

Practice Analysis Exercise 'UK Space'



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Participant Instructions

Introduction

This exercise is designed to enable you to familiarise and practice an analysis type exercise. In general, analysis exercises have an emphasis on gathering, sifting and interpreting data, as well as drawing accurate conclusions, albeit they often assess other areas too such as written communication.

This exercise is a **short-form** analysis exercise which can serve as a useful introduction to this type of assessment. However, please note that the FSAC Analysis Exercise is longer (1 hour and 30 mins), with a greater amount of data to be covered, including video content.

No specialist knowledge is required to do well in this exercise; **all the information you need to provide a full answer are in these documents**. You should not make any assumptions about the politics or policies of the Government of the day or of the Minister in the scenario - other than those described.

Note: this exercise is entirely fictitious, is not intended to represent the real views of any government or other entity. It is designed solely to provide material with which to familiarise and practice analysis-type exercises.

Timing

You have **70 minutes** to complete all tasks in this exercise. To ensure this practise is realistically challenging, you should ensure that you strictly adhere to these timings. **You should aim to start writing after 25 minutes, or you are unlikely to have time to complete both tasks. You should spend most of this time on task 1, allowing no more than 10 minutes in total for task 2.**

Your tasks

In this scenario, you have been tasked by the Minister to recommend an initiative for the government to invest in to further stimulate growth in the UK space industry. You need to read the **Participant Briefing Pack** carefully as it sets out the tasks that the Minister would like you to complete. **You will need to refer back to it as you work through the tasks.**

You should respond to each of the two tasks below in **written form**. Your written response to the Minister should address:

- 1. Which one of three initiatives should the government invest in;**
- 2. What key points the Minister should make to sell the recommended initiative to the public.**

It is **important** that you address **each** of these tasks and that you clearly state your decision or proposed solution and the reasons why.



Areas assessed

This exercise is designed to assess whether you can:

- Absorb and interpret a body of material.
- Provide in **task 1** a **comparative analysis** of the three initiatives on the basis of **the information** you are given, and a reasoned recommendation on which is the better option to choose, against the **key criteria**. Aim to show: benefits and risks; financial data; and recommendation.
- Suggest a series of **clear selling points** for **task 2** – emphasising key areas that are likely to engage the public.



Participant Briefing Pack

Background

The year is **2025**. The UK government is planning to put substantial investment into the UK Space Industry under the banner of the 'Space Industry Trailblazer Investment' (SITI) Initiative. Specifically, SITI will invest in an area of the space industry in which the UK can become a world-leading commercial force over the next 20 years. Through consultation with stakeholders in the industry, three investment options have been identified. The Minister, whose responsibility it is to agree the decision, has requested that you look at the options and make a recommendation, as well as highlight the key lines to take in terms of selling the initiative to the public.

The UK Space Industry has shown robust year on year annual growth of 9% (far above the national average of 1.7%), contributes over £12 billion to the UK economy per year, directly employs close to 50,000 people, and indirectly enables a further 100,000 jobs. The UK Space Industry itself has publicly stated that it wants to grow its global market share from 6.5% to 10% by 2035 (when the global market will be worth £400 billion per year). The government, however, is interested in boosting job creation and market share in the sector further.

In 2020, the government set out its National Space Policy envisaging added support to the UK Space Industry and the building of the first UK spaceport. Building will be complete in the next 12 months on the UK's first spaceport on the island of Anglesey in Wales. Although no UK companies yet possess their own rocket launch vehicles to use at the new spaceport, international companies who do have are being attracted to use the spaceport as an alternative launch site for small commercial satellites.

UK Space Industry track record

The UK has a long history in spaceflight, becoming only the third nation to place a space-faring satellite in orbit, *Ariel 1*, in 1962; and one of only a few nations to produce its own successful orbital launch vehicle – the *Black Arrow* rocket in 1971. From small beginnings, the UK Space industry has continued to grow.

In the past few years, companies in the UK have focused on unmanned satellites and space probes. Such companies have produced sophisticated spacecraft sub-systems such as sensors on the 2014 Gaia mission to map the galaxy and the *Huygens* mission to Saturn's moon Titan; space propulsion engines for satellites and deep space probes such as the *Mars Global Surveyor*, *Messenger* (Mercury) and *Juno* (Jupiter) missions; and complete satellites such as *TechDemoSat-1*, which enables space-based experiments to be conducted on up to eight different payloads.

Aims of SITI

The government has stated that the each option should be considered in relation to each of these **key criteria**:

- a. To enhance the global profile of the UK Space Industry to attract further business and investment.



- b. To increase the UK Space Industry's global market share beyond the existing predictions for 2030.
- c. To help make the UK a world leader in innovative space-based products and services.
- d. To inspire the next generation to want to become the UK space engineers and scientists of the future.

