Determination and Report on the Maximum Level of Aviation Terminal Service Charges that may be imposed by the Irish Aviation Authority

23 March 2007

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FOREWORD

The Commission for Aviation Regulation hereby makes the second determination on the maximum levels of aviation terminal services charges that may be imposed by the Irish Aviation Authority.

This Determination shall come into force on the 26 March 2007.

There has been significant public information exchange between the CAR, the IAA and various interested parties. In addition, the CAR retained a number of consultants who have analysed different parts of the IAA's business and have greatly assisted the CAR in reaching this Determination. I would like to thank all those who have made representations. The views received greatly assisted the CAR in discharging its statutory functions.

Cathal Guiomard
Commissioner
23 March 2006

DETERMINATION

This Determination shall enter into force on 26 March 2007.

The IAA shall ensure that, when setting tariffs for each regulatory period, the revenue yielded for the provision of aviation terminal services to flights departing from Dublin, Shannon and Cork airports during that period shall have a reasonable expectation of not exceeding a level of allowed revenues, calculated in the form:

$$R \leq t \times N$$

where t = the maximum permitted revenue per tonne of aircraft departing from Dublin, Shannon and Cork airports from air terminal services charges and N is a measure of the departing flights, calculated with reference to the maximum take off weight of the departing aircraft in metric tonnes.

The 't' term is determined separately for each regulatory period with reference to formulae. The formula for the regulatory period 26 March to 31 December 2007 is specified in section 1.1. The formula for the regulatory periods 2008, 2009, 2010 and 2011 is specified in section 1.2.

The formulae take into account a variable revenue component that varies with traffic volumes, 'v', expressed in €/tonne terms, and a fixed revenue component, 'f', which provides for a level of revenues in € terms that does not vary with traffic volumes.

Initial values are specified for two terms in the formula (v_{2007} *and* FR_{2007}) for the regulatory period 26 March to 31 December 2007. In each subsequent regulatory period during the operation of the determination, those terms will be subject to CPI+X adjustments. The value of X for each of those periods is 3.75%. The assumptions leading to this figure are set out more fully in section 2.

Regulatory Period 26 March to 31 December 2007

For the period 26 March 2007 to 31 December 2007,

$$t_{2007} = v_{2007} + f_{2007} + w_{2007} + k_{2007}$$

Where,

%	One per cent is one hundredth. For amounts expressed in per cent terms, each 1% is 0.01.
2007	The regulatory period 26 March 2007 to 31 December 2007.
06/07	The regulatory period 26 March 2006 to 25 March 2007.
t_{2007}	The maximum permitted revenue per tonne of aircraft departing from Dublin, Shannon and Cork airports during the regulatory period 2007. The IAA is required to set Aviation Terminal Service Charges at levels that provide a reasonable expectation, after taking into account the best forecasts of tonnages available at the time of setting those charges, that: $R_{2007} \leq t_{2007} \times N_{2007}$
R_{2007}	The total revenue from aviation terminal services charges during the regulatory period 2007, extracted or derived from audited accounts of IAA. This term can only be finally determined after the end of 2007.
N_{2007}	The sum of the weight of aircraft that actually depart from Dublin, Shannon and Cork airports during the regulatory period 2007, measured as the number of metric tons in the maximum certificated take-off weight of the aircraft as shown in the certificate of airworthiness or any equivalent official document provided by the aircraft operator, calculated on a basis consistent with Annex IV, paragraph 5 of the European Commission (EC) Regulation No 1794/2006 of 6 December 2006 or superseding regulation. This term can only be finally determined after the end of 2007.
v_{2007}	= €1.060
f_{2007}	$= \frac{0.8 \times FR_{2007}}{N_{2007}}$

FR_{2007}	= €10,114,000
w_{2007}	$= \frac{WR_{06/07} \times (1 + I_{06/07})}{N_{2007}}$ Note that the W term is derived from $WR_{06/07}$, which is carried over from the previous period.
$WR_{06/07}$	The difference between the actual costs and expenses of the CAR and budgeted costs and expenses for the regulatory period 26 March 2006 to 25 March 2007, as calculated in accordance with the Determination for the regulatory period 26 March 2006 to 25 March 2007, expressed in Euros (not €/tonne).
$I_{06/07}$	= 2.90%, calculated as the average of the 3 month Exchequer Bond rates reported by the National Treasury Management Agency daily for the calendar months March 2006 to February 2007.
k_{2007}	$= \frac{KR_{06/07} \times (1 + I_{06/07})}{N_{2007}}$ Note that the K term is derived from $KR_{06/07}$, which is carried over from the previous period.
$KR_{06/07}$	$= \left(Y^{Iaa}_{06/07} - Y^{*Iaa}_{06/07}\right) \times N_{06/07}$
$Y^{Iaa}_{06/07}$	Is a term calculated in accordance with the Determination for the regulatory period 26 March 2006 to 25 March 2007.
$Y^{*Iaa}_{06/07}$	The actual average revenue per tonne of aircraft departing from Dublin, Shannon or Cork Airport in the regulatory period 26 March 2006 to 25 March 2007, calculated on a consistent basis with the equivalent terms for earlier periods in accordance with the Determination for that period.
$N_{06/07}$	Is the tonne of aircraft departing from Dublin, Shannon or Cork Airport in the regulatory period 26 March 2006 to 25 March 2007 calculated in accordance with the Determination for that period.

Regulatory Periods 2008, 2009, 2010, and 2011

For the periods 2008, 2009, 2010 and 2011:

$t_y = v_y + f_y + w_y + k_y$

Where,

%	One per cent is one hundredth. For amounts expressed in per cent terms, each 1% is 0.01.
y	A regulatory period representing any of the calendar years 2008, 2009, 2010 and 2011. The subscript y-1 for a variable indicates that the variable should be calculated in respect of the regulatory period that ends immediately before the regulatory period y.
t_y	The maximum permitted revenue per tonne of aircraft departing from Dublin, Shannon and Cork airports during the regulatory period y. IAA is required to set Aviation Terminal Service Charges at levels that provide a reasonable expectation, after taking into account the best forecasts of tonnages available at the time of setting those charges, that: $R_y \leq t_y \times N_y$
R_y	The total revenue from aviation terminal services charges during the period y, extracted or derived from audited accounts of IAA. This term can only be finally determined after the end of each regulatory period y.
N_y	The sum of the weight of aircraft that actually depart from Dublin, Shannon and Cork airports during the regulatory period y, measured as the number of metric tons in the maximum certificated take-off weight of the aircraft as shown in the certificate of airworthiness or any equivalent official document provided by the aircraft operator, calculated on a basis consistent with Annex IV, paragraph 5 of the Commission Regulation (EC) No 1794/2006 of 6 December 2006 or superseding regulation. This term can only be finally determined after the end of each regulatory period y.
v_y	$= v_{y-1} \times \left(1 + CPI_y + X_y\right)$

CPI_y	Is the percentage increase in the Irish All Items Consumer Price Index (Base Dec 2001 = 100) as published by the Central Statistics Office Ireland ('CPI index'), between the third month prior to the start of the regulatory period y-1 and the third month prior to the start of regulatory period y. The third month prior to the start of a regulatory period is the October before the start of each regulatory period y and January 2007 for the regulatory period starting on 26 March 2007.
X_y	= 3.75% for all y, a fixed factor reflecting the anticipated rate of change in t_y at the time of the Determination set at a level that the CAR considers appropriate to meet the CAR's statutory objectives.
f_y	$= \frac{FR_y}{N_y}$
FR_y	$= FR_{y-1} \times \left(1 + CPI_y + X_y + G_Y\right) + FM_y$
G_y	= 4.00 for all y, a fixed factor reflecting the anticipated annual rate of change in N_y at the time of the Determination.
FM_y	Is the sum of all fixed milestone adjustments for the regulatory period y, applied in the manner specified in section 1.3 below, after adjusting for the increase in the CPI index between CPI_D and the CPI index for June of the regulatory period y.
CPI_D	= 115.7, the CPI index basis used to express real terms monetary values in this Determination.
w_y	$= \frac{WR_{y-1} \times \left(1 + I_{y-1}\right)}{N_y}$ Note that the W term is derived from the WR term for the previous period.
WR_y	The costs attributable to the regulatory period y and levied on the IAA by the CAR in respect of the Terminal Services business less the corresponding costs allowed for in the Determination, after adjusting for the increase in the CPI index between CPI_D and the CPI index for June of the regulatory period y.

I_y	The average of the 3 month Exchequer Bond rates reported by the National Treasury Management Agency daily for all calendar months of the regulatory period y except for the calendar month in which the period ends plus the calendar month in which the regulatory period y-1 ended, multiplied by the number of calendar months in the period and divided by 12.
k_y	$= \frac{KR_{y-1} \times (1 + I_{y-1})}{N_y}$ Note that the K term is derived from the KR term for the previous period.
KR_y	$= t_y \times N_y - R_y$

Explanatory Notes

Purpose of the formulae

The CAR has structured the formulae and determined values for key terms in those formulae to effect the following policies:

i. provide a reasonable prospect for the IAA's aviation terminal services business to make a reasonable rate of return on the regulatory value of the assets employed in providing those services

ii. reflect the levels of cost involved in providing ATS that the CAR believes it is reasonable to assume, taking into account the scope for the IAA to be cost effective

iii. specify in advance the formulae for determining allowed revenues, thereby securing the economic incentives for the IAA to be cost effective

iv. provide for a sharing of risk between the IAA and its users with respect to uncertainty in projections of traffic volumes, thereby permitting a lower cost of capital than would otherwise have been necessary for the benefit of users and providing a more secure foundation for the IAA to finance its activities

v. provide for increases in revenue allowances that are conditional on the IAA achieving specified milestones in the commissioning of certain new facilities involving substantial levels of capital expenditure

vi. provide for the automatic correction of inevitable under- and over-recoveries of allowed revenues by carrying forward correction terms into subsequent regulatory periods

vii. provide for the automatic correction of allowed revenues for the effects of inflation

viii. at the earliest opportunity, align the regulatory periods with the IAA's financial years and preferred tariff setting cycles which are defined as calendar years.

Milestone adjustments

Milestone adjustments are reflected in the term (FM_y) in the formula that increases the maximum allowable charges where the IAA has achieved specified capital investment milestones.

There are two milestones. The first, "MILESTONE: Cork Tower", relates to the building and completion of a new air traffic control tower at Cork Airport by the IAA. The second, "MILESTONE: Dublin Tower", relates to the building and completion of a new air traffic control tower at Dublin Airport by the IAA.

The milestones referred to above, regarding the proposed new Cork and Dublin Airport air traffic control towers, respectively, are defined as:

(a) the building and completion of the new air traffic control tower at Cork Airport by the IAA, achieved on its opening date for the purpose of training air traffic controllers in its use for the provision of air terminal services at Cork Airport. The CAR recognises that this event may happen (up to a year) in advance of that control tower being used for actual operations at Cork Airport.

(b) the building and completion of the new air traffic control tower at Dublin Airport by the IAA, achieved on its opening date for the purpose of training air traffic controllers in its use for the provision of air terminal services at Dublin Airport. The CAR recognises that this event may happen (up to a year) in advance of that control tower being used for actual operations at Dublin Airport.

The milestone adjustments shall be calculated as follows:

MILESTONE: Cork Tower is a fixed annual sum of money of €1,145,000, expressed in 2006 price terms, applicable from the opening date of the proposed new air traffic control tower at Cork Airport. If the milestone is achieved part way through a regulatory period, then the milestone adjustment shall be apportioned based on the number of days that have elapsed from the beginning of that period, with the remainder being a milestone adjustment for the following period. The definition of the FM_y term provides for suitable adjustments for inflation.

MILESTONE: Dublin Tower is in two parts. The first part is a fixed annual sum of money of €4,928,000 and the second part is a fixed one-off sum of money of €500,000 relating to additional operational training at Dublin Airport linked to the planned new parallel runway. Both parts are expressed in 2006 price terms and are applicable from the opening date of the proposed new air traffic control tower at Dublin Airport. If the milestone is achieved part way through a regulatory period, then both parts of the milestone adjustment shall be apportioned based on the number of days that have elapsed from the beginning of that period, with the remainder being a milestone adjustment for the following period. The second part, relating to the fixed one-off sum of money, shall further be treated as a negative milestone adjustment at the first anniversary of the achievement of the milestone (thus securing no more than the value of the one-off sum of money). The definition of the FM_y term provides for suitable adjustments for inflation.

Associated with these milestone adjustments are corresponding adjustments to the allowances for regulatory depreciation. The annual depreciation adjustments would be €541,000 for MILESTONE: Cork Tower and €2,268,000 for MILESTONE: Dublin Tower.

Forecast revenues arising from the formulae

The CAR has specified the terms of the formulae to provide a reasonable prospect for the IAA's ATS business to make a reasonable rate of return on the regulatory value of the assets employed in providing those services. It considers this prospect is secured if the discounted present value of ATS revenues, adopting the CAR's assumptions for traffic volumes, over the period of the determination equates to the present value of the CAR's assumptions for the relevant costs during the period and the values of the regulatory asset base at the start and end of that period. This equation is set out as a 'yield table' and explained in section 2.4.

Applying the formulae

In order to effect the CAR's policy of providing for the sharing of traffic risk between the IAA and users, the level of allowed revenues for a regulatory period must only be determined definitively once outturn traffic volumes are known. The final calculation of the 't' term and the 'N' term in the expression R ≤ t x N can only therefore take place after the end of the regulatory period. In common with the formula used since the start of regulation in 2002, the formulae provide for correction terms to carry forward the value of any under- or over-recovery of aviation terminal service charges by the IAA. Also in common with the old formula, these terms will only be definitively known after the end of the regulatory period, i.e. after the start of the following regulatory period (to which they will apply). The calculation of the 't' and 'N' terms will therefore be provisional at the time the aviation terminal services charges are set by the IAA and will only be finalised some time later.

To assist an understanding of how the formulae will work, the following table sets out an illustrative application of the formula for one year, 2008, showing how the formula would handle a significant variance in traffic volumes, a 'traffic shock'.

Table 1: Illustrative Example of the Formula

Illustrative application of the formula	2008	2008	Change
For 2008, assuming w_{2008} and k_{2008} terms are zero			
	Anticipated before the year starts	*Traffic shock outturn*	
Change in CPI			
Illustrative consumer price index values			
Oct 2007 (reference month for 2008)	117.9	117.9	
Jan 2007 (reference month for prior period)	121.1	121.1	
CPI term	2.69%	2.69%	
X and G terms			
X	3.75%	3.75%	
G	4.00%	4.00%	
Calculation of v term			
v_{2007} (€/tonne)	1.060	1.060	
1+CPI+X	1.064	1.064	
v_{2008} (€/tonne)	1.128	1.128	0.0%
Calculation of f term			
FR_{2007} (€000s)	10,114	10,114	
1+CPI+X+G	1.104	1.104	
FR_{2008} (€000s)	11,169	11,169	0.0%
Illustrative N *(MTOW 000s)*	**9,922**	**7,938**	**-20.0%**
$f_{2008} = FR_{2008} / N_{2008}$ (€/tonne)	1.126	1.407	+25.0%
$t_{2008} = v_{2008} + f_{2008}$ (€/tonne)	2.254	2.535	+12.5%
Allowed revenue = $t_{2008} \times N_{2008}$ (€000s)	**22,364**	**20,125**	**-10.0%**
R_{2008}, revenue collected* (€000s)		17,900	
KR_{2008}, correction term carried forward to 2009 (€000s)		2,225	

** In this illustration, R_{2008} is close to the t_{2008} anticipated before the year starts multiplied by the outturn N_{2008}. The KR_{2008} term would be carried forward to 2009 in the calculation of the k_{2009} term.*

This illustration demonstrates the risk-sharing feature of the formulae. It supposes that there is an event that leads to a 20% reduction in traffic volumes in 2008 compared with previous expectations. The illustration shows that the IAA's revenues allowed under the formula would also reduce, but only by a factor of 10%. While the IAA may not have had the opportunity to adjust its charges during the course of the period (and may not have wished to burden its users with such an increase at that time), the formula provides the scope for the IAA to carry forward the resulting under-recovery into subsequent periods. The formula gives the IAA discretion on when it recovers this sum.

The use of MTOWs

The CAR is aware that the IAA will, during the operation of this determination, be subject to EC Regulation No 1794/2006.[1] This regulation sets out a revised basis of setting terminal service charges that will apply to the IAA. The regulation specifies the aircraft weight factor, the 'Terminal Services Unit', that the IAA will need to use in levying ATS charges. The weight factor is defined as "the quotient, obtained by dividing by fifty the number of metric tons in the highest maximum certified take-off weight of the aircraft . . . to the power of 0,7". The regulation provides for a transitional period of five years over which time this exponent may lie between 0.5 and 0.9. The regulation also provides that Member States may defer the application of the relevant Article until 1 January 2010.

At the time of concluding this determination, it is not clear how the IAA will define its terminal services units during the transitional period. The CAR has concluded that it should specify this determination with reference to the units currently used by the IAA, the certified maximum take off weights of the aircraft departing from Dublin, Shannon and Cork airports, without reference to the quotient specified in the EC regulation. This basis will remain effective for the purpose of this determination irrespective of the basis that the IAA adopts for the levying of aviation terminal service charges.

[1] Commission Regulation (EC) No 1794/2006 of 6 December 2006 laying down a common charging scheme for air navigation services, 7.12.2006 OJ L341/3.

REPORT

1. EXECUTIVE SUMMARY

This Determination specifies the maximum level of aviation terminal charges that the Irish Aviation Authority (IAA) may impose between 26 March 2007 and 31 December 2011.

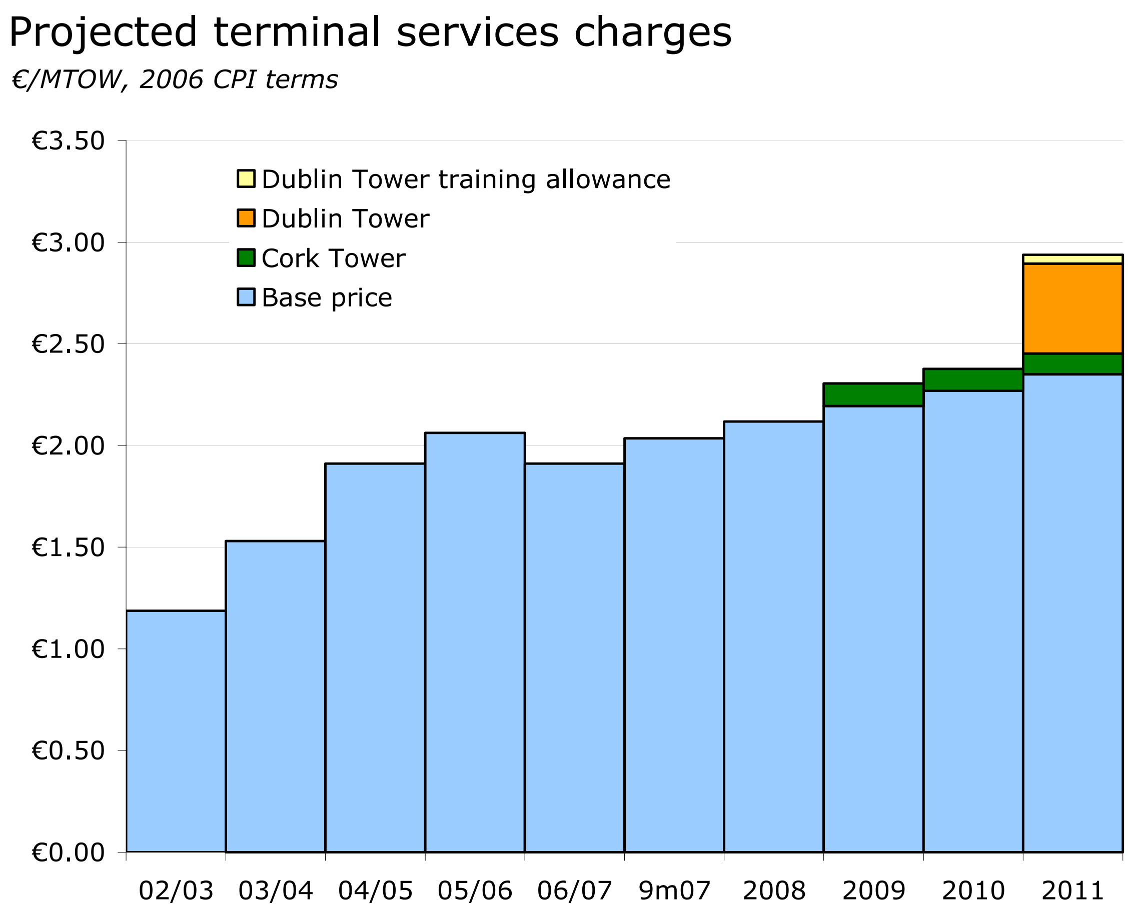
Regulating these charges is one of the principal functions of the Commission for Aviation Regulation (CAR) under Section 7 of the 2001 Aviation Regulation Act. In determining the maximum level of charges the CAR has aimed "to facilitate the development and operation of safe, cost-effective terminal services that meet international standards", as required under Section 36 of the Act. The CAR has also had regard to seven specified factors.

