



# REVIEW OF HEATHROW AIRPORT'S Q6 CAPEX GOVERNANCE FRAMEWORK

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FINAL REPORT

**ORIGINAL**

Prepared by:

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## EXECUTIVE SUMMARY

### Introduction

CEPA has been appointed by the CAA to assess whether the new capital expenditure governance regime put in place for the latest control period (Q6) is fit for purpose and providing the intended incentives on Heathrow Airport Limited (HAL) to deliver capital efficiency. Our advice is split into three parts reflecting the terms of the commission:

- a review of effectiveness to assess whether the capex governance arrangements are delivering the anticipated benefits;
- a discussion of recommendations; and
- thoughts on how recommendations might be implemented.

We have based our assessment on evidence gathered from four workstreams:

- a top-down review of performance at the portfolio level based on internal reporting to the Capital Portfolio Board (CPB);
- a structured review of a small sample of projects selected by CPB members and extended by ourselves following discussion with the Independent Fund Surveyor (IFS) and the CAA;
- shadowing a monthly project cycle of meetings, up to and including the December 2016 Capital Portfolio Board (CPB) meeting; and
- one-to-one meetings with participants: HAL, the airlines, the IFS and the supply chain.

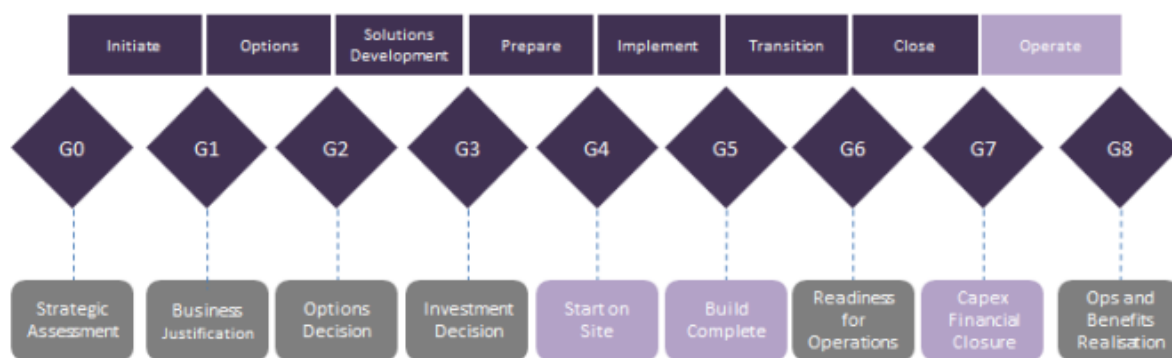
### Context

For Q6 a new approach to the governance of capex expenditure was introduced to Heathrow. It incorporates a two tier approach to treatment of capital expenditure; the concept of “core” and “development” capex. Core capex refers to capital for those projects developed to a level that permits a firm investment decision; development capex refers to those that had not yet reached this stage but would do so within Q6. The level of uncertainty in the projects making up development capex is reflected in a P80<sup>1</sup> budget estimate for each and collectively in the development capex allowance that makes up a substantial part of the Q6 capex determination. Projects which have advanced to core capex are costed at P50. The process is summarised in the figure E.1 below.

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<sup>1</sup> P80 means a cost estimate that, on the basis of information available, and for the scope as defined at that time, is expected not to be exceeded for 80% of the time. This does not mean that P80 cost estimates are only exceeded for 20% of deliveries, because in practice scope often changes.

Figure E.1: Project gateway process



Source: Heathrow Capex Efficiency Handbook

## Overall evaluation

The vision set out in HAL’s capital efficiency handbook for Q6 is as follows:

*“Optimise the use of capital to create valued benefits, making Heathrow successful for all, through visible and measurable improvements”.*

We found that at the highest level the capex envelope set in the CAA’s determination becomes a de facto target cost for the portfolio. But at the time of the determination it is no more than a budget estimate for projects that are not yet sufficiently developed to be confidently scoped or priced. Although the use of a P80 figure provides scope for uncertainty to be addressed in the early stages of the process, it is not clear as the portfolio is delivered over the course of the control period, that benefits are being maximised or that efficient costs are being delivered. This means that, despite the new process being in place, consideration of efficiency continues to primarily rest on the CAA’s ex post review of expenditure undertaken at the end of the control period.

At the time of our review (primarily December 2016) it was clear that there is mounting pressure on delivery within the capex envelope and a sense that this will be managed through an element of de-scoping to ensure that the de facto portfolio level target is met. What is less clear is whether the portfolio will also deliver value for money.

Although individual projects have business cases, these tend to be more qualitative than quantitative and we conclude that this lack of quantification is a significant contributor to the degree of scope and cost change that we observe in the early stages of the process. It is not currently sufficiently clear what the benefits are, whether they are being maximised or whether the level of cost associated with a project is commensurate with its expected value to passengers. As a project is developed there is no effective tool to assess whether the cost is affordable and/ or whether the cost benefit ratio is sufficient to warrant investment.

There are controls on the process – benchmarking, the IFS, regulatory incentives (although some argue that the only effective incentive on HAL is to spend up to the level of the

determination in order to maximise its return) – but they focus on cost and not on benefit and whether the two are in appropriate proportion.

We also observed a significant amount of change at and beyond the investment decision point at G3. Our view is that this is a consequence of projects being rushed to this stage, in part a function of the regulatory cycle requiring a ramp up in project preparation in the first half of the control period, and as a result being insufficiently developed to ensure that scope and cost are fixed and firm. This puts pressure on the commercial relationships and potentially there is a loss of competitive tension as projects are refined as part of the contracting process.

These are significant concerns and we consider that there is substantial scope to improve the current process noting that those working within it share some of our concerns and are already considering how best to address them. Notwithstanding these concerns projects are generally being delivered on time and within the overall capex envelope. The programme has reached the point where the majority of projects are now well underway; most having passed the investment gateway. All stakeholders see this process as an improvement on Q5 and there is a sense of commitment on all sides both to making the process work and to delivering improvement to it. They have identified weaknesses in practice and are actively seeking to address them collectively despite the frustrations that they are experiencing in doing so. There remains, however, significant concern amongst the airlines in particular about whether it will be possible to use this process in the next control period and in particular for the governance of capex related to the new runway.

The result of our review is a set of recommendations which are explained more fully in the main document but which are summarised in the box below and grouped around four key messages:

## Recommendations

### ***I. Revise Capital Efficiency handbook to incorporate the following:***

- *HAL to implement quantified business case appraisal and report to the CAA and airlines on its approach to this as soon as practicable.*
- *Extend the scope of the IFS role to include earlier involvement in project development and provision of support to business case development in line with the recommendation above.*
- *Undertake earlier benchmarking of 'Should Cost' to inform options and provide leverage in supplier negotiations.*
- *Ensure that live and comprehensive risk registers are reviewed as part of the G3 investment decision.*

### ***II. Improve the quality of monitoring :***

- *CAA to consider whether the regulatory arrangements can be developed further at the H7 price control review to ensure HAL (a) does not inappropriately de-scope projects rather than focus on efficient delivery and (b) has an appropriate approach to the prioritisation of projects e.g. no undue preference for projects with opex savings for HAL over airline priorities.*
- *In anticipation of the H7 price control, CAA to review whether there is scope to develop further incentives on HAL to deliver more efficiently in future.*
- *In particular we consider that CAA should consider the introduction of incentives that create greater certainty over the costs that will be passed to airlines post G3.*

### **III. Improve supply chain efficiency:**

- *HAL to ensure that projects are sufficiently well developed to facilitate firm pricing whatever its basis. Target cost approaches should not be the default where greater clarity on scope and risk could facilitate a fixed price if more work were undertaken internally prior to contracting.*
- *HAL to maintain commerciality in negotiations with suppliers, the form of contract should ensure appropriate risk transfer and negotiations should be concluded promptly.*
- *HAL should consider holding risk contingency at the portfolio level.*
- *Where there are changes in cost and/or scope post G3, HAL should clearly identify causes and require disciplined implementation of a rigorous and effective controls process to authorise change post G3.*
- *HAL to ensure future triggers give sufficient weight to benefit delivery. At the H7 price control CAA and stakeholders to consider improving the process for re-baselining of delayed project works so that they better protects airlines' interests.*

### **IV. Increase robustness of process pre G3:**

- *Airline capacity and capability to contribute effectively to the process should be strengthened.*
- *Greater emphasis should be placed on the resilience of proposed design solutions to shape preferred options and avoid later revisions.*
- *The status of the IFS working group should be revisited - could HAL give this greater priority?*
- *HAL should establish a timeline for response to these recommendations and where appropriate their implementation and report on this as soon as practicable to the CAA and airlines.*

## Implementing the recommendations

Our recommendations can be broadly grouped under the following themes:

- revising the Capital Efficiency handbook with specific recommendations related to process pre G3;
- improving CAA's quality of monitoring;
- improving supply chain efficiency; and
- increasing the robustness of process pre G3.

Seven of our recommendations relate to the early phases of the governance process. In the main these focus on gaining clarity early about scope and cost in order to ensure that projects offer value for money and are well prepared for G3. Most of our recommendations are self-explanatory but we propose a significant departure from current practice. We suggest that HAL and the airlines develop an approach to quantified business case assessment that will help all parties understand the value of a project in terms of its benefits and use this to manage expectations around the form of solution and its costs. Development of quantified business case at the beginning of the control period would be used as a guide for scope and level of spending as projects are developed in G1/G2. This would make design costs proportional to benefits delivered and provide a cap to spending when rising project costs are no longer justified by increased value.

We recommend starting from WebTAG because many of the values that are required for a business case appraisal are readily available within it. As is the cases for other users of this methodology some customisation for the aviation sector may be required. We note for instance that TfL's methodology starts from WebTAG but has additional 'London' values within it. TfL's approach to business case appraisal is summarised below:

### *Box E.2: Early stage development of TfL's projects*

TfL's project development process:

- requires a quantified business case for each project and the case must be updated throughout the project life including after the project has completed;
- mandates the business case being developed on a standard method; the Business case Development Manual which draws heavily on the standard WebTAG methodology;
- recognises that pricing for early stage projects can shift substantially as detail is developed. TfL uses Government's suggested risk allowances in addition to early stage estimates of expected costs;
- tends to set risk allowances in the range 30-50%;
- expects that business cases will at least achieve a minimum cost benefit ratio;
- requires alternative justification if projects do not achieve the required minimum ratio;
- splits governance between Project Manager and Sponsor. The Sponsor is responsible for protecting the benefits of the business case and is in place to challenge the project manager; and
- separates Project Managers and Sponsor reporting lines.

While the appraisal method that HAL applies need not be as comprehensive in all cases as those used elsewhere, it is fundamentally important that the value of a project to passengers whose views are broadly represented by the Airlines in the capex governance process, is understood and that this guides the costs that are expended on it.

Our next group of recommendations relate to preparedness for the investment decisions at G3. We believe that projects should:

- be clearly specified at this point;
- be capable of fixed or at least firm pricing with allowance made for residual risk where this cannot be removed;
- employ a range of contract types;
- have short negotiations to maintain competitive tension; and

we suggest that HAL look to the approach used in other very large infrastructure projects such as Crossrail, as a good practice benchmark.

### **Implications of the capex governance process for the regulatory regime**

Part of our remit is to consider whether, and if so how, the CAA's approach to the price control and in particular setting the opening level of the RAB for the next control period, should change as a result of the operation of the new capex governance process.

Our recommendations will inevitably take time to implement. For Q6 therefore we expect that CAA's ex post review should be undertaken as previously. The findings of our work will however assist in targeting that review process. We would suggest that particular attention be paid to projects which have experienced substantial change in price and/ or scope post G3. Within this we expect that the CAA will want to specifically review:

- the procurement approach and timing in particular to consider whether competitive tension was maintained throughout;
- whether fixed price components were contracted before work began and delivered as planned within the fixed cost;
- whether and for what reason target costs moved; and
- the management of variations.

Looking forward, Q6 has been extended for an additional year and our recommendation is that the capex governance process be revised wherever practicable to reflect the recommendations of this report in that extended period and results tested in that period.

How the current governance process impacts the CAA's preparations for H7 is, in part, dependent upon on how it chooses to develop the regulatory regime for H7; a subject on which it is still developing its thinking. In section 5 of this report we consider potential alternative regulatory models which represent incremental changes to the current regulatory



framework because, given the scale of the challenge in H7, it seems to us unlikely that CAA will conclude that its current approach will continue entirely unaltered.

## 1. INTRODUCTION

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- a discussion of recommendations; and
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### 1.1. Our approach

We have based our assessment on evidence gathered from four workstreams:

- a top-down review of performance at the portfolio level based on internal reporting to the CPB;
- a structured review of a small sample of projects selected by CPB members and extended by ourselves following discussion with the IFS and the CAA;
- shadowing a monthly project cycle of meetings, up to and including the December 2016 CPB meeting; and
- one-to-one meetings with participants: HAL, the airlines, the IFS and the supply chain.

Further evidence on our sample of projects is contained within Annex A. Details of our conversations with stakeholders are contained within confidential Annex B.

### 1.2. Report structure

Our report is split into three sections:

- Section 2 provides our evaluation of the current capex governance process and the issues that have been identified;
- Section 3 develops our recommendations further and provides relevant examples;
- Section 4 contains our recommendations for how this could change for H7; and
- Section 5 concludes the report and includes our framework for reviewing capex efficiency.

There are annexes with background to the current governance process and evidence on our assessment.

## 2. REVIEW OF EFFECTIVENESS OF CAPEX GOVERNANCE ARRANGEMENTS

In this section we review how well the existing arrangements are working and provide an evaluation of the capex governance process. For this purpose we have established evaluation criteria to underpin our assessment and we consider what features are currently in place in order to achieve these.

### 2.1. Current process and framework

A large scale and long term capital programme almost inevitably sits uncomfortably within a regulatory cycle which tends to cover a five year period. Outside of the regulated sector a long term plan would likely be in place and projects would be developed on an ongoing basis as the case for each project is made. With economic regulation in place, however, it is not unusual for a large number of capital projects to be priced into the regulatory determination for a price control, despite there being significant uncertainty about how each will eventually be delivered and their costs at the time of the determination. Most regulators need to manage this uncertainty, and there are a range of approaches in place to achieve this whilst protecting consumer interests.

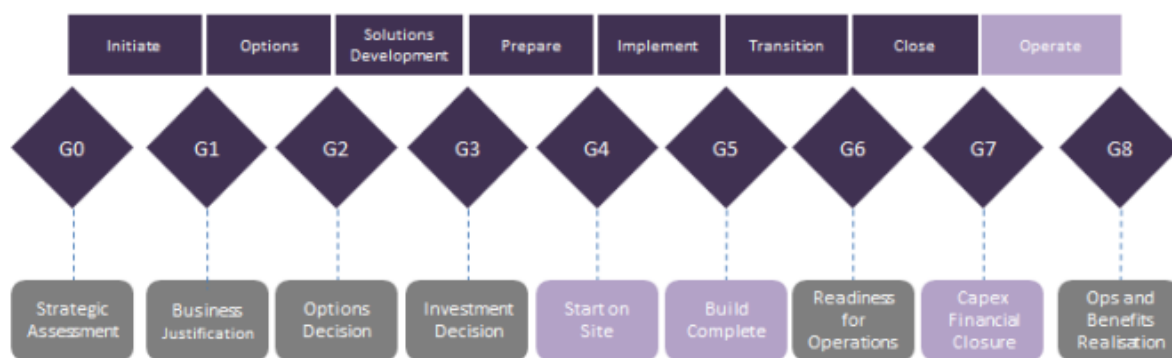
The parties involved in the Heathrow price control face this issue and, at the time of the Q6 determination, adopted a new approach to capex expenditure which acknowledged that projects planned for the Q6 were not all at the same stage of development. It introduced a two tier approach to treatment of capex; the concept of “core” and “development” capex. Core capex refers to those projects developed to a level that would permit firm investment decisions to be made; development capex refers to those that had not yet reached this stage but would do so within Q6. The level of uncertainty in the projects making up development capex is reflected in a P80<sup>2</sup> budget estimate for each and collectively in the development capex allowance that makes up a substantial part of the Q6 capex determination. Projects which have advanced to core capex are costed at P50.

Throughout the regulatory five year control period, projects are managed under the capex governance process. This is essentially a series of stages or gates through which each project must pass, without which its costs will not be admitted for regulatory purposes. The process is summarised in Figure 2.1 below.

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<sup>2</sup> P80 means a cost estimate that, on the basis of information available, and for the scope as defined at that time, is expected not to be exceeded for 80% of the time. This does not mean that P80 cost estimates are only exceeded for 20% of deliveries, because in practice scope often changes.

Figure 2.1: Project gateway process



Source: Heathrow Capex Efficiency Handbook

A project is described as development capex until it completes G3, when it becomes categorised as core capex. Further details of the process can be found in Annex C.

There are a number of mechanisms, including compulsory benchmarking and the use of an IFS (analogous to the independent reporter used in rail and previously in water), built into the process, which seek to provide additional assurance that capex is scoped efficiently and delivered at efficient cost. In addition, the airport operator (HAL) faces regulatory incentives around overall service quality, which will tend to drive its desire to ensure that capex projects are focused on effective and timely delivery of the desired quality of service. HAL also bears the risk that the regulator may conclude that any overspend on a particular project may not be fully recovered through regulated charges (paid by airlines and recovered from passengers). In the extreme case, the regulator may determine that a project included in the capex portfolio was unnecessary, and will not be funded at all through regulated charges. Some regulatory disallowances of capex spent have occurred from time to time, but to date they have been small in comparison to the overall programme.

Projects in the Q6 portfolio have significant interface with the day to day operations of the airport. HAL took the decision in Q5 to appoint firms familiar with these interfaces through a Q6 Delivery Integrator Framework. These contracts were initially set for a three-year period, but are extendable to the full length of the control period. Heathrow split the role of delivery integrator (DI) into four geographically based lots structured around the existing terminals. As a result there are four separate contractors (Ferrovial, Balfour Beatty, Mace and Morgan Sindall), each of which takes on responsibility for projects that fall into one of the four designated areas. Projects are further classified as each forming part of one of four capital programmes (Airport Resilience, Passenger Experience, Baggage and Asset Management), which make up the overall capital project portfolio<sup>3</sup>. Each of these programmes lies in the £600m-£900m<sup>4</sup> range. The DIs main roles are the management and integration of projects

<sup>33</sup> There is a further capital programme T2/Q6 realisation which accounts for c £300m, and relates to the finalisation of the T2 Q5 project.

<sup>4</sup> Only the asset management programme sits towards the top of this range.

which make up the portfolio and management of interfaces between them and the operations of the airport.

As part of the DI procurement process, Heathrow fixed components of the DI cost in unit or proportional terms, but not in total- preliminaries, overheads and profits percentages are all predetermined. On top of the DI cost estimate, HAL applies an estimated 15.5% cost for leadership and logistics. Under the terms of its framework contract each DI is also required to put packages of work out to tender to the next tier of the supply chain. In addition, the DI liaises with the cost consultant (see below) about how best to package works within each geographical territory.

HAL's relationship with the DIs is supported by both the IFS and its cost consultant Turner and Townsend (T&T). T&T provides advice to HAL's project managers on how to specify, and price projects. It uses data from other projects and its broader understanding of market prices to advise on the efficient cost level for each project in a programme.

## **2.2. Summary analysis**

In our review we have considered the operation of the governance process under four workstreams, the findings of which are discussed in brief below:

### **2.2.1. Portfolio level performance**

The CPB manages the portfolio and monitors the Q6 capex allowance envelope set at the beginning of the control period (£3.26bn). The board is comprised of representatives from HAL and the airlines, with an observing role for the CAA. It receives a monthly analysis of progress against the capex allowance. In this section we discuss this internal reporting of progress.

As at December 2016, HAL was over budget by 3% or £110.6m. The majority of the increase (between baseline and current estimate at completion (EAC)) results from significant problems on two projects - T3 Integrated Baggage System rolled over from Q5 (and for which there was a partial disallowance of cost in Q5) and the Tunnels Refurbishment project- which together and as at December<sup>5</sup> represented 73% of the £110m cost overrun<sup>6</sup>. If these two projects were removed the EAC would be 1% above the budget baseline.

By December 2016, 65% of the capex allowance had passed G3 and so been classified as core capex. This means that these projects are now in the delivery phase, and should have firm costs and be priced at a P50 level. The majority of the remainder are currently passing through the early stages of the governance process. Five projects have not yet started although four

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<sup>5</sup> The cost overrun quoted here is the best estimate at a point in time. We note that the full cost of the tunnels project remains subject to ongoing uncertainty.

<sup>6</sup> T3IB has also adversely impacted the Western Baggage Upgrade (WBU) at T5, which was paused in March 2014 and restarted in February 2015 to enable T3IB project to come into operation. This delay resulted in an additional £12.6m in funding to complete the WBU project by December 2016.

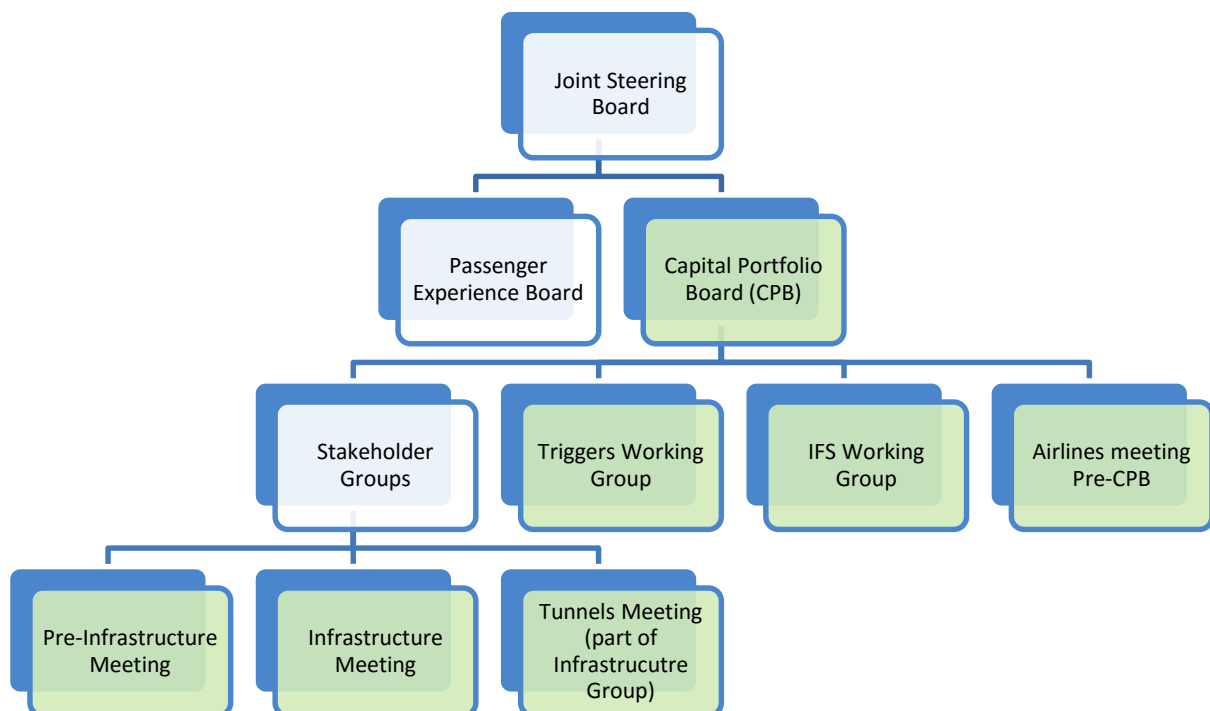
currently have a G3 target date before the end of the control period. Their aggregated baseline budget allowance is £198m, or 6% of the total baseline number.

Internal reporting prepared by HAL indicates that the outturn cost of the portfolio will be consistent with CAA’s determination. However there is significant pressure on that outturn, driven both by the two problematic projects and by changes to scope and cost in the development capex portfolio as those projects are transferred to core capex. HAL and the airlines are aware of this risk, and talk freely about maintaining budget respect. But it seems likely that either costs will overrun, or else that scope will need to be reduced, if the programme is to be delivered within the cost allowance in the determination. This raises broader questions about efficiency and whether the benefits that should accrue to the portfolio have been delivered in line with the costs.

### 2.2.2. Review of meeting cycle

Throughout December we shadowed the meeting cycle that culminated in the monthly CPB meeting. This monthly meeting cycle is shown in Figure 2.2 below. We attended meetings shown in green.

Figure 2.2: Cycle of meetings



The meetings provided insight into the process of preparing projects for G3; the investment decision. What was apparent from the meetings that we attended is that all parties are working together to progress the portfolio through the gateway process and enable delivery of projects. The process is new in this control period and it is clear those involved are monitoring its effectiveness and are acting on a number of issues that they have identified. These issues are discussed below:

## Budget respect

It is clear that a number of projects approaching G3 have undergone substantial changes in scope and, perhaps to a greater degree, cost that was not anticipated initially. As the airlines may not have been involved in the early gateways or because there has been significant change between G2 and G3 there is then a substantial amount of work for HAL in explaining why this is the case and the process that it has gone through to establish the likely G3 scope and costs. An example of this cost escalation is provided in Box 2.3 below.

### *Box 2.3: Cost escalation*

HAL and the airlines have been working on a smoking shelter project for T2. After introducing one facility in T4 in 2013, a project to install one in T2 was initiated in the prospect of improving passenger experience as research showed 6% of passengers (equal to 4 million passengers a year) would be using it. The project reached G3 before it became clear that the quoted price- £1m for the facility- was at least double that which airlines might have anticipated for that kind of project- £450k/£500k-, and by that point a significant sum had been spent on design (£150k). This increase in design cost is due to the change of location which was decided at G2. This example is illustrative of i) the issue of affordability and “budget respect” which is often evoked in meetings, and ii) the escalation of costs between G2 and G3. The airline community has expressed its intention to drop the project if the £500k cap level was not respected.

This degree of change places a burden on both the airport and airlines as they work towards being able to agree to invest. This issue has led all parties to refocus on project budgets and all parties refer to this as having budget respect. In part the focus on the budget reflects the fact that they are already acting on a known issue with the process.

## Resourcing

It is particularly clear that the airlines have limited resource to carry out capex scrutiny. Although they seek to use that resource effectively, they are not currently in position to act as the ex-ante arbiter of efficiency on many of the projects that they are expected to review. Not only is there limited resource availability, they do not have the required skill set to challenge effectively.

The airlines are essentially reliant on HAL for information. Although they can use the IFS to support their review of projects, the IFS is an independent adviser jointly to the CAA, HAL and themselves, and so not someone the airlines perceive as able to advocate their viewpoint. Nor can the IFS provide the specific specialist resource for what the airlines would require of such a role. This has generated some tension in the relationship between the airport and airlines, because the airlines do not feel that they are properly supported. On occasion this has resulted in the airlines themselves collecting data to challenge prices. As explained in Box 2.4 below, we understand that British Airways (BA) obtained market prices for self-bag drops machines and used this to demonstrate a material gap between prices it was being offered direct from the market and those emerging through the governance process.

#### *Box 2.4: BA direct procurement example*

As part of the Business Case 329 Automation of the Passenger Journey, BA directly procured and installed ICM Series 1 Self-Bag Drops units in T5 for a unit cost of around £40k, including purchase of the unit and full installation. HAL's initial quoted price for the same units (with installation included) was c£150k per unit.

