

THE STRATEGIC IMPACTS OF
DEREGULATION OF CIVIL AVIATION INDUSTRY:
MODERNIZATION OF AIR NAVIGATION TECHNOLOGY ON
SAUDI AIR NAVIGATION SERVICES

A Thesis submitted to the fulfillment of the requirements for the degree
Master of Science (International Business)
College of Business (International Business)
Universiti Utara Malaysia

By

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KOLEJ PERNIAGAAN
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ABSTRACT

Civil aviation industry is in conversion from a strictly government-controlled transport sector to a much more competitive, liberalized operating environment. For many years the Air navigation services has been under pressure to adapt to new institutional arrangements and increased operational requirements. Air traffic management must meet the challenges of the twenty-first century - in which a global, seamless airspace is developed, based on cost-effective and efficient services, with sufficient capacity to meet the world's air transport needs.

Modernization of air navigation services technology is intended to give users new abilities such as flexible departure and arrival routes and increased usage of preferred flight trajectories. The goal of air navigation technology modernization is to increase the flexibility and efficiency of the air navigation services by improving traffic flow and reduce user operation costs. CNS/ATM systems are global in nature and usually planned and implemented at a regional or global level, in some cases by collective regional entities or commercial service suppliers. The result of the proposed development would combine space and computer technology, which would render obsolete much of the existing system ground based equipment.

This study has developed a better understanding of the new uncertain environment for air navigation services from global perspective through the analysis of the deregulation of civil aviation industry and the new air navigation technology.

DEDICATION

I wish to dedicate this project to my wife, whose unrelenting support and encouragement helped me get the most out of this program and this project.

ACKNOWLEDGEMENT

First of all, all my praises and thanks be to Allah.

My highest and most sincere appreciation goes to my beloved parents, whose have always encouraged and guided me to be independent, never try to limit my aspiration.

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CHAPTER 1

1.1 Introduction

Air navigation services represent a series of methods and procedures ensuring safe navigation of planes in the airspace. It is a process based on a permanent exchange of information and a perfect cooperation among particular navigation units and between these units and navigated planes. The system includes users, planes, crews, airports and air navigation services. The whole system developed on the base of the gradually increasing needs of the air transport. Its development was very complex and interesting, concerning its organizational part as well as techniques used.

In the early stage of air transport development soon after World War I. can hardly be talked about air navigation services, the equipment used at that time can be rather described as air transport provision, although the meaning of both the terms is not precisely the same. Air transportation of cargo, mail or passengers in particular did not need only effective and safe aircraft technique. It was necessary to provide aircraft ground servicing and en-route navigation service. Appropriate internationally valid legal documents were needed for international transport, as well as there were appropriate legal regulations for domestic air transport. It was necessary to take measures for emergency cases; pilots needed information on meteorological situation on the route and in the target airport. Aviators started having navigation problems immediately after

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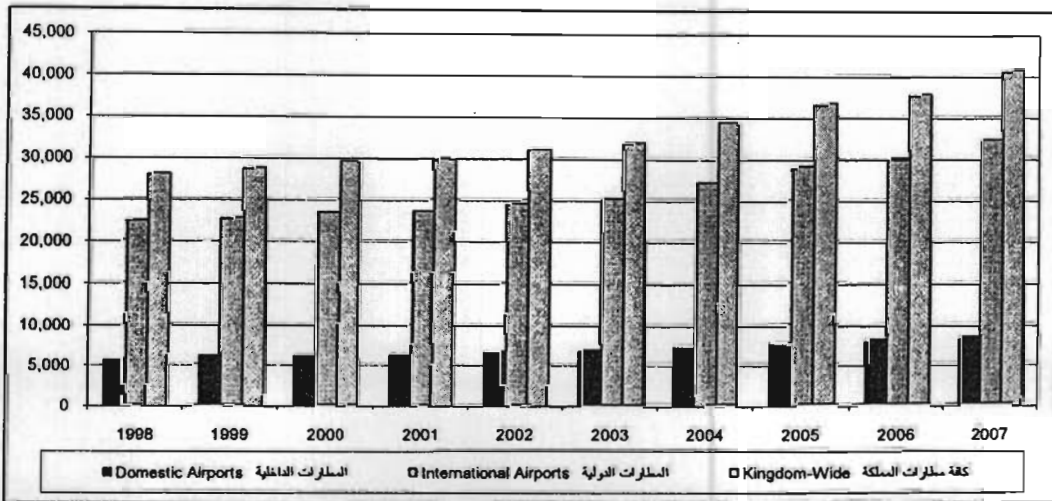
APPENDIX

إجمالي حركة المسافرين في كافة مطارات المملكة
الوصول والمغادرة للفترة من 1418هـ إلى 1427هـ

Total Passenger Traffic Kingdom-Wide
Arrival + Departure for The Period 1998 - 2007

Year	المطارات الداخلية Domestic Airports	المطارات الدولية International Airports	كافة مطارات المملكة Kingdom-Wide	السنة
1998	5,661	22,364	28,025	1418هـ
1999	6,016	22,725	28,741	1419هـ
2000	6,150	23,382	29,532	1420هـ
2001	6,290	23,531	29,821	1421هـ
2002	6,631	24,439	31,070	1422هـ
2003	6,748	25,097	31,845	1423هـ
2004	7,246	27,015	34,261	1424هـ
2005	7,628	28,982	36,610	1425هـ
2006	7,964	29,679	37,643	1426هـ
2007	8,363	32,184	40,547	1427هـ
% Change 2006-2007	5.01	8.44	7.71	نسبة التغير السنوية 1427 - 1426هـ

