

# National Infrastructure Commission Call for Evidence, January 2016

## London's Transport Infrastructure

### Submission from Thales UK

Thales is a global technology leader for the Aerospace, Transport, Defence and Security markets. With 61,000 employees in 56 countries, Thales reported sales of €13 billion in 2014. With over 20,000 engineers and researchers, Thales has a unique capability to design and deploy equipment, systems and services to meet the most complex security requirements. Its unique international footprint allows it to work closely with its customers all over the world. Thales UK employs 6,500 staff across 11 key locations.

Thales welcomes the formation of the National Infrastructure Commission and is pleased to contribute through this call for evidence. Long term integrated planning of jobs, homes, infrastructure and transport is essential for the future competitiveness and productivity of the UK.

This paper aims to address the questions raised in the National Infrastructure Commission's Call for Evidence dated 13th November 2015 in section 3 relating to London's Transport Infrastructure and specifically focuses on questions 1, 2 and 5.

With the forecast increase in population and travel demand, Thales believes that one of the key challenges for London's Transport infrastructure will be the demand on capacity. To address this challenge, investment in innovative modernisation programmes of existing infrastructure, in addition to major new infrastructure schemes, is necessary. Creating capacity through modernisation programmes can provide a more immediate impact on the economy by enabling growth in housing and jobs, as well as generating improvements for passengers and productivity through faster and more reliable journey times.

It should also be recognised that although modernisation programmes often provide very favourable benefit to cost ratios, their impact is not always recognised in the wider political and public domain. Addressing this by providing a narrative of the importance of continual upgrade and improvement, the benefits it brings both to the economy and the passenger journey (rather than the disruption), as well as the value of the supply chain it supports would be a positive step.

**Q1. What are the major economic and social challenges facing London and its commuter hinterland over the next two to three decades?**

- 1.1 London's population is forecast to rise from 8.6 million to 10 million by 2030 and 11.3 Million by 2050 with demand for public transport forecast to rise by 50%, with demand for the underground expected to rise by 60% and mainline rail by 80%<sup>1</sup>. Severe crowding on the Tube is forecast to double by 2041. It will be increasingly difficult to support passenger growth, operational reliability, efficiency and comfort expectations with the limited and ageing infrastructure capacity that we have available today.
- 1.2 Approximately 80% of daily passenger journeys in London occur on the road network, either by car, taxi, bicycle or bus. London's buses currently carry over 1 billion more passengers than the London Underground and account for nearly half of all the bus journeys made in England. TfL forecast an additional 1.25 million additional daily trips on the Capital's roads by 2018 with the forecast cost of associated delay being two and a half times its current level by 2031<sup>2</sup>.
- 1.3 National Rail in the South East is also suffering from increasing capacity issues. Demand for National rail services into Waterloo is set to increase by 40% by 2043. Today, almost 30% of passengers arriving at Waterloo in the morning peak have to stand.
- 1.4 With regards to London Underground, the London Infrastructure Plan 2050 highlights that even with the current plans for modernising the London Underground Network and opening Crossrail 1, the network will be full by 2030 and further capacity will be required. The Plan indicates the potential for mainline rail to carry twice the number of passengers as at present.
- 1.5 In addition, the gap is widening between North and South London with respect to tube capacity and quality of service. London has 242 underground stations north of the river and 28 stations south of the river. Residents North of the river are more likely to enjoy the modernised tube services at intervals of 1-2 minutes whereas South of the river suburban services will be a lot less frequent and tend to be less reliable.
- 1.6 Reliability of journey time is the most important factor for passengers when choosing trains over alternative modes of travel<sup>3</sup>. In addition, the frequency of trains is a key consideration in the decision to travel by rail. If unaddressed, increasing issues with capacity may make commuting to and travelling in London less attractive to the customer, potentially having a negative economic impact and limiting London's potential for growth.
- 1.7 As such delivering additional capacity on radial routes to new centres such as Stratford, Canary Wharf and Old Oak common will be key to ensuring the success of the newer growth areas.