Option 1: Britain - 'the Space Tourist Hub'

The concept of commercial trips into space for recreational purposes has already been tried and tested in both Russia and the US. In Russia, individuals can pay a sizable fee to the Russian authorities (approx \$25 million) to be given a place on one of the transports to the International Space Station. In the US, several 'spaceline' (a variation of the word 'airline') companies offer short, 30 minute, sub-orbital spaceflights to several paying customers at a time (approx \$150,000 per person). The large costs involved, together with limited transport capacity mean, however, that these sorts of service still remain exclusively the preserve of the rich. They do demonstrate, however, that there is a market for space tourism.

This option seizes on the potential demonstrated in this area, and aims to utilise the current Anglesey Spaceport – extending its development to accommodate passenger launch vehicles. This would, in the first instance, offer sub-orbital flights similar to those already offered in the US. The government will also offer financial incentives for UK companies to use it. This would be on the proviso that any such service would substantially reduce the costs and increase passenger capacity. This is thought to be a viable evolution of existing technology as 'spaceline' firms come to designing the second generation of such vehicles. Although, such a service would initially still be beyond the financial reach of most people – envisaged to be around £40,000 per person – it would act to drastically increase the scope of the market. As the industry grows, it would be possible to build on this success by using tax revenues from these passenger services to greatly expand the spaceport capacity further (should the government of the day be willing to do so) and offer further incentives to develop larger passenger spaceliners capable of offering space trips at a cost affordable to ordinary members of the public.

Economically, the effect of having spaceline companies operating from the UK would be considerable. It is estimated that it would create an additional 20,000 new jobs and an additional 4% to the UK's global market share by 2030.

In the long term, it is hoped this would further encourage the development of a third generation of passenger spaceliners capable of ferrying people into orbit. With many viable proposals for orbital commercial facilities now being considered, such as orbital hotels and resorts, and other major economies still reticent to invest heavily in this area, it is hoped the head-start this option provides will place the UK at the forefront of the passenger spaceflight industry well into the middle of the 21st century.

Timescale of government investment: over 5 years.

Cost of government investment: £3bn in first year to expand the spaceport facilities and, then a further £2bn per year in tax incentives.

Risks to government investment: As the spaceline sector is a new one, it is difficult to predict actual demand beyond 5 years. Competition currently comes mostly from



companies launching from the US, but expected to become much greater after 2030 if demand is high.

Option 2: Britain – a Centre for Unmanned Spaceflight

The manufacture of small satellites and satellite sub-components is the mainstay of the UK Space Industry, and one in which it has established a firm reputation within the market. The government's National Space Policy already sets out intentions to further grow the UK Space Industry's potential in the building and launching small satellites. This option provides the investment to help accelerate progress towards these aims by building on a strong foundation in satellite manufacture to make the UK a world leader in this area. Further, it will help enable the UK Space Industry to more quickly build capability to construct larger space-based hardware.

Currently the UK Space Industry caters for many types and parts of unmanned spacecraft – but by no means all. This option would provide government investment to develop current space manufacturing further, and establish new capabilities in areas where there are currently gaps in expertise, such as building on-board power systems and reusable rocket launch vehicles. This would help enable UK space manufacturing to exclusively build the full range of unmanned space-based systems from launchers to robot landers; and from complete business communications satellites to entire scientific space probes. In this way, it is hoped the extra investment will enable the UK Space Industry to eventually provide the complete manufacturing solution in unmanned space-based satellites, vehicles and stations.

The impact on the economy is hard to predict as the investment would be distributed across the whole UK Space Industry. It is however estimated that it would create an additional 20,000 new jobs and an additional 3% to the UK's global market share by 2035.

Timescale of government investment: 10 years.

Cost of government investment: £1.5bn per year.

Risk to government investment: Competition in this area is already fierce as new nations enter the market, although the UK has traditionally competed well up until now. As this is investment across the whole of the UK Space Sector who already have an established market position, the financial risks are fairly low.

Option 3: The Clear Skies Project

This option, emphasises the possibilities for the service industry in space. Britain is actively involved in United Nations Committee for the Peaceful Uses of Outer Space (UN COPUOS). A major concern for UN COPUOS is the growing threat posed by orbital debris around the earth to unmanned satellites, manned spacecraft and space stations. This debris is formed of refuse, wreckage, or lost components and equipment from previous space missions, dating back to the beginning of spaceflight. They can vary in size from tiny fragments to entire defunct satellites, but are all dangerous due to fact that they frequently travel at extremely high velocities. This means that if they hit active satellites/craft/stations – they have the potential to cause catastrophic damage to expensive installations resulting in negative economic impact for the owner, or even loss of human life if crew are aboard. Over the last 20 years the NASA space shuttle was hit several times by debris, and the



International Space Station has had to undertake more and more evasive manoeuvres to avoid an impact with space junk. The worst case scenario – where one collision causes a runaway chain reaction of more and more collisions known as the ‘Kessler syndrome’ (as depicted in the 2013 film *Gravity*) is getting more likely as space junk accumulates, and could potentially render earth orbit unusable for decades if it were to occur. The UN is very worried about the risk, and UN COPUOS has announced an international competition called ‘The Clear Skies Project’ to find a solution. The winning company(s) would be awarded a very lucrative 15 year contract to ‘sweep the skies clean’ on behalf of the United Nations.