Passengers in Thousands



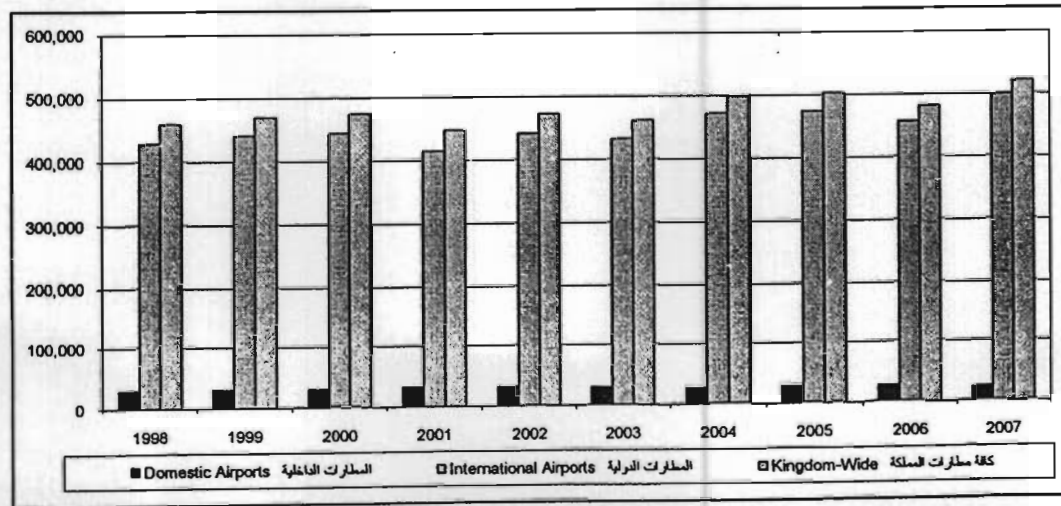
إجمالي حركة الشحن الجوي والبريد في كافة مطارات المملكة

الوصول والمغادرة للفترة من 1418هـ إلى 1427هـ (بالأطنان)

: Total Cargo Traffic Kingdom-Wide
Arrival + Departure for The Period 1998 - 2007 (metric tons)

Year	المطارات الداخلية Domestic Airports	المطارات الدولية International Airports	كافة مطارات المملكة Kingdom-Wide	السنة
1998	30,096	428,623	458,719	1418هـ
1999	30,685	439,488	470,173	1419هـ
2000	30,772	442,747	473,519	1420هـ
2001	32,525	413,984	446,509	1421هـ
2002	31,519	441,100	472,619	1422هـ
2003	29,283	432,231	461,514	1423هـ
2004	27,440	471,047	498,487	1424هـ
2005	28,538	472,786	501,324	1425هـ
2006	26,026	455,229	481,255	1426هـ
2007	22,685	497,701	520,386	1427هـ
% Change 2006-2007	-12.84	9.33	8.13	نسبة التغير السنوية 1427 - 1426هـ

Cargo in Tons



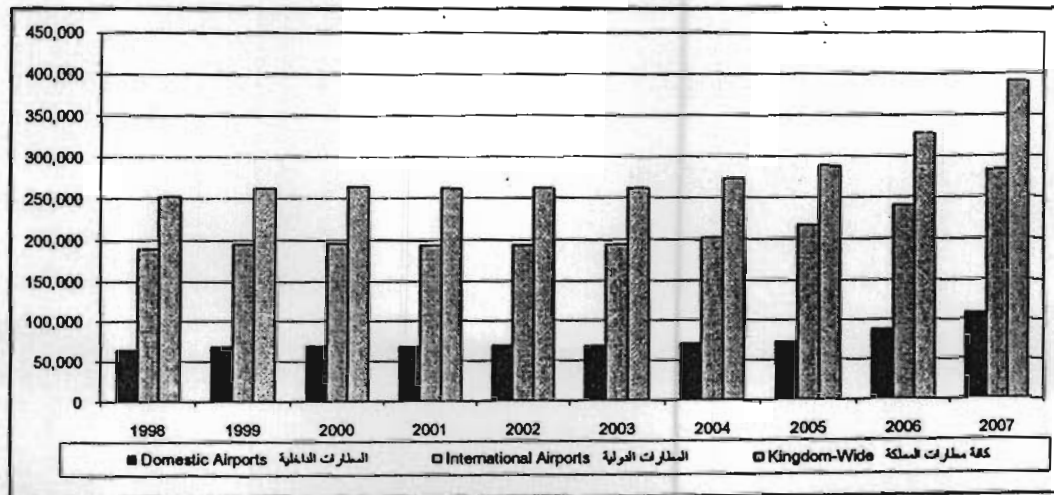
عمليات الطيران التجارية في كافة مطارات المملكة

الوصول والمغادرة للفترة من 1418هـ إلى 1427هـ

Commercial Aircraft Operations Kingdom-Wide Arrival + Departure for The Period 1998 - 2007

Year	المطارات الداخلية Domestic Airports	المطارات الدولية International Airports	كافة مطارات المملكة Kingdom-Wide	السنة
1998	63,635	189,181	252,816	1418هـ
1999	68,009	194,179	262,188	1419هـ
2000	68,834	195,234	264,068	1420هـ
2001	68,605	193,251	261,856	1421هـ
2002	68,810	193,095	261,905	1422هـ
2003	68,470	193,894	262,364	1423هـ
2004	70,613	202,217	272,830	1424هـ
2005	72,620	215,687	288,307	1425هـ
2006	87,232	240,166	327,398	1426هـ
2007	107,763	283,129	390,892	1427هـ
% Change				نسبة التغير السنوية
2006-2007	23.54	17.89	19.39	1427 - 1426هـ

Commercial Aircraft Operations



إجمالي حركة المسافرين في مطار الملك عبدالعزيز الدولي

الوصول والمغادرة للفترة من 1418هـ إلى 1427هـ (بالآلاف)