Those cost estimates were comparing the same units (and their components), therefore demonstrating a large discrepancy between HAL's quoted price and BA's. We understand HAL's estimates were initial quotes and would have probably decreased but the scale of the disparity seems to be evidence of a lack of commerciality from HAL. This could apply in other areas of expenditure and prove a greater concern over capex efficiency.

In more complex projects the airlines do not currently have the resource or expertise to undertake this sort of market testing themselves nor would most choose to procure outside of the process as BA has done. But this example provides an indication of the gap between market prices and those being offered to/ or by HAL and therefore the scope to use market testing more effectively in the process.

#### **Streamlining**

The gateway process can be slow, which does not serve the interests of any party, and has already led HAL and the airlines to implement a degree of streamlining. The airlines meet before the CPB to decide which of the projects on the list for investment decision they are content to agree. The CPB then focuses on projects where sufficient comfort is not yet in place. Where the airlines are not content to agree to invest, there may nevertheless be an agreement to progress a project subject to additional requirements placed on HAL, or projects are split so that they proceed in parts.

There is a sense among participants in the governance process that it is not acceptable to halt the progress of projects at the critical G3 stage, because of the knock-on effect on programme or costs of doing so. This inevitably reduces the discipline on project managers to be fully prepared for the G3 decision. It also adds further tension to the relationship, as airlines sometimes believe that they are being railroaded into a decision. It can also create additional work when compromises are reached on projects, such as splitting them, rather than sending them back to be reworked.

The parties are aware of this issue. The IFS has issued guidance on what should be in place for the G3 decision. We understand this will be written into the capex governance protocol in due course.

#### **Procurement**

HAL's procurement approach uses a two-tier system. Tier 1 delivery contractors are made up of four DIs that cover four geographical areas. DIs have competitively bid their overheads, profits and staff rate to be on the framework agreement for a duration of three years with the option to extend further in yearly increments. Those costs are fixed in the agreement.



HAL mainly uses a target cost type of contract with the DI. Tier 1 contractor then mainly use tier 2 suppliers under a competitive procurement approach. Tier 2 contracts are fixed price. The benefit of the DI framework for HAL is to avoid dealing with a number of contractors and to keep operation running when projects are complex and involve many interfaces.

There is some concern from the airlines (and recognition by HAL of their concern) that best value may not always be served through use of the DI framework. Smaller and less complex projects which do not have the operational interfaces that best utilise the skills of the DI, might be delivered more cheaply if HAL approached the second tier of the supply chain directly. Consequently HAL has now started to progress a small number of projects within the large asset management programme in this way. However an implication of this approach is that HAL itself has to tender the work and manage the contractor, thus increasing its internal costs; cost savings therefore need to be sufficient to cover this additional cost.

The default contract form used by HAL is target cost under the NEC<sup>7</sup> suite of standard form of contracts. It provides a method for setting a target cost and establishing a pain/gain share mechanism as an incentive to meet the target. HAL is of the view that this form of contract is the most appropriate approach in this control period where there are considerable operational interfaces between the airport and project delivery. These operational interfaces result in a degree of uncertainty of implementation cost which is not fully within the contractor's control. HAL's opinion is that this is best dealt with through a target cost approach.

We have not looked at all the projects in the portfolio, but it seems likely to us that more could be priced on a fixed basis, since the level of uncontrollable risk to the contractor is not always large, and most contractors are accustomed to managing at least some construction risk which potentially puts them in a better position to manage it than HAL. We also observe that in practice the second tier suppliers on many projects already deliver to a fixed cost contract, while the first tier enjoys the target cost mechanism.

Even after the contract has been awarded, we witness some cost movements that are potentially eroding the competitive tension benefits gained through the tendering process. For example, for the Baggage Standard 3 project, a major scope change was negotiated after the initial contract awarding and took two years to get to an agreed price. Regarding the two DI contracts (BBG and Mace), the IFS pointed out in its review that *"the "competition" benefits from tendering do not necessarily [...] flow through to the negotiation of a major scope change after contract award."* The Option C-Target Cost type of contract also exposes HAL to greater risk when cost movements appear post G3. On the Tunnels Refurbishment project, BAM Nuttall's Option C contract with HAL reflected BAM's tier 2 contract and therefore did not incentivise them to do the work. BAM was not delivering to key dates but the form of contract was not protecting HAL against a risk of non-productivity as BAM maintained resources on

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<sup>7</sup> See <https://www.neccontract.com/About-NEC>

site for non-critical work. A decision was made after a few months to move away from the Option C contract and to implement a lump sum contract with delay damages.

We noted some reluctance on the part of HAL staff at the meetings we attended to challenge the supply chain or do anything to disrupt the progress of projects through the governance process. While at senior levels we are assured that HAL places substantial pressure on the supply chain to obtain best prices, it is not clear to us that this attitude extends down through the working teams, thus in practice releasing the pressure to some degree. We therefore conclude that there would appear to be scope for a greater degree of commerciality in procurement and contract management.

### Development of the capex governance process

We also attended the IFS Working Group meeting. This group advises on a range of topics including the development of benchmarking and the development of the overall governance process.

The development of benchmarking to cover a wider range and variety of costs is ongoing and is valued by HAL and the airlines who want to be able to place greater reliance on this information as part of agreeing to invest.

Recent work on establishing what documents/ analysis should be in place for each project approaching G3 has been managed by this group and will be brought into the governance process documentation shortly. This should improve the flow of projects through the gateway.

There is a degree of concern from the IFS particularly that the group is not given sufficient status and should be attended by more senior staff from HAL who could facilitate better progress on the issues that are being considered.

### 2.2.3. Review of sample projects

In our third work stream we reviewed a sample of projects at various stages in the governance process. The sample was suggested by HAL and the airlines and added to by ourselves in consultation with the CAA and the IFS. Table 2.1 below gives a brief description of the projects reviewed.

*Table 2.1: Summary table of sample of projects reviewed*

Business Case	Name of Project	Description	Status	Budget baseline	Estimated Cost at Completion (EAC)
<b>B018</b>	T5 Connections	Alleviate transfer congestion during peak times in T5A by providing additional security	Complete	£38.9m	£37.5m

Business Case	Name of Project	Description	Status	Budget baseline	Estimated Cost at Completion (EAC)
	Security Capacity	lanes, new staff accommodation, new escalator and parallel loading capability.			
<b>B051</b>	T3 Integrated Baggage (T3IB)	Designated to provide a modern, highly automated baggage system for T3 carriers, which integrates with T5 to provide quick and reliable baggage transfers. Project has spanned two regulatory periods, Q5 and Q6. Cost overrun of £43.8m for the Q6 period, representing 47% of the Q6 budget. The CAA disallowed £35m of expenditure before Q6 as cost were incurred inefficiently.	Complete	£87.5m	£128m
<b>B111</b>	Enabling wide body growth- Sierra C	Project aims to improve airfield ground infrastructure during Q6 to facilitate growth in average aircraft size at Heathrow.	Complete	£21.6m	£20.8m
<b>B116</b>	T3 Connections Security Capacity	Provide inbound and outbound coaching facilities and additional security lanes. Existing T3 connections facility will be demolished and new one constructed.	In delivery	£74.1m	£77.3m
<b>B216</b>	Baggage Standard 3/ Asset Replacement T1/T2	Replacing Standard 2 hold baggage screening (HBS) machines with Standard 3 machines, consolidating screening rooms, replacing old existing assets and upgrading baggage handling IT infrastructure and applications.	In delivery	£456m	£465.9m
<b>B243</b>	Kilo Taxiways, Aprons & Stands	Provide a through taxi lane to offer a more flexible and efficient ground operation that reduces delays and maximises punctuality. And creation of 2 new stands and demolition of three buildings.	In delivery	£110.2m	£110.2m

Business Case	Name of Project	Description	Status	Budget baseline	Estimated Cost at Completion (EAC)
<b>B329</b>	Automation of the Passenger Journey	Project includes a number of initiatives: self-service bag tagging, self-service bag drop, self-boarding and connections self-service check-in.	Pre G3	£58.3m	£58.3m

Full details of our project reviews, which follow a standard template, can be found in Annex A. Our high-level analysis identified a number of issues across the projects reviewed; these are grouped in Boxes 2.5 to 2.7 below under the respective three headings: cost changes, risk and benchmarking, and supply chain. Lessons drawn from the project reviews are presented in Box 2.8.

#### Box 2.5: Changes to cost estimates/ Cost scrutiny (Pre and Post G3)

In our review of projects we observed:

- systematic cost increase between G2 to G3, often due to increased scope (e.g. Sierra C)
- projects being divided into tranches tending to increase costs (e.g. T5 Connections)
- client change management records not always provided when new scope introduced (e.g. T31B)
- problems in scope definition resulting in higher design costs and uncertainty in scope which impacts delivery (e.g. T31B)
- projects appearing to be rushed to G3 without robust specification or robust scope (e.g. T31B)
- the contract form being by default NEC Option C-Target Cost
- changes in costs occurring post G3 if implementation costs post G3 are not taken into account at G3 estimate (e.g. T3 Connections)
- cost pressures that could have been identified earlier to improve project controls (e.g. Baggage Standard 3)
- less cost scrutiny when project not well understood by Project Team and airlines (e.g. T31B)

#### Box 2.6: Benchmarking/Risk management

In relation to benchmarking and risk we noted:

- it was not always clear who owns risk and how to mitigate it (e.g. Sierra C)
- benchmark can be different in terms of scope and complexity, making it difficult to demonstrate value for money (e.g. T3 Connections)
- risk registers become out of date – implying a lack of focus on risk management
- that the IFS recommends doing work earlier than G3 regarding risk registers and benchmarking (e.g. Baggage Standard 3) where we observe parity of Should Cost and DI cost as cost planning done at same time of negotiations

### Box 2.7: Involvement of supply chain

We observe that:

- the DI, having been solely appointed to a geographical area, requires greater commerciality in negotiations from HAL
- loss of competitiveness in negotiations when no competitive tendering with contractors (e.g. T5 Connections)
- HAL is fully at risk when NEC Option E-Cost Reimbursable is applied (e.g. T3IB)
- evidence of lack of commerciality in negotiations with contractors (e.g. Tunnels)
- inefficiency in management of change and DI prices resulting in price inefficiencies (e.g. Sierra C)
- client schedules do not always represent the true status of project (e.g. Tunnels)
- the benefits of competitive tendering are lost if there is a negotiation of scope change a significant time after award of the contract (e.g. Baggage Standard 3)

### Box 2.8: Lessons learned

We note the following:

- Design specification period should:
  - allow sufficient time to arrive at a coordinated solution
  - ensure effective stakeholder engagement has been undertaken
  - ensure that project team and roles are assigned to best meet the needs of the project
  - allow interactions with other projects to be fully considered and the impact of disruption understood for the project in question
  - ensure that risk management processes are agreed upon before the project work begins
  - ensure assignment of clear roles and responsibilities with respect to Project Management
  - recognise cost implications, both for different parties and for different phases of the lifecycle, and ensure that these are taken into account
- Construction/ implementation period should
  - not start until the design specification phase has been completed
  - ensure that the specification continues to meet stakeholders' needs
  - ensure that reviews and triggers are undertaken on a timely basis to ensure that maximum time is provided to address problem / issues
  - require that co-ordination between multiple projects occurs
  - include ongoing review and reporting to the necessary groups
  - consider integrated management structures when projects are divided in multiple tranches

#### 2.2.4. Stakeholder meetings

In our final workstream we met, generally on a one to one basis, with the stakeholders of the capex governance process: HAL, CPB members, airline community representatives, IFS, T&T,

HAL project managers and the procurement team. These individual meetings helped us test our observations and probe issues at a more detailed level and from the particular perspective of each stakeholder.

There was a broad consensus on a number of points:

- The arrangements for Q6 were an improvement on Q5.
- Further development of the process is required in this control period and for the additional year, Q6+1.
- The way G3 acts as the key focal point for agreeing the investment is a good approach in principle, but in practice there are weaknesses in the early stages.
- The G2-G3 phase often crystallises tensions and frustration between stakeholders as costs and scope change and the airlines do not have control over this or, in some cases, full visibility. Nor do they have the tools properly to challenge them.
- There is a sense that the process is rushed to reach a G3 decision without clear and defined scope.

The tensions that we observed in multi-party meetings were much more apparent in these one-to-one sessions. There remains substantial frustration on the part of the airlines about what they perceive as an ongoing lack of effective consultation. They consider that:

- project costs at Heathrow are too high;
- HAL has limited incentive to control costs, since once they are agreed under the process they will be recovered from customers through charges; and
- the pressure the process places on them under current resource constraints are substantial.

In consequence, some elements of the airline community are strongly opposed to the current process being used in the next control period.

HAL staff are also frustrated by the additional burden placed on them by greater airline involvement, because this slows the delivery of projects, and impacts on cost and programme. Whatever the facts are here, the tensions are substantial and levels of trust are low. This inevitably slows the current process and raises significant questions about its use in H7.

### **IFS role**

One aspect of the process that is unanimously perceived as positive is the appointment of the IFS. Its independence and engagement with both parties have given more confidence to the airlines in the capex governance process, and have also allowed more transparency and clarity in the process. The IFS Working Group is recognised as helpful in the process but is considered, by some, as lacking influence with HAL's senior staff.

Parts of the airline community would like to see the IFS acting more as an advocate for their own views which should compensate for their lack of resources and capacity to efficiently challenge HAL. However, both the IFS itself and HAL note that there could be a significant downside to this e.g. if the IFS as a result had less access to and lost the confidence of HAL.

### Supply chain

Some of those we spoke to expressed concerns over the commerciality of HAL and its ability to negotiate tightly with the DIs. In part this is about being prepared to negotiate i.e. having project scope etc., sufficiently well-defined to enable a strong commercial approach to negotiation and maintain momentum. The two consultants (IFS and T&T) are recognised as doing a good job in benchmarking and verifying the costs and risk management process but negotiations can be protracted and appear in some cases to lose the focus on competitive tension and ensuring value for money.

Beyond this there is some concern about the relationship between HAL and its contractors and whether this is, in some instances too comfortable. There is particular concern about Ferrovial Agroman with its dual role as a HAL shareholder and contractor. Some consultees think the approach to contractors would need to be substantially overhauled for bigger projects like the new runway.

### Triggers meeting

In Q5, a portfolio plan was set at the beginning of the control period and triggers were linked to delivery of projects, therefore HAL would still pay rebates for projects that had changed and were not intended to be delivered. The split between development and core capex for Q6 solved that issue by allowing HAL to develop projects without worrying about paying any rebates before any investment decision was made. Triggers are set at G3 and designed to make sure that HAL only earns its return on actual investment made. It is therefore linked to a financial amount and has limited wider incentive properties. HAL and the airlines noted the difficulty in defining triggers for projects and the relevance of triggers at the end of a control period (e.g. T3IB project).

## 2.3. Overall evaluation

The vision set out in HAL's capital efficiency handbook for Q6 is as follows:

*“Optimise the use of capital to create valued benefits, making Heathrow successful for all, through visible and measurable improvements”.*

We focus on three particular aspects of how that could be delivered in order to assess how the process is working at present:

- delivery of outputs to maximise benefits to airport users;
- delivery of outputs at efficient costs; and

- delivery of outputs on a timely basis.

At the highest level the capex envelope set in the CAA's determination becomes a de facto target cost for the portfolio. But at the time of the determination it is no more than a budget estimate for projects that are not yet sufficiently developed to be confidently scoped or priced. Although the use of a P80 figure provides scope for uncertainty to be addressed in the early stages of the process, it is not clear as the portfolio is delivered over the course of the control period, that benefits are being maximised or that efficient costs are being delivered. This means that, despite the new process being in place, consideration of efficiency continues to primarily rest on the CAA's ex post review of expenditure undertaken at the end of the control period.

At the time of our review (primarily December 2016) it was clear that there is mounting pressure on delivery within the capex envelope and a sense that this will be managed through an element of de-scoping to ensure that the de facto target (discussed earlier) is met. What is less clear is whether the portfolio will also deliver value for money.

Although individual projects have business cases, these tend to be more qualitative than quantitative and we conclude that this lack of quantification is a significant contributor to the degree of scope and cost change that we observe in the early stages of the process. It is not currently sufficiently clear what the benefits are whether they are being maximised or whether the level of cost associated with a project is commensurate with its expected value to passengers. As a project is developed there is no effective tool to assess whether the cost is affordable and/ or whether the cost benefit ratio is sufficient to warrant investment.

There are controls on the process – benchmarking, the IFS, regulatory incentives (although some argue that the only effective incentive on HAL is to spend up to the level of the determination in order to maximise its return) – but they focus on cost and not on benefit and whether the two are in appropriate proportion.

We also observed a significant amount of change at and beyond the investment decision point at G3. Our view is that this is a consequence of projects being rushed to this stage, in part a function of the regulatory cycle requiring a ramp up in project preparation in the first half of the control period. As a result projects are insufficiently developed to ensure that scope and cost are fixed and firm at G3 when the investment decision is made. This puts pressure on the commercial relationships and potentially there is a loss of competitive tension as projects are refined as part of the contracting process.

These are significant concerns and we consider that there is substantial scope to improve noting, however, that those working within the process share some of our concerns are already considering how best to address them. Notwithstanding these concerns projects are generally being delivered on time and within the overall capex envelope. The programme has reached the point where the majority of projects are now well underway; most having passed the investment gateway. All stakeholders see this process as an improvement on Q5 and there is a sense of commitment on all sides both to making the process work and to delivering



improvement to it. They have identified weaknesses in practice and are actively seeking to address them collectively despite the frustrations that they are experiencing in doing so. There remains, however, significant concern amongst the airlines in particular about whether it will be possible to use this process in the next control period and in particular for the governance of capex related to the new runway.

### 3. RECOMMENDATIONS FOR REMAINDER OF Q6 AND Q6+1

This section of the report focuses on how the current governance process might be improved, setting out recommendations and supporting evidence for them. We recognise that the process is relatively new and still developing, and that many of the recommendations are already being considered by HAL and other stakeholders.

Recommendations are structured around improving the performance of the process against the evaluation criteria that we used to assess it at the end of Section 2. In some cases the recommendations span multiple criteria i.e. are relevant to more than one (and as such are not repeated).

#### 3.1. Maximise benefits to users

While the parties are collaborating to make the governance process work effectively there remains substantial scope for improvement. In relation to maximising benefits this includes:

- Status of the overall capex envelope.
- Benefits trade-offs.
- Demonstrating the benefits case clearly and using this to control scope and cost.
- Outputs not being delivered.
- Airline capacity.
- Role of the IFS.

##### 3.1.1. Status of the overall capex envelope

At the outset of a control period the determined development capex envelope is a figure that arises out of the business planning process. Earlier in the report we state our view that despite projects being at an early stage of development, it then becomes a de facto target for the control period. Although we note HAL's strong view that it does not work in this way, in regulatory terms HAL's incentive is to spend up to this amount to earn the maximum regulatory return. While some of our other recommendations, if implemented, would bring a greater focus to the costs and benefits of individual projects, we consider there may also be scope for greater incentive on the overall capex envelope via a mechanism that rewards efficient underspending. Such a mechanism would provide an incentive to consider whether to add additional projects and take the return on those or conclude that a project is unnecessary and reduce the scale of the capex envelope. The incentive would be set so that HAL would obtain a share of the cost saving and in this respect it would have some similarity with a contractual target cost mechanism.

We have also noted the opposite effect occurring in Q6. There is now considerable pressure on the determined figure as a result of cost overruns. In meetings, project deferral or de-

scoping is being discussed and some of the projects that we have reviewed show increasing costs for H7 (e.g. Baggage Standard 3 with £35m moved to H7 by G3). While change is inevitable, cost increases on some projects should not preclude or result in the deferral of other projects in the portfolio. We think that there should be greater transparency over these changes perhaps via the monthly reporting to the CPB and the CAA should consider whether this monitoring of delivery is sufficient. We might expect that the Q6 target envelope be reduced for de-scoping in this way because the P80 to P50 movement should, in theory, provide the ability to manage cost changes within the level of the overall determination.

### **3.1.2. Benefits trade-offs**

One aspect of having flexibility about choosing projects is that there will be trade-offs faced by HAL. We note two specific trade-offs that are worthy of monitoring:

- an opex-capex trade-off; and
- a trade-off between those projects that benefit HAL and those that benefit the airlines.

Benefits for several of the capex projects reviewed (Sierra C, Baggage Standard 3 and Automation) deliver reduced opex for HAL. Opex underspends are retained in full by HAL within a control period, although shared with the airlines in subsequent control periods. Capex costs, as long as they are efficiently incurred, and within the overall envelope, are funded through charges. This creates incentives on HAL to prioritise projects within the envelope to select those projects that reduce opex in the short term.<sup>8</sup>

We are also aware of a concern from the airlines that projects that they wish to pursue may not be a priority in the portfolio for HAL. The most discussed example of this is passenger automation which HAL has until recently declined to take forward. To the extent that these projects emerge from constructive engagement and form part of the business plan it is not clear to us why this should be permissible. We recommend that a portfolio plan be developed as part of the routine CPB reporting that sets out the expected order of projects and allows for a debate on this where the airlines have different priorities from HAL. If necessary a practical mechanism may need to be found to settle these differences if a solution cannot be reached in a sensible time frame between HAL and the airlines.<sup>9</sup>

### **3.1.3. Demonstrating the benefits case**

In finalising scope and costs for individual projects, it is important to maintain the link to the benefits derived. At present all projects have a business case but it is largely qualitative in nature which restricts the ability to use it as a firm control on cost and scope change. We note that the quality of the business case for one of the later projects that we have reviewed

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<sup>8</sup> We are not suggesting that this was the case for undertaking these projects we simply note they deliver opex savings.

<sup>9</sup> A formal issue resolution process is currently in place but has not been used during the Q6 despite airlines expressing some concern about differences of priority.

(Automation project) is an improvement over other evidence we have reviewed in terms of demonstrating a quantified case and suggests that this recommendation is practicable more widely.

Our suggestion is that right from the outset i.e. from the business planning process onwards, there should be a quantified cost-benefit case that is developed and monitored over time and which is used as a project develops to control the level of expenditure allocated to it. Having benefits quantified in measurable terms is also a recommendation from the IFS on the Kilo Taxiways project, and an issue highlighted on other projects (T3IB and Baggage Standard 3). We consider that this process would also help in the setting of triggers which in our view should also be based on the delivery of benefits.

We note concern from HAL and the airlines about the ability to define triggers in this way. They have attempted this previously without success. Our view is that the process will be more straightforward if projects are defined in terms of their benefits from the outset and if the business case is updated as the project progresses. Triggers are of course in place to control costs being passed through to passengers when projects have not been delivered. They are therefore financial in nature but we do not believe that a benefits based trigger is inappropriate.

Both HAL and the airlines acknowledge that defining triggers is difficult. A good illustration of that point is the Tunnels Refurbishment project trigger. The objective of the project is to mitigate existing life safety risks in both the Main Tunnel and the Cargo Tunnel. The trigger objective is therefore to incentivise the timely completion of the life safety systems enhancement and has been defined as: *“provide the contractor or the operation with the means to remotely monitor the operation of the critical life safety systems”*. Although this trigger seems to be linked to the benefit of the project, it does not require the full realisation of the benefit in order to be met.

#### **3.1.4. Airline capacity**

Having a transparent process in a complex setting, such as is the case at Heathrow, leads to a high volume of project related materials to digest and meetings to attend. This places a significant burden on the airlines and their representatives which was perhaps not fully considered when the process was established. From discussions with stakeholders, even with the IFS input, there are also technical areas where the airlines lack capability to engage.

Given the scale of the programme and the fact that costs are recovered through airline charges (with competitive pressures limiting the extent to which airlines can recover these costs from passengers), it does not seem unreasonable for the airlines to devote more resource to the programme whether this be through additional qualified staff, expert advisers or a mix of the two. It might be possible for these costs to be considered part of the overall portfolio cost rather than requiring the airlines to fund them; although these roles would likely generate savings considerably in excess of employment costs.

Additional resource would make it possible for the airlines to generate quantified business cases for their own projects as part of the business planning process and perhaps increase overall contestability of pricing by undertaking a degree of their own market testing. We note in Section 2 an example from the airlines, where BA directly procured machinery at a cost below that which the airport had proposed. There may be greater scope in the process for this approach to be taken on self-contained and less complex projects. We suggest that this be considered further.

### **3.1.5. Role of IFS**

The CAA, HAL and the airlines all say that the IFS is a valuable addition to the capex process. As reported earlier there is a suggestion that the IFS should become more of an advocate for the airlines or even the CAA. We agree with HAL and the IFS that there are potential downsides to this in terms of transparency and the relationship with HAL. As a result we recommend that the reporting line remains as specified today.

Some airlines representatives told us that they are becoming more familiar with the IFS's approach so there is evidence of familiarity and experience growing. However we note that even when the IFS suggested that some elements are missing, it did not necessarily result in the parties delaying an investment decision for instance. For example, on the Sierra C project where limited information was provided on interactions with the supply chain. The IFS has now issued guidance on what should be in place before a project progresses through G3. If the G3 requirements are incomplete we consider that the assumption should be that projects will not be presented for an investment decision.

Finally in relation to the IFS, we would suggest that earlier appointment might be helpful to programme control. It seems likely that the IFS could help project managers prepare business cases and monitor readiness for G3 and so they would add value earlier in the gateway process. Earlier involvement of the IFS should not jeopardize its independent review of the projects in later stages as the IFS only gives indication of evidence to be provided in certain areas (client management, risk management etc.) and does not dictate the work and documents HAL's teams must produce.

### **3.1.6. Recommendations**

*Recommendation 1 – CAA to consider whether the regulatory arrangements can be developed further at the H7 price control review to ensure HAL (a) does not inappropriately de-scope projects rather than focus on efficient delivery and (b) has an appropriate approach to the prioritisation of projects e.g. no undue preference for projects with opex savings for HAL over airline priorities.*

*Recommendation 2 – HAL to implement quantified business case appraisal and report to the CAA and airlines on its approach to this as soon as practicable.*

*Recommendation 3 – In anticipation of the H7 price control, CAA to review whether there is scope to develop further incentives on HAL to deliver more efficiently in future.*

*Recommendation 4 – Airline capacity and capability to contribute effectively to the process should be strengthened.*

*Recommendation 5 – Extend the scope of the IFS role to include earlier involvement in project development and provision of support to business case development in line with recommendation 2.*

## **3.2. Delivery of outputs at efficient cost**

### **3.2.1. Current mechanisms to achieve objectives**

There are a number of features within the regulatory regime and the commercial approach used by Heathrow which aim to ensure cost efficiency, e.g. competitive tendering, 'Should Cost' reports and risk sharing contracts to mitigate risks of inefficient costs. However there remains concern that projects have not been delivered at efficient cost and that cost increases are uncontrolled, especially through the early gateways. From our review, we noted the following issues:

- Rise in costs between G2 and G3.
- Ongoing cost/scope change beyond G3.
- Lack of transparency on changes in cost (and scope).
- Benchmarking/ competitive pressure.
- Issues arising from form of contract.
- Inadequate cost controls.

### **3.2.2. Rise in costs between G2 and G3**

As shown in Table 3.1, in the projects we have reviewed or discussed in meetings, we observe a general trend of significant cost increases between G2 and G3. An exception is Baggage Standard 3, where costs fell by 4%.