The Determination comes into force on 26 March 2007. As indicated previously, it is CAR policy to align its determinations with calendar years. Accordingly, the initial price cap will last for just over 9 months, until 31 December 2007. Thereafter the Determination specifies annual price caps until end December 2011.

There are two significant changes in the format of this Determination compared to the first determination, aside from the switch to aligning the regulatory year with the calendar year. First, the CAR has set the price-cap formula such that the IAA does not assume all the risks associated with traffic outturns deviating from a central forecast. Second, the Determination includes two "milestones" which will allow the IAA to set increased charges only after it has completed towers at Cork and Dublin airports respectively. The CAR has continued to use a regulatory till that only includes revenue earned by the IAA from aviation terminal services (ATS).

The chart below shows the charges that will arise if traffic volumes grow as predicted in the IAA's baseline forecast and assuming that the Cork and Dublin towers are completed in 2009 and 2011 respectively.

Chart 1: Price Cap Path Under Baseline Forecasts



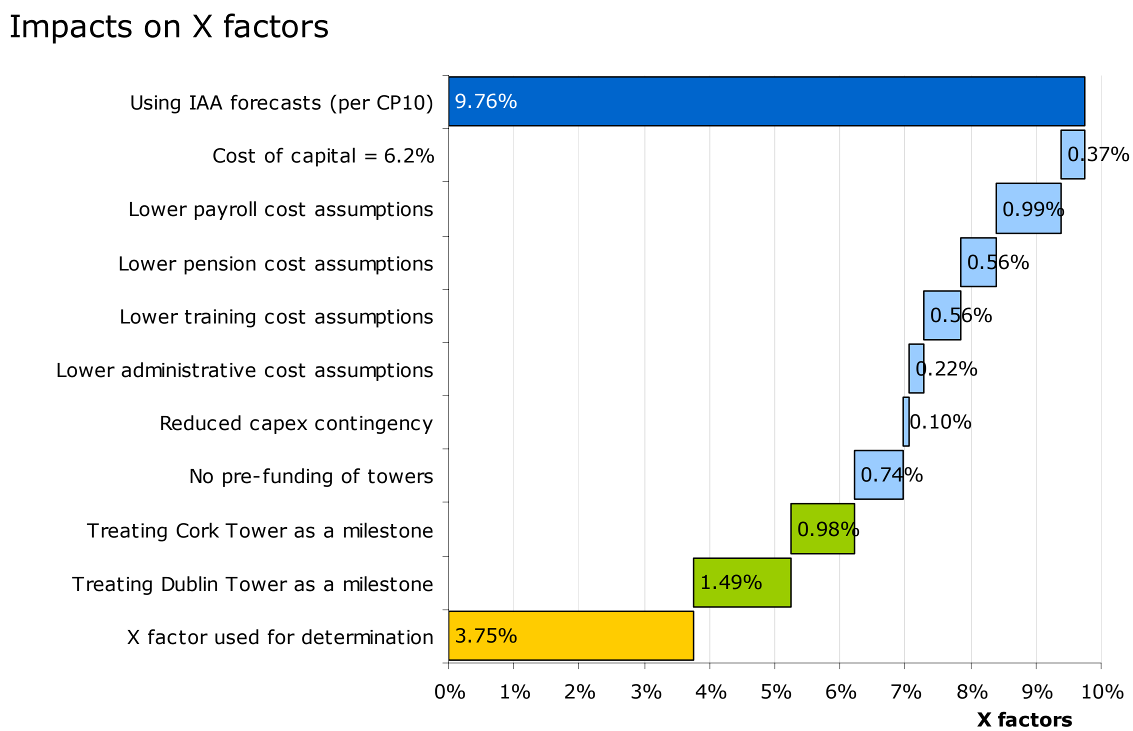
The CAR has reviewed the IAA's projected operating expenditure from an efficiency perspective. The projected costs relate to the baseline traffic forecast. The CAR has concluded that there was insufficient justification for some of the proposed increases, particularly relating to payroll (including pension) and training costs, and consequently these costs are not included in the Determination.

The capital expenditure plans of the IAA have been reviewed and, with the exception of contingencies in the technology plan, allowed in the Determination. This allowance includes over €54.5 million for the Cork and Dublin towers, costs that will only be included in the price cap calculations once the towers are completed. Moreover, the IAA will be expected to demonstrate that it has consulted with users in advance and satisfy the CAR that there was user support or evidence of a clearly positive cost-benefit analysis for all its major capital expenditure projects.

The CAR has allowed the IAA a real pre-tax rate of return on capital of 6.2%.

The net effect of the CAR's decisions and assumptions is an X factor over the entire period, representing a real annual rate of increase in the base level of aviation terminal service charges, of 3.75%. This figure compares with the figure of 9.76% which would have been the X factor calculated using IAA's unadjusted forecasts and an assumed cost of capital of 6.7%. The difference between 9.76% and 3.75% is analysed in the following chart. The X factor would be 6.22% if the revenues attached to the opening of Cork and Dublin Towers were recovered through the X factor rather than through milestone adjustments to the price formula.

Chart 2: Relating the X Factor to the IAA's Forecasts



An X of 3.7% provides for an average charge over the period of €2.20 in 2006 price terms. An X of 6.22% would provide for an average charge over the period of €2.36 over the period.

The CAR is sensitive of the fact that this remains a high rate of increase in prices and will represent a significant additional cost burden for users. It is almost entirely driven by high levels of capital investment, compared to the past five years. The CAR has been careful to scrutinise IAA's cost forecasts and make appropriate adjustments in its price cap calculations in respect of costs where the IAA has not been able to provide adequate justification.

2 ASSUMPTIONS FOR THE FINANCIAL MODEL

The CAR has made assumptions and judgements with reference to national and international legislation and regulations, including the Aviation Regulation Act 2001 and the EC's Regulation No 1794/2006 (which came into force since publication of the draft determination), responses from interested parties to consultation documents and explanations provided by the IAA.

The following table summarises the main assumptions.

Table 2: Financial Model Assumptions

Financial model assumptions	2006	2007	2008	2009	2010	2011
€000s - 2006 prices, CPI = 115.7, unless otherwise stated						
Traffic volumes *(MTOW 000s)*		9,568	9,922	10,309	10,732	11,161
Operating expenditure		13,156	13,070	13,256	13,449	13,945
RAB at 31 January 2006	24,271					
Base capital expenditure	4,544	16,179	12,520	6,522	9,314	2,925
Regulatory depreciation	(3,505)	(4,834)	(6,697)	(7,897)	(8,289)	(8,247)
The cost of capital *(% per annum)*		6.20%	6.20%	6.20%	6.20%	6.20%

2.1 Traffic Forecast

The IAA's baseline forecasts for 2007-2011 are for relatively more modest rates of growth than predicted in 2002. The forecast relies on estimates of other aviation bodies, particularly EUROCONTROL Statistics and Forecast Service (STATFOR).

Table 3: IAA Baseline Traffic Forecasts

ATS traffic assumptions	2005	2006	2007	2008	2009	2010	2011
Baseline volumes (MTOW 000s)	8,658	9,200	9,568	9,922	10,309	10,732	11,161
MTOW growth		6.3%	4.0%	3.7%	3.9%	4.1%	4.0%

The IAA has three forecast scenarios: high-growth, low-growth and baseline. In the three scenarios inputs such as economic growth and load factors are varied in order to capture the range of future growth in flight movements. The low-growth and high-growth scenarios capture the range; the baseline scenario indicates a "most likely" position within the range.

The financial model, and in particular the operating expenditure, is developed with reference to the baseline traffic forecast, which is effectively a centreline growth scenario using the IAA projections based on Eurocontrol's forecasting methodology. However, the Determination allows for the unit charges that the IAA can collect to fluctuate if traffic volumes deviate from this forecast.

The CAR is satisfied that the IAA's baseline forecasts have been prepared on a sufficiently robust basis for the purposes of setting this Determination. The relative importance of the traffic forecast in determining the price controls that will apply is reduced because the unit charges allowed depend on actual rather than forecast traffic levels.

2.2 Operating Expenditure

Section 36(e) of the 2001 Act requires the CAR to have due regard to the "operating and other costs incurred by the IAA in providing aviation terminal services." In making its first determination, the CAR sought to include in the price cap on aviation terminal services charges only those operating costs necessary for the maintenance of safety and for a given level and quality of service. The CAR is also required, under Section 36(c), to have due regard to the "efficient and effective use of all resources by the Authority".

The IAA has made submission to the CAR regarding its forecast levels of operating expenditure. These are summarised in the table below, which also lists the assumed levels of operating expenditure that that the CAR has allowed in the Determination.

Table 4: IAA Forecast Operating Expenditure

Operating expenditure	2006	2007	2008	2009	2010	2011
€000s - 2006 prices, CPI = 115.7						
IAA forecasts						
Payroll and related costs	6,073	6,217	6,541	6,883	7,243	7,622
Pension	1,398	1,657	1,928	2,031	2,139	2,253
Training	1,061	1,289	1,358	1,431	1,507	1,588
Administration etc.	2,789	2,767	2,821	3,123	3,198	3,286
Meteorological costs	1,504	1,610	1,641	1,673	1,705	1,738
Commission costs	238	312	47	46	44	345
Total	13,063	13,852	14,336	15,185	15,837	16,832
Commission assumptions						
Payroll and related costs	6,073	6,146	6,214	6,287	6,364	6,441
Pension	1,398	1,415	1,430	1,447	1,465	1,483
Training	1,061	907	917	928	939	950
Administration etc.	2,789	2,767	2,821	2,875	2,931	2,988
Meteorological costs	1,504	1,610	1,641	1,673	1,705	1,738
Commission costs	238	312	47	46	44	345
Total	13,063	13,156	13,070	13,256	13,449	13,945

The CAR has reviewed the IAA's forecasts at a high level from an efficiency perspective. In CP10/2006, the CAR noted that cost projections based on outturn 2006 expenditure and projected forward only for volume growth would be broadly consistent with stable charge levels (leaving aside increases in charge levels associated with the capital programme). Instead, IAA forecasts significant increases in operating costs, well above the assumed rate of consumer price inflation and above what would be necessary solely on account of volume growth.

The CAR has analysed the forecasts in the following components:

- Payroll costs
- Pension costs
- Training costs
- Administrative expenses

2.2.1 Payroll cost inflation

Over the past four years, since 2002, IAA's staff numbers appear to have fallen by about 1.6% per annum on average while pay rises per member of staff have averaged about 3.3% in real (inflation adjusted) terms. Net annual cost increases have therefore been about 1.8% in real terms. This compares with a rate of growth in volumes for ATS, measured in MTOWs, averaging about 6% per annum. Thus, recent history is broadly consistent with assumed cost elasticity of about 0.3.[2]

In contrast, for the future, the IAA projects payroll costs to increase by 25% in real terms between 2006 and 2011 while staff numbers are projected to remain stable. Annual pay rises would average 4.6% in real terms (around 8% per annum in money terms, significantly more than the 5% wage cost increases per employee projected by the Economic and Social Research Institute)[3].

IAA explained to the CAR that its projections were informed by the actual increase in payroll costs over the period 2000 to 2005, which averaged 8.29% per annum and was significantly affected by pay increases in the first two years of that period. IAA's breakdown of its annual increases includes 3% for national pay awards, close to the IAA's assumptions for inflation, a further 3% for payroll increments and 2.5% for local bargaining.

Some of the proposed increase in payroll costs might be attributed to forecast increases in ATS volumes. The CAR is neutral as to whether these increases will arise because of increasing staff numbers or increased productivity from existing staff with commensurate pay rises. Assuming a cost elasticity of 0.3 would imply a payroll increment of 1.2% per annum given the traffic forecast used.

The following chart illustrates the IAA's proposed payroll increases. It splits the proposed payroll increment between the growth that might be attributed to changes in ATS volumes and the remainder over and above this level.

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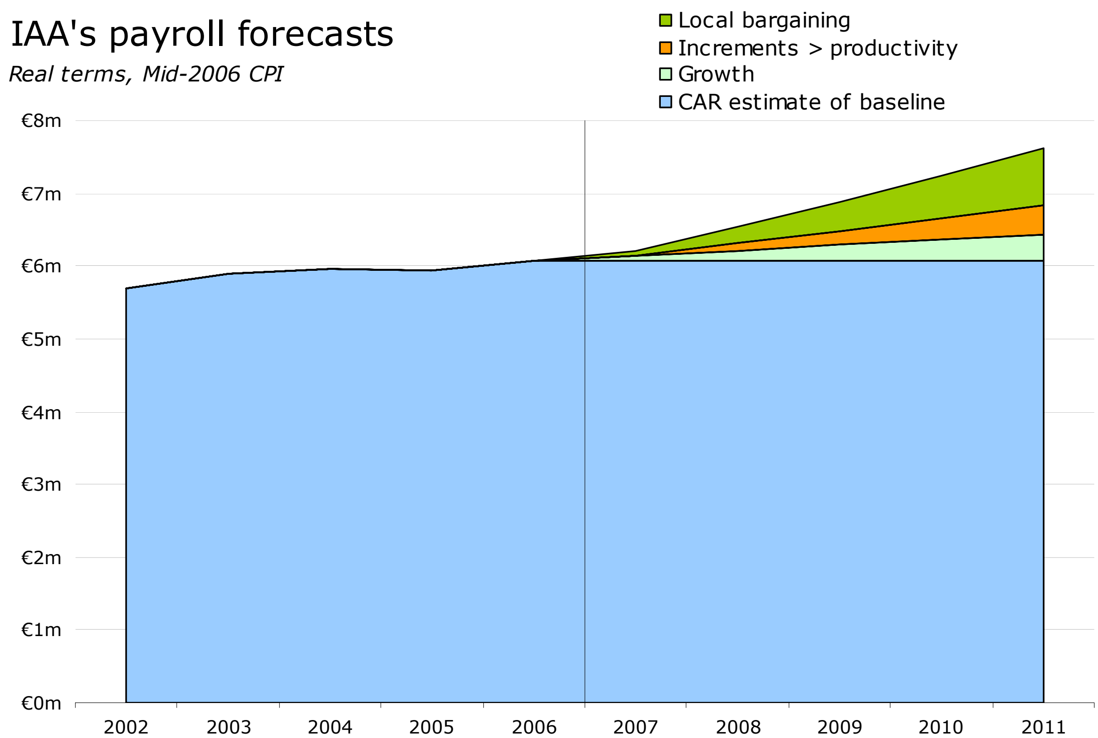
[2] Cost elasticity is the ratio of a percentage increase in costs arising from a percentage increase in volumes. An assumption of 0.3 is consistent with assumptions the United Kingdom's Civil Aviation Authority made in its cost projections for NATS's En Route services in its 2005 price review. NATS is the IAA's equivalent in the UK.

[3] See Barrett, Alan, Ide Kearney and Yvonne McCarthy (2006) "Quarterly Economic Commentary Winter 2006", Dublin: ESRI.

Chart 3: IAA's Payroll Forecasts



Very broadly, the CAR would expect real pay increases to be justified by improvements in productivity, as they seem to have been over the past four years. In the draft determination, the CAR noted that nationally the evidence on total factor productivity (TFP) suggests:

- over the period 1980 to 2004 the average TFP improvement was 3% per annum; and
- labour productivity has improved 3.8% per annum when measured against hours worked and 3% per annum when measured against the number of people employed.

The available evidence does not provide compelling evidence that sub-sectors of the economy that might be comparators for ATS have realised significantly different levels of improvement in labour productivity. Data for a subset of industries – air transport, communications, and computer and related activities, supporting and auxiliary transport activities, telecommunications equipment – showed average labour productivity growth of 3.2% per annum for hours worked and 2.3% per annum for people employed.

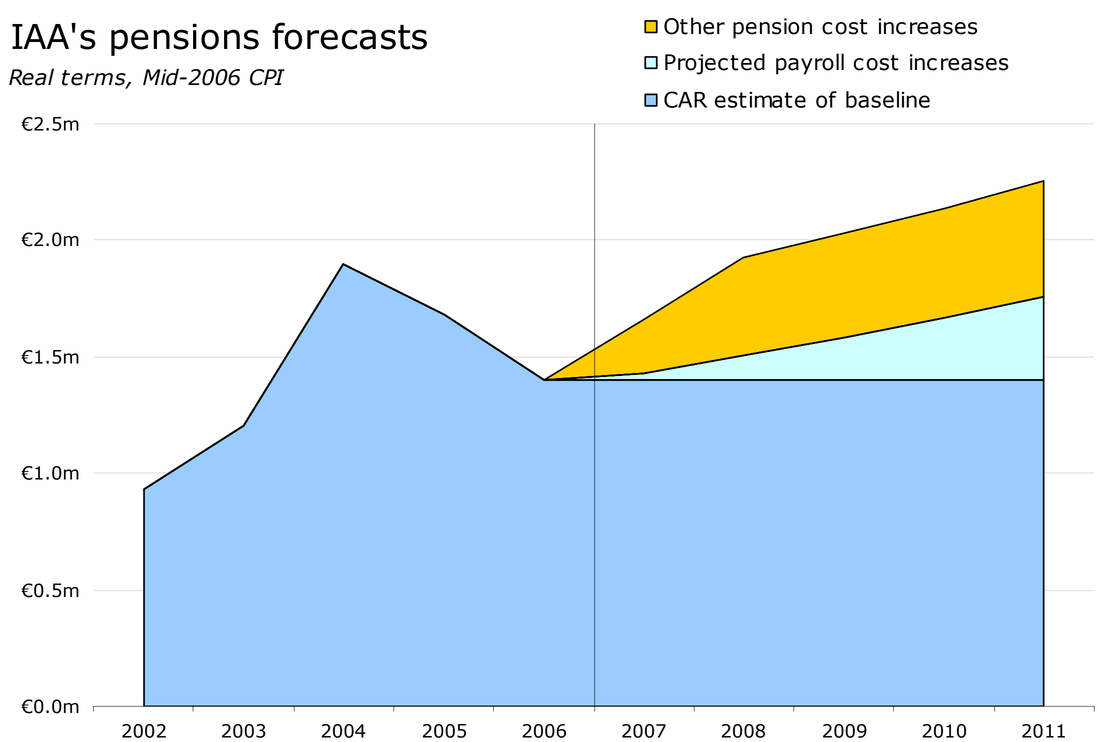
The CAR is also aware that the IAA is investing in major improvements in its systems and planning other changes to its processes, which are in part designed to improve flexibility of its staff resources. The CAR recognises that these investments are primarily safety driven, but has received no convincing argument has been made to link safety improvements with substantial real increases in pay levels.

