

**Accession to the Cape Town Convention by the UK:  
An Economic Impact Assessment Study<sup>1</sup>**

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<sup>1</sup> The views expressed herein are those of the author and do not reflect the views of Northwestern University. Moreover, the views of the author are based on research and analysis performed to date, and are subject to change based on additional data, evidence, research, and analysis. While a number of leading institutions in the air transport industry provided information and views which were taken into account in the preparation of this study, the responsibility for the study remains with the author.

## Executive Summary

The discretion of the insolvency administrator in the event of an airline insolvency and reorganization creates uncertainty in the timing of aircraft repossession and, thus, poses a financial risk for lenders and investors. The accession to and effective implementation of the Cape Town Convention and its Aircraft Protocol (CTC) with the OECD qualifying declarations (defined below) permitting prompt enforcement, in particular with the Protocol Article XI, Alternative A (rights on insolvency) with a maximum period of sixty (60) calendar days incorporated into national law by the UK, will remove this risk and result in the following benefits to the UK economy.

1) ***UK based airlines are expected to save between 538 million pounds and 2.705 billion pounds (best estimate 1.200 billion pounds) in funding costs on the estimated 98 billion pounds of financing relating to aircraft deliveries over the next 20 years.*** These figures only include direct estimates of funding cost savings on export credit, capital market (EETC), and commercial market (bank loans and leases) financing due to reduced risk (reduced loss given default (LGD)) of financing transactions, and do not quantify the overall increase in the availability of funds to UK airlines. In this respect we note the critical gateway role of the CTC in opening up UK airlines' access to capital markets, similar to the pivotal role of Section 1110 in opening up the US EETC market.

2) ***UK lenders and lessors will benefit from decreased risk for the financing of UK registered aircraft.*** The CTC introduces legal predictability by limiting the repossession delay to sixty days in the event of insolvency, thus reducing LGD of financing transactions and correspondingly reducing regulatory capital reserve requirements under Basel II and III. ***UK lenders financing aircraft registered in other jurisdictions will also benefit*** since the UK accession to the CTC is expected to facilitate ratification / accession by other jurisdictions around the world, including other EU members.

3) UK ratification of the CTC will result in lower funding costs for UK airlines, resulting in increased investment in aircraft and engines, in particular, accelerating fleet replacement cycles. This will be magnified to the extent UK accession encourages ratification / accession by others. This will result in ***benefits to UK based aircraft and engine manufacturers through increases in aircraft and engine sales, as well as possible upgrades in manufacturers' support services.***

4) UK ratification of the CTC will result in lower funding costs for UK airlines, resulting in faster fleet replacement cycles. ***UK flying public will benefit by enjoying newer, safer, more comfortable, and more environmentally friendly aircraft.***

***There are no material costs to the UK economy resulting from the CTC ratification other than minimal legal fees (estimated at no more than £5k per transaction for no more than the first year following accession). The CTC removes market inefficiencies, thus resulting in net economic benefits without any material costs.***

**Qualification** To produce maximum benefits, the CTC must be effectively implemented, including all actions necessary to ensure that their provisions will be strictly and reliably enforced by national authorities. The study results are predicated on full implementation and compliance.

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## 1. The Cape Town Convention: a Major Risk Mitigant in the Global Aircraft Financing Market

The discretion of the insolvency administrator in the event of an airline insolvency and reorganization creates uncertainty in the timing of aircraft repossession and, thus, poses a financial risk for lenders and investors. The accession to and effective implementation of the Cape Town Convention and its Aircraft Protocol (CTC) with the OECD qualifying declarations<sup>2</sup> permitting prompt enforcement, in particular with the Protocol Article XI, Alternative A (rights on insolvency) with a maximum period of sixty (60) calendar days incorporated into national law by the UK, will remove this risk. This document analyzes the economic benefits to the UK economy resulting from removing this risk.

*Predictably limiting the aircraft repossession delay (RD) in the event of insolvency to the maximum of sixty days reduces the risk and uncertainty to aircraft lenders (in particular, reduces the loss given default (LGD)), makes the global market for aircraft more efficient, attracts capital to the air transport industry, and leads to greater volume and lower costs of funding for airlines<sup>3</sup>.*

There are three main reasons the CTC reduces the LGD from a risk perspective.

- First, the CTC is a significant risk mitigant on narrow grounds of risk reduction via timing of repayment and the cost of delay.
- Secondly, the risk of collateral value depreciation is material in connection with insolvency delays and resulting non-compliance with contractual terms relating to aircraft maintenance, service, and record keeping, in addition to regular economic depreciation and exposure to aircraft market volatility during the repossession delay period.
- Thirdly, the longer the delay, the greater the risk that super-priority liens may arise, which may prevail over a creditor's security interest.