---

<sup>1</sup> London Infrastructure Plan 2050, Mayor of London

<sup>2</sup> Transport for London, Finance & Policy Committee, Surface Intelligent Transport System, 20 July 2015

<sup>3</sup> Office of Rail Regulation, Rail Passenger Experience Report, April 2014

- 1.8 The relationship between housing and transportation will become increasingly important in safeguarding London's growth in the next 20 years. Integrated planning is essential in order to ensure that the value is released from land around stations to contribute to the cost of transport infrastructure. It is important that transport focuses on opening up areas for growth and that growth in the economy and housing are taken into account when deciding on transport priorities.
- 1.9 The changing nature of passenger habits and expectations is also a significant consideration. Initially this may mean customers will increasingly wish to be connected whilst travelling, expecting high capacity data services to be available on the underground as well as the Overground. Passengers increasingly use data services to plan travel journeys and rely on these services in times of disruption. Customer Information can facilitate maximising capacity on the network, both when the network is running smoothly and especially in times of disruption.
- 1.10 In the longer term the way in which transport is undertaken will be disrupted through sharing economy models, on demand and multi modal transport and autonomous vehicles. These new technologies and business models have the potential to provide many benefits to London's transport system, including reducing road traffic injuries, optimising road capacity and extending access to those with mobility difficulties. They also present challenges from a city management perspective, ranging from a free market approach to ownership and usage to a centrally controlled model.<sup>4</sup>
- 1.11 Along with regulatory and cultural issues, increasing interconnectivity and automation, both on road and rail, has the potential to increase the threat to the security of the transportation systems through cyber-attack. The reputational effect of a maliciously controlled transport accident could be significant. Industry and transport service providers will therefore need to prepare for this increased risk and ensure it is considered as a priority when designing and implementing transportation systems which may be susceptible to this threat.

**Q2 What are the strategic options for future investment in large-scale transport infrastructure improvements in London - on road, rail and underground - including, but not limited to Crossrail 2?**

- **How should they be prioritised, taking account of their response to London's strategic transport challenges, including their impact on capacity, reliability, journey times and connectivity to jobs?**
- **What might their potential impact be on employment, productivity and housing supply in London and the southeast?**

- 2.1 London now has the Mayor's Transport Strategy and the London Infrastructure Plan 2050, which need to be funded and delivered. With the forecast increase in population and travel demand it is clear that just upgrading existing infrastructure will not be enough to meet the demand forecast beyond the next ten years.

---

<sup>4</sup> London Infrastructure Plan 2050, Mayor of London

2.2 It is therefore essential that a balance be struck between delivering cost effective improvements to existing infrastructure now and starting to invest in the major schemes, such as Crossrail 2 which will be to meet the capacity demands beyond 2030.

2.3 London's transport system makes a key contribution, not only to the productivity of the capital, but also to jobs across the UK with 60% of Transport for London's supply chain being outside London, supporting 60,000 jobs.

2.4 As the work that Thales has done in partnership with London Underground relates to existing infrastructure we have set out below the benefits that we believe could be achieved by extending this approach to other projects.

## **2.5 Delivering Transport Capacity for Growth – progress to date**

### **Capacity**

2.5.1 Thales UK, in partnership with London Underground has upgraded the Jubilee and Northern lines. New signalling on the Jubilee line has allowed 30 trains per hour every hour, carrying 12,500 extra passengers an hour. The Northern line signalling system has also been modernised, delivering up to 20% more capacity or space for an additional 11,000 customers per hour. Similarly, the Victoria line has been upgraded by LUL to 33 trains per hour.

2.5.2 The Four Lines Modernisation (4LM) programme to upgrade the sub-surface network is now in progress and will increase capacity on 40% of the network by a third. TfL's business case analysis confirmed a strong case for investing £2.5Bn in 4LM with the overall programme demonstrating a Benefit-Cost Ratio of 4.7 to 1.<sup>5</sup>

2.5.3 Whilst the Northern and Jubilee line have been upgraded, there is still more to be achieved, to meet increasing passenger demand. The world class capacity programme aims to increase the number of trains per hour on these lines to take full advantage of the benefits that can be realised from the newly installed signalling and control systems and additional trains. This enables people to access the highly productive employment centres in central London and ensures that London Businesses can compete on an international stage to attract the best talent.

2.5.4 TfL's business case analysis for the Jubilee line world class capacity programme gives results, based on reduced average journey time of 7.7:1 for the preferred option to raise the number of trains per hour from 30tph to 36tph, with an investment of £253M<sup>6</sup>. For the Northern Line Upgrade, the BCR is 4.4:1.

