Project Operation Report

1. Summarize the major decisions you made in constructing your preliminary project plan.

During the construction of our preliminary project plan we had made a few major decisions mostly in relation to communication between the group.
The decision to have meetings every week was made primarily so we could have open lines of communication between the group members in each role. This was integral to being able to quickly identify risks that were identified in the project plan, and quickly mitigate them with our planned risk responses. The meetings allowed the use of risk responses such as having set achievable tasks each week, regular contact, combining people's work, planning amendments and resolving poor time management.

Our decisions encompassed reducing the risks via tools such as a Facebook group and a Trello board to effectively communicate urgent tasks to each other. The Trello board was chosen due to us being able to manage staff performance and delegate specific tasks using cards. The git-log also was chosen as a way to keep track of everyone's contributions to the project.

It was an important decision to set very defined roles in our project plan. We split the work between front-end, back-end and testers such that each group was a pair. This choice was made because it meant that pairs of people working on similar areas of the project could meet and communicate more regularly than 8 people.

We also focussed on a realistic project breakdown. This breakdown was to form the basis of the weekly worksheets, and give a good idea of effort needed for each section. The work breakdown was to give a list of subtasks, and relationship between tasks. The dependency between tasks needed to be stated, so we could focus on tasks that would bottleneck the project. The individual tasks were to also graded by difficulty, the reasoning behind this being that we could delegate more members to a role with a higher difficulty grading than another task. Having roles associated with each task also asserted responsibility for each task.

2. What project management issues arose? (e.g. schedule delays, unforeseen risks, staff management issues, communication problems)

Some of the project management issues that arose were

Schedule delays

Schedule delays were a consistent problem during the project. With all group members having many other responsibilities, it was very difficult to have scheduled sections of the project finished week by week if the project was not the top priority. Hence it was sometimes an issue having members who were assigned to certain roles, complete the sections that were required week by week. It was necessary to continually delay the schedule by a small part every week, as evident in our worksheets, but we kept track of the delayed work such that it would not get out of hand.

Unforeseen risks

A risk that caused a fair amount of delay during the project was the problem that not everybody in the group was proficient in Python (our chosen language for front-end and back-end). An example of a particular issue that arose because of this, was finding the correct Python library for a calendar and correctly using it to choose flights. Although this problem was resolved, many problems like it emerged throughout the implementation of the back-end. These problems caused some delay, and sometimes produced badly crafted and poorly commented/messy code. The delays caused by inexperience in this language slowed progress towards the later stages of the project. These delays were occurred when we reached the debugging and testing stage. We were forced to go through the code and improve the documentation of every function, and go through the back end housing to sift through tasks relevant to the specification that were not addressed earlier

Communication problems

Throughout the project communication was also an issue. It was difficult, if not impossible organising 8 people together at the same time a majority of the time. Hence we ran into some issues with communicating between different roles, and setting weekly goals.

Staff management issues

We had minimal issues with staff management, since there was an optimal amount of people assignable to each task, it was often better to keep group members in their confined roles. It was sometimes necessary when one members role did not have as many responsibilities as others, to shift some of the work onto the member as to even the spread of effort. There were also issues where the inexperience with python of some group members would mean only certain members could complete certain tasks. This included a great amount of back-end work such as algorithm housing and debugging.

3. What actions did you take to deal with these issues?

Schedule delays

Many issues that caused schedule delays were an overburdening of assignments around the halfway point in project development. Hence for every worksheet that we made for that time there was always a task that was pushed to the next week. This accumulation of delayed work was not large enough to cause major issues, but rather was dealt with during our final week. During this week we resolved delays in relation to the compilation between the back-end and front-end. This need to complete delayed work made it necessary for 5-8 of us involved in back-end, front-end, testers to discuss and implement solutions via meetings in person, made possible by an abundance of time in the end of the project time-span. These meeting proved exceedingly useful, as it allowed experienced/inexperienced members to interact directly and solve persistent issues in the back-end/front-end much quicker than over Skype/Facebook.