*Table 3.1: Changes in estimated project cost between G2 and G3*

<b>Project</b>	<b>G2 estimate (£m)</b>	<b>G3 estimate (£m)</b>	<b>Change (£m, %)</b>
B018- T5 Connections	24	35	+11 (+47%)
B111- Sierra C	14	19	+5 (+39%)
B116- T3 Connections	40	74	+34 (+85%)
B216- Baggage Standard 3	383	368	-15 (-4%)
B243- Kilo Taxiways	133	176	+43 (+32%)

Reasons for the changes include there being uncertainty over design, complexity that was not fully understood and inclusion of scope change. An example of costs not included pre-G3 is developed in Box 3.1 below.

*Box 3.1: Cost escalation*

**Wide body growth/Sierra C – Project B111**

This is an example of a project where cost changed significantly. Morgan Sindall was appointed as DI and provided an initial bid of £9.4m for the works. With scope and design changes between G2 and G3, the G3 estimate rose to £18.9m from a G2 P80 estimate of £13.6m. The Target Cost for the DI included in the G3 estimate was £15.7m. (The G3 P50 estimate is higher than the DI contract price as it also includes overheads, HAL's logistics costs and risk).

The final contract price increased to £20.2m, following additional scope transferred from other business cases and from changes arising from surveys, services, risk realisation and delays associated with asphalt quality. The baseline was £21.6m which shows a 9% underspend for the project. However, as noted by the IFS, there was probably 'a potential initial 'overestimating' in respect to the project scope of works, this having direct impact on the DI pain/gain share'.

As there are frequent changes in cost estimates for projects, having clear and transparent information on what has led to those changes is important. The IFS has raised this with HAL on multiple occasions (e.g. T5 Connections and T3IB) yet it remains the case there are projects where it is uncertain whether the cost change is due to additional scope or for the existing scope (Sierra C and Baggage Standard 3).

While we recognise the high likelihood of change between G2 (options) and G3 investment decision it may well be the case that it only becomes clear to the airlines that the price of the G2 selected option is changing materially when the project is brought forward at G3. Such changes result in substantial additional work as HAL is required to explain what has happened to the airlines in order for the project to progress and the airlines have to devote time to getting up to speed.

We think that there needs to be mix of greater airline involvement in the earlier stages and greater transparency over risks to the prices quoted at G2 so that option selection is made on a fully informed basis. We also consider that there is scope for HAL's cost consultant to be involved earlier in providing at least high level 'Should Cost' analysis for options and in helping project managers to price option risk with the objective of reducing surprises at the G3 gateway.

**3.2.3. Change beyond G3**

In the case of the Sierra C project, change continued beyond G3 and into the setting of the target price as change was implemented in respect to surveys/uncharted underground services, risk realisation, and delays associated with asphalt quality and batching plant. As noted previously we consider that projects should not proceed beyond G3 unless they are capable of being firmly priced or in the case of inherent uncertainty (by which we mean that work must be undertaken in order to resolve uncertainty e.g. ground conditions, hidden asset

conditions) without a plan and price estimate for addressing this uncertainty. Although there will inevitably be some exceptions, the objective should be to close down scope and cost changes on projects at G3.

We consider that there could be scope for the CAA to intervene by setting an expectation that the G3 price will be that recovered through charges and added to the RAB or to provide additional incentives that achieve this. We note HAL's concerns that this could have range of unintended consequences and its view that doing this would materially inhibit its appetite to undertake certain projects at all. We note also its suggestion of an alternative approach that might move the investment decision later in the gateway process. On balance, and at this stage, we think HAL should be challenged to control scope and cost change beyond G3 and that the CAA should monitor progress against this recommendation carefully and consider intervention if other methods are unsuccessful.

#### **3.2.4. Procurement and Negotiation**

An issue discussed at the December CPB meeting is the form of contract which HAL enters into with its tier 1 suppliers. These are predominantly NEC Option C (target cost) or NEC Option E (cost reimbursable) contracts.<sup>10</sup> Such contracts leave a degree of risk with the client in this case HAL. While target cost contracts are a useful tool and there is a clear rationale for using them in some instances, they should not be used in preference to NEC Option A (fixed cost) contracts for instance simply because the scope and design is not yet sufficiently complete to allow fixed pricing. We would expect them to be used in instances where there is some ongoing or inherent uncertainty that cannot be easily addressed and where there is a case for incentivising the contractor via the pain/gain mechanism to minimise costs for managing this.

We would also expect HAL's procurement team to consider form of contract and set expectations for project managers about the level of detail/preparedness that is required for any form of contract. In principle this should be that the scope of work is fixed and can be priced by the supply chain. The basis of any uncertainty should be made clear at this stage such that HAL procurement can take an informed view on how to proceed; fixed cost, target cost or whether a project needs further work before it would be appropriate for the supply chain to price it on any basis.

We wonder whether change post G3 is so prevalent in part because projects are rushed to G3 (perhaps as a result of the regulatory cycle requiring a substantial ramp up in project preparation at the start of the control period) and as a consequence are insufficiently developed for procurement to commence. In these circumstances the current default use of target cost contracts would support poor preparation and potentially increase costs, affecting value for money.

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<sup>10</sup> Tranche 2 works under T5 Connections project and the VI contract under T3IB project were cost reimbursable contracts.



Part of the reason for the degree of change observed arises from the negotiation between HAL and its supply chain. On some projects, the negotiation phase has spanned more than two years (e.g. Baggage Standard 3). In these cases we expect it was extremely difficult to retain competitive pressure on price and ensure value for money.

### **3.2.5. Benchmarking/ competitive pressure**

There are two main methods through which confidence in a cost estimate can be delivered. The first is to develop an independent cost estimate through benchmarking. The second approach is to have an open tender competition.

It is important that benchmarking is done in a critical way which goes beyond looking at the proposed solution only. The IFS has previously raised concern that parity between the overall bid cost of a contract and the 'Should Cost' value provided by HAL's cost consultant (e.g. for Baggage Standard 3) is being delivered because the cost consultant is not providing estimates for alternative approaches. Having the cost consultant involved earlier i.e. in pricing options, might therefore provide a more effective means by which to challenge the supply chain and ultimately reduce costs.

Competitive tendering does not always guarantee pricing benefits if changes to the contract are made post award. On the Baggage Standard 3 project, the IFS noted erosion of potential benefits via the passage of time:

*"Much of the final scope has been priced/agreed via negotiation c.2 years after tendering and awarding the initial contracts. From the point of view of the IFS, the "competition" benefits from tendering do not necessarily or automatically flow through to the negotiation of a major scope change after contract award."*

Delivery via the DIs could be perceived as uncompetitive should this lead to protracted negotiation rather than traditional competitive tendering. On the Baggage Standard 3 project for instance, there was a change to the pain-gain share arrangements set out in the framework contract and the IFS raised a concern that this too could erode benefits from competitive tension. Reducing the need for protracted negotiation would be facilitated by providing greater certainty of scope and design by G2 (certainly before G3).

### **3.2.6. Cost controls and management of risk**

It is important that there are clear cost controls in place where cost increases are required. The IFS noted on projects Sierra C and T3 Connections that they would expect to see robust governance processes in place to manage and oversee changes. A system of delegated authorities might help control change or at least provide clarity and transparency over each change since formal approval would be needed for any change of a certain magnitude or higher.

## Management of risk

As projects develop the uncertainty allowance that is inherent in a P80 cost should diminish and appear as a firm cost or as part of a priced risk register. The projects that we have reviewed or discussed have such a register but we observed:

- The risk register being allowed to become out of date, implying that there is insufficient focus on risk.
- All risk funds being held at project level. In other capex processes that we have reviewed (e.g. the Network Rail GRIP process), funds allocated to high impact but low likelihood risks or risks that are likely to impact the whole portfolio (e.g. inflation) would be held at programme or even portfolio level.

An important part of pricing a project and controlling cost when in contract, is maintaining the risk register which should be a 'live' document for the full duration of the project lifecycle. Project managers should be maintaining registers and these should form a key part of the decision making process at G2 and G3.

Our review of projects has found there to be occasions where planning documents are incomplete or viewed by the IFS as not being of sufficient quality given the complexity of the works. This is typically around scheduling, integration and overall planning, with this being noted on a number of projects (Sierra C, T3 Connections, Baggage Standard 3 and Kilo Taxiways). Although it should be noted that there is an array of documentation and the majority of this is completed well.

At present HAL prefers to allocate all funds to projects because it regards this as a means of ensuring that the full capex allowance is put to work. We disagree because we consider that greater efficiency could be delivered by holding a central contingency fund – in this case the risk allowance should be overall smaller and spread over the portfolio potentially creating scope for additional projects within the capex envelope. We would also expect to see contingency being released in to the portfolio if it is not used; again as a means of funding more projects or returning not needed capex. We think that HAL might consider revisiting this for Q6+1.

### 3.2.7. Recommendations

*Recommendation 6 – Where there are changes in cost and/or scope post G3, HAL should clearly identify causes and ensure that its change control processes are both rigorous and effective and are routinely applied.*

*Recommendation 7 - Undertake earlier benchmarking of 'Should Cost' to inform options and provide leverage in supplier negotiations.*

*Recommendation 8 – CAA should consider introducing incentives that create greater certainty of the costs that will be passed to airlines post G3.*

*Recommendation 9 – HAL to ensure that projects are sufficiently well developed to facilitate firm pricing whatever its basis. Target cost approaches should not be the default where greater clarity on scope and risk could facilitate a fixed price if more work were undertaken internally prior to contracting.*

*Recommendation 10 – HAL to maintain commerciality in negotiations with suppliers, the form of contract should ensure appropriate risk transfer and negotiations should be concluded promptly.*

*Recommendation 11 – Ensure that live and comprehensive risk registers are reviewed as part of the G3 investment decision.*

*Recommendation 12 – HAL should consider holding risk contingency at the portfolio level.*

### **3.3. Delivery of outputs on a timely basis**

#### **3.3.1. Review of performance against criteria – timely delivery**

In order for the benefits of projects to be accrued, the project must be completed. This report discusses elsewhere a concern that projects may be being rushed to G3 and the consequences of that. We do not revisit that point here.

Once the project has reached investment decision at G3, the majority of projects we have considered appear to be delivered around the anticipated timescales. To help facilitate this, trigger mechanisms and broader service quality incentives impose time pressure.

It may however be the case that there are trade-offs between schedule and cost. Utilising a DI who has airport experience may reduce the risk of delays. Sierra C is an example of project where the IFS note that the DI worked well with HAL. But, the supplier may command a premium in light of this. In the case of the Tunnels project, there were difficulties experienced introducing a new contractor to the airport (BAM Nuttall), which led to large cost increases on the project.

There are also cases where projects have been delayed, for the good of the project in terms of conducting early testing or further developing plans. The IFS noted that T3 Connection is a good example of a delay in the planning phase leading to a positive outcome. Triggers have been used to delay revenues as well where there are costly delays, including for project T3IB.

While the overall framework appears to work fairly well for timely delivery of outputs, there are aspects which could be improved:

- reduction in the number of design revisions; and
- triggers linked to outputs.

## Design revisions

While changes to the design can be positive and increase benefits, they can also increase costs (both for the design work and the construction phase). On several of the projects reviewed (T31B, Sierra C, T3 Connections and Tunnels) we have witnessed changes to the design that raise questions around the quality of the original design and the overall project planning. This may reflect pressure to get to G3 so implementing the earlier recommendations may help limit post G3 changes.

## Triggers linked to outputs

All stakeholders told us that the triggers process has improved over time, however it was rather difficult to set the trigger against a particular outcome. An example of this is the Tunnels project as already mentioned in the above sections. Determining when the trigger is achieved on this project turned out to be trickier as the criteria for completion is to be fully commissioned and tested, but testing is being delayed due to operational constraints. Therefore there is disagreement on when the trigger is considered to be met. We recommend that triggers should be expressed in terms of the benefits expected from the project and be achieved when those benefits are realised.

### 3.3.2. Recommendations

*Recommendation 13 – Greater emphasis should be placed on the resilience of proposed design solutions to shape preferred option and avoid later revisions.*

*Recommendation 14 – HAL to ensure future triggers give sufficient weight to benefits delivery. At the H7 price control review CAA and stakeholders to consider improving the process for re-baselining of delayed projects works so that it better protects airlines' interests*

In addition we have a number of recommendations that do not fit neatly into the categorisation above. These relate to items that are not part of the flow of the capex governance process but are self-explanatory given the earlier discussion in this report.

*Recommendation 15 – The status of the IFS working group should be revisited - could HAL give this greater priority?*

*Recommendation 16 – HAL should establish a timeline for response to these recommendations and where appropriate their implementation and report on this as soon as practicable to the CAA and airlines.*

*Recommendation 17 – Governance process documents should be updated to reflect the changes brought in as a result of these recommendations.*

## 4. DEVELOPING OUR RECOMMENDATIONS

In the previous section, we set out a number of recommendations following our review. In this section, we provide examples of how these broad changes could be implemented to improve the capex governance process under the current circumstances.

Our recommendations can be broadly grouped under the following themes:

- strengthening the process in the stages up to the G3 gateway;
- controlling change at and beyond G3; and
- considering how the regulatory framework might be revised to support the above.

In this section we consider options for implementing those recommendations which require a substantial change to the current arrangements.

### 4.1. Strengthening the commercial process up to the G3 gateway

Seven of our recommendations relate to the early phases of the governance process. In the main these focus on gaining clarity early about scope and cost in order to ensure that projects offer value for money and are well prepared for G3. Most of our recommendations are self-explanatory but we propose a significant departure from current practice. We suggest that HAL and the airlines develop an approach to quantified business case assessment that will help all parties understand the value of a project in terms of its benefits and use this to manage expectations around the form of solution and its costs. Development of quantified business case at the beginning of the control period would be used as a guide for scope and level of spending as projects are developed in G1/G2. This would make design costs proportional to benefits delivered and provide a cap to spending when project costs are no longer justified by increased value.

Regulated companies routinely use economic appraisal to demonstrate the value for money of their projects. HAL is already familiar with approaches such as Transport for London (TfL)'s Business Case Development Manual and a similar approach is now required in Network Rail. These methodologies draw upon the Department for Transport's (DfT) WebTag system which is itself based on Treasury Green Book principles of appraisal. Box 4.1 below summarises DfT's approach:

#### *Box 4.1: DfT's Transport Business Case example*

The DfT uses the 'Transport Business Case'<sup>11</sup> approach for decision making. This complete approach to decision making incorporates a Value for Money (VfM) assessment that aims to quantify the benefits of a project to demonstrate that they outweigh the costs. The approach draws on the Five

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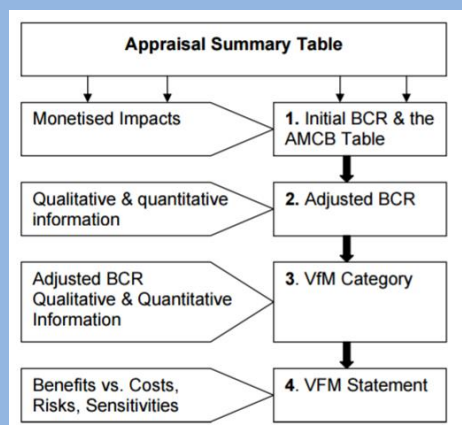
<sup>11</sup> <https://www.gov.uk/government/publications/transport-business-case>

Case model that underpins the Treasury’s Green Book<sup>12</sup> on decision making. The five cases are Strategic (need for change), Economic (value for money), Commercial (financially viable), Financial (affordable) and Management (can be implemented). We focus here on the Economic case, as that is at the core of whether the costs justify the benefits. VfM assessments conducted in the Economic Case must be performed in a manner consistent with the DfT’s WebTAG<sup>13</sup> guidance on the conduct of transport studies for the purpose of appraisal.

The Economic Case assesses the impacts and the VfM implications of all the options in the business case. The economic, environmental, social, distributional and fiscal impacts of a proposal are assessed using quantitative and monetised metrics where specified, and qualitative metrics in other cases.

The four steps assessment process below provides a template for the appraisal requirement.

Figure 4.2: Value for Money Process



Source: DfT (2013)

The assessment starts with the calculation of impacts that can be expressed in money terms. Costs and benefits are separately summed and the initial benefit cost ratio (BCR) calculated. Not all impacts can be monetised easily and therefore the assessment needs to take into account qualitative and non-monetised and qualitative information to construct an adjusted BCR. The BCR is in effect the amount of being bought for every £1.00 of cost to the public purse. BCRs are categorised as according to the following table.

Table 4.1: BCR ratio categories – Treasury Green Book

BCR Category	BCR Value Range
Poor	Below 1
Low	1 to 1.5
Medium	1.5 to 2
High	2 to 4
Very High	Over 4

We recommend starting from WebTAG because many of the values that are required for a business case appraisal are readily available within it. As is the cases for other users of this

<sup>12</sup> <https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

<sup>13</sup> <https://www.gov.uk/guidance/transport-analysis-guidance-webtag>

methodology some customisation for the aviation sector may be required. We note for instance that TfL's methodology starts from WebTAG but has additional 'London' values within it.

In the case of investments at Heathrow, the funders are ultimately passengers, mediated by the airlines. The value for money test is whether an investment delivers useful value such that passengers should pay for it. Since that value is collected from them through air fares, which will not be able to recover all of the direct value to each individual passenger, ultimately what matters is whether it is value for the increase in airfares necessary to pay for it.

A key part of the WebTAG methodology is setting out clearly what are the benefits, and, where appropriate, the dis-benefits, of a particular initiative for customers. This aspect of the method is clearly applicable to the Heathrow investments. A clear statement of what benefits the project delivers to customers, needs to be set out. The main methodology of WebTAG in monetising those benefits, where possible, involves putting experimentally determined values to passengers on them. At least in relation to some other modes of transport, values are available for matters such as journey time, convenience of interchange, ambience, comfort, access to facilities such as Wi-Fi etc.

For some Heathrow investments, some of the benefits will be compliance e.g. with health and safety rules. In such cases, the aim should be to minimise cost while achieving that compliance. In effect, the benefit matches the efficient cost of delivery. But many investments will deliver additional benefits to passengers beyond simple compliance. There is a question here as to how much additional value is generated through those benefits and how to measure this in order for airlines to recover their costs. For example, a security process that enables the passenger to pass through it more quickly, with less discomfort, has a value to the passenger beyond mere compliance with the security requirement. There is implicitly a willingness to pay for such a benefit. WebTAG values might be interesting as an approximate estimate of what the total value to passengers is, assuming the particular benefit is valued in WebTAG. But ultimately it is for airlines to agree what value can realistically be placed on benefits, in terms of their ability to recover it through fares.

Such values will be point values – values per passenger or per year. These will need to be converted into investment values by use of appropriate discount rates, and other standard background assumptions. The operating and maintenance cost of the facilities should also be taken into account. WebTAG uses discount rates suited for public sector appraisal, but rates appropriate for a commercial investment appraisal are relevant here, recalling also the regulated cost of capital.

By setting out a value in terms of a maximum willingness to pay for benefits that go beyond mere compliance, this will potentially create a framework that discards those projects that fail to deliver the value that airlines, acting on behalf of their customers, place on them and help control spending on projects that might be insufficiently valuable to justify proposed costs.

While the appraisal method that HAL applies need not be as comprehensive in all cases as those used elsewhere, it is fundamentally important that the value of a project to passengers or their proxy, in this case the airlines, is understood and that this guides the costs that are expended on it. There is clearly up-front work involved in creating an approach to business case appraisal that would work for Heathrow and potentially specific research required to support the values that are required in an airport context but we anticipate that there is substantial value in undertaking it via the ability to better shape projects and control their costs in the early stages of development.

Like HAL, TfL has a large portfolio of projects. Taking them forward depends on its priorities and funding availability. As these change, business plans are updated annually as part of an annual prioritisation process at which senior managers take a view on what will be the priority projects for any particular year. Box 4.3 below describes the requirements on early stage projects.

*Box 4.3: Early stage development of TfL's projects*

TfL:

- requires a quantified business case for each project and the case must be updated throughout the project life including after the project has completed;
- mandates the business case being developed on a standard method; the Business case Development Manual which draws heavily on the standard WebTAG methodology;
- recognises that pricing for early stage projects can shift substantially as detail is developed. TfL uses Government's suggested risk allowances in addition to early stage estimates of expected costs;
- tends to set risk allowances in the range 30-50%;
- expects that business cases will at least achieve a minimum cost benefit ratio;
- requires alternative justification if projects do not achieve the required minimum ratio;
- splits governance between Project Manager and Sponsor. The Sponsor is responsible for protecting the benefits of the business case and is in place to challenge the project manager; and
- separates Project Managers and Sponsor reporting lines.

#### **4.1.1. Create certainty at G3**

Our next group of recommendations relate to preparedness for the investment decisions at G3. We believe that projects should:

- be clearly specified at this point;
- be capable of fixed or at least firm pricing with allowance made for residual risk where this cannot be removed;
- employ a range of contract types; and
- have short negotiations to maintain competitive tension.



There is also potential for additional regulatory incentives as part of the H7 price control to support discipline around the above.

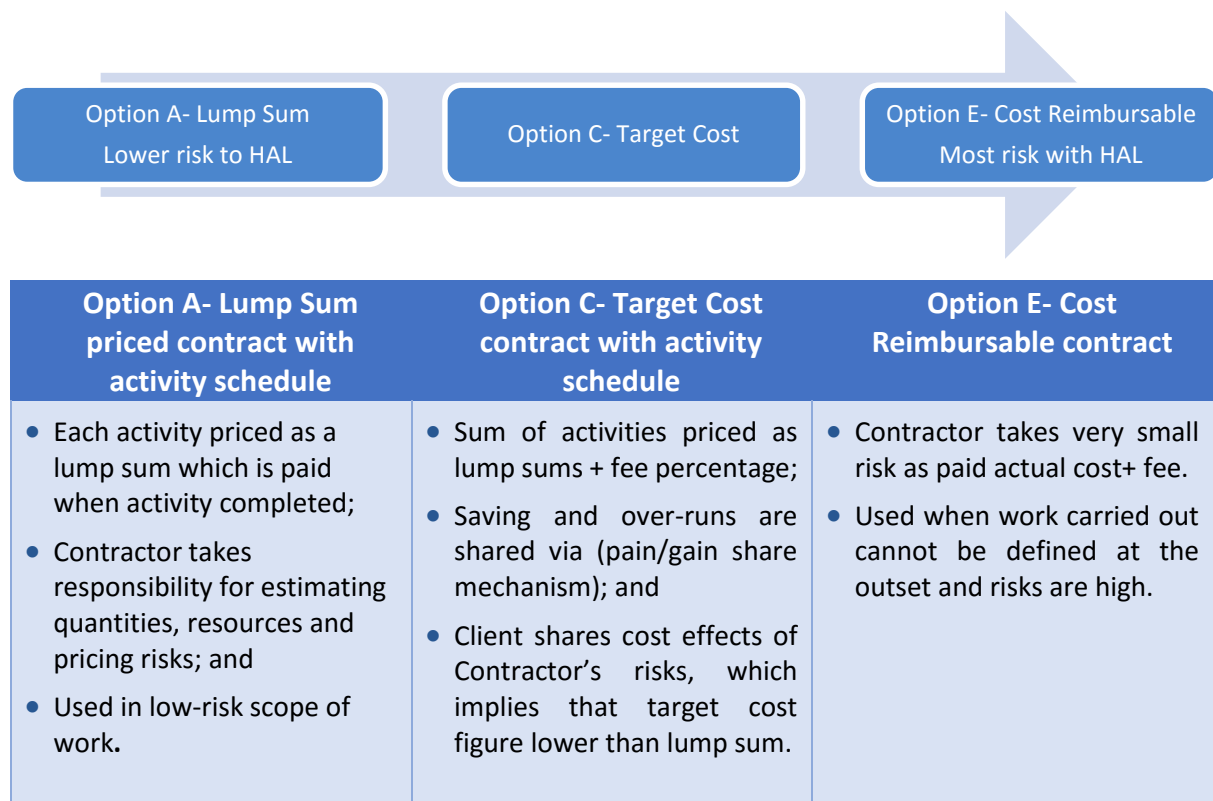
#### 4.1.2. Management of uncertainty

To manage the uncertainty around cost and scope at the time of the investment decision, the IFS has issued guidance on a number of questions around key areas: cost estimation, change management, risk management etc. As a result Project Management teams should be able to provide evidence at G3 that responds to those issues. For example, Project Managers should have a budget compliant option, cost should be broken down into evidenced components and there should be details of the change and their impact on cost and time. Those elements should be presented at G3 in order to remove the uncertainty around scope that would then be reflected in the contract forms and procurement approach used by HAL.

#### 4.1.3. Contract form

The type of contract chosen with the DI ultimately has an impact on HAL’s risk and the degree of commerciality that it needs to apply. Figure 4.4 below shows the degree of risk exposure for HAL depending on the type of contract:

Figure 4.4: HAL’s risk per contract type



As shown in the figure above, HAL’s risk is the lowest under a fixed price contract. However, it appears that the default contract type at Heathrow is the Option C-Target Cost as project scope/ and cost may not be sufficiently well defined at the time of pricing the contract. A greater emphasis in early stages of the process on defining scope clearly wherever

practicable, along with options benchmarking provided by T&T would provide HAL with greater leverage in negotiations with its contractors and allow it to utilise other forms of contract more often; in a portfolio of projects of this scale there is scope to adopt a less one size fits all approach.

#### 4.2. Case study example – Crossrail

Looking forward to H7 and the pressure that the new runway portfolio will put on HAL’s internal team, we consider that a delivery partner approach as used on Crossrail, HS2, the Olympics and Thames Tideway Tunnel might be considered. The box 4.5 below summarises the approach taken at Crossrail based on discussions with CH2M who provide these services for many of these large projects.

##### *Box 4.5: Crossrail delivery partner*

###### **Crossrail delivery partner**

Like many other very large scale infrastructure projects, Crossrail utilises a Delivery Partner structure. In 2009, Transcend (a joint venture between AECOM, CH2M Hill and Nichols Group) was appointed Programme Partner under a NEC3 Professional Service Contract worth £100m. The main value of this approach is to provide depth and breadth in project delivery that the client organisation is unlikely to have in sufficient volume and may not be able to procure through a resourcing strategy that adds to its own direct complement of staff.

At Crossrail, delivery partner staff form part of an integrated client side team and are involved in issues such as:

- resourcing the project;
- internal organisational development;
- project programme development and management;
- project performance management;
- procurement strategy; and
- contract management.

Best results are said to be achieved when the delivery partner or partners are fully integrated into the project team as this reduces the inefficiency of man marking of external resources. This requires buy-in from the client and wider stakeholders. Advantages are seen to be the delivery of strength and depth in client delivery resources and the integration of current best market practice into client organisations. An observation that was made to us is that the concept of a delivery partner works best where processes and procedures are unfettered by previous client side practice. The establishment of a separate delivery company for these projects may therefore be an important factor in success. Such an approach would have implications for HAL in terms of approach and organisation although we understand that it is already exploring this option.

The Crossrail Innovation Programme, Innovate8, has also incentivised all suppliers whatever their role to innovate and to be efficient by rewarding them through sharing savings. This approach is a feature of all Crossrail’s contracts.

## 5. PREPARATION FOR Q6+1 AND H7

Part of our remit is to consider whether, and if so how, the CAA’s approach to the price control and in particular setting the opening level of the RAB at the next control period,

might change as a result of the operation of the new Capex Governance process. We consider this further in this section, firstly focusing on the implications for the current control period and then for Q6+1.

