



Decision of the Commission further to a Referral by the Aviation Appeal Panel of the Commission's Decision in relation to its Determination of the 26th of August 2001, on the Maximum Levels of Airport Charges

Commission Paper CP2/2002

9 February, 2002

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1. Introduction

On the 26th of August 2001 the Commission made its determination (the "Original Determination") in respect of the maximum levels of airport charges which could be levied by an airport authority in respect of Dublin, Shannon and Cork airports. The Original Determination was made pursuant to section 32 of the Aviation Regulation Act, 2001 (the "Act").

The Minister for Public Enterprise (the "Minister") received appeals from five parties aggrieved by certain aspects of the Original Determination and accordingly the Minister established an Appeal Panel (the "Panel") pursuant to section 40(2) of the Act.

On the 10th of January 2002, pursuant to section 40(5) of the Act the Panel issued its decision and referred the decision in relation to the Original Determination back to the Commission for review. The decision of the Panel is available on the Commission's website at www.aviationreg.ie

Pursuant to this referral and to section 40(8) of the Act, the Commission undertook a review (the "Review") for the purpose of deciding whether or not to affirm or vary the Original Determination. Prior to undertaking the Review, the Commission published a notice in the national newspapers and issued Commission Paper CP1/2002 notifying interested parties of the Review and inviting submissions in respect of those matters identified by the Panel as constituting sufficient grounds for referring the Original Determination back to the Commission. A list of those matters, together with a description of the scope of the Review was set out in Commission Paper CP1/2002.

The purpose of this paper is to set out the Commission's decision, pursuant to Section 40(8) of the Act in relation to affirming or varying the Original Determination and to set out the reasons for its decision in this regard.

Section 2 of this document describes the Review, section 3 sets out the decision of the Commission pursuant to section 40(8) of the Act, section 4 sets out the reasons for the Commission's decision also pursuant to section 40(8) of the Act and section 5 sets out the Commission's Determination.

Appendix I set out a report on the Off-Peak "Landing and Take-Off" charges and aircraft classification.

Appendix II contains a number of tables which set out the Commission's treatment of the Regulatory Asset Base and Operating Expenditure having regard to the Commission's decision as set out in sections 3 (c) and 3 (j). This appendix also includes a table demonstration how the yields were calculated.

2. Review carried out by the Commission

The Commission's approach to the Review was set out in Commission Paper CP1/2002. As set out therein, the Review was limited to those matters identified by the Panel as constituting sufficient grounds for referring the Original Determination back to the Commission.

In carrying out the Review and in making its decision pursuant to section 40(8) of the Act the Commission considered the decision of the Panel and the reasons given by the Panel for the referral.

In response to CP1/2002 the Commission received submissions from the following parties: Aer Lingus, Aer Rianta, British Airways, Ryanair (together the "Parties").

The Commission has considered the submissions of the Parties and where the observations of the Parties to the Panel have been incorporated into their submissions, those observations have also been considered by the Commission in carrying out the Review and making its decision pursuant to Section 40(8) of the Act. In addition, the Commission has had regard to the statutory objective and the statutory factors set out in Section 33 of the Act.

In carrying out the Review, the Commission has not taken into account facts which came into being or events which occurred after the making of the Original Determination.

3. Decision of Commission Pursuant to Section 40(8) of the Act.

The Commission has decided to vary the Original Determination.

The Commission has identified and set out below the manner by which the Original Determination is hereby varied by the Commission. The Commission has used the same subject headings as those used by the Panel. In all other respects, the Commission has decided to affirm the Original Determination.

(a) Off-Peak 'Landing and Take-off' charges and aircraft classification

The Commission has varied the Original Determination by introducing a methodology by which aircraft not currently included in any of the aircraft categories in Schedule I of the varied Determination can be classified and charged appropriately.

The Commission has not varied the Original Determination in respect of the methodology by which maximum off-peak landing and take-off charges are calculated and specified. However, the Commission has revised its calculations in light of matters raised in the submissions. This has led to the re-classification of certain aircraft types and slight changes in some of the category charges. Tables setting out the reclassification of the aircraft and the relevant charges are set out in Schedule I of the varied Determination. The procedure for the categorisation of aircraft not listed in Schedule I and the revised calculations are described in the Report at Appendix I. The Commission has adopted the Report as part of its decision.

(b) Efficiency

The efficiency factors which the Commission applied to the Personnel Costs component of Aer Rianta's OPEX in the Original Determination, were at the uniform rate at Dublin and Shannon Airports respectively, in each of the five regulatory years, of 3.5% and 4%. No efficiency improvement was applied at Cork Airport.

The Commission has varied the Original Determination with regard to efficiency by taking these cumulative efficiency improvements of 18.76% and 21.66%, respectively, and spreading their application over 3 rather than 5 years. There is therefore no efficiency factor in years 4 or 5 at Dublin or Shannon Airports nor in any year at Cork Airport.

(c) OPEX (operating expenditure)

The Commission has decided to vary its Original Determination by publishing, in an aggregated form, more detailed information in relation to Aer Rianta's operating expenditure. The publication of this information is currently subject to Aer Rianta's designation of this information as confidential. Further to the settlement of High Court proceedings, Record Number 2001 136 SP., initiated by the Commission against Aer Rianta in relation to the furnishing and publication of confidential information, the Commission has today furnished Aer Rianta with 10 days notice of its intention to publish details today of Aer Rianta's operating expenditure in an aggregated form. Unless prevented from publishing this information by operation of law, the Commission will publish this information on its website upon the expiry of this 10 day period

(d) Depreciation

The Commission has varied the Original Determination by excluding land from the calculation of depreciation for the purpose of calculating maximum yields. In the Original Determination all assets in the regulatory asset base (the "RAB") were depreciated. As a consequence of this change, land will remain in perpetuity in the RAB as it will not be depreciated over time.

(e) Transfer and Transit passengers.

The Commission has varied the Original Determination in respect of this matter. Transfer passengers are now counted as a passenger each time they embark or disembark from an aircraft at an airport. Transit passengers continue to be treated as a single passenger.

In the Original Determination, the Commission treated transfer and transit passengers differently from other passengers. Transit and transfer passengers, being passengers who arrive and depart from the same Irish airport without leaving the airport, were counted as a single passenger in the Original Determination. Other passengers were counted as passengers each time they embark or disembark from an aircraft at an airport.

(f) Cargo Charges

The Commission has varied its Original Determination such that the per passenger revenue from charges in respect of cargo air services (as defined therein) is no longer subtracted from the maximum average revenue yield to give the cap on charges in respect of non-cargo air services (as defined therein) in the second and subsequent regulatory years. The Commission has maintained the sub-cap on charges in respect of services supplied in connection with the transportation by air of cargo to or from Dublin, Shannon or Cork airport.

(g) Security Surcharges

In the Original Determination, there was no provision for a cost pass through in respect of security charges.

The Commission has not varied the Original Determination. It provides a further clarification of certain issues raised in the Appeal in Section 4.

(h) Passenger Numbers/Forecasts

The Commission has varied the Original Determination. The Aer Rianta centreline forecast is now being used.

In the Original Determination, the Commission referred to two sets of passenger numbers: the Aer Rianta centreline forecast and a forecast reconstructed by the Commission. Notwithstanding the stated intention of the Commission in its Original Determination to use the Aer Rianta centre line forecast, the reconstructed forecast was erroneously used by the Commission.

(i) Interest Payments (under-and-over- recovery of maximum airport charges)

The Original Determination has been varied such that the correction factor (K) can now take a positive or negative value, and deals with interest payments whether the purpose in any particular regulatory year is to correct over - or under-recovery of maximum airport charges. The Determination no longer contains a separate section on "Treatment of Over-Recovery".

(j) Communication from the Commission

The Commission has varied the Original Determination in the following ways:

- i. by calculating the Return on the RAB of Aer Rianta based on the valuation as at the beginning of each regulatory year (e.g. 23 September 2001) whereas the Original Determination was based on the RAB at the end of each regulatory year (e.g. 23 September 2002);
- ii. by indexing the RAB for the first 9 months of 2001 at 4.5% whereas the Original Determination indexed the RAB for that period at a rate of 6%;
- iii. by writing down the RAB by €14m (IR£11m) for Pier C, by €7.6m (IR£6m) for the Shannon Terminal and by €6.5m (IR£5m) for the Dublin Aircraft Parking Stands, whereas the Original Determination had deducted €61m (IR£48m) for Pier C, €22m (IR£17m) for the Shannon Terminal and had not deducted a figure for the Dublin Aircraft Parking Stands;
- iv. by including in the RAB the Commercial CAPEX for the first 9 months of 2001 of €19m (IR£15m) which had not been incorporated into the RAB in the Original Determination;
- v. by including in the RAB Commercial CAPEX for the regulatory years 2001/02 to 2005/06 (identified in the Recoverable CAPEX programme) which had not been incorporated into the RAB in the Original Determination;
- vi. by including in the RAB €24m (IR£19m) of Non-Commercial CAPEX for the first 9 months of 2001 whereas the Original Determination had used the figure €14m (IR£11m).

4. Reasons for the Commission's decision

The Commission is obliged, pursuant to section 40(8) of the Act to notify any parties who requested the Minister to establish the Panel, of the reasons for its decision to vary its Original Determination. In addition to notifying those persons directly of the Commission's reasons for its decision, these reasons have been set out below for the benefit of all interested parties.

(a) Off –Peak 'Landing and Take Off' Charges and Aircraft Classification

The reasons for varying this part of the Commission's Determination are set out in full in the Report at Appendix I which has been adopted by the Commission.

(b) Efficiency

In its decision, the Panel considered that the particular grounds on which the Commission should consider setting more demanding efficiency targets were:

- (i) the need to reduce relative inefficiency levels vis-à-vis peer airports more rapidly (reflecting the reality of more competitive markets);
- (ii) economies of scale and technical improvements that should arise as the airports expand and develop.
- (iii) the concern that even the modest efficiency target of 4% per annum, set for Shannon, does not even meet the Commission's own objective of reducing the existing efficiency gap with peer airports by half during the period of the determination.

