



ALLPIRG/5-WP/4
Agenda Item 2.6

BUSINESS CASE MODEL FOR THE IMPLEMENTATION OF CNS/ATM SYSTEMS

(Presented by the Secretariat)

**Fifth meeting of ALLPIRG/Advisory Group
(ALLPIRG.5)
(Montreal, 23-24 March 2006)**

Outline

- ✓ What is it ?
- ✓ Main functions
- ✓ Main components
- ✓ Strengths and weaknesses
- ✓ Summary
- ✓ Conclusions
- ✓ Action by ALLPIRG

What is it ?

✓ The CNS/ATM Database and Financial Analysis Computer System (DFACS)

- an **analytical** and **interactive** software,
- including a **database** component.

Main function

✓ Enables air navigation service providers and airspace users to **build**, **evaluate** and **compare** alternative **options or scenarios** for the implementation of CNS/ATM systems

Other functions

- ✓ **Maintain databases:**
 - **Geographical locations**
 - **Air navigation services equipment**
 - **Airspace users fleet and avionics**

Main components

✓ Database

➤ Geographical data

- Regions reference
- States reference
- Locations reference

➤ Air Navigation Services Equipment

- Conventional Technology Equipment reference
- New Technology Equipment reference
- Equipment database by location

➤ Airspace users

- Aircraft types
- Avionics

Main components

✓ Scenarios

➤ Scenario manager

- Scenario creation
- Copy of a scenario

➤ Scenario Analysis

- Profitability
- Cash flows

➤ Scenario Comparison

- Summary table

Scenario building

- ✓ Homogeneous Area
- ✓ Conventional technology equipment types
- ✓ Scenario parameters
- ✓ Conventional technology equipment decisions
- ✓ New technology equipment decisions
- ✓ Fleet forecast
- ✓ Aircraft movements forecast
- ✓ Avionics equipage process
- ✓ Additional costs

Scenario Name:

Flight Hours Forecasts

Aircraft Equipage Decision
Process

Aircraft Equipage Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs**Homogeneous Area**Conventional Technology
Equipment Types

ANSP Parameters

ANSP Conventional
Technology Decision
ProcessANSP New Technology
Decision Process

Aircraft Fleet Forecasts

Save

Cancel

Africa
Asia Pacific
Caribbean and South America
Europe
Middle East
North America

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Areas Under The Control Of The Pale:
Bahrain
Iran (Islamic Republic of)
Iraq
Israel
Jordan
Kuwait
Lebanon
Qatar
Saudi Arabia
Syrian Arab Republic
United Arab Emirates
Yemen

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Oman

Scenario Name:

Flight Hours Forecasts

Aircraft Equipment Decision
Process

Aircraft Equipment Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs

Homogeneous Area

**Conventional Technology
Equipment Types**

ANSP Parameters

ANSP Conventional
Technology Decision
ProcessANSP New Technology
Decision Process

Aircraft Fleet Forecasts

Save

Cancel

Communication
Navigation
Surveillance

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MSSR
PSR

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DVOR
ILS CAT II
VHF VOICE/DATA
VOR

Scenario Name:

Flight Hours Forecasts

Aircraft Equipage Decision
Process

Aircraft Equipage Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs

Homogeneous Area

Conventional Technology
Equipment Types**ANSP Parameters**ANSP Conventional
Technology Decision
ProcessANSP New Technology
Decision Process

Aircraft Fleet Forecasts

Save

Cancel

Analysis Period

Start of Analysis Period 1 /01/06

End of Analysis Period 1 /01/25

Cost Recovery

Start of Cost Recovery Period 1 /01/15

End of Cost Recovery Period 1 /01/25

Discount Rate (%) 10

Profit Margin (%) 10

CNS/ATM Operational Dates

	Equipment Category	Operational Date
►	Communication	1/01/15
	Navigation	1/01/15
	Surveillance	1/01/15

ANSP Equipment Decommissioning cost

Consider decommissioning cost ☐

Other parameters

Transition Period (Years) 10

Default Installation Date 1 /01/95

Default Life Cycle (Years) 10

Max. Stretching Period 10

Max. Refurbishment Period 10

Year switching Month 6

ANSP Equipment Residual Values

Consider residual value at the end of the
transition period to CNS/ATM ☐Consider residual value of conv. tech. at
end of the analysis period ☐Consider residual value of new tech. at the
end of the analysis period ☐