*The foregoing risks combined have a significant detrimental impact on the LGD. The CTC expressly addresses all of these risks.*

Prof. Linetsky has developed a mathematical model for risk assessment and risk-based pricing of secured asset financing transactions, the *Dynamic Asset Financing Model*

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<sup>2</sup> By 'qualifying declarations', we mean those so defined in OECD Aircraft Sector Understanding (ASU), which crucially include, but are not limited, to Article XI of the Aircraft Protocol, Alternative A (insolvency), with a 60 day waiting period. The ASU recognizes that EU member states would need to effect the foregoing article through national law rather a (directly applicable) declaration, given EU competence issues. In any event, we understand that in the UK treaties are implemented through legislation.

<sup>3</sup> We understand that while UK insolvency law generally favors the prompt return of assets to secured creditors, considerable discretion resides with the insolvency administrator. Financiers, markets, and risk assessors impose an uncertainty premium (in one form or other) where such type of discretion exists.

(DAFIM). The model is generally applicable to a range of collateral assets, including aircraft. DAFIM has recently been applied to the analysis of export credit financing in the context of the ASU and to the analysis of global economic benefits of the CTC.<sup>4</sup> DAFIM is capable of directly quantifying the LGD reduction in financing transactions and the commensurate reduction in financing costs resulting from shortening repossession delays. A brief description of DAFIM is provided in Annex 1. The present document applies DAFIM to assess economic benefits of acceding to the CTC with the qualifying declarations in the UK context.

## 2. Quantitative Analysis of Economic Benefits to the UK Airlines

### 2.1. General Assumptions

**Assumptions about UK aircraft deliveries.** According to forecasts by Airbus and Boeing, the value of aircraft deliveries to UK airlines is projected to reach **USD 154.5 billion in the next twenty years.**<sup>5</sup> We assume that the airlines will finance 20% of their deliveries via export credit, 20% via capital markets (EETC issuance)<sup>6</sup>, 40% via other commercial financing sources (bank loans, leases), and 20% equity.

**Assumptions about UK airline credit ratings.** We use British Airways (BA) as the proxy. The current (2010) BA rating is BB-. We have examined Moody's KMV history of one-year expected default frequencies (EDF) for BA from November 1998 to September 2010. The *average* EDF over this period was consistent with the current BA rating of BB-. During this period BA's EDFs have fluctuated from the range corresponding to investment grade ratings to the range corresponding to B to B- ratings. In the foregoing analysis we assume the following range for average UK airline ratings over the next twenty years: best estimate BB-, low estimate B, high estimate BB+.<sup>7</sup>

**Currency assumption.** US dollar is the base currency of aviation finance. All figures in this study are expressed in US dollars. The final economic impact figures are converted to pounds at the current exchange rate of 1.577 USD per GBP as of 25 November 2010.

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<sup>4</sup> V. Linetsky, 2009, "Economic Benefits of the Cape Town Treaty." Available on the AWG web site <http://www.awg.aero>.

<sup>5</sup> This figure represents the *average* of Airbus and Boeing UK aircraft deliveries forecasts and includes all types of civil aircraft (single aisle, twin aisle, regional, and freighter).

<sup>6</sup> We note that capital markets financing is becoming increasingly important in the aftermath of the global financial crisis that has reduced overall banks' lending capacity, as well as resulted in some banks historically active in this space to exit this market entirely. Furthermore, more stringent capital requirements for banks under BIS III may lead to higher cost of capital in the bank market. In contrast, capital markets have the potential to provide the deepest source of financing to the air transport industry. Our estimate of 20% capital markets financing may prove conservative over the next twenty years, as the CTC may open access to capital markets for non-US airlines similar to the effect Section 1110 has had on the opening of the US EETC market.

<sup>7</sup> According to Standard and Poor's historical data on default frequencies, a corporation rated BB- has had a 27% historical probability of default within the subsequent 15 year period.

## 2.2. Analysis of Export Credit Financing

The 2007 Sector Understanding on Export Credits for Civil Aircraft (ASU) provides discounts on minimum premium rates for jurisdictions that have properly ratified the CTC (CTC Discount). For Category 1 aircraft (large aircraft), the level of discount varies according to the credit standing (as classified by the OECD) of an airline. Under the current ASU, the UK, together with France, Germany, Spain and the US, adhere to so-called home market restrictions, which prohibit export credit into these countries.