The CAR has not been convinced of any rationale for payroll cost increases beyond those justified by growth in ATS activity. It has therefore made allowance for payroll cost increases from provisional 2006 levels only to that extent.

2.2.2 Pension costs

Pension costs increased significantly between 2002 and 2004, from a level of 17% to over 32% of payroll costs. Between 2004 and 2006, pension costs reversed part of this increase to about 24% of payroll costs. IAA projects pension costs to rise again to more than 30% of payroll costs by 2008 and remain at that level thereafter. The following chart illustrates this outlook. The IAA has since indicated to the CAR that a rate of 27.6% of pension costs might have been more appropriate since not all payroll costs are pension-able.

Chart 4: IAA's Pension Forecasts



IAA's accounts for 2005 indicated that pension costs represented about 19% of payroll costs, accounted for under FRS 17 (representing the actuarially determined cost of pension benefits promised to employees earned during the year plus any benefit improvements granted to members during the year, but excluding the impact of pension-scheme deficits).[4] The additional contributions over and above 19% of payroll costs represent the contribution rates recommended by the actuaries to eliminate the deficit over an appropriate period.

The inherent uncertainties associated with pension schemes mean that the size of any deficits (or surplus) fluctuates. For example, information from the IAA's pension-scheme actuary shows that the deficit at the last actuarial valuation on 1 January 2006 was lower than the deficit disclosed in the 2005 accounts. Given this uncertainty, the CAR would not expect the IAA to respond immediately to any pension deficit by fully funding the scheme with a single payment.

A pension deficit necessarily has an economic implication for some or all stakeholders in a company. However, to the extent that a deficit arises from decisions by the business, for example to take a pension contribution holiday or to grant more generous benefits to existing employees, it would not be reasonable to attribute the impact to users – a firm in a competitive market would not be able to increase its prices unilaterally to recover the costs of these kinds of decisions. There is also the question of whether a pension deficit is an operating cost or whether it is more appropriately treated as a component of the business's funding structure – FRS17 deals with the impact of pension-scheme deficits under financing costs. This distinction highlights an important risk characteristic of defined-benefit schemes, that it exposes the company to significant risk relating to investment returns on pension assets and demographic factors relating to pension liabilities. These risks might be borne by the shareholder, as they might in many competitive sectors, or might alternatively be shared with users.

For this review, the CAR allows for a continuation of the proportion of payroll costs shown in 2006, about 24%. The CAR recognises that the current level of the pension deficit is partly a function of decisions taken prior to 2002 and the commencement of the economic-incentive regime. The CAR concludes that it is not appropriate for the

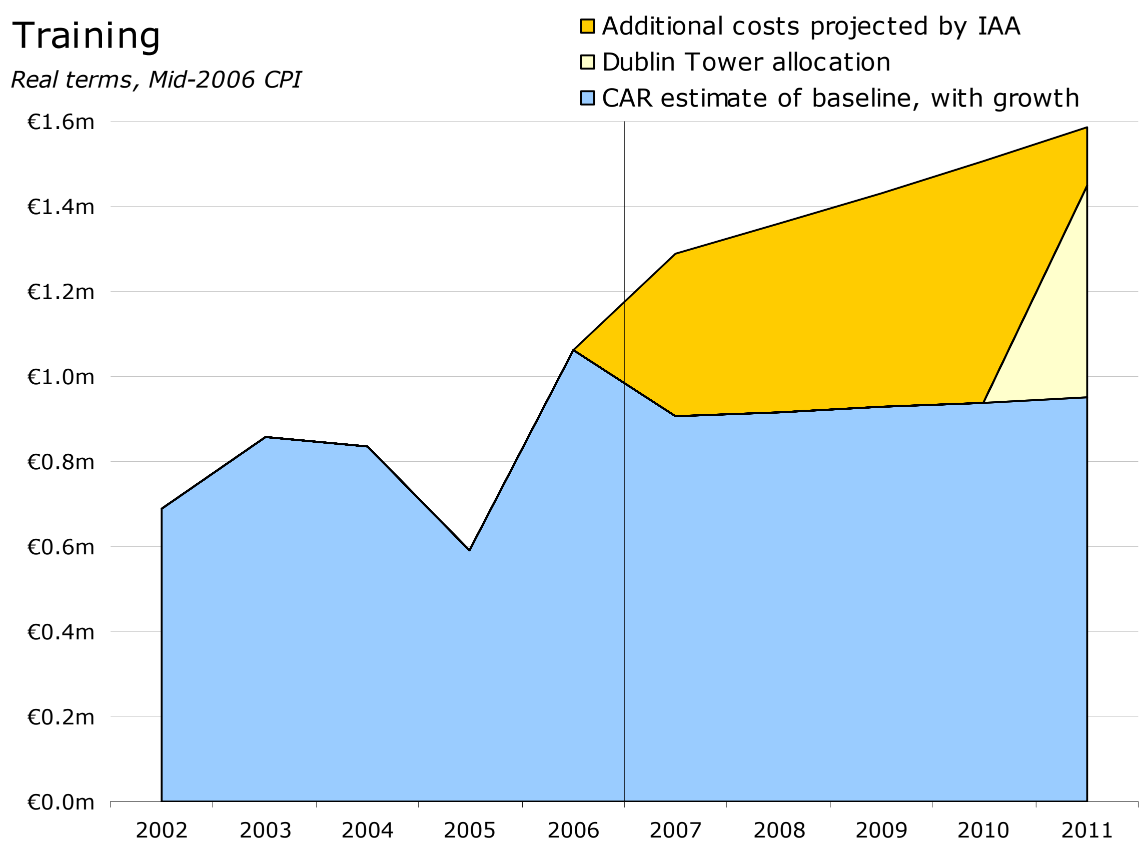
[4] Note 3 to IAA's 2005 accounts.

next regulatory period to make allowance for further increases in pension costs. In due course, the CAR would expect pension costs attributable to ATS to converge towards the underlying actuarial cost of pensions.

2.2.3 Training costs

The CAR has reviewed IAA's forecasts for training costs in the light of the pattern of costs over the last five years. Although training costs were projected to increase significantly in 2006, the average level of training cost over the past two years, taking 2005 and 2006 together, was broadly consistent with the average level for the previous three years. The CAR considers that compelling evidence of an underlying increase in the costs of training is not yet evident from the history. The relationship between historical levels and IAA forecasts is illustrated in the following chart.

Chart 5: IAA's Training Costs



To justify its projections, the IAA has outlined the principal components of its training programme, as follows:

(a) Centralisation of Shannon and Cork approaches at Dublin

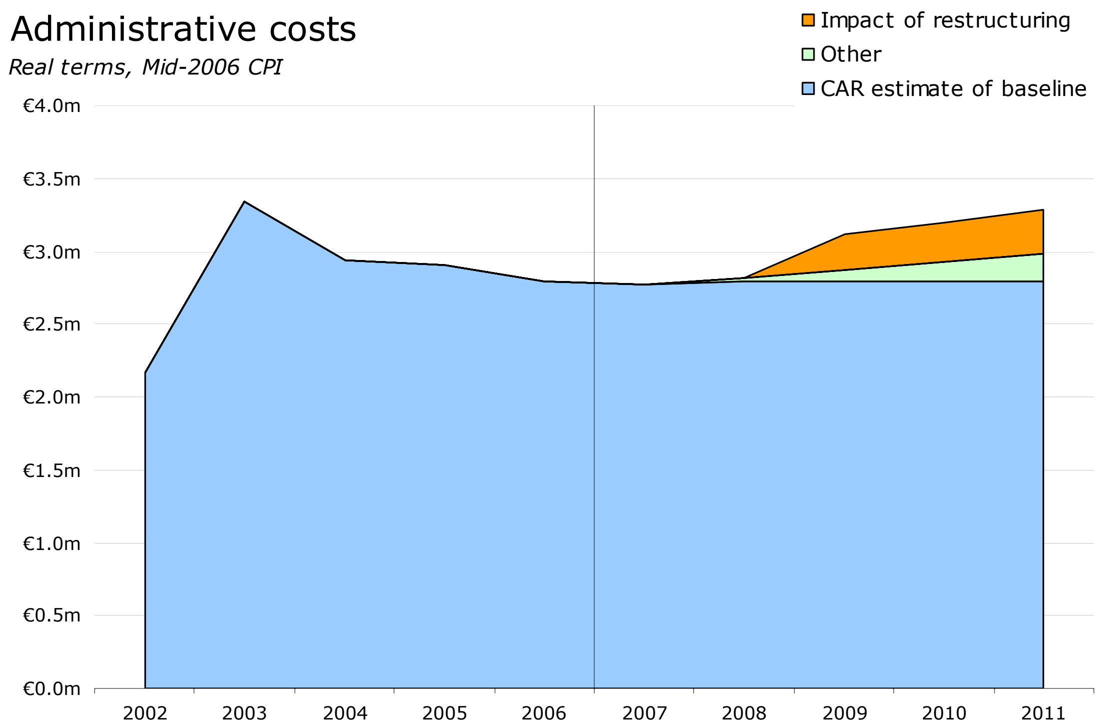
(b) Recruitment of new controllers to replace planned retirees
(c) Continuation and refresher training to meet ongoing regulatory requirements
(d) For tower controllers – ratings training, tower air movements training, tower surface training, approach and radar training
(e) Training of tower controllers for the introduction of a new parallel runway at Dublin.

The CAR notes that some of these factors are ongoing, will have existed over the past five years and do not provide the CAR with conclusive evidence for a significant increase in the allowance for training costs. The Determination allows for a training budget that is similar in magnitude to the IAA's historical training budget, plus an allowance for growth. It does not include the increases sought by the IAA with the exception of set-up training costs that might arise if a new tower is built at Dublin airport (these training costs are included as a separate milestone, discussed in more detail in section 2.3.3).

2.2.4 Administrative expenses

After a step increase in administrative costs in 2003, administrative costs for ATS (including administration, utilities, telecommunications and other operating costs not included in payroll, pensions, training, MET or regulation) have fallen significantly in real terms. IAA's forecasts indicate significant increases in the future, as illustrated in the following chart.

Chart 6: IAA's Administrative Costs



The CAR has identified that an important part of the forecast increase going forward is a result of the proposed restructuring of the IAA relating to the creation of a separate safety regulator from 2009. When making a determination the CAR is reluctant to make allowances for costs predicated on assumptions about possible future legislation. Furthermore, even if the IAA is restructured into two separate entities, the IAA's allocation of possible costs associated with duplication of central functions appears not to have been symmetrical. In particular, the IAA forecasts an increase in ATS's average share of the IAA's non-MET and non-regulation costs from 11.4% over the period 2006-08 to 12.9% over the period 2009-11, an increase of 1.5%, or nearly €2 million per annum. It appears that the creation of a safety regulator is projected to lead to some savings within the generality of IAA but not within ATS. The CAR therefore considers the inclusion of additional charges payable to the new safety regulator is liable to double count costs already included in projections for ATS. The restructuring costs are thus excluded from the price-cap computation.

2.2.5 Meteorological (MET) costs

The CAR determined in 2002 that the IAA provided ATS at a level below the fully allocated cost of providing the service. This was because the IAA did not allocate any portion of the cost of the provision of meteorological services to aviation terminal services charges. The determination set the maximum charge at a level to cover all such costs. The IAA has informed the CAR that, by the end of the current determination, it will be allocating 20 per cent of aeronautical meteorological service ("MET") costs to the aviation terminal services cost base. The CAR accepts this proportionate 80/20 allocation of MET costs within the IAA for the next price control period.

The CAR believes the service area allocations of aeronautical MET costs (i.e., an 80/20 split between en route and terminal respectively) is appropriate, and consistent with the principle of the International Civil Aviation Organisation (ICAO) that "the allocation of aeronautical meteorological costs should be determined in such a way as to ensure that no users are burdened with costs not properly allocable to them."[5]

2.2.6 Cost-effectiveness & benchmarking

Section 36(g) of the 2001 Act requires the CAR to have due regard to "the cost competitiveness of aviation terminal services with respect to international practice." At the time of the first determination, the CAR examined evidence of the IAA's international cost competitiveness and found that the IAA's (albeit en route) costs were below those of the other service providers in the study.

As mentioned in CP8/2006, Eurocontrol's ATM Cost Effectiveness ("ACE") 2004 Benchmarking Report suggests that this picture has changed little in the interim.[6] CAR notes that the ACE 2004 benchmarking is a purely factual analysis of the cost-effectiveness indicators and that a normative analysis would require a proper consideration of exogenous factors, especially input prices and traffic complexity. European Air Navigation Service Providers ("ANSP") are characterised by significant heterogeneity and comparing their data is a complex task, with particular difficulties in the areas of the categorisation of non-air traffic control staff, differences in

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[5] See ICAO Manual on Air Navigation Services Economics – Appendix 6.
[6] See Eurocontrol (2006) "ATM Cost-Effectiveness (ACE) 2004 Benchmarking Report", www.eurocontrol.int.

ownership structure and hence costs, different methods used to finance assets, the treatment of regulatory costs and of costs that are recovered outside of ATS.

In May 2005, consultants Steer Davies Gleave (SDG) with the Solar Alliance produced a report for the UK Civil Aviation Authority benchmarking NATS's costs relative to a select group of 13 European ANSPs. Comparators were chosen on the basis of similarities in unit labour costs and in airspace density and included the IAA. The principal added value of the report was a more comprehensive analysis and isolation of NATS costs of ANS/CNS provision.

Preliminary drafts of a more recent benchmarking study by Eurocontrol appear to demonstrate significantly lower costs for the IAA. But the caveats alluded to above about the problems of comparing the IAA's performance with other ANSPs still apply. The IAA's operations have changed in scope, so that significantly lower costs do not necessarily represent improved efficiency.

The CAR believes its high-level analysis of ATS's operating costs and its decisions to adjust where appropriate the IAA's forecast costs when setting this Determination is a proportionate response to the issue of performance.

2.3 Capital Expenditure

The CAR has sought to allow the IAA sufficient funds to recover the costs associated with earlier capital investments not yet fully depreciated and to undertake necessary capital expenditure during the forthcoming regulatory period.

2.3.1 Starting Regulatory Asset Base

This Determination assumes a starting regulatory asset base (RAB) of €28.146 million. The CAR has rolled forward the RAB in general price terms based on outturn capital expenditure and depreciation allowed for in the price-cap calculation. The calculation relies on forecast capital expenditure for 2006 and an allocation of forecast capital expenditure for 2007. The IAA provided these forecasts.

Table 5: Starting RAB

Opening RAB	2006	3m 2007
€000s - 2006 prices, CPI = 115.7		
RAB at start of period	24,271	25,310
Base capital expenditure	4,544	4,045
Depreciation allowance	(3,505)	(1,209)
RAB at end of period	25,310	28,146

During the first price control period, the IAA has a forecast cumulative under-spend of €3.3 million. This arises because forecast expenditure of €5 million on refitting the existing Cork Tower did not occur while other projects required €1.7 million more capital expenditure than forecast in 2002.

The 2002 determination did not specify exactly how the capital expenditure should be allocated to different projects; the CAR accepts that there will be deviations, in both directions, from the forecast capital expenditure. Instead the determination sought to forecast the IAA's likely capital expenditure needs, in some cases by reference to larger projects identified as necessary. The IAA had discretion to adapt its capital expenditure plans during the period to the changing environment. Its decision not to refit Cork Tower was clearly optimal given it sought planning permission to build a new tower.

The CAR is satisfied that the capital expenditure that the IAA has undertaken should be included in the starting RAB for this Determination. This is €3.3 million less than envisaged when the 2002 determination was made.

2.3.2 Capital Expenditure Allowance

The IAA has submitted a proposed investment programme for the forthcoming price-control period that entails significantly more capital expenditure than it undertook during the first price-control period. It envisages spending nearly €103 million between 2007 and 2011, as shown in table 3.

Table 6: IAA Forecast Capital Expenditure

Capital expenditure	**2007**	**2008**	**2009**	**2010**	**2011**
€000s - 2006 prices, CPI = 115.7					
IAA forecasts					
Communications	1,793	465	90	500	500
Navigational aids	3,694	5,800	500	0	0
Surveillance	5,276	3,313	3,507	500	250
Flight Data Processing (FDP)	2,436	2,267	1,750	7,639	1,500
Data Communications	443	0	0	0	0
Other	1,047	250	250	250	250
ICT	692	375	375	375	375
Training	491	175	175	175	175
Buildings & Security	307	125	125	125	125
Cork Tower	0	10,500	0	0	0
Dublin Tower	0	0	0	44,000	0
Total	16,179	23,270	6,772	53,564	3,175

The Determination allows the IAA to collect sufficient revenues to fund capital expenditure of €43.4 million, with discretion granted to the IAA on how to allocate such expenditure between different capital projects. This is less than the IAA's €103 million forecast capital expenditure largely because the costs of building towers at Cork and Dublin airports have been excluded from the general capital expenditure allowance (instead allowance for their costs to be recovered in charges will be made conditional on completion, as described elsewhere in this document). A contingency of €1 million for technology projects has been excluded since the CAR considers that the capital investment allowed already provides sufficient funds for the IAA to respond to changing capital expenditure needs.

The allowance of €43.4 million represents an 85% increase on the level of capital expenditure allowed in the last price control (in 2006 prices). The CAR would expect the IAA to realise efficiency savings, such that over time there will be a fall in the IAA's required operating and capital expenditure for a given level of service. It is possible that there will be some substitution between operating and capital expenditure, but generally the CAR would not forecast capital expenditure to rise as steeply as it has between 2002 and 2007.

However, the CAR is also aware that capital expenditure is necessarily more "lumpy" than operating expenditure. Because many assets will have useful asset lives extending through more than one price-control period, it is to be expected that there will be some price-control periods when higher replacement activity and consequently capital expenditure is necessary than in other periods. The IAA's investment plan includes three projects, each costing more than €1 million, that involve replacing existing systems that have reached the end of their useful asset lives. Projects to replace radar and navigational aids equipment will each cost in excess of €6 million.

There are other factors that may lead to increasing capital expenditure needs, such as international agreements and decisions that the IAA has to implement. For example, some investment may be necessary to handle new technology standards and their associated software costs. The IAA's investment plan includes €1 million for ADS-B and €9 million for the jointly developed COOPANS software.[7] There are also upgrades to hardware forecast to cost €4 million.

The CAR has reviewed the business cases that the IAA has provided for the various components in its forecast capital expenditure plan and, with the exception of a €1 million contingency budget for technology projects, is satisfied that the forecast costs are currently justified. External contractors are used throughout, selected through competitive processes, with major projects such as COOPANS subject to independent review.