These three matters have been reviewed by the Commission, which considered the views of the Panel together with the submissions from the Parties and that of Aer Rianta.

(i) The need to reduce relative inefficiency levels vis-a-vis peer airports more rapidly

The Commission's views on the validity of the Benchmarking Study, and its reasons for setting the efficiency factors selected at the time of the Original Determination were given in the report accompanying the Original Determination and are not repeated here.

With regard to eliminating more of the difference in unit costs, the Commission carefully explained in its Original Determination that it did not consider all differences in unit costs necessarily to be inefficiencies.

The Commission considers that an adequate case has not been made for raising the efficiency factors much closer to the measured unit cost differences.

In the Original Determination the extent of the unit cost difference shown by the Benchmarking Report was interpreted conservatively. The Commission now considers that a case has been made for front-loading the efficiency adjustments into the earlier years of the regulatory period. Therefore, as the 3.5% and 4% factors are considered by the Commission to be to a significant extent an efficiency gap, Aer Rianta should eliminate such inefficiency more rapidly than over five years.

(ii)(a) The need to allow for the impact on unit costs of economies of scale that should arise as the airports expand and develop.

In evaluating the diverging submissions received, the Commission noted the conflicting evidence regarding scale factors at airports. Thus the Original Determination set Opex growth in line with traffic (and price) growth. A linear adjustment seemed prudent in these circumstances with only assumptions rather than evidence being forthcoming regarding the relationship at Irish airports. The Commission has not varied its Original Determination in this respect.

However, as previously indicated in report CP9/2001 that accompanied the Original Determination, the Commission considers that the possible existence of factors such as scale issues and technical change means that the efficiency improvements sought by the Commission from two airports are not extremely demanding.

(ii)(b) The need to allow for the impact on unit costs of technical improvements over time

The Commission, following consideration of the submissions, decided that there was not sufficient evidence of how general technical progress could be expected to reduce airport unit costs other than such evidence as it had already

considered. The Commission has not varied the Original Determination in this regard.

(iii) Commission's decision to vary the efficiency factors in its Original Determination

On the basis of its consideration of the submissions received, the Commission has decided to leave the cumulative efficiency factors unchanged on the grounds that the submissions have not changed the reasoning given by the Commission in the Original Determination. In the Original Determination the Commission interpreted the extent of inefficiency in the unit cost differences in the Benchmarking Report conservatively. The Commission, in varying its Determination, has front-loaded these efficiency factors, in that they must now be achieved over 3 rather than 5 years. As the 3.5% and 4% factors are considered by the Commission to be to a large extent an efficiency gap, the Commission has decided that Aer Rianta should eliminate such inefficiency more rapidly than over five years.

(c) OPEX (Operating Expenditure)

The Panel stated that “[h]aving due regard to operating costs requires an explanation as to how the opening Opex is derived.”

The Commission accepts the position of the Panel and for this reason has decided to provide more detailed information on the calculation on the opening Opex, subject to the legal constraints identified in Section 3 (c).

(d) Depreciation

The Panel stated that the Commission’s Original Determination may have applied, in practice if not in intent, accelerated depreciation of Aer Rianta’s assets thus giving the airport operator excessive cash flow.

The Commission did not apply accelerated depreciation in the Original Determination. However, given the limited information furnished to it regarding the airport operator’s depreciation policy, the Commission applied, as a rule of thumb, an assumption that the remaining life of the assets in the Aer Rianta regulatory asset base was 15 years.

As part of the Commission’s Review, the Commission has decided that 15 years may be too short a life span for an asset base partly composed of land. Therefore, by excluding land from the calculation of depreciation, and applying the 15 year life to other assets, the Commission has lengthened the average remaining life span of the regulated assets of Aer Rianta. For new investment (CAPEX), the depreciation policy applied in the Financial Model is unchanged; a 20-year life is assumed for 90% of new assets and a 5-year life for the remainder. As a consequence of this change, land will remain in perpetuity in the RAB as it will not be depreciated over time.

(e) Transfer and Transit passengers

The Panel has stated that the Commission should review its treatment of transit and transfer passengers.

In the Determination, transfer and transit passengers were treated differently from other passengers in that such passengers were treated as a single person.

It has been submitted that for the purposes of determining airport charges both transfer and transit passengers should be treated the same as other passengers since "these passengers are using the same facilities and services as originating or destination passengers."

Aer Rianta has stated in its submission to the Commission that it is not possible to produce reliable forecasts of transit passengers.

The Panel itself has noted that within Europe there is no uniform charging mechanism for the treatment of transfer and transit passengers and that the treatment of transfer passengers is clearly a matter of commercial judgement for any airport.

The Commission has decided to treat transfer passengers the same as other passengers. Therefore, for the purpose of calculating the maximum airport charges, transfer passengers are now counted as both arriving and departing passengers. The reason for this decision is that this will facilitate traffic forecasting and bring the Original Determination more in line with international practice.

Transit passengers continue to be treated as a single passenger. The reason for this decision is that reliable forecasts of transit passengers are not available.

(f) Cargo Charges

Regulation that takes the form of a price cap expressed as a maximum average revenue yield per passenger can pose the following difficulty. If charges are set by the airport authority such that forecasted average yields (based on expectations of the total traffic and of its mix) are equal to the maximum permitted average yields (as specified by the price cap), any additional services carrying terminal passengers, where the incremental yield is less than or equal to the price cap, will not cause the airport to exceed the overall cap. However, if the additional services are not carrying terminal passengers, the extra revenue from landing and parking fees has no associated passenger numbers. This has the effect of producing an apparent over-recovery against the price cap that has to be refunded to users with an interest penalty, thus depriving the airport operator of any commercial benefit from these additional services. This could have the effect of discouraging the airport authority from attracting and developing commercial cargo business.

To address this potential problem, the Commission made its Original Determination such that the maximum average revenue yield per passenger for the first regulatory year 2001/02 is reduced by the per passenger revenue for cargo air services, with the resulting sum (after the annual CPI-X adjustment) becoming the price cap for 2002/03, but only for airport charges paid in respect of non-cargo air services.¹ The Commission was satisfied that, in respect of services supplied in connection with the landing, parking or take off of cargo aircraft (one element of cargo air services), the airport authority would be sufficiently restrained from engaging in behaviour which might frustrate its statutory objective set out in Section 33 of the Act.

In the responses of interested parties to CP6/2001, the Commission was made aware that no charge for services supplied in connection with the transportation by air of cargo existed. The analogous non-cargo air service charges are those

¹ Cargo air services and non-cargo air services were defined in the Definitions section of the Original Determination.

levied in respect of the arrival at or departure from an airport by air of passengers. In terms of the cost imposed on the airport authority of handling either passengers or cargo, the Commission had no accurate information as to the relationship between cargo and passengers as airport output. Therefore, the Commission was concerned whether in the short to medium term, the operation of competition law in respect of charges for services supplied in connection with the transportation by air of cargo, would be adequate.

The Commission was also aware that, prior to its establishment, the airport authority purported to introduce a cargo handling fee of €12.74 (IR£10) per tonne of cargo. Approval of this fee is outstanding under the Ground Handling Regulation (SI 505/1998). As the issue fell to be considered by the Commission in the wider context of its Original Determination, it decided to place a €12.74 (IR£10) per tonne sub-cap on charges for services supplied in connection with the transportation by air of cargo for the regulatory year 2001/02, with annual CPI-X adjustments for the remaining period of the price cap.

However, because the per passenger income from the entire set of cargo air services is subtracted from the 2001/02 cap to give the cap on non-cargo air services for the regulatory year 2002/03, the incentive for the airport authority is to charge nothing for services supplied in connection with the transportation by air of cargo during the regulatory year 2001/02. In doing this, the airport authority would maximize the starting value allowed for revenue per passenger in respect of non-cargo air services and recover any costs associated with the provision of services supplied in connection with the transportation by air of cargo from charges levied in respect of non-cargo air services. In addition, the airport authority could, during the regulatory year 2002/03, raise charges for services supplied in connection with the transportation of any cargo to the limit of €12.74 (IR£10) per tonne because they fall outside the overall cap, thus substantially increasing its revenue.

The Commission's intention in setting the €12.74 (IR£10) sub-cap was to prevent cargo operators being penalized in favour of passenger operators when the airport authority determined its structure and levels of individual charges in order to comply with the Original Determination. The Commission did not intend non-cargo air services to finance costs incurred in the provision of services supplied in connection with the transportation by air of cargo, with the airport authority gaining additional revenues when it introduced a charge for such services in the second regulatory year.

The Commission notes that the difficulty with an average revenue yield price cap only becomes an issue when the quantity of cargo air services exceeds the forecasted amount which was used to calculate the airport authority's total revenue requirement². Therefore, the loss of revenue only becomes significant when the amount of cargo air services over and above those forecast in calculating the total revenue requirement becomes significant. The Commission takes the view that the uncertainty as well the administrative difficulties generated by its attempt to resolve this problem outweighs the benefits that would accrue to the relevant parties from the marginal precision that its resolution yields.

However, the Commission still wishes to guard against cargo operators being penalized in favour of passenger operators. Therefore, the Commission has decided to retain the €12.74 (IR£10) sub-cap on charges for services supplied in connection with the transportation by air of cargo. However, the Commission has varied its Determination such that the per passenger revenue from charges in respect of cargo air services is no longer subtracted from the maximum average revenue yield to give the cap on charges in respect of non-cargo air services in the second and subsequent regulatory years.

² This total revenue requirement was divided by the forecasted number of passengers during the regulatory year 2001/02 to give the maximum average revenue yield.

(g) Security Surcharges

The Panel is of the view that the uncertainty that attends the passing through of security charges whether arising out of September 11th or otherwise and those costs, if any, that are related to the operation of "Hold Baggage Screening" (HBS) should be clarified.