Historically, the answer has been to try and restrict the amount of debris left in orbit, but this has only slowed down the problem slightly. This option suggests that the UK become the first nation to provide a service to mitigate the threat caused by space debris. The idea would be to use government investment in a proposed new orbital vehicle named a ‘*Star Clipper*’. Its pioneering *solar sail* technology allows a Star Clipper to propel itself using high energy particles emitted by the sun to move, change direction, speed up and slow down, without using bulky chemical engines. It can also power its internal systems from the sail rendering refuelling unnecessary. It therefore has a very long operational life. Although slow to get into position, this craft would be able to intercept dangerous objects in earth orbit, link onto them, and either shunt them upward into a ‘graveyard orbit’ (22,400 miles above the earth and far away from active craft), downward into the earth’s atmosphere to burn up, or, for larger pieces, into the designated international ‘spacecraft cemetery’ located in the Southern Pacific Ocean. The Star Clipper would be tasked directly with urgent tasks, or left to automatically search and destroy the nearest and most dangerous space junk. Conversely, it could be used to rescue craft in the wrong position or in danger of falling from orbit.

This revolutionary vehicle has been devised by a UK business conglomerate of GMF-X Ltd (who invented the solar sail concept and hold the patent), Prospero Plc and Vektor Technologies Plc. Although, the solar sail technology shows success in early trials, it has not yet been tested on a large scale and will require further orbital testing over the next 2 years. Should it be successful, however, the conglomerate would be in an excellent position to win the Clear Skies competition giving them access to substantial international funds (accounting for an additional 2% of global market in 2035). The technology has the potential to revolutionise long range space travel, offering a cheaper, lighter and less risky way to travel long distances without large fuel payloads and nuclear power cells. Such spin-offs offer a scope for the UK Space Industry to corner a further 5% of the global market by 2035.

Timescale of government investment: 6 years.

Cost of government investment: £4bn in first 2 years, then (should the technology be proved to work) 1bn for each subsequent year.

Risk to government investment: Global competition in this areas is low as this is an entirely new technology exclusive to the UK. Initially high financial risk as the technology is not fully tested. Should it be successful however, this risk will diminish to a moderate level as revenues from the technology are expected to be high.



Department for Culture, Media and Sport

“Thank you for allowing DCMS to comment on the proposed investment in the UK Space Industry.

Although other stakeholders will be in a better position to comment on the technical and political aspects of the investment options, we feel it may be useful to underscore the media and public opinion implications of each of the options.

Whilst there will always be the view amongst some that government investment in the space industry would be better spent in hospitals and education, each of the options is likely to capture the public imagination in a different way. **Option 1** is likely to have the most public appeal. Space tourism will be very much in the media spotlight, and more visible in the sense that it will be reinforced in the public consciousness through advertising. It also seems to play much more to public expectations about what space travel should be about. The prospect that, in time, such an opportunity to travel into space may also be attainable to the average person, will also be a tantalising and serve to keep it fresh in people’s minds.

Conversely, to the public, **Option 2** will seem less immediate, less visible and be perceived (rightly or wrongly) as more of the same as it is an expansion of the existing UK industrial capability.

Option 3, is more difficult to predict. However, given the green credentials of the initiative – that it will be seen as ‘clean’ and fulfilling an environmental role – it is likely to be seen very positively by the public as a great beacon of British innovation, and amongst the patriotic, as an example of the UK once again leading the world in new technology. This is likely to reduce public resistance to such large government spending at the beginning of the project, but expect this effect to wear-off over time as it loses its novelty value.

David McCone - Defence Consultant

“**Option 2** is favoured by military as defence satellites, their sub-systems and software can be made more secure if the manufacturing is done exclusively within the UK.

Option 3 will be perceived as very useful to the military, for the same reasons that others will find it useful – it reduces the risk to their high value military satellites from space junk, and could potentially come to their aid if such satellites are damaged or suffer a systems failure. The technology could also be adapted to provide longer-lasting military satellites.”

