

E&A Report - H.E.L.P.HALO v1.0

by Paul Lawrence

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Halo Emergency Logistical Provisions (H.E.L.P.)



Enterprise and Innovation

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-Business Description, Product Design and Development Report-

Contents

Table of Figures.....	3
Introduction	4
Section 1: Business Overview	4
Section 1.1: H.E.L.P. Logo.....	4
Section 1.1: Mission Statement	5
Section 1.2: H.E.L.P. Slogan.....	5
Section 1.3: Objectives.....	5
Section 1.4: Values.....	5
Section 2: Product Design	5
Section 2.1 Product Name	6
Section 2.2: Brainstorming/Planning Ideas.....	6
Section 2.3: Logical Technical Design.....	7
Section 2.3: Halo v1.0 Case Physical Design	10
Section 2.4: 'Halo v1.0' Case Engineering Drawings	12
Section 2.5.: HALO V1.0 Finished Prototype.....	13
Section 3: Conceptual Image of 'Halo v1.0' and Satellite dish.....	15
Section 4: Command and Control Centre	15
<u>Section 5: Unique Selling Point (USP).....</u>	16
References	16
Bibliography	20
Appendix – A:	20

Table of Figures

Figure 1: H.E.L.P. Company Logo [10]	4
Figure 2: H.E.L.P. Head Office Sign [10]	4
Figure 3: Sketch of Prototype Mobile Network [27]	7
Figure 4: Evolution® X3 Satellite Module [29]	8
Figure 5: CISCO1921-SEC/K9 Integrated Services Route [40]	8
Figure 6: Cisco SGE2000 24-Port Gigabit Switch [42]	8
Figure 7: Cisco Aironet 1300 Series Outdoor Access Point/Bridge [43]	9
Figure 8: TRACO TIS Series 1Kw UPS.....	9
Figure 9: Intel® NUC Kit NUC6CAYH Mini PC [53]	10
Figure 10: Halo v1.0 Case Front View [10]	11
Figure 11: Halo v1.0 Case Back View [10]	11
Figure 12: Halo v1.0 Case Side View [10].....	12
Figure 13: Halo v1.0 Case 3rd Angle Orthographic Engineering Drawings [10].....	13
Figure 14: Halo v1.0 Conceptual Prototype [10].....	14
Figure 15: Conceptual Image of 'Halo v1.0' and Satellite dish [10]	15
Figure 16: Command and Control Centre Example [62]	16

Introduction

The aim of this 'Enterprise and Innovation' project is to design and develop an Information Technology (IT) product/business that will contribute to communications and logistics within disaster zones and remote areas where traditional communication is not feasible. [1], [2]

The focus of this report is to outline the description of the business, the design and development of a prototype product that will be the foundation of the business's mission statement.

Section 1: Business Overview

The name of the start-up company that the project team have created is; 'Halo Emergency Logistical Provisions' (H.E.L.P.). The legal classification of the business will be a 'Limited' (Ltd) company [3] that will initially aim to be funded by investors who will have a small stake in the company in exchange for their economic contributions [4]. Further grant funding will also be solicited from government/aid agencies i.e. United Nations (UN) [5], Oxfam [6], Direct Relief International (DRI) [7], Red Cross [8] etc. These agencies will benefit directly from H.E.L.P.'s business objectives and values because they align with their own objectives and values; to provide humanitarian aid [9] to people around the world after a natural disaster or emergency.

These key business points will be discussed in further detail in additional reports prepared by 'H.E.L.P.' team members: 'Henry Cobbold – Business Management', 'George Searle's - Marketing' and 'Ross Jones - Finance'.

Section 1.1: H.E.L.P. Logo

A company logo was created for H.E.L.P. that encompasses the bespoke functionality of the company that utilises high speed satellite communications and the company name shown in *figure 1*



Figure 1: H.E.L.P. Company Logo [10]

The logo was also projected onto a generic office building sign to depict the sign that would be installed at the head office of the company shown in *figure 2*

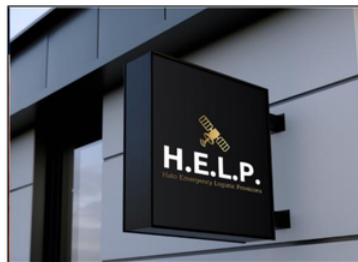


Figure 2: H.E.L.P. Head Office Sign [10]