The Panel noted that arising out of the Determination there was uncertainty amongst users as to the funding of security costs. In particular, there was uncertainty as to the funding of the costs of the operation of HBS and uncertainty as to which entity should provide that service (Aer Rianta or the airlines).

It is for this reason and with a view to clarify matters that the Commission has decided to provide more information.

1. The Determination does not contain a security cost pass through. Therefore, any additional security charge levied by Aer Rianta on the airlines falls within the overall constraints of the Determination, provided, of course that the additional charge relates to activities covered by airport charges as defined under the Act. In particular, in the case of HBS, since the provision of HBS clearly falls within such a category of activities, any charge levied by Aer Rianta for HBS (whether it be categorised as Capex or Opex) falls within the overall limits of the Determination.
2. The Determination does not contain any requirement that Aer Rianta provide a certain set of services. Neither does the Determination set service quality standards. Therefore, the Determination, by its own terms, does not require Aer Rianta to provide HBS services to the airlines.
3. In making its Determination, the Commission included a provision for OPEX based on the Aer Rianta general ledger for the first six months of

2001. This general ledger does not contain any provision for the operation of HBS.

(h) Passenger Numbers/Forecasts

The Panel has stated that the Commission should review its treatment of passenger numbers. The Panel pointed out that an anomaly existed in the passenger numbers cited in the Original Determination.

The Commission had intended to use the Aer Rianta centreline forecasts in the Original Determination. This was not done, due to an oversight.

The Commission has decided to vary the Original Determination and correct this oversight.

(i) Interest Payments (under- and over- recovery of maximum airport charges)

The Panel stated that there is a lack of consistency in the manner in which this part of the Determination is applied.

The Commission accepted the Panel's suggestion that there was a lack of consistency in the manner in which the Determination treated the correction of over- and under-recovery of maximum airport charges. That is, recovery of under-charging is spread over the following regulatory year (though with interest) and repayment of over-charging in a lump sum within 45 days (without interest). The Commission also accepted a submission that the lack of reciprocity in charging no interest on any sum to be repaid to users by Aer Rianta for over-charging during the regulatory year could be inequitable.

(j) Communication from the Commission

The Commission wrote to the Panel on 20th December 2001 and identified certain computational matters in the Original Determination. The Panel stated that in order to avoid the Statutory Objective being frustrated, sufficient grounds have been established in respect of all issues identified in the letter. The Commission has varied the Original Determination to address these computational matters.

The Commission's reason for making the variations are that the computations in the Financial Model used to determine the maximum airport charges in the Original Determination did not fully correspond to the Commission's policy intentions.

5. Varied Determination in respect of the maximum levels of airport charges that may be levied by an airport authority in respect of Dublin, Shannon and Cork airports.

This section sets out the determination as varied. This varied determination replaces the Original Determination as set out in Commission paper CP7/2001.

Schedule 1 – Aircraft Classification

| Aircraft Cost Category 1 (ACC, i=1) Starting Charge per Movement per Tonne = €0.25 | | | | | | | | | | Aircraft Cost Category 2 (ACC, i=2) Starting Charge per Movement per Tonne = €0.79 | | |
|---|---------|----------|----------|----------|----------|---------|---------|---------|--|---|--|--|
| All aircraft <30 tonnes | B737529 | B7572Q8 | BAE146RJ | E110 | SB20 | A300 | B7373YO | B747200 | | | | |
| AN24 | B737530 | B7572T7 | BAEATP | EMB110 | SD360 | A300203 | B737600 | DC9 | | | | |
| ARJ | B737548 | BA11 | BAEJ41 | EMB145 | SF34 | A300600 | B737683 | DC941 | | | | |
| ATP | B73755S | BA11501 | BAERJ85 | F100 | SH36 | A300B4 | B737700 | DC951 | | | | |
| ATR42 | B7375K5 | BA11510 | CL60 | F50 | SH360 | A310 | B7377AK | DC980 | | | | |
| ATR42300 | B7375L9 | BA11523 | CL600 | F70 | SH360100 | A310300 | B7377L9 | DC982 | | | | |
| ATR72 | B757 | BA11530 | CL6002B | FK100 | TU134 | A310304 | B737800 | DC983 | | | | |
| B717 | B757200 | BA146300 | CL65 | FK50 | TU154 | B737300 | B73785H | DC987 | | | | |
| B737 | B757217 | BA41 | CRJ | FK70 | TU154B | B737329 | B73785P | | | | | |
| B737200 | B757224 | BA46200 | D328 | L610 | TU154M | B737330 | B73786N | | | | | |
| B737222 | B757236 | BA46300 | D328110 | PA23 | | B73733A | B737883 | | | | | |
| B737229 | B75723A | BAE146 | DH8 | PA31 | | B73736 | B7378K2 | | | | | |
| B7372YF | B75723N | BAE14610 | DHC7 | RJ100 | | B737382 | B7378Q8 | | | | | |
| B737500 | B75727B | BAE14620 | DHC8 | RJ85 | | B7373S3 | B747 | | | | | |
| B737505 | B75728A | BAE14630 | DO82 | SAAB2000 | | B7373Y5 | B747128 | | | | | |

| Aircraft Cost Category 3 (ACC, i=3) Starting Charge per Movement per Tonne = €1.26 | Aircraft Cost Category 4 (ACC, i=4) Starting Charge per Movement per Tonne = €1.94 | Aircraft Cost Category 5 (ACC, i=5) Starting Charge per Movement per Tonne = €2.69 |
|--|---|---|
| A319 A330301 B767332 A319100 A340312 B7673Q8 A319111 AN12 B777 A319112 B727 DC10 A319114 B737400 DC1030 A320 B737429 DC862F A320200 B737448 L1011 A320211 B73746B L10111 A320212 B7374Q8 L101114 A320214 B7374YO L1011385 A320231 B747400 MD80 A320232 B767 MD81 A330 B767200 MD82 A330200 B767204 MD83 A330243 B767300 MD87 B767304E MD87H | A321 A321131 A321132 A321200 A321211 A321231 MD11 MD90 MD9030 | B727256 B727276 |

Appendices

Appendix I – Report on Off-Peak ‘Landing and Take off’ Charges and Aircraft Classification



**REPORT
ON OFF-PEAK 'LANDING AND TAKE OFF' CHARGES
AND AIRCRAFT CLASSIFICATION**

**OLIVER HOGAN
DAVID STARKIE
KIERAN FEIGHAN**

FEBRUARY 2002

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1. Introduction

This report sets out the considerations of Decision 8.01 (Off-Peak 'Landing and Take Off' Charges and Aircraft Classification) of the Appeals Panel. We deal first with the methodology. As section 2.5 will demonstrate, the approach is different to the purely weight-related charging structures that are currently applied at airports, but it is one based on the principle of cost-reflectiveness. It uses an internationally recognised damage classification system to determine the damage caused by different aircraft types, such that landing and take-off charges reflect more accurately the differing marginal damage costs imposed by these aircraft types. We subsequently address other specific points raised by the Panel, including the miscategorisation of certain aircraft and the categorisation of new aircraft.

2. Methodology

The Panel questioned the methodology for calculating the maximum off-peak landing and take-off charges on a number of grounds. These are

1. That the specified Pavement Classification Number (PCN) at Dublin Airport is larger than the Aircraft Classification Number ("ACN") of most aircraft types operating into the airport with the exception of the MD11, B747-400 and some B777. Therefore, as Decision 8.01 states, "the vast majority of aircraft operating into Dublin cause little more than normal wear and tear to the runway and taxiway pavements." The Appeal Panel defines the PCN as expressing "the bearing strength of a pavement allowing an unlimited number of movements."
2. That ACN-PCN calculations are primarily intended to enable aircraft operators to determine the permissible aircraft types and operating masses, and for aircraft manufacturers to ensure compatibility between airport pavements and aircraft under development.

3. That the use of ACN as the basis for setting landing and take off charges is a unique exercise, with none of the appellants being aware of such a methodology being applied at any other airport. The 'normal' method is based on Maximum Take Off Weight (MTOW).

Our intention is to provide further detailed explanation of the methodology employed to respond to the points reviewed by the Appeal Panel and to clarify anomalies in the aircraft classification.

2.1 Background

Standard practice in establishing landing (or take off) charges has been to use the weight formula, where a flat charge per tonne is charged according to the aircraft's maximum permissible take off weight (MTOW). Weight-based charging structures are considered to reflect runway damage costs and 'ability to pay'; the latter because heavier aircraft usually fly longer distances and carry greater numbers of passengers, thus accruing more revenue than lighter aircraft for each take-off or landing. Equally, airports traditionally have been viewed as providing a public service, evidenced by the fact that most airport companies have, until recently, been in the public sector. Therefore, it is probable that weight-based charging structures reflect distributional/equity considerations in the pricing of a public service. However, with the privatisation of many airports and the transformation of others into commercial enterprises albeit sometimes still within the public sector, the emphasis has shifted towards encouraging more efficient use of these assets.

Economically efficient use of runways, taxiways and aprons requires a charging structure that reflects the marginal cost associated with an additional aircraft movement (landing or take-off). However, aircraft movements are not uniform throughout the day and although existing off-peak traffic (as well as much of the foreseeable growth in that traffic) could continue to be handled by existing runway infrastructure, there are periods when the limitations of existing runway capacity become evident. Therefore, in order to encourage more efficient use of that capacity and, thereby, facilitate the development and operation of cost-

effective airports which meet the requirements of users, the Commission decided in the Original Determination to place a sub-cap on charges in respect of aircraft movements at off-peak times in order to encourage the introduction of a peak/off-peak differential by Aer Rianta. The basis for this off-peak sub-cap is the marginal cost associated with an additional aircraft movement.

2.2 Measuring Marginal Costs

During peak times, the marginal cost of an additional aircraft movement comprises the cost of damage to pavements together with the costs of delay that the additional aircraft movement imposes on other flights.³ At off-peak times, congestion costs are absent so that the damage costs alone constitute the marginal cost of use. Section 2 of Appendix VIII to the Commission's Original Determination outlines the approach taken to measure these marginal damage costs.