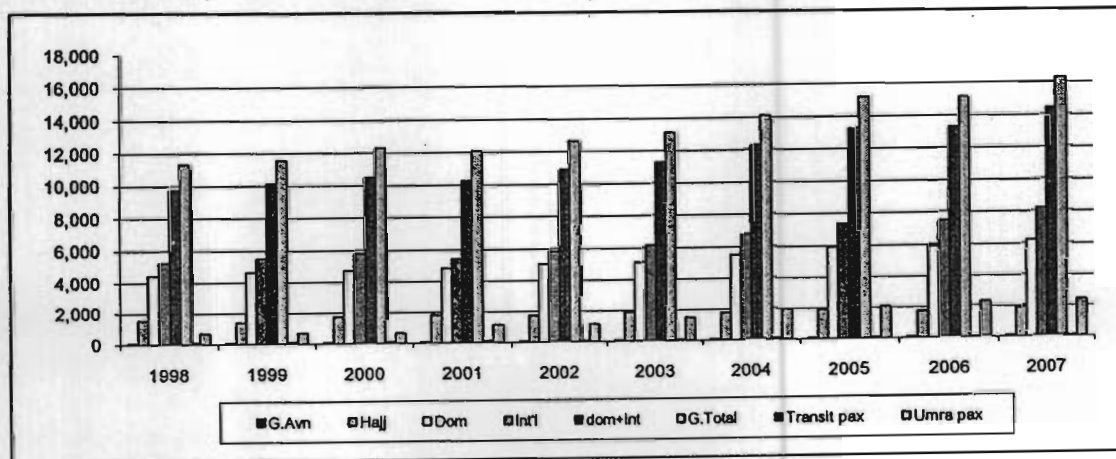
Passenger Traffic at King Abdulaziz International Airport
Arrival + Departure for The Period 1998 - 2007 (in thousands)

Year	Scheduled & Non Scheduled			General Aviation	Hajj Pilgrims	Grand Totals	* Umra Passenger	Transit Passenger	السنة
	Domestic	International	Totals						
1998	4,462	5,254	9,716	66	1,550	11,332	716	133	→ 1418-19
1999	4,656	5,493	10,149	64	1,368	11,581	698	147	→ 1419-20
2000	4,717	5,748	10,465	65	1,734	12,264	691	138	→ 1420-21
2001	4,823	5,414	10,237	72	1,781	12,090	1,162	131	→ 1421-22
2002	5,050	5,799	10,849	76	1,713	12,638	1,167	96	→ 1422-23
2003	5,102	6,146	11,248	77	1,818	13,143	1,490	113	→ 1423-24
2004	5,504	6,753	12,257	83	1,762	14,102	1,932	134	→ 1424-25
2005	5,903	7,336	13,239	88	1,857	15,184	2,060	98	→ 1425-26
2006	5,835	7,430	13,265	109	1,718	15,092	2,256	92	→ 1426-27
2007	6,192	8,164	14,356	128	1,825	16,309	2,382	76	→ 1427-28
% chg									نسبة التغير السنوية
2006-2007	6.12	9.88	8.22	17.43	6.23	8.06	5.59	-17.39	→ 1427 - 1426

* إحصائيات العمرة ضمن المجموع الكلي

عدد المسافرين بالآلاف

Passengers in Thousands



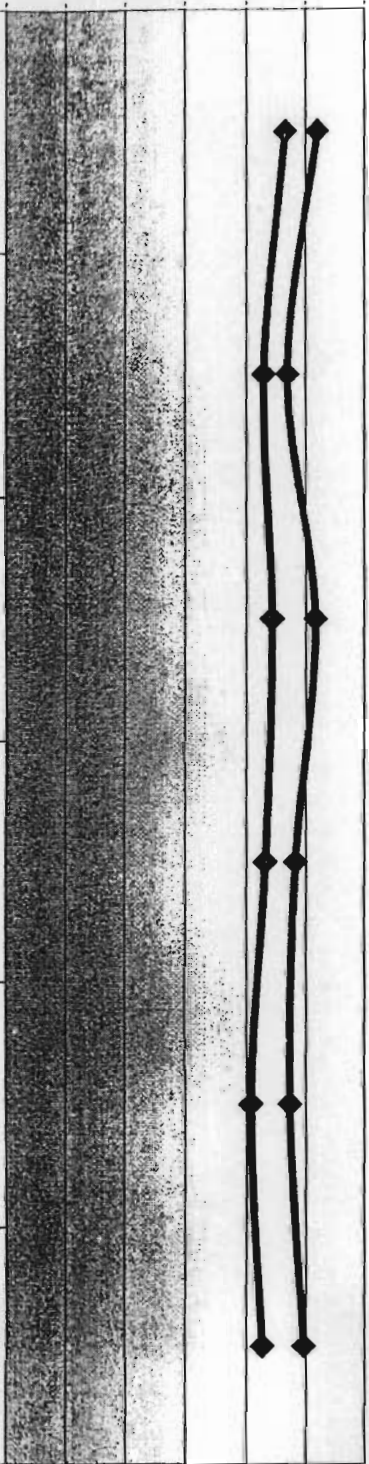
Passenger Movement

Passenger Movement 2004- 2005 (2nd Quarter)

Month	Uplifted		Discharged		Transit		Total		% inc
	2004	2005	2004	2005	2004	2005	2004	2005	
JAN	896,667	994,353	883,665	1,009,187	80,197	78,211	1,860,529	2,081,751	11.9%
FEB	786,348	883,550	862,077	922,329	67,738	70,278	1,716,163	1,876,157	9.3%
MAR	851,638	979,507	849,407	1,013,517	71,637	75,272	1,772,682	2,068,296	16.7%
APR	825,510	925,270	839,353	936,449	62,214	69,035	1,727,077	1,930,754	11.8%
MAY	783,406	908,586	789,515	914,435	57,810	69,422	1,630,731	1,892,443	16.0%
JUN	855,396	1,000,737	786,732	917,402	64,833	69,731	1,706,961	1,987,870	16.5%
TOTAL	4,998,965	5,692,003	5,010,749	5,713,319	404,429	431,949	10,414,143	11,837,271	13.7%

