SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
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School of Mechanical

Department of Aeronautical Engineering

UNIT- I – AVIATION MANAGEMENT - SAE1403

1.1 Introduction

The term aviation was coined by a French pioneer named Guillaume Joseph Gabriel de La Landelle in 1863. It originates from the Latin word avis that literally means bird. Aviation means all the activities related to flying the aircraft.Aviation management involves managing the workflow of airline, airport, or other businesses pertaining to aviation or aerospace industry by carrying out the day-to-day operations of an airport or an airline.The Ministry of Civil Aviation (MoCA) of Government of India is responsible to formulate policies and programs to develop and regulate civil aviation, and to implement the schemes for expanding civil air transport. It also oversees airport facilities, air traffic services, and air carriage of passengers and goods. An Indian regulatory body for civil aviation named The Directorate General of Civil Aviation (DGCA) is under the MoCA. This directorate investigates aviation accidents and incidents.

The following are some most important factors that drive civil aviation:

- The Low Cost Carriers (LCCs), modern airports
- Emphasis on regional connectivity
- Foreign Direct Investment (FDI) in domestic airlines
- Advanced information technology (IT) interventions

In May 2016, domestic air passenger traffic rose 21.63 per cent from 7.13 million to 8.67 million as compared to the traffic in May, 2015. In March 2016, total numbers of flights at all Indian airports are recorded as 160,830; which is 14.9 per cent higher than the flights of March 2015.According to the reports of the Centre for Asia Pacific Aviation (CAPA), by FY2017, Indian domestic air traffic is expected to cross 100 million passengers compared to 81 million passengers in 2015. According to CRISIL's reports, the airlines of India are expected to record a collective profit of INR 8,100 crore (US$ 1.29 billion) in year 2016.

Hindustan Aeronautics Limited (HAL), a government-owned corporation based at Bangalore, Karnataka, is an Indian giant that is governed by Ministry of Defence (MoD). It is involved in manufacturing and assembly of aircraft, navigation, and allied communication equipment. It also governs airports operations.HAL works in collaboration with numerous international aerospace agencies such as Airbus, Boeing, Sukhoi Aviation Corporation, Israel Aircraft Industries, RSK MiG, Rolls- Royce, Dassault Aviation, Indian Aeronautical Development Agency, and the Indian Space Research Organization (ISRO).

Airline includes its equipment, routes, operating personnel, and their management. Airline provides a regular service of air transport on various routes. It is responsible for booking the tickets for the prospective passengers, taking care of the passengers and their luggage during transit, and transporting them safely to their destination. As the types of duties required to be done are multifold, the airline business is always working round the clock.

An organization that owns and operates many aircrafts, which are used for carrying passengers and cargo to different places.The world's first airline named DELAG established on 16th November, 1909. An airline business can be of various sizes and the ownership also varies. For

example, it can be privately owned, jointly owned, or publicly owned. It also can be as small as a Domestic or as large as an International airline.

1.2 Organizational Structure of an Airline

Airline, as any other business calls for teamwork from its personnel. As we see in the diagram given below, there are various responsibilities the airline staff needs to carry out and the structure is indeed like that of a big elephant.

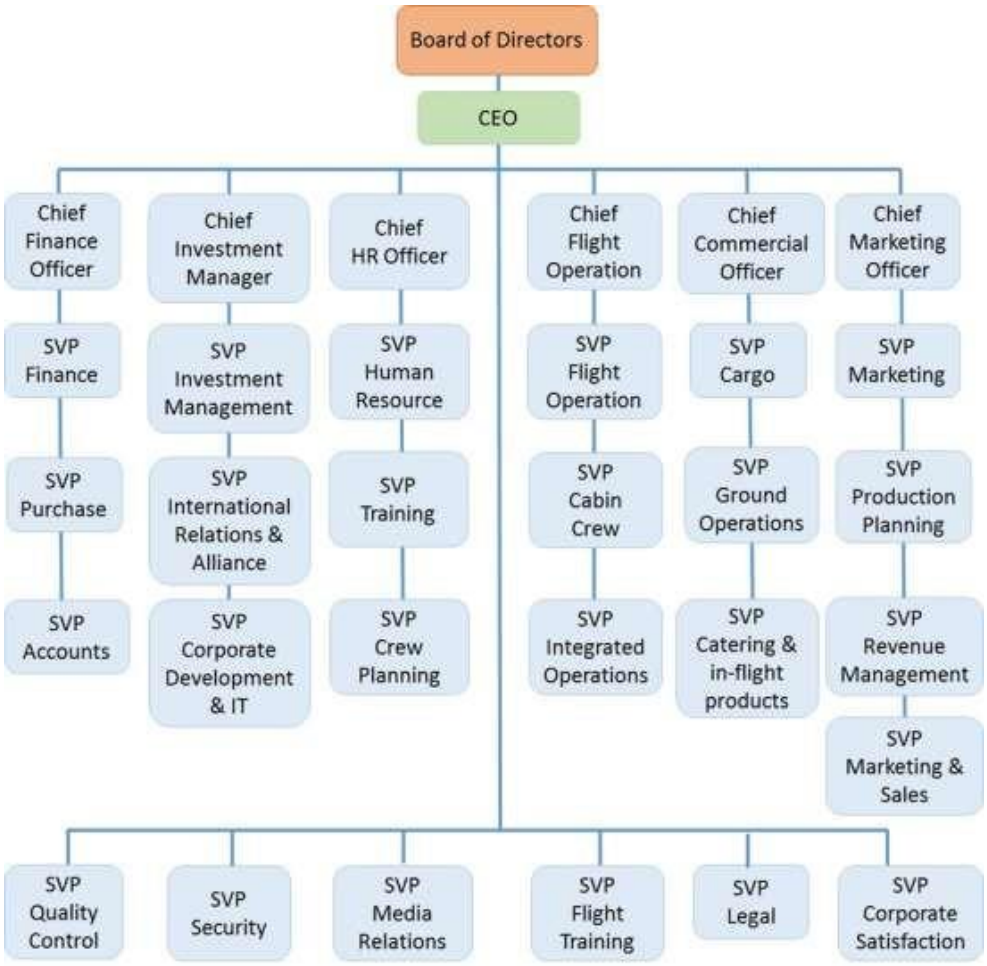

Fig1.1 Organizational Structure of an Airline

1.2.1 Cockpit Positions in Flight

- **Pilot:** The highest ranking member of the aircrew, designated as Pilot-in- Command.
- **First Officer:** He is a pilot who is not the chief pilot.
- **Second Officer:** He works as a relief pilot and also performs selected duties.
- **Flight Engineer:** He is responsible for flight systems and fuel. Today, the position is diminished and his position is typically crewed by a dual-licensed Pilot and Flight Engineer.
- **Airborne Sensor Operator:** He gathers information from airborne platforms.

1.2.2 Cabin Positions in Flight

- **In-Flight Service Manager:** This manager is a team lead of the rest of the cabin crew.
- **Flight Attendant:** They are responsible for assisting the passengers and their safety.

- **Flight Medic:** A Para-medic officer employed on flying ambulance.
- **Loadmaster:** For cargo aircrafts, he is responsible to load the goods and check the weight and balance before and after the loading.

1.3 INDIAN AVIATION SECTOR

The Indian aviation sector can be broadly divided into the following main categories:

1. **Scheduled air transport service:** It is an air transport service undertaken between two or more places & operated according to a published timetable. It includes: Domestic & International Airlines.
   - Air Deccan,
   - Spice Jet,
   - Kingfisher Airline &
   - Indigo
2. **Non-scheduled air transport service:** It is an air transport service other than the scheduled one & may be on charter basis. The operator is not permitted to publish time schedule & issue tickets to passengers.
3. **Air cargo services:** It is an air transportation of cargo & mail. It may be on scheduled or non-scheduled basis. These operations are to destinations within India. For operation outside India, the operator has to take specific permission of Directorate General of Civil Aviation demonstrating his capacity for conducting such an operation.
4. **Apart from this, the** players in aviation industry can be categorized in three groups:
   - Public players : Air India, Indian Airlines
   - Private players : Jet Airways, Air Sahara, Kingfisher Airlines, Spice Jet, Air Deccan
   - Start up players: Omega Air, Magic Air, Premier Star Air & MDLR Airlines.

1.4 Airport Authority of India(AAI)

The Airport Authority of India (AAI) is a public authority that provides Air Navigation Service (ANS) at the airports. It works under the Ministry of Civil Aviation (MoCA) to build, upgrade, maintain, and manage civil aviation infrastructure in India.

The Indian government formed this organization in April 1995 by merging two organizations: One, International Airports Authority of India (IAAI) that was founded in 1972 to manage the nation's international airports and two, the National Airports Authority (NAA) that was formed in 1986 to look after domestic airports.

The major roles of AAI include:

- To provide communication, navigation, and surveillance systems (CNS).
- To provide Air Traffic Management (ATM) service in Indian airspace and adjoining oceans.
- To manage all the Indian airports.
- To ensure the safety of the airports and aircrafts.
- To provide calibration of navigational aids in the flights of Indian Air Force, Indian Navy, Indian Coast Guard, and private airfields in India.
- To provide passenger facilities and information system at the passenger terminals at airports.

1.4.1. Airports in India

Airports in India are managed by the Airports Authority of India (AAI) under the Ministry of Civil Aviation is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India. It provides Air traffic management(ATM) services over Indian airspace and adjoining oceanic areas.

1.4.2. Category of Airport:

- Total 125 Airports
- 18 International Airports,
- 7 Customs Airports,
- 78 Domestic Airports and
- 26 Civil enclaves at Military Airfields

Table 1 List of Some Important Airport:

No	STATE	CITY	AIRPORT NAME
1.	**Andaman & Nicobar Islands**	**Port Blair**	**Veer Savarkar International Airport**
2.	**Andhra Pradesh**	**Visakhapatnam**	**Visakhapatnam International Airport**
3.	**Assam**	**Guwahati**	**Lokpriya Gopinath Bordoloi International Airport**
4.	**Bihar**	**Gaya**	**Gaya International Airport**
5.	**Delhi**	**New Delhi**	**Indira Gandhi International Airport**
6.	**Goa**	**Goa/td**	**Goa International Airport/Dabolim Airport**
7.	**Gujarat**	**Ahmedabad**	**Sardar Vallabhbhai Patel International Airport**
8.	**Jammu & Kashmir**	**Srinagar**	**Srinagar Airport**
9.	**Karnataka**	**Bengaluru**	**Kempegowda International Airport**
10.	**Karnataka**	**Mangalore**	**Mangalore International Airport**
11.	**Kerala**	**Kochi**	**Cochin International Airport**
12.	**Kerala**	**Kozhikode**	**Calicut International Airport**
13.	**Kerala**	**Thiruvananthapuram**	**Trivandrum International Airport**
14.	**Madhya Pradesh**	**Bhopal**	**Raja Bhoj International Airport**
15.	**Maharashtra**	**Mumbai**	**Chhatrapati Shivaji International Airport**
16.	**Maharashtra**	**Nagpur**	**Dr. Babasaheb Ambedkar International Airport**
17.	**Manipur**	**Imphal**	**Tulihal International Airport**
18.	**Odisha**	**Bhubaneswar**	**Biju Patnaik International Airport**
19.	**Punjab**	**Amritsar**	**Sri Guru Ram Dass Jee International Airport**
20.	**Rajasthan**	**Jaipur**	**Jaipur International Airport**
21.	**Tamil Nadu**	**Chennai**	**Chennai International Airport**
22.	**Tamil Nadu**	**Coimbatore**	**Coimbatore International Airport**

23.	**Tamil Nadu**	**Madurai**	**Madurai Airport**
24.	**Tamil Nadu**	**Tiruchirapalli**	**Tiruchirapalli International Airport**
25.	**Telangana**	**Hyderabad**	**Rajiv Gandhi International Airport**
26.	**Uttar Pradesh**	**Lucknow**	**Chaudhary Charan Singh International Airport**
27.	**Uttar Pradesh**	**Varanasi**	**Lal Bahadur Shastri Airport**
28.	**West Bengal**	**Kolkata**	**Netaji Subhash Chandra Bose International Airport**

1.5 THE DGCA

The Directorate General of Civil Aviation (DGCA) is the Indian governmental regulatory body for civil aviation under the Ministry of Civil Aviation. This directorate investigates aviation accidents and incidents.

1.5.1 RESPONSIBILITES & FUNCTIONS OF DGCA

1. Statutory authority responsible for laying down standards and their implementation covering:
   - Airworthiness,
   - Safety and operation of aircraft,
   - Flight crew standards & training,
   - Air transport operations.
2. Licensing of flight crew, aircraft engineers and civil aerodromes.
3. Certification of aircraft operators.
4. Investigation into incidents and minor accidents.
5. Regulation and control of air transport operations.
6. Formulation of aviation legislation.
7. Research and development activities in the field of civil aviation
8. Handling of matters relating to ICAO.

1.5.2. DIRECTORATE OF AIRWORTHINESS (INSPECTION)

- Exercising of airworthiness regulatory control of civil aircraft registered in the country.
- Laying down airworthiness standards.
- Licensing of aircraft maintenance engineers.
- Issue of certificate of registration of civil aircraft.
- Issue and revalidation of certificate of airworthiness of aircraft.
- Approval of firms dealing with manufacture, maintenance and overhaul of aircraft and components.
- Approval and monitoring of quality control standards and procedures of aircraft maintenance.
- Surveillance and spot check on the engineering activities of operators, manufacturers, storage facilities and approved firms.
- Investigation of major defects.
- Airworthiness control of VVIP aircraft.