Paragraph 8.01(c) of the Decision of the Panel states that "the bearing strength of a pavement allowing an unlimited number of movements is expressed in terms of a Pavement Classification Number (PCN). The specified PCN at Dublin Airport is larger than the ACN of most aircraft operating into the airport..." such that "the vast majority of aircraft operating into Dublin cause little more than normal wear and tear to the runway and taxiway pavements". We do not accept that this is correct. There is also damage to the basic structure of the runways, taxiways and aprons that eventually lead to their reconstruction. Recognition of this gradual loss of structural load-carrying capacity over time is the fundamental principle underpinning pavement design. On concrete pavements, the chief structural failure mechanism is through fatigue cracking of the concrete induced by many repetitions of the loading and unloading cycle as aircraft move towards, over and away from the point of loading.

The ICAO PCN (Pavement Classification Number) is defined as "A number expressing the bearing strength of a pavement for unrestricted operations". It is important to stress that the PCN definition does not refer to unlimited

³ It is the congestion costs that inform the case for additional runway infrastructure.

operations. "Unrestricted" is generally taken to mean that movements of an aircraft are not restricted within the design life of the pavement.

In "A Guide to Airfield Pavement Design and Evaluation"⁴, the primary source used in pavement design and evaluation on civil airfields in the United Kingdom, it is stated in relation to the PCN definition that the term "unrestricted use" of a pavement is not specifically defined. However, it is a pavement design parameter which should reflect current and forecast use over an appropriate design life before major maintenance is required". Inherent within the PCN definition is an acknowledgement that the structural life of the pavement will be consumed over a design period, and the pavement will then require further structural maintenance and/or rehabilitation to continue to serve its function. Accordingly, the PCN is a relevant and appropriate parameter in conjunction with the ACN of the aircraft types using the facility to allocate long-term structural costs and ongoing routine maintenance costs arising from the damage effects induced in the pavements.

Paragraph 8.01(f)(ii) of the Decision of the Panel states that the Commission has taken no account of other related costs, for example, ground-based navigation aids and the provision of rescue and fire fighting services. That is because these costs are fixed, common or overhead costs and do not vary with an additional aircraft movement. Damage costs alone constitute the marginal cost of off-peak use. In setting off-peak charges according to marginal cost, the Commission has aimed to provide an incentive to Aer Rianta to introduce a peak/off-peak differential in landing charges. It has set the overall price cap such that the company has the ability to cover all fixed, common and overhead costs, while providing as strong incentives as possible to encourage more efficient use of the existing runway infrastructure.

⁴ "A Guide to Airfield Pavement Design and Evaluation," Directorate of Civil Engineering Services, HMSO, 1989.

2.3 Damage Allocation – ACN or MTOW?

Different aircraft types cause different amounts of damage on runway, taxiway and apron pavements, and a methodology for allocating the total marginal damage cost across these aircraft types was necessary. In Ireland, prior to the Commission’s Original Determination and, indeed, internationally, charging for landings and take-offs has been based on the aircraft’s Maximum Take Off Weight (MTOW) so that, in general, a fixed charge per tonne is incurred with the total landing or take off charge increasing in direct proportion with aircraft weight.

Dr Kieran Feighan of Pavement Management Services Ltd advised the Commission that aircraft weight was one of several factors that contribute to pavement damage and that Aircraft Classification Numbers (ACNs) were the best available tool for damage cost allocation. The ICAO Aerodrome Design Manual⁵ defines the ACN as “a number expressing the relative effect of an aircraft on a pavement for a specified standard subgrade strength” and describes their use as “a standard procedure for evaluation of the load rating of aircraft.” In simple terms, an ACN is an ICAO rating based on the equivalent damage caused by, among other things, different weights, landing gear (or undercarriage) and tyre pressures of aircraft. In general, a higher ACN indicates a more damaging aircraft and, for the same load, more wheels and lower tyre pressures usually result in a lower ACN.

Paragraph 8.01(e) of the Panel’s decision comments on the uniqueness of the approach adopted by the Commission. While the Commission’s approach is unique, it is one based on the principle of cost reflectiveness. It uses an internationally recognized (ICAO standard) damage classification system to determine the damage caused by different aircraft types, such that landing and take-off charges reflect more accurately the differing marginal damage costs imposed by these types. In doing so, it recognizes that aircraft weight is one but not the only determinant of the damage imposed by aircraft on pavements.

⁵ ICAO Aerodrome Design Manual, Part 3 – Pavements, 2nd Edition, 1983.

The Commission`s approach ensures that more damaging aircraft pay more and less damaging aircraft pay less; it removes the arbitrariness of simply allocating costs according to aircraft weight and makes charges more cost-reflective.

Figure 1 in the Annex I shows a plot of ACN against MTOW for aircraft landing and taking off at Dublin Airport and (through square markings) provides two examples of pairs of aircraft that, in the first instance, share a very similar MTOW, but whose ACNs are very different and, in the second instance, share very similar ACNs, but whose MTOWs are very different. Both cases illustrate that MTOW is not an efficient basis of allocation of damage costs. In the first case, both aircraft weigh approximately 100 tonnes and would pay the same with MTOW-based charging. However, the aircraft with an ACN of over 60 is inducing a very different quantum of damage per movement. In the second case, both aircraft have similar ACNs and therefore induce similar amounts of damage. However, with MTOW-based charging, the aircraft that weighs in excess of 350 tonnes would pay much more than that weighing approximately 150 tonnes.

2.4 Methodology using A.C.N. to Allocate Damage Costs

In an ideal world, an airport authority would be able to allocate damage costs precisely according to the incremental amounts imposed by each individual aircraft type. However, such a charging structure would defy practicality and would place an undue burden on the airport authority through excessive complexity. Therefore, based on the most recent year for which all aircraft movements (number and aircraft type) are available (calendar year 2000), we sought to group aircraft according to, in the first instance, the damage that they impose (that is, according to ACN numbers) and, in the second instance, the weight of the aircraft. The implication is that the aircraft types within each of the aircraft damage categories induce a similar amount of damage per landing as well as per tonne. The added benefit of this system of damage categorisation is the flexibility for new aircraft types or variants to be added to existing aircraft categories.

Table 1: Aircraft Damage Categorisation and corresponding A.C.N. and MTOW Ranges.

| Aircraft Damage Category | Aircraft Types | A.C.N. | | MTOW | |
|---------------------------------|--------------------------------------|----------------|----------------|----------------|----------------|
| | | Minimum | Maximum | Minimum | Maximum |
| 1 | < 10t | 2 | 7 | | |
| 2 | 10 - 20t | 7 | 12 | | |
| 3 | 20 - 30t | 12 | 12 | | |
| 4 | CRJ; FK70; BAe146; BA11; RJ85; TU134 | 16 | 28 | 34 | 47 |
| 5 | FK100; RJ100; B717; B737-200, 500 | 31 | 35 | 44 | 53 |
| 6 | TU154; B757 | 32 | 38 | 100 | 110 |
| 7 | B737-300, 600; DC9 | 36 | 39 | 55 | 57 |
| 8 | A319; AN12; B737-400, 700, 800 | 41 | 46 | 61 | 71 |
| 9 | A320; B727; MD80 | 48 | 49 | 68 | 79 |
| 10 | A321; MD90 | 52 | 58 | 79 | 83 |
| 11 | A300; A310 | 52 | 58 | 142 | 150 |
| 12 | B747-100, -200 | 59 | 66 | 340 | 378 |
| 13 | B767-200, 300; DC8 | 61 | 63 | 152 | 176 |
| 14 | B727-200 | 63 | 63 | 95 | 95 |
| 15 | A330; B777; L1011 | 63 | 66 | 211 | 234 |
| 16 | A340; DC10 | 67 | 68 | 260 | 264 |
| 17 | B747-400 | 75 | 75 | 362 | 363 |
| 18 | MD11 | 79 | 79 | 273 | 274 |

Table 1 shows how the aircraft operating from Dublin airport during 2000 are now grouped into aircraft damage categories. The original aircraft damage categorisation was presented in Table 6 of Appendix VIII to the Commission's Original Determination. Having considered paragraphs 8.01(f)(iii) and 8.01(h) of the Decision of the Appeal Panel as well as the general suitability of the aircraft damage categorisation presented in table 6 of the original report, we have revised the damage categorisation to give the 18 "Aircraft Damage Categories" shown in Table1. (There were previously 14.)

Based on the 4th power law for pavements, the damage induced by aircraft A relative to aircraft B is the ratio of the A.C.N. of aircraft A to the A.C.N. of aircraft B, all raised to the 4th power. Therefore, we selected a 'design' aircraft with an A.C.N. close to the highest A.C.N. of any aircraft using the airport and calculated the damage induced by all other aircraft relative to this design aircraft. This provided a consistent basis for the allocation of damage costs

based on relative damage induced by aircraft types. Multiplying this relative damage factor per landing by the actual number of landings of each aircraft type in the design year (2000) gave the equivalent number of landings of the design aircraft for each aircraft type. The proportion of damage attributable to each aircraft damage category is the sum of the equivalent number of landings of the design aircraft for all aircraft in each of those damage categories divided by the total equivalent number of landings of the design aircraft summed over all aircraft types. Table 2 presents the proportion of damage attributable to each of the damage categories.⁶

Table 2: Proportion of Damage to Rigid Pavements attributable to each of the 18 Aircraft Damage Categories.

| Aircraft Damage Category | Aircraft Types | % Damage to Rigid Pavements |
|---------------------------------|---|------------------------------------|
| 1 | < 10t or similar | 0.00 |
| 2 | 10 - 20t or similar | 0.04 |
| 3 | 20 - 30t or similar | 0.02 |
| 4 | CRJ; FK70; BAe146; BA11; RJ85; TU134 or similar | 2.08 |
| 5 | FK100; RJ100; B717; B737-200, 500 or similar | 11.98 |
| 6 | TU154; B757 or similar | 1.09 |
| 7 | B737-300, 600; DC9 or similar | 1.25 |
| 8 | A319; AN12; B737-400, 700, 800 or similar | 10.62 |
| 9 | A320; B727; MD80 or similar | 7.69 |
| 10 | A321; MD90 or similar | 36.74 |
| 11 | A300; A310 or similar | 1.00 |
| 12 | B747-100, -200 or similar | 0.14 |
| 13 | B767-200, 300; DC8 or similar | 4.71 |
| 14 | B727-200 or similar | 2.38 |
| 15 | A330; B777; L1011 or similar | 17.83 |
| 16 | A340; DC10 or similar | 0.32 |
| 17 | B747-400 or similar | 0.01 |
| 18 | MD11 or similar | 2.15 |
| | | 100 |

⁶ See table 6 of the original report in Appendix VIII of the Original Determination.