The ASU is currently under review, and a revised agreement is expected to enter into force in the near term. The position of the above-mentioned countries on the home market restriction is the subject of attention in connection with that process. Without expressing a view, we note the CT-related benefits to UK airlines should the home market restriction not be followed by these countries. In the *Ad Referendum* Final Text<sup>8</sup> (dated 20 December 2010) the proposed level of the CTC discount is 10% for all borrowers (all ratings) in jurisdictions that have properly ratified the CTC and have been placed on the “Cape Town List”. Assuming non-applicability of the home market restriction, ***the ratification of the CTC by the UK would make UK airlines eligible for the CTC Discount.*** This provides an immediate and easily quantifiable benefit to the UK economy. Table 1 calculates the value of this benefit based on assumptions in Section 2.1. For each of the three airline credit ratings (B, BB-, BB+), the column “MPR with CTC (upfront)” gives the ASU Minimum Premium Rates expressed as percentage of the export credit support (according to *Ad referendum* Final Text), “MPR with CTC (upfront)” gives the MPR with the CTC Discount of 10%, “CTC Discount USD millions” gives the value of the CTC discount in millions of USD, assuming USD 30.9 billion in export credit financing for UK airlines (20% EC share of the USD 154.5 billion in UK aircraft deliveries). ***The estimated range of economic benefits is from \$323.5 million to \$413.1 million (\$340.8 million best estimate).***

Airline Credit Rating	MPR (upfront)	MPR with CTC (upfront)	CTC Discount USD millions
BB+	10.47%	9.42%	323.5
BB-	11.03%	9.93%	340.8
B	13.37%	12.03%	413.1

**Table 1.** The estimated value of the CTC Discount to UK airlines.

***In the event that the home market restriction continues to be followed, the other CT-related benefits set out in the study would apply to the other forms of financings (which would cover the 20% assumed herein for export credit). Thus, and taking into account the benefit ranges set out in this study, the application or not of the home market restriction, over time, does not materially affect the basic benefit range set out herein. See Annex 2 for details.***

<sup>8</sup> Subject to agreement by the governments by 20 January 2011.

### ***2.3. Analysis of Commercial Market Financing***

In this Section we quantify how predictably limiting the repossession delay in the event of insolvency to the maximum of sixty days reduces the risk of aircraft financing via reducing LGD, and, as a result, leads to greater volume and lower costs of funding for airlines.

#### ***Capital Markets Evidence***

Section 1110 of the U.S. bankruptcy code paved the way for the development of the EETC market in the U.S. by providing legal *predictability* to investors by limiting the repossession delay to sixty days.<sup>9</sup> Since 1996, the EETC market has become the first choice for U.S. airlines to finance their fleets. ***Since 1996, U.S. airlines have raised nearly USD 56.4 billion via 119 EETC issues covering 1899 aircraft. The most recent EETC issues by Continental Airlines and Delta Airlines in November 2010 have been heavily oversubscribed and set records by pricing at below 5% yields.***

***In stark contrast to U.S. airlines, European airlines have had virtually no access to capital markets, despite significantly higher corporate credit ratings.*** European airlines have raised only \$2 billion via 4 issues to date (vs. over \$56 billion via over 119 issues for U.S. airlines): Air France in 2003 and Iberia in 1999, 2000, and 2004. Moreover, investors required ***significantly longer liquidity facilities: 36 months for Air France and 36 to 42 months for Iberia vs. the standard 18 month liquidity facility in U.S. EETC issues.***<sup>10</sup>

Despite higher credit ratings, UK airlines have *never* issued EETCs. According to a EETC underwriting expert from a major investment bank, British Airways would likely have to secure a ***24 month liquidity facility vs. 18 months for U.S. airlines*** and would have likely ***priced at higher yields than the recent Continental and Delta EETC issues in the U.S., despite the fact that the corporate rating of BA is BB- vs. B ratings for Continental and Delta.***

***We argue that accession to the CTC by the UK will pave the way for UK airlines to access global capital markets at significantly lower costs.***

Shortening liquidity facility from 24 to 18 months will result in two immediate economic benefits:

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<sup>9</sup> We note that credit rating agencies require an independent legal opinion on the applicability of the Section 1110 to the EETC issue that is included in the Prospectus. Standard and Poor's states that US financings are likely to benefit from a one- to two-notch credit rating enhancement by virtue of the protection afforded to creditors under Section 1110 (Standard and Poor's, 1999, "Structured Finance: Aircraft Securitization Criteria").

<sup>10</sup> It has been noted by industry observers that substantially higher costs of Air France and Iberia EETC issues relative to US airlines' EETC issues, despite their generally higher credit ratings, have discouraged further EETC issuance by European airlines. The clear reason for higher costs is the lack of the analog of the Section 1110 protection. The ratification of the CTC will remedy this.