### **5.1. The CAA's current approach**

As we state at the outset of the report, the regulatory process requires that a capex allowance is set for the airport as part of the periodic review. This estimate is based on HAL's business plan for which much of the capex project detail is, at the time of preparation, undeveloped. Given the uncertainty this introduces into the estimates the capex allowance will always be somewhat incorrect. In order to counterbalance this effect, and as part of its periodic review process, CAA routinely carries out an ex post review of the capex programme and has the ability to disallow inefficient capex expenditure based on the outcome of this review. At the end of the last control period for instance, costs were disallowed for the T3 integrated baggage project. Costs were also disallowed at the end of Q4 for the POD monorail project.

In this section we consider how the new capex governance structure – two tier capex, the introduction of the IFS etc., impacts on the work that CAA undertakes in preparation for the next control period and in particular for setting the opening value of the RAB.

### **5.2. The implications of the current governance process for CAA's ex-post review**

Our review of the operation of the capex governance process to date suggests that the willingness of those involved to make the new governance process work is ensuring that it functions broadly as planned. However we observed some significant weaknesses and have made a series of recommendations about how they might be resolved and we are aware that those involved in the process are actively pursuing changes in many of the areas of weakness that this review has identified.

However the recommendations will inevitably take time to implement. For Q6 therefore we expect that CAA's ex post efficiency review will be undertaken as previously. The findings of our work should however assist in targeting that review process. We would suggest that particular attention be paid to projects which have experienced substantial change in price and/ or scope post G3. We expect that the review consider:

- the procurement approach and timing in particular to consider whether competitive tension was maintained throughout;
- whether fixed price components were contracted before work began and delivered as planned within the fixed cost;
- whether and for what reason target costs moved;
- the management of variations; and

- where possible, benchmarking of underlying unit costs perhaps drawing on the work of HAL and its cost consultant T&T but also looking to external comparators.

### 5.3. Implications for H7

Looking forward, Q6 has been extended for an additional year and our recommendation is that the capex governance process be revised wherever practicable to reflect the recommendations of this report in that extended period and results tested in that period.

Implementation of the recommendations which relate to the current regulatory regime could be undertaken in a number of ways. We present below two alternative options for change to the regulatory approach which represent relatively incremental changes to the current framework. The first of these is a 'light' model whereby the majority of features of the current regime are maintained but with greater emphasis on ongoing monitoring of the capital portfolio. The second model involves greater change and utilising strong regulatory incentives on HAL for delivery of capex.

Model 1 (as presented in figure 5.1 below) differs to the current model in four core areas:

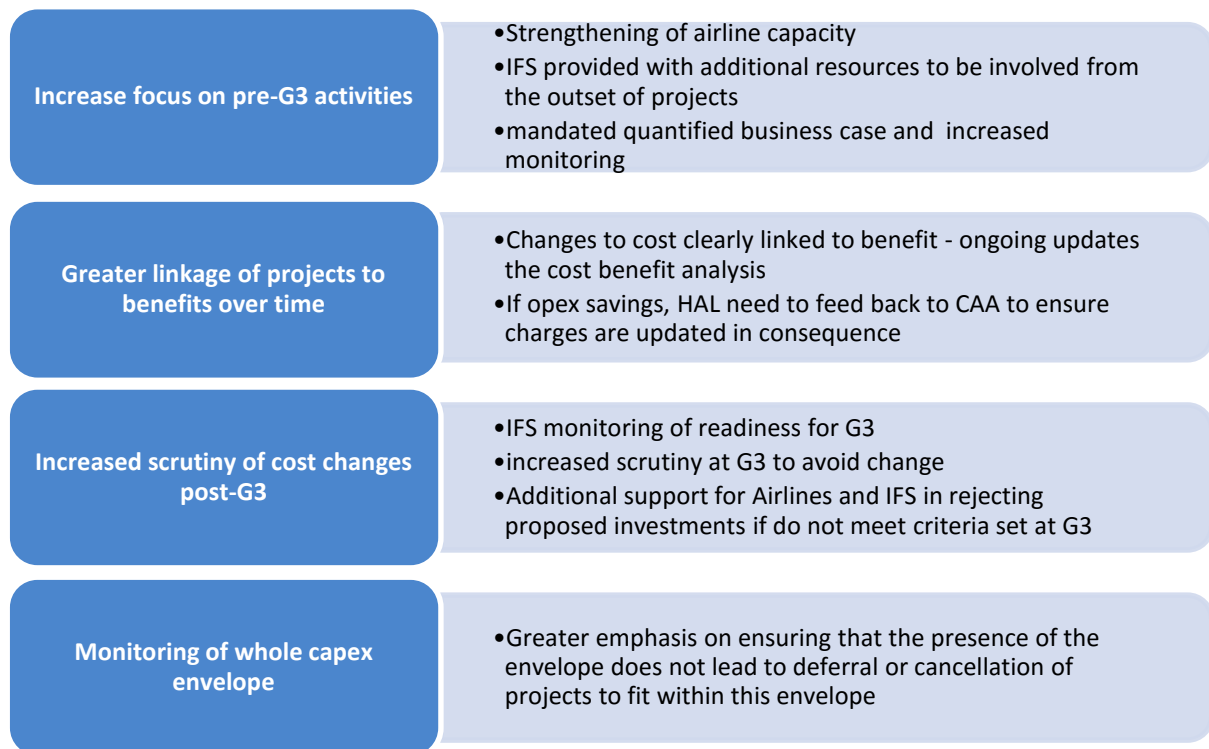
- increased focus on pre-G3 activities;
- greater linkage of projects to benefits over time;
- increased scrutiny of cost changes post-G3; and
- monitoring of the whole capex envelope.

These points align with our recommendations around the process and include supporting the provision of additional resources for airlines, earlier involvement of the IFS and cost consultant and developing quantified business cases prior to G3. In order to maintain a 'light touch' approach, rather than make significant changes to the regulatory regime, this model anticipates increased monitoring of how the process is working. This includes monitoring in relation to project included in the portfolio, business case development, expected opex savings, post-G3 changes in cost and scope and on project selection to ensure that expenditure is not undertaken to simply in order to expend the complete capex envelope.

Increased monitoring of projects if undertaken by the CAA potentially increases its risk of exposure to challenge around capex disallowances and so it will be important that CAA considers its interventions carefully. Notwithstanding this risk, a potential benefit is that CAA develops a more granular understanding of the portfolio over the course of the control period and can limit the work that is undertaken in its ex post review as a result.

Figure 5.1 below summarises this approach:

*Figure 5.1: Model 1: Enhanced Status Quo*

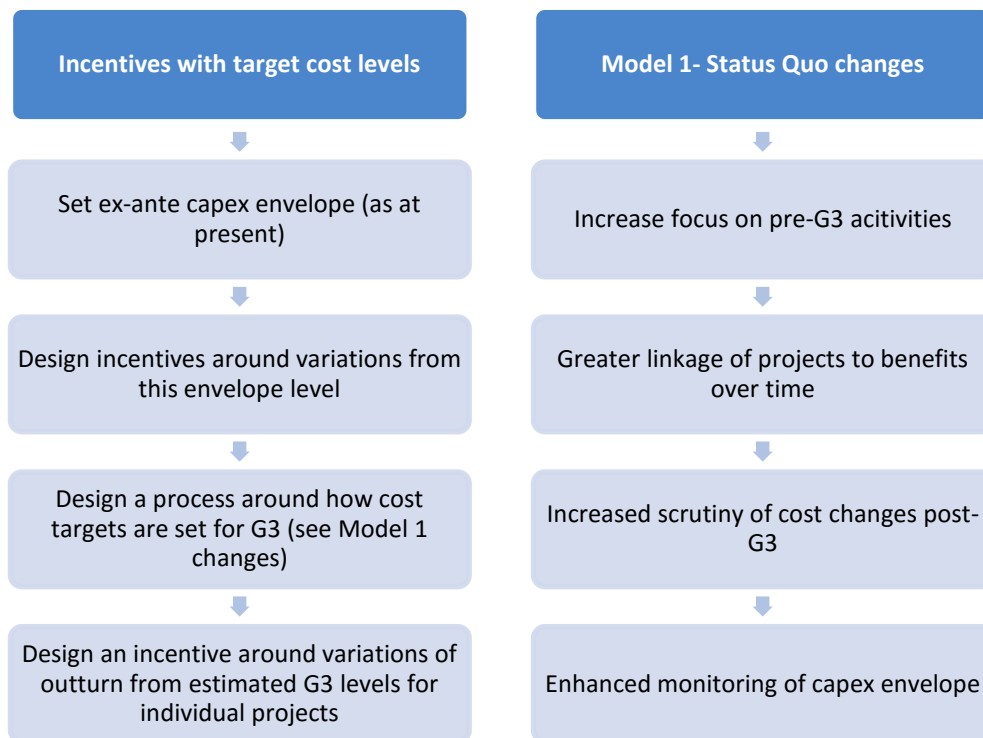


We note earlier in this report HAL’s concerns about setting wider regulatory incentives e.g. setting an assumption that the G3 price is recovered through charges and transferred to the RAB, but the CAA may wish to review how the governance process develops over the next few years and whether current weaknesses are fully addressed. It could then take a view perhaps in anticipation of H7 on whether it wishes to revisit current incentives.

Model 2 would involve the development of a more highly powered incentive framework, building upon Model 1 changes, in particular by setting incentives in place of additional monitoring. The CAA might for instance consider two additional incentives relative to Model 1:

- The first would involve having an incentive operate around the overall level of the capex envelope, with HAL retaining a share savings below this level, such that the incentive to spend up the level of the capex envelope is balanced by a reward for delivering the whole portfolio at lower cost (after taking into account any change in scope).
- The second would relate to the G3 gateway and be designed to encourage HAL to reach firm costs/ benefits before an investment decision is made and discourage cost increases thereafter through the use of cost sharing above the agreed G3 target. There are a number of options available around how these incentives might operate. They do not necessarily need to be applied symmetrically (i.e., identical treatment of under- and over-spends), and can have different characteristics. This model would be applied if the changes in Model 1 were seen to be insufficient. Figure 5.2 below presents the characteristics of Model 2.

*Figure 5.2: Model 2: Stronger incentives*



### Characteristics of cost sharing incentive

There are a number of choices around the design of the incentive. These include:

- Symmetry of incentive: is the same factor applied to deviations above and below the target cost.
- Nature of allowance: capex, opex, or totex.
- Use of dead-bands: is there an amount around the target where there is no sharing.
- Level of sharing factor: what should be the strength of the incentive?<sup>14</sup>
- Target adjustments: is the target revised for certain events or uncontrollable costs?

Both of the model approaches we consider above are designed to provide greater confidence in the governance process and the projects managed under it as they are developed and implemented. As such they shift the emphasis away from the current reliance on ex-post analysis (which inevitably focuses on disallowances rather than on the potential for efficiency as projects are developed).

Given the scale of the challenge in H7 it seems to us unlikely that the current ex post review of capex in isolation will be a sufficient mechanism by which to regulate efficiency and therefore these models represent a potential path towards an alternative regulatory regime for H7. Clearly there are wider questions about the approach to delivering the new runway that are yet to be considered and the regulatory models described here would need to be

<sup>14</sup> Where there is greater confidence around the target, then there would typically be a higher sharing factor.

reviewed alongside the selected delivery approach to ensure that they are fit for purpose in the actual circumstances of H7.

## ANNEX A PROJECT REVIEWS

### A.1. B018 T5 Connections Security Capacity

#### Project scope & description

The key objective of the T5 connections security capacity project was to alleviate transfer congestion during peak times in T5A and to provide capacity for forecast growth. Previously, demand was difficult to manage between the North and South concourse. Existing security lane space and configuration also prevents the offering of a premium security product as at other Heathrow terminals.

The preferred solution was to provide a second transfer route to enable passengers to access both the North and South central search areas by introduction of:

- additional security lanes;
- parallel loading capability;
- new staff accommodation; and
- a new escalator between arrivals and south security.

The contract began on 16 June 2014 and had an original planned completion date of 9 May 2016, with delivery in three tranches. As of March 2016 all build works were complete. Tranches 1 & 2 passed through gateway 6 on 6 November 2015. Tranche 3 passed through gateway 5 on 23 March 2016 and was scheduled to pass gateway 6 on 9 May 2016.

The development budget was £38,879,900. As of March 2016, estimated project expenditure at completion was £37,866,847 - which would be £1,013,053 (2.6%) below budget.

#### Changes to cost estimates

As noted above, project expenditure is currently estimated to come in just over £1m (2.6%) below budget. Build works under the first two tranches were completed close to budget, with a 2% underspend and 2.3% overspend respectively. Although expenditure is set to be near budget overall for tranche 3, several cost items have deviated significantly from expectations.

Over-budget items include:

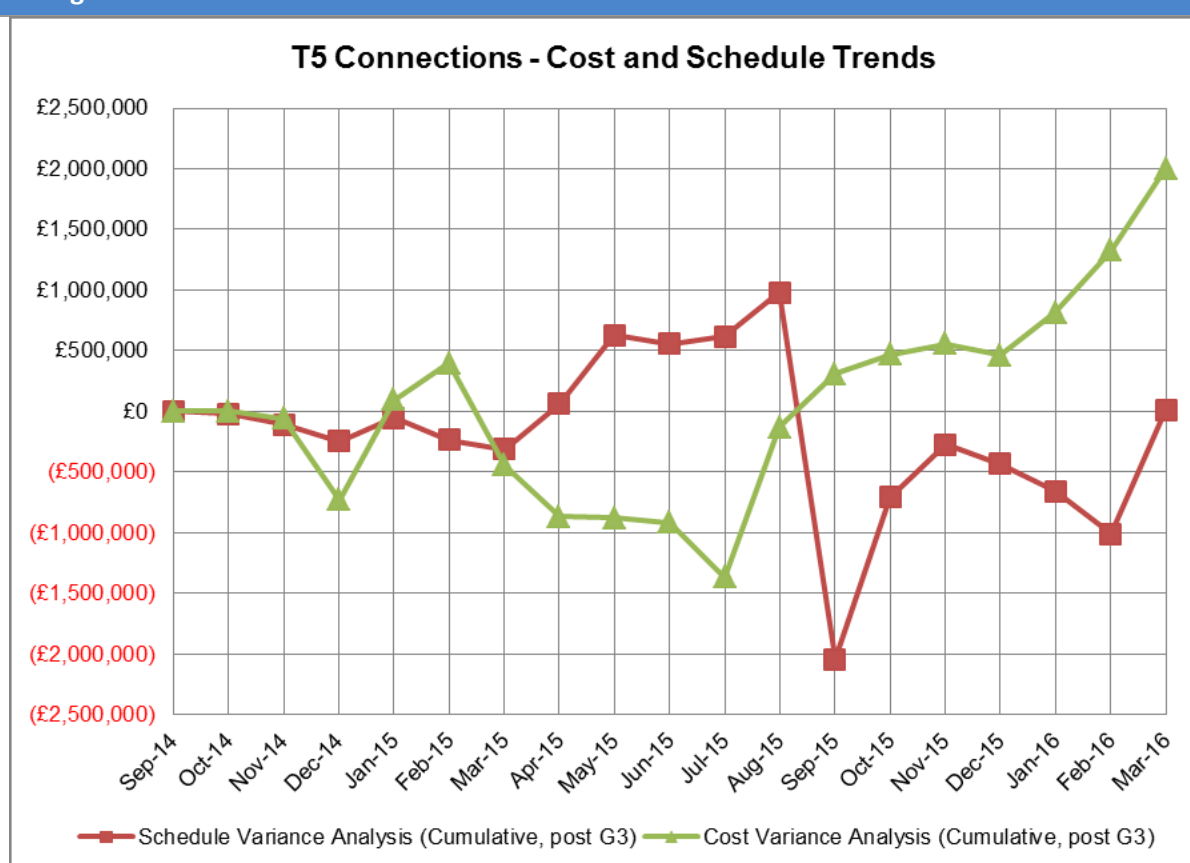
- IT Services - £2,273,493 overspend expected (909% of budget).
- Main contractors Project/design team - £1,885,912 overspend expected (486% of budget).
- Unlet/Opportunity Costs - £1,230,977 overspend expected (354% of budget).
- Superstructure - £1,161,915 overspend expected (73% of budget).

Under-budget items include:

- Services - £2,634,417 underspend expected (91% of budget).
- Main Contractors preliminaries - £2,246,040 underspend expected (83% of budget).
- HAL Development/Project Costs - £1,663,037 underspend expected (73% of budget).
- "Risk" had a budget line of £942,481 which was not used.

The chart below shows expected cost and schedule variance from budget as reported over the period in which the IFS has been reviewing monthly performance.





Schedule variance (red) finishes at zero to reflect timely project completion. Cost variance rose during the last three months of the project to reflect gradually falling estimated expenditure at close - though this includes reduction of the risk allowance line item consistent with a project nearing completion.

The negative cost variance during 2015 was attributed to three causes:

- Evolving design development as the DI gained better understanding of the complexity of the works.
- Adjustment from a five day to six day working week to meet the revised schedule requirement of having the escalator complete and operational ahead of the Easter 2016 peak period in view of stakeholder interests.
- Elements of price inefficiency following the decision to divide the project into three distinct tranches rather than delivery through a single phase (and dilution of competitiveness through negotiating with the incumbent tier two contractors for the Tranche 3 works, rather than tendering to multiple tier two contractors from the outset of Tranche 1).

The IFS initially mentioned in their G3 note a number of observations regarding costs not being explained properly and asked what is included in specific cost items. The IFS also asked HAL to explain these fully and will include the responses in the monthly reporting. The IFS also raised questions regarding the protocols and rigour that exist for documenting processes that have occurred in tracking and reconciling the costs from the initial tender to the agreed target cost in its tranche 3 G3 report.

BA noted at the tranche 2 G3 meeting that they would need more detail on why costs had changed from P2 to G3. IATA agreed with this. HAL noted that they would respond to these requests in January.

## Changes to cost estimates

IFS reported that the decision to shorten delivery duration had been fully informed by a cost impact assessment and that endorsement was received from the full stakeholder community.

## Role of IFS

The IFS was engaged on this business case from July 2014. Monthly reporting commenced in September 2014. Since then, the IFS has issued the following key reports:

- An initial review report was issued to HAL in August 2014
- The Tranche 1 G3 report was issued to HAL in November 2014
- The Tranche 2 G3 report was issued to HAL in April 2015
- The Tranche 3 G3 report was issued to HAL in October 2015
- Close-out report (not yet available).

Summaries were presented at the Capital Programme Board (CPB).

The IFS also attended bi-weekly stakeholder meetings; stakeholder events; and briefing sessions with the HAL PM team and T&T to observe project progress and issues that have arisen.

For tranche 2, the IFS was provided with clear details that enabled the level of scope definition to be reviewed before the G3 event as the decision to split the project into future tranches was taken.

In February 2015 the IFS requested that HAL provide a Design Management Plan, drawings, system selection and other design reports that exist and that they keep a record of remaining design assumptions and qualifications, as these were not provided for either the remaining project scope (tranche 2 & 3), or tranche 2 on its own.

The IFS noted that the details provided on budget and cashflows fell short of expectations set by the HAL Capital Efficiency Handbook, and Cost Estimating procedures.

No organisation structure or management plan was provided, according to the G3 Tranche 2 report in Feb 2015.

IFS was not provided with a procurement or contract strategy as part of the G3 Tranche 2 report or the wider business case.

## Business case methodology

The Requirements Document (15000-XX-BR-XXX-000062) clearly and concisely sets out the objectives of the project as they have developed and evolved through the life of the business case, the primary objective being “to reduce transfer congestion and increase the efficiency and capacity of T5’s security facilities to provide for peak demand and forecast growth”.

The business case comprises content from a Benefits Map, the Requirements Document, Schedule and cost and risk reports.

The outputs and capabilities on the Map are confirmed as the additional security lanes, parallel loading capability, new staff accommodation and the new escalator between arrivals and south security.

The Outcomes are mapped as improved passenger experience, improved efficiency in security operations and happier staff, offset by an impact on OPEX and REVEX due to reconfigured retail accommodation resulting in less retail space. The project documentation suggests that opex is likely to increase by £996k (see Capital Board Approval documentation), which is c.£1.94m less than the

## Business case methodology

P2 estimates. However, this is offset by an increase in total capex from £24.7m to £35m. Overall, net revenue between P2 and the CPB approval improved by £4m.

Overall the project is expected to deliver c.£10.6m EBITDA loss, which is lower than the £18.2m loss forecasted at G2 and the £16.5m loss forecasted at P2.

## Cost scrutiny and benchmarking

The T&T value for money (VFM) report sets out the Independent “Should Cost” Estimate and Methodology, benchmarking details and a summary of the processes undertaken in determining the DI’s Target Cost and Cost Plan.

The VFM report used the T3 Baggage Hall & Immigration Hall refurbishment, T3 Pier 7 Refurbishment, and T4 Refurbishment as high-level comparators. Based on these, the T5 Tranche 3 works compared favourably.

For Tranche 3 works, the HAL PM/T&T team decided that the incumbent second tier contractors for Tranches 1 and 2 would be invited to submit quotations and then agree a cost, rather than seeking competitive tenders from a range of subcontractors. The rationale behind this was primarily schedule driven. Whilst it would have been preferable to seek competitive tenders from a range of tier two subcontractors, the IFS considered the approach to be reasonable for the following reasons:

- an increase in market activity had made subcontractors more selective about the projects that they bid for;
- Mace and T&T had knowledge and relationships with second tier subcontractors who were delivering tranches 1&2 in an effective manner either on or ahead of schedule; and
- the existing second tier supply chain understood the site constraints and logistics, which assisted in removing ambiguity and helped realistic costing.

The VFM report confirmed that the target cost had undergone rigorous review and challenge to ensure that the target cost was at its optimum level.

According to the IFS tranche 3 G3 report the DI should cost estimate for both elements of tranche 3 were £8.63m and £13.17m for overall costs. However, target total costs for tranche 3 are £12.26m and £17.41m for the DI and overall costs respectively, which are £3.63m and £4.24m higher than should cost estimates. HAL’s cost consultants (T&T) attribute this to the labour costs associated with having to work more than 5 days a week on this site and aspects of the design that have increased the costs.

The IFS reviewed the tender returns that made up the DI cost and was satisfied that a reasonable degree of transparency existed, tracking the tender through to the Business Case. The IFS questioned what protocols and rigour existed around documenting the process for tracking and reconciling costs from initial tender to agreed target cost. There were no records of discussions, meetings or correspondence that comprised negotiation and settlement of the target cost, so the IFS could not test the assumption that the HAL / T&T team used its best endeavours throughout the process to secure the best value for the project.

In the tranche 2 G3 report the IFS noted that no benchmarking had been undertaken in line with HAL Cost Estimating procedures at the time of reporting.

The IFS noted that the ‘retail estimate’ of costs needed to be broken down further and benchmarked against similar Heathrow projects.

### Cost scrutiny and benchmarking

The IFS noted that items including DI's overhead and profit were priced in accordance with recognised and agreed levels and are consistent with HAL and DI Contract Nr HAL0396. Preliminaries totalling 21% were in line with levels seen elsewhere at the airport.

### Involvement of supply chain

The following contractors were appointed on the project:

- Cost and Commercial Consultant – T & T
- Programme designer – Arup
- DI – Mace

The building contract was provided under the Heathrow Works Contract with Main Option (C & E). The Tranche 1/Early works were procured under a Target Cost contract (NEC Option C), with a pain/gain incentive for the DI to deliver to or better the budget (in accordance with HAL's favoured method of engagement). Due to the uncertainty of existing conditions (a result of a lack of progressed surveys) and consequently a design that did not run in line with the desired project timeline, Tranche 2 was delivered as a cost reimbursable contract (NEC Option E). This placed greater risk on HAL, with cost escalation 100% at the client's risk.

Tranche 3 was procured under NEC Option C (Target Cost), and works were added to the contract for Tranche 1 rather than as a separate contract. The IFS considered this to be a positive and appropriate arrangement.

### Risk management

The IFS states in its G3 report for October 2014 that it was not possible to review the arrangements in place to manage risk of any scope items that will not be undertaken by the DI, where HAL may still hold interface and performance risk.

The IFS notes in its tranche 2 G3 report that the construction cost estimate includes a 7% allocation for risk. Tranche 3 also includes a £1.1m provision for risk (P50) of a total works cost of £12.1m (c.10%).

As part of its tranche 3 report IFS noted that a risk register had been developed containing 35 open threats, 11 of which were amber. Of the 14 risks that are assessed as requiring a cost provision, 5 are amber with a range of cost of £633I-£1.3m.

The latest risk register notes that only 2 open threats remained as of March 2016, which included the Mace final account and the design not being to BA's/end user's requirements.

### Triggers

The AOC noted in the tranche 2 G3 meeting that the trigger definition needs to be reviewed and potentially updated at the trigger sub group since the phasing of the work has impacted on the relevance of the escalator delivery as the trigger milestone.

The latest IFS report states that the trigger for tranche 3 as 'Access via New South Escalator from Transfer Arrivals (from Level 10 to 30), the date of which is May 2016.

### Triggers

It is not clear whether the project trigger is specifically linked to outputs from reviewing the project documentation.

### Lessons learned

The Lessons Learned Log for these works [04/07/2014 15000-XX-KN-XXX-00036] was not provided. However, the IFS issued several schedule-related recommendations in its Tranche 3, G3 report in response to the added complexity arising from separation of the project into three tranches - with three instances of the project schedule being developed. The IFS recommended that:

- HAL should consider establishing an Integrated Master Schedule for projects with multiple tranches where there are logic linkages between DI and IT schedules;
- An integrated management structure should be provided showing all the delivery parties (including IT), across all tranches;
- Adequate schedule benchmarks are prepared to demonstrate confidence in delivery; and
- Further detail is provided around key interfaces within the schedule to monitor progress.

### Other notes

The Stakeholder Management Plan logs all instances of engagement that have occurred since February 2014, which has included a regular fortnightly joint stakeholder forum and site visits. The IFS confirms that regular dialogue and consultation with Stakeholders appears to have occurred. The Requirements Document (15000-XX-BR-XXX-000062 v.2 dated 23 July 2015) clearly summarises the requirements of: British Airways; Security; Retail; UKBF; PRM; Operational Readiness; and Training.

As regards specific airlines, the documents suggest that BA was engaged in the discussions, but there is little reference to other airlines. BA staff appeared to understand some of the technical aspects of this project.

## A.2. B051 T3 Integrated Baggage (T3IB)

### Project scope & description

The Terminal 3 Integrated Baggage (T3IB) Project has been in process for a number of years with the original statement of need created in 2007. It is designed to provide a modern, highly automated baggage system for T3 carriers, which integrates with T5 to provide quick and reliable baggage transfers.

The original governance for the project took place in Q5 and completion for the main building was planned for November 2014. Consequently this project has spanned two regulatory periods, Q5 & Q6. The works to be delivered in Q6 include:

- Completion of the 'Main Building', a separate facility containing the baggage sortation, screening and make up capability.
- Delivery of the cut in works for the existing Terminal 3 baggage hall connecting the new system to the existing check in and arrivals system.
- All transfer bag inputs into and out of the systems including the T5 Baggage System and tunnel via the Western Interface Building.

The overall value of works to be completed in Q6 is now £87.5m. Construction programme spans from 9<sup>th</sup> of January 2012 to 31<sup>st</sup> of October 2016.