These proportional ACNs could then be used to allocate a similar proportion of the damage costs to each aircraft damage category (column 3 of table 3). Dividing these amounts by the number of landings of aircraft within the damage categories gave an average marginal damage cost per landing of aircraft within each of those categories (column 5 of table 3).

Table 3: Allocation of total marginal damage cost to aircraft damage categories, number of landings and average marginal damage cost per landing of aircraft within those damage categories.

| Aircraft Damage Category | Aircraft Types | Allocation of Total Marginal Damage Costs | Number of Landings | Average Damage Cost per Movement |
|---------------------------------|---|--|---------------------------|---|
| 1 | < 10t or similar | | | € 0.04 (IR£0.03) |
| 2 | 10 - 20t or similar | | | € 0.34 (IR£0.26) |
| 3 | 20 - 30t or similar | | | € 0.67 (IR£0.52) |
| 4 | CRJ; FK70; BAe146; BA11; RJ85; TU134 or similar | | | €11.94 (IR£9.40) |
| 5 | FK100; RJ100; B717; B737-200, 500 or similar | | | € 33.72 (IR£26.55) |
| 6 | TU154; B757 or similar | | | € 66.63 (IR£52.47) |
| 7 | B737-300, 600; DC9 or similar | | | € 61.47 (IR£48.41) |
| 8 | A319; AN12; B737-400, 700, 800 or similar | | | € 144.13 (IR£113.51) |
| 9 | A320; B727; MD80 or similar | | | € 180.09 (IR£141.83) |
| 10 | A321; MD90 or similar | | | € 319.70 (IR£251.78) |
| 11 | A300; A310 or similar | | | € 256.88 (IR£202.30) |
| 12 | B747-100, -200 or similar | | | € 555.06 (IR£437.14) |
| 13 | B767-200, 300; DC8 or similar | | | € 450.30 (IR£354.64) |
| 14 | B727-200 or similar | | | € 512.23 (IR£403.41) |
| 15 | A330; B777; L1011 or similar | | | € 580.90 (IR£457.49) |
| 16 | A340; DC10 or similar | | | € 685.84 (IR£540.14) |
| 17 | B747-400 or similar | | | € 1028.85 (IR£810.28) |
| 18 | MD11 or similar | | | €1266.53 (IR£997.47) |

Although table 3, in itself, provides a relatively simple and more practical charging schedule than charging according to the incremental damage imposed by individual aircraft types, the Commission decided in the Original

Determination to minimise the administrative burden on the airport authority by converting it into a per tonne charging schedule consistent with current practice. Therefore, the Commission developed a per tonne charging schedule based on MTOW, the tonne rates of which varied according to damage caused. For each aircraft type, the appropriate marginal damage cost per landing shown in Table 3 was divided by the MTOW tonnage of that aircraft to give a marginal cost per tonne per landing. Using the pragmatic approach of identifying significant increments in marginal cost per tonne, the following bands were considered to be the most suitable for the purpose of categorizing aircraft according to the cost that they impose (Table 4).

Table 4: *Cost per tonne bands used for classification of aircraft into Aircraft Cost Categories.*

| Aircraft Cost Category | Cost per tonne band € |
|-------------------------------|------------------------------|
| 1 | < € 0.84 |
| 2 | € 0.85 - € 2.11 |
| 3 | € 2.12 - € 3.38 |
| 4 | € 3.39 - € 4.65 |
| 5 | > € 4.66 |

We have now calculated a weighted marginal damage cost per landing per tonne for each of those 5 categories. These were found by dividing the sum of the cost of the landings of all aircraft types within each aircraft cost category $\left[\sum(\text{marginal damage cost per landing} \times \text{number of landings}) \right]$ by the sum of the total MTOW weights of those landings $\left[\sum(\text{MTOW} \times \text{landings}) \right]$. The resulting tariff schedule is as follows (where the marginal cost per tonne per *movement* was found by halving the marginal cost per tonne per *landing*) and the new aircraft classification is set out in Appendix II.

Table 5: Schedule of Charges for Off-peak Aircraft Movements at Dublin Airport.

| Aircraft Cost Category | Weighted Marginal Damage Cost per Landing per Tonne | Weighted Marginal Damage Cost per Movement per Tonne |
|-------------------------------|--|---|
| 1 | € 0.50 (IR£0.39) | € 0.25 (IR£0.19) |
| 2 | € 1.59 (IR£1.25) | € 0.79 (IR£0.62) |
| 3 | € 2.52 (IR£1.98) | € 1.26 (IR£0.99) |
| 4 | € 3.88 (IR£3.05) | € 1.94 (IR£1.52) |
| 5 | €5.38 (IR£4.23) | € 2.69 (IR£2.11) |

Each of the aircraft damage categories (in tables 1, 2 and 3) falls into one of the aircraft cost categories (in tables 4 and 5). These results are shown in table 6.

Table 6: Aircraft Cost Categorisation of the 18 Aircraft Damage Categories with corresponding charge per movement per tonne.

| Aircraft Damage Category | Aircraft Types | Aircraft Cost Category | Charge per Movement per Tonne |
|---------------------------------|---|-------------------------------|--------------------------------------|
| 1 | < 10t or similar | 1 | € 0.25 |
| 2 | 10 - 20t or similar | 1 | € 0.25 |
| 3 | 20 - 30t or similar | 1 | € 0.25 |
| 4 | CRJ; FK70; BAe146; BA11; RJ85; TU134 or similar | 1 | € 0.25 |
| 5 | FK100; RJ100; B717; B737-200, 500 or similar | 1 | € 0.25 |
| 6 | TU154; B757 or similar | 1 | € 0.25 |
| 7 | B737-300, 600; DC9 or similar | 2 | € 0.79 |
| 8 | A319; AN12; B737-400, 700, 800 or similar | 3 | € 1.26 |
| 9 | A320; B727; MD80 or similar | 3 | € 1.26 |
| 10 | A321; MD90 or similar | 4 | € 1.94 |
| 11 | A300; A310 or similar | 2 | € 0.79 |
| 12 | B747-100, -200 or similar | 2 | € 0.79 |
| 13 | B767-200, 300; DC8 or similar | 3 | € 1.26 |
| 14 | B727-200 or similar | 5 | € 2.69 |
| 15 | A330; B777; L1011 or similar | 3 | € 1.26 |
| 16 | A340; DC10 or similar | 3 | € 1.26 |
| 17 | B747-400 or similar | 3 | € 1.26 |
| 18 | MD11 or similar | 4 | € 1.94 |

2.5 ACN-based Charging vs. MTOW-based Charging

Table 7 provides a numerical example analogous to that presented at the end of subsection 2.3.⁷ The B757 is heavier than the B727-256, but induces less damage as represented by its relatively low CAN. Prior to the Original Determination when a weight-based charging regime applied the B757 would have had to pay €278.68 per movement (€2.56 per tonne), nearly eleven times what the damage-based charging regime suggests. The B727-256, although of similar weight, exerts a great deal more damage than the B757, which is, in turn, reflected in the much higher charge per movement. It can be seen that the B727-256 benefited under the old regime and paid less than the B757.

The B747-200 is heavier than the L1011, but exerts the same amount of damage as represented by the common ACN of 66. However, prior to the Original Determination, the carrier would have had to pay almost twice the amount as would have been charged for the L1011. Under this scheme, both aircraft pay approximately the same charge per movement but are charged different per tonne rates in order to compensate for their differing weights.

These are two examples of less damaging aircraft subsidising more damaging ones under a simple weight-based charging structure and thus leading to an inequitable outcome. It is both inefficient and inequitable to charge more for aircraft that cause less damage, even if they are heavier.

Table 7: Comparison of ACN based charging versus MTOW-based charging for a sample of aircraft types.

| Aircraft Type | Charge per Movement per Tonne | MTOW | ACN | Total Charge per Movement | Total Charge - former MTOW Charging |
|----------------------|--------------------------------------|-------------|------------|----------------------------------|--|
| B727-256 | € 2.69 | 95.04 | 63 | € 255.66 | € 243.30 |
| B757 | € 0.25 | 108.86 | 38 | € 27.22 | € 278.68 |
| L1011 | € 1.26 | 211.375 | 66 | € 266.33 | € 541.12 |
| B747-200 | € 0.79 | 377.84 | 66 | € 298.49 | € 967.27 |

⁷ Note that the ACNs in table 6 are the actual values for the aircraft in question. Note also that this table provides amounts in Irish Punts, as this was the prevailing currency when the former weight-based charging structure was in place.

3. Response to Specific Points Raised by Appeal Panel

The aircraft classification set out in the Report (Appendix VIII to the Commission's Original Determination) included a number of computational errors and inaccuracies, the latter arising from the fact there were only 14 aircraft damage categories as opposed to 18 in these revised calculations. The revised calculations and resulting aircraft classification (set out in Appendix II) have removed the anomalies. The following analysis refers to, among others, aircraft that were a particular cause for concern to the Appellants.