1) Reduction by 25% in the direct cost of the liquidity facility (LF) charged by LF providers. In U.S. EETC issues LF providers have charged around 1% to 1.25% upfront and 1% to 1.25% per annum ongoing for the committed LF amount. For U.S. EETC issues the committed amount (Com. Amt.) is 3 semiannual interest payments at the coupon rate. Table 2 estimates LF cost savings from shortening the facility from 4 semiannual coupon payments (24 months) pre-CTC to 3 semiannual coupon payments (18 months) post-CTC accession for three coupon assumptions. Present values (PV) of LFs are computed based on 3.5% per annum discount rate. Based on our assumption of 20% capital market (EETC) financing, the total EETC issuance is estimated at USD 30.9 billion over the next twenty years. This forms the basis for our calculation of LF costs and savings to UK airlines. In Table 2 we consider a coupon range from 5.5% to 7.5% for UK airlines' hypothetical EETC issues over the next twenty years (the actual coupon will depend on both the level of interest rates and the credit of the airline).

EETC coupon assumption	18 mo. LF Com. Amt. USD billions	24 mo. LF Com. Amt. USD billions	LF Rate Upfront + Per annum	18 mo. LF PV of Cost USD millions	24 mo. LF PV of Cost USD millions	PV of Cost Savings USD millions	PV of Cost Savings GBP millions
5.5%	2.549	3.399	1.000%	239.1	318.8	79.7	45.0
6.5%	3.013	4.017	1.125%	317.9	423.9	106.0	59.9
7.5%	3.476	4.635	1.250%	407.6	543.5	135.9	76.8

**Table 2. EETC Liquidity facility cost analysis.**

2) Reduction in the claim of the liquidity facility providers on the recovery to EETC investors in the event of default (LF claim is senior to the A tranche). The effect of this is reflected in the LGD and risk spread calculations below.

We also note the following additional benefits of the CTC in regard to opening up the access to capital markets for UK airlines.

- 1) A number of Section 1110 US EETC transactions have been collateralized with vintage aircraft with ages in the five to ten year range. For vintage aircraft that have shorter remaining useful economic life, the ability of swift repossession is critical. Accession to the CTC may allow UK airlines to refinance their fleets via capital markets issuance similar to the successful re-financings by US airlines. In this document we have only quantified direct economic benefits for financing of new deliveries. Refinancing of existing fleets will likely increase our figures further.
- 2) Section 1110 US EETC issues have generally had longer maturities than those available in the bank loan market. Fifteen year EETC maturities have been standard (with some substantially longer), in contrast to standard bank loan maturities of ten to twelve years pre-crisis and as short as five to seven years post-crisis.



**Probable Worst Case Repossession Delays in the Event of Insolvency and Reorganization of a major UK Airline**

In order to apply DAFIM to quantify the economic impact of reducing repossession delays in the event of insolvency on the risk and pricing of aircraft financing, we need to make assumptions about *aircraft repossession delays in the event of insolvency and reorganization of a major airline*.<sup>11</sup> These delays can then be input into DAFIM to evaluate the risk and pricing of aircraft financing in jurisdictions that have not yet selected Article XI, Alternative A. The same financing transaction is then evaluated by DAFIM, assuming the jurisdiction has selected Article XI, Alternative A with the sixty day period. *The reduction in risk of the financing transaction and the commensurate reduction in the annual running spread/margin and the equivalent upfront risk fee directly measure the economic benefit of reducing the repossession delay to sixty days.*

To ascertain repossession delay in the event of airline insolvency and reorganization in the UK, we have three data points.

1) According to expert opinion, a likely liquidity facility of 24 months would be required for a BA EETC issue in the absence of the CTC ratification and selection of Article XI, Alternative A with the 60 day period. This is 6 months longer than the 18 month liquidity facility in U.S. EETC issues. Since the waiting period is limited to 60 days under Section 1110 in the U.S., we assume that the balance of 16 months is for remarketing of repossessed aircraft. Assuming the remarketing period is the same for U.S. and UK issues, a 24 month liquidity facility in the UK implies that ***EETC investors assume the possibility of 8 month repossession delay as the probable worst case scenario in insolvency and reorganization.*** That period may include an uncertainty premium designed to address the risk associated with insolvency administrator discretion.

2) We have solicited opinions of a UK insolvency expert on possible repossession delays for bank loans secured by essential operational assets (aircraft) in the event of insolvency and reorganization of a major UK airline. According to the expert's opinion, the realistic worst case court delay in insolvency would be four to five months.

