area and resources that are likely to be affected due to an oil spill in the Gulf of Kachchh, India. The analysis indicates that the coral reef, mangrove, and mudflat ecosystems of the gulf near Narara and Kalubar Island are at high risk due to oil spills from SPMs and there is a need of a comprehensive contingency plan to protect these resources. The advantage of such a sensitivity analysis system is that it provides more comprehensive and rapid information and identification of resources likely to be affected compared to conventional methods. This is vital for responding to a spill incident in a dynamic marine environment like the Gulf of Kachchh. This sensitivity analysis and risk assessment for Gulf of Kachchh, India, uses integrated modeling. (Kankara, 2007)

Analysis of Assumptions made to Generate the Financial Projections

The three basic assumptions behind the GRG 10-Year financial projections are summarized as follows:

- The long-term crude oil planning price is $84.00/gallon established in accordance with (lower than many) industry long-term forecasts to the year 2020;
- That the oil industry and the oil transportation industry will support GRG following the successful live air-sea oil spill recovery demonstrations in the Gulf of Mexico and in the Straits of Malacca;
- That the oil industry and the marine insurance underwriters industries will support GRG to charge an environmental protection fee (monthly retainer) based on ¼ of 1% of the value of all crude oil shipments in all regions where GRG provides 24/7 oil spill protection services.

3.f) Recommended Metrics to Measure Performance of the Technology Project Plan:

- Regarding the GRG global oil spill emergency response operations, the primary metrics to measure success will be the oil spill recovery efficiencies measured as a percentage of each oil spill that is recovered;
- Regarding the GRG global program to control forest and jungle fires, the primary metrics to measure success will be degree to which GRG effectively controls fires on a global scale and the degree to which GRG reduces CO2 emissions into the atmosphere and the contribution that GRG makes towards reducing global warming. These are quantifiable metrics that can be compared to all global CO2 emissions.
- The specific metrics for measuring the performance of this technology project plan will be the feedback from GRG management and GRG strategic alliance and joint venture partners, and from the various national and international environmental authorities and the insurance underwriters industry as to the effectiveness of the GRG internet and intranet IP systems to be developed as described herein.

4) Models and Theories of Change

Introduction

GRG is involved in implementing enormous changes to several word-wide industries, all related to environmental disaster response. This paper relates change models to the global change initiatives of GRG in the context of these global industries, rather than from the perspective of only the company. This expanded approach is taken because GRG is a start-up organization introducing new technology that involves extremely significant changes throughout several industries that will affect thousands of employees world-wide. The scope of these changes are appreciated by visiting: www.globalresponsegroup.com

Researchers and managers have long recognized the importance of following a framework for the design, execution, and implementation of change management plans. A plan should be appropriate in both design and scalability – matching the culture of the organization. The project should define potential change models in order to demonstrate that adequate investigation has been performed. The project should demonstrate that an assessment of each model has been thoroughly performed to facilitate the selection of the most appropriate model.

Application of Change Models: "Change affects people's ability to feel comfortable, capable and confident because it means that they must learn new systems, work in new ways, and accept new responsibilities". (Craine, 2007)

The author analyzed several change theories or models including the Kotter change model, and the change theories and models developed by Chekland, Banathy, and Franz.

The author determined that for the GRG Technology Project Plan, the Chekland, Banathy, and Franz models do not apply nearly as well as the Kotter change model.

Managing the human component of change resistance has been widely discussed in both practical and academic contexts and the project should demonstrate that these have been examined. All individuals in the organization are impacted by change and careful consideration of this change component is critical to the success of the overall project. Failure to take into account the human aspect when changing operations can derail the entire project. The change model should address the scale of the change, the metrics to gauge the success of the change and the monitoring strategies.

Lastly, the project should address the topic of resistance in the context of the proposed changes and identify strategies to mitigate and manage them.

4.a) Identification of most applicable change theory

Change models and theories are beneficially employed to manage organizational change. The change model selected by the author to apply to GRG is the Kotter Change Model, described as follows:

Kotter's Change Model

John Kotter's books 'Leading Change' (1995) and 'The Heart Of Change' (2002) describe a useful model for understanding and managing change. Each stage acknowledges a key principle identified by Kotter relating to people's response and approach to change, in which people see, feel and then change. (Bozarth, 2002) Kotter's 8-step change model is summarised as follows:

- ***Increase Urgency***: inspire people to establish relevant objectives.
- ***Build the Guiding Team***: get the right people in place with emotional commitment, and the right mix of skills.
- ***Get the Vision Right***: establish a simple vision and strategy, focus on emotional and creative aspects necessary to drive service and efficiency.
- ***Communicate for Buy-In***: Involve as many people as possible, communicate the essentials, respond to people's needs. De-clutter communications - make technology work for you.
- ***Empower Action***: Remove obstacles, enable constructive feedback and support from leaders - reward progress and achievements.
- ***Create Short-Term Wins***: Set aims easy to achieve in bite-size chunks. Manageable numbers of initiatives. Finish current stages before starting new ones.
- ***Don't Let Up***: Foster determination and persistence - ongoing change - encourage ongoing progress reporting - highlight achieved and future milestones.
- ***Make Change Stick***: Reinforce the value of successful change via recruitment, promotion, new change leaders. Weave change into culture. (Bozarth, 2002)

4.b) Human Implications of Major Organizational Change; Critical Success Factors for Organizational Change from the Perspective of Managing People

Regarding critical success factors, preparation is vital. Successful change needs the support of the people it will affect. Prior to initiating major change projects, management must discuss proposals with colleagues to establish clear understanding and good lines of communication.

The issue of creating consensus is an extremely important critical success factor (CSF) for major organizational change. In fact, the predominant CSF, according to the research, is the ability to build and sustain consensus throughout the organization. If there is improper prioritization of change activity or a lack of partnership with key stakeholders, and if there is failure on agreement as to the impending organizational change, the change project will fail. Change must involve the people affected, it can not be successfully implemented by "imposing" change on people without their support.

The change priorities must be aligned with the corporate mission statement and strategic business plan. Other key CSFs include quality management and skills development, requiring good monitoring and metrics.

Another key CSF is "vision". If there is a lack of alignment between discrete change
programs and the overall strategic plan, business vision and strategies, this could easily lead to serious disharmony and contention for resources across competing programs or projects.

Another key CSF is "leadership". If there is not a clear overall vision for the company, or if there is a failure of senior management to properly understand the vision, this could easily lead to friction and a lack of purpose and teamwork at all levels.

4.c) Human Implications of the GRG Technology Project Plan and the Author's Proposed Change Management Project; Assessment of How the Identified Change Models Might be Used to Address these Human Implications

Related to this project, there are vast implications for many people in various industries, summarized as follows:

- Oil Transportation Industry (tankers) and Oil Spill Response Organizations: This involves thousands of people who will have to adapt to totally new methods of operation. They will need to make the transition from dealing with local/regional conventional ship-borne emergency response practices in responding to oil spill disasters and adapt to a revolutionary airborne, satellite-controlled, global network. They will need to adapt to a global communications system rather than a very localized communications system, and in the case of large oil spill disasters, they will need to learn to work with many organizations from many countries simultaneously.
- Air Force & Other Military Personnel: This project involves the conversion/reallocation of significant military assets and large numbers of military personnel from their traditional military roles to a radically different environmental protection role. It also involves combining currently active military personnel with retired air force personnel from many different cultures and countries. These changes obviously will have major human implications for the personnel involved.
- Maritime Insurance Underwriters Industry: The project envisioned will significantly revolutionize the way this industry conducts its business. This industry will suddenly have access, via GRG, to real time global coverage 24/7 of all oil spill disasters as they occur. They will have the opportunity to significantly reduce payouts for oil spill pollution claims and the opportunity to play a key role in the implementation process of GRG's global network of emergency response bases by implementing a multi-tier system of insurance premiums for all tankers (=~ 7,000 ships) and merchant marine vessels over 300 tons (=~65,000 ships) offering lower premiums for ships registered with GRG where GRG emergency response and environmental protection services are commercially available.

Cotter's Model is the most applicable to address the specified human implications. The change project envisioned will readily permit "increasing urgency" and inspire people due to increasing global awareness about environmental problems. "Building the guiding team", "getting the right vision", "communicating for buy-in", and "empowering action" are obvious additional key elements for ensuring successful change.

5) Application of Change Models

Introduction
GRG is implementing enormous changes to several global industries related to environmental disaster response. Change models are beneficially employed to manage organizational change. (French, 2004) This paper uses the Kotter change model to explain the global change initiatives of the ***AEROS Project*** (Sullivan, 2008) in the context of these global industries. These global change initiatives are demonstrated in considerable detail on the GRG web site, at: www.globalresponsegroup.com (Global, 2008)

5.a) Where the GRG AEROS Project Fits on the Time-Scale Continuum of Changes

The GRG AEROS Project will be affecting changes over the next 15 years to the oil spill emergency response industry, the maritime insurance industry, and the forest fire-fighting industry, all on a global scale. Therefore, the project involves a **large-scale and long-term change process**.