Section 1.1: Mission Statement

The mission statement of H.E.L.P. is to provide and deliver a pre-configured temporary mobile network [11] to be utilised by rescue/aid workers in the immediate aftermath of a natural disaster where traditional communication methods may no longer be viable because of damage to cell/wireless communication towers [12], [13]. The mobile network will enable emergency communications locally, between rescue/aid workers for damage assessment and coordination of rescue efforts in the affected area, that will then be relayed back to the H.E.L.P. emergency trained staff that specialise in logistics [14] whom will be located within a 'Command and Control' (C&C) centre [15] based in the UK. Their roles within H.E.L.P. will be to liaise with aid agencies and/or governments around the world to provide geographical damage updates and emergency logistics of; medical treatment, additional rescue workers, rescue equipment i.e. machinery, shelters, food/water etc to the affected areas for a rapid humanitarian response to save more lives.

Section 1.2: H.E.L.P. Slogan

The H.E.L.P. company slogan encompasses the companies mission statement clearly and concisely for non-technical persons to digest easily.

The company slogan reads:

'H.E.L.P.: To deliver logistical support and communications to disaster/remote areas, anywhere in the world where traditional methods fail'

Paul M Lawrence – H.E.L.P. Product/Network Design Engineer [16]

Section 1.3: Objectives

The H.E.L.P. company objectives are to:

1. Design a reliable, efficient and relevant mobile network product using non-traditional Wide Area Network (WAN) communication methods. [17]
2. Design a C&C data centre that will be the hub for all communications to and from the mobile networks. [18]
3. Market the business and product to the relevant authorities. [19]
4. Create a business hierarchical structure with relevant staff who can fulfil H.E.L.P.'s mission statement and core values. [4]
5. Develop a training course for operational staff within emergency logistics and liaising. [20]
6. Obtain funding to create the product, C&C centre and business structure i.e. staff etc. [21]

Section 1.4: Values

The core values of H.E.L.P. and the reasons behind the initial idea of the product/company were to utilise the advanced networking, business, marketing and finance skills that have been acquired by the team from university to bridge the gap between a natural disaster and the coordinated response times [22] of emergency humanitarian aid within the affected areas to help save more lives.

Section 2: Product Design

Designing a product presents many challenges, all potential build, technical compatibility and real-world application issues must be foreseen at the planning stage to manage the potential issues that may arise at the development stage of the project that could add costs, technical delays and/or prevent the product from being developed. [23]

Section 2.1 Product Name

The product prototype was named 'Halo v1.0' because the word 'Halo' resonates with people as a mythological symbol of a saviour that gives hope in seemingly impossible situations. This encompasses the core values of the product and its intended application.

Section 2.2: Brainstorming/Planning Ideas

During the initial brainstorming of 'Halo v1.0' there were design considerations that needed to be analysed and adhered to for the product to be practical and efficient within its intended environment. These considerations were:

Physical Case Design: The design of the case would need to be small, compact, light, waterproof and durable due to its indented environment. The devices housed within the case would also have to be accessible for maintenance and battery changes.

Technical Design: The logical design of the product would need to create a secure WAN communication tunnel [24] outside of the disaster/remote area it was being utilised within. Traditional means of communication may not be possible within these disaster/remote areas i.e. cell communication, WI-MAX etc because there would be a high possibility that the communication towers that are needed for these technologies to work would be damaged within a disaster area or out of range within remote locations i.e. mountains, sea, desert, north/south pole etc. Therefore, a satellite WAN communications topology would have to be designed into the product.

The product would also have to provide a Local Area Network (LAN) [18] and a Wireless Local Area Network (WLAN) [25] [26] communications infrastructure for rescue/aid worker on the ground to communicate with each other locally via voice and/or video to organise rescue equipment, rescue workers, medical assistance, area surveys etc to a specific zone within the disaster area because as previously stated traditional communication methods may be damaged and unavailable after a disaster.

During the initial brainstorming and planning, a rough drawing was created depicting how the envisaged product may look shown in *figure 3*.