Paragraph 8.01(f)(iii) of the Decision of the Panel refers to the Boeing 737-800 and the Airbus 319 and 320 and the inconsistency in the fact that, although these aircraft have similar ACNs, they were placed in different aircraft cost categories. In these revised calculations, the A319 and A320 are classified as category 3 and the B737-800 is classified as category 2. The ACNs of these aircraft are 42, 48 and 46 respectively. As expected, the marginal damage cost per landing of these aircraft should be broadly similar and table 2 confirms this. The A320 is slightly more damaging (with a higher ACN of 48) than the B737-800 and this is reflected in a moderately higher marginal damage cost per landing of €180.09 compared to €144.13. Comparing the A319 and the B737-800, the former is a lighter aircraft at 64 tonnes and, therefore, needs to pay a higher per tonne charge in order to cover the cost of imposing approximately the same amount damage as the heavier B737-800 (at 70.53 tonnes). Although the A320 is a heavier aircraft than both, its marginal damage cost per landing is slightly higher, leading it also to be classified as category 3.

Paragraph 8.01(f)(iii) of the Panel's Decision also refers to the Airbus 321 (category 4 in the original aircraft classification) and the Boeing 727 (category 5 in the original classification) as having a lower or similar ACN to aircraft that were classified as category 2 or 3. In the revised calculations, we have separated the B727 from the B727-200, as they have different ACNs (48 compared to 63). The result has led to a re-classification of the B727 to category 3, as opposed to the B727-200, which remains classified among the most expensive category 5.

Paragraph 8.01(h) of the Panel's Decision states that "the maximum charges for each category relative to each other appear to be out of proportion when compared with the relative ACN values for aircraft in each of the corresponding categories" and subsequently quotes British Midland commentary on the issue. We believe that the revised calculations have removed the anomalies that the Panel and British Midland have referred to, which, as stated before, were due to computational errors and inaccuracies. The following analysis (based on the revised calculations) is in response to the specific concerns of British Midland:

1. The B737-200 and -500 series have MTOWs of 52.39 tonnes, while the B757 series has a MTOW of 108.86. However, their ACN values are 32 and 38 respectively, which define the damage imposed by these aircraft. The marginal damage cost per landing was found to be €33.72 for the B737-200s and -500s and €66.63 for the B757s. The damage imposed by the B757, as well as its weight, is approximately twice that of the B737s. Therefore, the B757 needs only to pay the same per tonne charge as the B737-200s and -500s in order to cover the cost of imposing twice the amount of damage.
2. The MTOW tonnage of the A321 is 83. However, its ACN is considerably higher than that of the B737-200s and -500s at 56. The result is a higher marginal damage cost per landing of €319.70, resulting in classification in a more expensive category of aircraft (category 4).
3. The B747, B747-100 and B747-200 are classified as category 2. The B747 and B747-100 have an ACN of 59 and were found to impose damage of €555.06 per landing. Although this is a greater amount of damage than that imposed by the A321 (€319.71), the weight of the B747 is far greater than that of the A321 at 340.195 tonnes. Therefore, it is clear that the B747 needs to pay less per tonne in order to cover the damage imposed by its landings.

4. The Inclusion of New Aircraft

The list of aircraft in the revised aircraft classification is limited to those aircraft that operated to and from Dublin airport during the calendar year 2000 based upon information submitted to the Commission. In order to avoid aircraft not on this list falling outside this part of the regulatory framework, the Commission must put in place a mechanism for their inclusion. An exhaustive set of restrictions such that all combinations of ACN and MTOW for possible new aircraft would be complicated and difficult to produce. Therefore, the following methodology provides a set of procedures for the purposes of classifying aircraft not currently listed in schedule I of this Determination. These procedures can be applied to classify the Hercules C130 and the A320 with dual-tandem undercarriage, which were both specifically mentioned by the Appellants.

Table 1 above gives the minimum-maximum ranges of the ACN values of aircraft contained within each of the 18 aircraft damage categories. We reproduce those ACN ranges in table 8 with some minor amendments in order to provide a contiguous set. Table 8 also shows the corresponding marginal cost per landing for each of the 18 categories, taken from table 3. The following are the procedures:

1. Classify aircraft into one or more aircraft damage category using table 8 according to the range(s) within which the aircraft's ACN falls;
2. Identify an approximate marginal cost per landing for the new aircraft from table 8. If the aircraft's ACN is such that it falls into more than one of the 18 aircraft damage categories, the approximate marginal cost per landing is found by taking the average of the individual marginal cost per landing of the relevant damage categories;
3. Calculate the new aircraft's per tonne marginal cost per movement by halving the marginal cost per landing and dividing by the MTOW of the new aircraft;
4. Classify the new aircraft into one of the cost per tonne bands in table 4. The cost per tonne band gives the cost category classification of the new

aircraft. The corresponding per tonne charge per movement is found in table 5 for landings and take offs at Dublin airport.

Table 8: Set of contiguous ACN ranges for the purposes of the classification of new aircraft and corresponding marginal cost per landing.

| Aircraft Damage Category | ACN Range | | Marginal Cost per Landing |
|--------------------------------|-----------|---------|---------------------------------|
| | Minimum | Maximum | |
| | 1 | 2 | |
| 2 | 7 | 12 | € 0.34 |
| 3 | 12 | 15 | € 0.67 |
| 4 | 16 | 30 | € 11.94 |
| 5 | 31 | 35 | € 33.72 |
| 6 | 32 | 38 | € 66.63 |
| 7 | 36 | 40 | € 61.47 |
| 8 | 41 | 47 | € 144.13 |
| 9 | 48 | 51 | € 180.09 |
| 10 | 52 | 58 | € 319.70 |
| 11 | 52 | 58 | € 256.88 |
| 12 | 59 | 66 | € 555.06 |
| 13 | 61 | 63 | € 450.30 |
| 14 | 63 | 63 | € 512.23 |
| 15 | 63 | 66 | € 580.90 |
| 16 | 67 | 70 | € 685.84 |
| 17 | 71 | 75 | € 1,028.85 |
| 18 | 76 | >76 | € 1,266.53 |

The following are two examples of how these procedures for the classification of new aircraft would operate in practice.

4.1 Example 1

An airport user wishes to operate an aircraft with an ACN of 49 and a MTOW of 70 tonnes. We follow the procedures to classify this aircraft into a cost category:

1. This aircraft, with ACN of 49 can be classified as aircraft damage category 9;
2. The corresponding marginal cost per landing is €180.09;

3. Halving this amount and dividing by the aircraft's MTOW of 70 tonnes gives the aircraft's approximate per tonne marginal cost per movement of €1.80;
4. This lies within the second cost per tonne band €0.85 – €2.11. Therefore, the aircraft is classified as a cost category 2 aircraft, with a per tonne per movement charge of €0.79 for landings and take offs at Dublin airport.

4.2 Example 2

An operator wishes to operate an aircraft with ACN of 54 and a MTOW of 100 tonnes. Again, we follow the procedures:

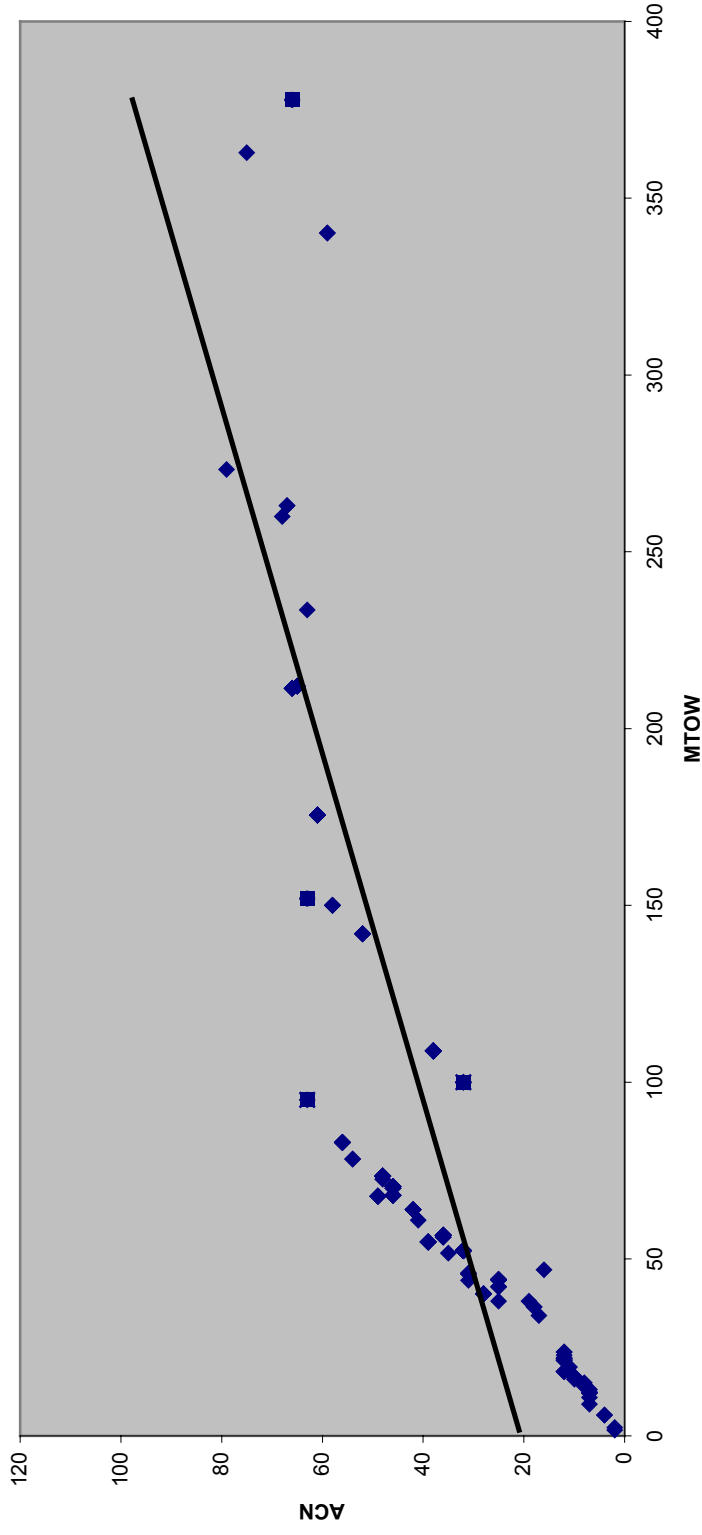
1. This aircraft, with ACN of 54 can be classified as aircraft damage category 10 or 11;
2. The corresponding marginal cost per landing is €319.70 and €256.88 respectively. The average of the two is €288.29;
3. Halving this amount and dividing by the aircraft's MTOW of 100 tonnes gives the aircraft's approximate per tonne marginal cost per movement of €1.44;
4. This also lies within the second cost per tonne band €0.85 – €2.11. Therefore, the new aircraft is classified as cost category 2.