At the time of the next determination the CAR will need to be satisfied that any expenditure that has taken place is justified before it is rolled forward into the next RAB. Given user complaints about the lack of appropriate consultation when developing its existing programme, the CAR will expect the IAA to explain why an investment was made. In cases not driven by safety or external factors, the IAA will need to demonstrate that it has consulted with users and satisfy the CAR that there was user support or evidence of a clearly positive cost-benefit analysis. The CAR will provide guidelines outlining in more detail the type of evidence it will be seeking.

The resulting base case assumptions for capital expenditure are set out in the following table.

[7] The COOPANS project involves a common system upgrade to the Irish, Swedish and Danish air traffic control systems

Table 7: Base Allowable Capital Expenditure

Capital expenditure	2007	2008	2009	2010	2011
€000s - 2006 prices, CPI = 115.7					
Commission assumptions - base capital expenditure					
Communications	1,793	465	90	500	500
Navigational aids	3,694	5,800	500	0	0
Surveillance	5,276	3,313	3,507	500	250
Flight Data Processing (FDP)	2,436	2,267	1,750	7,639	1,500
Data Communications	443	0	0	0	0
Other	1,047	0	0	0	0
ICT	692	375	375	375	375
Training	491	175	175	175	175
Buildings & Security	307	125	125	125	125
Cork Tower	0	0	0	0	0
Dublin Tower	0	0	0	0	0
Total	16,179	12,520	6,522	9,314	2,925

2.3.3 <u>Specific Capital Expenditure Allowances with Milestones</u>

For the period 2007-2011 the Determination is predicated on the IAA spending no more than €43.4 million on capital projects that it deems necessary. This allows the IAA the flexibility to adapt to changing circumstances without being unnecessarily constrained by forecasts developed in 2007.

However, in some instances a proposed investment is sufficiently large that the CAR feels it is appropriate to be more prescriptive. The buildings of both Cork and Dublin towers are examples of projects which significantly increase the capital expenditure that the IAA expects to incur. Consequently, the CAR has decided to "ring fence" the revenue allowance for these projects.

The CAR has decided that capital expenditure for these major projects should only be remunerated when milestones are met. This will remove the possibility of the IAA over-or under-recovering revenues because of a major investment not taking place. There are also desirable incentive properties associated with such milestones, since it places the risk of projects over-running with the party best able to manage this risk.

Although the IAA has made a planning application for the new Cork tower, and the existing tower will cease to be operational, there is some uncertainty about the exact timing of the project. The CAR will allow an increase in revenues equivalent to an increase in the RAB of €10.5 million once the new tower is built and completed by the IAA and training of air traffic controllers in the new facility has commenced. The cap on aviation terminal service charges will be adjusted from that date forward, with a restatement of the term "t" for the remainder of the regulatory period.

The IAA will need to give two month's notice to the CAR, the Cork airport operator and users that it intends to commence training in the new air traffic control tower. This will give the CAR an opportunity to verify the "milestone" event and to make the necessary changes to the price-cap calculations.

There is more uncertainty about if and when the IAA needs to build a new tower at Dublin airport. The need for a tower depends on the development of a new parallel runway, for which planning permission has yet to be granted. If developments at Dublin airport justify the IAA building a new tower before of the end of 2011, the period covered by this Determination, the CAR will allow an increase in revenues equivalent to an increase in the RAB of €45 million and adjust accordingly the revenues from that date forward that the IAA can collect in aviation terminal service charges. As for the Cork tower, the milestone for including capital expenditure on Dublin tower in the RAB will be the date when the tower is complete and training of air traffic controllers in the new facility has commenced.

The IAA has argued that a new tower at Dublin will require an increased training budget. A new tower responsible for two main runways rather than one currently will entail significant set-up training costs. To ensure that the new tower is operational, the IAA currently forecasts additional training costs in 2010 and 2011 of €500,000. As such, the Dublin tower milestone includes a one-off allowance for training costs of €500,000 that will be included once the CAR has verified a new Dublin tower is complete and training of air traffic controllers in the new facility has commenced.

For both towers, the CAR will expect the IAA to demonstrate that it has consulted with users in advance and satisfy the CAR that there was user support or evidence of a clearly positive cost-benefit analysis. The CAR will provide guidelines outlining in more detail the type of evidence required.

2.3.4 *Cost of Capital*

The CAR has used a value of 6.2% for the IAA's real post-tax cost of capital. An expert consultancy study prepared for the CAR by Dr Elaine Hutson and Professor Colm Kearney informed this decision. Their report is published in appendix 1.

The cost of capital estimate has been revised since publication of the draft determination following the entry into Irish law of the European Commission Regulation No 1794/2006. Articles 6(2) and 6(3) of EC Regulation No 1794/2006 have implications for the cost of capital that air navigation service providers, such as the IAA, may recover.

The regulation requires that the actual proportion of financing through debt and equity respectively shall be used when estimating the weighted average cost of capital. The option of estimating an optimal level of gearing is not available. In practice, this may not be significant because of Ireland's current tax regime, with low rates of corporate tax.

For the purposes of setting the forthcoming Determination, the most material change from 2002 (and the draft determination) relates to the cost of debt that the IAA is allowed to recover. Article 6(3) of the Regulation requires that the cost of debt should equal the average interest rate on the IAA's debts, and not some hypothetical cost of current debt. The interest on bank loans that the IAA pays, on average, is about 38 basis points above the Euribor rate. Adding this to the risk-free rate results in a cost of debt that is lower than might otherwise have been allowed.

The CAR has continued to rely on a capital-asset pricing model to estimate the cost of equity. This is consistent with the new regulations, which require that the cost of equity be set taking into account the national bond rate as a guide and allowing an additional premium to ensure adequate consideration of the financial risks assumed by the IAA.

Following consultation the CAR has decided that, in exchange for lower ATS charges than would otherwise be the case, users should assume a greater share of the financial risks associated with deviations in traffic volumes. In the first determination, the volume risks were borne solely by the IAA. The CAR is satisfied that the deviations in traffic levels are largely outside the control of the IAA. Hutson and Kearney have referred to estimates for the asset beta of NATS, which is subject to a price-control regime that includes traffic-risk sharing, when determining a suitable estimate of the IAA's asset beta.[8]

2.3.5 Depreciation

The IAA employs straight-line depreciation of fixed assets. Asset lives are 20 years for buildings, 8 years for installations and other works, and 3-5 years for office equipment and non-operational software. The company's annual report and accounts provide details.

The CAR has assumed the same asset lives as the IAA uses, and applies these to an indexed historic-cost RAB to derive the depreciation charges included in the calculations for revenue the IAA is allowed to collect. This approach complies with Article 6(2) of the EC Regulation No 1794/2006.

2.4 Calculation of the Price Cap

The CAR has adopted a conventional price cap calculation methodology, consistent with what it has done previously for ATS charges and in its determinations of airport charges at Dublin Airport. The method is also consistent with that used by other regulators, including in the aviation sector.

The methodology secures that, given the CAR's central assumptions and forecasts, the discounted present value of the revenues that are projected to arise from the operation of the price-control formulae are equal to the discounted present value of the operating costs, capital expenditure and the opening and closing value of the regulatory asset base. The expected net present value should be zero. If the IAA can achieve the economies that the CAR considers to be reasonable, the economic impact of the determination on the shareholder should be broadly neutral. If the IAA can operate more efficiently, there is scope for the shareholder to gain; if the IAA under-performs, the shareholder's profits will be lower than it might reasonably have hoped.

[8] The asset beta is a measure of the systematic business risk facing a firm.

The yield table summarises the present value equation, showing how the present values of revenues, costs and opening and closing values of the regulatory asset base are projected to equate to zero.

Table 8: Yield Table

Yield table	9m 2007	2008	2009	2010	2011	PV
€000s - 2006 prices, CPI = 115.7						
RAB						
RAB at the start of each period	28,146	36,655	42,477	41,102	42,128	
Capital expenditure	12,134	12,520	6,522	9,314	2,925	
Allowed depreciation	(3,626)	(6,697)	(7,897)	(8,289)	(8,247)	
RAB at the end of each period	36,655	42,477	41,102	42,128	36,806	
Discount rate	*4.72%*	*6.20%*	*6.20%*	*6.20%*	*6.20%*	
Discount factors for cash flows:						
- at the start of the period	1.000					
- during the period	1.023	1.079	1.146	1.217	1.292	
- at the end of the period					1.332	
Cash flows and NPV check						PV
RAB at the start of the period	(28,146)					(28,146)
Capex	(12,134)	(12,520)	(6,522)	(9,314)	(2,925)	(39,080)
Opex	(9,867)	(13,070)	(13,256)	(13,449)	(13,945)	(55,180)
Regulated revenues	15,579	21,019	22,617	24,360	26,225	94,776
RAB at the end of the period					36,806	27,630
Total NPV						(0)

The first period in the yield table is a part-year period, from 26 March to 31 December 2007. The values for the part-year period are derived from the full financial year assumptions, allocated as set out in the table below.

Table 9: Derivation of Yield Table for Regulatory Period 2007

Initial part-year period	2007	Allocation	3m 2007	9m 2007
€000s - 2006 prices, CPI = 115.7, unless otherwise stated				
Traffic volumes *(MTOW 000s)*	9,568	80%	1,914	7,654
Operating expenditure	13,156	75%	3,289	9,867
Base capital expenditure	16,179	75%	4,045	12,134
Regulatory depreciation	(4,834)	75%	(1,209)	(3,626)

The projections for regulated revenues are derived from the operation of the determination formulae set out in section 1 above. The following table sets out this projection.

Table 10: Calculation of Regulated Revenues

Calculation of regulated revenues	9m 2007	2008	2009	2010	2011
€000s - forecast inflation, unless otherwise stated					
Calculation of variable revenue					
Reference months for the CPI term	Jan-07	Oct-07	Oct-08	Oct-09	Oct-10
Forecast CPI for reference month	117.9	121.1	124.7	128.4	132.3
Forecast CPI change		2.69%	3.00%	3.00%	3.00%
X factors		3.75%	3.75%	3.75%	3.75%
CPI + X		6.44%	6.75%	6.75%	6.75%
v term*/MTOW (2006 = €1.94)	1.060	1.128	1.204	1.286	1.372
Forecast MTOWs	7,654	9,922	10,309	10,732	11,161
Variable revenue	8,114	11,194	12,416	13,798	15,318
** Rolled forward on CPI+X basis*					
Calculation of fixed revenue					
G factors		4.00%	4.00%	4.00%	4.00%
CPI + X + G		10.44%	10.75%	10.75%	10.75%
FR term†	10,114	11,169	12,370	13,700	15,173
0.8 factor for part year	0.8	1.0	1.0	1.0	1.0
Fixed revenue	8,091	11,169	12,370	13,700	15,173
† Rolled forward on CPI+X+G basis					
Fixed + variable revenue	16,205	22,364	24,786	27,498	30,491
Adjustment to real (inflation adjusted) terms					
Forecast fixed + variable revenue *(with inflation)*	16,205	22,364	24,786	27,498	30,491
Forecast mid-period CPI	*120.3*	*123.1*	*126.8*	*130.6*	*134.5*
2006 CPI used for this determination	*115.7*	*115.7*	*115.7*	*115.7*	*115.7*
Real fixed + variable revenue	15,579	21,019	22,617	24,360	26,225

The milestone adjustments to the allowed revenue formula are calculated to provide an annual revenue allowance equivalent, in discounted present value terms, to the revenue allowance that would have been calculated under the conventional building block methodology. The calculation takes into account the CAR's policy decision that the financing costs of the capital projects involved during the course of construction should be capitalised into the regulatory valuation of those projects, thereby funded by users only once the assets are in operation.

3 LEGAL CONSIDERATIONS

3.1 Duration of Determination

Section 35(3) of the 2001 Act, as amended, states that, "a determination shall – (a) be in force for such period of not less than 4 years, and (b) come into operation on such day, as the Commission specifies."

For the purposes of the first Determination, a period of 5 years was prescribed by the legislation. The first determination ceases to be in force on 25 March 2007.[9] The CAR has discretion in choosing the duration of the second Determination, provided it is equal to or longer than 4 years.

The CAR sees merit in making a Determination with duration in excess of the statutory minimum. The CAR also believes it makes sense for regulatory years to be aligned with the financial year of the regulated firm. The IAA's financial year-end is 31 December.

Accordingly, this Determination comes into operation on 26 March 2007 with a move to a calendar-year basis on 1 January 2008. Therefore, the opening price cap to applies for a period of some 9 months, followed by annual price caps thereafter.[10] After this initial nine-month period the Commission proposes that the price cap will remain in force for a further four years. Thus, the price cap will commence on 26 March 2007 and expire on the 31 December 2011.

3.2 Scope of Regulation

Section 2 of the 2001 Act states that "terminal services" should have the meaning assigned to it by the Irish Aviation Authority Act, 1993 ("the 1993 Act"). The 1993 Act defines terminal services as "the air navigation services provided for aircraft landing at or taking off from an aerodrome or while in the vicinity of an aerodrome before landing at or taking off from that aerodrome." Air navigation services are defined by the 1993 Act as including "services providing, giving, or issuing

[9] See Commission Paper CP4/2004 the Review of the Determination on Maximum levels of Aviation Terminal Services Charges and report outlining that the regulatory period 06/07 ends on 25 March 2007.
[10] This would give a price control of 4 years and nine months from end March 2007 to December 2011.

information, directions or instructions, or other facilities, for the purposes of or in connection with the navigation or movement of aircraft."

As set out in the first determination[11] the Commission has interpreted this meaning in light of the ICAO charging policies, that is, that the reference to "aircraft landing at or taking off from an aerodrome" in the 1993 Act corresponds with aerodrome control in the ICAO principles and that the reference to "while in the vicinity of an aerodrome before landing at or after taking off from that aerodrome" in the 1993 Act corresponds with approach control in the ICAO principles.

The Commission continue to use this interpretation of the meaning of air terminal services charges. It is consistent with the new EC Regulation setting out a common charging scheme for air navigation services.[12]

As set out in CP8/2006, the CAR believes that the cost base for aviation terminal services includes the costs incurred by the IAA in respect of the Dublin, Shannon and Cork towers and certain proportions of the costs of the Dublin and Ballycasey ACCs.

As well as aviation terminal services at each of Dublin, Shannon and Cork airports, the IAA provides en route navigation for movements in Irish-controlled airspace,[13] Shanwick Communications,[14] safety regulation, air navigation for exempt air traffic[15] and commercial and training activities.

Where there are resources that are used to provide both ATS and other services, the CAR continues to use the cost allocation rules that Eurocontrol developed after reviewing the IAA's systems in 1993. This involves approximately a 25:75 split between ATS and en route services respectively. The allocations were aimed at ensuring full cost recovery in accordance with ICAO principles.

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[11] Maximum Levels of Aviation Terminal Services Charges, Commission Paper CP3/2002. 26 February 2002, www.aviationreg.ie

[12] Commission Regulation (EC) No 1794/2006 of 6 December 2006 laying down a common charging scheme for air navigation services, 7.12.2006 OJ L341/3.

[13] Aircraft that fly through Irish airspace en route between Europe and North America, generally above 28,000 feet and that do not touch down in Ireland.

[14] Shanwick Communications provides a long-range voice communications service for Oceanic air traffic control in the eastern half of the north Atlantic, the Volmet Broadcast Service and is the AFTN (Aeronautical Fixed Telecommunications Network) COM for Ireland.

[15] Exempt air traffic includes military, search and rescue, flights with heads of State and any aircraft with a weight under two tonnes.

3.3 Design and Scope of the Price Control

Section 35(4)(a) of the 2001 Act states that a determination, specifying the maximum level of aviation terminal services charges, may "provide

1. For an overall limit on the level of aviation terminal services charges;
2. For limits to apply to particular categories of such charges, or
3. A combination of any such limits."

By virtue of section 35(4)(b) a determination may "operate to restrict increases in any such charges, or to require reductions in them, whether by reference to any formula or otherwise" or, as stated in section 35(4)(c), "provide for different limits to apply in relation to different periods of time falling within the period to which the determination relates."

This price control continues to takes the form of a cap on the average revenue per metric tonne of departing aircraft weight. The cap imposes annual limits, although any shortfall (or under-recovery) in outturn average revenue compared with the maximum may be added to the following year's allowed revenue and, likewise, any over-recovery is deducted from future allowed revenue. This system of collection is restricted to the period of the price control.

The CAR favours efficient charging structures, with individual users paying charges that reflect the costs they impose on the IAA. This is consistent with ICAO policies in respect of charges for airports and air navigation services.[16] At present, the manner in which these principles are applied is agreed with Eurocontrol's Central Route Charges Office (the CRCO). Specifically, the IAA has entered into a bi-lateral agreement with Eurocontrol, entrusting the latter with the calculation, billing, accounting and collection on its behalf of charges for the use of terminal services in accordance with the laws and regulations in force in Ireland. Pursuant to this agreement and in accordance with the recommendations of ICAO, Eurocontrol has published *"Rules Governing Terminal Charges in Ireland"*.[17] Article 3 of these rules

[16] See ICAO (2004), "Policies on Charges for Airports and Air Navigation Services," Seventh Edition, Doc 9082/7, p. 15.
[17] These rules are incorporated in a document titled "Information Circular: Terminal Charges in Ireland", effective 1 January 2007 (Ref. EI 2007/01), www.eurcontrol.int/crco

states that, “the terminal charge (**R**) shall be calculated in accordance with the following formula:

$$\mathbf{R = t \times N}$$

where **t** is the unit rate of charge and **N** is the number of service units. Article 4 of the rules states “that for a given departing flight, the number of service units in respect of terminal charges, designated (**N**), shall be equal to the maximum certified take-off weight (MTOW) for the aircraft concerned, expressed in metric tonnes…”

Section 36 (a) of the 2001 Act requires the CAR to have due regard to these principles.

3.4 Statutory Objective

Under Section 36 of the 2001 Act, the CAR is obliged to “aim to facilitate the development and operation of safe, cost-effective terminal services which meet international standards.”

In aiming to facilitate the development and operation of safe, cost-effective terminal services, the CAR must have due regard to the 7 specified factors contained in Section 36 of the Act. However, the extent to which reliance on any one of these factors contributes to the achievement of the statutory objective is a matter for the CAR to determine.

The manner in which the CAR believes it has achieved its statutory objective is set out in the report on this determination. The manner in which it believes it has had due regard to the factors listed in section 36 of the Act is set out below by reference to more detailed sections in the report equating to the respective factors.

The CAR received representations from interested parties on both the statutory objective and the statutory factors. The CAR response to these representations is set out in Appendix 1.

3.4.1 Statutory Factors

a. *"the relevant charging principles of the International Civil Aviation Organisation and of Eurocontrol"*[18]

The CAR, in setting the maximum levels of Aviation Terminal Services Charges has had regard to those charging principles of ICAO and Eurocontrol charging principles which the CAR considered relevant to the discharge of this function. It has had regard to ICAO's policies for air navigation services and Eurocontrol's rules governing terminal charges in Ireland. These policies and rules have not changed in principle or approach since they were set out at length in the CAR's first determination on aviation terminal services charges made on 26 March 2002.

These rules state that the terminal charge (R) shall be calculated in accordance with the following formula:

$$\mathbf{R = t \times N}$$

Where (t) is the unit rate of charge and (N) is the number of service units corresponding to terminal services used or made available. The CAR determines the unit rate "t".

b. *"the level of investment in aviation terminal services by the Authority, in line with safety requirements and commercial operations, in order to meet current and prospective needs of the airline industry[19]"*

In making its first determination, the CAR assessed the IAA's capital expenditure against the future needs of the airline industry and allocated the cost of a portion of that capital expenditure to users (through regulated charges) of aviation terminal services.