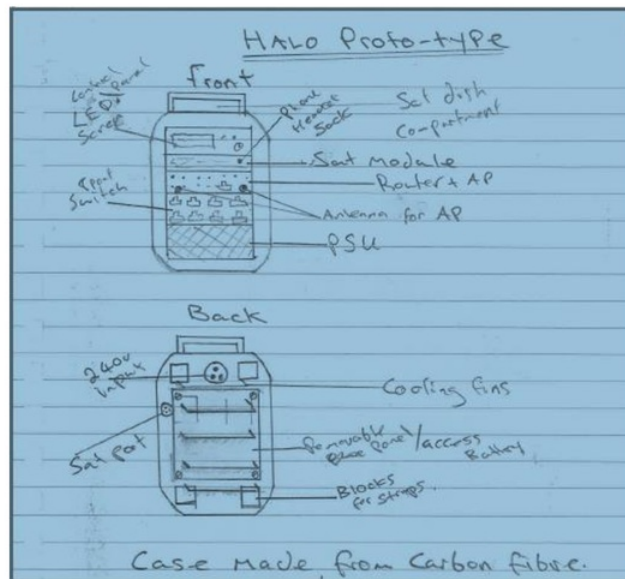


Figure 3: Sketch of Prototype Mobile Network [27]

Section 2.3: Logical Technical Design

Utilising the design considerations identified within the brainstorming/planning section of the product, suitable devices were then researched to develop a product that would meet all the previously identified communications criteria and business objectives:

Satellite Modem: A satellite modem was a key feature within the design of the product because it will provide high throughput WAN communications from the affected area via a satellite orbiting earth back to the C&C centre in the UK. [28], [29]

This device will be responsible for modulating [30] packets generated by the router and converting them to Radio Frequency (RF) signals and then relaying the signals off an overhead satellite that would in turn relay the signal to the C&C centre within the UK where the signal would be de-modulated. This device will have a satellite antenna interface for the satellite dish to connect to the module. [31]

The Internet Service Provider (ISP) [32] ViaSat [33] that provides satellite communications to customers boast a 1 GB/s throughput [34] which will be ideal for high data communications such as voice and video. ViaSat also provide a mobile satellite dish with each subscription that is compatible with their satellite service.

A similar satellite modem currently available on the market that weighs 1.95Kg and has a surface area of W 292 mm x D 251 mm x H 51 mm was researched and analysed to estimate the weight and size of the custom device that would be used within 'Halo v1.0'. Shown in *figure 4*.



Figure 4: Evolution® X3 Satellite Module [29]

ISP Router/Firewall: An ISP router with an integrated firewall and 1GB throughput ports was utilised within the product to secure, prepare and then route packets generated by the LAN to the packets WAN destination; the C&C centre via the satellite module. At the integrated firewall within the router a deep packet inspection [35] will be conducted to prevent malicious actors accessing the network unlawfully. [36]

A Dynamic Multipoint Virtual Private Network (DMVPN) [37], [38] will also be configured at this device to encrypt the sensitive information being transmitted across the WAN (satellite) using military grade Asymmetric Encryption Standard (AES) – 256 bit encryption [39].

A similar ISP Router/Firewall currently available on the market that weighs 3Kg and has a surface area of W 343 mm x D 292 mm x H 44 mm was researched and analysed to estimate the weight and size of the custom device that would be used within 'Halo v1.0'. Shown in figure 5.



Figure 5: CISCO1921-SEC/K9 Integrated Services Router [40]

Layer-2 LAN Switch: For the LAN segment of the network a 24-port Layer-2 managed switch with 1GB throughput ports will be utilised for the switching of frames between end devices for local communications. This device will also be the input for wired end devices i.e. laptops to connect and access the temporary network. [41], [42]

A similar 24-port LAN switch currently available on the market that weighs 4.3kg and has a surface area of W 375 mm x D 400 mm x H 44 mm was researched and analysed to estimate the weight and size of the custom device that would be used within 'Halo v1.0'. Shown in figure 6.



Figure 6: Cisco SGE2000 24-Port Gigabit Switch [42]

Industrial Outdoor Wireless LAN Access Point (AP): This device will operate in the 2.4Ghz frequency band and have a point-to-point range of 1.5 kilometres [43] with 330Mb/s throughput that will be used by rescue workers to connect wirelessly to the temporary LAN network the product creates whilst they are searching the surrounding disaster area so that they can communicate with the temporary rescue command base located within the disaster zone to relay information i.e. voice, video etc back to the C&C centre within the UK. This device will also use Wi-Fi Protected Access (WPA) 2 – 256 bit encryption [44].