- Anti sabotage checks and fuel quality control check for VVIP flights.
- Review of service bulletins and airworthiness directives and their compliance.

1.5.3 DIRECTORATE OF AIRWORTHINESS (EXAMINATION)

1. To conduct examinations for issue and endorsement of aircraft maintenance engineers' license, glider maintenance engineers license and basic aircraft maintenance engineers' certificate.
2. To conduct technical examinations for pilots and flight engineers.

1.5.4. TRAINING WING (ENGINEERING)

To impart specialized training to the officers of DGCA in technical fields, to arrange refresher courses for the DGCA officers and to arrange frequent meetings between DGCA officers, pilots, engineers and air traffic control officers to achieve proper coordination and understanding of each others functions and responsibilities.

1.5.5. DIRECTORATE OF TRAINING & LICENSING

- Training of pilots at flying and gliding clubs/institutions/schools including flying subsidy allotment to flying clubs.
- To conduct examinations for various categories of pilot licenses.
- To review medical examination reports of pilots.
- To issue and renew pilots licenses of various categories.

1.5.6. DIRECTORATE OF FLIGHT INSPECTION

- Approval of check pilots, instructors and examiners on various types of aircraft for carrying out periodic proficiency checks of pilots.
- To carry out standardization checks of check pilots/instructors/examiners.
- To conduct random proficiency checks of pilots and monitor their skill.
- Approval of training simulators, flying training programmes, key operational personnel and operations manual.
- Surveillance of various operational aspects of the airlines and operators.

1.5.7. DIRECTORATE OF REGULATIONS AND INFORMATION

- Review and implementation of air services agreements with foreign governments.
- Clearance of schedules of foreign airlines.
- Examination and ratification of international conventions.
- Drafting of bills to implement international convention.
- Rendering of aeronautical information service through issuance of aeronautical information circulars, NOTAMS, AIP and other regulatory publications.
- Amendment of aircraft rules.
- Issuance of various permits under aircraft rules (for example aerial photography, carriage of dangerous goods, dropping of flowers from aircraft etc.).
- Examination of ICAO recommendations.

1.5.8. DIRECTORATE OF AERDROME STANDARDS

- Licensing and inspection of civil airports, civil enclaves, private and state govt. Airfields used for air transport operations.
- To check serviceability of Various Navigational, communication and Landing Facilities, safety services and Proper Maintenance of aerodromes.

1.5.9. DIRECTORATE OF AIR SAFETY

- Investigation of civil aircraft incidents and minor accidents.
- To provide technical experience to courts/committees of inquiry.
- To associate with the investigation of incidents/accidents to Indian registered aircraft abroad.
- To monitor implementation of recommendations made by various courts and committees investigating aircraft incidents.
- Periodic inspection of aerodromes and facilities therein.
- To coordinate implementation of measures to prevent bird strikes to aircraft at all civil airports.
- To monitor action taken reports on safety audits carried out on airlines and aviation agencies.
- To issue air safety circulars, bulletins, posters and publication of annual civil aircraft accident summary.

1.5.10. DIRECTORATE OF RESEARCH & DEVELOPMENT

- Type certification of civil aircraft, engines and components.
- Approval of repairs and modifications of aircraft and components.
- Design and development of prototype light aircraft, gliders and glider launching winches.
- Indigenous development and standardization of aircraft equipment and materials.
- Laboratory investigation of failed components.
- Economic evaluation of civil aircraft.
- Monitoring of air transport data for implementation of laid down requirements.
- Quality control test of aviation fuel.
- Study of aircraft noise and other operational problems.

1.5.11. DIRECTORATE OF AIR TRANSPORT

- Issue and renewal of scheduled and non- scheduled operators permit including agricultural operators.
- Clearance of non-scheduled flights, charter tourist and cargo flights.
- Approval of flight schedules of Indian operators.
- Publication of Indian air transport statistics.

- Study of IATA fare and tariff structure.
- Scrutiny of tariff schedules of carriers for transportation to and from India.

1.5.12. DIRECTORATE OF ADMINISTRATION

- All establishment work of DGCA including creation of posts, filling up of posts, transfers etc.
- Vigilance and disciplinary cases.
- Security arrangements of department.
- Welfare of the employees of the department.
- Budget work.
- Parliament work.

1.6. AIR TRAFFIC MANAGEMENT

The term "air traffic management" (ATM) is generally accepted as covering all the activities involved in ensuring the safe and orderly flow of air traffic. It comprises three main services:

- **Air traffic control (ATC),** the principal purpose of which is to maintain sufficient separation between aircraft and obstructions on the ground to avoid collisions. However, this safety objective must not impede the flow of traffic and must therefore meet the needs of users. Appendix 2 describes how this service is provided in practice, and the division of responsibilities between the various parties involved.
- **Air traffic flow management (ATFM),** the primary objective of which is, again on safety grounds, to regulate the flow of aircraft as efficiently as possible in order to avoid the congestion of certain control sectors. The ways and means used are increasingly directed towards ensuring the best possible match between supply and demand by staggering the demand over time and space; and also by ensuring better planning of the control capacities to be deployed to meet the demand. The Commission communication on congestion and crisis in air traffic is described how this service is performed.
- **Airspace management (ASM),** the purpose of which is to manage airspace -a scarce resource - as efficiently as possible in order to satisfy its many users, both civil and military. This service concerns both the way airspace is allocated to its various users (by means of routes, zones, flight levels, etc.) and the way in which it is structured in order to provide air traffic control services.

1.6.1. The basic ATM functions

Air traffic management comprises two distinct, basic functions - one "regulatory, in a broad sense; and the other "operational". The first of these functions involves setting broad objectives in terms of the safety, quantity, quality and price of the .services to be provided and taking steps to ensure that they are met. It also involves the allocation of airspace to its various users including military users, and all the measures needed to meet a wide range of other policy objectives to do with such issues as environmental protection, town and country planning, national defense and meeting international commitments. The second function is the 'actual provision of services, for reward,

within the regulatory framework provided by the first function. This is a quasi-commercial activity, the safety aspect of which is of course essential.

1.6.2. The participants

These services and functions are the responsibilities of individual countries, which have put in place the necessary organizations and infrastructure by their own. In few cases, two or more countries have used regional organizations to provide some of the corresponding services ' and functions jointly on their behalf ' in Europe EURO CONTROL' s control centre at Maastricht provides air traffic control for the upper airspace of the Benelux countries and Northern Germany under specific agreements between the Agency and the States concerned. EURO CONTROL has also been given responsibility for setting up and implementing a Central Flow Management Unit (CFMU) to provide ATFM over nearly all of Europe. The regulatory framework in which the operational function is provided nevertheless always remains a national prerogative, except when exist "ICAO Standards, which are binding international commitments, or "EUROCONTROL Standards made mandatory by the Community. As a consequence, each State .is almost entirely free to decide the level of service to be provided and the means to be employed for this purpose, with the result that the technology used and the results achieved vary very widely from one country to another, making the overall system less efficient than it should be. To overcome this problem, if only in part, most countries in the world have felt it necessary to develop their international cooperation. They have done so on the basis of the principle of "full and exclusive sovereignty of each country over its own territory, as established in the Chicago convention of.1944 which laid the foundation of the, global system of international air transport.In this context, the International Civil Aviation Organization (ICAO) was set up to define and adopt the common rules - the "ICAO standards" - needed to make the system interoperable so that anyone aircraft could travel anywhere in the world. This organization, which has 184 member countries around the globe, is also responsible for ensuring that the services correspond as closely as possible to the needs of the users by adopting and amending from time to time Regional Air Navigation Plans, including the European Regional Air Navigation Plan. It may, consequently, give certain States responsibility for supplying such services to aircraft crossing international waters.

It is nevertheless a relatively flexible framework, within which it is possible to notify differences from the common rules, while the undertakings given in the Regional Plans are not legally binding. Groups of States have also chosen to cooperate more closely at regional level and, in some cases, to consider actually integrating their national services. It was for this reason that EURO CONTROL was set up in 1960 by an international convention, to provide air traffic control for the entire upper airspace of its Member States. This however, represented too great a transfer of sovereignty for some of the first of its member countries: even before the Convention entered into force, France and the United Kingdom reclaimed control of the whole of their own. airspace, and Germany later largely followed suit. Consequently, EURO CONTROL was given essentially a coordinating role in planning and research, and its Convention was supplemented by a multilateral agreement under which it was given responsibility for collecting route charges.

In parallel' with these developments, and, in, view of the lessons learned from overambitious attempts at integration, ICAO reinforced the existing. mechanisms for cooperation at regional level by setting up the EANPG, 4 which meets once or twice a year as necessary and works more or less continuously on updating and monitoring the European Regional Air Navigation Plan. At a more political level the European Civil Aviation Administrations have established, under the aegis of the Council of Europe, the European Civil Aviation Conference (ECAC)S where they can discuss and co-ordinate their various policies. Up until now, despite the existence and continuing development of its competence in aviation, the Community has no formal status in any of these organizations. It is only involved as an observer, in certain aspects of their work.

1.7. International Air Transport Association (IATA)

Private organization promoting cooperation among the world's scheduled airlines to ensure safe, secure, reliable, and economical air services. Through IATA, local airlines have combined their individual ticketing and reservation networks into a global system that overcomes differences in currencies, customs, languages, and laws. Founded in Hague in 1919 as International Air Traffic Association, it was given the current name in 1945 in Havana and now includes 280 airlines from 130 countries which handle over 95 percent of the world's scheduled air traffic. IATA accredits the travel agents all over the world, except the US where a local organization (Airline Reporting Corporation) provides accreditation. IATA's headquarters are in Montreal, Canada and the executive offices are in Geneva, Switzerland. Not to be confused with International Civil Aviation Organization (ICAO) this is a governmental organization.

During World War II, the air transport industry has been affected very badly at the world level, in general and, in the USA, UK, Germany, India, France and Canada, in particular. As a non-governmental organization, it derived its legal existence from a special Act passed by the Canadian Parliament in December 1945. The IATA closely resembles with the International Civil Aviation Organization in terms of its activities and organizational structure.

1.7.1. IATA Objectives:

As per the Articles of Association of IATA, the main objectives are:

1. To promote safe, regular and economical air transport for the benefit of the people of the world, to foster air commerce and, to study the problems connected therewith;
2. To provide means for collaboration among the air transport enterprises engaged directly or indirectly in international air transport services;
3. To cooperate with the International Civil Aviation Organization and other international organizations;
4. To provide a common platform for travel agencies/tour operators
5. To promote and develop international tourism.

1.7.2. The Organizational Structure of IATA is given below:

- Each air transport enterprise, irrespective of its size, and operation, has a single vote in the

IATA council. Thus, the main source of authority in IATA is its annual general meeting, in which all active members have an equal vote.

- Year-round policy direction is provided by an elected Executive Committee which is subsequently carried out by its Financial, Legal, Technical, Traffic Advisory and Medical Committees.
- Negotiations of fares and rates agreement are carried out through the IATA Traffic Conferences, with separate conferences as regards passenger and cargo matters.
- Members of various IATA Committees are nominated by individual airlines, but these serve as experts in the interests of the entire industry. In the Traffic Conference(s), however, delegates act as representatives of their individual companies.
- While the Executive Committee fixes the terms of reference of these conferences, their decisions are subject only to the review of governments and cannot be altered by any other part of IATA. The organizational structure of IATA is the formal network of performing various types of activities and powers/duties associated with each role in this network
- IATA administration and management is carried out under a Director General who is supported by other executive officers like Treasurer and Financial Director, Secretary, Technical Director, and Traffic Director.
- The main IATA headquarter is in Montreal while Administrative Headquarters of the IATA Traffic Conferences and IATA Clearing House are located in Geneva. The IATA Enforcement Office is in New York and the Regional Technical Offices in London, Singapore, Kenya, USA, and Belgium.
- IATA activities are closely related with operation of the airlines, the airlines charges to the public and the airlines desire to ensure maximum possible convenience and safety to the passengers.
- Every year constant and progressive efforts are taken to simplify and standardize devices, procedures and documentations, within the airlines themselves, and by IATA to streamline growth and progress of airlines business.

1.7.3. Three Broadly Classified Membership of IATA

The membership of the association is classified as under:

1. Active Members:

Any air transport enterprise which has been licensed to operate a scheduled air service under proper authority in the transport of passengers, mail or cargo between the territories of two nations, is eligible to become an active member of the association.
These members have various rights, duties and responsibilities prescribed in the articles of association. Presently, there are more than 275 air transportation companies from 200 countries on the membership register in this category.

2. Associate Members:

- Associate membership is open, to any organization/enterprise operating in Air transport under the Flag of the state and eligible to qualify as member of ICAO is eligible to become associate member of IATA.
- After a period of ninety days, any associate member comes to be qualified for active

membership. However, its associate membership shall be automatically terminated, unless during such period it shall apply to the Executive Committee for transfer to active membership.

- Any member desirous of terminating its membership may do so by giving notice to the Director General. Further, the membership of a member may be terminated by the Executive Committee on following counts but only after due substantiation:

    i. A breach by the member concerned of one or more articles of the association or any regulation;

    ii. Failure by the member concerned to comply with any procedures of the association.

    iii. Adoption of unprofessional and illegal practices.