Foreign & Commonwealth Office

“All options would offer significant value in terms of enhancing the UK’s prestige abroad, and underscore its reputation for being a world leader in high technology products and services.

We believe that **option 1** would be of particular value in increasing the profile of the UK as an international travel hub – as long as there are no accidents or incidents - a solid safety record is going to be essential in establishing an enduring international reputation for UK



space tourism. The UK's good reputation as a relatively stable and secure country will also help reassure businesses and the public that the launch site is safe from extremist attack.

Option 3 is potentially more complex. UK companies acting to address safety issues that affect the world, will have a very positive impact on our diplomatic and industrial profile abroad. However, it is possible that the technology might be seen as posing a military threat by nations less friendly to the UK. The concern would be that if the Star Clipper can 'retire' space junk, it can also do the same to functioning satellites and other craft. This is at least, technically feasible regardless of the fact it would have UN monitoring of its use. This perceived threat may cause unintended difficulties at a diplomatic level that may put the future of the initiative in jeopardy."

Department for International Trade

"**Option 2** in our view, provides the most robust and diversified economic solution. Space is one of the harshest environments known to man, and difficult and expensive to access. Spreading investment throughout the industry also spreads the risk, and broadens the scope of the number of businesses it can benefit.

Option 3 has some clear risks, but also potentially a huge pay-off if successful, and really showcases the potential of UK industry. "

Department of Transport

"**Option 1** is likely to lead on best return on spaceport in the long term. Enables, a whole new transport sector to be opened up in the UK ahead of other countries.

The geographic position of the British Isles in relation to other countries makes it a strategically good position – accessible from all corners of the globe – for a space tourist hub. The volume of passengers moving through the UK to Anglesey will need to be carefully monitored over time; but if the volumes of passengers grow gradually from a low base over 10 years, as we expect, this would mean there would be time for gradual increases in regional transport capacity to the spaceport. For example, increases in railway, airport and seaport capacity to provide better access to Anglesey."

Correspondence from Anglesey Bird Protection & Preservation Society

"We are writing to register our great concern and outrage at recent stories in the press that the government is considering investing more money in expanding the Anglesey Spaceport. It is a matter of public record that we always objected to the original building of the Spaceport on the island. In the end, we were somewhat reassured by undertakings at the time of the original planning for the spaceport, to minimise the impact on local bird habits - and that the government had 'no further plans' to expand it. Now we hear reports in the newspapers that the government are thinking about extending the launch facilities to allow UK companies to launch their own rockets and even that passenger trips will soon begin from the spaceport. Not only would this extend the footprint of the original spaceport to



cover more greenfield sites in Anglesey, but the added launch activity (which is extremely disruptive and polluting to the environment) poses a very real threat to local birds such as Cormorants, Arctic Turns and the rare Chough – of which there are only a few breeding pairs left.

We insist that the government stick with not extending the spaceport and put this beautiful habitat first. Otherwise our activists will have to take action against the spaceport to highlight the plight of Anglesey's birds."

HM Treasury

"Given the very large investment expenditure in just one sector of the economy, the government can expect a great deal of scrutiny both by Parliament, Press and Public. Whichever option is going to be chosen, that case will need to be a strong one; that is easily be understood, with very clear accountabilities and robust monitoring of progress. Any risks in the project will need to be thought through carefully in order to ensure that considerable money is not lost.

Bernadette Casey, UK Space Industry Analyst

With the prospect of a large injection of investment cash into the UK Space Industry and a decision in the offing on the where it will be invested, the industry and the financial sector are abuzz with rumours. Many feel that the government will go with 'the Space Tourist Hub idea' for its publicity value to the 'UK Brand'. Although some UK companies in the sector are concerned it will benefit US companies who already have working space passenger vessels, most of all. Their sense is that UK money would be better invested within the UK's current areas of strength – the production of unmanned spacecraft. Shareholders in most UK space manufacturing companies agree. Although those with shares in the much lauded 'Star Clipper' conglomerate of GMF-X Ltd, Prospero Plc and Vektor Technologies Plc will no-doubt have everything crossed that they get the investment they need to win the UN's multi-billion £ 'Clear Skies' competition.

Article from last week's 'The Financial Insider'

"GMF-X in Tax Probe

Inside sources this week point to the innovative space manufacturing company GMF-X Ltd – key partner in the Star Clipper enterprise – as currently being targeted by tax authorities due to irregularities in their annual accounts. These are thought to be on a large-scale, and if these rumours are found to be true, it may result in substantial financial penalties for the company. It is already known that they have accumulated a large amount of debt in the development of their ground-breaking solar sail technology at it is feared that this might tip the company into insolvency just when they stood to reap the rewards of their new technology/.

Quite how the government and their business partners Prospero Plc and Vektor Technologies Plc, will react to this news is currently unknown."