The scope has been organised in the following structure comprising individual supplier scopes of work:

Control Account No.	Work Breakdown Element	Supplier
1	Enabling Works (Design and Delivery)	Ferrovial
2	Main Building	Ferrovial
3	Baggage Systems	Vanderlande Industries (VI)
4	HBS Baggage	Vanderlande Industries
5	HBS Baggage (existing buildings)	Vanderlande Industries
6	Minor Building Works	Mace
7	HAL IT Specialist Systems	Cap Gemini
8	Existing Buildings	Mace
11	Existing Buildings- Baggage System	Vanderlande Industries
12	Transfer Docks Relocation	-
13	TD Management	HAL
14	Managed Services/Integration	Jacobs
15	Business Change Management Team	HAL
16	Risk/Opportunity	-

## Changes to cost estimates

There is a chronology in changes of costs and cost overrun throughout this project.

### 1) Changes until 2013

T3IB was originally estimated in the Q5 CIP at £234m (outturn), with a forecast completion date of December 2011. In March 2012 the EAC was increased to £360m (outturn) with a forecast completion date for the main building of September 2014, and an operational date of December 2015. At the 3rd June 2013 Planning & Regulation Board (PRB) HAL reported to the airlines that the **EAC was now £435m**. The cost increase at this time was split £40m in Q5 and £35m in Q6. The airline community indicated it was not prepared to finance this further increase as HAL had not consulted on the spend, and the airline community could not be assured it was efficiently spent.

	Q5	Q6	Total
March 2012	£308.2m	£51.1m	£359.3m
June 2013	£352.4m	£82.1m	£434.5m
December 2013	£343.9m	£90.3m	£434.2m
March 2013	£341.9m	£92.3m	£434.2m

### 2) Changes from 2014

A £43.8m variation in costs was first reported by HAL in September 2014. **At December 2014 period end the project reported an Estimate At Complete (EAC) of £478.9m including the value of this 'variation' (£43.8m) against a budget of £435m.** The variation represents 10% of project budget pre-variation and 47% of Q6 budget. Initial trigger date of 29<sup>th</sup> of January 2016 was delayed due to the following:

- Vanderlande Industries Software Prolongation – schedule movement from 11 November 2014 to 6 February 2015
- Operational Readiness Prolongation – schedule movement from 11 December 2014 to 3 March 2015
- EBH Site Integration Prolongation – schedule movement from 9 February 2016 to 17 May 2016

Cost items are categorised by the IFS in 4 categories:

- Prolongation: costs associated with extension of time;
- Price growth: price increases for the project but not related to prolongation, product robustness or scope related.
- Product robustness actions: additional activities post implementation of the variation related to additional testing and operational support; and
- Enhanced scope.

As shown in the table below, 29% of the variation in costs comes from prolongation, 33% from price growth for existing scope, 37% from additional product robustness actions and 1% from enhanced scope.

## Changes to cost estimates

Activity ID	EAC_P6	Plan D	Variance	(a) Prolongation	(b) Price Growth (Complexity)	(c) Product Robustness Actions	(d) Enhanced Scope & Content	Total	Variance	Comments based on estimate certainty
CA 1 FAUK ENABLING (DES & DIVER.)	14,880,981	14,880,981	-	-	-	-	-	-	-	No change
CA 2 FAUK BUILDING	131,774,963	131,774,963	-	-	-	-	-	-	-	No change
CA 3 VI BAGGAGE	128,985,689	147,946,000	18,960,311	6,081,416	919,421	10,759,474	1,200,000	18,960,311	-	Estimate cost review based on most likely plus 10% values
CA 4 VI HBS BAGGAGE	6,429,550	6,429,550	-	-	-	-	-	-	-	No change
CA 5 HBS EXISTING BUILDINGS	3,850,001	3,850,001	-	-	-	-	-	-	-	No change
CA 6 MINOR WORKS	11,895,272	12,645,272	750,000	600,000	150,000	-	-	750,000	-	Limited data received
CA 7 HAL IT SPECIALIST SYSTEMS	25,521,922	27,821,922	2,300,000	500,000	-	1,800,000	-	2,300,000	-	Estimate cost review based on most likely plus 10% values
CA 8 EXT. BLDG. BUILDINGS	22,037,691	26,887,691	4,850,000	800,000	1,800,000	-	2,250,000	4,850,000	-	Estimate cost review based on most likely plus 10% values
CA 11 EXT. BUILDING BAGGAGE	18,764,566	21,404,566	2,640,000	1,880,000	-	760,000	-	2,640,000	-	Estimate cost review based on most likely plus 10% values
CA 12 TRANSFER DOCKS RELOCATION	4,200,000	4,200,000	-	-	-	-	-	-	-	No change
CA 13 TD MANAGEMENT	44,943,884	49,199,116	4,255,232	753,232	400,000	1,310,000	1,242,000	3,705,232	550,000	Estimate cost review based on most likely plus 10% values
CA 14 INTEGRATION SUPPLIER (MSP)	25,745,190	26,530,190	785,000	585,000	-	100,000	100,000	785,000	-	Estimate cost review based on most likely plus 10% values
CA 15 BUSINESS CHANGE	2,340,749	4,049,124	1,708,375	1,108,375	-	500,000	100,000	1,708,375	-	Estimate cost review based on most likely plus 10% values
CA16 INFLATION	1,103,653	-	- 1,103,653	-	-	-	- 1,103,653	- 1,103,653	-	-
CA16 THREAT	4,076,900	7,675,000	3,598,100	-	-	3,598,100	-	3,598,100	-	-
CA16 OPPORTUNITY	- 2,710,386	- 2,210,000	500,386	-	-	500,386	-	500,386	-	-
CA16 HLC EAC VALIDATION	- 11,000,000	-	11,000,000	-	11,000,000	-	-	11,000,000	-	-
CA16 UNCERTAINTY	2,147,000	3,207,930	1,060,930	-	-	600,000	460,930	1,060,930	-	Limited data received
T3IB JOURNAL PLAN	-	- 7,434,000	- 7,434,000	-	-	- 3,600,000	- 3,834,000	- 7,434,000	-	Limited data received
<b>01 T3 Integrated Baggage System</b>	<b>434,987,625</b>	<b>478,858,306</b>	<b>43,870,681</b>	<b>12,308,023</b>	<b>14,269,421</b>	<b>16,327,960</b>	<b>415,277</b>	<b>43,320,681</b>		
			<b>Percentage Increase</b>	<b>29%</b>	<b>33%</b>	<b>37%</b>	<b>1%</b>			

The 3-month deferral on the completion date meant that the trigger penalty was enacted (circa £1.1m).

The overall value of works to be completed in Q6 went down from £92.3m to £87.5m. As of July 2016, the EAC is estimated at £128m with a variation of £40.5m compared to baseline.

As noted by the IFS, the level of fluidity in the baseline at control account level remains abnormal at this stage of completion of a project. In their monthly review in June 2016, they noted that no corresponding change records were provided for packages whose baseline had changed during the month.

## Role of IFS

The IFS conducted a variation review in and published a final version of this in October 2015 (although the review was previously shared with HAL as early as April 2015) as a result of the £43.8m variation in costs. They pointed out that “*evidence exists for stakeholder consultation regarding scope of activity however the cost and time impacts were not signed off*” and also that they “*have not been provided with any client change management records (for the purpose of stakeholder endorsement and funding) to support the introduction of product robustness actions or new scope. Heathrow did not produce a CCRS as the stakeholder community made clear that approval would not be given*”.

The IFS are meeting monthly with the HAL cost and commercial team to review information issued relevant to project close out. They produce a monthly report to review the project. In their July report for the T3IB project they noted that they were still waiting for further evidence on two key points below:



## Role of IFS

- Evidence that HAL apply an appropriate level of governance structured around delegated authorities for each type of change/budget movement
- Evidence that risk contingency is subjected to governance control

The IFS note in their variation report that they were provided with insufficient information in the following areas:

- No client change management records (for the purpose of stakeholder endorsement and funding) which would have supported the introduction of product robustness actions or new scope;
- incorrect schedule information (as noted in November 2014) and progressed detailed analysis before suspending the review and meeting the project team to discuss this; and
- limited information regarding the direct links between the schedule and cost impact assessments, meaning that they could only provide a top-down view of the relationship between cost and time.

## Business case methodology

In a 2014 meeting it was noted that HAL would provide a quantification of the opex impacts (maybe using a % impact mechanism). No quantification of the opex savings could be found in the project documentation.

The benefits for the T3IB project are discussed qualitatively in the documents provided, and are mentioned in the project scope & definition section. The operational improvements brought about by the project will benefit both HAL and the airlines using the facilities.

## Cost scrutiny and benchmarking

In their variation review in October 2015, the IFS provided a detailed cost commentary and benchmark information. The IFS recommended in their Variation Report that as costs were finalised for implementation at the time of reporting evidence of value for money should be produced to provide assurance at that point.

The IFS Variation Report states that where the cost estimate has been based on resources over time, the IFS has been able to benchmark the rates utilised and confirm that these are reasonably reflective of the current market. However, where a lump sum price is provided with little scope definition to support it was not possible to provide a useful benchmark.

In the latest IFS monthly report, the IFS has reviewed each of the four CEMAR contract status report and provided the summary table below with the agreed final contract Total of Prices. It shows that the Total of Prices continues to increase as impacts of items are closed out.

In particular, they have noted for one of the four contracts, the VIP Suite Demo/EBH, that anticipated total of the prices keep changing each month.

IFS have requested clarification on prices against recorded client change and associated governance.

	Apr-16	May-16	Jun-16	
The Contract Price	49,234,855	49,234,855	49,234,855	0
Total Change to the Prices for Implemented Compensation Events	139,080,524	141,448,346	141,779,598	331,252
<b>Revised Total of the Prices</b>	<b>188,315,379</b>	<b>190,683,201</b>	<b>191,014,453</b>	<b>331,252</b>
Estimated Change to the Prices for Non Implemented Compensation Events	2,084,500	1,954,000	1,723,500	-230,500
Quoted proposed Change to the Process for Non Implemented Compensation Events	1,505,241	1,099,822	1,089,644	-10,177
<b>Anticipated Changes to the Prices</b>	<b>3,589,741</b>	<b>3,053,822</b>	<b>2,813,144</b>	<b>-240,677</b>
<b>Anticipated final Total of the Prices</b>	<b>191,905,119</b>	<b>193,737,023</b>	<b>193,827,597</b>	<b>90,575</b>

The MPR report for T3IB presents performance data for the entire project to period ending June 2016:

Project/ Scope Packages	TOTAL			IN PERIOD			POST G3: CUMULATIVE TO DATE		
	Baseline	Estimate At Complete (EAC)	Variance At Complete (VAC)	Baseline	Actual Cost of Work Performed (ACWP)	Budgeted Cost of Work Performed (BCWP)	Baseline	Actual Cost of Work Performed (ACWP)	Budgeted Cost of Work Performed (BCWP)
	CA1 FAAL Enabling	14,880,986	14,880,981	5	0	0	0	14,880,986	14,880,981
CA2 FAAL Building	130,504,962	130,504,962	0	0	0	0	130,504,962	130,504,962	130,504,956
CA3 VI Baggage	144,571,012	140,897,999	3,673,013	0	0	0	144,571,012	140,897,999	144,571,012
CA4 VI HBS Baggage	6,429,549	6,429,551	-2	0	0	0	6,429,549	6,147,563	6,146,872
CA5 HBS Existing Buildings	3,850,000	3,331,899	518,101	0	0	0	3,661,342	2,896,007	2,895,695
CA6 Minor Works	15,100,315	13,321,009	1,779,306	0	0	0	15,100,315	13,221,009	13,203,080
CA7 HAL IT Specialist Systems	27,091,671	26,104,299	987,372	101,564	115,464	231,275	26,857,538	25,654,658	25,657,519
CA8 External Buildings	28,262,610	26,360,570	1,902,040	1,222,733	937,251	801,950	27,250,354	22,639,361	22,540,776
CA11 Ext Building Baggage	26,602,487	25,031,683	1,570,804	901,255	1,065,489	0	26,328,724	24,530,599	23,466,107
CA12 Transfer Docks Relocation	4,385,000	4,385,000	0	0	0	0	4,385,000	4,385,000	4,385,000
CA13 TD - Des/Dev	48,789,253	49,177,657	-388,404	64,502	312,885	0	48,638,781	50,780,980	48,422,861
CA14 Integration Supplier	26,865,486	26,840,484	25,002	85,229	0	0	26,348,703	26,761,300	26,722,553
CA15 Business Change	3,433,122	2,553,534	879,588	147,000	60,476	0	3,202,106	2,438,283	2,376,448
CA16 Threat Opps Inflation	175,838	646,934	-471,096	0	0	0	0	0	0
Journal Plan	-7,434,000	0	-7,434,000	0	0	0	-1,500,000	0	0
EVM Adjustment Line to enable EV to end of Project	-43,320,673	261,850	-43,582,523	0	0	0	0	0	0
Adjustment from Total Project to Q6 Only	-342,690,626	-342,690,228	-398	0	0	0	-342,690,626	-342,690,228	-344,322,422
No Detailed Performance	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>87,496,992</b>	<b>128,038,184</b>	<b>-40,541,192</b>	<b>2,522,283</b>	<b>2,491,565</b>	<b>1,033,225</b>	<b>133,968,746</b>	<b>123,048,474</b>	<b>121,451,440</b>

## Involvement of supply chain

The Orange Partnership Report which is an independently commissioned review of the project highlighted that the DI contract went for a Target Price to a Cost Reimbursable contract, placing predominant commercial risk with the client. The review pointed that the HAL/Jacobs team did not conduct enough verification of costs on the VI contract as recommended in the review.

This review pointed out some issues with the quality of the commercial management applied to the VI account during the delivery phase.

When deciding to postpone the Go-live date of the project to March 2015 (3-month delay from the initial launch date), HAL engaged with VI at a senior level to get their commitment and engagement.

It was questioned whether VI should suffer financial consequences from delay but HAL advised that it was difficult to keep them engaged to complete the project without due recompense.

## Risk management

The latest IFS report notes that it has received a risk register, along with the risk headlines reported in the MPR, a cash-flow and risk drawdown analysis dated June 2016. The risk drawdown schedule reports that a net of c.£571k has been realised as opportunities. The Risk Register provided did not provide pre-mitigated scores for risks and opportunities (although it had previously been provided). Of the 28 active risks listed, the IFS noted that six did not have a mitigation action identified. This was the same figure provided in the five previous reporting periods. The risk exposure closeout for the open risks was also moved back from May to July 2016. This had been moved back previously, which the IFS stated that this implied a lack of planning behind the mitigation actions had taken place.

The latest IFS report also notes that the risk EAC as a percentage of the remaining work (ETC) was 13% which in its opinion was reasonable. However, the percentage of risk exposure against ETC was 31%, which indicated that there was a high value of risk for the remaining work and highlights that there may be items on the risk register can be retired.

## Triggers

The trigger is defined as 'T3IB cut-ins completed and baggage system operational' and the initial trigger date was 29<sup>th</sup> January 2016. However, this was delayed due to the following:

- Vanderlande Industries Software Prolongation – schedule movement from 11 November 2014 to 6 February 2015
- Operational Readiness Prolongation – schedule movement from 11 December 2014 to 3 March 2015
- EBH Site Integration Prolongation – schedule movement from 9 February 2016 to 17 May 2016

The monthly rebate is based on the P50 capital value of £82.1m at was set at £366k per month.

## Lessons learned

This project showed in Q5 issues with:

- Management of project scope, schedule and cost

### Lessons learned

- Cost overrun due to delays in re-engineering requirements which were both rejected by carriers
- Linkage with related projects not governed at an umbrella level
- Design changes: project had several external designers throughout development prior to appointment of designer late 2009
- Lack of BAA scope definition leading to cost and programme uncertainty

Overall the project has exerted issues with:

- Cost overrun
- Cost changes and governance
- Commercial approach

### Other notes

In the CAA Economic Regulation at Heathrow Airport dated April 2014, the CAA stated “that it should disallow £30 million from the RAB due to capital inefficiency. The test it used is whether the expenditure would have been incurred by an efficient operator, and for the reasons stated in the ASA report, the CAA considered that this expenditure was inefficiently incurred. The CAA has also stated that it will remove a further £35 million of expenditure forecast in Q6 from HAL's RAB, pending a review of the efficiency of that expenditure once the project is complete

### A.3. B111 Enabling Wide Body Growth Sierra C

#### Project scope & description

The project under BC 111 overall aims to improve airfield ground infrastructure during Q6 to facilitate growth in average aircraft size at Heathrow. The works proposed should remove the constraints that restrict Code F aircraft using Taxiways Alpha, Sierra and Bravo.

This follows a large forecast increase in the use of A380s from T4 and T5. The benefits of the project include improved transfer time. The project is split into four different areas:

- Bravo Taxiway
- Sierra A
- Sierra C
- Stand 255 upgrade

The G2 exit gateway in July 2013 split the project into these elements. The G1 gateway was in January 2013. G3 was in July 2014, with Morgan Sindall appointed as Delivery Integrator that month.

#### Changes in cost and scope

IFS note in their G3 report that there was an inconsistency between the G2 P50 cost included in T&T's documentation and the cost included in the ECH document. According to HAL, the IFS was just getting set up at the time of reporting and therefore needed to get up to speed with what each number referred to, as one was the actual P50 whereas the other was an earlier estimate.

The increase in cost to G3 since G2 was noted to be due to a change in scope, including:

- Mitigating stepped level changes
- Widening of the S6 Link
- Change of design solution for taxiway to improve whole life costing (i.e. reducing airport opex to increase capex)
- All night work to minimise impact on airport operation

Between G2 and G3, the costs increased by £2.7m (19% of the budget) due to new items being brought into scope. An example of this was not including the estimated cost of £200-400k for S6 Rapid Exit Taxiway (RET) works, although this was identified as required in the Business Case. Total costs increased from G2 to G3 by £5.3m (or £5.9m if considering Morgan Sindall's price), with other costs increases being to prelims, design fees and overheads. The IFS then noted that it could not comment on these elements without reviewing the detailed supporting documentation.

There were a number of scope changes identified by the IFS that were not used to inform Solutions Development and subsequently G3.

In addition, there were changes made to scope that could have stemmed from affordability:

*"The IFS highlighted as an example an item in the Sierra Taxiway Risk Register (May 2014) where a decision was taken to reduce the asphalt thickness to meet budget constraints accepting the risk that asphalt surfaces can fail prematurely leading to early remedial works which would have both cost and operational impact at a later date. The IFS remain concerned that the likelihood of this occurring has been deemed to be 0% and therefore no allowance made. The IFS would recommend that a provisional allowance for this be made within the asset management budget for H7. Our experience at other UK airports suggests that the life of asphalt surfaces often falls short of its expected life."*

## Changes in cost and scope

The Sierra C Taxiway project was delivered £800k (4%) under budget.

In their close-out report the IFS note that the project team experienced difficulties in accurately forecasting costs, but this was remedied in the final four months of the delivery stage.

The budget value (G3 cost estimate) indicated in the business case document provided for IFS review at the G3 event was £15,881,437 (inclusive of risk and on costs). The table below provides a breakdown of G3 project cost estimate as presented in the Business Case document.

Cost Element Value:

Base Cost £10,360,897

Project Specifics £2,191,684

On-Costs £1,823,856

Risk £1,505,000

The above G3 estimate was explained to be in a -/+10% accuracy range. Also it is noted that the estimate was excluding scope of works for S6 RET that was estimated at the time to be between £200k and £400k.

The G3 Authority P50 Breakdown Report is indicating an authority P50 figure of £18.224m; (Implementation - £15,372,216; Additional Costs - £1,175,975; Risk - £1,675,000).

We also note the following as presented in the Estimate & Benchmark Report for B111 – Sierra C taxiway Refurbishment - dated July 14:

- Morgan Sindall (Delivery Integrator) Target Cost Offer was £15.37m. This was explained to have increased from the initial value of £9.429m, offered during the DI tender period, due to instructions to include additional scope and amended design solutions.
- G2 P80 estimate was £13,638,449
- G3 P50 estimate incorporating Morgan Sindall target price was 18,943,922. This included £2.7m of additional cost in respect to the G2 estimate, the remainder of the c£5.3m difference between the two was split between prelims, design fees and overheads.

IFS understanding is the G3 sanctioned budget for the Sierra C project was £15,881,437 as indicated in the business case document.

*“The agreed DI contract price was £15,695,396 this is circa 50% more than HAL original G3 cost estimate. While we have limited information showing that part of this was related to additional scope (that was not factored in the original G3 estimate) we lack any evidence around governance for this significant increase in the DI contract price.*

*The DI final contract price was £20,173,650 ~ c29% increase from the original contract price, though we note that this included for circa £1.66m of additional scope transacted into the project from other business cases. The rest of the price fluctuation is related to change being implemented in respect to surveys / uncharted underground services, risk realisation, and delays associated with asphalt quality and batching plant. The overall at completion cost of the project was £20,767,181, comparing this to the final baseline cost (after all change has been implemented) we note the project has underspent by c£1.9m, if we exclude the £1.1m (DI) contractor pain/gain share.*

*While the 9% underspent is positive for the project, we highlight inefficiencies regarding management of change (e.g. savings not being transacted in the client baseline) and in agreeing the original DI contract price (c50% escalation in respect to the original DI offer) that may have impacted on the overall pain / gain share mechanism. Analysing at a scope package level we note significant underspends in respect to the External Works scope package ~ £1.9 m and Main Contractor Preliminaries ~£1.1m. As a consequence we highlight potential initial ‘overestimating’ in respect to the project scope of works, this having a direct impact on the DI pain/ gain share.”*

The figure below shows change since the awarding of the contract to Morgan Sindall.



Scope Packages	Baseline	EAC	Variance at Completion (VAC)	% VAC
Airfield Pavement and Airbridges	£2,292,727	£2,173,911	£118,816	-5.2%
External Works	£10,126,864	£8,194,190	£1,932,674	-19.1%
Facilitating Works	£681,474	£434,049	£247,425	-36.3%
HAL development/ project oncosts	£3,185,189	£3,678,086	£492,897	15.5%
Main Contractors Risks & Credits	£417,818	£0	£417,818	-100.0%
Main Contractors Overhead & Profit	£354,641	£354,641	£0	0.0%
Main Contractors Preliminaries	£4,033,437	£2,921,443	£1,111,994	-27.6%
Main Contractors Project/ Design Team	£555,606	£467,580	£88,026	-15.8%
Risk (HAL)	£1,911,052	£20,000	£1,931,052	-101.0%
Services	£644,062	£323,292	£320,770	-49.8%
Substructure	£1,201,680	£1,099,989	£101,691	-8.5%
Unimplemented Change	£0	£0	£0	
DI Pain/Gain Share	£0	£1,100,000	£1,100,000	
	<b>£21,582,446</b>	<b>£20,767,181</b>	<b>£815,265</b>	<b>-3.8%</b>

### Role of IFS

The IFS undertook their G3 report in August 2014. They note that this was constrained by the provision of documentation late in the process of review. This includes not having received an up to date Schedule.

The IFS also undertook a Close Out Report in March 2016.

The project material was first issued to the IFS in May 2014, which formed the basis of the initial review report.

### Business case methodology

The Project Management Plan was deemed to be skeletal and requiring significant work to ensure that it clearly outlines how the project will be delivered and by whom. This also was missing supporting evidence – including a benefits management plan, a benefits options assessment and the benefits map. A comment from the IFS was that this was generic and contained limited written information specific to the project.

### Business case methodology

The IFS noted that evidence was insufficient in early phases of the work:

*“The core survey results showed significantly different thicknesses than recorded and greater variation across the taxiway blocks. Unfortunately the GPR survey was still not complete which could have further confirmed the variations. HWD results were also not available and survey data taken in 2006 has been used to assess the general elastic stiffness of the concrete along Sierra Taxiway. IFS recommend that for all future airfield projects these surveys and assessments are all completed within the Solutions Development stage and pre G3.”*

According to the IFS Close Out report the airlines will be able to reduce their operating costs as a result of the project as a result of the following: i) Optimised taxi routing for T4 A380 operators will reduce fuel burn costs (estimated to be £0.5m-£1m per annum for A380 operators only; and ii) upgrading taxi routing for wide bodied aircraft enables airlines to operate aircraft with greater fuel burn efficiencies (with potential savings estimated as c.20% per pax). In addition, HAL will benefit from a reduction in operating costs through the taxiway asset replacement works minimising AGL energy and maintenance costs (estimated at £42k per annum, or £200k throughout Q6).

These benefits are outlined in HAL’s Business Case, which include targets for reduced taxi time for both A380s in T4 arrival from 27L (13.3mins to 7.3mins) an average time (8.57mins to 8mins) for 27L arrival mode. The impact assessment in the business case also includes lower levels of runway crossings, improvements in pavement condition PCI, improvement in the condition of 600 stands, maintaining the current level of centre-lines on Royal Suite and maintaining 4x code E3 and 2x code E1’s plus punctuality for 747-8 on stands 601.

Additional benefits include reduced environmental pollution and improved passenger and airline satisfaction.

### Cost scrutiny and benchmarking

IFS notes in its G3 report that the design addendum report shows that the team carried out a whole life value based assessment of the options, and identified the optimum value for money.

The IFS refers to benchmarking in its G3 report carried out by T&T in their Estimate and Benchmark report. This makes comparisons with three projects delivering around 20,000m<sup>2</sup> of pavement works at a cost of £400m<sup>2</sup>, which appears to be increasing the overall average benchmark rate. However, the IFS noted that confirmation was needed to understand if these projects are based on similar scope or if additional or unusual works are driving the higher m<sup>2</sup> rates (although no further discussion is provided in the documents).

Atkins, supported by ECH, were appointed as Heathrow’s cost consultants.

### Involvement of supply chain

Morgan Sindall were appointed as the Delivery Integrator for works on site. The IFS did not receive contract documents and so were unable to assess the commercial and technical submission.

With respect to the contracted party, the IFS in their close out report note that:

*“Morgan Sindall has been awarded the contract for design and delivery. The IFS have not received contract documents and therefore have not assessed their commercial and technical submissions. Morgan Sindall had previous experience of working at Heathrow with a full understanding of the logistical environment imposed, previously delivering the rehabilitation projects for the southern and northern runways. HAL utilised the Heathrow Works Contract (based upon the NEC form of contract) with Main Option C- Target Cost, cost reimbursable contract with target cost mechanism*



### Involvement of supply chain

*to incentivise contractor performance. This was an appropriate form of contract and it appears that the Target Cost pain/gain mechanism acted positively, contributing to delivery within stated cost and time targets.”*

### Risk management

IFS note in their Close Out report that throughout the project delivery it has seen evidence of active project risk and opportunity management, though challenges have been experienced by the project team in the period April to June 2015, in terms of aligning risk register reported values and the values reported by MPR. This position was addressed by the project team in the following months. The IFS also noted that it had been presented with evidence of Quantitative Cost Risk Analysis (QCRA) being undertaken on a periodical basis, especially in the later part of the project. They highlighted that it was not always possible to relate the values and movement in mitigation measures to the project figures.

HAL provided a close-out risk register identifying that all project risks had been closed out except one. This risk referred to Premature Surfacing Failure, i.e. the life of asphalt resurfacing will not meet expected ten years before resurfacing is required. This is a consequence of asphalt thickness being reduced to meet budget constraints, and may have an operational impact on HAL.

### Triggers

The documentation suggests that the project did not have a set trigger milestone date.