5.b) Change Model Selected for the Project
The change model selected for the Project is Kotter 's change model. Each stage acknowledges a key principle identified by Kotter relating to people's response and approach to change, in which "people see, feel and then change". (Bozarth, 2002)
Kotter's 8-step change model is considered to be very applicable and valuable to GRG management as this

technology Project Plan evolves. Therefore, the Kotter change model is repeated as follows, with subsequent analytical commentary:

- ***Increase Urgency***: inspire people to establish relevant objectives.
- ***Build the Guiding Team***: get the right people in place with emotional commitment.
- ***Get the Vision Right***: establish a simple vision and strategy, focus on emotional and creative aspects necessary to drive service and efficiency.
- ***Communicate for Buy-In***: Involve as many people as possible, communicate the essentials, respond to people's needs.
- ***Empower Action***: Remove obstacles, enable constructive feedback and support from leaders - reward progress and achievements.
- ***Create Short-Term Wins***: Set aims easy to achieve.
- ***Don't Let Up***: Foster determination and persistence.
- ***Make Change Stick***: Reinforce the value of successful change. Weave change into the culture. (Kotter, 2002)

Kotter's model is appropriate for analyzing the human change processes of the AEROS Project. The project will readily permit "increasing urgency" and inspire people to take action and support the project due to increasing global awareness about environmental problems. "Building the guiding team", "getting the right vision", "communicating for buy-in", and "empowering action" are obvious additional key elements for ensuring successful change in the AEROS project.

5.c) Plan to Address the Human Critical Success Factors of the GRG AEROS Project

Successful change needs the support of the people it will affect. (French, 2004) GRG must inform and involve all key stakeholders to establish a clear understanding and to obtain the necessary support for the project.

Creating and sustaining consensus is the most critical success factor (CSF) for this project. GRG must prioritize all change activities. The project planning stage must involve the people to be affected and the change priorities must be aligned with GRG's strategic business plan. Other CSFs include quality management and skills development where GRG must ensure good monitoring and metrics. Another CSF is "vision". GRG must align all discrete change programs with the overall strategic plan. Another CSF is "leadership". GRG has a highly qualified and experienced management team with excellent leadership and a crystal clear overall vision for the company's future.

5.d) Measures to Monitor the Human Change Elements of the GRG AEROS Project

This project involves vast change implications for many people in different industries. The following measures are recommended to monitor these human change elements:

5.d.1) Oil Transportation Industry (tankers) and Oil Spill Response Organizations:

This involves thousands of people who must adapt to totally new methods of operation. They will need to make the transition from dealing with conventional ship-borne emergency response practices in responding to large oil spill disasters and adapt to a revolutionary, airborne, satellite-controlled, global network. They will need to adapt to a global communications system rather than a localized communications systems, and they will need to learn to work with many organizations from many countries simultaneously. Measures recommended to monitor and facilitate the successful evolution these human change elements include:

a) Prepare a high caliber audio-visual presentation that clearly demonstrates how this revolutionary system will function and how AEROS will smoothly be integrated within the modus operandi of existing oil spill response organizations, governmental environmental protection agencies, maritime oil tanker transportation industry, and the maritime insurance underwriters industry.
b) Launch a national and global television campaign with a high-caliber and exciting TV documentary to be broadcast on numerous well-known, popular networks such as: CNN, Discovery Channel, National Geographic Channel, BBC, NBC, ABC, as well as popular European and Asian networks. Note: It is considered that much of this publicity can be obtained at no cost due to the universal public appeal of controversial global environmental issues that are being seriously addressed by GRG.
c) Organize and deliver personal presentations to all maritime countries in the geographic regions to be protected by the AEROS System well in advance of actual operations.
d) Conduct a major lobbying campaign with the oil industry and oil tanker transportation industry to solicit their support; demonstrate how the project will be in the long-term bottom-line interests of all oil companies by reducing the current very high

levels of civil and criminal legal liability exposure to the oil companies and their senior executives.

e) Conduct similar campaigns with the maritime insurance underwriters industry to emphasize how GRG can substantially reduce oil spill claims and positively affect the bottom line of this industry.

5.d.2) Air Force & Other Military Personnel

As identified above in Sub-Section 4.c, the project involves the conversion/reallocation of significant military assets and large numbers of military personnel from their traditional military roles to a radically different environmental protection role. It also involves combining currently active military personnel with retired air force personnel from many different cultures. These changes obviously will have major human implications for those involved. Measures recommended to facilitate the successful implementation of these human change elements include:

a) Create an international training center in Canada to retrain active and retired military personnel from around the world;
b) Create a professional multi-media presentation for governmental authorities responsible for environmental protection.