2,400,000
2,000,000
1,600,000
1,200,000
800,000
400,000
0

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Passengers in Millions

1st half Passenger Mvt 2004 - 2005

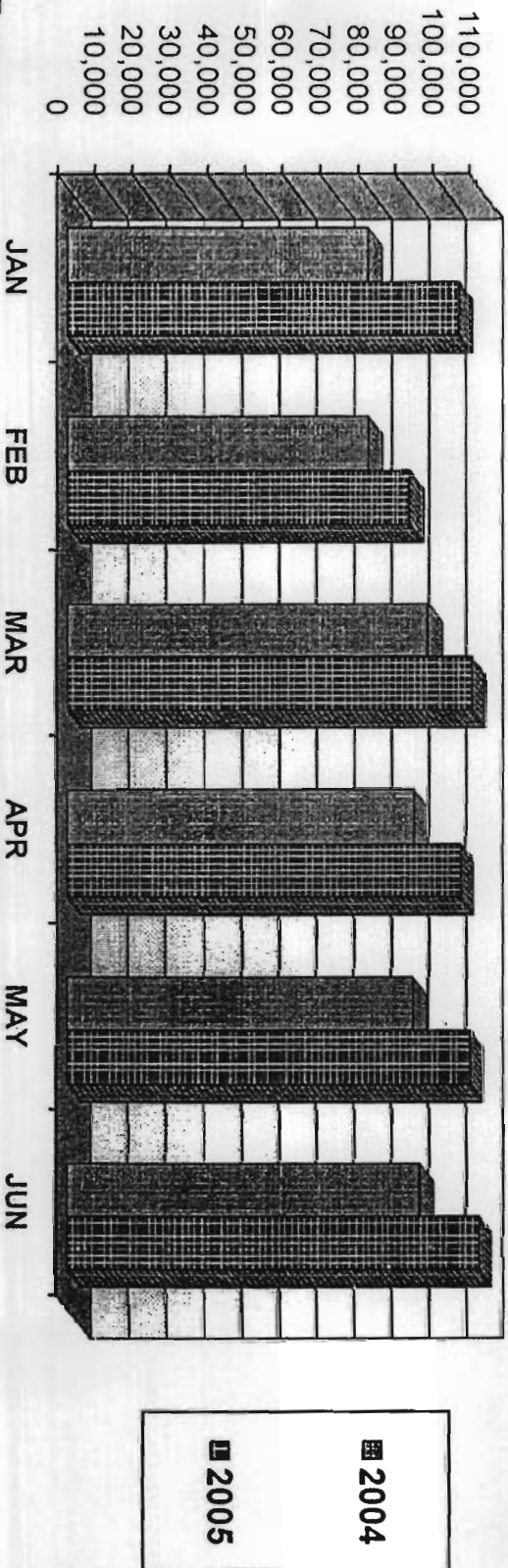
Cargo Movement

Govt. of Dubai
Department of Civil Aviation
Cargo Movement 2004 - 2005 (2nd Quarter)

Month	Uplifted		Discharged		Total (Tonnes)		% inc/dec
	2004	2005	2004	2005	2004	2005	
JAN	37105	48,840	42931	55,415	80,036	104,255	30.3%
FEB	37229	42,574	42878	48,527	80,107	91,101	13.7%
MAR	45148	49,989	50938	57,861	96,086	107,850	12.2%
APR	42870	48,720	49736	56,316	92,606	105,036	13.4%
MAY	41781	49,468	50514	58,019	92,295	107,487	16.5%
JUN	42774	51,444	51308	59,041	94,082	110,485	17.4%
TOTAL	119,482	141,403	136,747	161,803	535,212	626,214	17.0%