### Lessons learned

The IFS comment about the overall planning and risk mitigation responsibilities:

*“The IFS conclude from this document and previous risk work that there is good identification of the key risks but that it is not evident who owns the risk and the action in place to mitigate the item in a timely manner.”*

In their close out report, the IFS note that the site team provided by Morgan Sindall worked well and were integrated with HAL’s approach to delivering the scope on site.

The administration of change between HAL and Morgan Sindall proved to be challenging, with improvements being seen in the final months of the project. £1.66m of additional scope was transacted into the business case.

With respect to timings:

*“Throughout the delivery of the project it was challenging to relate the content and narrative from the MPR, associated with the delivery of the works, and the client schedule. Invariably the client schedule did not accurately represent the true status of the project. The lack of maturity in respect to the schedule data and lack of integrity robustness sometimes contributed to errors in the reported project performance data. While we note that the project sometimes demonstrated good progress in respect to site activity, mostly in the second part of its delivery, G5 completion date being achieved earlier than the revised baseline G5 completion date, we highlight that there were more than 2 months delay in respect to the outset 2014 target dates. While we acknowledge that contributors to the movements in respect to the ‘original’ dates were additional scope transacted in from other business cases and delays related to surveys activity, asphalt batching plant and asphalt quality, IFS*

## Lessons learned

*notes that having a more robust client schedule in place might have helped to further minimise impact of these issues.”*

The Close Out report notes that from the start of the IFS' engagement it has been issued with presentation materials provided for the various client governance and stakeholder engagement that were showing that the project team has actively engaged with relevant stakeholders, that they had not been presented with evidence of Gateway sanction for G2 and G3.

While the IFS was provided with a stakeholder management plan and a communication plan that provided for a robust detailed plan to engage with various governance groups, little evidence of the ongoing stakeholder engagement process was provided throughout the IFS reporting period. Therefore, the IFS recommended that greater efforts were made to capture issues and their resolution for the regulatory record.

Having said this, after the IFS acknowledged that the project has been successfully delivered in advance of the revised planned target date, it strongly recommended that all lessons learned from the stakeholder engagement process be captured and made available for other airfield projects at Heathrow.

#### A.4. B116 T3 Connections Security Capacity

##### Project scope & description

This project will provide inbound and outbound coaching facilities and additional security lanes. The existing T3 connections facility will be demolished and a new facility constructed, and a temporary facility will be used whilst the main works are progressing.

The project is required to meet the forecast increase in connecting passenger numbers by 2020.

The construction programme is split into three phases:

- 1) Temporary Facility Works (1<sup>st</sup> June 2014 – 29<sup>th</sup> May 2015)
- 2) Permanent Flight Connection Centre (FCC) (June 2015 – November 2017)
- 3) Removal Interim FCC (January – July 2018)

The project reached G3 on 22<sup>nd</sup> June 2015 and G4 on 8<sup>th</sup> September 2015, in line with the project's baseline assumptions.

##### Changes to cost estimates

The project has a development budget of £74.1m (referred to as the Delivery Integrator (DI) target budget as of May 2015), which includes £15m for the Interim FCC and £39m for the permanent FCC. This is significantly higher than the G2 budget of £39.9m, and £18m higher than the G3 budget as of October 2014. The additional £18m is driven by a range of factors, including better understanding of temporary works requirements (£2m), changes to HAL standards for heating and cooling the building (£2m) and increase in L&L/risk as a result of the changes (£3m). The IFS requested that further clarity be provided on some of the additional costs as £7m was not accounted for. For these costs the IFS states that they may be due to *“a combination of various other design changes/development as documented in the Revised Gateway Report and cost escalation in the construction market, which has experienced marked increases in labour and material costs in the last 12 – 18 months.”*

As of August 2016, the cost Estimate at Completion (EAC) was c.£77.3m, resulting in a Variance at Completion (VAC) of £3.2m above the budget. This variance is attributable to additional costs that were not included at G3, and discovered post-G3 and account for the majority of the cost variance to date. Details of the changes in costs are provided in the table below. As the table shows, nearly 64% of the additional costs reflect the G4 implementation costs that were not taken account of under the G3 budgets. The VAC has remained the same since August 2015. Further, actual spend for the period July 2015 – January 2016 was substantially less than forecast, which is attributed to steelwork being purchased early and vested to help limit the risk of fluctuating steel prices. The IFS stated that *“this is a prudent decision by HAL, removing uncertainty brought about by currency fluctuations experienced since the EU referendum.”*

Project/ Scope Packages	TOTAL			IN PERIOD			POST G3: CUMULATIVE TO DATE		
	Baseline	Estimate At Complete (EAC)	Variance At Complete (VAC)	Baseline	Actual Cost of Work Performed (ACWP)	Budgeted Cost of Work Performed (BCWP)	Baseline	Actual Cost of Work Performed (ACWP)	Budgeted Cost of Work Performed (BCWP)
B116 T3 Connections Security Capacity	0	0	0	0	0	0	0	0	0
CM Forecast Adjustment	0	0	0	0	0	0	0	0	0
External Works	1,454,088	1,454,088	0	19,511	96,596	111,093	527,485	462,016	461,237
Facilitating Works	2,198,978	2,196,324	2,654	30,506	22,929	52,551	2,005,201	1,938,141	1,992,089
Fittings furnishings and equipment	787,546	787,546	0	0	1	0	75,175	75,325	75,175
G5 Implement	0	0	0	0	0	0	0	60,446	0
G3 Implement	1,351,590	1,351,590	0	0	0	0	1,351,590	1,351,590	1,351,590
G4 Implement	0	2,069,281	-2,069,281	0	0	0	0	2,069,281	0
HAL development/ project costs	7,319,921	7,342,455	-22,534	183,614	140,270	123,810	1,950,778	1,896,702	1,898,845
Inflation	0	0	0	0	0	0	0	0	0
Internal finishes	5,467,713	5,467,713	0	4,160	0	0	4,160	0	0
IT Services	2,614,999	3,234,225	-619,226	10,724	10,725	44,194	1,072,897	1,404,168	1,403,993
Main contractors overheads and profit	1,632,514	1,639,306	-6,792	32,822	31,601	36,394	559,837	519,380	556,330
Main contractors preliminaries	5,389,612	5,317,825	71,787	248,815	166,120	239,838	2,604,110	2,493,405	2,540,663
Main contractors Project/ design team	605,677	645,677	-40,000	37,078	52,560	37,251	363,033	370,604	353,352
Main contractors Risk	837,527	797,528	39,999	61,269	0	0	122,596	0	0
Prefabricated buildings and building	0	0	0	0	0	0	0	0	0
No Detailed Performance	0	0	0	302,067	0	0	302,067	0	0
Risk	2,529,640	2,115,259	414,381	46,049	167,906	91,556	1,037,969	1,119,253	1,034,981
Services	7,961,395	8,033,184	-71,789	362,599	262,641	264,325	2,240,441	2,120,907	1,953,598
Substructure	3,084,304	3,475,554	-391,250	31,305	93,892	157,597	602,216	1,070,911	984,477
Superstructure	9,974,438	9,974,439	-1	0	0	0	0	0	0
Unlet/ Opportunity Costs	0	535,446	-535,446	0	0	0	102,716	27,716	27,716
Works to existing structure	812,716	812,716	0	0	0	0	0	0	0
B116 T3 Connections Security Capacity	0	0	0	0	0	0	20,082,815	20,088,677	20,082,812
B116 T3 Connections Security Capacity	20,082,812	20,088,676	-5,864	0	0	0	0	0	0
<b>Total</b>	<b>74,105,470</b>	<b>77,338,832</b>	<b>-3,233,362</b>	<b>1,370,519</b>	<b>1,045,241</b>	<b>1,158,609</b>	<b>35,005,086</b>	<b>37,068,522</b>	<b>34,716,858</b>

## Role of IFS

The IFS was initially briefed on the Business Case in May 2014 ahead of the Interim FCC G3, and their involvement has been continuous through the delivery of the Interim FCC, including briefings and provision of information in respect of the Permanent FCC.

The IFS also undertook a G3 review in May 2015. Comments for the different focus areas are summarised below:

- 1) Scope definition** – The documentary outputs provide sufficient detail regarding the scope for the stage of the project and there were no variations that raised risk or concern.
- 2) Drawings & Specifications** – The level of design information at the G3 stage was appropriate, and it was expected that various aspects of the detailed design would be developed as the works progressed. However, incomplete and absent asset record plans resulted in HAL undertaking additional surveys which revealed a far more complex structure to the existing FCC than originally envisaged. The resultant reprogramming and costs associated with the demolition of the FCC, along with the stand back review contributed to the increase in forecast cost. The IFS questioned whether additional or more effective survey work could have been undertaken at an earlier stage.
- 3) Budgets & Cash Flows** – As mentioned, there was a marked increase in the budget from the G2 gateway, following the stand back review and obtaining more detailed information concerning the existing FCC. This forecast cost moved from an earlier indicative forecast of £90m in March 2015.
- 4) Development programme, management structure & resources** – The duration of the delivery programme was deemed adequate, as was the management structure and resources.
- 5) Statutory approvals** – The Solutions Development report contained a section for records of correspondence, but these were incomplete, and therefore the IFS requested that these were updated.

## Role of IFS

**6) Procurement & Contract Determination** – Documents regarding the DI award was seen as suitably comprehensive, which included the project scope for sourcing and specific outputs and deliverables.

**7) Project Outcomes** – The Business Case provided to the IFS was generally well populated and clear.

The IFS is also responsible for producing monthly reports, which provide updates on the progress of the project with regards to expected costs, performance and quality.

The IFS notes in its G3 report that it is not able to review the surveys and drawings undertaken, therefore it did not have a full understanding of the scope and intensity of the survey work and in turn was unable to comment on the thoroughness or diligence undertaken. It also notes that it was not provided with any cash flow profiles to enable observations to be made.

## Business case methodology

There is no discussion on the potential opex savings for investing capex, given that the project is more about expanding services rather than lowering opex. The main benefit of the project will be to increase the capacity for T3 connections by demolishing the existing T3 connections facility and constructing a new one with increased and future safe-guarded capacity improved wayfinding and, together with Gate 324, an increased capacity for coaching. An initial driver of the business case was to also provide a facility that would safeguard against a drop in pier service levels at T3.

As mentioned previously, the IFS noted that Business Case provided was generally well populated and clear for the project. However, according to the IFS G3 report, benefits had not been quantified at that stage.

## Cost scrutiny and benchmarking

The IFS noted in its presentation at the G3 event that the evidence of negotiation and agreement provided required further development to demonstrate VfM.

The Cost & Commercial Consultant for the project (Turner & Townsend, or T & T) undertook an analysis of the DI costs (£39m for the delivery of the permanent FCC structure), which found that the costs were within 3.57% of the HAL “should cost” estimate on a like for like basis and when represented against other facilities it was seen to represent value for money. The benchmarks provided were with piers and satellites which are different in scope and complexity, and the IFS requested that a narrative for this benchmark be provided to support demonstration of value.

In addition, at the G3 event the IFS gave its view that, based on the information provided at the time, the overall budget was reasonable. However, it wanted to see further and more detailed evidence from the project team to support the rigour claimed. Only one Tier 2 supplier was willing to tender on piling due to the project’s complexity, which raised VfM concerns for the IFS. However, in their G3 report they note that the tender was within 8% of benchmark rates and they were allowed to proceed to avoid a 4-6 week delay.

## Involvement of supply chain

The following contractors were appointed on the project:

## Involvement of supply chain

- Cost and Commercial Consultant – T & T
- Programme designer – Arup
- DI – Mace

The building contract was provided under the New Heathrow Works Service Contract on a Target Cost Basis (Option C), which was seen as appropriate. A number of subcontract suppliers will be engaged by the DI under an Option A fixed price subcontract, including:

- Piling
- Structural Steelwork
- Metalwork
- MEP
- Fire alarm

The use of Option A for a proportion of the work demonstrates greater cost certainty for these elements which account for £12.34m of the £38.56m target price (32%).

## Risk management

The IFS notes in its August report that there are three red rated risks in the project's risk register. These include: i) subcontractor insolvency; ii) changes due to stakeholder aspiration being misinterpreted and not effectively captured, leading to increased costs; and iii) operational delays (primarily late flights during craneage activities). These were noted several times and were not expected to change in the short-term. The IFS supported this approach so that they are given higher priority. The IFS notes that risks outside the control of the project remain, and whilst they are identified as portfolio risks, the project has accepted accountability for consequential impact without evidence of a plan to mitigate against them.

## Triggers

The trigger for the project is defined as follows:

*"All connecting passengers in T3 will be using the new FCC facility (the Permanent Facility) in the scope of B116. The Interim Facility has been taken out of service, removed and the stand handed back to operation. The stand will not be fully functional at this point due to certain elements of work still being undertaken to bring stand 323 up to date including air bridge replacement, FEGP upgrade, HHOCo fuel main works, Stand PQ replacement".*

The IFS noted that following regarding risk allowances:

*"The P50 output for risk is £2,755,025. The Budget of £74m includes both this sum and a further £700k for risk associated with the steelwork contractor. This is a joint risk held by HAL and the DI to reflect that this project in terms of contract size is notably more than the steelwork contractor has undertaken previously under the DI at Heathrow and represents a significant proportion of their annual turnover.*

*HAL and the DI are discussing options to deal with this risk, including implementing a series of advance payments to cover the cost of steel orders which is in line with industry practice.*

## Triggers

The G3 Stakeholder presentation documents identify the key risks moving forward reflecting what are considered in the Risk Register (with likelihood denoted as a (%)).

- Complex build methodology (20% based on complexity of the project)
- Transient IT services (40% - based on information from completed surveys)
- Unexpected services (40% - based on known complexity of the site)
- Failure of existing structure during demolition (20% - Mace risk)
- Discovery of unexpected ground contamination (30% based in legacy operations in the area)

These are reflected in the risk register. The relevant contingent provisions should be profiled and met with timebound mitigation plans to allow progressive monitoring of drawdown and/or retirement.

No amount or percentage of revenue is given for the trigger in the documentation.

## Lessons learned

As mentioned, the IFS believe the additional or more effective survey work could have been undertaken earlier, and this may have resulted in cost savings.

With regard to the DI, the IFS noted that “By extending the date of the G3 event date HAL has been able to ensure that the DI has provided its best price and obtained the best prices from its supply chain, creating a reduction in proposed price of £16m (for equivalent scope) in just over one month.”

On the schedule, the IFS noted that: “Though we have observed that the schedule risk items have been informed by a QSRA (as indicated in the T&T document), we note these do not provide sufficient confidence as they need to be fully logic linked and integrated with the rest of the schedule activities.”

## Other notes

Details of the project Gateways and their dates are provided below.

The IFS note in their July 2016 report that HAL and the DI have undertaken extensive engagement with numerous stakeholders in the lead up to the temporary road/diversion becoming operational.

Gateway Milestone	Baseline	This Month	Variance vs. Last Month
Gateway 3 (G3)	22 Jun 15	22 Jun 15	0
Gateway 4 (G4)	08 Sep 15	08 Sep 15	0
Gateway 5 (G5)	21 Nov 17	21 Nov 17	0
Gateway 6 (G6) (Excl. Demo of Interim FCC)	16 Jan 18	16 Jan 18	0
Gateway 6 (G6) (Inc. Demo of Interim FCC)	10 Jul 18	10 Jul 18	0
Gateway 7 (G7)	22 Jan 19	22 Jan 19	0
Gateway 8 (G8)	26 Sep 19	26 Sep 19	0

## A.5. B216 Baggage HBS Standard 3 Asset Replacement T1/ T2

### Project scope & description

This project involves replacing Standard 2 hold baggage screening (HBS) machines with Standard 3 machines, consolidating screening rooms, replacing old existing assets and upgrading baggage handling IT infrastructure and applications. This should improve efficiency, reliability, compliance with standards and reduce handling injuries.

The project is split into four workstreams, each of which proceed through the Gateways at different times. These are:

- 1) T3 Asset Replacement
- 2) Manual handling aids
- 3) Baggage IT asset replacement
- 4) HBS and Baggage Asset Replacement

Replacement of Terminal 3 HBS equipment forms part of the T3IB project.

A summary of the scope is provided below.

Item	T1/2	T4	T5	Total
HBS machines (Smiths)	6	4	7	17
HBS Machines (Morpho)	11	7	22	40
New baggage conveyor (replaced inline)	1,780m	1,800m	337m	2,277m
New baggage conveyor (replaced offline)	1,261m	0m	53m	1,314m
Asset replacement	PLCs E-stops	Sorter Collector Conveyor PLC's E-stops	Frequency converters	-
Change in process	COG/Reflight	Single image/single machine	Remote screening	
Number of phases	10 / 12	26	20	-
In system time impact?	Up to +2 mins	No Impact	+40 secs	-

### Changes to cost estimates

Q6 settlement for the project was £508m (development capex).

IFS noted a late notification of cost pressure and having design costs increase by timing of change to single image solution. The figure below shows how costs changed over time, with a significant fall after the G2 gateway and then a steady increase.

IFS note in their G3 report that there was an inconsistency between the G2 P50 cost included in T&T's documentation and the cost included in the ECH document. According to HAL, the IFS was just getting set up at the time of reporting and therefore needed to get up to speed with what each number referred to, as one was the actual P50 whereas the other was an earlier estimate.

The IFS then noted that it could not comment on these elements without reviewing the detailed supporting documentation.



## Changes to cost estimates

G2 was February 2014, with G3 for T1/2/4 being in July 2016 and T5 in August 2016. In between these dates, there was a Business Case Review (July 2015), Design Update (November 2015), SHBC Review (April 2016) and Balfour Beatty Group (BBG) Contract (June 2016).

G3 was delayed by one year to further develop the solution.

Changes to scope after G2 appear extensive. This includes Transfer Screening being moved to IDL, Single Image Process added, T2 screening design and layout change, inclusion of permanent magnetic motors, greater access to T4 make-up and micro PLC replacement.

The IFS commented on these changes in their G3 Gateway review:

*"The IFS has observed the content of the above presentations to be mainly focussed on the technical matters. Evidence in support of the evolution or update of time/cost/risk documents has not been comprehensive. Given the deferment of the original G3 was intended to provide more certainty to the time/cost outcomes for the project, the IFS is of the opinion it is reasonable for the airline community to have benefitted from robust updates in relation to these matters via the stakeholder engagement deployed between G2 and G3. The issues associated with the time/cost/risk engagement to date are amplified by the late emergence of time/cost pressure (now confirmed)."*

Conversion of £416.3m development to core Capex will be presented at the Capital Portfolio Board on 18/8/16:

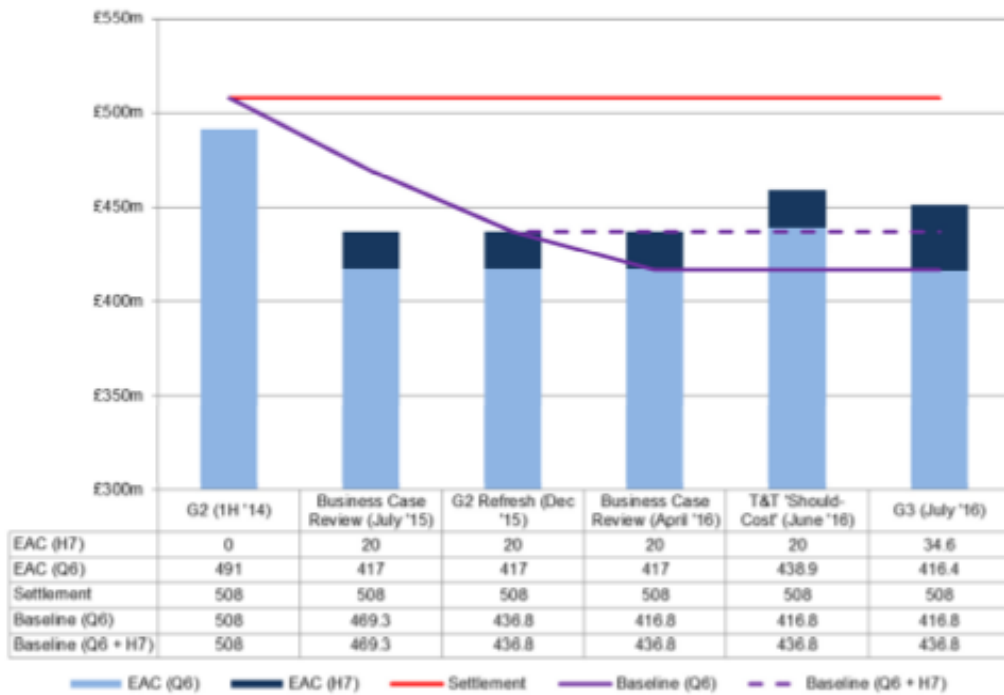
In terms of changes to cost, the IFS note that as the Estimate At Completion (EAC) and Baseline are based on the same scope, this is indicative of cost pressure against the approved Baseline. The IFS noted that:

*"The IFS notes the discrepancy between the "Should Cost" G3 cost plans when compared to the approved Baseline. Presentation of such a discrepancy at such a mature stage of the G3 development process is not considered good practice. It is the understanding of the IFS that the deployment of project controls (MPR reporting) at G2 for this project was intended to better inform airline community stakeholders through the G2 to G3 phase of the project (c28 months).*

*It is noted the costs presented at the Business Case Review held in April 2016 were based on MPR reporting for period ending February 2016. The magnitude of cost shift between April '16 (Business Case Review) and June '16 ('Should-Cost' Plan) prompts questioning of the relationship between the MPR reporting and the G3 proposal, noting an emerging cost pressure (within this work-stream) was not identified through the monthly MPR reporting.*

*It is the opinion of the IFS that it is reasonable for the airline community to expect earlier insight to emerging cost pressures on projects and this could have been provided via more effective project controls."*

### HBS & Baggage Asset Replacement Cost Plan History



Date/Milestone	Q6 Cost	H7 Cost	Total
Q6 settlement	£508m		£508m
G2 – February 2014 (£17m transfer to Portfolio)	£491m		£491m
T3 scope delivered separately (-£38m)	£453m		£453m
T4 scope deferred to H7 (£20m)	£433m	£20m	£453m
Declared savings transferred to portfolio	£417m	£20m	£437m
Business Case Review #1 – Sept 2015	£417m	£20m	£437m
Business Case Review #2 – March 2016	£417m	£20m	£437m
G3 Gateway (incorp. certain DI quotes)	£416m	£35m	£451m

G3 July 2016 - To be converted to core			
	Q6	H7	
T2	111,569,737	1,369,850	112,939,587
T3	2,883,174	0	2,883,174
T4	119,942,796	22,929,587	142,872,383
T5	133,772,680	10,343,052	144,115,732
Next Gen IT WS2	13,510,227	0	13,510,227
<b>G3 Total</b>	<b>381,678,614</b>	<b>34,642,489</b>	<b>416,321,103</b>
Future G3			
Manual Handling	11,314,328	0	11,314,328
Next Gen IT remaining	23,275,773	0	23,275,773
Non G3 Total	34,590,101	0	34,590,101
<b>Overall Total</b>	<b>416,268,715</b>	<b>34,642,489</b>	<b>450,911,204</b>

### Role of IFS

Following G2 approval in February 2014, IFS were engaged in April 2014 to issue an initial G2 report in July 2014. IFS continued to have a role through G3 and championed the need for regular updates to ensure stakeholder engagement. Identified risks and interface issues.

IFS were focused on the largest value workstream - HBS & Baggage Asset Replacement. This represented £399.4m of the £508m costs at the Q6 settlement.

IFS made recommendations around process e.g. need for more detailed project management plan (to detail how the HBS and Asset Replacement Project will be delivered, by whom, what they will do and when) and the need for additional outputs.

In their Gateway 3 review, the IFS comment that:

*" It is the opinion of the IFS the PMP's are too brief and too generic. There is no strong evidence that confirms the PMP's consider the specific issues/challenges that face the project, meaning there is no strong evidence which confirms the PMP's meet their objective (stated above).*

*Areas where content is considered brief or missing include:*

- *Schedule, schedule integration and progress management*
- *Delegations of authority and control of risk*
- *HAL contract obligations and the plan to deliver upon them accordingly*
- *Design management including HAL reviews and approvals*
- *Defect management*
- *Training and handover*
- *Management of program/portfolio level risks*
- *Issue management and resolution.*"

A number of recommendations were made around the business case methodology (see below).

IFS support the T1/2/4 element being progressed through the G3 gateway (July 2016).

### Business case methodology

There is perhaps less need for a robust business case here, as this is principally a compliance project. EU Directive EU1087/2011 requires all EU airport HBS installations to comply with HBS Standard 3 requirements by September 2020. The UK Department for Transport (DfT) has further directed that all UK airports must be Standard 3 compliant by September 2018. Consequences of non-compliance are significant in terms of operation of the airport and the passenger experience.

## Business case methodology

Certain existing baggage equipment is approaching the end of its service-life and/or is no longer supported by the supply chain. Consequently there is a risk to the functionality, efficiency and reliability of the system.

The IFS commented on the benefits case that:

- Content in relation to Benefits is generally considered brief. The IFS is not in receipt of documentation which supports rigorous Benefit Mapping or Benefit Realisation planning.
- DfT Compliance benefits do not appear to recognise the staged approach to compliance.
- Much of the definition of project Benefits is incomplete.
- Cost sensitive benefits (e.g. Opex) have not been valued.

The IFS further commented that:

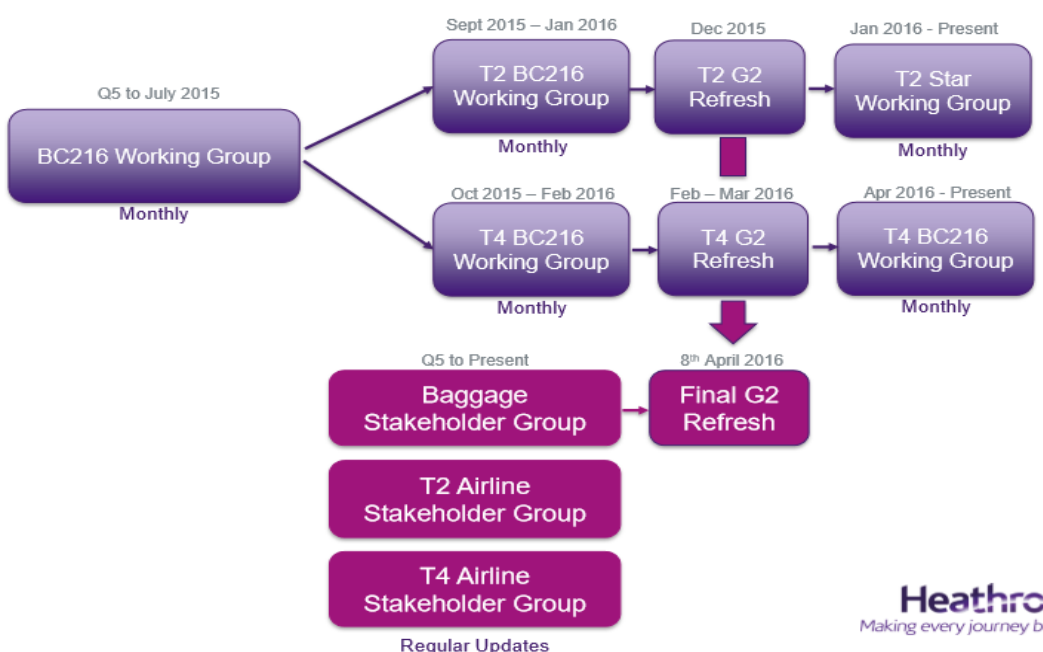
*"Based on the evidence provided in relation to Benefits, it is difficult to clearly relate project Benefit with the plan to achieve such, and will ultimately make the articulation of delivered Benefit difficult.*

*There is clearly scope to refine the articulation of the project Benefits argument to obtain alignment with the airline community. The IFS suggests there appears to be an opportunity to demonstrate clear linkage between Benefits and project Requirements via the approach to Requirements Management (discussed later in this requirement), validation of requirements via the V-cycle development process, and capture of requirements delivered via the Requirement Traceability Matrix."*

A further area identified by the IFS is integrating the project within the overall strategic plan.