A similar WLAN AP currently available on the market that weighs 0.5Kg and has a surface area of W 116 mm x D 77 mm x H 38 mm was researched and analysed to estimate the weight and size of the custom device that would be used within 'Halo v1.0'. Shown in *figure 7*.



Figure 7: Cisco Aironet 1300 Series Outdoor Access Point/Bridge [43]

Uninterruptable Power Supply (UPS): UPS technology is used within data centres for servers to maintain power via a battery in the event that the main grid power supply is lost for redundancy. Within 'Halo v1.0' 2 x Lithium-Ion batteries [45] that each have a 6-hour charge will be utilised for emergency backup power and a 240v industrial input for power supplied by on site generators will be installed into the UPS for the main power source of 'Halo v1.0'. [46] [47] [48]

A similar UPS device currently available on the market that provides 1Kw of power weighs 3Kg and has a surface area of W 350mm x D 250 mm x H 95 mm was researched and analysed to estimate the weight and size of the custom device that would be used within 'Halo v1.0'. Shown in *figure 8*.



Figure 8: TRACO TIS Series 1Kw UPS

Halo Control Panel Unit (Miniature PC): This device will be used as the internal brain of the product to configure/troubleshoot the network devices from a touchscreen Liquid Crystal Display (LCD) [49]. Physical dials and buttons will also be added to this device in the event the touchscreen is damaged. This device will contain a 2.4Ghz dual core processor [50], 1TB of non-volatile Solid State Drive (SSD) [51] memory and 8GB of volatile DDR-4 Random-Access Memory (RAM) [52] to efficiently manage the devices within 'Halo v1.0'.

A similar miniature PC currently available on the market that weighs 3Kg and has a surface area of W 120mm x D 110 mm x H 50mm was researched and analysed to estimate the weight and size of the custom device that would be used within 'Halo v1.0'. Shown in *figure 9*.



Figure 9: Intel® NUC Kit NUC6CAYH Miniature PC [53]

An integrated control panel with LCD will also be added to the device for operations, configurations and maintenance.

Custom versions of these devices will be made by an external company that will then produce the entire product in large quantities.

Section 2.3: Halo v1.0 Case Physical Design

After researching various materials; mild steel [54], stainless steel [55], aluminium [56] and carbon fibre [57], it was decided that carbon fibre would be best suited to be used within the HALO V 1.0 product because it is 10 times stronger [58] than steel and 5 times lighter [58], it also does not expand, contract or crack within various thermal environments making it a perfect material for the nature of the product and the geographical locations it will be used within; rough terrain, cold environments, hot environments etc. Rounded corners were also implemented into the design for added strength and to prevent injury to the rescue workers hands [59]. A removable carbon fibre panel with 'grille' vents for cooling [60] was also designed into the product for maintenance as previously discussed within the brainstorming section of this report.

The prototype design of the 'Halo v1.0' case can be found in *figures 10-12*.

Front View of Case:



Figure 10: Halo v1.0 Case Front View [10]

Back View of Case:



Figure 11: Halo v1.0 Case Back View [10]

Side View of Case:



Figure 12: Halo v1.0 Case Side View [10]

Section 2.4: 'Halo v1.0' Case Engineering Drawings

After analysis of the dimensions of the similar networking products previously identified, the overall dimensions of the case were created: (H) x (W) x (D) = 725mm x 540mm x 540mm. The weight was then calculated from the similar identified devices (15.75Kg) plus the weight of the material (Carbon fibre estimated @ 1Kg per square metre = $(650\text{mm} \times 3) + (540\text{mm} \times 2) = 3030\text{mm} / 1000 = 3.03\text{ meters} = 3\text{Kg}$) which came to 18.75Kg for the overall product net weight. [61]

The overall weight will be reduced when the devices are custom made to an estimated 15Kg

From the case dimensions a 3rd angle orthographic engineering drawing was produced for the external company to manufacture 'Halo v1.0' case to the correct specification shown in *figure 13*.