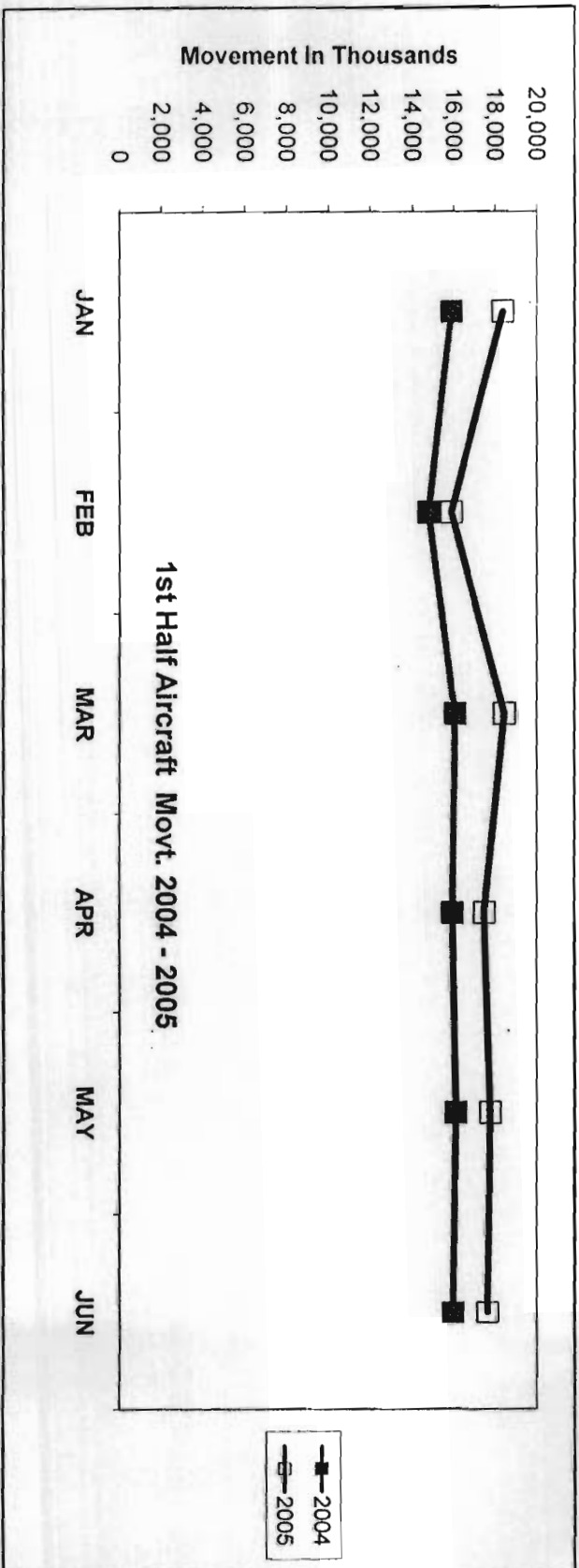
* including mail

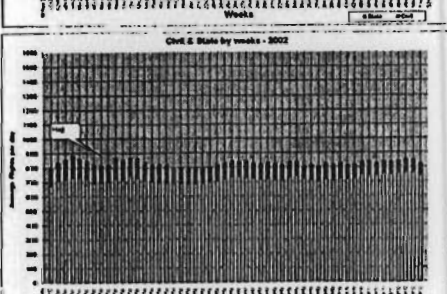
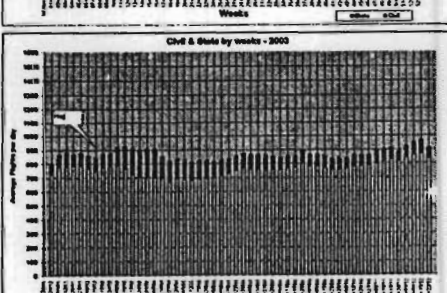
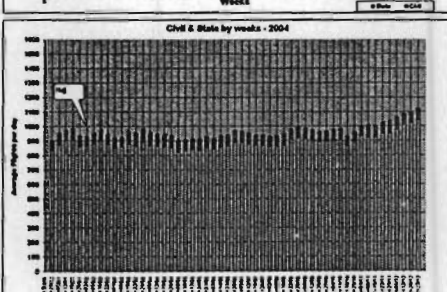
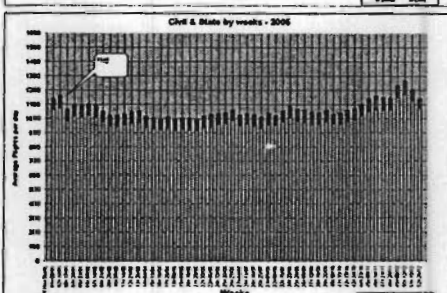
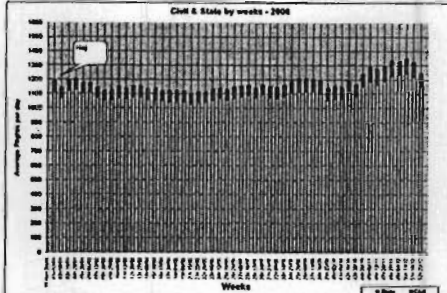
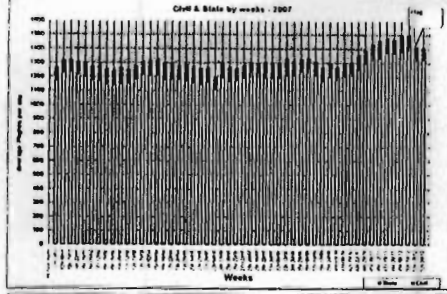
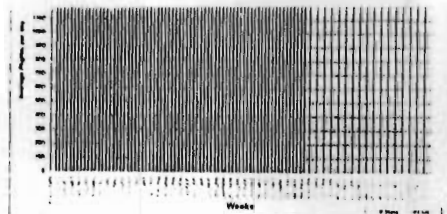
Cargo in Tonnes



Aircraft Movement

Month	Scheduled		Non-Scheduled		Military		Total		% Inc/dec
	2004	2005	2004	2005	2004	2005	2004	2005	
JAN	13218	15,023	2,271	2,914	405	451	15,894	18,388	15.7%
FEB	12,393	13,060	2,003	2,413	395	422	14,791	15,895	7.5%
MAR	13,555	15,139	2,141	2,805	375	511	16,071	18,455	14.8%
APR	13,452	14,634	2,067	2,326	427	528	15,946	17,488	9.7%
MAY	13,754	14,985	1,975	2,273	380	520	16,109	17,778	10.4%
JUN	13,626	14,874	1,929	2,300	429	468	15,984	17,642	10.4%
TOTAL	79,998	87,715	12,386	15,031	2,411	2,900	94,795	105,646	11.4 %





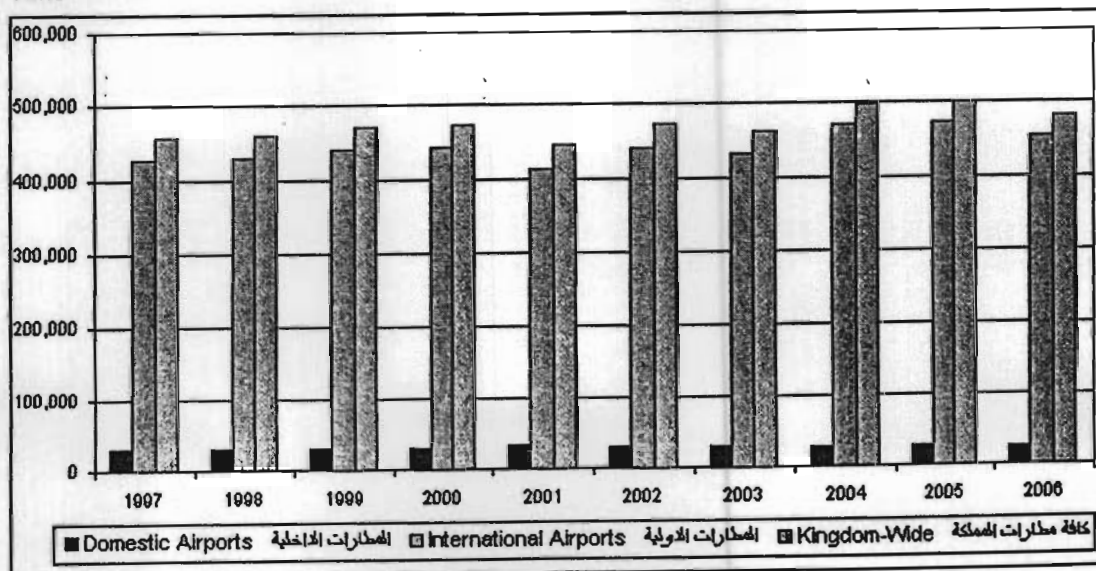
إجمالي حركة الشحن الجوي والبريد في كافة مطارات المملكة