3. Allied Members:

Allied members are those who after membership can deal with airlines tickets and can use IATA Logo for all purposes. These types of membership are open to travel agencies/ tour operators and those who are selling airline tickets to the general public on behalf of airlines.

Application for the membership in the association must be submitted in prescribed form for the consideration and action of the executive committee and all such applicants can become active, associate or allied members, only after approval of IATA.

However, any organization whose membership application is rejected by the Executive Committee has every right to appear in the next General Meeting of members and the action taken thereat is deemed to be final.

1.7.4. Rules and Conditions, Required to Become IATA Approved Travel Agency / Tour Operator

1. An application for recognition shall be addressed to the Director, Agency Investigation Panel IATA.

2. The application for grant of approval shall be in the prescribed form. The objective of recognition is to promote and develop air transport and tourism industry at global, regional and national level.

3. Travel agency has to be in the business for the last two to three years.

4. The travel/tour company must have professional staff members, qualified from IATA approved institutions.

5. The agency must have financial credibility.

6. The location of the agency must be freely accessible and clearly identified to the tourists.

7. Security for the control of airlines tickets block/stock.

8. Ability to generate business.

9. The travel/tour company granted approval shall be entitled to such rights and privileges as may be granted by the Association from time to time and shall abide by the several terms and conditions of recognition as prescribed by the Association from time to time.

10. The agency must attach audited annual reports with the application form.

11. The agency must attach the statement of International Sales with the application form.

12. The decision of the IATA in the matter of recognition shall be final. The association may refuse to recognize any Travel/Tour company without assigning any reason.

13. The association reserves the right to withdraw at any time, the recognition already granted, without assigning any reason.

14. The recognition granted by the IATA shall not automatically entitle the Travel Agency/ Tour Operator to be approved by any other organization/association.

1.7.5. IATA FACT SHEETS

IATA fact sheets present up-to-date key facts and figures related to Air Transport Industry issues such as.

- IATA Agency Program
- IATA Financial Services

1. **Industry Statistics**
   - Fuel
   - Economic and Social Benefits of Air Transport
   - Industry Facts and Statistics
   - Aviation Charges, Fuel Fees and Taxes
2. **Safety & Security**
   - Safety
   - Security
   - IATA Safety Audit Programs (IOSA / ISSA / ISAGO)
   - Cargo Security
   - Cyber Security
   - Lithium Batteries
   - Remotely Piloted Aircraft Systems (RPAS)
   - Public Health Preparedness
   - Volcanic Ash
3. **Environment**
   - Climate Change
   - Green Taxation
   - Alternative Fuels
   - Technology Roadmap
   - Night flights
4. **Policy**
   - European Airspace Strategies
   - Unruly passengers
   - Wildlife
   - MC99
   - Airport Privatization
   - Smarter Regulation

- Airport Slots

5. **Innovation**
   - New Distribution Capability (NDC)
   - ONE Order
   - ONE Record
   - ONE iD
   - Fast Travel
   - e-freight and the e-Air Waybill
   - RFID & Bag Tag Initiative

1.7.6. IATA Committee's

1.7.6.1. CARGO COMMITTEE

The Cargo Committee shall act as advisor to the Board of Governors, the Director General, IATA management and other relevant IATA bodies on all air cargo industry policy issues and develop, enhance and prioritize policies/guidelines/positions/action plans to resolve such issues. Areas of activity include:
(i) Cargo Security and Safety
(ii) Cargo technology and automation
(iii) Cargo handling
(iv) Cargo trade facilitation
(v) Cargo-related regulatory development
(vi) Cargo Distribution/CASS
(vii) Agent / carrier relations

1.7.6.2.ENVIRONMENT COMMITTEE

The Environment Committee shall act as advisor to the Board of Governors, the Director General, and other relevant IATA bodies on environmental matters and act as the focal point in IATA on environmental issues. Specifically, the Environment Committee shall:
(i) Monitor, assess and respond to environmental developments, policies and regulations of concern to IATA Member airlines
(ii) Develop and recommend common industry positions on environmental issues
(iii) Advise and, as necessary, implement strategies to promote IATA positions with regulatory bodies and stakeholders
(iv) Develop and adopt non-binding best practices on environmental issues.

1.7.6.3.FINANCIAL COMMITTEE

The Financial Committee shall act as advisor to the Board of Governors, the Director General, and other relevant IATA bodies on IATA's industry financial services and activities connected with international air transport. The Financial Committee shall advise IATA management on development of industry financial positions, IATA priorities, strategy, objectives, and policy implementation for industry financial matters, and promote campaigning, particularly in the following areas:

(i) Industry Financial Strategy: Industry challenges and trends impacting the airline financial community
(ii) Industry Financial Services and Settlement Systems
(iii) Industry Financial Standards and Services that support airlines' financial processes
(iv) Industry External Charges and Cost Management
(v) Industry risk management

1.7.6.4.INDUSTRY AFFAIRS COMMITTEE

The Industry Affairs Committee shall act as advisor to the Board of Governors, the Director General, and other relevant IATA bodies on all industry affairs and aero-political matters connected with international air transport. It should identify future trends that could have a significant impact on our industry and recommend IATA establishes necessary work programs related to identified risks and opportunities.
The Industry Affairs Committee shall develop industry positions, supervise policy implementation, and promote campaigning, particularly in the following areas:
(i) Customer service, including passenger and airport services
(ii) Facilitation
(iii) Governmental, intergovernmental and other air transport policy including taxation
(iv) Distribution
(v) Slots and related Infrastructure issues
(vi) Multilateral interlining
(vii) Promotion and enhancement of competition within the aviation industry and of its overall competitiveness

1.7.6.5.LEGAL COMMITTEE

The Legal Committee shall act as advisor to the Board of Governors, the Director General, the General Counsel and other IATA bodies on legal and compliance matters affecting member airlines or IATA. The Committee shall:
(i) identify opportunities for IATA to act as an advocate for the air transport industry by participating in judicial, regulatory, and legislative proceedings;
(ii) remain apprised of IATA's strategic objectives and Board-monitored activities and seek opportunities to advance them through the tools available to lawyers;
(iii) provide advice to, or coordinate with, IATA Legal Services in obtaining from outside legal resources advice on legal and regulatory issues of interest to the air transport industry;
(iv) liaise with member airlines' in-house counsel, other IATA Industry Committees, and other industry associations on matters relating to the air transport industry;
(v) identify, recommend and approve to the General Counsel, based on one or more of the following criteria, which issues should be litigated, or where IATA should intervene before courts, tribunals, or regulatory bodies, on an industry wide basis or through a smaller group of airlines.
(vi) in conjunction with the General Counsel, advise which law firm(s) should be representing the interests of IATA in industry or regional matters;
(vii) provide recommendations for the following year's Industry Litigation budget for approval by the Board of Governors and review periodically the development of the Industry Litigation budget for any necessary changes or adjustments as the case may be;

(viii) advise on the legal and compliance aspects of IATA Conference issues and services operated by IATA on behalf of the industry;
(ix) develop best practices and templates for legal and compliance issues affecting the industry;
(x) advise IATA on matters related to the development of international law; and
(xi) take any other action relating to industry legal affairs which is considered necessary and appropriate.

1.7.6.6.OPERATIONS COMMITTEE

The Operations Committee shall act as advisor to the Board of Governors, the Director General, and other relevant IATA bodies on all matters that relate to the improvement of safety, security and efficiency of civil air transport. This will include, but not be limited to matters that relate to:

(i) airline safety
(ii) flight operations, ground operations, and global air traffic management
(iii) engineering and maintenance
(iv) security
(v) aviation infrastructure

1.8. INDIAN AVIATION SECTOR

Indian aviation sector is growing at an accelerating rate and the country is getting the benefits of its improved connectivity. Since its inception the sector has seen many changes. The vast geographical coverage of the country and its industrial growth makes the aviation sector more meaningful. The rising working group and economic improvement of Indian middle class is also expected to boost the growth of the sector further. As a result of this growing demand the Government of India is planning to increase the number of airports to 250 by 2030.This improvement in infrastructure has happened to be as a result of improved business and leisure travel. The major requirement of the aviation sector is development of ground infrastructure. The Government of India has planned to invest approximately US$12.1 billion, out of these private investment is in the tune of US$9.3 billion.

Private investment is one of the important components to develop the ground infrastructure. It is not possible for the government to develop a robust nature like this without the help of private players. More importantly the private players have the expertise to develop a technology enabled airport which is the need of the hour. Another area which now a days the government is also focusing is to create green airport to reduce the environmental impact. To improve the participation of private players, the government has decided to increase the FDI upto 49% through automatic route in case of air transport. Thus, the sector which was mainly dominated by the government agencies now is going hand in hand along with the private players. The increased competition in the market helps to improve the on air as well as ground services

Growth of Indian aviation sector Indian aviation sector has a long history and moved from private sectors to government sector then again in the hand of both government and private sectors. With every passing year, the sector witnessed significant improvement in the movement of traffic in both the passenger and cargo segment. According to India Brand Equity Survey Report, 2017 India stands at 9th position in terms of market size. During the financial year 2017, the country

witnessed 21.5% improvement in domestic passenger traffic. If this is the growth rate, the sector is expected to become 3rd largest aviation market in the world by 2020.

With the increase in standard of living and introduction of economy class the passenger's preference also changed dramatically. Earlier airlines being used by class people only. Now a days the trends changed and now the mass people also able to travel in airlines. This is being reflected with the number of increase of passenger's volume. In 2015-16 the domestic passengers were 85.20 million and in 2016-17 it becomes 103.75 million. In case of international passengers also increased from 49.78 million in 2015-16 to 54.68 million in 2016-17. The top players are Indigo with 38% market share, followed by 15.9% share by Jet airways. Similarly Spice jet with market share of 14%, Indian airlines with 13.2% and Go air with 8%.

1.9. AIRLINE INDUSTRY OF INDIA AIR INDIA CASE STUDY

Overview India is the 9th largest aviation market in the world with a size of around US$ 16 billion and is poised to be the 3rd biggest by 2020. India aviation industry promises huge growth potential due to large and growing middle class population, rapid economic growth, higher disposable incomes, rising aspirations of the middle class and overall low penetration levels.. The Indian airports have a combined capacity to cater to 220.04 million passengers and 4.63 million tones cargo per annum and handled 168.92 million passengers and 2.28 million tones cargo in 2013-14. As per estimates, passenger traffic at Indian Airports is expected to increase to 450 million by 2020 from 159.3 million in 2012- 2013. History Civil Aviation in India traces back to 18 February 1911, when the first commercial civil aviation flight took off from Allahabad for Naini over a distance of 6 miles (9.7 km). During the Allahabad Exhibition Henri Piquet, a French aviator, carried 6,500 pieces of mail on a Humber-Sommer biplane from the exhibition to the receiving office at Allahabad, marking the world's first official airmail service. FDI up to 49% allowed in domestic airlines by the foreign carriers. Foreign equity up to 100% allowed in airport development. Domestic and international passenger traffic expected to grow at annual average rate of 12% and 8% in next five years. Annual average rate of growth of domestic and international cargo estimated to be 12% and 10% during next five years. MRO industry to triple in size from INR 2250 crore in 2010 to INR 7000 crore by 2020. Around 3,50,000 new employees are essential to facilitate growth in the next decade Market Opportunities

1.9.1. Market Opportunities

- An investment of over US$ 12 billion required during the Twelfth Five Year Plan
- Airlines are expected to operate about 1000 aircraft's by 2020, up from the present 450
- Investment to the tune of US $4 billion required for General Aviation aircrafts by 2017
- Air Navigation Services entails investment worth US$ 7 billion in Twelfth Five Year Plan

The civil aviation market in India is all set to become the world's third largest by 2020. Total passenger traffic stood at a 190.1 million in FY15, registering an increase of 12.47 per cent. By 2020, passenger traffic at Indian airports is expected to increase to 421 million from 190.1 million

in 2015. Domestic passenger traffic expanded at a compound annual growth rate (CAGR) of 11.8 per cent over FY06–15. It is expected to touch 209 million by FY17. International passenger traffic posted a CAGR of 9.5 per cent over FY06-15 and is set to touch 60 million by FY17.

1.9.2.Major Carriers of India

- Air India
- Air India Express
- Jet Airways
- Air Asia
- IndiGo
- Spice Jet
- Vistara
- Go Air

1.10. Air India

The history of civil aviation in India began in December 1912, with the opening of the first domestic air route between Karachi and Delhi. This was by the Indian state Air services in collaboration with the imperial Airways, UK. Three years later, the first Indian airline, Tata Sons Ltd., started a regular airmail service between Karachi and Madras without any patronage from the government. At the time of independence, the number of air transport companies, which were operating within and beyond the frontiers of the company, carrying both air cargo and passengers, was nine. It was reduced to eight, with Orient Airways shifting to Pakistan.