5. Conclusion

In conclusion, we are satisfied that the revised calculations resolve the anomalies identified by the Panel. We are also satisfied that the approach adopted provides an efficient and equitable system of charging for off-peak landings and take offs at Dublin airport than the more simple weight-based structure advocated by the appellants. Finally, the inclusion of a methodology for the classification of aircraft types using Dublin airport for the first time ensures that no aircraft operating out of the airport at off-peak times will fall outside this part of the regulatory framework.

Annex I – Figure 1

Plot of Relationship between Damage (ACN) and MTOW



Annex II – Revised Aircraft Classification

| | | Aircraft Cost Category 1 (ACC, i=1) | | | | | | Aircraft Cost Category 2 (ACC, i=2) | |
|--------------------------|---------|---|----------|----------|----------|---------|---------|---|--|
| | | Starting Charge per Movement per Tonne = €0.25 | | | | | | Starting Charge per Movement per Tonne = €0.79 | |
| All aircraft < 30 tonnes | B737529 | B7572Q8 | BAE146RJ | E110 | SB20 | A300 | B7373YO | B747200 | |
| AN24 | B737530 | B7572T7 | BAEATP | EMB110 | SD360 | A300203 | B737600 | DC9 | |
| ARJ | B737548 | BA11 | BAE141 | EMB145 | SF34 | A300600 | B737683 | DC941 | |
| ATP | B73755S | BA11501 | BAERJ85 | F100 | SH36 | A300B4 | B737700 | DC951 | |
| ATR42 | B7375K5 | BA11510 | CL60 | F50 | SH360 | A310 | B7377AK | DC980 | |
| ATR42300 | B7375L9 | BA11523 | CL600 | F70 | SH360100 | A310300 | B7377L9 | DC982 | |
| ATR72 | B757 | BA11530 | CL6002B | FK100 | TU134 | A310304 | B737800 | DC983 | |
| B717 | B757200 | BA146300 | CL65 | FK50 | TU154 | B737300 | B73785H | DC987 | |
| B737 | B757217 | BA41 | CRJ | FK70 | TU154B | B737329 | B73785P | | |
| B737200 | B757224 | BA46200 | D328 | L610 | TU154M | B737330 | B73786N | | |
| B737222 | B757236 | BA46300 | D328110 | PA23 | | B73733A | B737883 | | |
| B737229 | B75723A | BAE146 | DH8 | PA31 | | B73736 | B7378K2 | | |
| B7372YF | B75723N | BAE14610 | DHC7 | RJ100 | | B737382 | B7378Q8 | | |
| B737500 | B75727B | BAE14620 | DHC8 | RJ85 | | B7373S3 | B747 | | |
| B737505 | B75728A | BAE14630 | DO82 | SAAB2000 | | B7373Y5 | B747128 | | |

| Aircraft Cost Category 3 (ACC, i=3) Starting Charge per Movement per Tonne = €1.26 | Aircraft Cost Category 4 (ACC, i=4) Starting Charge per Movement per Tonne = €1.94 | Aircraft Cost Category 5 (ACC, i=5) Starting Charge per Movement per Tonne = €2.69 |
|---|---|---|
| A319 A330301 B767332 | A321 | B727256 |
| A319100 A340312 B7673Q8 | A321131 | B727276 |
| A319111 AN12 B777 | A321132 | |
| A319112 B727 DC10 | A321200 | |
| A319114 B737400 DC1030 | A321211 | |
| A320 B737429 DC862F | A321231 | |
| A320200 B737448 L1011 | MD11 | |
| A320211 B73746B L10111 | MD90 | |
| A320212 B7374Q8 L101114 | MD9030 | |
| A320214 B7374Y0 L1011385 | | |
| A320231 B747400 MD80 | | |
| A320232 B767 MD81 | | |
| A330 B767200 MD82 | | |
| A330200 B767204 MD83 | | |
| A330243 B767300 MD87 | | |
| B767304E MD87H | | |

Appendix II – Tables

| | |
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TABLE 1A : Calculation of the RAB @ 23 September 2001 for Aer Rianta

| EURO Figures | | € | € |
|---|------------------|------------------|--------------------|
| Per Aer Rianta Submission 26 July 2001 | | | Indexed |
| Gross Airport Indexed Assets @ 31/12/00 | | | 1,307,830,221 |
| Head Office Assets @ 31/12/00 | | | 16,506,595 |
| Indexed Cumulative Depreciation | | | (676,770,396) |
| Indexed Net Book Value @ 31/12/00 | | | 647,566,420 |
| Deduct Indexed Write Down of Assets | | Unindexed | |
| | Dublin Pier C | (13,516,362) | (13,921,853) |
| | Dublin Stands | (6,475,664) | (6,669,934) |
| | Shannon Terminal | (7,424,159) | (7,646,883) |
| RAB @ 31 December 2000 | | | 619,327,750 |
| Index 31/12/00 - 23/9/01 @ | | | 1.045 |
| Gross Indexed Assets @ 23/09/01 | | | 1,383,931,973 |
| Deduct Indexed Write Down of Assets | | | |
| | Dublin Pier C | | (14,548,336) |
| | Dublin Stands | | (6,970,081) |
| | Shannon Terminal | | (7,990,993) |
| CAPEX from 31/12/00 to 23/09/01 | | | 43,359,989 |
| Cumulative Indexed Depreciation on all assets | | | (772,429,499) |
| RAB @ 23 September 2001 | | | 625,353,052 |

| IRISH POUND EQUIVALENT | | IR£ | IR£ |
|---|------------------|------------------|--------------------|
| Per Aer Rianta Submission 26 July 2001 | | | Indexed |
| Gross Airport Indexed Assets @ 31/12/00 | | | 1,030,000,000 |
| Head Office Assets @ 31/12/00 | | | 13,000,000 |
| Indexed Cumulative Depreciation | | | (533,000,000) |
| Indexed Net Book Value @ 31/12/00 | | | 510,000,000 |
| Deduct Indexed Write Down of Assets | | Unindexed | |
| | Dublin Pier C | (10,645,000) | (10,964,350) |
| | Dublin Stands | (5,100,000) | (5,253,000) |
| | Shannon Terminal | (5,847,000) | (6,022,410) |
| RAB @ 31 December 2000 | | | 487,760,240 |
| Index 31/12/00 - 23/9/01 @ | | | 1.045 |
| Gross Indexed Assets @ 23/09/01 | | | 1,089,935,000 |
| Deduct Indexed Write Down of Assets | | | |
| | Dublin Pier C | | (11,457,746) |
| | Dublin Stands | | (5,489,385) |
| | Shannon Terminal | | (6,293,418) |
| CAPEX from 31/12/00 to 23/09/01 | | | 34,148,766 |
| Cumulative Indexed Depreciation on all assets | | | (608,337,666) |
| RAB @ 23 September 2001 | | | 492,505,551 |

TABLE 1B : Calculation of the RAB @ 23 September 2001 for Dublin Airport

| EURO Figures | | € | € |
|---|--|------------------|--------------------|
| Per Aer Rianta Submission 26 July 2001 | | | Indexed |
| Gross Dublin Indexed Assets @ 31/12/00 | | | 843,106,084 |
| Dublin share of Head Office Assets @ 31/12/00 | | | 12,743,156 |
| Indexed Cumulative Depreciation | | | (375,664,732) |
| Indexed Net Book Value @ 31/12/00 | | | 480,184,508 |
| Deduct Indexed Write Down of Assets | | Unindexed | |
| Dublin Pier C | | (13,516,362) | (13,921,853) |
| Dublin Stands | | (6,475,664) | (6,669,934) |
| RAB @ 31 December 2000 | | | 459,592,721 |
| Index 31/12/00 - 23/9/01 @ | | | 1.045 |
| Gross Indexed Assets @ 23/09/01 | | | 894,362,456 |
| Deduct Indexed Write Down of Assets | | | |
| Dublin Pier C | | | (14,548,336) |
| Dublin Stands | | | (6,970,081) |
| CAPEX from 31/12/00 to 23/09/01 | | | 32,531,957 |
| Cumulative Indexed Depreciation on all assets | | | (433,855,595) |
| RAB @ 23 September 2001 | | | 471,520,400 |

| IRISH POUND EQUIVALENT | | IR£ | IR£ |
|---|--|------------------|--------------------|
| Per Aer Rianta Submission 26 July 2001 | | | Indexed |
| Gross Dublin Indexed Assets @ 31/12/00 | | | 664,000,000 |
| Dublin share of Head Office Assets @ 31/12/00 | | | 10,036,051 |
| Indexed Cumulative Depreciation | | | (295,860,019) |
| Indexed Net Book Value @ 31/12/00 | | | 378,176,032 |
| Deduct Indexed Write Down of Assets | | Unindexed | |
| Dublin Pier C | | (10,645,000) | (10,964,350) |
| Dublin Stands | | (5,100,000) | (5,253,000) |
| RAB @ 31 December 2000 | | | 361,958,682 |
| Index 31/12/00 - 23/9/01 @ | | | 1.045 |
| Gross Indexed Assets @ 23/09/01 | | | 704,367,673 |
| Deduct Indexed Write Down of Assets | | | |
| Dublin Pier C | | | (11,457,746) |
| Dublin Stands | | | (5,489,385) |
| CAPEX from 31/12/00 to 23/09/01 | | | 25,620,998 |
| Cumulative Indexed Depreciation on all assets | | | (341,689,048) |
| RAB @ 23 September 2001 | | | 371,352,493 |