Unforeseen risks

The risks associated with members in the group possessing different skill levels in python were persistent but manageable. These risks were both addressed at the beginning of the project and also during. At the beginning of the project it was integral to have the paired roles (front-end,back-end,testers) have at least one person who was proficient in python and one who was not as experienced. Having this mix allowed for the less experienced member to learn more, and have somebody more experienced with the intricacies of the language to assist at all times. During the project this proved to be immeasurably useful, as when problems arose with messy or badly documented code, we had meetings where an experienced member would rectify the problem.

Staff management issues

Staff management issues were mainly resolved with reallocation of effort. Since most staff management issues stemmed from the fact that some members were not as experienced in python as others it was important to utilise members in roles and tasks that strongly reflected their abilities. Whenever there was a conflict between lack of experience and need to do a task, it was integral to assign pairs to work on a task, so that the inexperienced member could assist and learn from the more experienced member. Where there would usually be a discrepancy in the workload between members, the discrepancy was minimised usually by reassigning roles and pairing with different members.

Communication problems

Communication problems were generally overcome by direct contact between relevant roles. By forming the group into sub-groups with responsibilities set every week we attempted to

minimise necessity for contact time. The sub-groups could communicate and meet up with each other when others in the group were not needed for progress on the project.

4. Which components of the project plan proved useful as these issues arose? Were there any that you did not find useful?

The part of the project plan that proved most useful was the schedule.This was not due to the fact that we followed it exactly, rather that it allowed us to see that if there were delays, exactly how far behind we were. The ability to see these delays through the worksheets greatly helped to reduce the risk associated with accumulation of unfinished work.

The specified roles helped to directly assume responsibility for tasks to those with relevant roles. This aspect of the project plan allowed a more effective spread of work, and the utilisation of most of the group members towards the end goal of the assignment. Having split the responsibilities meant that group members working on the front end and back end did not have to worry about verification or organisation. Although the roles helped to assert this divide, the roles did remain flexible, as to allow for better reallocation of effort for tasks that required more time and attention.

The particular section of the project plan that did not prove useful was the estimated time. It was very difficult to estimate the time many of the sections due to inexperience with python and dafny. Contrary to initial estimation the implementation of the back-end took much more time than the front-end. The dafny section also required much more effort than expected due to issues with the language and the verification of such a large algorithm.

5. What changes to the project plan resulted as you monitored and controlled the project?

The majority of changes to the project plan stemmed from the delays that occurred throughout the duration of the project implementation. The project plan had to constantly be altered to account for schedule delays. Each delay forced the team to re-evaluate which task was the highest priority at the time. Having evaluated the task importance, we transitioned from having back end as the top priority, to front end and then to verification of our algorithm. Adjustments to task priority triggered more changes to the project plan. Hence according to our documented risk response, efforts were made to assign more people to work on higher priority tasks.

Another informal change that was necessary, was the redefinition of roles. As we didn’t initially understand the difficulty or effort necessary for each part, we instead assumed flexibility for roles. Roles such as Project manager, Product owner, and testers were flexible throughout the project. Both manager and owner assisted in the implementation of the back-end/front-end connection. Since we didn’t understand the full extent of Dafny verification

needed for the project, the primary role of testers was switched from testing the actual program, to writing the Dafny verification framework necessary for the back-end flightpath algorithm.

Individual Member Statements

Kirsten Hendriks (z5018670) : Front-End Developer

As a front-end developer I spent most of my time developing the GUI together with the other front-end developer, Brendan Roy. We used Tornado and Python to run the GUI as a web application. While Brendan did a lot of the server setup and created the initial files for Tornado I did more work using Bootstrap, Html and CSS to create an interface which was intuitive and worked smoothly. For the early days of the project we met up as a pair and later joined the group to connect the backend to the frontend. During the last week we worked together to remove the final bugs and make the interface as smooth as it could be. During the stages where we needed to wait for the backend I created some extra test files to use when testing.