The CAR has continued with this approach to deciding capital expenditure allowances for the purposes of determining maximum levels of aviation terminal services charges. The CAR has sought to allow the IAA sufficient funds to recover the costs

[18] Section 36(a)
[19] Section 36(b)

associated with earlier capital investments not yet fully depreciated and to undertake necessary capital expenditure during the forthcoming regulatory period.

The CAR carefully reviewed the historic and medium-term capital expenditure programme of the IAA, in particular the 2006-2015 Technology Plan and later amendments to it, and was assisted in this regard by Europe Economics.

The CAR assessed the IAA's capital expenditure against the future needs of the airline industry and allocated the cost of an appropriate portion of that capital expenditure to users of aviation terminal services.

The CAR has made provision in the Determination for the IAA to maintain and enhance the safety and quality of the aviation terminal services provided by the IAA. This includes resources for the IAA to upgrade its technology systems to enable it to provide increases in capacity, to achieve increases in productivity and safety as well as to comply with its international commitments under the European Air Traffic Management Programme managed by Eurocontrol.

Furthermore, in order for the CAR to have due regard to the level of investment by the IAA, there is an implicit requirement that the IAA be given a rate of return at least equal to its cost of capital, so that it may obtain funds for the purposes of investment. The ICAO principles also recognise the link between the ability of the provider of air navigation services to undertake investment and the rate of return that is earned by that firm.

Therefore, the CAR had an expert consultancy study prepared by Elaine Hutson, Lecturer in Finance, and Colm Kearney, Professor of Finance, at Trinity College Dublin. This is published as an appendix to the Report on the Determination. The consultancy study concluded that the IAA's costs of capital, on a real, after-tax basis, is equal to 6.2%. Therefore, in calculating the maximum average revenue from terminal services charges, the CAR has allowed the IAA a real, after-tax rate of return equal to 6.2 %.

c. ***"efficient and effective use of all resources by the Authority"***[20]

The CAR is required to have due regard to the "efficient and effective use of all resources by the IAA". Accordingly, it has analysed the forecast operational expenditure in the following components:

- Payroll costs
- Pension costs
- Training costs
- Administrative expenses

The CAR's detailed consideration of this factor is set out in the text of this determination at section 2.2.

The CAR also had regard to recent cost benchmarking of air traffic control services, as described in section 2.2.6 of the Report.

d. ***"the level of the Authority's income from aviation terminal services and other revenue earned by the Authority generally"***[21]

In respect of this factor, the CAR must assess what are the appropriate revenues to be taken into account in determining maximum levels of aviation terminal services charges so that economic welfare is enhanced.

The IAA's revenues consist of those for aviation terminal services, the control of en route movements in Irish controlled airspace, Shanwick Communications, safety regulation, exempt air traffic and commercial and training activities.

As in 2002, it remains the CAR's view that there is no justification for taking into account revenues earned by the IAA for the control of en route movements in Irish controlled airspace, Shanwick Communications, safety regulation, exempt air traffic or commercial and training activities for the purposes of this Determination. Accordingly, the regulatory till here only includes revenue earned by the IAA from Aviation Terminal Services.

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[20] Section 36(c)

[21] Section 36(d)

e. "operating and other costs incurred by the Authority in providing aviation terminal services" [22]

As explained in section 2.2 of the Report accompanying its Determination, the IAA submitted to the CAR operating cost projections for the years 2007-2011. The CAR carefully reviewed the historic and projected operating costs of the IAA and was assisted in this regard by Europe Economics.

Likewise, the CAR reviewed the IAA's capital expenditure plans at a high level from an efficiency perspective and include in the price cap planned investment that would be consistent with cost minimisation.

f. "the level of quality of aviation terminal services, and the reasonable interests of the users of these services" [23]

The CAR is not proposing to introduce performance standards with regard to service quality at this time. The CAR will continue to investigate the possibility of introducing a system of financial bonuses and penalties linked to service quality, but for the purposes of setting this Determination has not done so. There remain many unresolved questions about how such a scheme might work in practice.

g. "the cost competitiveness of aviation terminal services with respect to international practice" [24]

The CAR has examined evidence of the IAA's international cost competitiveness and found that the IAA's (albeit en route) costs were below those of the other service providers in the study. Evidence reviewed includes the ATM Cost Effectiveness ("ACE") 2004 Benchmarking Report[25], the preliminary draft of the updated version of this report and a report by Steer Davies Gleave on NATS, the UK equivalent for the IAA in relation to the provision of air navigation terminal services.

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[22] Section 36(e)
[23] Section 36(f)
[24] Section 36(g)
[25] See "ATM Cost-Effectiveness (ACE) 2004 Benchmarking Report" prepared by Eurocontrol's Performance Review Unit (PRU) with the ACE Working Group and commissioned by Eurocontrol's Performance Review Commission (PRC), MM 2006.

APPENDIX 1: RESPONSES TO THE DRAFT DETERMINATION

The CAR received comments from four parties – Aer Lingus, the IAA, IATA and Ryanair – to its draft determination (CP10/2006). This appendix summarises the responses received and how the CAR has addressed these comments. The material has been structured using the same headings as in the explanatory memorandum of the draft determination. The full text of the submissions received is available on the CAR's website.[26]

Traffic Forecasts

While IATA has confidence in the STATFOR forecasts, they would like local operators to assess the figures before finalisation, to ensure that their operational plans are incorporated.

> The determination has used the STATFOR forecasts. The introduction of traffic risk sharing has reduced the importance of the traffic forecast in determining the allowable revenues that the IAA can collect. The CAR is satisfied that the traffic forecast used is reasonable and that there are insufficient benefits to warrant requiring local operators assess the figures before finalisation.

Volume Risk

The IAA claims that it is unable to react to volume risks as it has limited ability to stimulate traffic. Reference is made to the effect of the fall in traffic following unanticipated events such as September 11th on its revenues. The IAA offered to forego unrecovered costs equal to €2.9m in exchange for a promise to accept a lower pre-tax cost of capital of 6.7%, if traffic risk is eliminated.

Aer Lingus supports proposals for the IAA and the airlines to share financial risk resulting from unpredictable traffic movements. IATA believes that users should pay lower charges in exchange for accepting greater risks.

> The CAR has adapted the price-cap formula so that users bear some of the risks associated with deviations in traffic volumes.

[26] www.aviationreg.ie/ER_ATSC_Documents_Submissions_Received_CP10_2006.html

Capital Expenditure and the Regulatory Asset Base

The IAA thinks it has an excellent track record of delivering capital projects on time, to specification and within budget, while ensuring that safety is maintained. Safety may be in jeopardy if the CAR were to disallow expenditure that is required for the maintenance of safety. The new ATC towers at Cork and Dublin airports are required to serve safety and operational requirements. The IAA point out that they have a consultation process called the "Customer Care Programme," which offers a link between the IAA and its users.

Aer Lingus would like an independent review of the costs of investments. They do not consider the IAA to have engaged with the users of the terminal navigation services in a thorough manner. Aer Lingus had no knowledge abut the plan to build new ATC towers at Dublin and Cork Airports. It is suggested that no allowance for planned investments be allowed until the IAA has consulted properly with all users. Aer Lingus view it as unacceptable to include a valuation of the fixed assets in the regulatory asset base without considering the associated operating and maintenance expenses. The example of the associated costs of the new ATC towers is given.

IATA wants the IAA to consult fully with users about capital expenditure plans. It suggests introducing milestones or triggers to incentivise the IAA to deliver timely and cost-efficient investment.

Ryanair find it unacceptable that there were no public consultation meetings on the capital expenditure plans. They cannot comment on the IAA's investment plans without an evaluation of the projects. Ryanair advocates not including any capital expenditure in the price cap Determination until proper consultation has taken place.

The CAR has undertaken a detailed review of the IAA's capital expenditure plans (see section 2.3.2).

> It is disappointing that the almost universal acceptance of the IAA's capital expenditure plans in 2002 was not repeated in 2007. It is possible that this just reflects that the size of the programme was considerably smaller five years ago. Nevertheless, the CAR is keen that the IAA should consult fully with users, and will require the IAA to demonstrate that major capital expenditure projects were only undertaken after consultation with users.

The CAR has reviewed the IAA's capital expenditure plans and undertaken a more detailed investigation of its procurement processes (see section 2.3).

The CAR has introduced milestones for the proposed towers at Cork and Dublin airports.

Operating Expenditure

Aer Lingus would like explanations for rises in some cost categories, especially as the airline industry is lowering its costs and prices to consumers.

IATA suggests that the increases in training, personnel and administration costs are scrutinised by the regulator. IATA is concerned about the use of pass-through costs, which would weaken the incentive properties of the regulation of ATSCs.

The CAR has reviewed the projected operating expenditure and disallowed certain costs. In conducting the review, the CAR was mindful of ensuring that the IAA received sufficient funds to maintain safety in a cost-effective manner. The CAR continues to reject the principle of straight pass-through of costs because of the weak incentive properties.

Meterological Costs

IATA suggests that the allocation of MET costs is based on where the services and facilities are needed and used. This analysis should be conducted instead of continuing with the current 80/20 split.

The CAR has continued with the 80:20 split for the reasons outlined in section 2.2.5.

Cost Effectiveness & Benchmarking

The IAA compares themselves against studies by the FAA in the USA and the DFS in Germany, which show that the IAA is more efficient than ANSPs there. The IAA recognises that they are the smallest Area Control Centre (ACC) which skews some of the performance measures.

Aer Lingus gives support to any future analysis that the CAR may undertake on the IAA's cost competitiveness.

IATA acknowledges the IAA's good performance in the Eurocontrol Performance Review. However as the IAA is ranked 27th in terms of complexity and density of airspace, this should be kept in mind during any comparison with other ANSPs.

The CAR will continue to monitor the IAA's performance and cost effectiveness, including by reference to benchmarks when appropriate. This Determination does not make an allowance for costs where the IAA failed to demonstrate that they are necessary for the functioning of an efficient ATS provider.

Cost of Capital

Aer Lingus call for a review of the cost of capital, as the IAA is a monopoly provider of terminal services and not subject to commercial risk. IATA suggests that the cost of capital rate could be lower to take account of the low volume risk of an ANSP. Ryanair describe a cost of capital of 6.7% as being overly generous to a monopoly provider of terminal services.

> The CAR is satisfied that the cost of capital calculations it has relied upon have addressed the risks facing the IAA in an appropriate manner, consistent with requirements outlined in Article 6 of EC Regulation No 1794/2006. The standard CAPM model used by almost all regulators when estimating the appropriate cost of capital depends on the systematic (non-diversifiable) risk facing a firm. A monopoly provider of a service can be subject to systematic risk and the level of this risk is not necessarily lower than for firms that face competitive constraints.

Other Comments

Service Quality

The IAA outlines that delay in terminal operations occur at Dublin airport in general due to weather conditions, traffic bunching, airport infrastructure, incidents at the airport, military activity, etc. IATA asks the CAR to consider the use of a financial incentive to enhance quality of service, especially with respect to reducing the costs of delays. IATA recommends that the CAR initiate discussions with local operators and IATA with a view to introducing an asymmetric penalty system on delays that the IAA can directly control. Likewise, Ryanair supports the use of a penalty system to maintain a high level of service.

The CAR will continue to investigate the possibility of introducing a system of financial bonuses and penalties linked to service quality, but for the purposes of setting this Determination has not done so. There remain too many unresolved questions about how such a scheme might work in practice.

Price Cap

The IAA strongly disagrees with the indicative price cap of €2.07. It would like the full cost recovery of its costs to ensure that the appropriate investment in infrastructure necessary to ensure the safety and effectiveness of terminal services is maintained.

Aer Lingus views the €2.12 price cap in 2006 terms as acceptable as it excludes the costs of the new ATC towers and 20% of the cost of other capital projects.

> The CAR has carefully considered the potential safety or operational efficiency implications of its allowances for operating expenditure. It notes that safety is a fundamental responsibility of the IAA. The IAA must take whatever steps are necessary to secure appropriate standards of safety, and incur the consequent levels of expenditure. The CAR's role is to make appropriate allowance for efficient levels of such expenditure within its computation of the price cap in order to protect the interests of users. The CAR recognises that the IAA may spend more than the amounts allowed for in the CAR's computation, and that, other things being equal, such higher levels of expenditure would reduce the profits that the IAA would make over the period of the price control. Similarly, the IAA may spend less than its allowances, which would increase its profits. The CAR seeks to maintain this incentive approach and believes that the levels of profit allowed for provide the IAA with both the flexibility to withstand some loss of efficiency without any need to compromise safety and the incentives to improve its efficiency further.

Cost Pass Through

As the IAA under-recovered their costs by €2.9million at 31st December 2005, they strongly encourage the CAR to adopt the cost-pass through principle instead of price-cap regulation. The IAA dismisses suggestions that this could lead to over-investment as its aim to remain efficient and cost-effective results could prevent *such occurrences. They refer to the CAR's recovery of its costs as an example of cost-pass through in action.*

IATA supports the CAR ensuring that the incentive effects are sufficiently robust and challenging to prevent full-cost recovery.

> The CAR stated in CP10/2006 that "to accept such an approach would be to alter economic regulation of aviation terminal services charges from an incentive based regime to a cost pass through regime. The CAR has not been persuaded by this approach in the past in relation to any of its price regulation functions. Indeed it is arguable that such an approach is incompatible with its statutory remit."
>
> The CAR has considered the submissions received and remains committed to the use of price-cap regulation. This provides better incentives than a cost-pass through regime would, encouraging efficiency savings where they are available.

<u>EC Regulation</u>

IATA would like to know how the CAR will respond to the new EC Charging Regulation.

The main effects of the regulation for the purposes of making this Determination relate to how costs for capital expenditure can be recovered, particularly with regard the cost of capital that can be charged. The relevant sections of this document make reference to the regulations when they affect the assumptions that the CAR can use in its financial model (see sections 2.3.4 and 2.3.5).

> The IAA has discretion on how it adjusts charges to satisfy the requirement that they ultimately be set in terms of terminal service units equal to (MTOW/50)^0.7. This Determination identifies the total annual revenues the IAA may collect for a given volume of traffic measured in terms of weight.

APPENDIX 2: HUTSON & KEARNEY COST OF CAPITAL REPORT

The Irish Aviation Authority's Cost of Capital

Report to the Commission for Aviation Regulation

March 2007

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Executive Summary

1. *The weighted average cost of capital (WACC) approach is used to estimate the IAA's cost of capital. To implement this approach, it is necessary to estimate the IAA's cost of equity, its cost of debt and its gearing ratio. Following a brief financial summary, the cost of equity is discussed in Section 3, the cost of debt is discussed in Section 4, the IAA's gearing is discussed in Section 5, and Section 6 brings these together in the WACC calculations to derive the estimate of the IAA's cost of capital.*

2. *The estimated equity risk premium is 5 percent. The IAA's asset beta and its equity beta are estimated at respectively 0.65 and 1.1. The resulting estimate of the IAA's real cost of equity is 7.34 percent.*

3. *With a real risk-free rate of interest at 1.84 percent, and an actual debt premium (over Euribor) of 38 basis points, the resulting estimate of the IAA's real cost of debt is 2.22 percent.*

4. *The corporate tax rate that applies over the coming years is assumed to remain at 12.5%.*

5. *The resulting estimates of the IAA's post-tax WACC and pre-tax WACC are 5.42 percent and 6.20 percent respectively. These compare to the central estimates of PricewaterhouseCoopers (2004) for NATS of 5.0 and 6.1 percent for post-tax and pre-tax WACC respectively.*

[1] Introduction and overview

In our previous report to the Commission for Aviation Regulation (CAR) in which we estimated the cost of capital for the IAA (Hutson and Kearney, 2002), we used the CAPM-WACC (capital asset pricing model-weighted average cost of capital) framework. In this report we use the same approach, which involves estimating the cost of equity and cost of debt components, and the weighting them according to their relative weights in the regulated company's capital structure. To implement this approach, it is therefore necessary to estimate the IAA's cost of equity, its cost of debt and its gearing ratio. In doing so, we update our previous estimates in Hutson and Kearney (2002), with reference to current data relating to the components of the cost of capital such as IAA's business risk and its debt premium. We include new estimates from academic studies and recent regulatory precedent on the equity premium and the risk-free rate of interest. This is designed to ensure that the derived estimate for the IAA's cost of capital is consistent with best practice in aviation regulation in Ireland and elsewhere. This approach has wide acceptance in regulation internationally, and it has been reaffirmed in recent determinations, including the CAA's for the London airports.

It is important to note that in updating our estimate of the cost of capital for the IAA, the European Commission (2006) has recently brought in regulation no 1794/2006, which became legally binding on 1st January 2007. This regulation is designed to establish a common charging scheme for air navigation services throughout Europe. Article 6 of this regulation refers to the costs of services that providers are allowed to include in their charging, and they include staff costs, other operating costs, depreciation costs, the cost of capital, exceptional items including non-recoverable taxes, custom duties paid, and all other related costs.

In paragraph (5) of section (2) of Article 6, the EC (2006) states that:

> '[The] cost of capital shall be equal to the product of:
>
> (a) the sum of the average net book value of fixed assets used by the air navigation service provider in operation or under construction and of the average value of the net current assets that are required for the provision of air navigation services; and
>
> (b) the weighted average of the interest rate on debts and of the return on equity.'

In paragraph (1) of section (3) of Article 6, the EC (2006) further states that:

> '[In calculating the cost of capital], the weight factors shall be based on the proportion of the financing through either debt or equity. The interest rate on debts shall be equal to the average interest rate on debts of the air navigation service provider. The return on equity shall take into account the financial risk of the air navigation service provider taking the national bond rate as a guide.'

In order to ensure consistency in determining the IAA's cost of capital with the new EC (2006) regulations, we must apply the above-quoted sections from Article 6. We will refer to these new EC regulations where necessary in our report.

There are three versions of the WACC framework: the 'plain vanilla' WACC, the pre-tax WACC and the post-tax WACC. Estimates of the cost of capital that do not include any adjustments for corporate taxation yield the plain vanilla WACC, which has a post-tax cost of equity and a pre-tax cost of debt. The rationale for using the plain vanilla WACC is that it describes the cost of finance that the regulated utility has to recover, because it must pay a post-tax cost of equity to its shareholders, while paying a pre-tax cost of debt to its creditors.

This plain vanilla estimate of the WACC can be adjusted to provide either a pre-tax WACC or a post-tax WACC. The former adds a tax adjustment to the cost of equity, while the latter removes the tax adjustment from the pre-tax cost of debt. In adjusting the plain vanilla WACC to either the pre-tax WACC or the post-tax WACC, an important regulatory issue concerns whether the appropriate tax rate to use in conducting the adjustment is the current statutory corporate tax rate or the expected likely effective tax rate that will apply during the term of the determination. In applying the tax adjustment to regulated utilities in Ireland, it is reasonable to assume that the difference between the actual corporate tax rate and the effective rate that is expected to apply during the term of the determination are insignificantly different from each other given Ireland's low corporate tax rate of 12½ percent.

In our previous report for the CAR (Hutson and Kearney, 2002), we estimated IAA's cost of capital at 6.5 percent. In a recent determination by the British CAA the cost of capital, estimated by PricewaterhouseCoopers (2004) was 6.1 percent. It is readily acknowledged that the circumstances within which the IAA operates are different to those within which NATS operates insofar as the IAA is a government-owned enterprise whereas NATS has been partially privatised. It is also acknowledged that while the British and Irish aviation scenes share many common features, there may be some differences. It is appropriate, therefore, to consider an Irish comparator company as well. The closest Irish organisation is the Dublin Airport Authority (DAA), for which we estimated a cost of capital in 2005 (Hutson and Kearney, 2005).