5.d.3) Maritime Insurance Underwriters Industry:

As identified above in Sub-Section 4.c, the project will significantly revolutionize the way this industry conducts business. Suddenly, the world will have access, via GRG, to real time global coverage 24/7 of all oil spill disasters as they occur. Insurance underwriters will have significantly reduced payouts for oil spill pollution claims and the opportunity to play a key role in the implementation process of GRG's global network of emergency response bases by implementing a multi-tier system of insurance premiums for all tankers (=~ 7,000 ships) and other merchant marine vessels (=~65,000 ships) offering lower premiums for ships registered with GRG wherever GRG emergency response services are commercially available. (Sullivan, 2007) Measures recommended to facilitate the successful implementation of these human change elements include:

a) Prepare a sophisticated multi-media presentation that clearly and convincingly demonstrates the advantages of the new system to the underwriters industry and to the world;

b) Make appropriate personal presentations with major insurance underwriters including: the Protection and Indemnity ("P&I") Clubs, Lloyds of London, and the International London Underwriters organization ("ILU");

c) Conduct high-level meetings with the International Maritime Organization (IMO") to disclose all pertinent aspects of the project affecting the maritime industry and to lobby their support;

5.d.4) The Forest Fire-Fighting ("FFF") Industry

The project will cause major changes to the status quo of this industry and to conventional FFF methods. In addition to regional systems, there will be a global system controlled by a network of 15 integrated GRG AEROS emergency response air bases. In addition to the current lookout towers widely dispersed throughout the great forests of many countries like Canada, the USA, and European countries, forest fires will be more effectively detected and monitored by satellites. Thousands of summer jobs as "fire spotters" may be eliminated. Measures recommended to facilitate the smooth evolution of these human change elements include:

a) Establish lines of communication with all forest firefighting governmental agencies in the world to help prepare for the change and clearly explain the advantages of the project;
b) GRG should conduct an objective, scientific study to demonstrate how many millions of tons of CO2 emissions will be prevented from being released into the atmosphere as a result of the GRG global forest fire control system and to quantify this in terms of overall global warming parameters.

5.e) Contingency Strategies for Managing Resistance to the Changes

One of the most effective contingency strategies to manage the resistance to this project from industry leaders who may want to protect the status quo is to launch a major publicity campaign with the general public worldwide.

A feature length documentary about the project on the Discovery Channel and other popular TV networks would soon create support with many millions of people from around the world. This same documentary should then be shown on other major environmental and global TV channels, including: Natural Geographic, Nature, BBC, as well as popular European and Asian TV networks. This strategy, in fact, forma part of the GRG Business Plan, and GRG has already obtained support for this from Discovery Network Permanent Chair, Dr. Richard Rosenthal. (Sullivan, 2007) This publicity campaign will create many millions of supporters for

the project, many of whom will lobby government representatives and the oil industry to support and utilize the AEROS System.

The AEROS System customer performance live oil spill recovery trials with the initial full scale AEROS System scheduled for the Gulf of Mexico, Malaysia, and the Arabian Gulf Region, should be broadcast live by CNN and witnessed live by representatives of major oil companies, the oil tanker transportation industry, the marine insurance underwriters industry, and governmental environmental authorities.

The strategy for managing the large loss of jobs in the forest fire fighting industry is for GRG to negotiate well in advance for these jobs to be reallocated from the status of fire spotters to frontline fire fighters, as an integral part of the ground support forest fire operations organizations necessary to compliment AEROS aerial spraying operations in all countries where GRG operates.

The AEROS Project will invoke major organizational transformation throughout several industries. Organization Transformation (OT) is "the cutting edge of planned change" and is generally referred to as "second generation OD" (Organization Development). According to Porras, one of the definitions of OT is: "promoting paradigmatic change that helps the organization create … desirable future environments" (Porras, 1991) and this certainly applies to GRG and the AEROS Project.