الوصول والمغادرة لعام 1417هـ - 1426هـ (بالأطنان)

Total Cargo Traffic Kingdom-Wide
Arrival + Departure for 1997 - 2006 (metric tons)

Year	المطارات الداخلية Domestic Airports	المطارات الدولية International Airports	كافة مطارات المملكة Kingdom-Wide	السنة
1997	29,449	427,313	456,762	1417هـ
1998	30,096	428,623	458,719	1418هـ
1999	30,685	439,488	470,173	1419هـ
2000	30,772	442,747	473,519	1420هـ
2001	32,525	413,984	446,509	1421هـ
2002	31,519	441,100	472,619	1422هـ
2003	29,283	432,231	461,514	1423هـ
2004	27,440	471,047	498,487	1424هـ
2005	28,538	472,786	501,324	1425هـ
2006	26,026	455,229	481,255	1426هـ
% Change 2005-2006	-8.80	-3.71	-4.00	نسبة التغير السنوية 1426 - 1425هـ

Cargo in Tons



إجمالي حركة المسافرين في مطار الملك عبدالعزيز الدولي

الوصول والمغادرة لعام 1417هـ - 1426هـ (بالآلاف)

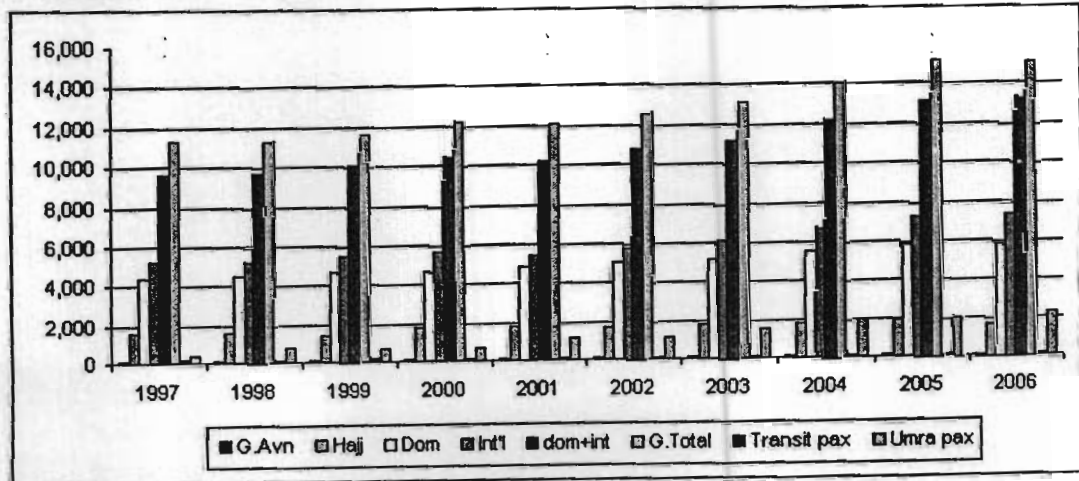
Passenger Traffic at King Abdulaziz International Airport
Arrival + Departure for 1997-2006 (in thousands)

Year	Scheduled & Non Scheduled			General Aviation	Hajj Pilgrims	Grand Totals	* Umra Passenger	Transit Passenger	السنة
	Domestic	International	Totals						
1997	4,381	5,255	9,636	73	1,613	11,322	353	152	→ 1417-18
1998	4,462	5,254	9,716	66	1,550	11,332	716	133	→ 1418-19
1999	4,656	5,493	10,149	64	1,368	11,581	698	147	→ 1419-20
2000	4,717	5,748	10,465	65	1,734	12,264	691	138	→ 1420-21
2001	4,823	5,414	10,237	72	1,781	12,090	1,162	131	→ 1421-22
2002	5,050	5,799	10,849	76	1,713	12,638	1,167	96	→ 1422-23
2003	5,102	6,146	11,248	77	1,818	13,143	1,490	113	→ 1423-24
2004	5,504	6,753	12,257	83	1,762	14,102	1,932	134	→ 1424-25
2005	5,903	7,336	13,239	88	1,857	15,184	2,060	98	→ 1425-26
2006	5,835	7,430	13,265	109	1,718	15,092	2,256	92	→ 1426-27
% chg 2005-2006	-1.15	1.28	0.20	23.86	-7.49	-0.61	9.51	--6.12	نسبة التغير المئوية → 1426 - 1425

* إحصائيات العمرة ضمن المجموع الكلي

عدد المسافرين بالآلاف

Passengers in Thousands



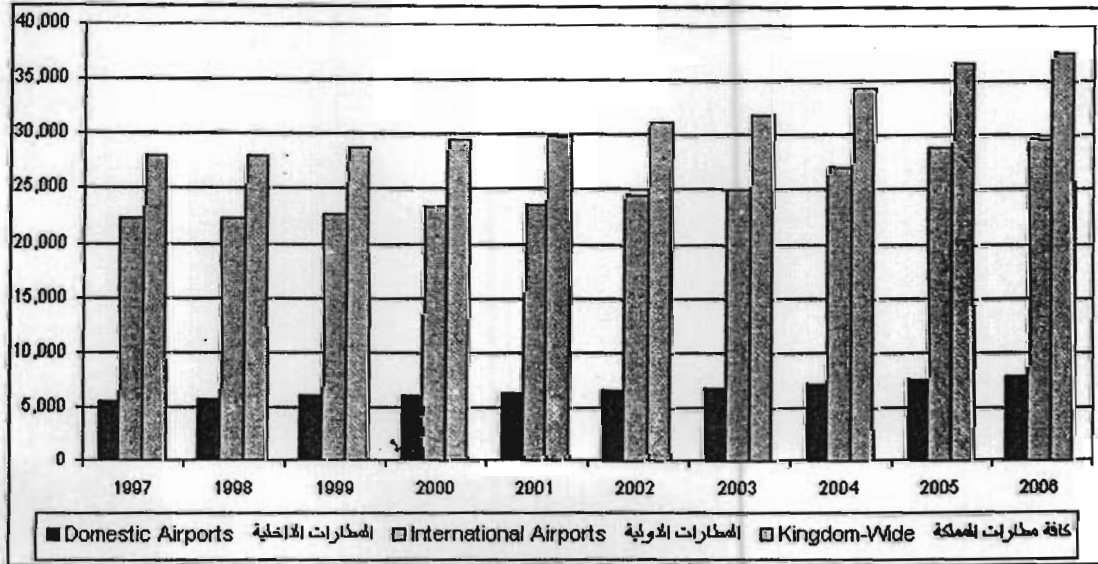
إجمالي حركة المسافرين في كافة مطارات المملكة