This report begins with a brief financial summary of the IAA. The cost of equity is discussed in Section 3 and the cost of debt is discussed in Section 4. The IAA's gearing is discussed in Section 5. Section 6 brings these together in the WACC calculations to derive our estimate of the IAA's cost of capital.

[2] The IAA's core business and financial summary

The core businesses of the Irish Aviation Authority (IAA) are the provision of aviation-related services and managing overflights of Irish air space on the north Atlantic routes. The component of IAA's activity that is regulated by the CAR is limited to terminal navigation services provided to aircraft for approach, landing and takeoff at Cork, Dublin and Shannon airports. The vast majority (approximately 80 percent) of the IAA's turnover is generated from managing Irish airspace, and 11 percent is generated by terminal navigation services. In recent times, the provision of commercial services, such as training and consultancy activities, is becoming more important in the IAA's overall non-core business. According to the IAA's 2005 annual report, activities in this category relate to aviation security, safety management and airport performance analysis. Examples of the type of businesses that have been engaged in include analysis of best practice in aviation security, the review of air transport infrastructures in new EU member states, analysis of land-use planning, advice on the development of a European aviation code, and regulatory advice to civil aviation authorities in Europe and the Middle East.

Although the value of the IAA's turnover on its businesses that are subject to price cap regulation is quite small in absolute terms, and small relative to the authority's overflight navigation services, it is nevertheless of significant importance in the context of Ireland's economy. As in other modern economies, Ireland relies heavily on air transport for business passengers, domestic and international tourism, and also for freight. Any inefficiencies in or disruption to the provision of aircraft support services is likely to be transmitted to other sectors in the economy.

Terminal services is defined in the IAA Act 1993 as:

> 'the air navigation services provided for aircraft landing at or taking off from an aerodrome or while in the vicinity of an aerodrome before landing at or taking off from that aerodrome. Air navigation services are further defined as including services providing, giving or issuing information, directions or instructions, or other facilities, for the purposes of or in connection with the navigation or movement of aircraft.'
> [CAR website, www.aviationreg.ie].

Table 1 provides the IAA's profit and loss account for the 10-year period from 1996-2005, and Table 2 provides a breakdown of turnover by business line: en route income, terminal income, Shanwick communications, safety regulation, exempt air traffic, and commercial, training and other. In formatting Table 2, the data are net of the income equalisation account, as explained in note 1 to the profit and loss accounts. This is because the IAA performs the state's function in relation to the multilateral Eurocontrol agreement whereby differences between income and costs in a given year are recovered from or returned to providers in the subsequent year.

Table 1 shows that income overall has almost doubled in the period 1996, from €67.4 millions to €127.7 millions. Table 2 shows that terminal income has increased from €7.7 millions in 1996 to €16.1 millions in 2005. Figure 1, Panel A depicts the variation over time in annual terminal turnover as a percentage of total turnover, and Panel B provides the average terminal turnover as a percentage of total turnover along with the other major components of the authority's turnover. These graphs provide important information insofar as only the IAA's terminal activity is subject to price cap regulation by the CAR. Panel A of the figure shows that terminal turnover as a percentage of the authority's total turnover has varied from a minimum of 9.5 percent in 1999 to a maximum of 12.6

percent in 2005. The average terminal turnover as a percentage of the Authority's total turnover over the 10-year period from 1996 to 2005 is 11 percent, and this is the same as the proportion calculated in Hutson and Kearney (2002) for the period 1994-2000. Overall, Table 2 and Figure 1 show that although terminal turnover as a percentage of total turnover has varied from year to year, the average of 11 percent has tended to remain stable since the beginning of the Authority's operations in 1994. The core businesses of the authority's operations are *en route* and *Shanwick*, which account for approximately 80 percent between them, and is sourced from customers flying the north Atlantic route.

The Authority's balance sheet data for the 10-year period from 1996 to 2005 is summarised in Table 3. In the 10 years since 1996, IAA's tangible asset value has trebled from €31.4 million to €98.4 million in 2005. To support this considerable growth in fixed assets, IAA's long-term debt has increased from almost negligible levels in the early 2000s to €63.1 million in 2005. The change in IAA's gearing over the period is shown in Figure 2, which contains a graph of IAA's total debt ratios (Panel A) and long-term debt ratios (Panel B). The total liabilities-to-assets ratio (Panel A) has ranged between a low of 33.6 percent in 1999 to 57 percent in 2003. The Authority's ratio of total liabilities-to-assets in 2005 stands at 48 percent, which is very close to its 10-year average. The ratio of long-term debt-to-assets, however, has been more volatile, showing an increase from 1.6 percent in 2001 to 38 percent in 2002 (Panel B). This was due to borrowings of €45 million to finance the major capital expenditure associated with the new air traffic management re-equipping programme, which involved new buildings, systems and equipment at Cork, Dublin and Shannon airports. IAA's long-term debt-to-assets ratio currently stands at 40 percent, which is considerably higher than the average of 20 percent.

Table 1

The IAA's profit and loss account, 1996-2005

€ millions

	1996	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Turnover	67.4	70.9	74.3	76.3	75.5	87.1	95.8	110.6	124.5	127.7
Operating expenses	-54.0	-57.4	-59.7	-61.7	-60.8	-69.6	-77.0	-89.7	-113.5	-108.4
Operating profit - continuing activities (EBIT)	5.5	5.4	6.1	6.2	6.5	5.2	5.4	7.4	10.9	19.3
Interest receivable	0.9	1.3	1.5	1.0	0.5	0.4	0.1	0.2	0.2	0.4
Interest payable							-0.7	-1.6	1.6	1.6
Profit on ordinary activities before tax	6.4	6.7	7.7	7.2	7.0	5.7	4.8	6.0	9.6	16.2
Tax credit/(charge) on profit on ordinary activities	-3.1	-2.3	-3.7	0.5	-1.5	-1.1	0.5	-0.9	-0.6	-2.8
Profit for the financial year	3.3	4.4	4.0	7.7	5.5	4.5	5.3	5.1	9.0	13.4
Dividend				-1.3	-1.2	-1.1	-1.0	-1.3	-2.2	
Transfer to contingency reserve	-3.2	-4.4	-3.8	-6.5	-4.5	-3.5	-4.3	-3.8	-6.7	
Profit and loss account at beginning of year	0.7	0.8	0.8	1.0	0.9	0.8	0.7	0.7	0.7	
Profit and loss account at year end	0.8	0.8	1.0	0.9	0.8	0.7	0.7	0.7	0.7	

Table 2

IAA's revenues by business unit

€ thousands

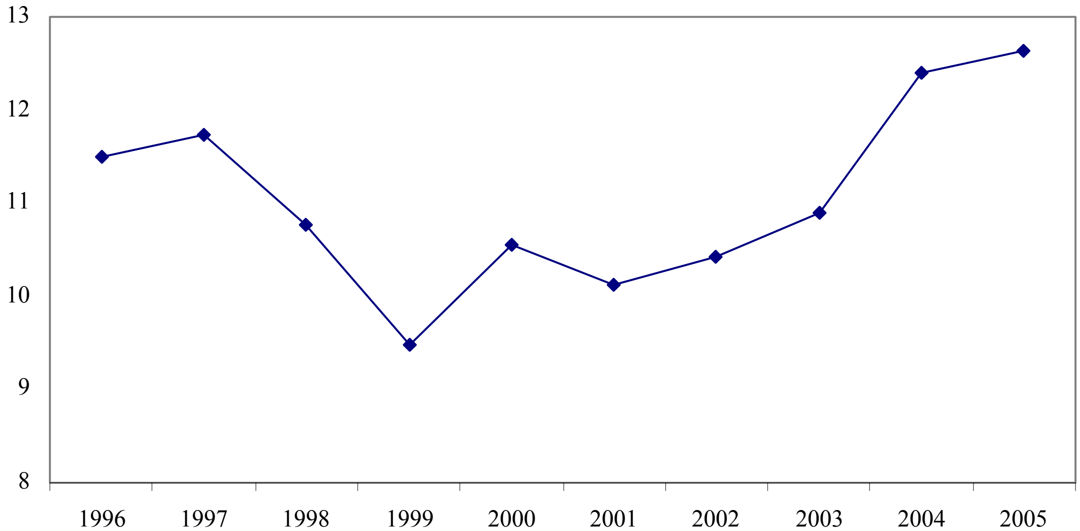
	En route	Terminal	Shanwick	Safety regulation	Exempt air traffic	Commercial, training & other	**Total**	Terminal as a % of total
1996	44098	7740	11823	2782	932	0	67375	11.5
1997	45868	8308	12493	3141	1042	0	70852	11.7
1998	47324	7991	13672	3394	784	1110	74275	10.8
1999	50573	7227	12570	4324	1346	242	76282	9.5
2000	49314	7972	11955	4478	1134	655	75508	10.6
2001	57302	8823	11584	5571	1062	2804	87146	10.1
2002	63334	9975	11073	6284	1297	3791	95754	10.4
2003	74348	12045	12035	6964	1837	3341	110570	10.9
2004	81886	15421	13034	8143	3605	2377	124466	12.4
2005	84160	16140	14192	9083	1853	2253	127681	12.6
Average	**59820.7**	**10164.2**	**12443.1**	**5416.4**	**1489.2**	**1657.3**	**90990.9**	**11.0**

Table 3 The IAA's Balance Sheet, 1996-2005
€ millions

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Fixed assets										
Tangible assets	31.4	30.7	25.3	23.9	48.8	63.2	87	107.9	104.2	98.4
Current assets										
Debtors	10.2	12.2	13.7	15.5	13.7	16.3	22.9	24.9	24.1	29.8
Cash at bank and in hand	19.4	24.7	32.2	27.9	13.5	3	9.4	8.4	13.7	30.2
Total current assets	29.7	37	45.9	43.4	27.2	19.4	32.3	33.3	37.8	60
Total assets	61.1	67.6	71.2	67.3	76	82.6	119.3	141.2	142	158.4
Creditors: amounts due within 1 year	-20.8	-24.5	-22.7	-14.8	-18.2	-28.6	-16.6	-24.5	-37.9	-13.5
Net current assets (liabilities)	8.9	12.5	23.2	28.6	9	-9.2	15.7	8.8	-0.1	46.5
Creditors: amounts due after > 1 year	-10.4	-8.9	-10.2	-7.8	-8.3	-1.3	-45	-55	-36	-63.1
Provisions for liabilities and charges					-0.5	-0.2	-0.9	-1.1	-0.8	-0.9
Total Liabilities	-31.2	-33.4	-32.9	-22.6	-26.9	-30.1	-62.5	-80.6	-74.7	-77.5
Capital and Reserves										
Called up share capital	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
Profit and loss account	0.8	0.8	1	0.9	0.8	0.7	0.7	0.7	0.8	14.3
Other reserves	6.3	10.8	14.6	21.1	25.6	29.1	33.4	37.2	43.9	43.9
Shareholders' funds	29.8	34.3	38.2	44.7	49	52.5	56.8	60.6	67.3	80.9

Figure 1
IAA's turnover

Panel A: Terminal turnover as a percentage of total turnover



Panel B: Average turnover for the period 1996-2005

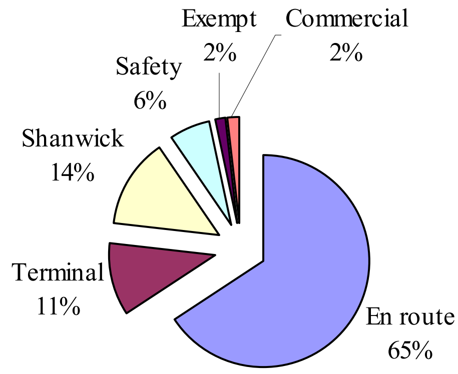
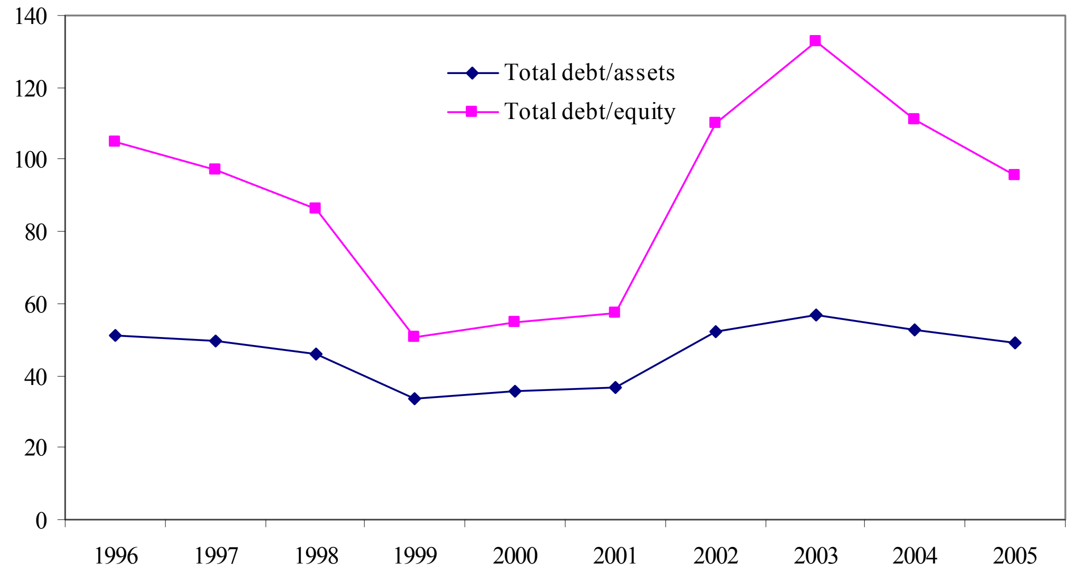
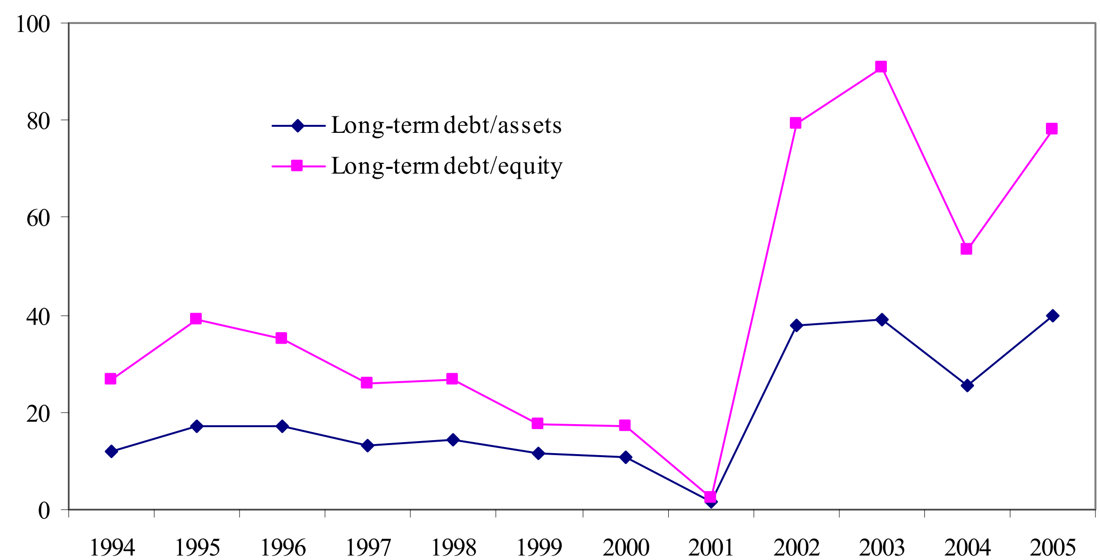


Figure 2
IAA's gearing 1996-2005

Panel A: Total debt ratios (percent)



Panel B: Long-term debt ratios (percent)



[3] The cost of equity

As discussed in Hutson and Kearney (2002), there are three approaches to estimating the cost of equity: the capital asset pricing model (CAPM), the dividend growth model, and the arbitrage pricing theory model. Of these, the CAPM is the most widely used approach. There is an extensive literature on both the theoretical and practical problems related to its usage in many different applications (see, for example, Harrington (1987), Cochran (1999), the CAA (2001), De Fraja and Stones (2004) and the recent report by Smithers & Co. (2006)). In the context of aviation regulation, the CAPM approach continues to be the most widely used methodology as evidenced by recent determinations by the CAA.

The CAPM model is written in equation form as follows.

$$E(R_i) = r_i + \beta_i [E(R_m) - r_f] \tag{1}$$

In this equation,

$E(R_i)$ is the expected return on stock *i*;
r_f is the risk-free rate of interest;
$E(R_m)$ is the expected return on the market portfolio; and
β_i is the asset's 'beta', representing the systematic risk of stock *i*.

The CAPM model in equation (1) describes the return on equity as the risk free rate, r_f, plus a premium for risk, $\beta_i[E(R_m) - r_f]$. The risk premium is defined as the quantity of risk multiplied by the price of risk. The quantity of risk is measured by the systematic risk of the stock as measured by its beta β_i (the covariance of the stock's return with the return on the overall market), and the price of risk is measured by the equity risk premium, $[E(R_m) - r_f]$. The essential insight in the CAPM model is that in order to invest in equity rather than purchase a risk-free asset, investors expect to be rewarded by earning the risk free rate of interest plus a premium for the risk associated with holding equity.

The CAPM is a theoretical model that is built upon a number of assumptions: all investors are risk-averse expected utility maximisers, asset quantities are fixed and all assets are divisible and marketable, markets are competitive and frictionless, with costless information simultaneously available to all investors, and there are no taxes, regulations, or other restrictions on market behaviour. Although these assumptions do not hold in the real world, they can be relaxed to a greater or lesser extent at the cost of additional complexity in the model. The simple form of the CAPM as stated above, however, remains useful and widely applied in utility regulation because it provides a universally accepted methodology for quantifying and pricing equity risk. It is important to note that significant problems arise in implementing the CAPM due to the necessity to estimate its three parameters, and there exists an extensive literature on how best to overcome these problems when applying the model.

3.1 The risk-free rate of interest

The risk-free rate is a theoretical construct defined as the rate of interest that has no variance and no covariance with the market. It is usually proxied by the yield on default risk-free government securities such as treasury bills or bonds. Such nominal rates of interest include both a real and an expected inflation component, as described by the Fisher equation:

$$(1 + r_{nominal}) = (1 + r_{real})(1 + I_{expected}) \quad (2)$$

In this equation, *r* denotes the interest rate and *I* denotes the rate of inflation. Because our task is to estimate IAA's real cost of capital, we need to estimate an appropriate real risk-free rate of interest.

One way to estimate the real risk-free rate of interest is by using the yield on inflation index-linked government bonds (ILGs). The British government has issued long-term index-linked gilts for many years. However, there are two reasons why yields on these bonds are an inappropriate proxy for the real rate of interest in estimating IAA's cost of capital for regulatory purposes. *First*, as a member of the Eurozone Ireland is subject to Eurozone rather than British monetary policy, so European base rates are more appropriate. *Second*, yields on British ILGs have fallen in the past few years to unusually low levels. PricewaterhouseCoopers (2004) show that the 10-year index-linked gilt yield fell substantially during the 1990s from over 4 percent in 1992 to 2 percent at the end of 2004. In 2005 and 2006, ILG yields have fallen further. Shorter-dated bonds are now yielding less than 2 percent, and long-dated ILGs have recently yielded as low as 0.4 percent.[1] This is due to greater demand from pension funds and increasing concerns amongst investors who are seeking a haven from inflation risk at a time when inflationary expectations are on the rise.