6) Leading and Sustaining Change

Introduction: Summary of AEROS Project Change Plan Goals

The following is a summary of GRG short-term goals and recommended functional tactics and policies that constitute the action plan for the effective implementation of the AEROS Project and achievement of the company's long-term objectives;

- Obtain private financing to build, test and demonstrate the 1st operating prototype of the AEROS System, acquire the three identified, related operating companies; [Functional tactics: Be honest, open, and forthright at all times; Answer all questions clearly and concisely. Respond promptly to all requests for additional information; Listen carefully during meetings; Be prepared to accommodate reasonable requests of serious parties contemplating major investment;

- Organize the public demonstration, televised live, oil spill recovery customer performance trials;

- Develop a set of corporate policies that empower management and employees. Policies should be designed for adapting to change and rapid growth;

- Develop an effective reward system for senior and middle management and all employees, including share options, performance cash bonuses, and an appropriate profit sharing scheme;

- Pursue the "roadmap" of specific functional tactics identified to help ensure effective implementation of the GRG change project and achievement of GRG long-term goals:

The technological risks have been adequately addressed. The other principal risk inherent in the business of GRG is the issue of identifying customers and ensuring revenues. In this regard, GRG must answer the following key questions:

a) How does GRG get the first customers for the AEROS System; who are they?

b) Why and how will these customers pay GRG?

In this critically important aspect of the overall business development plan, the GRG strategic market development plan is specific and clear. (Sullivan, 2008)

Regarding the universally public concern over global warming, Dr. Carlos Corvalan, environmental epidemiologist expert of the U.N.World Health Organization, recently warned how global warming is affecting the health of world populations. He discussed heat waves, saying they have killed increasingly more people over recent decades. Dr. Corvalan warns that many more of such extreme events are expected in upcoming decades due to man-made climate change.

After the 2003 heat wave in Europe, that "killed tens of thousands of people, early warning systems are being set up, and lives are being saved. So action is possible." (Corvalan, 2008)

6.a) Recommended Leadership Behaviors required to Keep Momentum Alive During the Implementation of the Proposed Change Project, known as the *AEROS® Project.*

The change model selected to apply to this project is the Kotter change model. Kotter gives an interesting account of why many transforming organizations fail.

He identifies leadership as the main transformation engine. A corporate leader with a purely managerial mind-set will inevitably fail to produce effective change. (Lester, 2008)

The key to success during the implementation of the ***AEROS Project*** is in acquiring a solid understanding of why organizations resist change, and to have a totally dedicated champion sponsoring the change (GRG definitely has this), and to make sure that the practices to complement and reinforce change are comprehensive and based on an appropriate change model like Kotter. Kotter outlines a useful eight-stage process for organizing and conducting a successful change process. He argues that successful change project leaders must create a detailed road map that guides the way and GRG has done exactly this as witnessed by the GRG Business Plan. (Sullivan, 2008)

An important leadership behavior to keep the momentum of a large change project is that of maintaining lifelong learning habits and enhanced leadership skills. In *Leading Change*, Dr. Kotter provides us with a detailed road map that highlights potential dangers and offers solid advice to all leaders orchestrating effective change. (Lester, 2008)

The following is a brief list of recommended leadership behaviors that can maintain the management team's commitment to achieving the main goals of the GRG change project, which will, in turn, maintain appropriate energy levels and enthusiasm throughout the organization:

- Honest and open general communications with reasonably full disclosure;
- Willingness to hold regular organization-wide circulars and meetings that clearly demonstrate how the change plan initiatives and achievement of major milestones are consistently in alignment with the company's strategic plan;
- Enthusiasm: Senior management must consistently display enthusiasm for the change project objectives and for all milestones as they are achieved;
- Integrity, punctuality, and a high work ethic: Senior management must consistently demonstrate the highest integrity in every respect and maintain a high work ethic, including the daily attendance record, punctuality for all appointments, meetings, and commitments at all levels;
- Respect: Senior management must constantly demonstrate respect for all colleagues, employees, customers, and all stakeholders;
- Team spirit: Senior management should embrace and promote a healthy, strong team spirit at all levels of the organization;
- Faith and patience in the face of adversity or set-backs: When the change project is of a large scale and long time-frame, with large challenges, management must demonstrate faith in the long-term goals of the change plan and patience with temporary set-backs (careful planning and proper contingency plans established at the beginning of the change project are of critical importance);
- Commitment and Perseverance: These are virtues that are always rewarded with success, especially in the long-run;
- Open door policy: Management must consistently allow colleagues and subordinates access to communicate concerns, suggestions for improvements (better work conditions, cost savings, higher productivity, less redundancy, etc);
- Acknowledge and reward exceptional performance and outstanding personal initiatives: If management properly acknowledges and rewards exceptional performance and outstanding personal initiatives, this will create an environment where all employees will want to contribute and perform to the best of their abilities.

6.b) Evaluation of Elements of the Organization's Culture and Explanation of How They May Influence Successful Implementation.