Default Parameters

Scenario Name:

Flight Hours Forecasts

Aircraft Equipage Decision
Process

Aircraft Equipage Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs

Homogeneous Area

Conventional Technology
Equipment Types

ANSP Parameters

**ANSP Conventional
Technology Decision
Process**ANSP New Technology
Decision Process

Aircraft Fleet Forecasts

Save

Cancel

Total Number: 6

	Location	ICAO Location Indicator	Type of Equipment	Installation Date	Option
▶	MUSCAT/SEEB INTL.	OOMS	VOR	1/01/93	Keep until the end of the transition period
	MUSCAT/SEEB INTL.	OOMS	VHF VOICE/DATA	1/01/86	Replace at the end of each life cycle
	MUSCAT/SEEB INTL.	OOMS	ILS CAT II	1/01/93	Do not include in the analysis
	MUSCAT/SEEB INTL.	OOMS	PSR	1/01/95	Do not replace at the end of life cycle
	MUSCAT/SEEB INTL.	OOMS	MSSR	1/01/95	Do not include in the analysis
	MUSCAT/SEEB INTL.	OOMS	DVOR	1/01/85	Do not include in the analysis

 Apply to all

Apply to Selected

Scenario Name:

Flight Hours Forecasts

Aircraft Equipage Decision
Process

Aircraft Equipage Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs

Homogeneous Area

Conventional Technology
Equipment Types

ANSP Parameters

ANSP Conventional
Technology Decision
Process**ANSP New Technology
Decision Process**

Aircraft Fleet Forecasts

Save

Cancel

	Location	Equipment	Installation Date
▶	00IZ - IZKI		
*	00JN - JARF NORTH		
	00KB - KHASAB		
	00LK - LEKHWAIR		
	00MA - MASIRAH		
	00MM - MUSCAT FIR		
	00MS - MUSCAT/SEEB INTL		
	00MX - MARMUL		
	00NZ - NIZWA		

Scenario Name:

Flight Hours Forecasts

Aircraft Equipage Decision
Process

Aircraft Equipage Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs

Homogeneous Area

Conventional Technology
Equipment Types

ANSP Parameters

ANSP Conventional
Technology Decision
ProcessANSP New Technology
Decision Process**Aircraft Fleet Forecasts**

Save

Cancel

Aircraft type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 ▲
A320	56	57	59	61	63	64	66	68	70	73	75	
A310	50	51	53	54	56	58	59	61	63	65	67	
C130	23	24	25	25	26	27	28	29	29	30	31	
A340	21	21	22	23	23	24	25	26	26	27	28	
K35R	6	6	6	6	7	7	7	7	8	8	8	
B-757	6	6	6	6	6	7	7	7	7	7	8	
IL18	6	6	6	6	6	6	7	7	7	7	7	
C17	4	5	5	5	5	5	5	5	5	6	6	
AN12	4	4	4	4	4	5	5	5	5	5	5	
AN24	4	4	4	4	4	5	5	5	5	5	5	
SH7	4	4	4	4	4	4	5	5	5	5	5	
T154	4	4	4	4	4	4	5	5	5	5	5	
BA11	3	3	3	3	3	3	3	3	4	4	4	
IL76	2	2	3	3	3	3	3	3	3	3	3	
GLF4	2	2	2	3	3	3	3	3	3	3	3	
C135	2	2	2	2	2	2	2	3	3	3	3	
P3	2	2	2	2	2	2	2	2	3	3	3	
UH1	2	2	2	2	2	2	2	2	2	2	3	
NIM	2	2	2	2	2	2	2	2	2	2	2	
B707	2	2	2	2	2	2	2	2	2	2	2	
OTHERS	27	28	28	29	29	30	30	31	32	32	33	

Clear forecast grid

Add aircraft type

Scenario Name:

Homogeneous Area	Conventional Technology Equipment Types	ANSP Parameters	ANSP Conventional Technology Decision Process	ANSP New Technology Decision Process	Aircraft Fleet Forecasts
Flight Hours Forecasts	Aircraft Equipage Decision Process	Aircraft Equipage Profile	Flight Efficiency Rates	ANSP additional costs	Airspace users additional costs