Personally I did not notice too big of a difference in this project compared to others due to project management, however the lack of difference despite it being such a big group is quite a big achievement in my opinion. At the start I was quite worried that the workload would be left to a subset of the group but that was not the case. Having a distinct role meant that I could worry about my part in the knowledge that others were working on theirs. This meant I could work without the concern that the project as a whole would not be completed. Knowing who was in charge of which section also made it easier to direct questions to specific people. Separating out did mean there were longer waiting periods between getting sections done, and it was easily forgotten that there was still work to be completed. This meant we pushed back more work in our plan than I would have liked to (however we did have other large assessment tasks throughout the weeks we had to work which contributed to work being pushed back).

In my next project I would assign roles in a similar fashion as we did in this one. This would help divide up the work and ease the load on people who usually do larger portions of work. Meeting up as a group to code together was also successful, and perhaps setting this up earlier in the project would help in getting larger amounts of work done earlier. Depending on the size of the project and the group I would not spend as much time as we did on setting up the rules and regulations as formally. We did not refer to them despite a lot of time and work being put into them.

Overall the project went better than I thought it would. As a group I felt that the work was more evenly divided then it would have otherwise been and we followed our plan closer than I had expected.

Brendan Roy (z5017725): Front-End Developer

My main role during this project was to work on designing and developing the graphical interface
the users would use to make queries and receive responses. I did this alongside Kirsten Hendriks. We met up at several stages throughout the development cycle, in order to design the interface, and divide tasks between ourselves. Initially, we brainstormed ideas for development of the front end. After testing some proof of concept designs, Kirsten settled into a stronger web design focus, while I wrote additional python code to handle the interface between the web and the back-end.
I had additional roles in the project's development, mainly focused around teaching, implementing and refining python code with other group members who were not so familiar with the language. This included setup and maintenance of the tornado library we made use of for the front end, as well as guiding the group's style so that we produced more clean and efficient code. Eventually I helped to fix consistency errors in the backend, as well as refine some code into more efficient solutions; sometimes a team member had written code which a standard library function already performed.

In retrospect, I am impressed with the results of the project, and I think they are mainly a result of the more formal approach we took to the project. Initially, the group was more hesitant to begin work, however once members started to divide tasks up, progress was made at an impressive rate. Something worth noting was the use of Python as the language for development of the project. Some team members had small amounts of experience using the language, and it is a relatively forgiving language to learn and write. The final product was not as clean as I had imagined. I think this is almost entirely due to people's inexperience with python. While I am happy with the final result, I believe we may have been able to achieve more consistent design and code if we had used a language more of the group was familiar with, perhaps Java as an example.
I think that the communication and organisation of the group, once we got started, was really above par in comparison to other group projects which I have been part of. I would say that the use of additional tools such as Trello contributed to this, and that having Gregory in a Project manager Role was a vital part to the success of the project.

In the next project I'm part of, I would certainly consider using additional tools such as bug and task trackers. I think that having one group member in a management role was good, and while there might not have to be a dedicated member for smaller groups/tasks, I think that I will take a little more of an organised and structured approach to development into my next group project. Lastly, I'd probably like to spend a little more time on the design aspects of the project, I feel that our organisation was good, but that the back end code is inconsistent with good design in some places, which could possibly be partly attributed to the back end developer's unfamiliarity with python. I don't think I helped in that regard as much as I should have.

Gregory Chernishov (z5020633): Project Manager
My role was project manager and throughout the span of project ensured that the plan was followed closely and everybody was on track with their tasks. During the implementation, every week I was in charge of organising the group in regular meetings to update each other on progress. I also had to keep updated on the progress made between members in each role to make sure that communication was open between members that were reliant on each other.
I assisted in constructing the back-end, and closely observed progress made in back-end as to have a better understanding of the effort necessary to complete each section.

The most important part of my role was to consistently ensure the group was moving forward with the project, and that work was spread evenly and that we had the ability to work concurrently on different sections. This meant communicating with every role and keeping updated on progress made by every role group. This was integral to achieving the predetermined tasks every week, and by maintaining project management tools such as Trello I could set achievable tasks for each role.