*"The IFS does note the extent of works within Terminal 1. It is proposed to install new assets within the existing (redundant) building. From the perspective of the Masterplan, it may be worth considering the proposed service life of new assets proposed for Terminal 1 against the time-frame for expansion (and therefore demolition) within the existing Terminal 1 area."*

The groups used for stakeholder engagement are shown in the figure below.



## Cost scrutiny and benchmarking

Benchmarking was undertaken for Baggage Handling Equipment, Steelworks, Scaffolding and Preliminaries. No cost plan was provided for the cost of baggage handling room consolidation (£8.1m).

The IFS have reviewed the benchmarking and while the costs appear comparable, there is an example of the difficulty of reviewing this with identifying reasons why costs may not be comparable:

*"Rates for the supply and installation of structural steelwork compare high against similar benchmarks. It is understood this is driven, in part, by the extent of night working required and the labour intensity of the installation."*

In their Gateway 3 review, the IFS comment that the capital efficiency section in the Project Management Plan is insufficiently detailed.

In Heathrow documents, it is noted that Delivery Integrator costs were lower than those estimated by T&T, the Commercial and Control Consultants. T&T produced benchmark of £174m; BBG submitted a price to signal the start of the negotiation, final negotiation was with HAL employees and following collaborative dialogue, final target of £168.5m was agreed with £1.5m in achievement milestones. The evolution of the target price for BBG is shown below.

The IFS comment on this evolution of price with Balfour Beatty, noting that:

*"Of concern to the IFS is that all outcomes priced by the DI exceed the project team's initial pricing of additional scope and exclusions (assuming the costs graphs are like-for-like in terms of scope). It is recommended this be reconciled and understood to support the claim that the price secured represents value for money."*

*The project team refers to the parity between the "Should Cost" plan and the negotiated outcome as being a positive indication of securing value-for-money. Whilst it is agreed this is positive, the timing of release of the "Should Cost" plan (June 2016) and the involvement of the cost planning team in the negotiation means parity between "Should Cost" and the DI price should be expected. Of interest to the IFS would be evidence of how the cost plan was utilised to drive the negotiation process to secure value-for-money."*

*Given such a large proportion of the works has been negotiated, the IFS considers it important to demonstrate to the airline community that the negotiated target is competitive given the knowledge and de-risk benefits obtained (and shared with the DI) by delaying the G3, the risk allocation, and the intent of the Framework Agreement."*

The IFS also comment on specific items and where they are potentially not consistent with the stated method. An example of this is on the provisions around different HBS machines:

*"For the Morpho machines, the provision totals £31,637 (£790 per machine). By comparison, the Smith machine provision totals £442k (£26k per machine). Discrepancy between the two is significant. Neither unit rate compares with the analysis contained in the HBS Standard 3 Procurement Evaluation Report."*

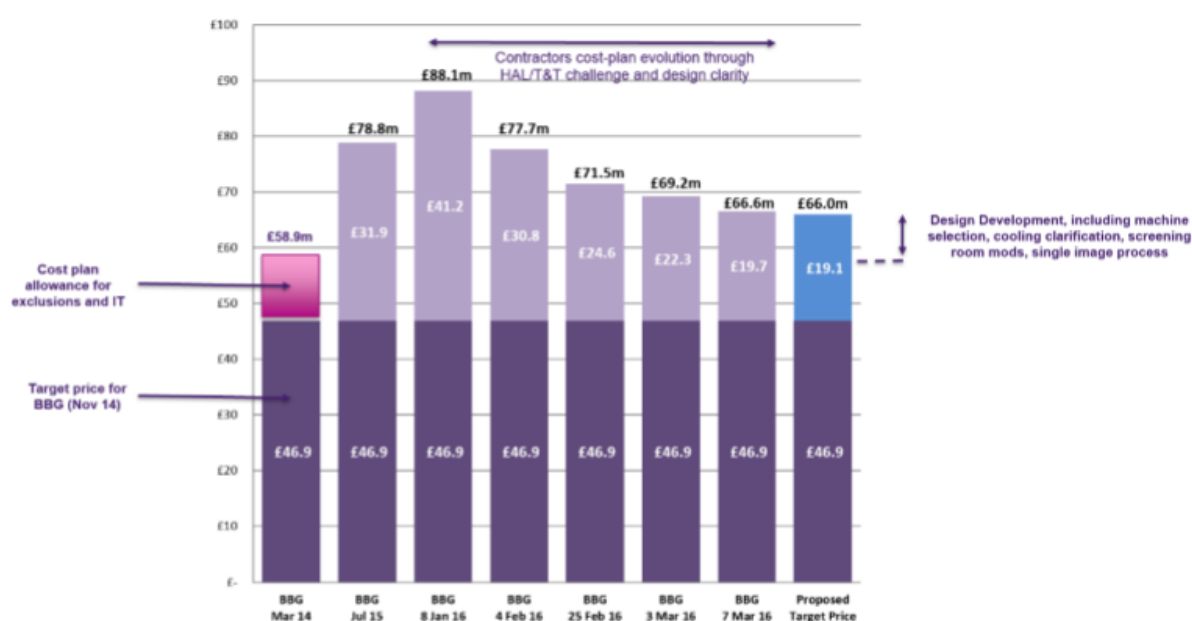
The IFS G3 report includes an extensive discussion on value for money (VfM). Within this, they note that T&T have provided a Gateway 3 Cost and Commercial Value for Money Report. The conclusion of the report is that VfM has been achieved in the DI contracts by competitive tendering (two thirds of the benefits), close negotiation in contracts between the DI and the C&CC, competitive tendering of the HBS machines, rigorous challenge and scrutiny of DI price submissions, favourable benchmarking of cost submissions and the overall cost plan for all the scope being 6.3% below the 'Should Cost' estimate. However, the IFS note that:

## Cost scrutiny and benchmarking

"Much of the final scope has been priced/agreed via negotiation c.2 years after tendering and awarding the initial contracts. From the point of view of the IFS, the "competition" benefits from tendering do not necessarily or automatically flow through to the negotiation of a major scope change after contract award."

The IFS also notes that the Cost Plan represents VfM, meaning the individual DI contracts have not been considered separately. However, the IFS states that it is prudent to consider each DI contract separately when assessing VfM, particularly given the splitting of the G3 investment decision. Based on the VfM criteria outlined, the IFS believes that the BBG contract represents VfM, however it was too premature at that stage to conclude the Mace contract represented VfM, given that a large proportion of the un-let works and the uncertainty associated with the value of these works.

## T1/T2 BBG Target Price Waterfall



## Involvement of supply chain

There has been use of different groups, including Commercial and Control Consultants (Turner & Townsend), Project Designers (Arup), Solution Development (Beumer for T1/2/4 and Vanderlande/Babcock for T5) and Delivery Integrator (Balfour Beatty for T1/2/4 and Mace for T5).

The building contract was an delivered under an NEC3 Option C arrangement. The pain/gain share contract negotiated was different to standard. This was in favour of the Delivery Integrator. Further incentives were included in the budget. In terms of risk faced by the parties, the IFS produced the table below. The provisions were considered marginally low for the phase.

On the pain/gain share contract, the IFS comment that (the rates are shown below):

"The IFS has modelled scenarios against the regime outlined above and notes a 5% overspend (£8.4m) would result in the DI making the same total margin as if the Target was achieved. Such a scenario would come at significantly greater cost to the airline community. It is the IFS opinion the regime outlined above provides a certain amount of "comfort" for the DI."

"This [the Contractor's Share] has been altered with the pain thresholds remaining as per the Q6 agreement and the gain switching to 50/50 as per the table below with break points for 100% Heathrow at 80% of target.

The rationale for the change was provided by Heathrow:

## Involvement of supply chain

*"The reason for the extra gain share was as a result of negotiations. The contractor when assessing the overall return for the works sought a better margin given the level of the spend. It was considered by Heathrow that for a larger piece of scope and given the market for such works internationally it was reasonable to increase the gain share and promote the behaviours to better the target. To avoid any ambiguity Heathrow also combined the contracts to ensure the target represented the works for the programme."*

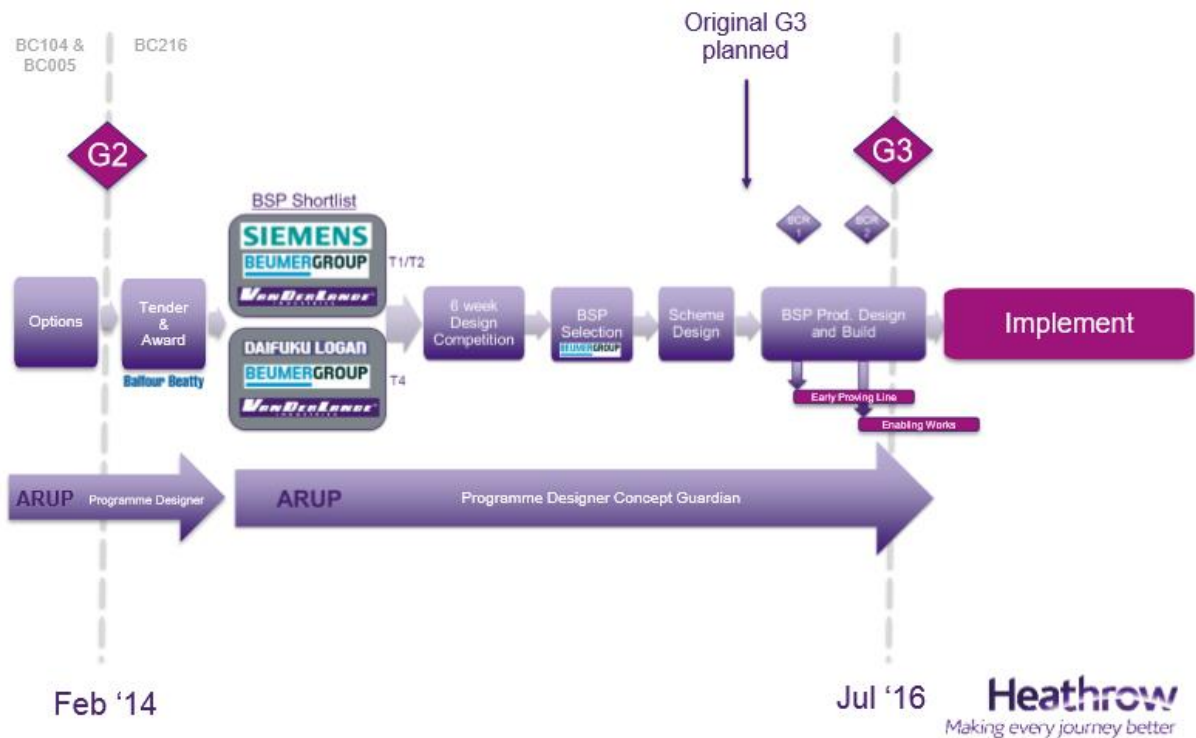
The IFS comment on this rationale for the different BBG pain-gain share mechanism:

*"The IFS questions if any change to the pain/gain share regime agreed for Q 6 should be the subject of stakeholder engagement and buy-in from the airline community. The IFS is not in receipt of any evidence that supports the communication of this intent to the airline community. The IFS does not consider the request for greater margin from a contractor as unusual given the project is negotiating the value of additional works as opposed to competitively tendering. It is the opinion of the IFS that contractor margins agreed for Q6 are based on the risk profile and potential volume of work made available through the Framework Agreement. Agreeing margin levels specific to a project delivered under the Framework risks eroding the competition and efficiency benefits procured via the Framework contract in the first instance."*

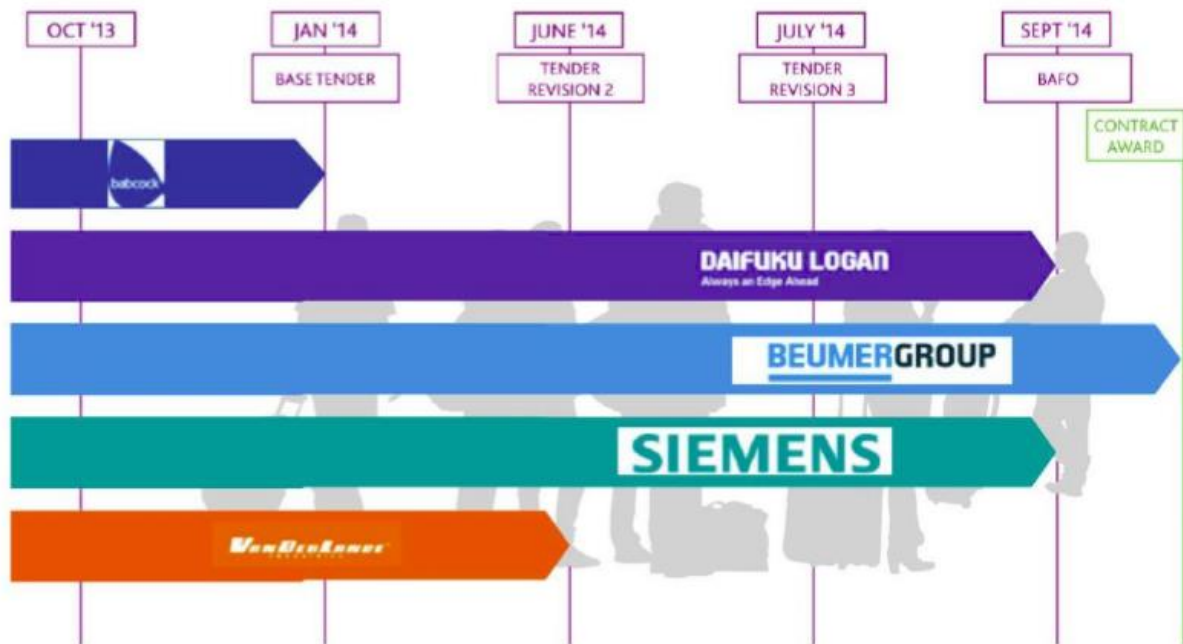
HAL has provided less information on the T5 contract with Mace, and the IFS note that this additional information is important given that preliminary costs are higher than for the BBG equivalent and the 'should cost' estimates.

	DI Risk	HAL Risk	Total
Terminal 1/2	£5,882,008	£7,920,561	<b>£13,802,569</b>
Terminal 4	£5,091,562	£8,547,479	<b>£13,639,041</b>
Terminal 5	£4,835,953	£9,225,523	<b>£14,061,476</b>
<b>Total</b>	<b>£15,809,523.00</b>	<b>£25,693,563.00</b>	<b>£41,503,086</b>

Band	Share Range of Target Price	Heathrow's Share %	Contractor's Share %
8	Over 120%	0%	100%
7	Over 115% up to 120%	50%	50%
6	Over 105% up to 115%	70%	30%
5	Over 100.0% up to 105%	90%	10%
4	Over 95% up to 100%	50%	50%
3	Over 85% up to 95%	50%	50%
2	Over 80% up to 85%	50%	50%
1	Under 80%	100%	0%



### BAGGAGE SPECIALIST PROVIDER SELECTION JOURNEY



### Risk management

The IFS G3 report indicates that c.£41.5m of risk provisions have been made, which comprises c.15.8m of DI risk and c.£25.7m of HAL risk. The IFS observed the following with regard to risk provisions: i) DI risk values had been agreed with the relevant DI, but it was unclear how the values had been derived and agreed with the DIs; ii) HAL risk values had been derived from the contingent risk model developed by the project team, the value adopted being a P50 output; and iii) various allowances had been included in addition to risk, including labour mitigation (£6.8m for all



## Risk management

terminals, KPI for schedule milestone achievement (£1.5m for T1/T2/T4, validation of existing luggage system (£1.1m in T5) and minor asset replacement including risk (£1m in T5). In relation to these, the IFS noted that it should be confirmed whether the above allowances related to known planned scope/works or should have been considered concurrently with the broader allowances for risk.

The IFS monthly reports also include extensive discussion regarding how risks are being managed on the project. For example, the September 2016 report outlines how the risk registers for different terminals has varied in recent months, and shows that risks remained relatively stable for preceding months but there was a marked increase in red risks in September 2016. September 2016 also showed a marked jump in closed risks. However, the IFS states that these jumps were not clearly explained to them by HAL and that clarity needed to be provided.

## Trigger

Triggers have been set to align with DfT compliance dates (Sept 2018), although information regarding the nature of the triggers are not included in the documentation.

## Lessons learned

The IFS comment on the value for money assessment conducted and the limitations of this:

*"From a general VfM perspective, the IFS further observes that the heavy reliance on the outcomes of procurement and tendering means the VfM "conversation" is unable to start until significant progress and financial commitment is made, "directions of travel" are established or set, meaning the opportunities to respond to challenges to VfM are limited. Consequently the VfM conversation will always be somewhat retrospective (lag) based on this measure (tender return).*

*Alternative approaches to VfM could include the development of a plan for VfM. This could be a project specific approach that outlines how any project will achieve VfM, with due consideration to the projects specific risks, constraints or complexities. Such an approach would also ensure the important topic of VfM benefits from early focus and engagement."*

The IFS note the benefit of early testing:

*"It is the opinion of the IFS that the project team has benefitted from knowledge gained via the deployment of the Early Proving Lines. The team has expressed its commitment to fostering a project team culture predicated on knowledge sharing and continuous improvement."*

On the Programme Management Plan, the IFS note that:

*"Whilst the programme is understandably high-level (Level 1), it is not possible to identify the dependencies that undoubtedly exist and are understood by the HAL project teams to carry risk.*

*Given the criticality of the IT interface, it is recommended a robust Interface Management Plan and Integrated Schedule be developed and monitored frequently. It is further recommended that Interface Milestones are clearly defined and identified within the schedule, and accountabilities for Interface Management and Milestones are allocated. It is critical that the dependencies that exist between the scope delivered by the DI's, and that of HAL IT are clearly defined and understood."*

If the G3 initial date of July 2015 had been observed and there was no deferral, there would have been a number of issues, including:

*"• Poor definition of non-baggage works (interfaces) • Solution Development for Baggage IT Applications incomplete • Concerns over schedule robustness and an associated risk of delay due to*

## Lessons learned

*the lack of schedule integration • Concerns over robustness of cost plan • Levels of engagement from DI's."*

The IFS monthly reports for July and August 2016 notes that stakeholder engagement has been positive. However, in September 2016 the IFS note that HAL was struggling to achieve alignment with operational stakeholders on works set out in the project plan.

## Other notes

Increasing proportion of scope is in H7 given deferral of G3.

Funds were returned to the portfolio before full opportunity was realised, leading to additional need for funding request (p28 of main doc).

In the case of permanent magnetic motors these involve a higher capex cost to lead to opex benefits. How is this whole life cycle cost optimisation incentivised in the price control?

The IFS provide clear and tangible recommendations in their Gateway 3 report.

It is noted that the commencement of physical works (Early Proving Lines) afforded the project the opportunity to test the emerging design documentation in delivery in advance of the major investment decision (G3).

*"The project has advised it was agreed in March 2015 that the BC216 G3 would be delayed to enable learning from early works/activities to be fed in to the solution, thereby improving certainty of cost and schedule, prior to the G3.*

*The PMP states that this approach was driven by Q5 experience in which the first line installation took considerably longer (and consequently by association cost considerably more) than subsequent installations. It was subsequently proposed to bring forward the construction of the first line in each contract (Early Proving Line) for the purpose of de-risking the project pre-G3."*

In terms of the risk-register, the IFS note a narrow bound between P50 and P80 - is this driven by the nature of the two-bucket capex process?:

*"Overall, the IFS considers the HAL contingency values reported per terminal to be conservative. Upon review of the probabilistic cost curve, the IFS also consider the range between P50 and P80 confidence to be too narrow for a project of this magnitude and complexity at this stage of its delivery."*

Future dates for Gateways are shown below. The IFS note that the G3 & G4 events are to take place one day apart, on 14 & 15 July 2016. The "HAL Q6Baggage Programme – Programme Management Plan" (v2.0, April 2016) states that for a G4 event, Detailed Design needs to have been carried out. Although it is acknowledged that implementation work is underway, the IFS seek to understand the Programme's Gateway management strategy and how that relates to the Programme Management Plan.

The following was noted from CEPA's call with the project's manager:

- The project was more involved in terms of the number of business case reviews and stakeholder interactions than normal projects
- The response from stakeholders was very positive
- The project built on learnings from Standard 2 review
- The project is an example of direct procurement of HBS machines; seen to have market power and other UK airports noted this favourable pricing
- The project wouldn't have met deadlines without Early Proving Lines

#### Other notes

- Changes to portfolio balance are based on discussions every quarter
- The pain-gain share mechanism change was subject to negotiation; and it was decided that it was better to flex this than change the overall headline price

<b>Gateway Milestone</b>	<b>T1 / 2</b>	<b>T4</b>
Gateway 3 (G3)	15 Jul 16	15 Jul 16
Gateway 4 (G4)	15 Jul 16	15 Jul 16
Gateway 5 (G5)	24 Jul 18	11 May 20
Gateway 6 (G6)	07 Sep 18	25 Jun 20
Gateway 7 (G7)	19 Oct 18	06 Aug 20

## A.6. B243 Kilo Taxiway, Aprons and Stands

### Project scope & description

The project will provide a through taxi lane to offer a more flexible and efficient ground operation that reduces delays and maximises punctuality. The project will also involve creation of 2no. new Code F stands on T2B, demolition of Europier, Euro lounge and Euro link buildings, including stands 139 and 141. In addition, the detailed design is to be completed for the active safeguarding below the taxi lane for future subsurface Early Bag Store (EBS), and tunnels for baggage and track transit systems (TTS).

The full scope of the project is outlined below.

	Description	Notes / dependencies	Target Date	QSRA output
1	S139/141 become dead parking only Access to Europier closed	G3	Jul-16	
2	Demolition starts		Nov-16	
3	VCC 234 start on site	Demolition of Europier	Mar-16	
4	Eurobuildings demolished	Excluding East Link	Jun-17	
5	Mobilisation for Taxiway / Stand Construction	Stand 209 & 210 -1month	Sept-17	
6	Taxilane Handover		Sept-18	
7	VCCs complete and Stands ready for OR		Oct-18	
8	Stands ready for use	Project complete	Nov-18	p50 Mar 2019 p80 Apr 2019

### Changes to cost estimate

The table below outlines how costs have varied between different stages. As shown, variance between G2 and G3 was £42.6m, or a 32% increase between periods. HAL were able to provide some cost assurances for the Ferrovial Agroman (FAUK) costs (associated with demolition, taxiway and stand works) but the IFS were not provided with assurances regarding Balfour Beatty (BBG) costs (new Vertical Circulation Cores (VCCs) and creation of coaching gateway). From telephone discussions with HAL this was largely to do with the scope of the project changing as some parts of it were not included in the G2 estimates. Some material costs also changed as the markets had changed between the different gateways.

With reference to specific aspects of the project, the IFS noted the following:

*“The demolition works makes up over a third of the prime costs. Demolition costs are often influenced by project specific and method related factors making it highly desirable to obtain market feedback for cost certainty. The IFS notes that the DI has obtained tenders for the demolition works which appear to confirm the estimate allowances are robust. The airfield taxi lane and stand works are comprised of elements for which there are many sources of current comparable rates. The level of cost certainty should therefore be high provided the design, survey and risk positions are well understood. The FAUK scope also includes the provisions of the air bridges. These are commodity*

## Changes to cost estimate

*items where the majority of the cost is in the manufacture and delivery so can be well defined and priced accurately ahead of construction.”*

Despite noting that these costs should be obtained with some degree of certainty, the T&T Should Cost Estimate for these elements totalled £51.651m, yet the G3 Cost Plan estimate was £55.367m. The reason for this change is the particularly high estimated costs associated with constructing air bridges.

	<b>B098 Element</b>	<b>P2 (Total)</b>	<b>G2 (Total)</b>	<b>G3 July 2016</b>	<b>G2 to G3 Variance</b>
1.	G3A - Common Elements (inc Safeguarding & Remote coaching design)	-	£49.5m	£56.0m	£6.5m
2.	G3B - VCCs & Coaching Gate (inc VCC design)	-	£12.2m (coaching gate not priced at G2)	£21.6m *	£9.4m
<b>3.</b>	<b>Sub-total G3A &amp; B</b>	<b>-</b>	<b>£61.7m</b>	<b>£77.6m</b>	<b>£15.9m</b>
4.	G3C - B098 Safeguarding Elements (by Jan 17)	-	£71.5m	£98.3m *	£26.8m
<b>5.</b>	<b>Totals for B098</b> Note * Cost yet to be assured by HAL	<b>£113.2m</b>	<b>£133.3m</b>	<b>£175.9m</b>	<b>£42.6m</b>

## Role of IFS

Gardiner & Theobald produced the IFS Initial Report at G2 stage, which was issued as a final version on 21<sup>st</sup> December 2015. IFS engagement was intermittent through 2015. An initial G2 report was provided in December 2015 and monthly meetings have been taking place since November 2015. Since December 2015 when the Airline Working Group was established to management stakeholder communications a high degree of engagement between the IFS and HAL has taken place. This has involved attending various meetings to provide updates on project strategy and development and discussion on key issues leading up to the G3 stage.

The IFS raised the following points during the monthly engagement process:

- “1. *Split Investment Decision – question in relation to strategy for implementation of G3B.*
2. *Project Risks – IFS expectations of early sight of emerging / developing risk register.*
3. *Procurement Plans – Discussion on pros and cons of a combined contract strategy with T1 Opportunity Stands.*
4. *G3 Stage – IFS expectations in terms of cost, commercial, schedule and risk were set out.”*

The IFS noted that the following pieces of information were missing at the G3 stage:

- An integrated client schedule associated with integrating the Kilo and T1 Ops projects;
- a Gateway Management Plan (GMAP). There was a gateway management section included in the Stakeholder Management Plan but this was not complete;
- a Gateway Certificate recording stakeholder endorsement;
- a Benefits Management Plan;
- a Delivery Integrator Risk Analysis; and

## Role of IFS

- details on client change control.

## Business case methodology

The IFS note the following benefits that are outlined in the business case:

- *“Increasing pier service by c.1%”*
- *Delivering a quality product when arriving / departing at any T2 gate.*
- *Reducing walking distances for T2B passengers.*
- *Enabling more predictable and consistent taxi-in/out times which minimises delay and improves arrivals and departures punctuality thereby allows airlines to adhere to schedule flight times.*
- *Minimising future ops disruption when T2 Phase 2 construction commences.*
- *Improving the resilience of the airfield by offering another north-south taxi lane route”*

However, the IFS noted that the Jacobs Solutions Development report suggested figures are included for annual savings to be made by airlines resulting from the project totalling £2.1m per annum. However, these are not part of the HAL business case, and therefore the IFS recommended that HAL confirm that Baseline Data exists in respect of the benefits that are quantified in measurable terms.