2.5.5 The benefit generated by these programmes is summarised in table 1 below

---

<sup>5</sup> Transport for London, Finance & Policy Committee, Modernisation of the District, Metropolitan, Circle and Hammersmith & City Lines and Automatic Train Control Contract, 17 June 2015

<sup>6</sup> Transport for London, Board item 10, Jubilee Line World Class Capacity, 5 November 2014

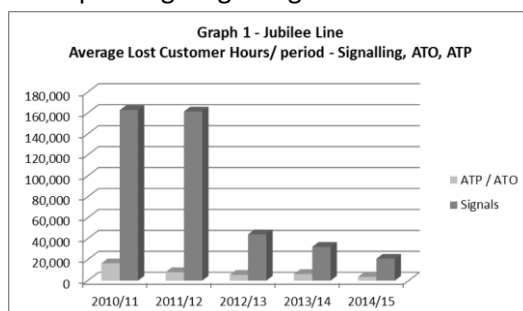
Line	% increase in line capacity	Trains per hour	Additional Customers/hour	Date
Jubilee Line	22%	30	12,500	2012
Northern Line	20%	24 on both branches during AM peak	11,000	2014
Jubilee Line World Class Capacity	20%	36		2019
Northern Line extension		28		2019
Northern Line Upgrade 2		30 on both branches		2021
District	24%			2021-23
Met	27%			2021-23
Circle	65%			2021-23
H&C	65%			2021-23
Crossrail 2	-	Up to 30	90,000	2030

2.5.6 The Jubilee line extension is a good example of how projects with a low BCR, if coupled with economic development areas and housing can completely transform an area, such as Canary Wharf. This experience indicates that projects should be assessed on their ability to pay back the original investment, including the project's ability to create jobs, grow the economy and generate new tax receipts. This would give a more realistic view of the benefits of infrastructure investment and support investment not just in London but in other cities around the UK too.

## 2.6 FASTER & MORE RELIABLE JOURNEY

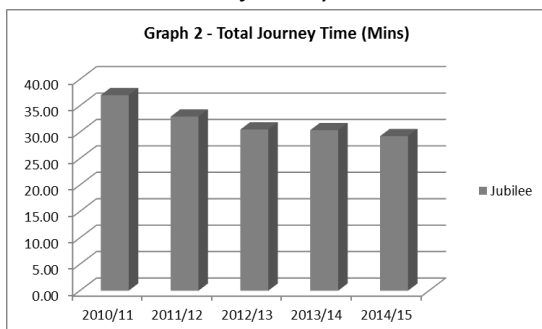
2.6.1 In addition to providing additional capacity, the upgrade programmes have also provided faster and more reliable journeys for passengers<sup>7</sup>. The following paragraphs use the Jubilee line as a case study to provide evidence of the performance improvements achieved by investing in modernising existing infrastructure.

2.6.2 Since the new signalling systems have been introduced on the Jubilee line the number of Lost Customer Hours attributed to Signalling, Automatic Train Operation (ATO) and Automatic Train Protection (ATP) has decreased by a factor of 7 as shown in graph 1 below, resulting in more passengers getting to their destinations on time.

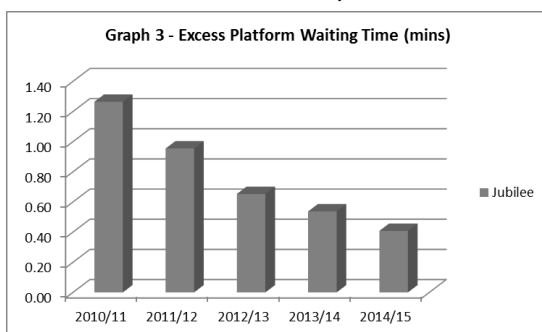


<sup>7</sup> London Datastore, LU Performance Data Almanac

- 2.6.3 For passengers the Total Journey times have been reduced by around 13% with around 5 minutes being saved on the average journey per passenger as shown in graph 2 below. This is as a result of faster journeys as well as increased reliability of the line.



- 2.6.4 With an increased number of trains per hour, the next train arrives much sooner for a passenger waiting at a platform. The Platform waiting times on the Jubilee line are down from 0.81 in 2011 to 0.41 in 2014/15 2013.