My experience in this project was not particularly different compared to other major group projects that I have done. The main difference was that having distinct designated roles throughout the whole project made it much easier to divide work, and subsequently get more work done. In other projects I've worked on, roles were blurred and changed all of the time, this meant there was a lot more effort was put into constantly updating people on parts of the project that they otherwise would have no part in.
The designated roles also put much more responsibility on the relevant group members to work on a specific part of the project, with other groups a lack of direct responsibility and defined tasks lead to confusion and delays.

As a result of this experience I think in future projects I will put much more effort into designating defined roles and specific tasks for certain people. Having people in charge of specific sections gives a much stronger sense of urgency for certain sections to be complete on time.
The ability to reference risk responses during implementation of the project also helped. This allowed me to make adjustments to the project plan where necessary, and direct effort where effort was needed.

Brayden Morris (z3424596) - Product Owner

In my role as Product Owner I was continuously checking that the plan the Project Manager laid out would fulfil the required task in the time we had available. Shortly after starting the project it became apparent that Product Owner was not a full role, so I was additionally assigned the role of back-end developer, and worked under Nathan in that area.

Typically the Product Owner is somebody who has conceived the project, and then works to ensure that what the team is developing will fulfil that idea. As the project was defined by the specification statement I had to instead emulate the standard role as best as possible. I studied, and become very familiar with the specification statement. Because of this, I could approach all conversations and plans about the project knowing what needed to be done at the abstract (top) level. As per the role of a product owner, I never tried to set out in stone what should occur, but I did look at the tasks and check that they were on the right track, keeping a broader goal in mind.

As it is the Product Owner's job to closely emulate the employer's wishes, any confusion or conflicts in the project requirements were sent through the Product Owner. I then approached Ron or Liam with the discrepancy and communicated that back to the team. An example of this was when their test case had inconsistencies with the spec, such as the way it determined flight time and handled frequent flier points as top preference. We resolved the difference, and checked that our program was still within their vision.

As back end developer I worked closely with Greg to form the housing for our search algorithm. I set up all of the input stripping for the Graph & Queries, The date and time conversions from a string and then to a number of minutes, as well as the valid flight algorithm. We then debugged the code, which was a fairly extensive task due to the group's lack of familiarity with python syntax.

This project was the first time I have witnessed the benefit of using a conscious project management process first hand. Before we subdivided roles the group, and task, was so large nobody wanted to go near it. Little to no progress was made for the first few weeks because there was no responsibility, and thereby no accountability. Once we broke into GUI (Brendan & Kirsten), Back End (Nathan, Brayden & Greg) and Dafny (Vi & Ben), and then further broke those roles down into small tasks, real progress was made very quickly and the project felt much more manageable.

This drastic and immediate turnaround really demonstrated the effectiveness of structured Project Management. I don't think I will use it on smaller, or individual tasks, but on these sorts of larger projects splitting everything into user stories and allowing developers to complete these stories one at a time is highly effective. One thing that I would change is how we brought everything together at the end. Some sort of an ongoing framework to check that your part is doing what is required. I would love to try merging Programming-By-Contract in with the Project Management practiced in this course. This project management breaks the task down, and programming by contract makes the building up far easier than what we ended up having to do.

Benjamin Timbrell (z5019614): Tester/Quality Assurance Manager

My role for the project mainly focussed on Dafny verification which I did along with Vi Nguyen. This involved translating all of the core backend functions from Python into Dafny and then adding the appropriate preconditions, postconditions, invariants and assertions to allow Dafny to verify that our program was correct (however this was much easier said than done). This also meant that I was responsible for notifying the group of any bugs that were discovered during the verification process. Throughout the project, I also set up most of the weekly worksheets for the group.