Tata Services became Tata Airlines and then Air- India and spread its wings as Air-India International. The domestic aviation scene, however, was chaotic. When the American Tenth Air Force in India disposed of its plane sat throwaway prices, 11 domestic airlines sprang up, scrambling for traffic that could sustain only two or three. In 1953, the government nationalized the airlines, merged them, and created Indian Airlines. For the next 25 years JRD Tata remained the chairman of Air-India and a director on the board of Indian Airlines . After JRD left, voracious unions mushroomed, spawned on the pork barrel jobs created by politicians

- **Headquarters in Mumbai:**

The Air India Building is a 23-storey commercial tower on Marine Drive in Nariman Point, Mumbai, India. The building served as the corporate headquarters for the Indian national airline, Air India, up to 2013. There are at least 10,800 square feet (1,000 m2) of space on each floor of the building. In February 2013, Air India officially vacated the building as part of its asset-monetization plan, and shifted its corporate office to New Delhi. The Indian Airlines House was chosen as the airline's new headquarters.

Statistics (Rupees in Million)

- Revenue in 2013-14 : 190934.9
- Expenses in 2013-14: 264201.9 Net loss for the current year (62796.0)

Problems

- Over – Employment of employees
- Increased fuel prices result to decline of air traffic

- Increasing competition in the market
- Over Staffing
- Large no of staff not required that they had

Solutions

- Must have that staff that is required in operating a plane
- Operating expenses cutting/ cost cutting
- Must have good marketing policies
- Good knowledge about market competitors
- Better management policies

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2.1. International Civil Aviation Organization (ICAO)

ICAO consists of an Assembly of representatives from the contracting states, a Council of governing bodies out of various subordinate bodies, and a Secretariat. The chief officers are the President of the Council and the Secretary General. ICAO conducts meeting every three years to discuss about the work and to set future policies.

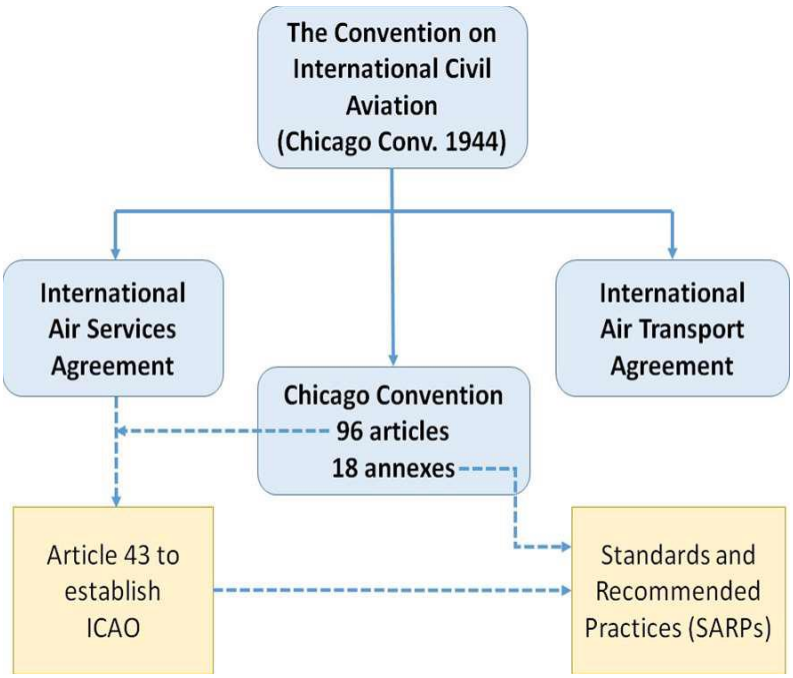

Fig2.1 ICAO

The suggestions, standards, and recommendations are amended by the convention. ICAO identifies nine separate geographical regions to plan the provision of air navigation facilities and on-ground services the aircrafts require for flying in these regions.

ICAO's objectives, are to foster the planning and development of international air transport so as

to ensure the safe and orderly growth of international civil aviation throughout the world; encourage the arts of aircraft design and operation for peaceful purposes; encourage the development of airways, airports, and air navigation facilities for international civil aviation; meet the needs of the peoples of the world for safe, regular, efficient, and economical air transport; prevent economic waste caused by unreasonable competition; ensure that the rights of contracting states are fully respected and that every contracting state has a fair opportunity to operate international airlines; avoid discrimination between contracting states; promote safety of flight in international air navigation; and promote generally the development of all aspects of international civil aeronautics.

The International Civil Aviation Organization (ICAO) is a specialized agency and an aviation technical body of the United Nations. Its headquarters is located in Montreal, Canada. It was created after the Chicago Convention on International Civil Aviation of which was signed by 52 countries in 1944 and was ratified and founded in 1947. ICAO's primary role is to provide a set of standards which will help regulate aviation across the world. It classifies the principles and techniques of international air navigation, as well as the planning and development of international air transport to ensure safety and security. It also oversees the US Government's International Group on International Aviation (IGIA). The international aviation standards were provided to the 191 member states of ICAO around the globe through a global forum in which the member states are expected to adopt and implement these standards. However, the International Civil Aviation Organization (ICAO) only provides the fundamental guidelines or SARPs (Standards and Recommended Practices). It is possible for each member states/countries to modify and adjust these regulations when necessary under ICAO's approval. Despite slight variations from different countries based on the actual implementation in national regulations, civil aviation standards and regulations are still harmonized all over the world. These local differences are then reported back to ICAO and published.

2.2. FEDERAL AVIATION ADMINISTRATION (FAA)

The Federal Aviation Administration (FAA) or formerly "Federal Aviation Agency" is a national aviation authority of the United States formed in 1958. The FAA is primarily responsible for the advancement, safety, security and regulation of civil aviation. FAA ensures that every aircraft pilot is perfectly adequate to their role as air navigators, and that all aircraft in operation follows a strict set of guidelines in order to ensure safety and minimize danger. To accomplish these things, FAA created an effective set of aviation regulations known as the Federal Aviation Regulations.

The Federal Aviation Regulations or FAR is a document which consists of tens of thousands of sections covering every details of aviation. It gives detailed instructions such as aircraft maintenance, pilot requirements, hot-air ballooning and model rocket launches, covering almost everything that is needed in order to understand how, when and what to fly. Aircraft pilots and air carriers are very much required to be familiar with the rules and regulations outlined in the FARs.

Aside from its regulatory role, the FAA is also responsible for research and development of aviation related systems and technologies, air traffic control system, maintenance of air navigation facilities infrastructure, airspace and development of commercial space travel.

2.3. Primary roles of ICAO and FAA

Some of the major roles of ICAO and FAA in aviation are already mentioned above. One of their primary roles is of course to ensure security and safety by regulating all aspects of civil aviation which includes the construction and operation of airports, the management of air traffic, the certification of personnel and aircraft, enforcing rules and regulations for obstruction lighting, aeronautical charts, search and rescue standards and many more aspects pertaining to air navigation.

We may sometimes think that there are too many laws, rules and regulations in the world today. We may somehow think that they steal away our freedom and hinder us on what we want to do. But remember that these laws, rules and regulations are made for our protection. We may not appreciate them now, but once something bad or unnecessary happens, maybe we will.

2.4. Aircraft Owners and Pilots Association (AOPA)

The Aircraft Owners and Pilots Association is a Frederick, Maryland-based American non-profit political organization that advocates for general aviation. The organization started at Wings Field in Blue Bell, Pennsylvania. On 24 April 1932, The Philadelphia Aviation Country Club was founded at Wings Field.AOPA has several programs.

2.4.1 AOPA Foundation, is AOPA's 501(c)(3) charitable organization. The foundation's four goals are to improve general aviation safety (under the auspices of its Air Safety Institute), grow pilot population, preserve and improve community airports, and provide a positive image of general aviation.

2.4.2 AOPA Political Action Committee is just for AOPA members. Through lobbying, it represents the interests of general aviation to Congress, the Executive Branch, and state and local governments. The AOPA PAC campaigns in favor of federal, state and local candidates that support their policies and oppose those who do not through advertising and membership grassroots campaigns.

2.4.3. GA Serves America was created to promote general aviation to the public.Legal Services Plan/Pilot Protection Services, provides AOPA members with legal defense against alleged FAA enforcement charges as well as assistance obtaining an FAA flight medical. Enrollment in Pilot Protection Services is only open to AOPA members and requires an additional payment above dues. The Legal Services Plan was combined with the former medical program in May 2012 under the name Pilot Protection Services. The Legal Services Plan was created in June 1983.

2.4.4 Air Safety Institute (formerly the Air Safety Foundation) is a separate nonprofit, tax exempt organization promoting safety and pilot proficiency in general aviation through quality training, education, research, analysis, and the dissemination of information.

2.5 Aviation Management Consulting Group

AMCG has been promoting general aviation management excellence through the provision of trusted aviation management consulting services, support, and resources for over 20 years. AMCG's clients consist of airports, aviation businesses, agencies, associations, and other industry stakeholders (e.g., aircraft owners and/or operators; airport property lessees and/or developers; industry vendors; financial institutions; law firms; architectural, engineering, and planning firms; etc.). AMCG is composed of a unique blend of talented and respected aviation industry professionals who have strong credentials, proven track records, and over 125 years of combined aviation industry experience. Together, these individuals have first-hand aviation, aviation business, and airport planning, development, operations, management, leadership, and consulting experience and each of the firm's principals, consultants, and project analysts are pilots. As a result, AMCG has the unique ability to view any project and any issue that may arise from a multi-dimensional (airport, aviation business, and aircraft operator) perspective. This team of highly qualified, knowledgeable, and results-oriented professionals works collaboratively to maintain a company culture focused on meeting the needs and exceeding the expectations of the client. Airport services include:

- Strategic Planning / Business Planning
- Primary Management and Compliance Documents (Rules and Regulations, Leasing

Policy, Rents and Fees Policy, Minimum Standards, Development Standards)

- Rent Study (wholesale and retail - land, hangar, office, shop, cargo, etc.)
- Fee Study (landing, based aircraft, fuel flowage, etc.)
- Appraisal (fee simple estate, leasehold interest, and leased fee estate)
- Valuation (business, stock, and asset)
- Transaction Services (acquisition, divestiture, and due diligence)
- RFP Development and Proposal Evaluation
- Agreement Development and Negotiation (Lease, Use, Operating, Through-The-Fence, etc.)
- Assessments and Feasibility Studies (including FBO Options Analysis)

- Operational, Managerial, and Financial Assessments
- Land Use, Site Planning, and Facility Programming
- Marketing and Business Development
- Litigation Support and Expert Testimony

These services are provided with the goal of:
- Improving relationships
- Enhancing the range, level, and quality of products, services, and facilities
- Maximizing efficiency and productivity
- Increasing revenues and decreasing costs/expenses
- Capitalizing on opportunities
- Minimizing risk
- Creating value

With AMCG, you can be assured that we put our clients first and you will get straight answers, objective advice, accurate and timely information, and only the highest quality services, support, and resource

2.6. IAAE

In the early 1990s, major global barriers around the world were dissolving. To effectively address the challenges of managing airports in a global economy, there was a need for advanced airport management education and professional development around the world. To respond to that need, AAAE's commitment to professional excellence and the AAAE accreditation program went international through the creation of the International Association of Airport Executives (IAAE) in 1992.

The International Association of Airport Executives provides international access to the benefits of AAAE. IAAE members are eligible to apply for the Certified Member (C.M.) and Accredited Airport Executive (A.A.E.) programs.

There are three categories of IAAE members:

- IAAE Affiliate – Any individual with responsibility for the management or staff functions of a public airport.
- IAAE Associate – Any individual not otherwise qualified for membership, who has a business or professional interest in airports and aviation.
- IAAE Corporate – Public or private companies and corporations, engaged in activities related to aviation.

IAAE members enjoy a wide range of member benefits and rewards, including:

- Networking Opportunities
- Career Development Opportunities
- Vital Industry Information
- Training Opportunities
- Membership Rewards

Join your IAAE below:

2.6.1.IAAE Affiliate Member - Open to any individual who has active full time responsibility for the management, administration, or staff functions of a public airport. Affiliate members become eligible to enter the Accreditation program after a minimum of one year in airport management.

2.6.2. International Associate Member - Open to individuals who have an interest in airports and aviation and do not fall into any of the other specified membership categories.

2.6.3. International Corporate - Open to public or private companies and corporations, who are engaged in activities related to aviation, or who offer a product or service of interest to airport management and wish to further their contacts within the aviation industry. IAAE and AAAE airport executive members are encouraged to buy products and services from IAAE corporate members and these members also receive substantial savings on marketing and promotional opportunities for their products or services.

2.6.4. Central European - Open to individuals who work in the countries of Central Europe.

2.7. FAIRS

FAIRS is a management information system operated by GSA to collect, maintain, analyze, and report information on Federal aircraft inventories and cost and usage of Federal aircraft and Commercial Aviation Services (CAS) aircraft and related aviation services. Executive agencies of the United States Government must report to FAIRS if they own, bail, borrow, loan, lease, rent, charter, contract for, or obtain by ISSA Government aircraft.

- Inventory data on Federal aircraft, including Unmanned Aircraft Systems (UAS),
- Cost and utilization (flight hours) data on Federal aircraft, including Unmanned Aircraft Systems (UAS),
- Cost and utilization data on Commercial Aviation Services (CAS) aircraft and related aviation services,

The Capital Asset Planning (CAP) Tool section of FAIRS is an OMB approved substitute for the Exhibit 300 process for Aviation that can be used to meet the capital asset planning requirements of OMB Circular A-11.

2.8. Federal Aviation Administration (FAA)

The Federal Aviation Administration (FAA) is the agency of the United States Department of Transportation responsible for the regulation and oversight of civil aviation within the U.S., as well as operation and development of the National Airspace System. Its primary mission is to ensure safety of civil aviation.