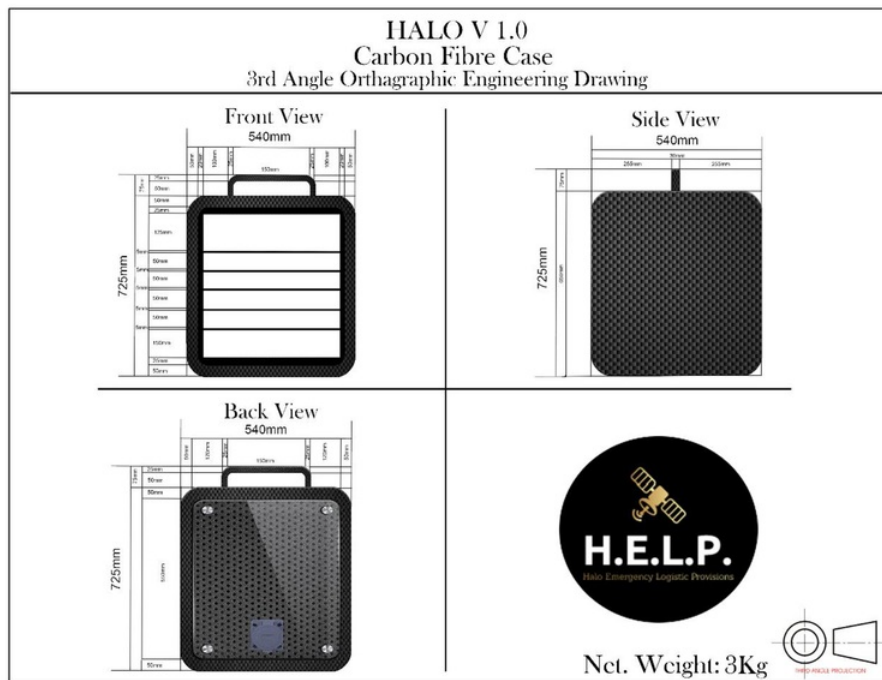


Figure 13: Halo v1.0 Case 3rd Angle Orthographic Engineering Drawings [10]

Section 2.5.: HALO V1.0 Finished Prototype

A conceptual design of the finished product was also produced depicting all the identified devices housed within the previously designed case shown in figure 14.