My experience with this project was generally positive. Once we eventually got into the implementation, I found that having our own well defined roles made it much easier to work effectively on the tasks of the project. In comparison to other projects where a project management process was not directly applied, this project made significant progress towards the final product much more quickly and consistently. Group members seemed more motivated to contribute to the group when others were making visible progress as well. The fact that each person held responsibility for a certain aspect of the project also positively impacted group participation. Another thing that worked well was allocating designated time for all group members to work on the project in the same room, even if each person was working independently. This ensured that everyone was doing work consistently and it also meant that group discussions could happen immediately and much more effectively than with online forms of communication.

One thing that I noticed that wasn't particularly different from other projects without a conscious management process was actually beginning tasks early on. Some possible reasons for this were that there was a lack of understanding of the project's required tasks, the work breakdown structure was not specific enough and every student had the same assignments throughout the semester and so there were no opportunities for group members to cover more work when others were busy.

Based on my experience of working on this project, in my next project I intend to make sure that each team member has a clear role in the project's development from the very beginning. I will also make sure that the team has meetings more regularly than what occurred in this project, especially during the first couple of weeks. I also plan to have plenty designated time for the group to work on the project together, even if not much collaboration is necessary at the current point in the project. Finally, more effort will also be placed on creating a detailed work breakdown structure that serves as a clear and specific reference document for the tasks to be completed during every stage of the project.

Vi Nguyen (z5015972): Tester/Quality Assurance

This is the first time that I have been in such a large scale project, covering the design, to the justification and production of code. The role that I was originally tasked with was that of

tester, however as other aspect of the project became more of concerning, that role quickly changed to verifier. As a verifier, along with a group member Ben Timbrell we used the tool ‘Dafny’ in order to verify (make sure the code is of sound logic) our algorithms. The role was time consuming, as trying to get Dafny to work was not as simple as dumping the code onto it. This, coupled with my lack of experience in python (the language we used in order to create the project) really chewed up time, as it was one part deciphering the code in python, then trying to translate that piece of code into Dafny to try and make it work verified.

As one of the verifier, we just focused on the verification of the algorithms, such as “searchFlight” and “getFlights”. This meant that Dafny started halfway through the code itself, so we had to make a lot of helper functions/predicates in order for Dafny to make sense of things that had not been passed in.

The closest thing that had a project comparable to SENG2011 was COMP2911 Connect4 game. The organization in this SENG project kept us on track, as it required us to get something out every week. This was also done in the 2911 project, both with great effect in terms of time management. It meant that fewer things were due closer to the due date than it would have been. Thus the scheduling of the weekly meetings kept us on track. Having such a large group to the assignment meant that splitting roles up once we drew up the plan progressed smoothly, as there were plenty of people for each role.

Another comparison can be made to the 1927 course assignment (4 people group not as large as SENG), where there was no project management. The assignment was done by whoever and partitioned into roles fairly late in the semester. This had put a huge strain on the group, as a result barely made it to the deadline with a finished product. This establishes that having an active project management scheme it not only allowed for people to stay on task, but also allow for better timer management.

As a result of this experience, for my future group project and to a certain extent, individual assignments. I will strive to deploy a project management schematic as there was clear evidence that having a conscious project management meant work was spaced evenly throughout the running of the project.

Nathan Sher (z5017806): Back-end Developer

As the back end developer, I was the person who had to make sure that everything in the back end worked properly. This means that I had to design and implement at least the overarching algorithm that was used in the backend. This quickly became a role that meant that I had to make sure that everyone working on the back-end knew how the algorithm worked and was capable to implementing the sections that they needed to.

What I did during most of the time was to make sure that the back-end was being developed properly. After writing the overarching back-end algorithm, I ran the development of the back-end, collaborating with the other group members who were working on the backend, so that as the project went on, the finished project would work as needed. This was needed in the overall project as this was the development itself that made the project happen. As the project went on, I had to make sure that all of the classes and functions were being developed properly, and that everything compiled and ran as it developed.

This role meant that I was working closely with most of the members of the group. I had to align my code in the back-end to the front-end, which meant working with the front end developers, I also had to work with the testers, so that they were able to properly design the tests around how the back-end works, as well the rest of the team in project management so that they can understand how the back-end works and when it should be finished.