The responsibilities of the FAA include:

- Regulating civil aviation to promote safety within the U.S. and abroad;
- Encouraging and developing civil aeronautics, including new aviation technology;
- Developing and operating a system of air traffic control and navigation for both civil and military aircraft;

- Researching and developing the National Airspace System and civil aeronautics;
- Developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation;
- Regulating U.S. commercial space transportation. The FAA licenses commercial space launch facilities and private launches of space payloads on expendable launch vehicles.

Investigation of aviation incidents, accidents and disasters is conducted by the National Transportation Safety Board (NTSB), an independent US government agency.
Along with the European Aviation Safety Agency (EASA) the FAA is one of the two main agencies world-wide responsible for the certification of aircraft.

2.8.1. Organisation of the FAA

- FAA is managed by an Administrator, assisted by a Deputy Administrator. Five Associate Administrators report to the Administrator and direct the line-of-business organisations that carry out the agency's principle functions.
- The Chief Counsel and nine Assistant Administrators also report to the Administrator. The Assistant Administrators oversee other key programs such as Human Resources, Budget, and System Safety.
- FAA also has nine geographical regions and two major centers, the Mike Monroney Aeronautical Center and the William J. Hughes Technical Center.

2.8.2. Key Activities

The FAA's key activities may be summarized as:

- **Safety Regulation**

Issuing and enforcing regulations and minimum standards covering manufacturing, operating, and maintaining aircraft. Certification of airmen and airports that serve air carriers.

- **Airspace and Air Traffic Management**

The safe and efficient use of navigable airspace is one of the FAA's primary objectives. The Administration operates a network of airport towers, air route traffic control centers, and flight service stations, as well as developing air traffic rules, assignment of the use of airspace, and the control of air traffic.

- **Air Navigation Facilities**

The FAA builds/installs visual and electronic aids to air navigation, maintains, operates and assures the quality of these facilities as well as sustains other systems to support air navigation and air traffic control, including voice and data communications equipment, radar facilities, computer systems, and visual display equipment at flight service stations.

- **Civil Aviation Abroad**

The FAA promotes aviation safety and encourage civil aviation abroad. It exchanges aeronautical information with foreign authorities, certifies foreign repair shops, airmen, and mechanics, provides technical aid and training, negotiates bilateral airworthiness agreements with other countries and takes part in international conferences.

- **Commercial Space Transportation**

The FAA regulates and encourages the U.S. commercial space transportation industry, including licensing commercial space launch facilities and private launches of space payloads on expendable launch vehicles.

- **Research, Engineering, and Development**

The FAA undertakes research on, and development of, the systems and procedures needed for a safe and efficient system of air navigation and air traffic control. The Administration helps develop better aircraft, engines, and equipment and tests/ evaluates aviation systems, devices, materials, and procedures. It also undertakes aeromedical research.

2.8.2. The FAA's Role in ATM

The FAA has a complex set of responsibilities in the ATM field. It provides the vast majority of tower-based ATM, including all major airport facilities. It is the sole provider of en-route ATM services in the US. The FAA's service-provision tasks are undertaken by the Air Traffic Organisation (ATO), which has been established as a functionally separate entity within the FAA's organisational structure.

At the same time, the FAA is responsible for the safety regulation of all US aviation activities, including ATM. For this purpose, an ATM Safety Oversight organisation has been established within the regulatory division of the FAA with responsibility for oversight of the safety of the ATO's operations and activities.

2.8.3. The History of ICAO and the Chicago Convention

- The Convention on International Civil Aviation, drafted in 1944 by 54 nations, was established to promote cooperation and "create and preserve friendship and understanding among the nations and peoples of the world."
- Known more commonly today as the 'Chicago Convention', this landmark agreement established the core principles permitting international transport by air, and led to the creation of the specialized agency which has overseen it ever since – the International Civil Aviation Organization (ICAO).
- The Second World War was a powerful catalyst for the technical development of the aeroplane. A vast network of passenger and freight carriage was set up during this period, but there were many obstacles, both political and technical, to evolving these facilities and routes to their new civilian purposes.
- Subsequent to several studies initiated by the United States, as well as various consultations it undertook with its Major Allies, the U.S. government extended an invitation to 55 States to attend an International Civil Aviation Conference in Chicago in 1944.
- These delegates met at a very dark time in human history and travelled to Chicago at great personal risk. Many of the countries they represented were still occupied. In the end, 54 of the 55 States invited attended the Chicago Conference, and by its conclusion on 7 December, 1944, 52 of them had signed the new *Convention on International Civil Aviation* which had been realized.

- Known then and today more commonly as the 'Chicago Convention', this landmark agreement laid the foundation for the standards and procedures for peaceful global air navigation. It set out as its prime objective the development of international civil aviation "…in a safe and orderly manner", and such that air transport services would be established "on the basis of equality of opportunity and operated soundly and economically."
- The Chicago Convention also formalized the expectation that a specialized International Civil Aviation Organization (ICAO) would be established, in order to organize and support the intensive international co-operation which the fledgling global air transport network would require.
- ICAO's core mandate, then as today, was to help States to achieve the highest possible degree of uniformity in civil aviation regulations, standards, procedures, and organization.
- Because of the usual delays expected in ratifying the Convention, the Chicago Conference presciently signed an Interim Agreement which foresaw the creation of a *Provisional* ICAO (PICAO) to serve as a temporary advisory and coordinating body.
- The PICAO consisted of an Interim Council and an Interim Assembly, and from June 1945 the Interim Council met continuously in Montreal, Canada, and consisted of representatives from 21 Member States. The first Interim Assembly of the PICAO, the precursor to ICAO's triennial Assemblies in the modern era, was also held in Montreal in June of 1946.
- On 4 April 1947, upon sufficient ratifications to the Chicago Convention, the provisional aspects of the PICAO were no longer relevant and it officially became known as ICAO. The first official ICAO Assembly was held in Montreal in May of that year.

- During this march to the modern air transport era, the Convention's Annexes have increased in number and evolved such that they now include more than 12,000 international standards and recommended practices (SARPs), all of which have been agreed by consensus by ICAO's now 192 Member States.
- These SARPs, alongside the tremendous technological progress and contributions in the intervening decades on behalf of air transport operators and manufacturers, have enabled the realization of what can now be recognized as a critical driver of socio-economic development and one of humanity's greatest cooperative achievements – the modern international air transport network.

2,9 INTERAGENCY COMMITTEE FOR AVIATION POLICY (ICAP)

GSA established the Interagency Committee for Aviation Policy (ICAP) to promote sound policy and foster the highest aviation standards.

GSA provides a leadership role by chairing the committee, providing programs to support aviation activities, and collecting and reporting data related to Federal aviation management.

2.9.1 Members of ICAP

Department of Agriculture • Department of Commerce • Department of Defense • Department of Energy • Department of Health and Human Services • Department of Homeland Security • Department of Interior • Department of Justice • Department of State • Department of the Treasury

• Department of Transportation • Department of Veterans Affairs • Environmental Protection Agency • General Services Administration • National Aeronautics and Space Administration • National Science Foundation • Office of Management and Budget • Tennessee Valley Authority

2.9.2. Aircraft Engineers International

The Aircraft Engineers International (AEI) is an international umbrella organization of trade unions of aircraft technicians. In the Netherlands, the union The Union with its aircraft technicians is a member of this international organization. Around 41 organizations worldwide are members of the AEI.

2.9.3. Objective

The objective of the AEI is to promote aviation safety by striving to ensure that skilled and well-trained technicians work in a safe working environment and under good working conditions and with sufficient independence in their actions to ensure that safety is beyond direct financial gain.

3. AIR LAW

- Aviation Law is one of the specialty fields in Studies of Law. Air Law is a general viewpoint that covers the special characteristics and demands of aviation field. There is no governing body with the right to frame the air laws governing all states in the legal sense or there is not any international law. But the phrase Air Law is used to describe a system of implicit and explicit agreements that the nations together. These agreements are known as conventions. There are numerous conventions such as Chicago, Rome, Tokyo, Geneva, and few more.
- It is a branch of law that is concerned with air transport operations, and all the associated legal and business concerns. This is a series of rules that governs the use of airspace for aviation, and its benefits for the general public and the nations of the world.
- The first attempt to set the air law was made around 1910, when German air balloons repeatedly trespassed over French territory. The French government wanted both the governments to come together to form an agreement to resolve the problem. The Paris Conference of 1910 was in favor of the sovereignty of states in the space above their territories.
- It started developing further when after the World War I, the first scheduled flight from Paris to London took its first flight in 1909.

3.1. Public International Air Law: Chicago Convention

A Convention on International Civil Aviation was signed at Chicago on 7th December, 1944. It established specific principles in order to develop international civil aviation in a safe and orderly manner. It also ensures that international air transport services are established on the basis of fair opportunity for participating countries.The convention formed the International Civil Aviation Organization (ICAO), the Canada-based agency of the United Nations. It sets the principles of international air navigation and works to:

- Ensure a well-ordered growth of international civil aviation throughout the world.
- Encourage aircraft design and operation for peaceful and constructive purposes.
- Promote the development of airways, airports, and air navigation facilities for international civil aviation.
- Meet the safety, regularity, efficiency, and economical air transport needs of the people around the world.
- Prevent unplanned economic decisions and in turn waste.
- Ensure that each Contracting State has an opportunity to operate international airlines.
- Encourage flight safety in international air transport.
- Foster the development of all aspects of international civil aviation.

3.2 Air Law in European Union

The laws are regarding the following:

Sovereignty: It is the right of a state to impose its national law on users of its airspace.
Territory: It is the airspace over and within the territorial borders of a state. Territorial airspace has no vertical limit. For the states with sea boundaries, territorial airspace extends beyond the land. This limit is internationally agreed limit of the territorial waters.

3.3. International Air Laws

The three International Air Laws are as follows:

- **Public International Law**
  It refers to the process which binds the states and international organizations to agreements with respect to their aviation activities. The activities may be among various problems of political, technical, economical, financial, social or legal nature. For example, the Chicago Convention, the Geneva Convention, and some international conventions.
- **Private International Law**
  It is the series of rules pertaining to the relations between private persons involved in the operation and the use of aircraft. It applies to the travelers and airline staff. For example, the Tokyo Convention frames the prohibition of unlawful acts committed on the aircraft.
- **Supranational Law**
  It is a law that a higher body can impose with legal force on one or more states. For example, EU air laws.

3.4 The Geneva Conventions

- In 1864 the Geneva Conventions were created during a conference in Geneva Switzerland, and were immediately ratified by twelve countries. Now there are one hundred and ninety-four countries that have signed and ratified the conventions (ICRC 1 – 6). The Geneva Conventions set the standards in international law for the humanitarian treatment of the

victims of war.

- **There are four conventions in total, and all of which deal with a different aspect of war.** The first Geneva Convention, which deals with the treatment of wounded and sick soldiers on the field during times of war, was put into effect in 1864. The Seconds Convention, which deals with the treatment of shipwrecks and sick members of armed forces as sea, was put into effect in 1907.
- The development of the Geneva Conventions was closely associated with the Red Cross, whose founder, Henri Dunant, initiated international negotiations that produced the Convention for the Amelioration of the Wounded in Time of War in 1864. This convention provided for (1) the immunity from capture and destruction of all establishments for the treatment of wounded and sick soldiers and their personnel, (2) the impartial reception and treatment of all combatants, (3) the protection of civilians providing aid to the wounded, and (4) the recognition of the Red Cross symbol as a means of identifying persons and equipment covered by the agreement.
- The 1864 convention was ratified within three years by all the major European powers as well as by many other states. It was amended and extended by the second Geneva Convention in 1906, and its provisions were applied to maritime warfare through the Hague conventions of 1899 and 1907. The third Geneva Convention, the Convention Relating to the Treatment of Prisoners of War (1929), required that belligerents treat prisoners of war humanely, furnish information about them, and permit official visits to prison camps by representatives of neutral states.
- Because some belligerents in World War II had abused the principles contained in earlier conventions, an International Red Cross conference in Stockholm in 1948 extended and codified the existing provisions. The conference developed four conventions, which were approved in Geneva on August 12, 1949: (1) the Convention for the Amelioration of the Condition of the Wounded and Sick in Armed Forces in the Field, (2) the Convention for the Amelioration of the Condition of the Wounded, Sick, and Shipwrecked Members of Armed Forces at Sea, (3) the Convention Relative to the Treatment of Prisoners of War, and (4) the Convention Relative to the Protection of Civilian Persons in Time of War.
- The first two conventions elaborated on the principle that the sick and wounded have neutral status. The prisoner-of-war convention further developed the 1929 convention by requiring humane treatment, adequate feeding, and the delivery of relief supplies and by forbidding pressure on prisoners to supply more than a minimum of information. The fourth convention contained little that had not been established in international law before World War II. Although the convention was not original, the disregard of humanitarian principles during the war made the restatement of its principles particularly important and timely. The convention forbade inter alia the deportation of individuals or groups, the taking of hostages, torture, collective punishment, offenses that constitute "outrages upon personal dignity," the imposition of judicial sentences (including executions) without due-process guarantees, and discriminatory treatment on the basis of race, religion, nationality, or political beliefs.
- In the decades following World War II, the large number of anti-colonial and insurrectionary wars threatened to render the Geneva Conventions obsolete. After four years of Red Cross-sponsored negotiations, two additional protocols to the 1949 conventions, covering both combatants and civilians, were approved in 1977. The first, Protocol I, extended protection under the Geneva and Hague conventions to persons

involved in wars of "self-determination," which were redefined as international conflicts. The protocol also enabled the establishment of fact-finding commissions in cases of alleged breaches of the convention. The second protocol, Protocol II, extended rights protections to persons involved in severe civil conflicts, which had not been covered by the 1949 accords. It specifically prohibited collective punishment, torture, the taking of hostages, acts of terrorism, slavery, and "outrages on the personal dignity, in particular humiliating and degrading treatment, rape, enforced prostitution and any form of indecent assault."