The culture of an organization to a large degree will determine the type of leader required for change. Having an in-depth understanding of the organization's culture will help to select the right type of leader for any proposed change plan.

Effective change management requires the leader to effectively articulate the vision for the change and how it will be incorporated into the organization. The leader must then find and develop followers who will fully commit to the achievement of the vision.

Researcher Banutu-Gomez (2005) wrote that there are seven main traits that capture the essence of an organization's culture. It is useful to compare these gudeline cultural elements to those of GRG, as follows:.

1. Innovation and Risk Taking: Management and employees are encouraged to be innovative and create change. In this category, GRG excels.

2. Attention to Detail: employees are expected to exhibit precision, analysis, and attention to detail. The GRG COO is a task-master in this department.

3. Outcome Orientation: Leadership focuses on results rather than on the techniques used to achieve such outcomes. GRG definitely focuses on outcomes as demonstrated by the GRG Business Plan. (Sullivan, 2008)

4. People Orientation: Leadership decisions take into consideration the effect of outcomes on people within the organization. Since GRG is a start-up in pre-commercialization / prototype development phase, this element does not really apply yet to the organization.

5. Team Orientation: Work activities are organized around teams rather than individuals. GRG has formed very proficient teams for various major tasks.

6. Aggressiveness: People are aggressive and competitive rather than easygoing. Here, GRG excels and this is the only way GRG can succeed.

7. Stability: Organizational activities emphasize growth versus maintaining the status quo. GRG focuses totally on growth.

In the case of GRG, the culture did not exist before the inventor of the technology and principle developer was well along the path to developing the company's organization and culture. Researcher Schein stated that culture and leadership are two sides of the same coin and the leader creates the organization's culture as he/she creates the groups that form the organization. (Schein, 2000)

"What gives organizations their unique character is not the existence of the cultural dimensions but how those dimensions relate to one another" (Schein, Goffee, Jones, 1997).

Identifying and addressing key cultural dimensions of an organization is critical in order to effectively recommend suitable leadership behaviours. The change project plan should identify, discuss and recommend leadership behaviours and demonstrate how and why they are suitable. Threats, limitations, and strengths should be addressed in order to develop a suitable cultural risk mitigation strategy for the implementation of the project. (French, et.al. – 2008)

GRG has established global cultural characteristics due to the fact that the company is engaged in organizing a globally integrated network of environmental emergency response bases. For example, at the present time, GRG is negotiating operating joint venture agreements with China and Malaysia and will very soon be negotiating similar agreements with Mexico and other countries.

The GRG international training center that will retrain military personnel from around the world from a traditional military role to a strictly environmental and humanitarian role is an initiative that will promote global harmony in addition to the benefits that GRG technology offers to protect the Earth's environment and to preserve the world's oceans and forests and to slow down global warming.

This global culture aspect of GRG can readily be harnessed to support and maintain successful implementation of the numerous GRG emergency response air bases that are planned to be located around the world. Likewise, the GRG AEROS System live oil spill recovery trials planned for the Straits of Malacca (Malaysia) and the Gulf of Mexico, to be broadcast on global television networks will reinforce international support for a successful implementation of the proposed GRG change project.

6.c) Strategies to Deal Effectively with Organizational Cultural Issues to Ensure Success of the AEROS Project Change Plan.

GRG must deal with a great many cultures around the world. The reasons why governments and industry will want to pay for AEROS technology & services include the following (these are the drivers that determine the strategies to deal effectively with the eventual organizational cultural issues GRG must face):

a) Better protection against oil spills & less pollution; also, better protection to control forest & jungle fires;
b) AEROS System will eventually save governments, industry & the public hundreds of millions of dollars in clean-up costs, 3rd party legal liability costs & fines; also, enormous savings will be achieved by better protecting homes as well as forestry and agricultural resources;
c) Prestige on the international stage;
d) Political points at home;
e) Job creation; (each AEROS Base will provide permanent employment for over 150 local

employees, and will support many local companies and key suppliers in the general area of each GRG Emergency Response Base (ERB);
f) Better protection for the environment;
g) Benefits many sectors of the economy, including tourism, fishing industry, coastal sea food farms, and other coastal resources;
h) Very useful and prestigious re-allocation of military resources;
i) Dual purpose application of AEROS infrastructure to fight forest fires and jungle fires;
j) Spin-off benefits for the national economy of the countries hosting AEROS Bases and benefits to neighboring countries. (Sullivan, 2008)

Some of the key GRG strategies to deal with organizational cultural issues to ensure project success are summarized as follows:

- Enter into joint ventures with foreign government agencies and private industry partners in each country where a GRG emergency response base is proposed;
- Hire a high percentage of local nationals for each regional GRG response base;
- Enter into joint venture manufacturing agreements wherever appropriate;
- Conduct intensive cultural orientation and language training for GRG staff in each country where GRG operates;
- Understand and observe all important local customs and regulations.