An alternative approach is to estimate real rates of interest from nominal rates. There is an extensive literature on how to do this (see, for example, Harrington (1987), Chapter 5) and Weil (1989)). The choice of whether to use current rates or to calculate some historical average is contentious (see CAA, 2001 and Hutson and Kearney, 2001), and particularly pertinent at present because not only are interest rates at their lowest levels for several decades, but the yield curve is inverted with longer-term rates being currently lower than their short-term counterparts. Longer-term rates are generally preferred for calculating the cost of capital for regulatory purposes because empirical studies show that longer-term rates are less volatile and less influenced by changes to rates by monetary authorities, and because longer-term rates better match real investment horizons. Consistent with the generality of recent regulatory determinations, we believe that a long-term average is the best approach to estimating the risk-free rate.

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1 http://www.actuaries.org.uk/Display_Page.cgi?url=/finance_invest/indexlinkedgilts_briefing.html, consulted 6/12/06.

We follow the procedure used in our previous reports for the CAR (Hutson and Kearney, 2001, 2002 and 2005), but instead of looking at German, UK and US data, we imply a real rate for the Eurozone using the 10-year benchmark Eurozone bond rate and Eurozone inflation rates.[2] In this report, however, we have to adjust the procedure used in our previous reports in order to allow for the recent regulation from the European Commission (2006). As mentioned in our introduction, paragraph (1) of section (3) of Article 6, the EC (2006) states that:

> "The return on equity shall take into account the financial risk of the air navigation service provider taking the national bond rate as a guide."

We first review recent trends in risk-free rate estimation to update our estimates of the risk-free rate based on the procedure used in our previous reports. We then apply the Irish bond rate using the 10-year government bond rate from the Central Bank and Financial Services Authority of Ireland (2007) in order to ensure compliance with EC (2006).

3.1.1 Nominal interest rates, inflation, and the real rate of interest for the Eurozone

Figure 3 plots the 10-year Eurozone benchmark bond yield (our proxy for the nominal risk-free rate of interest), the Eurozone annual rate of inflation, and the 'real' rate, which is the former minus the latter, for the period from January 1991 to November 2006. The data were obtained from the ECB's website (www.ecb.int). It must be noted that when we calculate our 'real' rate of interest, we are assuming that the current rate of inflation is a good proxy for expected inflation. The mean rate of inflation, the 10-year benchmark bond yield, and the ex-post real rate of interest during the period are 2.3 percent, 6.2 percent, and 3.8 percent respectively. Figure 3 shows the clear downward trend in both the rate of inflation and Eurozone government bond yields during the 1990s. As well as declining inflation and inflationary expectations, the downward trend in the yield also reflects the gradual convergence of Eurozone government bond yields throughout the 1990s as the market perceived a increasing likelihood that the currency zone project would come to fruition.

The very high 'real' rate of interest during the early 1990s that we have derived – of over 6 percent – is probably a significant overestimation of the true real rate of interest for the period. Instead, it is likely to be the result of the market's consistent overestimation of the future rate of inflation. By the same token, the unusually low current ex-post real rate of interest of 2 percent may reflect the market's assessment that inflation will be even lower in the future than it is at present. Alternatively, it has been widely discussed in the markets and in the financial press that the current (unusually low) long-term bond yields and the flattening of the yield curve reflect a very high level of demand for higher-yielding securities because of minuscule nominal yields on short-term deposits and treasury securities. Since the start of the current period of low nominal interest rates in the early 2000s, demand has shifted to relatively risky securities as investors seek higher

[2] The Eurozone rate of inflation must be used rather than Ireland's rate of inflation, because interest rates faced by Irish organisations and individuals are determined by the European Central Bank. Eurozone official interest rates thus reflect Europe-wide rates of inflation.

returns, including shifting up the yield curve and also investing increasingly in risky securities and markets such as high-yield bonds and emerging markets. It also reflects increasingly strong demand for assets with long maturities by pension fund managers as they try to match their long-term liabilities with assets of similar maturities. The result of all these factors is high prices, low yields and relatively small risk premiums for longer-dated securities.

However, rather than interest rates being unusually low at present, it is possible that they have fallen back to long-term historical averages. (We discuss this issue in the next section). As can be clearly seen in Figure 3, inflation and interest rates in the past 5 years have been considerably lower than during the 1990s. For the period 2000-2006, inflation averages 2.2 percent, Eurozone benchmark bond yields average 4.4 percent, and the ex post real rate of interest averages 2.45 percent. Given that the deceleration of inflation during the 1990s was not widely anticipated by the market, and given that current bond yields and other economic indicators reflect moderate inflationary expectations in the medium-term, it is perhaps these latter averages that are a better guide to the appropriate risk-free rate to be used as an input to IAA's estimated cost of capital over the next 5-year period.

3.1.2 Previous estimates of the real risk-free rate

Table 4 (Panel A) summarises the findings of recent studies that have attempted to estimate the real risk-free rate of interest. It is a copy of Table 1 in Hutson and Kearney (2005), and it presents estimates of the risk-free rate of interest defined over various time periods. The entries under '75 years' and under '100 years or more' include long-term estimates using either bills or bonds. It is well known that using bills rather than bonds as the benchmark tends to provide lower estimates of the real risk-free rate, because historically an upward-sloping yield curve is the most common yield curve shape. The estimates from long time-series based on bonds include those of Annin and Falaschetti (1998) and Ibbotson and Chen (2001) for the US, and Jenkinson (1999), CSFB (2001) and LBS/ABN Amro (2001) for the UK.

As discussed in section 3.1.1, it is plausible that rather than interest rates being unusually low at present, that the current interest rate regime can be better described as a return to long-run averages following a period of unusually high real rates. One of the most rigorous studies of the long-term risk-free rate of interest is Dimson, Marsh and Staunton (2002), whose estimates for Germany, the UK and the US appear in the bottom two rows of Panel A in Table 4. Their estimates of the real risk-free rate using bills are 0.1, 1.0 and 1.2 percent; and using bonds the estimates are 0.3, 2.3 and 2.1 percent for Germany, the US and the UK respectively. Against this backdrop, our calculated 'real' long-term rate in the last few years of less than 2 percent (see Figure 3) is a return to what might be referred to as the long-run equilibrium real interest rate.

3.1.3 Adjusting for the inflation risk premium

While the rates of return on OECD government securities are generally assumed to be default risk-free, they are not free of risk even if held to maturity. This is because actual (ex-post) inflation will seldom equal expected inflation, and investors will be concerned that ex-post inflation may turn out to be more than the anticipated inflation that is reflected in yields, in which case their real return will be eroded. The inflation risk premium is the additional yield required by investors to compensate them for the probability that ex-post inflation is greater than the expected rate impounded in the yield when they purchased the security. (Purchasers of index-linked bonds, in contrast, do not bear inflation risk, so the yield on these bonds would not reflect inflation risk). Expected inflation can be viewed as a random variable that follows some underlying distribution, and the longer the maturity of the instrument, the greater the dispersion of the distribution. It is intuitive, therefore, that long-term bonds should be associated with a larger inflation prediction premium than short-term bonds or bills.

Figure 3
Eurozone inflation and interest rates
(percent annual)

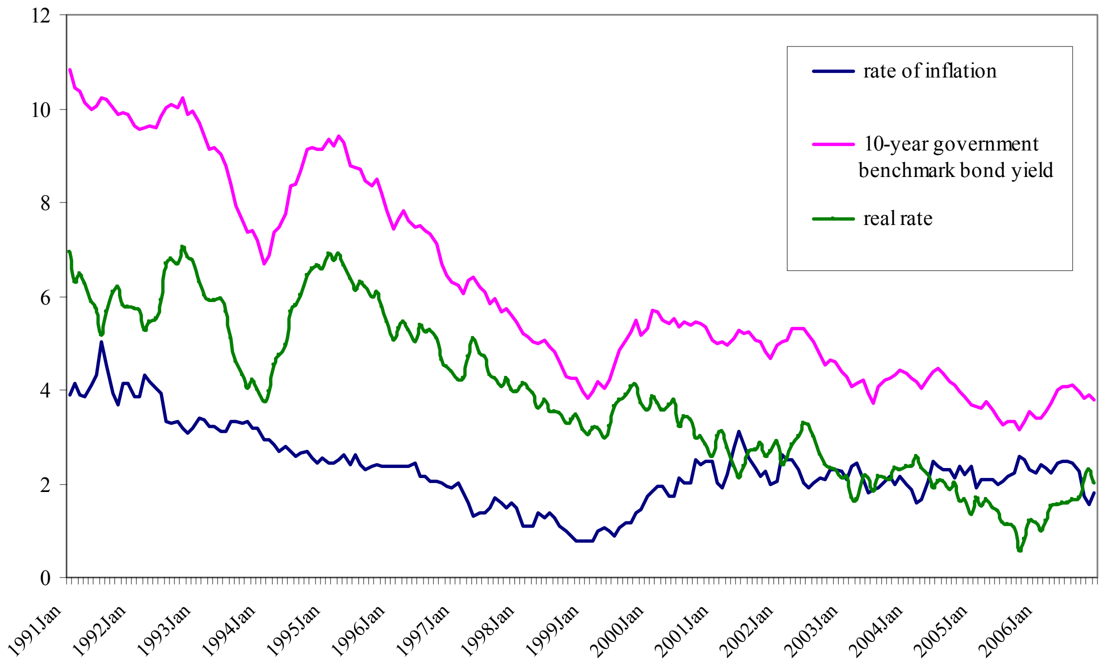


Table 4 Estimates of the real risk-free rate

Panel A: *Estimates from long run time series*

Data and Study	*Period*	*Bills / Bonds*	***Country*** *Germany*	*UK*	*US*
75 Years					
Siegel (1992)	1926-1995	Bills			0.7
Annin and Falaschetti (1998)	1926-1996	Bonds			2.0
Jenkinson (1999)	1919-1998	Bonds		2.1	
Ibbotsen and Chen (2001)	1926-2000	Bonds			2.0
100 years or more					
CSFB (2001)	1869-2000	Bonds		1.8	
LBS/ABN AMRO (2001)	1900-2000	Bonds		1.0	
Mehra and Prescott (1985)	1889-1978	Bills			1.0
Dimson *et al* (2002)	1900-2000	Bills	0.1	1.2	1.0
		Bonds	0.3	2.3	2.1

Panel B: *Estimates used in recent regulatory determinations*

CAA (2006)	London airports	2.0
Ofgem (2006)	Electricity transmission	2.2
Ofcom (2005)	BT	2.0
CAA (2005)	NATS	2.5
Postcomm (2005)	Royal mail	2.5
CAR (2005)	DAA	2.6
Ofwat (2004)	Water and sewerage	2.7
Ofgem (2004)	Electricity distribution	2.6
CAR (2002)	IAA	2.6
CC (2002)	London airports	2.6
CAR (2001)	Aer Rianta	2.6

Note: Panel A is adapted from Hutson and Kearney (2005). Panel B is adapted from Table 2.1 in Europe Economics (2006).

In Hutson and Kearney (2001) we deducted an inflation risk premium of 40 percent from our calculated real risk-free rates. This estimate came from Breedon and Chadha (1997), who estimated this figure for UK interest rates. Dimson, Marsh and Staunton (2002) provide estimates of the inflation risk premiums at 0.2 percent, 0.9 percent and 1.0 percent for, respectively, Germany, the UK and the US, and their estimate for Ireland is 0.8 percent.

More recently, some economists have argued that the reduction in long-term real interest rates observed over the past decade can be explained by a dramatic reduction in the inflation risk premium, as a result of reduced volatility in inflationary expectations (or more strongly 'anchored' inflationary expectations), which is traced to the improved credibility of monetary authorities. Reduced inflation around the world has also been explained by the entry of China and more recently India into the world economy, whose inexpensive goods enhance price competition and whose cheap labour moderates wage pressures around the world. Certainly current low interest rates reflect moderate inflationary expectations in the medium-term, and there is a strong argument to say that this would be accompanied by a reduction in perceived inflation risk.

In section 3.1.1 we calculated an average 'real' interest rate of 3.8 percent for the 16-year period 1991 to 2006, and 2.45 percent for the period 2000-2006. As discussed in section 3.1.2, the real average rate of interest we have calculated for the 2000s is certainly closer to the long-term averages that have been calculated by various experts presented in Table 4, so there is a strong argument to say that interest rates have recently tended to move back towards their long-term historical mean. This may well reflect a dramatic reduction in the inflation risk premium for longer-term bonds. We consequently estimate the real risk free rate of interest to be within the range of 2.00 - 2.45 percent, and our best estimate is 2.2 percent. As Panel B of Table 4 shows, this is within the range of more recent regulatory determinations, including the figure of 2.0 percent in the recent CAA proposed determination for the London airports.

3.1.4 Allowing for EC (2006) regulation on estimating the cost of equity

We now must adjust the procedure to allow for the recent regulation from the European Commission (2006). Paragraph (1) of section (3) of Article 6, the EC (2006) states that:

> "The return on equity shall take into account the financial risk of the air navigation service provider taking the national bond rate as a guide."

In order to take the national bond rate as a guide, we apply the Irish bond rate using the 10-year government bond rate from the Central Bank and Financial Services Authority of Ireland (2007). The yield on 10-year government securities in Ireland was 3.95 percent in December 2006, and 4.12 percent in January 2007, which averages 4.035 percent. This is a nominal rate, and we have to subtract the expected rate of inflation to derive a real rate of interest. As mentioned in the third paragraph of section 3.1.1, inflation in the Eurozone averaged 2.2 percent for the period 2000-2006. Although Irish inflation has been consistently higher than Eurozone inflation during this period, given that Irish nominal rates are priced off European base rates, it is not appropriate to use an expected

Irish rate of inflation to obtain an estimate of the real interest rate. Taking the national bond rate as a guide, therefore, and using our estimate of expected Eurozone inflation of 2.2 percent, yields an estimate of the real risk-free rate of 1.84 percent.

3.2 The equity risk premium

The equity risk premium is the return that investors require to induce them to purchase and hold equity rather than risk-free bonds. The equity risk premium is a forward-looking variable that reflects investors' expectations, and it cannot be directly observed. There is an extensive literature on the determinants and measurement of the equity risk premium, and a significant element of judgment is required in establishing an estimate for input into the cost of capital calculation. Kocherlakota (1996) and Siegel and Thaler (1997) provide reviews of this literature. Given the complexities involved in estimating the equity risk premium, we extrapolate from the most reliable and comprehensive studies to estimate the equity risk premium for IAA's cost of equity.

3.2.1 The preferred estimation method

The equity risk premium can be estimated in three ways. The *first* method uses historical time series data to calculate the difference between the long-run return on a stock market index, and the long-run return on risk-free bills or bonds. The *second* method uses models that incorporate fundamental information such as earnings, dividends or economic productivity (see, for example, Diermeier, Ibbotson and Siegel (1984), Shiller (2000) and Fama and French (2001)). The *third* method uses surveys of the views of professional financial analysts (see, for example, Welch, 2000). The second method, as discussed in Hutson and Kearney (2001), is complex and often difficult to implement in practice. Estimates of the equity risk premium emanating from such studies, however, tend to be lower than market-based studies. Claus and Thomas (2001), for example, estimated the discount rate that equated US stock market valuations with the present value of prevailing cash flow forecasts, and found that the equity risk premium may be as low as 3 percent. The third approach – surveying analysts – was derided by Dimson, Marsh and Staunton (2002) for being highly biased to fads and trends.

For these reasons, it is widely accepted that expected equity returns are best approximated by actual (ex-post) equity returns, and in this report we draw on studies that have used this approach. It is essential that such studies use data drawn from a very long period. Equity markets are well known to move in a cyclical fashion and to lead the business cycle. Long periods of bull market conditions are common, and are often followed by bear markets, so care must be taken to include data from both types of periods. Data drawn from a bear market, for example, may well result in a negative estimate, which is nonsensical, while data drawn a bull market period will produce overestimates of the equity risk premium.

Table 5 Estimates of the equity risk premium

Panel A: *Estimates from long-run time series*

Data and Study	*Period*	*Bills / Bonds*	*Country* Germany	*UK*	*US*	*Average*
75 Years						
Annin and Falaschetti (1998)	1926-1996	Bonds			7.3	
Cornell (1999)	1926-1997	Bonds			4.5	
Ibbotsen and Chen (2001)	1926-2000	Bonds			6.0	
100 years or more						
Mehra and Prescott (1985)	1889-1978	Bills			6.0	
Siegel (1992)	1802-1990	Bills			5.3	
LBS/ABN AMRO (2001)	1901-2000	Bonds	9.9	5.6	6.9	6.7
Dimson *et al* (2002)	1900-2000	Bills	10.3	6.5	7.7	6.2
		Bonds	9.9	5.6	7.0	5.6
Dimson *et al* (2006)	1900-2005	Bills				4.7

Panel B: *Estimates used in recent regulatory determinations*

CAA (2006)	London airports	4.5
Ofgem (2006)	Electricity transmission	5.3
Ofcom (2005)	BT	4.5
CAA (2005)	NATS	4.5
Postcomm (2005)	Royal mail	4.2
CAR (2005)	DAA	6.0
Ofwat (2004)	Water and sewerage	4.5
Ofgem (2004)	Electricity distribution	3.5
CAR (2002)	IAA	6.0
CC (2002)	London airports	3.5
CAR (2001)	Aer Rianta	6.0

Note: Panel A is adapted from Hutson and Kearney (2005). Panel B is adapted from Table 2.2 in Europe Economics (2006).

3.2.2 Estimates from academic and practitioner studies

Table 5 summarises the estimates of the equity risk premium from a selection of previous studies (Panel A) and recent determinations (Panel B). Panel A is an updated version of Table 3 in Hutson and Kearney (2005). Dimson, Marsh and Staunton's (2002) study is the most extensive and rigorous. They estimate the equity risk premium for 16 countries for the period 1900-2001, and argue that by looking at a range of markets they address the problem of survivorship bias. Many studies of the equity risk premium use data mostly from 'successful' economies like the UK and the US. Ignoring other markets that have been less successful or have weathered more economic volatility than others, they argue, leads to the overestimation of the equity risk premium. In a second innovation, Dimson, Marsh and Staunton claim to control for 'success bias' – that is, standard stock market indices are intermittently re-jigged to include only companies with a particular size by market capitalisation. They attempt to overcome success bias by ensuring that their indices are compiled from a very large number of underlying stocks.

The more recent 'world' estimate of Dimson, Marsh and Staunton (2006) is an update of the equity premium calculations from their 2002 book. They find that for the period 1900 to 2005, the equity premium on a world portfolio (estimated from 17 countries) is 4.7 percent, so they argue that the appropriate equity premium is in the range 4.5-5 percent.

Panel B of Table 5 presents the mid-point estimates of recent regulatory determinations. The CAA's (2006) proposed central estimate of 4.5 percent for the London Airports cost of capital calculation embodies a range of 3.5 – 5.0, and this is the same equity premium used when applied to NATS (2005). The Ofgem (2006) estimate for use in cost of capital calculations for electricity transmission of 5.3 embodies a range of 4.75 – 5.85, and Ofwet's (2004) estimate of 4.5 for water and sewerage firms lies within a 4.0 – 5.0. Overall, we are persuaded by the estimate in Dimson, Marsh and Staunton (2006) of 4.7 percent, which falls within the range of recent regulatory determinations. With this in mind, our previous estimates of the equity risk premium in Hutson and Kearney (2001, 2002, 2005) of 6.0 percent appear somewhat higher than the more recent ranges of the estimate. We therefore revise our estimate to 5.0 percent. As mentioned at the start of this section, there is need for a considerable element of judgment, and our estimate lies within the ranges proposed by CAA (2006) for NATS, by Ofgem (2006) for electricity transmission, and by Ofwet (2004) for water and sewerage.

