Chapter 1. Introduction

1.1 Background

The 20th century has seen the popularity of high-speed rail for both passenger and freight trains to have significantly increased. The first major breakthrough in high-speed trains was back in 1964 (Japan), this provided rapid-mass movement and ever since it has had a major influence on the world's understanding of infrastructure (Lee, 2007). However, at that time the growth of high-speed trains was very slow, as they were very expensive to launch, with limited research and understanding available (Gourvish, 2009). In addition, as trains operated at lower speeds than compared to aeroplanes, this meant trains attracted little attention from fluid dynamists, therefore the complete understandings of train aerodynamics was neglected (Rahgunathan, Kim & Setaguchi, 2002). At the time the popularity of high-speed trains amongst society was also very low due to other alternatives available (Gourvish, 2009).

The means of transportation favoured by society was cars as they were more convenient, with lower fuel prices, and they provided an adequate means of rapid economic growth (Lee, 2007). This phenomena was repeated all over the world thus car popularity increased rapidly during the 19th century. However, since 1980s the transportation system, which primarily focused on cars, has been gradually changing (Lee, 2007). Many factors contributed towards this change, which included; higher fuel prices, congestion charges (road congestion), high road taxes, parking charges and air pollution (Gourvish, 2009). These factors aimed at limiting car usage and reducing its impacts on the environment while prolonging the life of natural recourses. A change in policy also occurred such that a demand policy was implemented rather than a supply policy, and as a result this all contributed towards a sudden rise in railway transportation (Lee, 2007). Furthermore, many countries began to seek for methods which were environmentally-friendly, energy-saving and were capable of mass transportation due to their economic and social benefits (Lee, 2007). High-speed trains can meet these requirements as they can provide; high speed links between city to city transportation, mass transportation, safe and comfortable transport with minimal air-noise pollution, high reliability with low costs (Rahgunathan, Kim & Setaguchi, 2002). Many countries have since tried to adapt to a high-speed railway system, from as early as 1940 (figure 1).

Chapter 1 Introduction

1.1 Background

The 20th century has seen the popularity of high-speed rail for both passenger and freight trains to have significantly increased. The popularity of high-speed rail has increased significantly throughout the 20th century. Contemporary high-speed passenger trains were pioneered in Japan in 1964 (the Shinkansen), and these engineering developments have led to a greater understanding of the requirements of rolling stock and infrastructure on high-speed railway lines (Lee, 2007). As is often the case with technological advances (take the motor car for instance), the growth in demand for high-speed rail travel was initially slow. Motor cars and air travel were generally preferred to rail travel (Gourvish, 2009), and the technology was costly to implement on a large scale; most global infrastructure was not designed to handle high-speed trains and the rolling stock was expensive and not fully understood from an engineering design perspective. The first major breakthrough in high-speed trains was back in 1964 (Japan), this provided rapid-mass movement and ever since it has had a major influence on the world's understanding of infrastructure (Lee, 2007). However, at that time the growth of high-speed trains was very slow, as they were very expensive to launch, with limited research and understanding available (Gourvish, 2009). In addition, as tTrains had typically operated at much lower speeds than compared to aeroplanes, therefore consideration of the aerodynamic effects of high-speed trains had been reasonably neglected by engineers up until this point. this meant trains attracted little attention from fluid dynamists, therefore the complete understandings of train aerodynamics was neglected (Rahgunathan, 2002; Kim & and Setaguchi, 2002). At the time the popularity of high speed trains amongst society was also very low due to other alternatives available (Gourvish, 2009).

Rail travel catalysed and facilitated the great economic growth seen in industrial Britain in the late 19th century. During the early to mid 20th century the popularity of the train diminished due to the increasing financial accessibility, convenience and performance of the motor car (Lee, 2007). By the 1960s the motor car had replaced the train as the tool for convenient travel and economic growth - industrialisation lowered its production costs and global trade allowed for cheaper fuel, hence the motor car became an affordable commodity (Lee, 2007; Gourvish, 2009). The means of transportation favoured by society was cars as they were more convenient, with lower fuel prices, and they provided an adequate means of rapid economic growth (Lee, 2007). This phenomena phenomenon was repeated witnessed all over the worldon a global scale thus as the popularity of the motor car car popularity increased rapidly during throughout the 19th century. However, since By the 1980s, however, the transportation system, which had been primarily focused on cars, has been gradually changingbegan to change (Lee, 2007). Many A variety of factors contributed towards this change, which included; : higher fuel prices, road congestion and parking charges (road congestion), higher road taxes for more polluting cars and increased environmental awareness shaping public opinion, parking charges and air pollution (Gourvish, 2009). Given the increases in the price of oil and climate change awareness, changes in policy were implemented aimed at reducing demand for road travel (Lee, 2007). Rail travel therefore became a more economical and environmental alternative, and new high-speed trains were introduced to cope with this increased demand (such as the Class 43 High-Speed Train) (Nock, 1983). These factors aimed at limiting car usage and reducing its impacts on the environment while prolonging the life of natural recourses. A change in policy also occurred such that a demand policy was implemented rather than a supply