- The end of the Cold War, during which tensions between ethnic groups had been suppressed in states throughout eastern and central Europe and elsewhere, gave rise to a number of civil wars, blurring the distinction between internal and international conflicts and complicating the application of relevant legal rules. In a number of cases (e.g., in Yugoslavia, Rwanda, and Somalia), the United Nations Security Council declared that internal conflicts amounted to a threat to or a breach of international peace and security, which thus made its resolutions on the conflicts binding on the combatants. Because of the Security Council's activities in expanding the definition of international armed conflicts, an increasing number of rules outlined in the Geneva Conventions and their protocols have come to be regarded as binding on all states. Such rules include the humane treatment of civilians and of prisoners of war.
- More than 180 states have become parties to the 1949 conventions. Approximately 150 states are party to Protocol I; more than 145 states are party to Protocol II, though the United States is not. In addition, more than 50 states have made declarations accepting the competence of international fact-finding commissions to investigate allegations of grave breaches or other serious violations of the conventions or of Protocol I.
- The importance of the Geneva Conventions and their additional protocols was reflected in the establishment of war-crimes tribunals for Yugoslavia (1993) and Rwanda (1994) and by the Rome Statute (1998), which created an International Criminal Court.

Summaries of the multilateral treaties deposited with other depositaries Convention on Offences and Certain Other Acts Committed on Board Aircraft, Tokyo, 14 September 1963 (*)

- The Convention applies to offences and other acts prejudicial to good order and discipline on board an aircraft, committed while the aircraft is in flight or on the surface of the high seas or of any other area outside the territory of any State. It does not apply to State aircraft, for example, aircraft used in military, customs and police services.
- The purpose of the Tokyo Convention is to protect the safety of the aircraft and of the persons or property thereon and to maintain good order and discipline on board. The aircraft commander, members of the crew and, in specific circumstances, even passengers on board, is empowered to prevent the commission of such acts and to disembark the person concerned. The aircraft commander may also disembark the offender or, if the offence is serious, deliver him to the competent authorities of a Contracting State when the aircraft lands.
- The Convention protects the aircraft commander and any crew member or passenger assisting him in imposing the measures he finds necessary from any proceedings in respect

of actions taken by them. The State of registration of the aircraft is competent to exercise jurisdiction over offences and acts committed on board. Each Contracting State is obliged to take the necessary measures to establish its jurisdiction as the State of registration.

- The Convention does not eliminate existing or future jurisdiction in States other than the State of registration. A Contracting State which is not the State of registration may not interfere with an aircraft in flight in order to exercise its criminal jurisdiction over an offence committed on board except in certain cases, for instance, the offence has been effected in the territory of the State overflown, the offence has been committed by or against a national or permanent resident of that State, and the offence is against the security of that State.

3.5. THE HAGUE CONVENTION 1970

THE STATES PARTIES to this Convention, CONSIDERING that unlawful acts of seizure or exercise of control of aircraft in flight jeopardize the safety of persons and property, seriously affect the operation of air services, and undermine the confidence of the peoples of the world in the safety of civil aviation; CONSIDERING that the occurrence of such acts is a matter of grave concern; CONSIDERING that, for the purpose of deterring such acts, there is an urgent need to provide appropriate measures for punishment of offenders;
HAVE AGREED AS FOLLOWS:

Article 1
Any person who on board an aircraft in flight: unlawfully, by force or threat thereof, or by any other form of intimidation, seizes, or exercises control of, that aircraft, or attempts to perform any such act, or is an accomplice of a person who performs or attempts to perform any such act commits an offence (hereinafter referred to as "the offence").

Article 2
Each Contracting State undertakes to make the offence punishable by severe penalties.

Article 3
For the purposes of this Convention, an aircraft is considered to be in flight at any time from the moment when all its external doors are closed following embarkation until the moment when any such door is opened for disembarkation. In the case of a forced landing, the flight shall be deemed

to continue until the competent authorities take over the responsibility for the aircraft and for persons and property on board. This Convention shall not apply to aircraft used in military, customs or police services. This Convention shall apply only if the place of take-off or the place of actual landing of the aircraft on board which the offence is committed is situated outside the territory of the State of registration of that aircraft; it shall be immaterial whether the aircraft is engaged in an international or domestic flight. In the cases mentioned in Article 5, this Convention shall not apply if the place of take-off and the place of actual landing of the aircraft on board which the offence is committed are situated within the territory of the same State where that State is one of those referred to in that Article. Notwithstanding paragraphs 3 and 4 of this Article, Articles 6, 7, 8, and 10 shall apply whatever the place of take-off or the place of actual landing of the aircraft, if the offender or the alleged offender is found in the territory of a State other than the State of registration of that aircraft.

Article 4

Each Contracting State shall take such measures as may be necessary to establish its jurisdiction over the offence and any other act of violence against passengers or crew committed by the alleged offender in connection with the offence, in the following cases:
when the offence is committed on board an aircraft registered in that State; when the aircraft on board which the offence is committed lands in its territory with the alleged offender still on board; when the offence is committed on board an aircraft leased without crew to a lessee who has his principal place of business or, if the lessee has no such place of business, his permanent residence, in that State. Each Contracting State shall likewise take such measures as may be necessary to establish its jurisdiction over the offence in the case where the alleged offender is present in its territory and it does not extradite him pursuant to Article 8 to any of the States mentioned in paragraph 1 of this Article. This Convention does not exclude any criminal jurisdiction exercised in accordance with national law.

Article 5

The Contracting States which establish joint air transport operating organizations or international operating agencies, which operate aircraft which are subject to joint or international registration shall, by appropriate means, designate for each aircraft the State among them which shall exercise the jurisdiction and have the attributes of the State of registration for the purpose of this Convention and shall give notice thereof to the International Civil Aviation Organization which shall communicate the notice to all States Parties to this Convention.

Article 6

Upon being satisfied that the circumstances so warrant, any Contracting State in the territory of which the offender or the alleged offender is present, shall take him into custody or take other measures to ensure his presence. The custody and other measures shall be as provided in the law of that State but may only be continued for such time as is necessary to enable any criminal or extradition proceedings to be instituted. Such State shall immediately make a preliminary enquiry into the facts. Any person in custody pursuant to paragraph 1 of this Article shall be assisted in communicating immediately with the nearest appropriate representative of the State of which he is a national. When a State, pursuant to this Article, has taken a person into custody, it shall immediately notify the State of registration of the aircraft, the State mentioned in Article 4, paragraph 1(c), the State of nationality of the detained person

and, if it considers it advisable, any other interested States of the fact that such person is in custody and of the circumstances which warrant his detention. The State which makes the preliminary enquiry contemplated in paragraph 2 of this Article shall promptly report its findings to the said States and shall indicate whether it intends to exercise jurisdiction.

Article 7

The Contracting State in the territory of which the alleged offender is found shall, if it does not extradite him, be obliged, without exception whatsoever and whether or not the offence was committed in its territory, to submit the case to its competent authorities for the purpose of prosecution. Those authorities shall take their decision in the same manner as in the case of any ordinary offence of a serious nature under the law of that State.

Article 8

The offence shall be deemed to be included as an extraditable offence in any extradition treaty existing between Contracting States. Contracting States undertake to include the offence as an extraditable offence in every extradition treaty to be concluded between them. If a Contracting State which makes extradition conditional on the existence of a treaty receives a request for extradition from another Contracting State with which it has no extradition treaty, it may at its option consider this Convention as the legal basis for extradition in respect of the offence. Extradition shall be subject to the other conditions provided by the law of the requested State. Contracting States which do not make extradition conditional on the existence of a treaty shall recognize the offence as an extraditable offence between themselves subject to the conditions provided by the law of the requested State. The offence shall be treated, for the purpose of extradition between Contracting States, as if it had been committed not only in the place in which it occurred but also in the territories of the States required to establish their jurisdiction in accordance with Article 4, paragraph 1.

Article 9

When any of the acts mentioned in Article 1(a) has occurred or is about to occur, Contracting States shall take all appropriate measures to restore control of the aircraft to its lawful commander or to preserve his control of the aircraft. In the cases contemplated by the preceding paragraph, any Contracting State in which the aircraft or its passengers or crew are present shall facilitate the continuation of the journey of the passengers and crew as soon as practicable, and shall without delay return the aircraft and its cargo to the persons lawfully entitled to possession.

Article 10

Contracting States shall afford one another the greatest measure of assistance in connection with criminal proceedings brought in respect of the offence and other acts mentioned in Article 4. The law of the State requested shall apply in all cases. The provisions of paragraph 1 of this Article shall not affect obligations under any other treaty, bilateral or multilateral, which governs or will govern, in whole or in part, mutual assistance in criminal matters.

Article 11

Each Contracting State shall in accordance with its national law report to the Council of the International Civil Aviation Organization as promptly as possible any relevant information in its possession concerning: the circumstances of the offence; the action taken pursuant to Article 9;

the measures taken in relation to the offender or the alleged offender, and, in particular, the results of any extradition proceedings or other legal proceedings.

Article 12

Any dispute between two or more Contracting States concerning the interpretation or application of this Convention which cannot be settled through negotiation, shall, at the request of one of them, be submitted to arbitration. If within six months from the date of the request for arbitration the Parties are unable to agree on the organization of the arbitration, any one of those Parties may refer the dispute to the International Court of Justice by request in conformity with the Statute of the Court. Each State may at the time of signature or ratification of this Convention or accession thereto, declare that it does not consider itself bound by the preceding paragraph. The other Contracting States shall not be bound by the preceding paragraph with respect to any Contracting State having made such a reservation. Any Contracting State having made a reservation in accordance with the preceding paragraph may at any time withdraw this reservation by notification to the Depositary Governments.

Article 13

This Convention shall be open for signature at The Hague on 16 December 1970, by States participating in the International Conference on Air Law held at The Hague from 1 to 16 December 1970 (hereinafter referred to as The Hague Conference). After 31December 1970, the Convention shall be open to all States for signature in Moscow, London and Washington. Any State which does not sign this Convention before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time. This Convention shall be subject to ratification by the signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America, which are hereby designated the Depositary Governments. This Convention shall enter into force thirty days following the date of the deposit of instruments of ratification by ten States signatory to this Convention which participated in The Hague Conference. For other States, this Convention shall enter into force on the date of entry into force of this Convention in accordance with paragraph 3 of this Article, or thirty days following the date of deposit of their instruments of ratification or accession, whichever is later. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or accession, the date of entry into force of this Convention, and other notices. As soon as this Convention comes into force, it shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations and pursuant to Article 83 of the Convention on International Civil Aviation (Chicago, 1944).

Article 14

Any Contracting State may denounce this Convention by written notification to the Depositary Governments. Denunciation shall take effect six months following the date on which notification is received by the Depositary Governments. IN WITNESS WHEREOF the undersigned Plenipotentiaries, being duly authorized thereto by their Governments, have signed this Convention. DONE at The Hague, this sixteenth day of December, one thousand nine hundred and seventy, in three originals, each being drawn up in four authentic texts in the English, French, Russian and Spanish languages.

3.6. Montreal Convention

CONVENTION FOR THE SUPPRESSION OF UNLAWFUL ACTS AGAINST THE SAFETY OF CIVIL AVIATION

- ICAO convened a diplomatic conference at Montreal and on 23 September 1971 it adopted the Convention for the Suppression of Unlawful Acts against the Safety of Civil Aviation.
- The Convention entered into force on 26 January 1973. As of September 2002 it had 176 Parties, including 47 Commonwealth States.
- The United Kingdom ratified the Convention on 25 October 1973 also in respect of all its overseas territories.
- A number of them have since attained independence, some of which have formally succeeded to the Convention.

THE STATES PARTIES TO THIS CONVENTION

- CONSIDERING that unlawful acts against the safety of civil aviation jeopardize the safety of persons and property, seriously affect the operation of air services, and undermine the confidence of the peoples of the world in the safety of civil aviation;
- CONSIDERING that the occurrence of such acts is a matter of grave concern;
- CONSIDERING that, for the purpose of deterring such acts, there is an urgent need to provide appropriate measures for punishment of offenders;

HAVE AGREED AS FOLLOWS:

ARTICLE 1

1. Any person commits an offence if he unlawfully and intentionally:
(a) performs an act of violence against a person on board an aircraft in flight if that act is likely to endanger the safety of that aircraft; or
(b) destroys an aircraft in service or causes damage to such an aircraft which renders it incapable of flight or which is likely to endanger its safety in flight; or
(c) places or causes to be placed on an aircraft in service, by any means whatsoever, a device or substance which is likely to destroy that aircraft, or to cause damage to it which renders it incapable of flight, or to cause damage to it which is likely to endanger its safety in flight; or
(d) destroys or damages air navigation facilities or interferes with their operation, if any such act is likely to endanger the safety of aircraft 'in flight;or
(e) communicates information which he knows to be false, thereby endangering the safety of an aircraft in flight.
2. Any person also commits an offence if he:
(a) attempts to commit any of the offences mentioned in paragraph 1 of this Article; or
(b) is an accomplice of a person who commits or attempts to commit any such offence.