The experience that I had with the project was much like other projects that I have done. While the learning about project management was a little better that before, the way that we went about project management was quite similar to other projects. We did however have quite well defined roles, something that I haven't had in many other projects, This was very good as it meant that we were able to effectively divide the tasks and get the work done efficiently and effectively. Without these roles it would have made quite a lot more difficult as we wouldn't be able to properly divide the tasks required to complete the project.

Because of this experience, I know that I will be able to understand they way that project management works, and will attempt to take that through to other projects. Being able to divide roles and tasks effectively between team members as well as properly estimate the time and resources needed to complete each task, means that I will be a more effective team member. I also know that it will allow any project to be better implemented in less time, and as a result make any project a better implemented system that takes less time to complete, meaning there can be a bigger focus on quality assurance.

Jackson Cung (z3493000): Back-end Developer

As a back-end developer, my job is write verification comments in the back-end code and communicate with testing team. Our group decided to do this project's back-end with Python and GUI with web interfaces. Since I had no knowledge about Python language, what I did in the project is to communicate with the testers/quality assurances and help them understand thoroughly how the algorithm worked whenever they needed. Furthermore, I came to the group on Week 7-8, which was late, so I had to catch up with the group and get to know other members of the group to finish my job.

My experience with the project is positive. Every team members know what they are doing and help each other out if possible. I was a late comer, therefore, the team leader helped me

to catch up the work and tell me to work as a communicator between back-end developers and testers due to the fact that I am not confident when working with Python.

This is such a large scale project that it contains the process of designing the backbone, developing back-end and front-end elements, testing and assuring the quality of the product. In my opinion, the project Connect4 from Comp2911 is the comparable project to Seng2011. Both projects required team members to keep on making progress and writing weekly reports of what we have done. This helped us to keep on track and make sure the project is done. Also in SENG2011 and COMP2911, having a numerous members means we can split roles up and concentrate on completing a significant role. It made the project done smoothly and effectively.

With this experience with SENG2011, I understand that project management is the key to the success of the project. Therefore, in the coming projects, I will make sure that everyone in the team has a clear role in the project. Team meetings and conversations will occur frequently in order to know the progress of each roles.

Worksheet 1: End of Week 8

Week	Task	Task Description	Document reference	Member	Output	Completed
8	1	Define the outcomes of the project	Ass. spec.	All	projectplan.pdf	Complete
8	2	Assess the criteria for the success of the outcomes	Ass. spec.	Project Manager	projectplan.pdf	Complete
8	3	Decide on the tasks required	Ass. spec.	Project Manager	projectplan.pdf	Complete
8	4	Breakdown the tasks required in terms of resources	Ass. spec.	Project Manager	projectplan.pdf	Complete
8	5	Decide on a development platform	Ass. spec.	All	projectplan.pdf	50%
8	6	Schedule tasks	Ass. spec.	Project Manager	projectplan.pdf Trello	Complete
9	7	Design the overall system specification	Ass. spec.	Back End Developer Front End Developer		0%

				Product Owner		
9	8	Detail the working of the backend	Project Plan	Back End Developer		0%
9	9	Design the interface	Project Plan	Front End Developer		0%
9	10	Create more system designs to align system design to the finer details	Project Plan	Back End Developer Front End Developer Product Owner		0%
12	11	Project operation Report	Ass. spec.	All	Project Operation Report.pdf	0%

(Misnomered as worksheet 1, the worksheet below is worksheet 2 (end of week 9))