3) Prof. Linetsky conducted a study in 2009 based on the World Bank (WB) data on contract enforcement delays in 180 jurisdictions worldwide. The data are available at <http://www.doingbusiness.org/ExploreTopics/EnforcingContracts/> and Linetsky's study is available at <http://www.awg.aero>. The WB data are collected through the study of the codes of civil procedure and other court regulations, as well as surveys completed by local litigation attorneys. In the WB data, the contract enforcement time is recorded in calendar days, counted from the moment the plaintiff files the lawsuit in court until payment. This includes both the days when actions take place and the waiting periods between. The respondents make separate estimates of the average duration of different

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<sup>11</sup> We recall that a historical probability of default of a BB- rated corporation is 27% over a 15 year period. In the case of a major airline, corporate bankruptcy would likely be accompanied by a significant restructuring that would take a substantial amount of time. Thus repossession delays constitute a financial risk to lenders and investors.

stages of dispute resolution: the completion of service of process (time to file the case), the issuance of judgment (time for the trial and obtaining the judgment) and the moment of payment (time for enforcement). The data estimate the average duration of contract enforcement cases through the courts in the majority of jurisdictions worldwide in a consistent and uniform manner. As far as we are aware, this is the only publicly available data set of this nature. *The estimate for the UK in the World Bank data is 13.2 months.*

<sup>12</sup> However, the WB contract enforcement delay data are not specific to aircraft repossessions. Prof. Linetsky performed a statistical adjustment to the WB data to translate to the aviation context. *The adjusted figure in Linetsky's 2009 study was 7.5 months, which is close to the 8 month delay implied by the 24 month liquidity facility.*

*Based on these data, we assume a range of probable worst case repossession delays in the event of insolvency and reorganization of a major UK airline from 4 to 8 months, with the 6 month average.*

### **Quantifying Risk Reduction and Commensurate Funding Cost Reduction with DAFIM**

To quantify economic benefits of reducing the repossession delay in the event of airline insolvency and reorganization from the 4- to 8-month range to the 2 month period provided by the CTC, we apply DAFIM to analyze a representative 12-year aircraft mortgage loan with semiannual payments and mortgage-style principal amortization with no balloon. The initial loan-to-value is 85% of the net purchase price of the aircraft. Assumptions about the probabilities of default, aircraft values, repossession process, and BIS II regulatory capital reserving are detailed in Annex 1.<sup>13</sup>

We consider 3 scenarios:

- Scenario 1: Low estimate of benefits: BB+ rated airline, 4 month repossession delay reduced to 2 months.
- Scenario 2: Best estimate of benefits: BB- rated airline, 6 month repossession delay reduced to 2 months.
- Scenario 3: High estimate of benefits: B rated airline, 8 month repossession delay reduced to 2 months.

For these scenarios DAFIM produced expected LGD figures for each year of the life of the transaction, the corresponding risk-based annual running spread (margin) in basis

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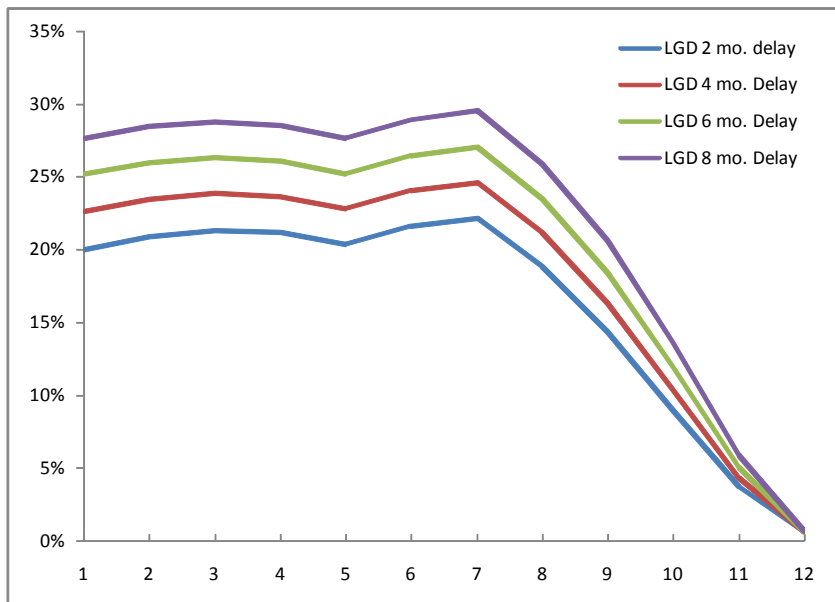
<sup>12</sup> We note that while the legal system in the UK is generally creditor friendly, World Bank data on contract enforcement delays specifically consider contested situations that are resolved through the court system. We note that contract enforcement delays for the UK in the World Bank data are substantial at 13.2 months. The WB data set is a unique source of such data in the public domain. We are not aware of any other public source of similar data.