6.d) Recommended Post-Implementation Management Practices for the Continued Success of the AEROS Project.

Some key post-implementation practices the author recommends for the AEROS Project include the following:

Prior to, and just after implementation, GRG will need to focus on a detailed strategic plan and translate strategic plans into organizational action, also known as **"strategy implementation"**. In order to accomplish this effectively, GRG needs to do the following:
-Identify short-term objectives;
-Initiate specific functional tactics;
-Develop and communicate policies that empower management and all employees;
-Develop a motivating and effective reward system for management and employees.
(Pearce-Robinson, 2004)

The firm's short-term objectives translate the long-term goals into specific focus action plans and if these short-term objectives are properly designed, clear, measurable, and clearly communicated, they can be powerful motivating agents to facilitate effective strategy implementation.

The recommended functional tactics will be used to translate GRG strategies into guidelines for day-to-day activities at all levels of the organization, and it is highly desirable that both senior and middle management all participate in the formulation of the functional tactics, thereby enrolling all employees into an effective implementation of the firm's strategies.

Good policies empower employees and simplify the daily decision making processes for both managers and all employees. Good policies reduce the time required for employees and managers to take daily decisions and policies facilitate actions that are consistent with the firm's short-term and long-term objectives and strategies.

An effective corporate reward system will have the benefit of ensuring the achievement of goals by aligning the personal priorities of all employees with the priorities and desired results of the organization. This, in turn, tends to ensure the achievement of the firm's goals and the creation of enhanced shareholder value, and a good reward system can provide strong motivation throughout the company with the desired result of effective strategy implementation.
The most important post-implementation management practices the author has determined as necessary for continued success of the change project proposed for GRG are summarized in the following list:

- Obtain independent certifications of oil-water separation efficiencies and overall performance measurements for all oil spill recovery demonstrations and oil spill response missions;
- Publicize the success of all environmental disaster response missions in the media worldwide;
- Obtain the active support of worldwide popular celebrities who are known as environmental activists, such as Sir Richard Branson, Leonardo di Caprio, Kevin Cosner, Meg Ryan, George Segal, Ted Danzen, Al Gore, and others;

- Monitor constantly all new technology innovations related to GRG's core technologies, products and services;
- Lobby the marine insurance underwriters' industry plus Lloyds of London and the International London Underwriters (ILU) Group as well as the Protection and Indemnity (P&I) Clubs to obtain their support to establish differential insurance rates for oil tankers and other vessels that are protected by the AEROS System compared to those vessels that are not part of the GRG AEROS oil spill protection network;
- Lobby the U.N.-World Bank funding organization known as the Global Environmental Facility "GEF" to obtain their support to establish an international financing plan to assist all developing countries to enable them to contract and pay for GRG environmental protection and related satellite services.

7) Systems Thinking and Change Management Evaluation

7.a) How systems thinking was incorporated into the project development, and applications to manage effective change in the future.

Understanding systems thinking is critical when implementing organizational change. An executive who implements change without the benefit of systems thinking is "at risk for becoming too deeply involved in their own agendas, personalizing conflict and resource allocation in a manner counterproductive to the broader goals of the organization" (Johnson, 2007, p. 9). A complete change plan must take into account all aspects of business functions as well as past and future activities in order to make the best business decisions. Failure to incorporate systems thinking into the change plan may result in a technology implementation that ends in an overall decline in business effectiveness. As an evaluation criteria, showing that systems thinking has been incorporated into a change management plan will give senior management confidence that all aspects of the organization have been taken into account, and will make the plan more likely to be approved. (French, et.al. – 2008)

GRG, from the very beginning, has taken an integrated systems approach to business, starting with the dual-purpose concept of using the C-130 Hercules aircraft for both oil spill response missions and for forest fire fighting missions.

In a similar fashion, the GRG strategic plan is to utilize the same satellite remote sensing, GPS, and telemetry systems for all the company's operations.

7.b) Stakeholder interests and resource constraints during project development and strategies employed to balance these different interests and constraints.

Implementing change within a large organization will likely affect a wide range of departments and individuals including customers, suppliers, and of course shareholders. An effective change plan must identify all stakeholder interests, both internal and external, and balance these interests with available resources. A change plan that fails to identify and control stakeholder interests may inadvertently create scope creep or may fail to deliver the required results.