Save

Cancel

Aircraft Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017 ▲
B-737-4	32992	33981	35000	36051	37132	38245	39395	40576	41792	43045	44339	45
B-757	4152	4277	4405	4539	4675	4813	4957	5108	5260	5419	5580	57
DC-9-50	1888	1947	2004	2064	2125	2189	2256	2323	2392	2464	2539	26
A-300-600	23496	24203	24928	25676	26445	27237	28056	28899	29764	30659	31579	32
B-767-3/ER	30917	31844	32800	33784	34797	35843	36916	38024	39165	40340	41549	42
B-777	34290	35317	36379	37469	38595	39752	40944	42172	43437	44740	46083	47
B-727-2	1512	1556	1604	1652	1701	1752	1804	1859	1915	1972	2032	20
DC-10-4	6308	6496	6692	6892	7100	7312	7532	7757	7989	8229	10476	87
MD-11	6941	7149	7364	7587	7813	8048	8288	8539	8795	9059	9331	96
B-747-4	58731	60492	62308	64176	66101	68084	70128	72232	74397	76629	78931	81
OTHERS	19765	20160	20564	20976	21395	21821	22260	22704	23157	23621	24093	24
A330	49659	51146	52683	54261	55891	57565	59293	61072	62904	64792	66733	68
A320	40603	41820	43075	44365	45699	47068	48480	49936	51435	52976	54565	56
A310	36221	37309	38428	39581	40768	41992	43252	44549	45885	47261	48680	50
C130	16957	17467	17989	18531	19085	19659	20248	20856	21483	22125	22789	23
A340	15195	15651	16117	16603	17100	17613	18141	18685	19245	19824	20419	21
K35R	4340	4469	4604	4741	4884	5032	5181	5339	5499	5661	5832	60
IL18	4059	4180	4304	4435	4565	4704	4845	4989	5140	5293	5453	56
C17	3189	3285	3384	3485	3589	3699	3808	3923	4040	4163	4285	44
AN12	2965	3053	3147	3240	3339	3437	3540	3645	3756	3868	3984	41
AN24	2955	3043	3133	3228	3324	3424	3525	3632	3741	3853	3971	40
SH7	2900	2988	3076	3171	3264	3363	3464	3568	3675	3784	3899	40 ▼

Scenario Name:

Homogeneous Area

Conventional Technology
Equipment Types

ANSP Parameters

ANSP Conventional
Technology Decision
ProcessANSP New Technology
Decision Process

Aircraft Fleet Forecasts

Flight Hours Forecasts

**Aircraft Equippage
Decision Process**

Aircraft Equippage Profile

Flight Efficiency Rates

ANSP additional costs

Airspace users additional
costs

Save

Cancel

Start of Equippage Date 1 /01/15

End of Equippage Date 1 /01/25

Aircraft Type	Avionic Equipment	Maximum # of a/c equipped each year	Efficiency Rate
B-737-4	Package 1	7	7
DC-9-50	Package 1	0	0
A300-600	Package 1	3	7
B-767-3/ER	Package 1	3	7
B-777	Package 1	5	7
B-727-2	Package 1	1	7
DC-10-4	Package 1	2	7
MD-11	Package 1	3	7
B-747-4	Package 1	10	7
ATR-42	Package 1	2	7
A330	Package 1	6	7
A320	Package 1	10	7
A310	Package 1	5	7
C130	Package 1	2	7
A340	Package 1	4	7
K35R	Package 1	1	7
B-757	Package 1	1	7
IL18	Package 1	2	7
C17	Package 1	2	7
AN12	Package 1	1	7
AN24	Package 1	1	7
SH7	Package 1	2	7
T154	Package 1	1	7

Delete equippage dec.

Scenario Name:

Homogeneous Area

Conventional Technology
Equipment Types

ANSP Parameters

ANSP Conventional
Technology Decision
ProcessANSP New Technology
Decision Process

Aircraft Fleet Forecasts

Flight Hours Forecasts

Aircraft Equipment Decision
Process

Aircraft Equipment Profile

Flight Efficiency Rates

ANSP additional costsAirspace users additional
costs

Save

Cancel

Cost Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Other	0	5000	7000	5000	6000	5000	6000	7000	0	0	0	0

Clear cost grid

Add cost line

Analysis output

- ✓ **Summary analysis output values**
 - Present values of costs, revenues
 - Average annual amount of user charges
 - Cost recovery year
- ✓ **Costs:**
 - ✓ by State,
 - ✓ by location,
 - ✓ by equipment type,
 - ✓ by specific equipment
- ✓ **Cost recovery charts for ANSP and airspace users**