<sup>13</sup> Sample transactions analyzed in this section are for illustration purposes only. In any commercial transaction there may be a variety of additional factors that influence transaction risk and commercial pricing. The pricing presented in this section is the model-based risk pricing. In any given commercial transaction the actual transaction pricing may differ from this theoretical pricing.

points per annum to compensate for the expected loss and the cost of regulatory capital reserving for the unexpected loss, and the equivalent upfront risk fee in percent of the loan principal.<sup>14</sup>

Year	Expected LGD			
	2 months	4 months	6 months	8 months
1	20.05%	22.7%	25.19%	27.7%
2	20.92%	23.5%	26.01%	28.5%
3	21.35%	23.9%	26.35%	28.8%
4	21.21%	23.7%	26.13%	28.6%
5	20.40%	22.8%	25.22%	27.7%
6	21.63%	24.0%	26.48%	28.9%
7	22.19%	24.6%	27.07%	29.6%
8	18.85%	21.1%	23.46%	25.9%
9	14.37%	16.3%	18.41%	20.6%
10	8.98%	10.4%	11.96%	13.7%
11	3.71%	4.3%	5.06%	5.9%
12	0.61%	0.6%	0.63%	0.7%
<b>Average</b>	<b>16.2%</b>	<b>18.2%</b>	<b>20.2%</b>	<b>22.2%</b>
<b>Maximum</b>	<b>22.2%</b>	<b>24.6%</b>	<b>27.1%</b>	<b>29.6%</b>

**Table 3.** Loss Given Default for 2, 4, 6, 8 month delays (12 year mortgage-style aircraft loan, 85% LTV, semiannual payments, 20% DSD, B rated airline, other assumptions as in the Annex).



**Figure 1.** Loss Given Default for 2, 4, 6, 8 month delays (graphical representation of data in Table 2).

<sup>14</sup> We note that the impact on LGD reduction produced by our model is in agreement with the ratings agencies' rating guidelines of one to two notch credit enhancement due to Section 1110 with 60 day repossession period in the US.

Table 2 and Figure 1 illustrate reductions in LGD figures due to shortening repossession delays in insolvency. In the modeling framework of DAFIM, the reduction in the LGD comes from: (1) reduction in the loss of unpaid interest due to shortened delay; (2) reduction in economic depreciation of the aircraft due to shortened delay; (3) reduction in continued exposure to aircraft market volatility due to shortened delay; (4) reduction in the asset distress (distressed sale discount or DSD) due to repossession delay resulting from possible non-compliance with contractual terms relating to aircraft maintenance, service, and record keeping, as well as possibility of super priority liens. The LGD reduction leads to the commensurate reduction in the annual risk spreads and the equivalent upfront fees (corresponding to the *present value* of running spread payments over the life of the loan).

Airline Rating	Rep. Delay	Spread bps p.a.	Upfront % principal	Rep. delay	Spread bps p.a.	Upfront % principal	Savings % of Fee
BB+	4 months	92.8	5.33	2 months	84.5	4.85	9.0%
BB-	6 months	157.8	9.16	2 months	131.4	7.60	17.0%
B	8 months	278.6	16.47	2 months	212.9	12.46	24.3%

**Table 4.** Annual risk spread in basis points per annum and equivalent upfront risk fee in percent of the loan principal for the three benchmark scenarios. The last column shows percentage reduction in the upfront fee resulting from reducing repossession delay to two months in each of the scenarios.

Airline Rating	Rep. Delay	Total Fees w/o CTC billions of USD	Total fees w/ CTC billions of USD	Total Savings billions of USD
BB+	4 months	4.941	4.496	0.445
BB-	6 months	8.491	7.045	1.446
B	8 months	15.268	11.550	3.717

**Table 5.** Upfront risk fee and the risk fee reduction applied to the total commercial market financing share of UK airlines' aircraft deliveries over the next 20 years (60% of \$154.5 billion) in each of the three scenarios.

**Caveat.** An important qualification to this study is the overriding assumption that the UK not only ratifies the CTC, but also follows through on the full and effective implementation and compliance. To produce maximum benefits, the CTC must be effectively implemented, including all actions necessary to ensure that their provisions will be strictly and reliably enforced by national authorities. All the results in this study are predicated on such full implementation and compliance. Without full confidence in the implementation and compliance, financial institutions and capital markets investors may be reluctant to grant borrowers full reductions in risk spreads/fees.