Worksheet 1: End of Week 9

Week	Task	Task Description	Document reference	Member	Output	Completed
8	1	Define the outcomes of the project	Ass. spec.	All	projectplan.pdf	Complete
8	2	Assess the criteria for the success of the outcomes	Ass. spec.	Project Manager	projectplan.pdf	Complete
8	3	Decide on the tasks required	Ass. spec.	Project Manager	projectplan.pdf	Complete
8	4	Breakdown the tasks required in terms of resources	Ass. spec.	Project Manager	projectplan.pdf	Complete
8	5	Decide on a development platform	Ass. spec.	All	projectplan.pdf	Complete
8	6	Schedule tasks	Ass. spec.	Project Manager	projectplan.pdf Trello	Complete
9	7	Assigned roles	Ass. spec	All	Facebook post	Complete
9	8	Design the overall system specification	Ass. spec.	Back End Developer Front End Developer Product Owner		Pushed to week 10
9	9	Detail the working of the backend	Project Plan	Back End Developer		Pushed to week 10
9	10	Design the interface	Project Plan	Front End Developer		Pushed to week 10
9	11	Create more system designs to align system design to the finer details	Project Plan	Back End Developer Front End Developer Product Owner		Pushed to week 10

Worksheet 3: End of Week 10

Week	Task	Task Description	Document reference	Member	Output	Completed
10	7	Design the overall system specification	Ass. spec.	Back End Developer Front End Developer Product Owner	flights.py flightClasses.py pages.py server.py	100%
10	8	Detail the working of the backend	Project Plan	Back End Developer	flights.py flightClasses.py	100%

10	9	Design the interface	Project Plan	Front End Developer	pages.py server.py	100%
10	10	Create more system designs to align system design to the finer details	Project Plan	Back End Developer Front End Developer Product Owner	-	pushed to wk11
11	11	Develop the backend path finding algorithm	Project Plan	Back End Developer		0%
11	12	Develop the framework to house the algorithm	Project Plan	Front End Developer		0%
11	13	Implement the GUI	Project Plan	Front End Developer		0%
11	14	Develop the interface between the backend and the frontend	Project Plan	Back End Developer Front End Developer		0%
12	15	Project operation Report	Ass. spec.	All	Project Operation Report.pdf	0%

Worksheet 4: End of Week 11

Week	Task	Task Description	Document reference	Member	Output	Completed
11	11	Develop the backend path finding algorithm	Project Plan	Back End Developer	algorithm.py	90%
11	12	Develop the framework to house the algorithm	Project Plan	Front End Developer	graph.py	90%
11	13	Implement the GUI	Project Plan	Front End Developer	pages.py, landing.html,	75%

					queryResponse.html	
11	14	Develop the interface between the backend and the frontend	Project Plan	Back End Developer Front End Developer	pages.py	75%
12	15	Design the tests required for the system	Project Plan	Tester		0%
12	16	Run the tests required	Project Plan	Tester		0%
12	17	Use the issues created to maintain and refine the program	Project Plan	Tester Quality Assurance Manager		0%
12	18	Assess the changes against the success criteria	Project Plan Ass. spec.	Tester Quality Assurance Manager		0%
12	19	Project operation Report	Ass. spec.	All	Project Operation Report.pdf	0%

Worksheet 5: End of Week 12

Week	Task	Task Description	Document reference	Member	Output	Completed
11	11	Develop the backend path finding	Project Plan	Back End Developer	algorithm.py	100%

		algorithm				
11	12	Develop the framework to house the algorithm	Project Plan	Front End Developer	graph.py	100%
11	13	Implement the GUI	Project Plan	Front End Developer	pages.py, landing.html, queryResponse.html	100%
11	14	Develop the interface between the backend and the frontend	Project Plan	Back End Developer Front End Developer	pages.py	100%
12	15	Design the tests required for the system	Project Plan	Tester		75%
12	16	Run the tests required	Project Plan	Tester		25%
12	17	Use the issues created to maintain and refine the program	Project Plan	Tester Quality Assurance Manager		25%
12	18	Assess the changes against the success criteria	Project Plan Ass. spec.	Tester Quality Assurance Manager		25%
12	19	Project operation Report	Ass. spec.	All	Project Operation Report.pdf	25%
12	20	Write Dafny	Project	Tester	flightbackend.	50%

		for backend	Plan	Quality Assurance	dfy	