Scenario Name:

ANS Conv. Tech. Costs

ANS New Tech. Costs

ANS Conv. Tech. Cost Chart

ANS New Tech. Costs Chart

Analysis Output Values

Costs by State (ANSP)

Costs by equipment category

ANS Cost Details

Airspace Users Cost Recovery Chart

Airspace Users Cost Chart

Airspace Users Benefit Details

Airspace Users Benefits Chart

Avionics Costs by a/c type and by avionic

Hours Growth Chart

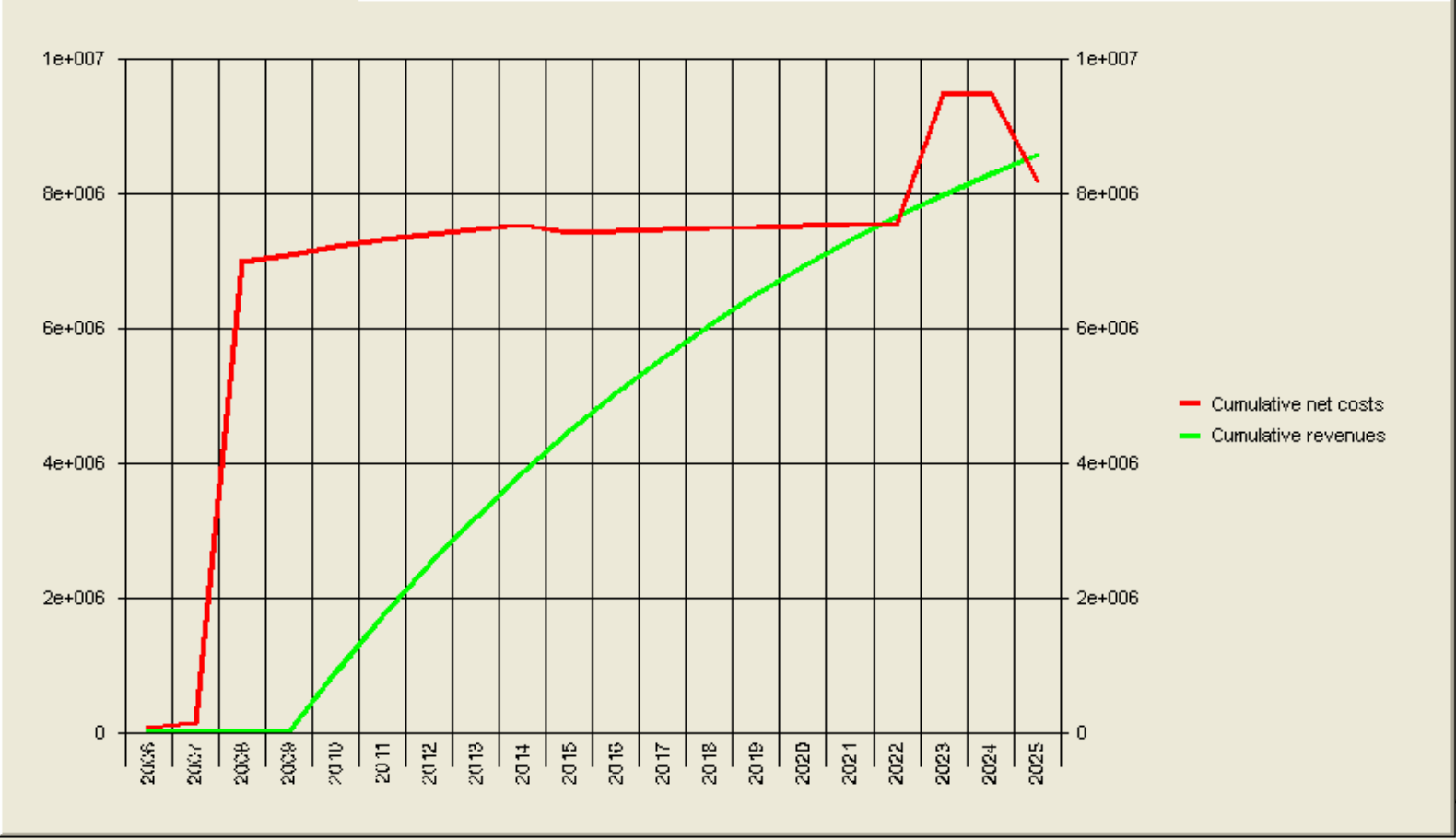
Avionics Costs Details

Avionics Costs by cost category

ANS Cost Recovery Chart

Scenario Details

Done



Scenario Name: Oman_Illustration

Airspace Users Cost Recovery Chart

Avionics Costs by a/c type and by avionics

Airspace Users Cost Chart

Airspace Users Benefit Details

Airspace Users Benefits Chart

ANS Cost Recovery Chart

Hours Growth Chart

Avionics Costs Details

Avionics Costs by cost category

ANS Conv. Tech. Costs

ANS New Tech. Costs

ANS Conv. Tech. Cost Chart

ANS New Tech. Costs Chart

Analysis Output Values

Costs by State (ANSP)

Costs by equipment category

ANS Cost DetailsScenario
Details

Done

Conventional Technology cost details