ARTICLE 2

For the purposes of this Convention:
(a) an aircraft is considered to be in flight at any time from the moment when all its external doors are closed following embarkation until the moment when any such door is opened for disembarkation; in the case of a forced landing, the flight shall be deemed to continue until the competent authorities take over the responsibility for the aircraft and for persons and property on board;
(b) an aircraft is considered to be in service from the beginning of the preflight preparation of the aircraft by ground personnel or by the crew for a specific flight until twenty-four hours after any landing; the period of service shall, in any event, extend for the entire period during which the aircraft is in flight as defined in paragraph (a) of this Article.

ARTICLE 3
Each Contracting State undertakes to make the offences mentioned in Article 1 punishable by severe penalties.

ARTICLE 4
1. This Convention shall not apply to aircraft used in military, customs or police services.
2. In the cases contemplated in subparagraphs (a), (b), (c) and (e) of paragraph 1 of Article 1, this Convention shall apply, irrespective of whether the aircraft is engaged in an international or domestic flight, only if:
(a) the place of take-off or landing, actual or intended, of the aircraft is situated outside the territory of the State of registration of that aircraft; or
(b) the offence is committed in the territory of a State other than the State of registration of the aircraft.
3. Notwithstanding paragraph 2 of this Article, in the cases contemplated in subparagraphs (a), (b), (c) and (e) of paragraph 1 of Article 1, this Convention shall also apply if the offender or the alleged offender is found in the territory of a State other than the State of registration of the aircraft.
4. With respect to the States mentioned in Article 9 and in the cases mentioned in subparagraphs (a), (b), (c) and (e) of paragraph 1 of Article 1, this Convention shall not apply if the places referred to in sub-paragraph (a) of paragraph 2 of this Article are situated within the territory of the same State where that State is one of those referred to in Article 9, unless the offence is committed or the offender or alleged offender is found in the territory of a State other than that State.
5. In the cases contemplated in subparagraph (d) of paragraph 1 of Article 1, this Convention shall apply only if the air navigation facilities are used in international air navigation.
6. The provisions of paragraphs 2, 3, 4 and 5 of this Article shall also apply in the cases contemplated in paragraph 2 of Article 1.

ARTICLE 5
1. Each Contracting State shall take such measures as may be necessary to establish its jurisdiction over the offences in the following cases:
(a) when the offence is committed in the territory of that State;
(b) when the offence is committed against or on board an aircraft registered in that State;
(c) when the aircraft on board which the offence is committed lands in its territory with the alleged offender still on board;

(d) when the offence is committed against or on board an aircraft leased without crew to a lessee who has his principal place of business or, if the lessee has no such place of business, his permanent residence, in that State.
2. Each Contracting State shall likewise take such measures as may be necessary to establish its jurisdiction over the offences mentioned in Article 1, paragraph 1 (a), (b) and (c), and in Article 1, paragraph 2, in so far as that paragraph relates to those offences, in the case where the alleged offender is present in its territory and it does not extradite him pursuant to Article 8 to any of the States mentioned in paragraph 1 of this Article.
3. This Convention does not exclude any criminal jurisdiction exercised in accordance with national law.

ARTICLE 6
1. Upon being satisfied that the circumstances so warrant, any Contracting State in the territory of which the offender or the alleged offender is present, shall take him into custody or take other measures to ensure his presence. The custody and other measures shall be as provided in the law of that State but may only be continued for such time as is necessary to enable any criminal or extradition proceedings to be instituted.
2. Such State shall immediately make a preliminary enquiry into the facts.
3. Any person in custody pursuant to paragraph 1 of this Article shall be
assisted in communicating immediately with the nearest appropriate representative of the State of which he is a national.
4. When a State, pursuant to this Article, has taken a person into custody, it shall immediately notify the States mentioned in Article 5, paragraph 1, the State of nationality of the detained person and, if it considers it advisable, any other interested States of the fact that such person is in custody and of the circumstances which warrant his detention. The State which makes the preliminary enquiry contemplated in paragraph 2 of this Article shall promptly report its findings to the said States and shall indicate whether it intends to exercise jurisdiction.

ARTICLE 7
The Contracting State in the territory of which the alleged offender is found shall, if it does not extradite him, be obliged, without exception whatsoever and whether or not the offence was committed in its territory, to submit the case to its competent authorities for the purpose of prosecution. Those authorities shall take their decision in the same manner as in the case of any ordinary offence of a serious nature under the law of that State.

ARTICLE 8
1. The offences shall be deemed to be included as extraditable offences in any extradition treaty existing between Contracting States. Contracting States undertake to include the offences as extraditable offences in every extradition treaty to be concluded between them.
2. If a Contracting State which makes extradition conditional on the existence of a treaty receives a request for extradition from another Contracting State with which it has no extradition treaty, it may at its option consider this Convention as the legal basis for extradition in respect of the offences. Extradition shall be subject to the other conditions provided by the law of the requested State.

3. Contracting States which do not make extradition conditional on the existence of a treaty shall recognize the offences as extraditable offences between themselves subject to the conditions provided by the law of the requested State.
4. Each of the offences shall be treated, for the purpose of extradition between Contracting States, as if it had been committed not only in the place in which it occurred but also in the territories of the States required to establish their jurisdiction in accordance with Article 5, paragraph 1 (b), (c) and (d).

ARTICLE 9
The Contracting States which establish joint air transport operating organizations or international operating agencies, which operate aircraft which are subject to joint or international registration shall, by appropriate means, designate for each aircraft the State among them which shall exercise the jurisdiction and have the attributes of the State of registration for the purpose of this Convention and shall give notice thereof to the International Civil Aviation Organization which shall communicate the notice to all States Parties to this Convention.

ARTICLE 10
1. Contracting States shall, in accordance with international and national law, endeavour to take all practicable measures for the purpose of preventing the offences mentioned in Article
2. When, due to the commission of one of the offences mentioned in Article 1, a flight has been delayed or interrupted, any Contracting State in whose territory the aircraft or passengers or crew are present shall facilitate the continuation of the journey of the passengers and crew as soon as practicable, and shall without delay return the aircraft and its cargo to the persons lawfully entitled to possession.

ARTICLE 11
1. Contracting States shall afford one another the greatest measure of assistance in connection with criminal proceedings brought in respect of the offences. The law of the State requested shall apply in all cases.
2. The provisions of paragraph 1 of this Article shall not affect obligations under any other treaty, bilateral or multilateral, which governs or will govern, in whole or in part, mutual assistance in criminal matters.

ARTICLE 12
Any Contracting State having reason to believe that one of the offences mentioned in Article 1 will be committed shall, in accordance with its national law, furnish any relevant information in its possession to those States which it believes would be the States mentioned in Article 5, paragraph 1.

ARTICLE 13
Each Contracting State shall in accordance with its national law report to the Council of the International Civil Aviation Organization as promptly as possible any relevant information in its possession concerning:
(a) the circumstances of the offence;

(b) the action taken pursuant to Article 10, paragraph 2;
(c) the measures taken in relation to the offender or the alleged offender and, in particular, the results of any extradition proceedings or other legal proceedings.

ARTICLE 14

1. Any dispute between two or more Contracting States concerning the interpretation or application of this Convention which cannot be settled through negotiation, shall, at the request of one of them, be submitted to arbitration. If within six months from the date of the request for arbitration the Parties are unable to agree on the organization of the arbitration, anyone of those Parties may refer the dispute to the International Court of Justice by request in conformity with the Statute of the Court.
2. Each State may at the time of signature or ratification of this Convention or accession thereto, declare that it does not consider itself bound by the preceding paragraph. The other Contracting States shall not be bound by the preceding paragraph with respect to any Contracting State having made such a reservation.
3. Any Contracting State having made a reservation in accordance with the preceding paragraph may at any time withdraw this reservation by notification to the Depositary Governments.

ARTICLE 15

1. This Convention shall be open for signature at Montreal on 23 September 1971, by States participating in the International Conference on Air Law held at Montreal from 8 to 23 September 1971 (hereinafter referred to as the Montreal Conference). After 10 October 1971, the Convention shall be open to all States for signature in Moscow, London and Washington. Any State which does not sign this Convention before its entry into force in accordance with paragraph 3 of this Article may accede to it at any time.
2. This Convention shall be subject to ratification by the signatory States. Instruments of ratification and instruments of accession shall be deposited with the Governments of the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America, which are hereby designated the Depositary Governments.
3. This Convention shall enter into force thirty days following the date of the deposit of instruments of ratification by ten States signatory to this Convention which participated in the Montreal Conference.
4. For other States, this Convention shall enter into force on the date of entry into force of this Convention in accordance with paragraph 3 of this Article, or thirty days following the date of deposit of their instruments of ratification or accession, whichever is later.
5. The Depositary Governments shall promptly inform all signatory and acceding States of the date of each signature, the date of deposit of each instrument of ratification or accession, the date of entry into force of this Convention, and other notices.
6. As soon as this Convention comes into force, it shall be registered by the Depositary Governments pursuant to Article 102 of the Charter of the United Nations and pursuant to Article 83 of the Convention on International Civil Aviation (Chicago, 1944).

ARTICLE 16

1. Any Contracting State may denounce this Convention by written notification to the Depositary Governments.

2. Denunciation shall take effect six months following the date on which notification is received by the Depositary Governments.
IN WITNESS WHEREOF the undersigned Plenipotentiaries, being duly authorized thereto by their Governments, have signed this Convention. DONE at Montreal, this twenty-third day of September, one thousand nine hundred and seventy-one, in three originals, each being drawn up in four authentic texts in the English, French, Russian and Spanish languages(4)

3.7. THE 2001 CAPE TOWN CONVENTION ON INTERNATIONAL INTERESTS IN MOBILE EQUIPMENT AND AIRCRAFT EQUIPMENT PROTOCOL: INTERNATIONALIZING ASSET-BASED FINANCING PRINCIPLES FOR THE ACQUISITION OF AIRCRAFT AND ENGINES

- ON NOVEMBER 16, 2001, delegations from 68 States and 14 international organizations,' meeting in diplomatic conference in Cape Town, South Africa, adopted the Cape Town Convention on International Interests in Mobile Equipment and the Aircraft Equipment Protocol thereto. This event was particularly noteworthy for a number of reasons: it was the first major diplomatic conference ever held in South Africa's "mother city" and the first time that Cape Town has given its name to an international treaty; it broke new ground in enshrining asset based financing principles in a multilateral treaty applicable to aircraft and engines; it demonstrated unprecedented cooperation between the International Institute for the Unification of Private Law (Unidroit) and the International Civil Aviation Organization (ICAO), the two organizations under whose aegis the Diplomatic Conference was convened; it represented the culmination of almost unprecedented public-private sector cooperation among governments, international organizations and the aviation industry, including aerospace manufacturers, aircraft and engine leasing companies, banks and other lending institutions engaged in financing aircraft and engine acquisition; and it laid the groundwork for the negotiation and adoption of at least two further Protocols to the Cape Town Convention: one on Railway Rolling Stock' and one on Space Assets.
- The Cape Town Conference was the successful result of more than thirteen years of work: within Unidroit from 1988 to 1997,and from 1997 to 2001 in several forums; in particular the Aviation Working Group (AWG), the International Air Transport Association (IATA) and ICAO, as well as in Unidroit. At the end of the period 1988 to 1997, Unidroit found itself in a veritable cul-de-sac as its diligent efforts to produce new treaty law governing security interests in cross border transactions concerning high-value mobile assets were largely frustrated by the virtual impossibility of devising a single regime applicable to property as diverse as aircraft and engines, railway rolling stock, space property, offshore oil rigs and certain types of ships.

- The Convention and Protocol were signed by 20 States at the conclusion of the Cape Town Diplomatic Conference on November 16, 2001, and since then by six additional States, including the United States, on May 9, 2003, and have thus far been ratified by only one State, Panama, on July 28, 2003. The list is set out below.
- The treaty instruments require eight ratifications in order to come into force.' Despite ICAO's initial insistence on 30 ratifications, this relatively low number was agreed to after many months of spirited lobbying by IATA and the AWG and rather heated debate in Cape Town. At its 57th Annual General Meeting in Madrid in June 2001, the Members of IATA

had unanimously adopted a Resolution stating that IATA: "strongly recommends that the treaties' rapid entry into force be facilitated by requiring a minimum number of ratifications for this purpose." IATA and the AWG forcefully argued that, since the treaties are private international commercially-oriented instruments, quasi-universality or even widespread acceptance is not needed to launch the new regime. This is especially so given that less than 30 States account for over eighty percent of all aircraft and engine transactions41 in today's world. The 30

- States are: Australia, Brazil, Canada, China, Egypt, Finland, France, Germany, India, Ireland, Italy, Japan, Malaysia, Mexico, the Netherlands, the three Scandinavian countries, Poland, Russia, South Korea, Saudi Arabia, Singapore, South Africa, Spain, Switzerland, the United Arab Emirates, the United Kingdom,
- and the United States. Indeed, it was the strongly held common view of IATA, the AWG and Unidroit, that any requirement for more than a single- digit number of ratifications would create a risk that the
- treaty instruments might never come into force, as has been the case with a number of ICAO treaties.43 After intensive corridor discussions and consultations among key government delegations, ICAO, Unidroit, the AWG, and IATA, the diplomatic conference endorsed this position.
- As noted above, as a member of the Aircraft Protocol Group ICAO had significant input into the Aircraft Protocol (and some modest involvement in the elaboration of the "umbrella" Convention), and the draft instruments were duly processed through the Legal Committee and the Council of ICAO. Furthermore,
- ICAO agreed to be a co-sponsor with Unidroit of the Cape Town Diplomatic Conference. However Unidroit, the AWG, and IATA were the continuing engines of progress, in particular, throughout the last three years of the negotiations. In particular, the AWG and IATA were constantly pressing for timelines,
- and it was they who sought out, visited and secured a commitment by South Africa to host the Diplomatic Conference.
- The AWG and IATA arranged, conducted, and their representatives participated in information seminars around the world, their representatives prepared and circulated information papers, and wrote articles in learned journals directed to de-mystifying asset-based financing for high-value mobile equipment.