Where customers are affected, an appropriate communication plan should be in place. Marketing, sales, and customer service personnel need to be engaged to facilitate the communication. Stakeholders who have been ignored in the change plan will add extra burden to timelines and budgets and may cause additional delays by creating obstacles or problems for the plan and for the change team. (Sullivan, et.al.-2008)

7.c) Impact of technology on effective managerial decision-making. Explanation of how new technologies drive change. How chosen technologies affected the change plan.

New technologies will drive change and affect managerial decision-making. Understanding the technologies and the impact they will have on systems, people, and the decision-making process itself is a crucial step in the planning process. Just as a new drug should not be released until its effectiveness and safety have been fully explored, a new technology and its impact must be completely understood. Failure to do so could result in unforeseen side affects that adversely affect the bottom line. A plan that has fully incorporated management strategies to deal with the effects of new technology is more likely to receive buy-in from stakeholders and win the approval of management. (Sullivan, et.al. – 2008)

7.d) The evolving role of ethics and corporate responsibility in the management of organizational change; ethics issues encountered during project development.

A project plan that has identified potential ethical issues prior to the implementation will be more effective in mitigating possible breaches of ethics. Managers and staff may face influences that do not align with project goals, and these potential conflicts must be identified early and managed throughout the change process.

As Mange points out, "the pressure for short term profit performance tied to bonus compensation and career advancement has provided more than enough pressure to push people over the line". These statements are truer now than they have ever been. Global markets are opening access to exciting opportunities for productivity gains, but cultural differences increase the possibility of an unforeseen breach of corporate ethics. (Mange-2002)

GRG has encountered significant ethics issues during early project development phases including the hotly debated topic of paying commissions "under-the-table" to local government officials in certain countries where this practice has always been the norm. Many countries, including the U.K., France, and others, now officially recognize this practice and allow such payments to be deductible for corporate tax purposes.

8) Conclusions and Recommendations

The only certainty in business is change! Major change projects can present enormous challenges that can be usually well managed by applying an appropriate change model (Jacobs).
By applying the Kotter change model to the AEROS Project, we have demonstrated that management can have a deeper understanding, be more flexible, and be better prepared to adapt to change and to manage the human change elements involved in this global change project.

This paper describes the business requirements analysis for two important IT projects that are proposed for Global Response Group (GRG). The paper presents the rationale for each project and summarizes use cases to assist the IT Division of GRG to analyze and design the technology solutions envisioned. The paper also describes a solution design for a "Technology Project Plan" for GRG, and explains the roles that databases, programming, and networks would play in the use cases identified in the GRG Business Requirements Analysis (Section 2). This paper also demonstrates how use cases aid in the systems analysis and design process, how internal and external stakeholders will be affected by the proposed Technology Project Plan, evaluates the inherent business and security risks. It also recommends several corresponding mitigation strategies, presents a financial plan, and provides a summary of the metrics to be used to measure the outcomes and future performance of the Technology Project Plan.

Several aspects of this Technology Project Plan involve technologies that are quite sophisticated and the author recommends that, in the immediate future, GRG should enter into agreements and joint ventures with companies that have extensive experience developing satellite telemetry command and control projects. The recommended candidates for such joint venture associations include: the ***European Space Agency*** "ESA"; USA Federal Government ***National Oceanic and Atmospheric Administration*** "NOAA"; ***Honeywell-Datalynx Division*** (Worldwide Satellite Control Group, and Telemetry Command & Tracking Group), ***Lockheed Martin Corporation***, and ***The Raytheon Company*** (Northrupp Group). These organizations and global companies have extensive experience with similar or related satellite technology projects and it is considered very appropriate for GRG to enter into agreements or into a joint venture consortium agreement with one or more of the companies and/or organizations in reference, with one of these global firms or agencies taking the lead or acting as the prime contractor for all future GRG satellite services in support of GRG environmental protection and disaster response missions.

In order to be able to decide on the optimum association or most suitable joint venture partner(s),GRG will need to gain more in-depth knowledge of each organization's capabilities. Therefore, it is recommended that a specific market survey be undertaken in this regard and that direct lines of communication be established between GRG and each of the organizations in reference.

This paper also developed recommendations for leading and sustaining change. The paper demonstrates the importance and the benefits to understanding the role of leadership vis-à-vis culture and the usefulness of applying an appropriate change model to develop strategies to help ensure a successful change management process from beginning to end.

As professed by Alison Jenkins, meticulous preparation is the key to successful change. (BusinessBalls, 2007)

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