State	Location	ICAO LocDesign	Equipment	Technical Option/Decision	Installation Date	2006	
Oman	MUSCAT/SEEB INTL.	OOMS	VOR	Keep until the end of the tr	1/01/93	0	0
Oman	MUSCAT/SEEB INTL.	OOMS	VHF VOICE/DATA	Keep until the end of the tr	1/01/86	750	7
Oman	MUSCAT/SEEB INTL.	OOMS	ILS CAT II	Keep until the end of the tr	1/01/93	75000	7
Oman	MUSCAT/SEEB INTL.	OOMS	PSR	Keep until the end of the tr	1/01/95	2000	2
Oman	MUSCAT/SEEB INTL.	OOMS	MSSR	Keep until the end of the tr	1/01/95	1000	1
Oman	MUSCAT/SEEB INTL.	OOMS	DVOR	Keep until the end of the tr	1/01/85	0	0
▶ Total						78750	7

New Technology cost details

State	Location	ICAO LocDesign	Equipment	Installation Date	2006	2007	2008
Oman	MUSCAT/SEEB INTL.	OOMS	AMHS	1/01/08	0	0	500
Oman	MUSCAT/SEEB INTL.	OOMS	AMSS Voice/Data	1/01/08	0	0	655
Oman	MUSCAT/SEEB INTL.	OOMS	GBAS	1/01/08	0	0	860
Oman	MUSCAT/SEEB INTL.	OOMS	SBAS-Ref	1/01/08	0	0	255
Oman	MUSCAT/SEEB INTL.	OOMS	SBAS-Mst	1/01/08	0	0	307
Oman	MUSCAT/SEEB INTL.	OOMS	ADS-B	1/01/08	0	0	395
Oman	MUSCAT/SEEB INTL.	OOMS	ADS-C (Workstations)	1/01/08	0	0	260
▶ Total					0	0	773