## 2.4. Summary of Economic Benefits to UK Airlines

Adding the savings in export credit (EC) risk fees, commercial financing (CF) risk fees equivalent to risk spreads/margins, and liquidity facility (LF) fees in EETC issuance, we arrive at the estimated range of economic benefits to UK airlines:

	EC Savings billions of USD	LF Savings billions of USD	CF Savings billions of USD	Total Savings billions of USD	Total Savings billions of GBP
Low Estimate	0.324	0.080	0.445	0.848	0.538
Best Estimate	0.341	0.106	1.446	1.893	1.200
High Estimate	0.413	0.136	3.717	4.266	2.705

Table 6. Estimated range of economic benefits to UK airlines.

## 3. Discussion of Non-quantified Benefits

In this Section we give a *qualitative discussion* of benefits to UK based lenders, lessors, manufacturers, and flying public. While these benefits are substantial, they are much harder to quantify.

### 3.1. Economic Benefits to UK Lenders and Lessors

1) UK ratification of the CTC offers benefits to UK lenders and lessors in terms of decreased risk for the financing of UK registered aircraft. Protocol Article XI, Alternative A (rights on insolvency) with a maximum period of sixty days introduces legal predictability and eliminates risk of longer delays, thus reducing LGD and, commensurately, reducing regulatory capital reserves under Basel II. As Basel III capital reserve requirements are expected to be higher than Basel II, LGD reduction will become more valuable to financial institutions.

2) In addition to benefits to UK lenders financing UK registered aircraft, UK lenders financing aircraft registered in other jurisdictions will also benefit since the UK ratification of the CTC is expected to facilitate ratification by other jurisdictions around the world. This aspect is hard to quantify, but is substantial. UK ratification will, in particular, facilitate ratification by other EU members.

### 3.2. Economic Benefits to UK Manufacturers

1) UK ratification of the CTC will result in lower funding costs for UK airlines, resulting in increased investment in aircraft and engines, in particular, accelerating fleet replacement cycles. This is expected to result in increased aircraft and engine sales, as well as well as possible upgrades in manufacturers support services.

2) Accession to the CTC ratification offers special benefits to UK based engine manufacturers. Engine manufacturers are frequently also lessors of engines, and borrowers of funds to finance those engines. Recently a UK based engine manufacturer sought pricing indications from many active lending banks (both UK and foreign) for a

loan facility to be secured on a pool of civil jet engines. Over half these banks, most notably those who report under Basel II, indicated that registration of mortgages over the engines with the international registry would result in lower pricing. The effect would be material. We estimate that over a 20 year period, the expected benefits of this category of savings would fall in the range of £10 – 100 million.

### **3.3. Benefits to UK Flying Public**

UK ratification of the CTC will result in lower funding costs for UK airlines, resulting in faster fleet replacement cycles. UK flying public will benefit by enjoying newer, safer, more comfortable, and more environmentally friendly aircraft.

### **4. Costs**

There are no material costs to the UK economy resulting from the CTC ratification. The only cost category might be approximately 5,000 pounds in additional legal fees per transaction for the first year after ratification required to set up the necessary CTC-related documentation. Even those fees may not apply in many cases since many parties are already subject to the CTC (if they buy for a party in a contracting state or lease from one, if that party borrowed money). *We emphasize that the CTC removes market inefficiencies, thus resulting in net economic benefits without any material costs.*

## Annex 1. Dynamic Asset Financing Model (DAFIM)

DAFIM consists of the following components:

- (1) Dynamic model of collateral aircraft market value (asset value process);
- (2) Default model;
- (3) Repossession model;
- (4) Financing facility model;
- (5) Advanced Internal Ratings Based (IRB) Basel II capital reserving model.

The outputs of the model are the annual risk spread (margin) and the equivalent upfront fee that compensates the lender for the expected loss (EL), as well as remunerates for the cost of carrying capital reserves for unexpected losses (UL) according to the Basel II Advanced IRB approach. The expected year-by-year Loss-Given-Default (LGD) values and the corresponding expected year-by-year capital reserves under Basel II are also calculated within the model.

A brief description of each of DAFIM components is provided below.