## 2.7 Delivering Transport Capacity for Growth – Plans in progress but not yet fully funded

### 2.8 Rail

- 2.8.1 New Tube for London (NTfL) will be needed to deliver additional capacity on the Piccadilly, Central, Bakerloo and Waterloo & City Lines to support the 1.6 Million forecast growth in the London population by 2030.
- 2.8.2 TfL's business case analysis confirms a strong case for investing £9.86Bn in NTfL with the overall programme demonstrating a Benefit-Cost Ratio of 4.2 to 1<sup>8</sup>.
- 2.8.3 The first stage in the programme plans to upgrade the Piccadilly line at a cost of £3.86Bn to deliver an additional 60% additional capacity. The Piccadilly line forms a vital link from central London to Heathrow and currently serves 210 million customers a year with demand expected to grow 20% by 2020<sup>9</sup>. In the London Chamber of Commerce 2014 business survey, 42% of

<sup>8</sup> Transport for London, Finance & Policy Committee, New Tube for London Programme – Delivery Stage: Design & Specification, 23 Jan 2014

<sup>9</sup> <https://tfl.gov.uk/campaign/tube-improvements/the-future-of-the-tube/new-tube-for-london>

businesses surveyed rated the Piccadilly and Bakerloo line upgrades as very important in addition to 44% considering Crossrail 2 very important for coping with population increases<sup>10</sup>.

2.8.4 The benefit that could be generated by these future programmes is summarised in table 2 below:

Line	% increase in line capacity	Tph	Additional Customers/hour	Date
Piccadilly	60%	33	19,000	2025
Central	25%	33	12,000	2030
Bakerloo line	25%	27	8,000	2033
Waterloo & City	50%	30	9,000	2032

2.8.5 Crossrail 2 will need to be approved and started by 2020, adding 10% to London's rail capacity. Crossrail 2 is expected to unlock land for up to 200,000 new homes and 200,000 jobs, adding up to £7.9 billion per annum to London's GVA and growing the national economy<sup>11</sup>.

## 2.9 ROADS

2.9.1 A similar approach should be taken for Roads, to ensure that we maximise the capacity and performance of existing infrastructure. Road traffic can be managed in a similar way to rail traffic to maximise capacity and reduce journey times.

2.9.2 TfL is currently proposing Surface Intelligent Transport System to deliver £1Bn benefit to road users by 2036 through reduction in delays using predictive signalling at a BCR of 5:1.

## 2.10 Delivering Transport Capacity for Growth – Ideas for the Future

### 2.11 RAIL

2.11.1 By the 2020s the tube will be full, even with the planned capacity upgrades and Crossrail 1. Additional capacity must be released from the mainline rail network, by upgrading existing infrastructure, particularly in areas such as South London, in addition to progressing new infrastructure projects such as Crossrail 2.

2.11.2 Thales has been working with Centre for London in recent months to contribute to a research study called Turning South London Orange. The work aims to demonstrate how South London services could be transformed to deliver additional capacity and a reliable service to Londoners, by following a model similar to the London Overground. Many of the South London mainline stations are currently under-utilised, for example, at Brixton on the Victoria

---

<sup>10</sup> London Chamber of Commerce and Industry, London Demands, The Business Agenda for General Election 2015

<sup>11</sup> Crossrail 2: Regional and National Benefits, September 2015

line there are over 29 million entrances and exits per year<sup>12</sup>, but at Brixton Overground station just one million<sup>13</sup>. Many South Londoners travel miles by bus, past mainline stations, to get the tube at Brixton.

- 2.11.3 The report which is planned to be published in January 2016 could provide valuable evidence to the National Infrastructure Commission by setting out the expected impact of the additional capacity on home building and economic activity in the area.
- 2.11.4 The experience gained from improving the standard of service on the London Overground shows passenger numbers increased from 0.6 million journeys/ week in 2007 to 2 million journeys per week by late 2011, with this success being attributed a major infrastructure upgrade to deliver increased train frequency, new trains, station enhancements and service quality enhancements<sup>14</sup>.
- 2.11.5 The contribution that Thales has made to the Turning South London Orange study shows the potential to reduce delay on the suburban network by around 10-20% by deploying modern traffic management systems. Further benefits would then be gained if the area was re-signalling to modern standards including the European Train Control System and Automatic Train Operation.
- 2.11.6 Network Rail's plans for the Digital Railway adopt a similar approach by using modern state of the art signalling and control systems to increase the capacity and performance of the existing network.
- 2.11.7 Network Rail are certainly not alone in this thinking, in mid December, SBB, the infrastructure manager for Switzerland's railways published a strategy for its 20 year signalling vision, including many of the same concepts.