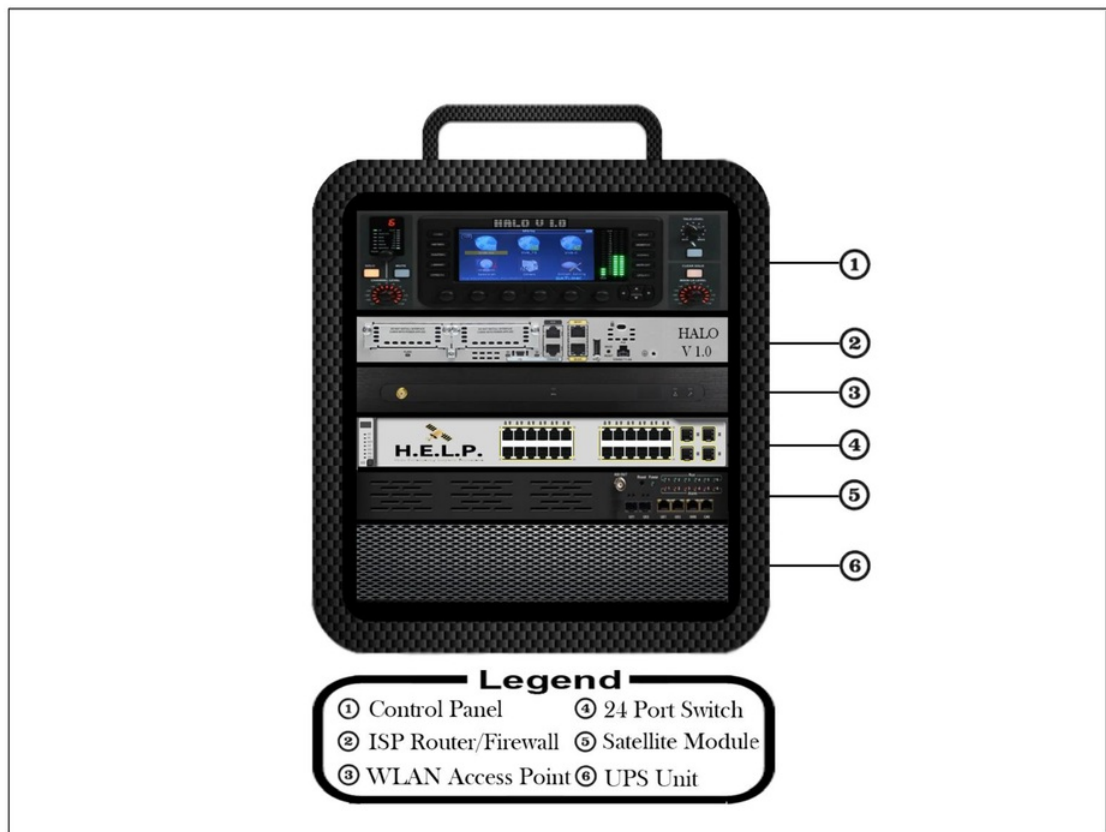


Figure 14: Halo v1.0 Conceptual Prototype [10]

Further technical schematics would need to be drawn up to produce these devices to fit within the 'Halo v1.0' case design if the product was to be developed within the real world.

Section 3: Conceptual Image of 'Halo v1.0' and Satellite dish

A conceptual image was created to illustrate how 'Halo v1.0' will look with the ViaSat dish connected that can be found in *figure 15*.



Figure 15: Conceptual Image of 'Halo v1.0' and Satellite dish [10]

The ViaSat dish was customised with carbon fibre to make the component lighter and more durable within the terrain it will be used for.

Section 4: Command and Control Centre

The command and control centre will be a large office that contains data centre equipment i.e. servers, switches, routers, satellite module and a large satellite located on the roof. That has trained emergency logistic staff stationed, each with there own terminal to deliver logistical support to rescue/aid workers in the disaster/remote areas. [62] An example of a C&C Centre can be found in *figure 16*.



Figure 16: Command and Control Centre Example [62]

Section 5: Unique Selling Point (USP)

Natural disasters are a global phenomenon [63] that will always plague people within cities around the world, 'Halo' will always be a relevant product because of this fact. The USP of 'Halo' is that it's a bespoke product aimed at governments and aid agencies who have massive disaster relief budgets, so sales of the product would not be an issue. Halo v1.0 aims to rapidly increase response times and coordinate logistical support from trained professionals outside of the affected area to the disaster zones by means of communicating via a small, lightweight, durable, mobile LAN and WLAN all packaged into one product, that utilises a high-speed satellite for WAN communications when traditional methods of communications are not viable as previously discussed. Market research analysis within this niche industry by team member; 'George Searle's' indicates this product has not been created by another company making it a unique relevant product.

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Appendix – A:

Weekly Team Meeting Minutes Chaired by Henry Cobbold – Business Manager:

Team Name: H.E.L.P. (Halo Emergency Logistic Provisions)

Team Member Names & Roles:

Paul Lawrence: Business Description

Paul Lawrence: New Product and Production

George Searle: The Market and Competitors

George Searle: The Marketing Plan

Ross Jones: Financial

Henry Cobbold: Management & Operations

~ Note: the above information should remain at the top of the document. And Weekly reports placed below and a new entry included during each tutorial. Assessment note: more marks are awarded for professional practice.

Weekly Progress report 1:

Date: 19/02/2018

In-Attendance: George Searle & **Paul** Lawrence. Apologies: Henry Cobbold, Ross Jones.

> Individual Updates:

- George Searle Update: Working very hard on market competitors; found some vaguely similar solutions. However, our market is niche, and the product is bespoke, so intricate research will be required to support the product proposal.

- Paul Lawrence Update: The name was finalised, and the logo designed. Also discussed previous/initial ideas noted in more detail.

No reports from Henry Cobbold or Ross Jones due to meeting absence

> Actions:

- **George Searle Actions:** Begin research on the key market competitors, main aspects of the rival systems can be listed and brought up for discussion. Writing up market competitors.
- **Paul Lawrence Actions:** Research suitable and compatible internetworking devices (and protocols) for product i.e. 24 port switch, Router, Access Point, Satellite module. Finalise dimensions and weight to start designing/drawing case which will be made from carbon fibre. Product needs to be light and small but also durable for disaster zones.
- **Henry Cobbold Action:** Assist George in market and competitor research. To further George's market research begin looking into emergency disaster spending currently. This will help provide us with valuable information as to how the product can change emergency response.
- **Ross Jones Actions:** Look at the graphical designed element and begin to undertake some initial financial based spec'ing around. Requires a copy of graphic processing software from either Henry or Paul for this task.