TABLE 2A : Calculation of the 2001/02 Yield for Aer Rianta

| EURO Figures | € |
|--|---------------|
| RAB @ 23 September 2001 | 625,353,052 |
| Multiplied by WACC | 6% |
| = Return on Capital | 37,521,183 |
| Plus : Depreciation | 47,043,859 |
| OPEX | 282,071,424 |
| Regulatory Fees Feb 01/Sept 02 | 3,853,415 |
| = Sub-total | 370,489,882 |
| Plus : Taxation | 10,692,833 |
| Minus : Gross Commercial Revenue | (252,546,401) |
| = Maximum Allowable Revenue | 128,636,313 |
| Divide by No of Passengers | 20,267,000 |
| = Maximum Average Revenue per Passenger | € 6.34 |

| IRISH POUND EQUIVALENT | IR£ |
|--|---------------|
| RAB @ 23 September 2001 | 492,505,551 |
| Multiplied by WACC | 6% |
| = Return on Capital | 29,550,333 |
| Plus : Depreciation | 37,050,050 |
| OPEX | 222,149,299 |
| Regulatory Fees Feb 01/Sept 02 | 3,034,811 |
| = Sub-total | 291,784,493 |
| Plus : Taxation | 8,421,290 |
| Minus : Gross Commercial Revenue | (198,896,454) |
| = Maximum Allowable Revenue | 101,309,329 |
| Divide by No of Passengers | 20,267,000 |
| = Maximum Average Revenue per Passenger | 5.00 |

TABLE 2B : Calculation of the 2001/02 Yield for Dublin Airport

| EURO Figures | € |
|--|---------------|
| RAB @ 23 September 2001 | 471,520,400 |
| Multiplied by WACC | 6% |
| = Return on Capital | 28,291,224 |
| Plus : Depreciation | 34,483,741 |
| OPEX | 182,106,970 |
| Regulatory Fees Feb 01/Sept 02 | 2,964,136 |
| = Sub-total | 247,846,072 |
| Plus : Taxation | 8,213,722 |
| Minus : Gross Commercial Revenue | (170,696,473) |
| = Maximum Allowable Revenue | 85,363,321 |
| Divide by No of Passengers | 15,850,500 |
| = Maximum Average Revenue per Passenger | € 5.38 |

| IRISH POUND EQUIVALENT | IR£ |
|--|---------------|
| RAB @ 23 September 2001 | 371,352,493 |
| Multiplied by WACC | 6% |
| = Return on Capital | 22,281,150 |
| Plus : Depreciation | 27,158,153 |
| OPEX | 143,420,894 |
| Regulatory Fees Feb 01/Sept 02 | 2,334,447 |
| = Sub-total | 195,194,644 |
| Plus : Taxation | 6,468,832 |
| Minus : Gross Commercial Revenue | (134,434,397) |
| = Maximum Allowable Revenue | 67,229,079 |
| Divide by No of Passengers | 15,850,500 |
| = Maximum Average Revenue per Passenger | 4.24 |

**TABLE 3A : Reconciliation of OPEX to Aer Rianta General Ledger
 Figures to be published subject to the legal constraints in 3 (c)
 IRISH Pound**

| Aer Rianta General Ledger 1 Jan - 30 June 01 | IR£ Net Profit |
|---|---------------------------|
| Dublin Airport | |
| Corporate | |
| Shannon Airport | |
| Cork Airport | |
| Net Profit @ 30 June 2001 per ART GL | |

| Corporate was re-allocated across the Airports by PAX | IR£ Net Profit |
|--|---------------------------|
| | PASSENGERS |
| Dublin Airport | |
| Shannon Airport | |
| Cork Airport | |
| Net Profit @ 30 June 2001 per ART GL | |

| Net Profit was split into Income & Expenditure | IR£ Income | IR£ Expenditure |
|---|-----------------------|----------------------------|
| Dublin Airport | | |
| Shannon Airport | | |
| Cork Airport | | |
| Total Income & Expenditure | | |
| Net Profit @ 30 June 2001 per ART GL | | |

| Expenditure categories | Dublin IR£ | Shannon IR£ | Cork IR£ |
|--|-----------------------|------------------------|---------------------|
| Personnel | | | |
| Professional & External suppliers | | | |
| Energy | | | |
| Maintenance & Supplies | | | |
| Insurance | | | |
| Other Expenses | | | |
| Airport Retail Expenses | | | |
| Business Rates & Bank Charges | | | |
| OPEX for the Financial Model | | | |
| Exclude Interest on borrowings + Depreciation + other finance items | | | |
| Reconciliation to Expenditure | | | |

EURO EQUIVALENT

| Expenditure was further split into the following categories | Dublin € | Shannon € | Cork € |
|--|---------------------|----------------------|-------------------|
| Personnel | | | |
| Professional & External suppliers | | | |
| Energy | | | |
| Maintenance & Supplies | | | |
| Insurance | | | |
| Other Expenses | | | |
| Airport Retail Expenses | | | |
| Business Rates & Bank Charges | | | |
| OPEX for the Financial Model | | | |
| Exclude Interest on borrowings + Depreciation + other finance items | | | |
| Reconciliation to Expenditure | | | |

TABLE 3B : EURO Calculation of OPEX for Dublin, Cork & Shannon
Figures to be published subject to the legal constraints in 3 (c)
EURO

| Expenditure categories | Dublin € | Shannon € | Cork € |
|------------------------------------|---------------------|----------------------|-------------------|
| Personnel | | | |
| Professional & External suppliers | | | |
| Energy | | | |
| Maintenance & Supplies | | | |
| Insurance | | | |
| Other Expenses | | | |
| Airport Retail Expenses | | | |
| Business Rates & Bank Charges | | | |
| Sub total | | | |
| Regulatory fees Feb 01 to Sept 02 | 2,964,136 | 583,980 | 305,298 |
| | | | |
| | PAX | PAX | PAX |
| Passengers Jan to June 2001 | | | |

| On a per Passenger basis & inflated @ 4.5% | Dublin € Per PAX | Shannon € Per PAX | Cork € Per PAX |
|---|-----------------------------|------------------------------|---------------------------|
| Personnel | | | |
| Professional & External suppliers | | | |
| Energy | | | |
| Maintenance & Supplies | | | |
| Insurance | | | |
| Other Expenses | | | |
| Airport Retail Expenses | | | |
| Business Rates & Bank Charges | | | |

| | Dublin | Shannon | Cork | TOTAL |
|------------------------------------|--------------------|-------------------|-------------------|--------------------|
| Apply to PAX Forecast 01/02 | 15,850,500 | 2,634,000 | 1,782,500 | 20,267,000 |
| | € | € | € | € |
| Personnel | | | | |
| Less : efficiency | | | | |
| Professional & External suppliers | | | | |
| Energy | | | | |
| Maintenance & Supplies | | | | |
| Insurance | | | | |
| Other Expenses | | | | |
| Airport Retail Expenses | | | | |
| Business Rates & Bank Charges | | | | |
| Sub Total OPEX | 182,106,971 | 78,836,918 | 21,127,536 | 282,071,425 |
| Regulatory Fees (per before) | 2,964,136 | 583,980 | 305,298 | 3,853,415 |
| TOTAL OPEX | 185,071,107 | 79,420,898 | 21,432,834 | 285,924,840 |

**TABLE 3C : IR£ Calculation of OPEX for Dublin, Cork & Shannon
 Figures to be published subject to the legal constraints in 3 (c)
 IRISH POUNDS**

| Expenditure categories | Dublin IR£ | Shannon IR£ | Cork IR£ |
|------------------------------------|-----------------------|------------------------|---------------------|
| Personnel | | | |
| Professional & External suppliers | | | |
| Energy | | | |
| Maintenance & Supplies | | | |
| Insurance | | | |
| Other Expenses | | | |
| Airport Retail Expenses | | | |
| Business Rates & Bank Charges | | | |
| Sub total | | | |
| Regulatory fees Feb 01 to Sept 02 | 2,334,447 | 459,922 | 240,442 |
| | | | |
| | PAX | PAX | PAX |
| Passengers Jan to June 2001 | | | |

| On a per Passenger basis & inflated @ 4.5% | Dublin IR£ Per PAX | Shannon IR£ Per PAX | Cork IR£ Per PAX |
|---|-------------------------------|--------------------------------|-----------------------------|
| Personnel | | | |
| Professional & External suppliers | | | |
| Energy | | | |
| Maintenance & Supplies | | | |
| Insurance | | | |
| Other Expenses | | | |
| Airport Retail Expenses | | | |
| Business Rates & Bank Charges | | | |

| | Dublin | Shannon | Cork | TOTAL |
|------------------------------------|--------------------|-------------------|-------------------|--------------------|
| Apply to PAX Forecast 01/02 | 15,850,500 | 2,634,000 | 1,782,500 | 20,267,000 |
| | IR£ | IR£ | IR£ | IR£ |
| Personnel | | | | |
| Less : efficiency | | | | |
| Professional & External suppliers | | | | |
| Energy | | | | |
| Maintenance & Supplies | | | | |
| Insurance | | | | |
| Other Expenses | | | | |
| Airport Retail Expenses | | | | |
| Business Rates & Bank Charges | | | | |
| Sub Total OPEX | 143,420,894 | 62,089,118 | 16,639,287 | 222,149,299 |
| Regulatory Fees (per before) | 2,334,447 | 459,922 | 240,442 | 3,034,811 |
| TOTAL OPEX | 145,755,341 | 62,549,040 | 16,879,729 | 225,184,110 |