## Cost scrutiny and benchmarking

In respect to the schedule submitted by FAUK, the IFS notes the following;-

- *“The scope of works is captured with a top down breakdown of the overall scope. This will need to be broken to show the entire scope from a bottom up approach. In particular the works around Airbridge Fabrication & delivery needs to be broken to stages. Other scope areas that need to be looked into are demolition works & services installation works.*
- *Benchmarking data is provide only for the concrete works and Benchmarking data for the other scope of works such as Demolition, asbestos removal and installation of services are expected to be provided at PMB submission.*
- *The schedule is not resource or cost loaded.*
- *In respect to the schedule submitted by BBG, The IFS notes the following;-*
- *The full scope of works is captured with a good breakdown of the overall scope of works but will need to be broken in more detail in particular for the production design, fit out, procurement for VCC, manufacturing of cladding and raised flooring, M&E finishes and removal of redundant services.*
- *An explanation for work by others (concrete for VCC foundation & UKPNS substation installation) is required and the scheduling constraints.*
- *There are many activities with constraints and missing logic which needs improvement with detailed explanation in the narratives.*

## Cost scrutiny and benchmarking

- *Benchmarking data is mentioned in narratives but it's more generic and not specific to project.*
- *Benchmarking data is required for M&E isolations.*
- *The schedule is not resource or cost loaded."*

This highlights that the IFS has some issues with the benchmarking data being used.

The IFS also notes some observations on specific costs benchmarked in the VfM report. As shown in the table below, observations for each individual element vary considerably. As mentioned previously, the costs associated with air bridges are seen to be particularly high.

The IFS noted that there were value for money concerns over air bridge pricing, and that DI costs were £3.7m higher than the cost consultants estimates for the FAUK contract. A complete review of the BBG contract was recommended to resolve the +£9.6m variance. The IFS noted that HAL needed to evidence further intent to lower the 'should cost' to 'cost plan' delta through cost reduction targets.

Element / Rate Benchmarked	IFS Observation
Taxi Way Paving (Machine Lay Concrete)	Appears satisfactory but rates quoted are much higher than Sierra A VfM report even after adjusting for thickness
Taxi Way Pavement Full Construction	Appears satisfactory
Excavation of Hard Material	Satisfactory
Plane Off Asphalt	Low rate should be checked
Air bridges (Manufacture & Transport)	High rate requires investigation
Air bridges (Installation)	Very high rate requires investigation
Demolition of Airside Buildings	Reference to other projects required

## Involvement of supply chain

At the time of writing the project is at a relatively early stage, therefore the nature of the building contract has yet to be confirmed. Turner & Townsend were appointed as Commercial and Controls Consultant, while Jacobs was responsible for programme design. The DIs for the project was Ferrovial Agroman (FAUK) for demolition, taxiway and stand works and Balfour Beatty (and formerly Morgan Sindall) for the VCC and creation of a coaching gateway.

The IFS made the following comment regarding the extension of the FAUK contract:

*"The report does not in our view offer much insight into the advantages and disadvantages of this proposal. The value for money savings referred to have not been demonstrated anywhere in the G3 documentation according to our review. Potential risks such as the impact of implementing the safeguarding works would have on the combined FAUK contract have not been addressed. The report does not address the fact the Morgan Sindall was originally allocated the Taxi Lane and Stands elements and had carried out a significant number of surveys prior to HAL making the decision to re-allocate the work to FAUK mid-way through Solutions Development. A key value driver of early involvement of the DI is for project learning and development of surveys and site information. The IFS requests clear confirmation that ownership and responsibility for the work carried out by Morgan Sindall has been transferred to FAUK. Furthermore the IFS now requests evidence that the contractual responsibility has been allocated to the DI as part of the procurement strategy and process for the project. The IFS has queried the allocation of risk between the contract parties. The HAL team has provided the project risk register showing lead owners for each risk. The IFS has not seen the DI's own risk register or a matrix showing the allocation of risk between HAL*

### Involvement of supply chain

*and the DIs. The IFS requests details of the contractual provisions regarding risk transfer. The IFS has not seen the project contract documentation.”*

### Risk management

The IFS note that due to the approach taken by HAL in separating the elements of the project as outlined above the risk position is complicated. The risk register and QCRA provided relates to common elements (FAUK and BBG scope) but exclude safeguarding works. The risk allowance generated based on the P50 QCRA output of the £5.04m is broken down into FAUK scope (£3.73m) and BBG (£1.31m),

The risk register lists 16 risk items that carry a cost effect. 40% by value of the total are set against generic items of estimating uncertainty and cost of time delay.

### Trigger

The trigger mechanism for the project is defined as:

*“Kilo Taxi lane is open for operations, operational restrictions have been removed from Stands 233 & 236 and both ‘Kilo East Stands’ 234 & 235 are ready for operational use (including completion of any Operational Readiness trials agreed to be required between HAL Airside Operations and the airline community).”*

The date for this trigger has been set for April 2019 (based on p80 for these stands). The value of the trigger is based on 2/5<sup>ths</sup> of the B311 project and 100% of the Kilo project EAC.

### Lessons learned

The IFS noted that some elements of the project’s design should have been decided in advance of the G3 event, as noted below.

*“IFS notes HAL project team intention to ‘combine’ T1 opportunity Stands and Kilo projects under a single integrated schedule. While this approach might provide opportunity in terms of projects resource usage and an overall integrated approach to project delivery – bringing efficiencies in the delivery time frame – we highlight that a corresponding integrated schedule should have been prepared in advance of the G3 event.”*

The IFS also noted that they would have liked to have reviewed the risk registers sooner in the project cycle rather than at the G3 stage.

The IFS noted in its report at G3 that not all Airline Working Group representatives were listed on the Stakeholder Management Plan, and recommended that HAL list all of them going forward. HAL also noted in a Capital Portfolio Board meeting that consultations with the community on this project had ‘not been ideal’ and lessons from this would be taken forward.

The project manager noted that key lessons will be captured following G3 and will be captured thereafter, suggesting that limited lessons could be drawn from the delivery of the project.



### Other notes

The table below outlines the current expected timeline for the project, which shows that the different gateways have been set back several months between G2 and G3.

<b>Key Date</b>	<b>G2</b>	<b>G3</b>	<b>Variance</b>
Gateway 2- Options Decision	08 Apr 15		N/A
Gateway 3 – Investment Decision	05 Feb 16	20 Jul 16	c5.5 months
Gateway 4 - Start on Site - Demolition & Early Works	17 May 16	03 Oct 16	c4.5 months
Gateway 4 - Start on Site - Main Woks	07 Sep 16	03 Oct 16	c1 month
Gateway 5 – Build Complete	13 Dec 18	25 Mar 19	c3.5 months
Gateway 6 – Readiness for Operations	07 Feb 19	24 Apr 19	c2.5 months
Gateway 7 – Capex Contract Complete	21 Feb 19	23 May 19	c3 months

## A.7. B329 Automation Of The Passenger Journey

### Project scope & description

The project includes a number of initiatives, including:

- Self-service bag tagging;
- Self-service bag drop;
- Self-boarding, including passenger biometric enrolment and passenger touch point
- Connections self-service check-in

This covers Terminals 2, 3, 4 and 5, with scope and airline readiness differing across the terminals. G2 is intended for November 2016 at the programme level (according to documents from Sept 2016). The pre-G2 process has involved meetings on costs and schedule, benefits, other regulated charges and the biometrics roadmap.

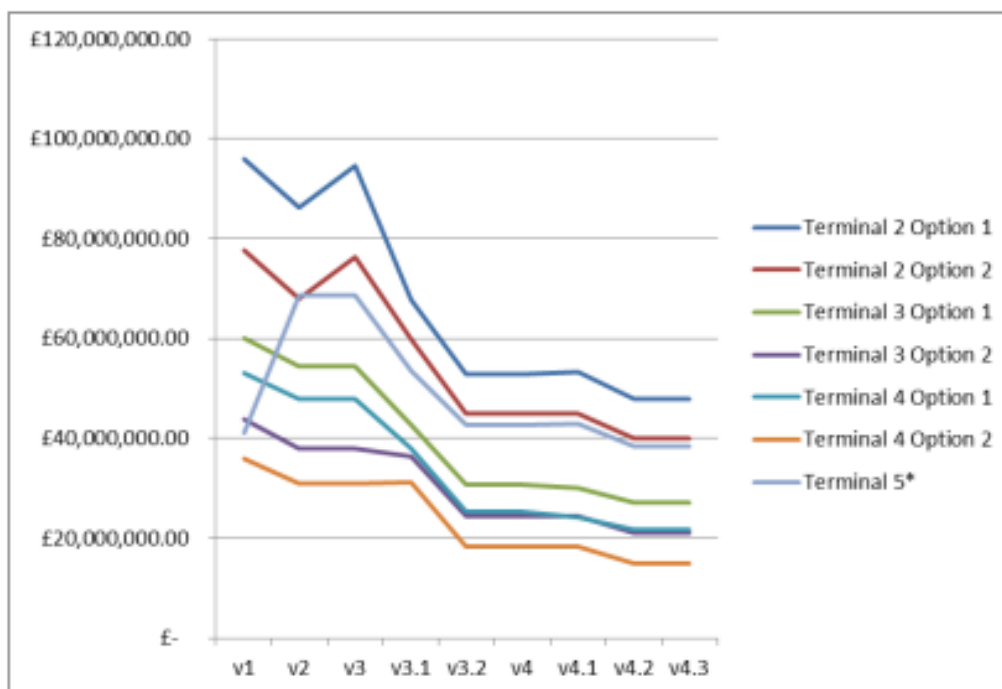
### Changes in scope and costs

The project remains in early phases and as such, there is limited scope and cost information prior to G2.

The Airline Community proposed Q6 scope at programme level G2 gateway (labelled as November 2015<sup>15</sup>) had total cost estimates of £69m to £86m.

Annual costs are estimated to be £447k p.a. for a full T2 roll-out of Self-Boarding Gates (SBGs). This is based on current support costs extrapolated for a further 54 gates.

There is one slide on capex costs that show a significant decline in costs – however, there is a lack of supporting detail. This is shown below.



<sup>15</sup> Would expect this to be November 2016.

## Role of IFS

We have not seen reference to the IFS within this documentation.

## Business case methodology

For the business case for G2, there were a number of outputs produced by Heathrow, including:

- Stakeholder Engagement and Business Change documents
- Q5+1 Lessons Learnt Review
- Operational Principles
- Regulated Charges Review
- Scope 'Tranche' definition e.g. by what/ where/ when and who
- IT Architecture Options Study
- Biometric modelling
- Re-evaluation of Business Case benefits
- Developed cost estimates
- Developed G2 schedule
- G2 optioneering
- Airline endorsement event

A tranche approach was seen to deliver benefits with respect to airlines, the airport and passengers. The approach was also intended to align to airline/ alliance roadmaps and capabilities.

HAL notes in its G2 documentation that both airlines and HAL will benefit from lower opex costs as a result of automation, which will mainly result from reducing staff numbers. For example, less airlines staff resources will be needed for the check-in and boarding process (c.30% for both these processes).

HAL sets out the benefits of the project in its G2 documentation, outlining that benefits will accrue to passengers themselves and will be felt through efficiency and capacity improvements. There is some quantification of benefits but given the relatively early stage of the project (pre-G3) most benefits are only outlined qualitatively. For passengers, benefits include increased speed in processing times, choice between manual and automated services and ease of journey through less touch points. Through initial trials passengers responded positively to the changes and stated that they would use them again. As mentioned previously, efficiencies will be felt mostly through opex reductions as a result of lower staff costs. Capacity improvements will be derived from increased check-in capacity with the installation of self-bag drops, however this is dependent on common use (i.e. the more airlines sharing the facilities the higher the benefits).

Heathrow note the following with regard to this investment:

*"Across departures, connections and arrivals, we recommend investing in six capabilities. We believe that these six capabilities will drive significant benefits for HAL (£20m to £75m pa), passengers and airlines (£40m to £80m pa). Realising these benefits could require an investment of ~£175m and an increase in operating costs that would likely be recoverable."*

### Cost scrutiny and benchmarking

We have not seen reference to cost scrutiny and benchmarking in the documentation – this may reflect the early phase of the process.

Heathrow note that current support contracts are due to expire and they will seek to reduce costs through operational efficiencies.

### Involvement of supply chain

There are two external providers referenced in the documentation: Arinc – responsible for coordinating fault resolution and governance, monitoring connectivity and managing hardware fault resolution. Capgemini – provide the Kaba monitoring application and supporting infrastructure, network connectivity and managing the Arinc Self-Boarding Gate (SBG) contract.

### Risk management

No comments on risk management from IFS given early stage of project.

### Triggers

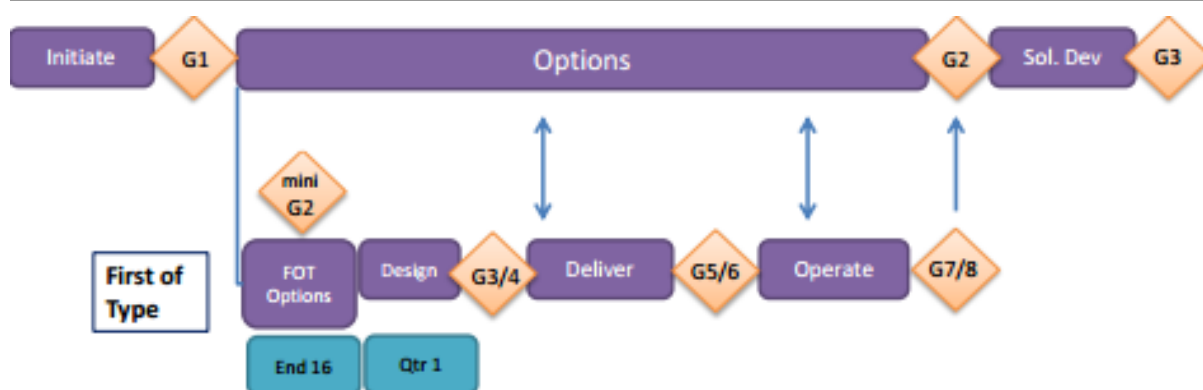
Triggers are not discussed in the documentation provided.

### Lessons learned

Comments in terms of operating principles noted that the T2 audience were receptive and informed, but ownership of the process was misunderstood.

For T3, the audience were uninformed about the collective vision and distrustful of the operating principles being binding statements. More communication was felt to be required.

A proposal included in the documents was to have a trial (First of Type) at a level that educated other parts of the project. The schedule for this is shown below.



### Other notes

The project talks about benefits from opex reduction. This question is contained within other project descriptions, raising the question of consistent treatment between opex and capex.

## ANNEX B SUMMARY OF CURRENT FRAMEWORK AROUND CAPEX

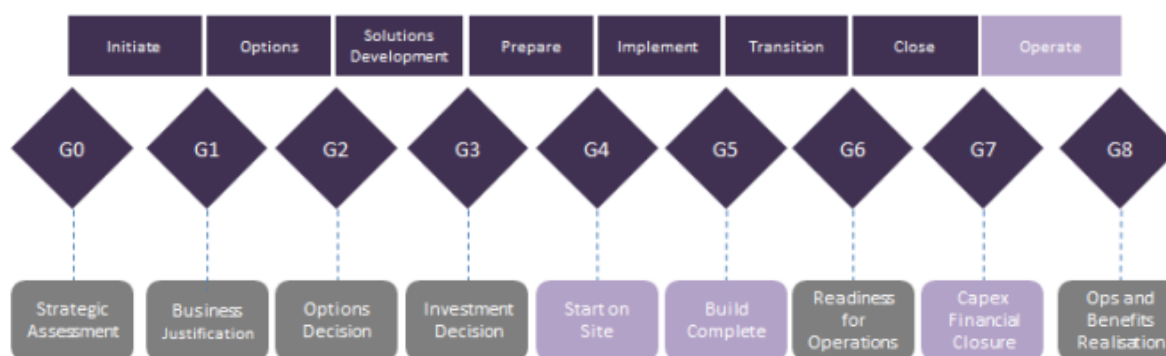
In the main report, we summarised the features of the regulatory regime and capex governance process that is operating for the Q6 price control. In this annex, we provide further detail around how the regime does function.

### Gateway process

The overall framework for capital investment decisions involves assessment at a Portfolio level, broken down into Programmes, which are then further broken down into individual Projects.

Projects follow an eight phase Gateway process. A summary of the gateway process for projects is contained below.

Figure D.5.1: Project gateway process



Source: Heathrow Capex Efficiency Handbook

### Core and development capex

Capex allowances include a fixed allowance for Core capex. These projects are those that have gone through Gateway 3 and as such there is certainty on scope and timing.

There is an indicative allowance for Development capex. This is for investment that has not gone through Gateway 3. Given uncertainty, this is priced at the P80 level rather than the P50 level for Core capex.

Over the control period, projects will therefore transition from Development to Core capex.

The Core capex pot at the start of the price control is fixed; the Development capex pot is indicative only and as such the price cap calculation is revised within period.

### Setting an ex-ante envelope for capex in the price control settlement

The CAA noted two approaches for setting a capex allowance. The first was to conduct an ex-ante review of costs for individual projects. The second approach was to set an overall

envelope for capex. The CAA chose to rely more on the second approach i.e. set an overall envelope. The rationale for this was that:

- The majority of programmes for the Q6 price control were not very developed e.g. only 2 of the 57 programmes in the Airport Business Plan (ABP) had reached Gateway 3 by July 2013.
- Airlines submitted their own business plan, for which the scope and budgets aligned with those produced in the ABP.
- The size and diversity of the capex programme for Q6 at Heathrow meant that an ex-ante review would impose significant transaction costs.
- Setting an allowance pre-empts discussion between airlines and Heathrow.
- In practice, the actual set of projects will differ significantly from what was assumed at the price control.
- The capex governance process and incentives on Heathrow mean that they do not receive a financial benefit from not investing.
- By allowing flexibility on project selection, this reduces shareholder risk as decisions can be made in light of changes to macroeconomic conditions.

The CAA may look at particular projects that are considered high value and conduct an ex-ante assessment.

The envelope for the Q6 price control was £2.82bn (in 11/12 prices). This is adjusted by inflation each year.

### **Ex-post efficiency review**

The CAA conduct an ex-post efficiency review of capex. This tends not to judge what an efficient risk allocation would be, instead looking at the procurement approach and whether costs were suitably incurred. Where this is not the case, costs can be disallowed from the RAB or removed from the capex allowance e.g. T3IB.

### **Incentives on capex governance**

Budgets are managed at the programme and portfolio level. Given the nature of investment and the industry structure, incentives around costs are different to in other regulated sectors. Where Core capex is not incurred on a project, this can be reallocated within the programme. For overall programmes that require additional budget, this can be requested from the portfolio level with a clear business case.

For Development capex, unused funds can be used to balance requirements of other Development projects, get progress unknown requirements or fund new ideas. The funds may not be invested if deemed appropriate and this decision is consulted on. Where the level of

development capex is revised within the price q, aeronautical charges are adjusted to reflect actual expenditure.

### **Treatment of capex over/ underspend against envelope**

At Q6 the regulatory regime changed to no longer allow firms to keep the return on underspends in the time between costs being projected and being actually incurred (as had been the case in Q5).

Efficiently incurred investment is included in the RAB at the start of the H7 price control, it is the treatment within period where the airport bears the risk of overspend or underspend.

### **Treatment of opex over/ underspend**

Where actual expenditure differs from allowed expenditure on opex, it is our understanding that the airport bears any difference i.e. keeping underspends, bearing the costs of overspends.

### **Trigger mechanisms**

HAL and the airlines agreed that triggers should once again be placed around 'Key Projects'. Triggers would initially be set for core capex, but would subsequently be applied to other projects that move during the period from development to core. Triggers are discussed in the first two gateways, but are formally attached during Gateway 3.

### **IFS**

There is an Independent Fund Surveyor (IFS) who reviews and reports on the reasonableness of key investment decisions. As such, there is a structure in place to address any issues in delivery of capital investments on an ongoing basis.

### **Role of airlines**

Prior to the Investment Decision (at Gateway 3), discussions are centred around design and options for delivering the projects. The general position is that, investment programmes must be agreed with the airline community and are signed off at the CPB of which the airline community are members.

### **Heathrow's commercial framework**

This sub-section discusses approaches to procurement by Heathrow Airport for different projects, including the current Delivery Integrator framework.

#### *Terminal 5 approach*

Moving away from the use of framework contracts, for Terminal 5, BAA sought a more flexible procurement process to the delivery of its planned investment programme. This was done in

a collaborative setting ('the partnership model'). BAA divided the programme into 18 projects (£10m-£200m in size) which was split into 150 sub-projects and 1,000 work packages. To achieve this, BAA appointed 80 Tier 1 partners and there were 20,000 lower tier suppliers involved in the delivery of the Terminal. The overall budget of £4.3bn represented two-thirds of BAA's capital value at the time. The project was delivered on time and within budget. The contracting strategy involved shared liability. A 'no fault' agreement was made with all parties that shared the cost impact risk between suppliers, subject to caps on liability. Where costs went above budget, BAA reimbursed suppliers this amount but prevented companies receiving a return on this excess. The project was seen to be low risk from a contractor perspective, which was felt to reduce risk premia charged by suppliers and enable a high degree of cost transparency.

#### *Heathrow Terminal 2 approach*

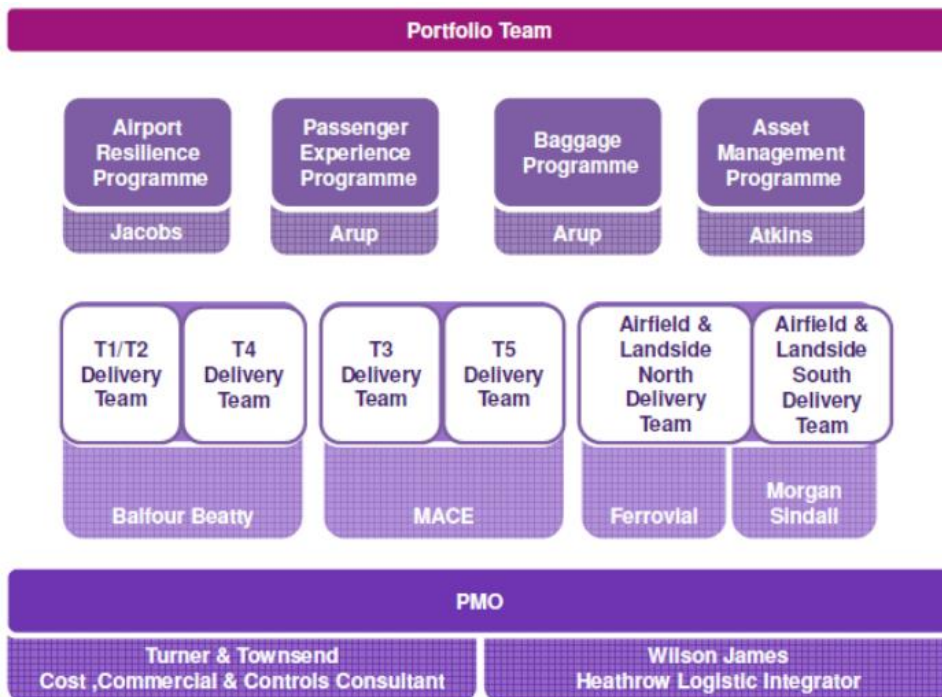
Following the delivery of Terminal 5 and other major projects, BAA considered that there was greater supply chain capacity for managing risk and complex projects. The overall approach placed more risk on contractors (facilitating higher potential returns) in a competitive tendering process. The approach was termed the 'Intelligent client' model. The model involved use of 'target costs', whereby contractors shared in the risks (and rewards) of delivering projects above (or below) this cost estimate. A cap and collar was placed upon profits and losses, with an open book basis being assumed. This approach was seen as facilitating competition in appointing suppliers and incentivising suppliers during design and delivery. The T5C satellite building had a target price of £230m, while the first phase of the T2B project involved the awarding of a £84m fixed price contract (the largest for an airside project under a fixed contract at that time).

#### *Heathrow Delivery Integrator Framework*

For delivery of its £1.5bn investment programme from 2014, Heathrow has chosen to utilise a Delivery Integrator Framework for a three-year period. Under this approach, Heathrow has split the works required into four Lots.

There are four separate contractors (Ferrovial, Balfour Beatty, Mace & Morgan Sindall) who each take on responsibility for one of the work programmes as 'delivery integrator'. Heathrow has chosen to appoint separate parties for these programmes, which range from £250m-£375m in size. This was chosen as the nature of works in the Q6 price control were typically smaller and more integrated than at Q5. With emerging costs pressures, it was felt as though entering into framework contracts in 2014 would help achieve value for money.





### *Interactions between Tier 1 and Tier 2 suppliers*

The DI framework relates to Tier 1 suppliers. These Tier 1 suppliers then enter into contracts with Tier 2 suppliers. Our understanding is that these tend to be fixed price contracts and that typically the DI tends not to deliver the constructions works themselves and instead are primarily responsible for managing interface risk. Second tier activities are competitively procured and HAL has the ability to review contracts of £250,000 and above. These tend to be agreed prior to Gateway 3 and agreement over the costs to be included in the contract with DIs, so there should be a large degree of price clarity at this point.

### *Direct procurement*

HAL also use direct procurement where they feel that they have market power and can achieve more favourable pricing than DIs. An example of this is the purchase of HBS machines under B216.

### **Designation of key projects**

Projects that have either a capital value of at least £20m, are considered complex, have a significant stakeholder impact or are of strategic importance may be classed as 'key projects'. These projects require approval from each party at the first three gateways and can have triggers attached to their revenue to ensure that projects are delivered to meet the required scope and on a timely basis.

### **Role of CAA in capex governance process**

The CAA have a role in the capex governance process as Arbiter where HAL and the airlines do not agree on the scope or costs of projects, or alternatively where parties agree but projects are not deemed to be in passenger/ cargo owners interests.

### **Identification of new projects**

Heathrow or the airlines can propose new development projects, for which to fund from the overall development capex envelope. This requires approval from both the airport and airlines to be included.

### **Issues for H7**

The CAA has discussed investigating a number of issues, including future changes that may be relevant for our analysis. These include:

- Role for a totex approach i.e. equal treatment of capex and opex
- ‘Pain and gain share’ mechanisms being introduced on opex
- Introduction of business planning incentives

## **ANNEX C    CRITICISMS OF THE Q5 CAPEX GOVERNANCE PROCESS**

The appendix contained within HAL's Capital Efficiency Handbook indicates problems identified in a review of seven projects during the Q5 price control. The issues found can be split into different phases and categorised as follows:

- Design specification
  - Permitting sufficient time to arrive at a coordinated solution
  - Effective stakeholder engagement has been undertaken
  - Ensure that the project team and roles are assigned to best meet the needs of the project
  - Interactions with other projects are considered and the impact of disruptions understood for the project in question
  - Risk management processes are agreed upon before the project work begins
  - Clear roles and responsibilities with respect to Project Management are assigned
  - Cost implications, both for different parties and for different phases of the lifecycle, are fully taken into account
- Construction/ implementation
  - This phase should not start until the design specification phase has been completed
  - Ensure that the specification continues to meet shareholder needs
  - Reviews and triggers are done on a timely basis to ensure that maximum time is provided to address problem issues
  - Coordination between multiple projects occurs
  - There should be ongoing review and reporting to the necessary groups.