**Q3. What opportunities are there to increase the benefits and reduce the costs of the proposed Crossrail 2 scheme?**

**Q4. What are the options for the funding, financing and delivery of large-scale transport infrastructure improvements in London, including Crossrail 2?**

- **What is an appropriate local and regional contribution - given the potential distribution of benefits to business, residents, transport users and the wider economy - and how could this be achieved?**
- **What innovative funding mechanisms could be considered to support delivery of key schemes?**

<sup>12</sup> London Datastore, multiyear station entry and exit figures for 2014, Transport Planning Strategy & Service development, June 2015

<sup>13</sup> Office of Rail Regulation, Train Station Usage, December 2015

<sup>14</sup> Transport for London, Rail and Underground Panel, London Overground Impact Study, 16 November 2011



- **What is an appropriate local and regional contribution - given the potential distribution of benefits to business, residents, transport users and the wider economy - and how could this be achieved?**
- **What innovative funding mechanisms could be considered to support delivery of key schemes?**

- 4.1 Thales contributed to the London First February 2014 “Funding Crossrail 2” report which can be found at [http://londonfirst.co.uk/wp-content/uploads/2014/02/LF\\_CROSSRAIL2\\_REPORT\\_2014\\_Single\\_Pages.pdf](http://londonfirst.co.uk/wp-content/uploads/2014/02/LF_CROSSRAIL2_REPORT_2014_Single_Pages.pdf)

Additional and updated material on funding is also available at the end of the ‘Crossrail 2 – regional and national benefits’ document which is available at <http://crossrail2.co.uk/why-crossrail-2/>

**5. How have major metropolitan areas in other countries responded to similar challenges and priorities? Are there any lessons to be learned and applied in London?**

- 5.1 Thales has worked with other major metropolitan areas in other countries faced by similar challenges. In particular, the lessons learnt in Tokyo, Hong Kong and China could provide insight which is of interest to the National Infrastructure Commission. Please note the metro infrastructures in these cities are younger than the ones in London.

## 5.2 Hong Kong

- 5.2.1 With the high reliability and availability of the metro service and area coverage of the metro network, the percentage of Hong Kong citizens relying on Hong Kong MTR metro network for traveling has been increasing rapidly. Today a high percentage of residents and tourists are relying on MTR.
- 5.2.2 Understanding the keeping in good state repair and modernization of existing metro lines takes longer duration due to limited night accessible time, MTR plans re-signalling/modernization project approximately at a 20-25 years interval.
- 5.2.3 MTR has recently let a major resignalling project for 7 lines (134 km, 73 stations, 158 trains). They decided to deploy one train control solution for all lines in order to simplify project implementation, operation management and skilled operation and maintenance resources.

## 5.3 China

- 5.3.1 With moving block signalling, suitable physical guide way and turn backs, in China they have been able to increase the number of trains and passengers. For example: the 50 km Beijing Line 4, currently is delivering approximately 1.5 million passengers daily with headway lower

than 90 second and the 66 km Guangzhou line 3 is delivering 1.3-1.5 million passengers a day with potential to deliver more.

- 5.3.2 In general all metro lines in Shanghai are relatively new compared to lines in London. The first line to be re-signalled in Shanghai is Line 5. To achieve capacity increase, passenger growth and area coverage, mitigate migration risk and reduce the requirements for night access, Shanghai city and Shanghai metro synchronized the timing for constructing extension (17 km extension added to a 17km existing line), adding new fleet of trains (32 6-car trains in addition or to replace the existing 17 4 car trains) and constructing new equipment rooms on the existing lines. The project is to be completed in less than 4 years.

#### **5.4 Japan**

- 5.4.1 The experience in Japan has shown that by connecting high speed to commuter and high density metro, in additional to building infrastructure at the connection stations (Shinagawa for example), then massive growth and development will follow. This can be seen also along the high speed lines.
- 5.4.2 Metro services are planned to be ideally within a 5-7 min walking distance from most points in the city – drastically reducing traffic congestion within the city.
- 5.4.3 Metro is looking at minimizing all wayside / maintenance to concentrate on the passenger services with minimal labour
- 5.4.4 The long term future that JR East and other operators are driving towards are larger interconnectivity between high-speed, sub-urban and metro areas – possibly towards implementing a seamless connection from low to high density traffic on the same line/train.