(1) The *asset value process* is a stochastic process similar to the one used in the Black-Scholes options pricing model. In contrast with the Black-Scholes model, it takes into account the age and the economic depreciation of the asset. To calibrate the asset value process to commercial aircraft historical market data, Prof. Linetsky undertook a statistical study of historical aircraft market values using AVAC and Ascend historical data from 1967 to 2008. In particular, inflation adjusted expected residual value curves reflecting the expected economic depreciation of the aircraft and volatility curves reflecting market fluctuations around these expected values were estimated across more than 450 model/vintage time series of annual current market value (CMV) appraisals, including a total of over 10,000 historical aircraft appraisal data points. The stochastic process modeling the aircraft market value through time was calibrated to the statistically estimated residual value and volatility curves. It serves as the engine for risk analysis and pricing in DAFIM.

(2) *Default model*. We use probabilities of default (PD) from historical Standard & Poor's 1981-2009 default data.<sup>15</sup>

(3) *Repossession model*. DAFIM assumes that the borrower's default results in the subsequent collateral repossession by the lender. In this scenario, the lender faces some repossession delay. The model assumes the repossession delay of 60 days in jurisdictions that ratified the CTC with Article XI, Alternative A. In other jurisdictions, the repossession delay is generally longer and is an important risk variable. The model allows the user to explicitly analyze the impact of the repossession delay on transaction risk, and thus provides an analytical framework for establishing the magnitude of the reduction in LGD and corresponding risk spreads/fees resulting from reduction in the repossession delay to 60 days. The lender also faces some fixed costs in repossession (legal costs,

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<sup>15</sup> Standard & Poor's, Default, Transition, and Recovery: 2009 Annual Global Corporate Default Study and Rating Transitions.

repair, maintenance, reconfiguration, remarketing), as well as the distressed sale discount (DSD) reflecting the necessity to sell or lease the aircraft to a 3<sup>rd</sup> party under the compressed time frame to prevent long downtimes. In this study the assumptions are: fixed costs in repossession 6% for the aircraft less than 6 years old, 10% for the aircraft 6 years old or older, as well as percentage distressed sale discount (DSD) of 20%. The DSD is further increased by 0.5% per month of repossession delay beyond two months to reflect additional stress on the asset value resulting from possible non-compliance with contractual terms relating to aircraft maintenance, service, and record keeping, as well as possibility of super priority liens.

(4) *Financing facility model.* DAFIM explicitly models terms and conditions of the financing facility, including payment schedule, loan-to-value (LTV), principal amortization profile, and subordination structure if any. A representative transaction studied in this document is a 12-year aircraft loan with semiannual payments and mortgage-style principal amortization with no balloon.

(5) *Advanced IRB Basel II capital reserving model.* DAFIM calculates the present value of the cost of reserving the BIS II regulatory capital for the entire life of the financing facility under the Advance Internal Ratings Based Approach (A-IRB). The DAFIM estimates expected capital reserve requirements needed in each year of financing facility's life. The LGD is internally generated in the model for each year of the loan, based on the asset and loan models. The LGD is different for each year of the facility's life and depends on asset depreciation vs. loan amortization. The regulatory capital is costed at the Return on Equity (ROE) minus LIBOR. In this study we assume 20% pre-tax ROE (often used internal corporate target). To reserve for unexpected loss (UL), the BIS II requires estimating the *distressed LGD* (as opposed to average or expected LGD used in the expected loss (EL) calculation). We define distressed LGD as the average LGD during the market downturn (bottom half of market cycle). We do this by estimating the Tail Conditional Expectation of LGD (Conditional VaR) defined as the expected LGD, conditional on the downturn (conditional on the bottom half of the asset value distribution below the median). Fixed repositioning costs and the distressed sale discount are applied on top of the market downturn LGD, resulting in conservative assumptions likely satisfy regulatory reviews.



## Annex 2. Alternative Home Market Rule Scenario

Further to the discussion in section 2.2 after Table 1, here we estimate the benefits to UK airlines under a scenario that does not assume changes to the currently followed home market rule. We note that, while under the home market rule UK airlines are not eligible for export credit on Airbus and Boeing aircraft, they remain eligible for export credit on aircraft by other manufacturers and will thus be eligible for the CTC discount on those models. For simplicity, here we do not break out the share of export credit into home market and non-home market manufacturers, and assume that the 20% share of EC will instead be financed through commercial markets, with 10% share through capital markets and 10% share through other commercial financing (bank loans, leases). Table 7 is a counterpart of Table 6 under these assumptions. *The range is somewhat wider since there is more uncertainty regarding the precise value of benefits, but is not materially different.*

	LF Savings billions of USD	CF Savings billions of USD	Total Savings billions of USD	Total Savings billions of GBP
Low Estimate	0.120	0.593	0.713	0.452
Best Estimate	0.159	1.928	2.087	1.324
High Estimate	0.204	4.956	5.160	3.272

Table 7. Estimated range of economic benefits to UK airlines without assuming changes to the home market rule.