الوصول والمغادرة لعام 1417هـ - 1426هـ

Total Passenger Traffic Kingdom-Wide Arrival + Departure for 1997-2006

Year	المطارات الداخلية Domestic Airports	المطارات الدولية International Airports	كافة مطارات المملكة Kingdom-Wide	السنة
1997	5,609	22,335	27,944	1417هـ
1998	5,661	22,364	28,025	1418هـ
1999	6,016	22,725	28,741	1419هـ
2000	6,150	23,382	29,532	1420هـ
2001	6,290	23,531	29,821	1421هـ
2002	6,631	24,439	31,070	1422هـ
2003	6,748	25,097	31,845	1423هـ
2004	7,246	27,015	34,261	1424هـ
2005	7,628	28,982	36,610	1425هـ
2006	7,964	29,679	37,643	1426هـ
% Change 2005-2006	4.41	2.40	2.82	نسبة التغير السنوية 1426 - 1425هـ

Passengers in Thousands



Interview

Assistant Director General, Director of Systems Engineering Division of Saudi Air Navigation Services Eng. Hazim A. Abudawd.

Q: The new technology of air navigation; Free flight, automation of many operations, and Deregulation of civil aviation industry; conversion to the privatization, competition, globalization, integrating of trade markets including air transportation agreements of WTO and Open skies agreements. All these factors create a new uncertain environment facing air navigation services providers around the world; this new environment will create new challenges and opportunities. As you know sir, Middle East is one of world's fastest moving economies; with increasing airline liberalization that cause an increasing of traffic and passengers movement and continued investment in the aviation sector, society demands safe and efficient Air Traffic Management throughout the Middle East. As you sir one of high level management and decision maker in Saudi air navigation Services would you please give your view about this new fundamental changes in air navigation services industry? First, would you please give your viewpoint about the strategic impacts of the new system of air navigation (the global navigation satellite system (GNSS), which a key element in the CNS/ATM system) on Air navigation services providers around the world and on Saudi Air Navigation Services?

A: In GACA We have developed a ten-year strategic plan where we addressed all the issues that we need to work on and improve on and this strategy produces initiative

project that we need to undertaken the next ten years. Of course they have different priority different time frame.

From the technology point of view here in GACA we have implemented and planning to implement several project regarding new technology. First of all, on GNSS we are currently have a contract to implement GNSS monitoring in the kingdom and introducing GNSS, GPS Non-Precision Approaches in the kingdom airports and we are installing monitoring station to do monitoring recording, alerting to the controller to the pilot regarding the help of GPS. On the same subject also, we were talking to the European to extend the EGNOS¹ to the area to “our region” the Arabian Peninsula, and this is also one of the strategic projects that we are pursuing to introduce again in GNSS augmentation in the region.

One of the challenges really when it comes to new technology it has to be done in a regional framework. It's not a single state decision like the old tradition air navigation system; you install ILS² here or VOR³ there and so forth. So, you have to do like “GNSS augmentation” regional solution and this has to be done again with all the states “neighboring states” in time frame, funding and so forth. Also Operation, legal, errors, really new issues have to be addressed in this environment. It is not like the old system. And by the way we speaking about this , we are hosting the final study that done of this

¹ EGNOS is (European Geostationary Navigation Overlay Signal)

² The Instrument Landing System (ILS) is a ground-based instrument approach system that provides precision guidance to an aircraft approaching a runway

³ VOR, short for VHF Omni-directional Radio Range, is a type of radio navigation system for aircraft.

“En Sha Allah” after December in the kingdom⁴ with all neighboring states to present to this study that will be made jointly with the European. So this is when it comes to GNSS, also new technologies in surveillance we’re introducing ADS-B⁵, also we introduce ADS-C⁶ in our new automation system. We are also introducing a new project where we are implementing wide area multi-allocation. And also we’re introducing the advanced service monitoring guiding system in Jeddah and Dammam’s airports. In ATM⁷ also we’re installing new ACC⁸, it has lots of safety, lots of automation tools to enable direct routing, to enable controller to provide flexible use of air space. We’re not close to free flight concept yet; it needs long time to come. But, at least we’re providing the tools to the controller to enable to have an optimized air space with all the safety net required in order ensuring flexible use of air space.

Talking also about air space we’re doing a workshop. within air space modeling with air service of Australia to optimize our air space route instruction, and we’re hosting a workshop with the military flying to work about a solution around restricted area that the kingdom air space to optimize the air space and to minimize Zigzagging airways and so forth. In Communication area we’re introducing also VDL mode 2 in the kingdom air

⁴ kingdom of Saudi Arabia is hosting the first CANSO Middle East ANSP Conference from 26 – 28 January 2009

⁵ ADS-B is an Automatic Dependent Surveillance - Broadcast

⁶ ADS-C is an Automation Dependent Surveillance- Contract

⁷ ATM is Air Traffic Management.