Scenario Name: Oman_Illustration9

Avionics Costs by a/c type and by avionic

Airspace Users Cost Chart

Airspace Users Benefit Details

Airspace Users Benefits Chart

ANS Cost Recovery Chart

Hours Growth Chart

Avionics Costs Details

Avionics Costs by cost category

ANS Conv. Tech. Costs

ANS New Tech. Costs

ANS Conv. Tech. Cost Chart

ANS New Tech. Costs Chart

Analysis Output Values

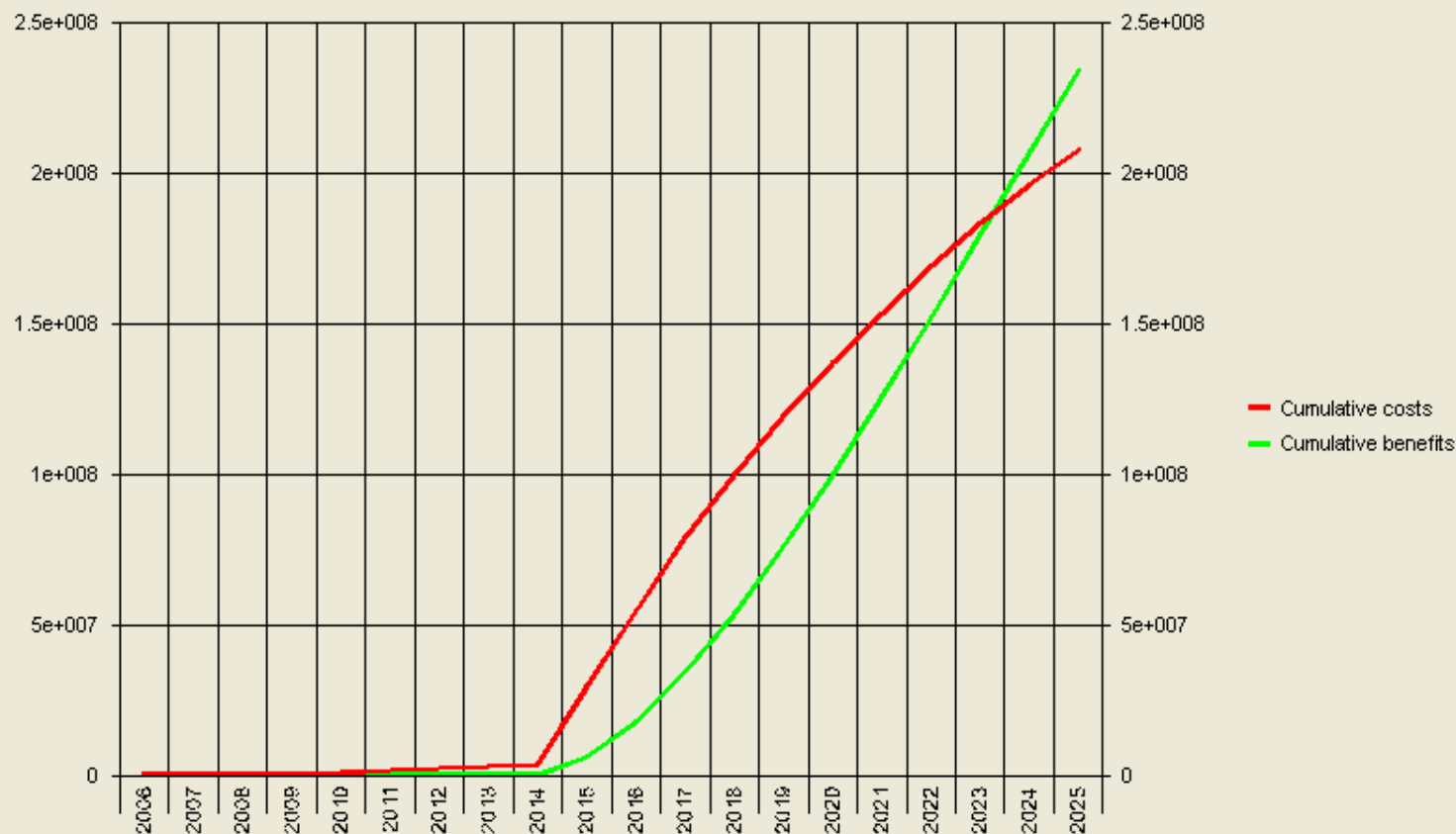
Costs by State (ANSP)

Costs by equipment category

ANS Cost Details

Scenario
Details

Done

Airspace Users Cost Recovery Chart

Strengths and weaknesses

- ✓ **Analysis covers ANSP and airspace users**
- ✓ **Scenario decisions for each individual equipment**
- ✓ **Average amount of user charges**
- ✓ **Detailed costs**
- ✓ **Reference costs are generic**
- ✓ **Flight efficiency benefits an input**
- ✓ **Multinational facility/service**



SUMMARY

- ✓ Flexible
- ✓ Interactive
- ✓ Open
- ✓ Evolutive



Conclusion 5/x: Workshop on the business case model for CNS/ATM Systems

That, in support of the development of business cases for the implementation of CNS/ATM systems, ICAO convene a **training workshop** for States at the Regional Offices through an appropriate mechanism, such as Special Implementation Projects (SIPs).

Conclusion 5/x: Application of the business case model for CNS/ATM Systems implementation

That PIRGs, States and airspace users:

- a) note that business cases for the implementation of CNS/ATM Systems leading to a global ATM system is a **key element** in the development of regional and national plans; and
- b) **develop business cases**, taking into account the initiatives across regions in the formulation of national and regional plans that facilitate achieving a global ATM system.



ACTION BY ALLPIRG

ALLPIRG is invited to:

- a) note the progress achieved in developing a business case model for the implementation of CNS/ATM systems; and
- b) adopt the conclusions cited in paragraph 5.