Weekly Progress report 2:

Date: 26/02/2018

In-Attendance: Henry Cobbold & George Searle, Apologies Paul Lawrence & Ross Jones

> Individual Updates:

- George Searle Update: Has completed X sections of the research documents. His research threw up several key product design aspects that need discussion, namely power source and a suitable connection speed (largest BGAN is 650kbps). No comparable competitors were identified, but these are more specialist and consider certain aspects of our product. Started work on PEST analysis including Legal and Political issues.
- Henry Cobbold Update: The first thing that is compromised in a natural disaster is the communications infrastructure. Several key references for George identified. Planning for finances and organisation structure have been started.

> Actions:

- George Searle Actions: Complete the Market Competitors section and begin undertaking the PEST analysis for the proposed product.
- Go away and start to make some decisions about the organisation structure side of things. Will be feeding back next week with issues raised as a way of finalising this element of the project.

Weekly Progress Report 3:

Date: 05/03/2018

In-Attendance: Henry Cobbold, George Searle, Paul Lawrence, Ross Jones

> Individual Updates:

- Henry Cobbold: Presented back on the number of financial and structure based questions, thoughts and queries to the team. Big discussions followed.
- Paul Lawrence: Worked mainly on the physical product itself alongside George, considered the look and design of the components the form that these will take. Decided upon the logo and produced professional versions, including one for the physical location. Both were really liked by the team and these initial designs were so popular they will be used for the final product/service branding.

- George Searle: Presented back on the cost of the product components, discussion as to the use and deployment of these followed
- Ross Jones: Limited contribution, work this week postponed.

> Actions:

- Decided upon the following:
 - The entire team discussed the points considered regarding organisational structure and operations from Henry. Decided in the end upon: physical location consists of 30 staff (made up of 1 location manager, 1 network engineer, 2 junior engineers, 5 team leaders [1 per 5 subscriptions taken out], and then a 2:1 ratio of staff subscriptions to staff [resulting in 25 total people actively managing the subscriptions])
 - Physical look of the product was drawn out by Paul including the front/back/internal aspects of the product using components provided sourced from a collaboration between George and Paul.
 - George continued to look around the need of the product, changes here were mainly as a result of adjustments to the organisational structures (outlined above in *Actions Point 1*)
- Ross Explored the use of cooling on the product, how might this be put into the product as a whole. Will go away and also begin breaking down the financial aspects of this assigned tasks. Contributions will be made from the rest of the team next week as a way of reviewing choices made here.
- Henry will draw up a physical diagram for the structure and operations elements what can be used to demonstrate how the aspects of product and service work. Export the 'Whatsapp' conversation and change the documents for his work to correctly represent the result of discussions made during todays meeting. More questions and discussion may arise therefore.
- George will continue to research the technology purpose and add to PEST scenario analysis as he feels he wants a little more information under this section.
- Ross will be doing financial side of things, begin to come up with some cash flow fore-castings for all the things.
- Paul will now take the very detailed plans drawn up during this weeks meeting and put them into a graphics software package. For next week the cooling aspect of the product will come from Ross and this will be included in the digital version of the build.

Weekly Progress Report 4:

Date: 12/03/2018

In-Attendance: Henry Cobbold, George Searle, Paul Lawrence, Ross Jones

> Individual Updates:

- George: Continue working on the technology aspect of PEST filling out the technologies' purpose.
- Henry: Limited contribution, no work occurred this week. Tasks put back to the following week.
- Paul: Spoke with James about overall project ideas and development; showed final production of logo and also prototype rough draft.
- Ross: Developed and started filling out the finance spreadsheet, information collated on the cooling aspect of the product.

> Actions:

- Had a group meeting with James about the progress of the Project, explained how we were working well and ahead of current schedule.

Weekly Progress Report 5:

Date: 26/03/2018

In-Attendance: Henry Cobbold, George Searle, Paul Lawrence, Ross Jones

> Individual Updates:

- No updates this week. Work continuing towards other modules across the 3 week Easter break.