⁸ ACC is an Area Control Center also known as a Center, is a facility responsible for controlling instrument flight rules aircraft en route in a particular volume of airspace (a Flight Information Region) at high altitudes between airport approaches and departures

space with SITA⁹ and we're introducing so of the FANS packages CPDLC¹⁰ and Digital-ATIS¹¹. All these new technology either have been done or will be done in the near future.

Q: Actually, the satellite system will bring a lot of improvement, but what about the challenges, what are the challenges facing Saudi Air navigation Services to apply this technology and what ANS do to adopt and face these challenges?

A: When it comes to satellite navigation, there are a lot of issues. Really Now, the only service available is through the American system GPS. There are a lots of institutional issues unresolved Right now, there is the question of the liability, the question of guarantying service. There is nothing that exists. So, many countries where are same in Saudi Arabia are very uncertainty to approve such a system without the safe card, that's why Saudi Arabia is really by introducing only non- Non-Precision Approaches with monitoring capability ensure that the system is at least monitored and record alert will be generated if anything goes wrong, Because the service is not provided by the service provider. That's why we're trying to support and even join Galileo¹² program which is more of international system and there is allowance for international participation. We

⁹ The SITA implementation of VDL Mode 2 services throughout Western Europe was initially driven by the increased bandwidth demanded by Aeronautical Operational Control (AOC) applications. The VDL Mode 2 deployment is now being further driven by the Link2000+ programme and has resulted in total VDL Mode 2 service coverage throughout Western Europe above flight level 245.

¹⁰ controller pilot data link communications (CPDLC) is envisioned to evolve into digital messaging that takes on an ever increasing role in controller to pilot communications

¹¹ Digital Automatic Terminal Information Service (D-ATIS) from runway and taxiway instructions, to information on avionics equipment, frequency outages, and local weather conditions, pilots can obtain ATIS messages worldwide with high reliability, at any time, using ARINC's Digital Automatic Terminal Information Service (D-ATIS).

¹² Galileo is a global navigation satellite system currently being built by the European Union (EU) and European Space Agency (ESA).

already have initiated talks with the European to join Galileo and to become a full member in the Galileo consultation.

The issue of liability, institution, control, monitoring and ownership is the major issue that has to be addressed in order forings satellite navigation to become usable everywhere in the world.

Q: The strategic location of Saudi Arabia and the Hajj period give ANS comparative advantages would you please give your strategic viewpoint about what ANS should do to optimize this comparative advantage and to improve the air traffic and put ANS in strong competition position in the future?

A:GNSS would give a much flexible procedure that will it allow airspace user to optimize their flight to minimize taking a longer flight that is not as lead in order to capture ILS and VOR signal support. So, GNSS is looked at to introduce more flexibility to air space user when it comes to landing procedure or to for routing procedure.

So, we want to introduce those services but again the institutional issue really has to be resolved. Right now, if you utilize GPS for example, utilization in airspace country is liable, if something happens due to wrong signal information, the country liability because it authorizes the procedure if the airspace is liable.

So, there are lots of institutional issues that need to be addressed before ready airspace users and airspace service providers can benefit from such a system.

Q: Okay, what about the privatization, would you please give your viewpoint about the challenges facing ANS to apply the privatization?

A: Privatization is a long process, it is very difficult to do it “to be done” in short period of time, from history, some states with this work done it resulted some negative aspects, so, in Saudi Arabia we’re planning to transit to this at low speed the plan to become air navigation in the kingdom to have company-structure type under GACA in the next three-four years after that, also moving toward complete independent company.

Privatization really brings lots of benefits bring lots of flexibility and change the way organizations think and support. The privatization focus again on customer, type of environment is unlike government environment. Organization focus on objectives really is changed hopefully improved and become more efficient organization. You’re privatize you have more flexibility unlike when it is a government agent.

Q: do you think sir Saudi air navigation services lags behind the rest of the world in the privatization, and the process of it very slow some countries had done privatization 10 years ago. For example, NAV Canada did it in 1997, and.....

A: and they did it in very short time; I think in less than two years, in Egypt, they did it in less than one year. In NAS it took maybe a bit longer. But, really we see maybe one year or two years it can be done of course but it resulted in negative aspect.

If it’s done slowly and surely reaching some objectives, we think it’s much better process

Unfortunately, different country has different way of doing business.

Even like United States still hundred percent under government. But in NAS Company they want all the way and even share in the stock market. So, different company has different way in doing privatization process. Here we see that it can be one hundred percent government own but in a company structure.

Q: Okay, may be sir the culture work of Saudi organization has affected the process of privatization?

A: It has to do really with creating your own structure and make sure your fund, revenue cover your cost. At least, you can be standing on organization; you don't depend on government funding. There are lots of things need to be done to improve and change from government environment to private environment.

Q: Okay, sir what about the deregulation of aviation, would you please give your strategic viewpoint about the advantages and disadvantages of open-skies agreement on Saudi air navigation service?

A: Advantages of course provide airspace user with freedom to schedule their flight whenever they want wherever they want and give them flexibility to meet their customers' needs. From our point of view this will help us of course to increase our customers base on this generate more revenue. That's an advantage from financial point

view. Maybe one of the disadvantages, that big traffic volume trying to come in the optimal hours and this would create work load on the operational side, and also the airport side. So, we will have a big period where everybody wants to come in this time frame and leave in that time frame and this is maybe happening in European airspaces or other countries. But, I think with proper coordination and management it can be managed.

There are lots of advantages for t open-skies agreements and I fully support such a direction.

Q: Automation of many operation and conversion to the privatization affect the human elements in air navigation service. Would you please give your viewpoint about a strategic plan should be applied to human resource to face the new fundamentals change in air navigation industry?

A: Really this is a key issue to make sure of your Human resources. Because they are the resources can carry out the work and implement the plan. So, without proper planning, proper coaching, recruiting, the plan cannot be implemented.

So, really I personify Human beings as the most important asset for air navigation.

For organization to move forward, they need to make sure their human resources are very well trained, very well prepared and informed and ready to move the organization to the new direction. So, the strategic issue, how much are we doing in here in GACA I don't think we're doing enough always we need to improve.