Comment [M1]: no need for Aerodynamic or High Speed Train to be capital letters in your header, nor is there any need for a comma between 'train, passed'. You should, however, hyphenate high-speed.

Comment [M2]: Full stop is not needed.

Comment [M3]: Personally I would try to keep all writing in black font colour, and also the numbers for each section should match the font/colour of the headings, subheadings etc. You can change this easily on Microsoft Word by editing the headings on the "Home" tab.

Comment [M4]: Freight trains have never been regarded as high-speed (the current European definition is trains running at 250 kph or greater - see the Technical Specification for Interoperability (European Commission, 2009).

Comment [M5]: I think you need to say that as passenger train speeds increased, freight train speeds needed to also increase in order to maintain the operational requirements (timetabling, minimising delays etc).

Comment [M6]: I suggest looking into this a little more - you could introduce the design of the 1964 Shinkansen from an aerodynamic perspective - the streamlined nose and smoother sides (a figure here would be ideal), though at this point in history the focus was on reducing drag and they were not necessarily concerned with reducing the magnitude of the head ... [1]

Comment [M7]: Always give the date for each author, even if two publications have the same date. Also I recomme ... [2]

Comment [M8]: This sentence does not really fit in here - I've made this point earlier so best to delete this sentence.

Comment [M9]: Phenomena is plural

Comment [M10]: I think you mean 20th

Comment [M11]: What you are saying is certainly true in the UK - however I doubt this is true in the USA. As the senten ... [3]

Comment [M12]: I always try to avoid using the word many as it is quantitatively qualitative - i.e., it implies that there ... [4]

Comment [M13]: Factors is ok, but you should distinguish later between external factors (price of oil, climate change ... [5]

Comment [M14]: Just use a colon here to introduce your list - let the grammar do the talking for you!

Comment [M15]: The factors themselves did not aim (factors don't "do" things themselves)

Comment [M16]: You could possibly be cynical here and add that they also aimed at increasing government revenue (... [6]

Page 1: [1] Comment [M6] **Martin** **10/5/2016 8:10:00 AM**

I suggest looking into this a little more - you could introduce the design of the 1964 Shinkansen from an aerodynamic perspective - the streamlined nose and smoother sides (a figure here would be ideal), though at this point in history the focus was on reducing drag and they were not necessarily concerned with reducing the magnitude of the head pressure pulse which your study is focusing on. You could perhaps incorporate the historical background in your second paragraph into the first paragraph and then your second paragraph could then focus on the aerodynamic development of high-speed trains, and introduce the aerodynamic phenomena in brief (drag reduction, pressure transients, slipstreams, crosswind overturning etc).

Page 1: [2] Comment [M7] **Martin** **10/5/2016 8:10:00 AM**

Always give the date for each author, even if two publications have the same date. Also I recommend using 'and' rather than '&' as this is consistent with most academic publications though it is up to you.

Page 1: [3] Comment [M11] **Martin** **10/5/2016 8:10:00 AM**

What you are saying is certainly true in the UK - however I doubt this is true in the USA. As the sentence before mentions "global" you should specify that you are focussing on the UK case.

Page 1: [4] Comment [M12] **Martin** **10/5/2016 8:10:00 AM**

I always try to avoid using the word many as it is quantitatively qualitative - i.e., it implies that there are a lot of factors but generally in engineering and scientific work we try to quantify everything with a number. You could change 'A variety' to Several key factors which might sound even better - will leave it up to you.

Page 1: [5] Comment [M13] **Martin** **10/5/2016 8:10:00 AM**

Factors is ok, but you should distinguish later between external factors (price of oil, climate change etc) and reactionary policy changes (congestion charges, higher road tax etc).

Page 1: [6] Comment [M16] **Martin** **10/5/2016 8:10:00 AM**

You could possibly be cynical here and add that they also aimed at increasing government revenue (taxes) in order to construct new highways and reduce congestion etc.