> Actions:

- No actions assigned due to work commitment for other modules, will convene as team members work on their sections. Planning allows for no work to place across this period, any progress is advantageous.
-

Weekly Progress Report 5:

Date: 23/04/2018

In-Attendance: Henry Cobbold, George Searle

> Individual Updates:

- **Lectures from this week are on a consultancy basis.**
- No updates this week from the East break. Work continuing towards other modules by all team members.

> Actions:

- Henry and George have explored the use of infographics in several areas of the product marketing and organisational structure aspects of material. Several useful platforms and templates have been identified. Looked at some hints for presentation (these have been noted by Henry and are accessible to the group when planning the presentation)
 - No actions assigned for next week other than that outlined above. Work commitments are still too much to work on this assignment. This position will be re-evaluated next week by the present team members.
-

Weekly Progress Report 6:

Date: 08/05/2018

In-Attendance: Henry Cobbold, George Searle, Paul Lawrence, Ross Jones

> Individual Updates:

- **Big updates from Paul. He presented the final designs of the HELP module including views from all angles and technical product designs showing precise component measurements.**

> Actions:

- Ross, George and Henry: All felt the designs were comprehensive and highly professional. Minor changes were suggested in response regarding the number of ports on the switch incorporated into the product design. This was highlighted by George with the relevant cost differences noted by Ross for his costings sheet.
 - Final product design complete, we could all now fully complete our sections of the product and service proposal.
-

Weekly Progress Report 7:

Date: 09/05/2018

In-Attendance: Meeting was conducted digitally, all contributed

> Individual Updates:

- **Short notice meeting about a key topic**
- Henry raised the issue of employee structure. This started a key debate influencing each section of the company.

> Actions:

- Henry needed to consult the team regarding structure as he felt it had not been discussed thoroughly enough.
- Paul contributed to provide a workable solution to the issues and concerns raised by other team members. In answer to George's worry about providing a global service around the clock

he suggested upping the operations staff count, but reducing the staff in the building during any one shift.

- Ross needed specific figures in order to accurately complete the 1st years costings sheet, and he asked questions regarding employee salary.
- George proposed a shift based system to ensure a 24hr service could be guaranteed to customers.
- All issues resolved and individual write up concerns were settled.

E&A Report - H.E.L.P.HALO v1.0

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

96/100

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18

PAGE 19

PAGE 20

PAGE 21

GRADING FORM: UWT SD GRADING FORM

PAUL LAWRENCE**96****1. RESEARCH LITERATURE**

Extent of research and/or own reading, selection of credible sources, application of appropriate referencing conventions.



+ Excellent and comprehensive use of citations throughout. + Excellent well formatted relevant varied and quality reference list.

20**2. KNOWLEDGE AND UNDERSTANDING**

Extent of knowledge and understanding of concepts and underlying principles associated with the discipline.



+ Good clear introduction and product description. + Legal classification. + Funding. + Business Strategy. + - Values.- additional research would add value here to allow a better understanding of business strategy formation to correctly document e.g. a refined mission, and key values. Objectives could be SMART however at this stage of product/business start-up the ones documented are good. + Product design. + Technical design. + Modelling. + Technical specifications. + USP.

17

3. ANALYSIS

Analysis, evaluation and synthesis; logic, argument and judgement; analytical reflection; organisation of ideas and evidence.



+ Product design: Case and Technical requirements. Excellent. + Physical design. + Operational planning. + URP and product viability.

20

4. PRACTICAL APPLICATION

Deployment of methods, materials, tools and techniques; application of concepts; formulation of innovative and creative solutions to solve problems.



+ Legal classification & Funding applied. + Logo and sign. Excellent. + Mission statement. – could be refined in accordance with mission statement creation guidelines. + Objectives. Good. + Slogan. + Product name. + Product design. + 3rd angle orthographic engineering drawing. Excellent. + Conceptual prototype and images. Excellent. Adds much value.

19

5. PROFESSIONAL PRACTICE

Attributes in professional practice: individual and collaborative working; deployment of appropriate media; presentation and organisation.



+ Excellent report format structure and presentation
- Short conclusion could be provided. + Very good team progress reports and individual contribution to the team. Excellent.

20