3.3 Beta

A stock's risk has two components: systematic and unsystematic (also known as idiosyncratic or stock-specific risk). The equity beta (β) of a stock is its systematic (or market) risk. It is well established in finance theory that only systematic risk is priced by the market – that is, it is only the systematic risk of the stock that investors should expect to be compensated for in terms of additional return, because investors can easily and cheaply diversify their portfolios to eliminate idiosyncratic risk. Equity beta is usually estimated using simple regression techniques that require a sufficient time-series of stock price data. This technique cannot be used for the IAA, however, because the Authority is not listed. The conventional approach in this case is to seek comparator companies that are listed, and to adjust the estimated beta based on any clear differences between the operations and gearing of the comparator companies and the firm for which beta is being estimated.

Equity betas are adjusted for gearing by calculating an *asset beta* – which is the beta for an unlevered firm and thus is a measure of systematic business risk – for the comparator company. Adjustments are made for differences in business risk, and the asset beta is then 're-geared' according to the capital structure of the firm for whom equity beta is being estimated, using the following formula:

$$\beta_{equity} = \beta_{asset}\left(1 + (1 - T_c)\frac{D}{E}\right) \tag{3}$$

For this calculation, as well as an estimate of IAA's asset beta, we need estimates of its debt-to-equity ratio (*D/E*) and the relevant corporate tax rate (T_c).

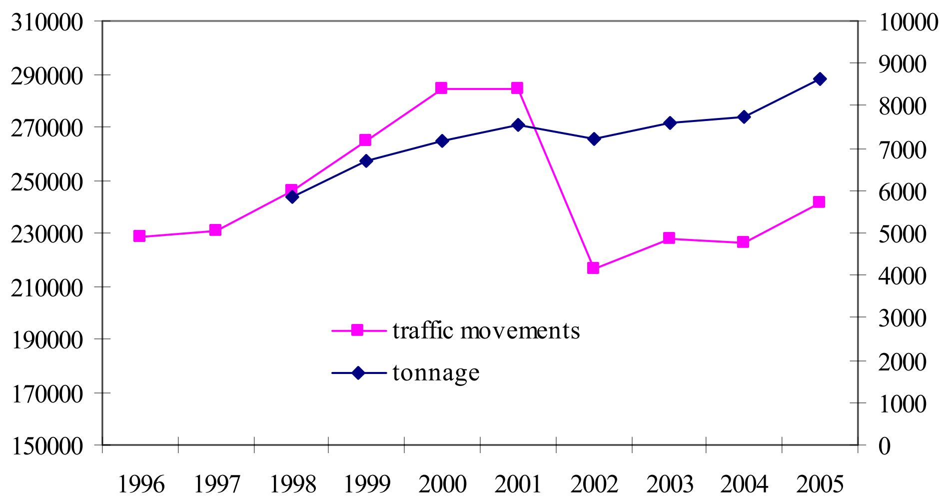
3.3.1 IAA's business risk

In our previous cost of capital calculation for IAA (Hutson and Kearney, 2002), we estimated the asset beta at 0.65 percent. Our comparator companies were Aer Rianta, BAA and NATS, whose asset betas were estimated at 0.50, 0.50 and 0.65 respectively. For this report, we continue to use NATS as the closest comparator, being an air traffic control company. To provide an Irish perspective on risks in the aviation industry, we use the Dublin Airport Authority (DAA) as a second comparator company. A critical difference between airports and the traffic control organisations is that the former are more capital intensive and a have larger proportion of commercial revenues. In addition, the air traffic control companies arguably face more technological risk due to their high-technology assets.

Events in recent years have led to a reassessment of the riskiness of the aviation business. Amongst the major risks that have been identified by the IAA and by other aviation operators and regulators in Ireland and abroad, the terrorist attacks of 11th September 2001 feature as the most significant. They have led to a growing level of concern amongst the flying public, and this has necessitated more security measures on the ground and in the air. While there seems to be a consensus among experts that this single event has increased risks substantially, it is difficult to quantify. The invasion of Iraq has added to the level of perceived risk in the industry, and the world avian flu scare in 2003 also exacerbated concerns. More recently hikes in global oil prices and the expectation of probable future green taxes on fuel has contributed to further uncertainty. In addition to these factors, the impact of new technologies and possible further deregulation of the international skyways has enhanced technological and regulatory risk. In Ireland, operators face regulatory risk associated with expected changes to aviation regulation due to the possible restructuring of the CAR to combine economic regulation with safety regulation.

While all these risk factors are significant for the aviation sector, Table 2 shows that the IAA's turnover from terminal activity, which is the regulated component of its operations, has grown in every year since 1999 when it declined by 9.6 percent following a prior decline of 3.8 percent in 1998. Figure 4 depicts traffic movements and tonnage for the period 1996-2005. As can be seen in the figure, there was a reduction in traffic movements in 2002 (following the events of 11th September 2001) from 284,135 to 216,549. Traffic movements have not yet recovered fully from the highs of 2001 following a reduction of traffic movements of around 24 percent, but tonnage was barely affected. This is consistent with our analysis in Hutson and Kearney (2005) of the business risks facing the DAA, which concluded that in spite of the aforementioned risks, the aviation industry has demonstrated an ability to recover quickly following periods of crisis.

Figure 4 Traffic movements and tonnage



In their analysis of comparator companies to estimate the asset beta for NATS, PricewaterhouseCoopers (2004) identified sectors and specific companies with similar risk profiles to NATS as the basis for their analysis of comparators. They calculated the equity and asset betas of utilities, airports and airlines. The group of utility comparators included 7 from a number of sectors in France, Germany, Greece, Spain and the United Kingdom. The average equity beta for the utilities was 0.58, with a minimum of 0.26 and a maximum of 0.93. The average asset beta was 0.30, with a minimum of 0.21 and a maximum of 0.39. The 6 airport comparators included airports in Austria, Denmark, Germany, Italy and the United Kingdom. The average equity beta was 0.81, with a minimum of 0.64 and a maximum of 1.01, and the mean asset beta was 0.62 with a minimum of 0.42 and a maximum of 0.89. The group of 10 airlines included companies from Finland, France, Germany, Italy, Spain, Turkey, Switzerland and the United

Kingdom. The average equity beta was 1.16, with a minimum of 0.50 and a maximum of 2.01. The average asset beta was 0.63, with a minimum of 0.28 and a maximum of 1.16. (Being listed in London, Ryanair was counted as a UK company and its estimated equity and asset betas were 0.86 and 0.72 respectively).

In their assessment of the implications of the comparator analysis for estimating the riskiness of NATS, PricewaterhouseCoopers (2004) argued that NATS, being more labour-intensive (particularly relative to the capital-intensive gas and electricity sectors), coupled with NATS' greater ratio of operating costs to assets of 40 percent (relative to that for utilities which is closer to 10 percent), suggests that its beta is likely to be higher. With regard to the airport and airline comparators, although NATS operates in the same industry, it is unlikely to be exposed to the same quantity of systematic risk faced by airlines. Taking all this comparator analysis into consideration, PricewaterhouseCoopers (2004) adopted an asset beta for NATS of 0.55 as the mid-point in the range 0.5 to 0.6.

In the more recently announced preliminary determination on the cost of capital for the London airports, Europe Economics (2006) estimates the beta for BAA at 0.80, being at the bottom of a range of 0.8 to 1.0, using two years of daily data on the listed stock price of BAA and the FTSE all-share index, up to the end of January 2006 (which was when speculation about the takeover began). The recommended beta of 0.80 lies at the bottom of the 0.80 to 1.0 range that was applied in the previous determination. In order to check the robustness of the estimated beta using the FTSE all-share index, Europe Economics (2006) performed the estimates using both the MSCI Europe and the MSCI global share price index. This investigation was motivated by the Smithers (2006) report, which argued that a representative investor in a listed regulated utility might well be domiciled outside the country of the utility. Using these global indices rather than the domestic index, somewhat lower estimates of the beta were obtained, but when a 70/30 weighting in favour of domestic as opposed to global estimate was applied the overall estimate was similar to that obtained using only the domestic share price index.

On the basis of our previous analysis of the asset beta of IAA, and taking into consideration the most recent set of profit and loss and balance sheet data for the authority provided in Tables 1 and 2, together with the other data provided in Table 2 and Panel A of Figure 1 on movements in terminal activity over time, and given the detailed analysis of NATS and its comparator companies performed by PricewaterhouseCoopers (2004), we argue that IAA's asset beta should be higher than BAA's; our estimate is 0.65. In addition to the reasons discussed above as to why NATS' business risk is lower than IAA's, NATS operates under the traffic risk-sharing scheme, in which the air navigation service supplier shares the traffic risks with the airlines. This traffic risk sharing scheme does not operate in Ireland. We understand that the CAR is considering adopting the NATS' risk-sharing approach for the IAA. If a risk-sharing system is put into place, it will strengthen risk comparisons between NATS and the IAA.

Our estimate of the asset beta for the IAA is therefore the same as that suggested in our previous report: 0.65.

3.3.2 IAA's gearing

There is some debate about whether actual or 'optimal' gearing should be used in the cost of capital calculation. In our last cost of capital calculation for IAA (Hutson and Kearney, 2002), the difference between actual and optimal gearing was substantial because at that time IAA had no long-term debt, and we assumed an optimal gearing ratio for IAA of 50 percent on the basis of NATS' gearing. As discussed in section 2, IAA embarked on a major capital expenditure programme in late 2002, and this was financed by banks loans. As Panel B of Figure 2 shows, the IAA's long-term debt-to-assets ratio is now 40 percent (as against a 10-year average of 20 percent) and its total debt-to-assets ratio is 48 percent. We use an average for the 4 years for 2002 to 2005 to calculate the debt-to-assets and debt-to-equity ratios. These are respectively 35.5 and 75.4. (As its 2005 current liabilities of €13.5 million are more than offset by total current assets of €60 million, the long-term debt ratio is more appropriate to use than the total debt ratio).

3.3.3 The equity beta calculation

In our last report regarding IAA's cost of capital (Hutson and Kearney, 2002), we assumed that the rate of tax stepped down from 16 percent in 2002 to 12.5 percent thereafter, giving an average tax rate for the period 2002 to 2006 as 13.2%. We assume that the corporate tax rate will remain at 12.5 percent for the foreseeable future.

$$\beta_{equity} = \beta_{asset}\left(1 + \left(1 - T_c\right)\frac{D}{E}\right) \tag{3}$$

$$\beta_{equity} = 0.65(1+(1-.125)0.754)$$

$$\beta_{equity} = 1.08$$

Our recommended equity beta for the IAA with an assumed debt-to-equity ratio of 0.754 is 1.1. This is a reduction of 0.1 from our prior estimate in Hutson and Kearney (2002), which was 1.2. There are two reasons for the difference. While the asset beta estimate remains at 0.65, the debt-to-equity ratio has fallen, and this reduces the equity beta given the asset beta. This is partially offset by a reduction in the corporate tax rate (which leads to an increase in equity beta) from an average of 13.5 in the previous estimate to 12.5.

[4] The cost of debt

Investors require a premium over and above the return on the risk-free asset to compensate them for the additional risk associated with corporate debt. The debt premium reflects the likelihood that the company will default on its debt obligations. It is determined by both the business and financial risks faced by the company, and it is usually determined by fundamental analysis of the company and its industry. If a regulated utility has publicly traded debt outstanding, the common method for estimating the nominal cost of debt is to take the current market yield on that debt. If the real cost of debt is required, the yield spread over benchmark is taken as the best estimate of the debt premium, and this is added to the estimated real risk-free rate of interest to determine the cost of debt. If the regulated utility has no outstanding public debt, the widely accepted approach is to seek comparator companies that have public debt.

In estimating the debt premium for BAA, the CAA (2002) used BAA's actual cost of debt together with the cost of debt for several comparator companies. They derived an estimated debt premium of 1.1 percent (110 basis points), with a range from 90 to 120 basis points. This was very similar to the PricewaterhouseCoopers (2004) central estimate of the cost of debt for NATS 120 basis points. In its proposed determination on the cost of debt for BAA, the CAA (2006) adopts the same methodology as it did previously to derive an estimated debt premium of 105 basis points with a range of 80 to 110 basis points. In our past estimates of the debt premiums facing Aer Rianta, the IAA and the DAA (Hutson and Kearney, 2001, 2002 and 2005, we followed standard regulatory practice in using combinations of comparator companies and/or the actual cost of debt where available.

At the time of the last determination the IAA had no long-term debt, but we needed an estimated cost of debt because we assumed an optimal debt ratio of 50 percent. We inferred a debt premium of 120 basis points from a group of comparator companies. As the Authority's balance sheet data shows (Table 3 and Figure 2), however, its ratio of long-term debt-to-assets rose from 1.6 percent in 2001 to 38 percent in 2002 (Figure 2, Panel B). This was due to bank borrowings of €45 million to finance the major capital expenditure associated with the new air traffic management re-equipping programme, which involved new buildings, systems and equipment at Cork, Dublin and Shannon airports. Using information on its borrowing costs provided by the Authority, we estimate that the IAA pays an average margin of 0.38 over Euribor for its bank loan facilities. On 7th December, 2006 the Euribor benchmark rate ranged from 3.503 for a 1-week maturity to 3.841 for the 12-month maturity, taking IAA's nominal cost of debt to approximately 4 percent.

Article 6 of the European Commission Regulation No. 1794/2006 includes the following statement: "The interest rate on debts shall be equal to the average interest rate on debts of the air navigation service provider."

In summary, therefore, we estimate the IAA's real cost of debt as our real risk-free rate estimate of 1.84 percent plus 0.38 basis points for the IAA's actual debt premium over Euribor. The resulting real cost of debt estimate for the IAA is 2.22 percent.

[5] Gearing

The weightings applied to the estimates of the cost of debt and equity in the WACC should in theory be based on the firm's 'optimal' capital structure. The term 'optimal' capital structure is based on the fact that, as the interest payments on debt are tax deductible, raising the quantity of debt in the capital structure adds to company value. The 'optimal' capital structure gives a level of debt at which the tax benefits of debt begin to be outweighed by the costs of financial distress caused by difficulties associated with servicing high debt obligations. The problem with the concept, however, is that the 'optimal' capital structure is difficult to determine, and there is no guiding theory as to how to estimate it. In our prior report on the Cost of Capital for the IAA (Hutson and Kearney, 2001), we used an assumed 'optimal' debt ratio of 50 percent because IAA had no debt at the time, and that they planned to raise debt financing in the near future. Our assumed debt ratio of 50 percent was estimated with reference to NATS' actual gearing at the time.

Furthermore, in countries like Ireland where there is a low corporate tax rate, or where a dividend imputation system reduces the tax benefit of debt, the concept of an 'optimal' capital structure is less important to company value. For this reason, we use IAA's actual gearing ratio of 35.5 percent, which as discussed in sections 2 and 3.3.2, is IAA's mean long-term debt-to-assets ratio for the last 4 years. The use of actual gearing is consistent with Article 6 paragraph 3 of the European Commission regulation 1794/2006, which states that "….the weight factors shall be based on the proportion of the financing through either debt or equity."

[6] The weighted average cost of capital

In its recent report on the cost of capital of NATS for the CAA, PricewaterhouseCoopers (2004) provide evidence that the vast majority of cost of capital determinations for regulated utilities since the early 1990s have used the real pre-tax approach to calculating the WACC. This is the approach that we have adopted in our prior reports (although we have also included the real post-tax WACC for comparison purposed), and it is also the approach that the CAA have used in the past and in its recent report on the cost of capital for the London airports. Again we provide estimates fir both the pre-tax and post-tax real WACC.

Post-tax WACC:

$$WACC_{post-tax} = \frac{D}{D+E}\left(r_f + \rho\right)\left(1 - t_c\right) + \frac{E}{D+E}\left(r_f + \left[ERP\right]\beta\right) \quad (3)$$

Pre-tax WACC:

$$WACC_{pre-tax} = \frac{D}{D+E}\left(r_f + \rho\right) + \frac{\frac{E}{D+E}\left(r_f + [ERP]\beta\right)}{(1-t_c)} \qquad (4)$$

where D = total debt
E = total equity
r_f = the real risk-free rate of interest
ρ = the debt premium
t_c = the corporate tax rate
ERP = the equity risk premium
β = equity beta

The expression $(r_f + \rho)$ is the company's real return on debt, and $(r_f + [ERP]\ \beta)$ is the company's real return on equity using the CAPM.

Inserting our estimates of the inputs to the WACC calculations provides our estimates of the IAA's cost of capital follows:

Post-tax WACC:

$$WACC_{post-tax} = \frac{D}{D+E}\left(r_f + \rho\right)\left(1 - t_c\right) + \frac{E}{D+E}\left(r_f + [ERP]\beta\right) \qquad (3)$$

= 0.355(1.84+.38)(1-.125) + 0.645(1.84+5(1.1))

= **5.42**

Pre-tax WACC:

$$WACC_{pre-tax} = \frac{D}{D+E}\left(r_f + \rho\right) + \frac{\frac{E}{D+E}\left(r_f + [ERP]\beta\right)}{(1-t_c)} \qquad (4)$$

= 0.355(1.84 + 0.38) + 0.645(1.84 + 5(1.1))/(1-.125)

= **6.20**

Our estimate of the post-tax real WACC at 5.42 percent is more than one percentage point below the estimate of 6.5 percent for the IAA in 2002, and the pre-tax real WACC of 6.20 percent is 1.3 percentage points less than our 2002 estimate of 7.5 percent. The real post-tax (real pre-tax) WACC calculated by PricewaterhouseCoopers (2004) for

NATS was estimated as lying within the range of 4.1 percent to 6.2 percent (4.9 percent to 7.4 percent), with a central estimate of 5.0 percent (6.1 percent).

A summary of our findings for the WACC and its components can be found in Table 6.

Table 6 Summary of the estimated WACC and is components

	IAA 2006	IAA 2002	Reasons for change
1. Risk-free rate	1.84	2.6	Lower world real interest rates and EC (2006) requirement to use national bond rate as benchmark.
2. Equity risk premium	5.0	6.0	Better recent academic studies of equity risks, and corresponding lower equity risk premiums in regulatory determinations.
3. Equity beta	1.1	1.2	Higher debt-to-equity ratio and lower corporate tax rate.
4. Gearing ratio	0.36	0.50	Use of actual recent debt-to-assets ratio rather than assumed 'optimal'.
5. Asset beta	0.65	0.65	The same.
6. Ireland's corporate tax rate	0.125	0.135	Equilibrium corporate tax rate now reached.
7. Cost of equity	7.34	9.8	Lower estimates for the real risk-free rate due to EC (2006) regulatory requirement; lower equity beta and equity risk premium.
8. Debt premium	0.38	1.2	More recent estimates of international debt premiums, and evidence of the IAA's actual cost of debt.
9. Real cost of debt	2.22	3.8	Lower risk-free rate and lower debt premium. EC (2006) requires use of IAA's actual cost of debt.
10. Post-tax real WACC	5.42	6.5	
11. Pre-tax real WACC	6.20	7.5	

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