3.8. FREEDOMS OF THE AIR

These are the Freedoms of the air which are negotiated in bilateral air services agreements. All these freedoms refer to scheduled passenger and cargo services or flights. All these freedoms refer to revenue traffic, i.e. passengers and/or cargo that pay to be transported on a flight. In all these freedoms we are referring to an airline registered in a specific country and performing scheduled flights. This specific country is the “home country” of this airline.

1. First freedom: The right to overfly another country without landing.

2. Second freedom: The right to make a landing in another country for technical reasons without picking up or setting down revenue traffic.
3. Third freedom: The right to carry revenue traffic to another country.
4. Fourth freedom: The right to bring revenue traffic from another country.
5. Fifth freedom: The right to carry revenue traffic between two other countries in a service (or flight) originating or terminating in the home country.
6. Sixth freedom: The right to carry revenue traffic between two other countries via the airline's home country as the transit point. Effectively this means using two sets of third and fourth freedom rights.
7. Seventh freedom: The right to carry revenue traffic between two other countries without stopping at the airline's home country.
8. Eighth freedom: This is also referred to as cabotage as part of a service originating or terminating in the home country: The right to pick up and set down revenue traffic between two domestic points in another country on a service (or flight) originating in the airline's home country.
9. Ninth freedom: This is also referred to as cabotage: The right to pick up and set down revenue traffic between two domestic points in another country, without the service (or flight) originating or terminating in the airline's home country.

3.9 Aviation Finance

- The Aviation Finance is a financial transaction specially invented for the use of airline carrier companies to procure aircrafts. Technically it is categorized largely as either loan or lease, which includes types of corporate loans to the airline company, official guarantee schemes provided by an export-import bank of government establishment, and loans to an aircraft leasing company
- The Aviation Finance has commonality in characteristics with the Ship Finance, the Project Finance
- or the Whole Business Securitization (WBS) in the sense that the fund is raised on a cash flow basis. It also has its uniqueness that requires particular analytical attention, in which the airline industry peculiarity comes to play.

The basic scheme of the leasing transaction is as below in fig 3.1,

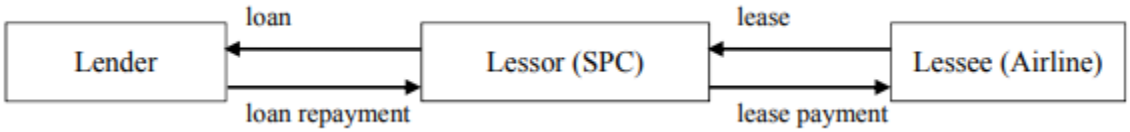

Fig 3.1 basic scheme of the leasing transaction

The Lessor raises fund by a loan and then purchases a given aircraft, owns and lets it out to the Lessee. The Lessee pays a lease fee to the Lessor which in turn pays interest and principal amounts of the loan out of the fees received from the Lessee.
It is often the case in which the Lessor is a SPC of mere ownership purpose and its actual ownership cum management/operational control belongs to a lease company.

Main sources of financing for airlines:

- Cash: cheapest way to finance, but only for profitable or State-owned airlines. The residual

value risk remains high

- Operating lease/sale and lease back transactions: similar to car hire and very frequently used. It is a flexible and relatively cheap source of financing
- Bank loan/finance leases: like mortgages. A finance lease is based on the same principle as a loan
- Export Credit Guaranteed loans: Ex-Im Bank in the US (for Boeing), Coface/ECGD (for Airbus). The relevant agency guarantees the loan. This system is not available to 'national' airlines
- Manufacturer support: residual value guarantees. This covers the price that the manufacturer will pay to buy the aircraft at lease end
-

Leasing – a flexible solution

Straight forward operating lease

Main elements:

o payment of up-front deposit

o the economic risk remains with the lessor

o strong focus on maintenance and redelivery conditions

o the risk of loss of the aircraft remains with the lessee

Advantages of operating leases:

o they could be short term, wet leases, etc

o lease rentals are 'debts' on the balance sheet

o Flexible to meet operational constraints and seasonal needs

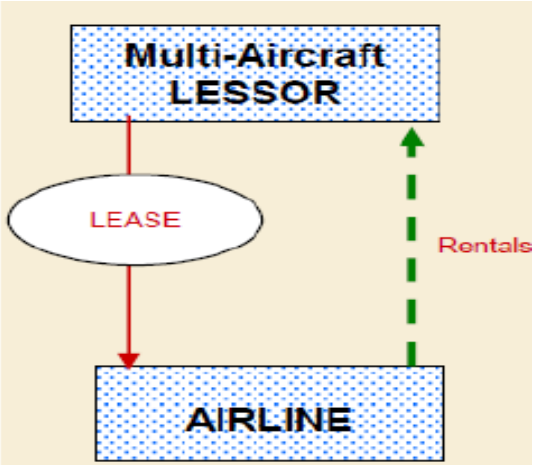

Fig 3.2 Lease vs Rental

Leasing – Various options

Possible support:

o Export Credit Agencies guaranteeing the lenders

Possible alternatives for liquidity needs:

o Sale and lease back transactions

Tax driven structures:

o Japanese Operating Leases

o French Leveraged Leases
o Spanish Operating Leases

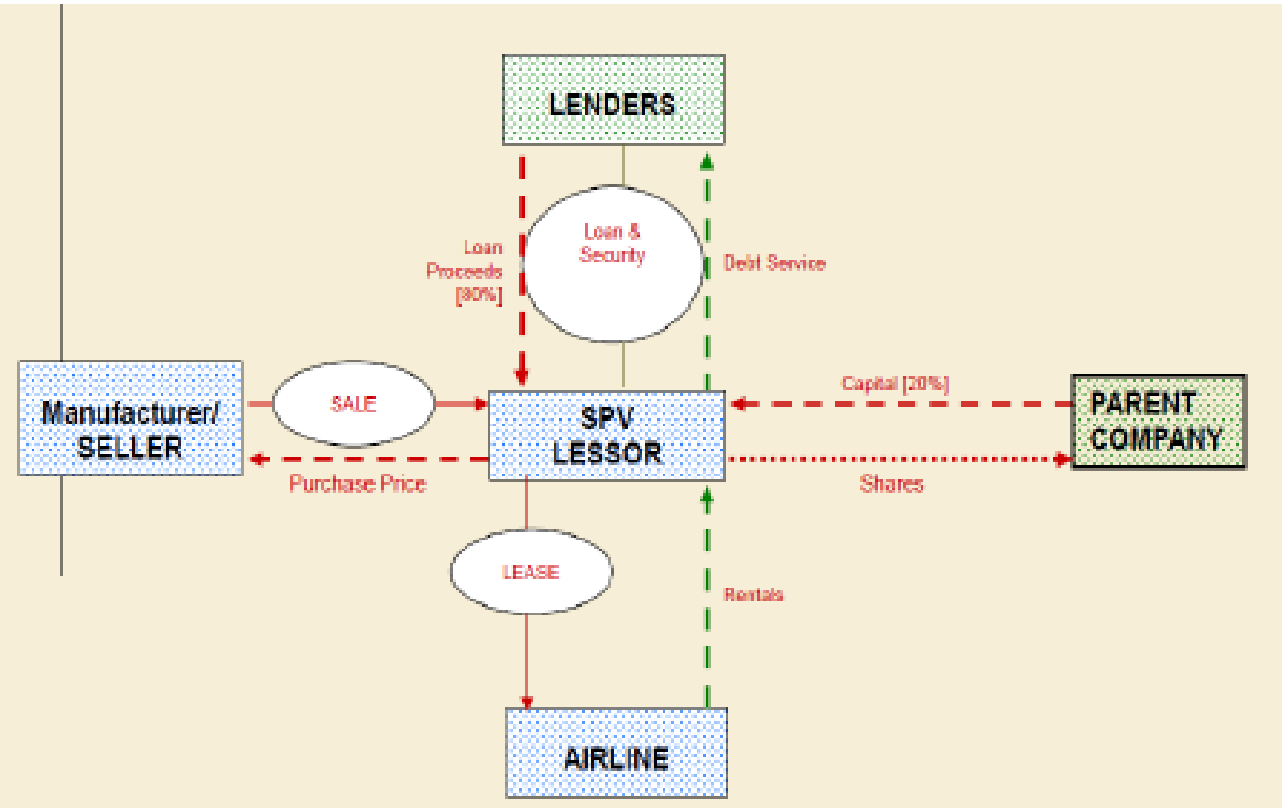

Fig3.3 Old vs New – available sources of financing

Old situation:

- o State owned rail operators
- o Long term players
- o Large access to government funding or government guarantees
- o Good credit rating when borrowing on financial markets

New situation:

- o New players entering the market
- o Franchising and concessions – terms and duration
- o Reduced availability of funds at State level

Available sources of financing:

- o State funds / EU funds
- o Eurofima loans: only available to state-owned operators
- o Private loans
- o Emergence of ROSCOs (Rolling Stock Leasing Companies)

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UNIT- IV – AVIATION MANAGEMENT - SAE1403

4.AIR SAFETY

4.1 Aviation − Safety Management

Aviation risks and threats are a part of the daily operations of the aviation industry. They can put passengers to face time delays, price hikes, uncertainty or even the loss of life. Though it uses radars, which spot intrusion into the controlled airspace and other navigational aids, the aircrafts face threats of losing its path. Today, though a large number of instruments aid aviation operations accurately in real time, aviation business is prone to hazards, risk, and threats. Since numerous passenger's travel by air frequently, there are objections related to risks, vulnerabilities, and threat.

Risks in Aviation

It is a potential loss or damage of property, information or lives (=assets) that can happen due to a threat. Literally, there is a risk if the assets, vulnerabilities, and threats are present together.

4.1.1Common Aviation Risks

Aviation risks include operational, strategic, compliance, or financial risks that than put the assets into problem. There can be several types of risks for aircraft as well as airport:

- Bad weather conditions for a flying aircraft
- Aircraft about to run out of fuel while in flight
- A person in the aircraft or airport needs medical aid critically
- Failure of electrical, electronics, or mechanical component
- Pilot's mistake
- Bird-strike at the time of aircraft movement
- An inexperienced employee or unknown person at the airport
- Unscreened passengers or their articles allowed to board the aircraft
- Repayment of loan

The risks can be seen as most forgivable to most intolerable.

Risk assessment is performed to uncover the loopholes in the systems and take corrective actions. ***Risk analysis*** is done to find out the particular cause of the accident or incident and reduce the likelihood of further risks.

Vulnerability in Aviation

Vulnerability is a weakness or a loophole in the security system. A threat can take undue advantage of a vulnerability to breach the security and destroy assets.

4.1.2.Common Aviation Vulnerabilities

The following can be the different vulnerabilities that the aviation industry undergoes:

- Access to airside area of the airport to non-traveler/non-staff people
- Poor screening methods for passengers and baggage
- Poor aircraft or airport maintenance
- Overcrowding near adjacent gates at the time of departure
- Poor security in handling information regarding flight plan

4.1.3.Threats in Aviation

A threat is a particular source of attack. Can someone forget the most notorious and perilous 9/11 attack where four airliners were hijacked to carry out a suicidal attack on World Trade Center and Pentagon. On December 24, 1999, Air India IC 814 with 178 passengers and 11 crew members was hijacked by terrorists and taken to Kandahar, under the then Taliban control. Today the terror methods have potentially increased with sophistication in destroying.

There are many such incidents when the aircrafts are hijacked by terrorists or extremists and this often leads to the loss of assets. These threats are mostly intentional. In some rare cases, mentally unstable people have been found to be the cause of such incidents.

4.1.4.Common Aviation Threats

The following can be the common aviation threats:

- Unattended or unclaimed baggage found at airport.
- A person carrying weapon without declaration.
- A person not cooperating with the security staff.
- A person carrying sharp objects with him.
- A call from an unknown person for destruction.
- A person with suspicious gestures and appearance.

4.2.Safety and Security in Aviation

- The airport security systems and staff together work towards the safety of the airport, the aircraft, and also the safety of the passengers. To manage the airport as well as the aircraft security, the following measures are employed:
- Aircraft and airport employees are trained on security and safety issues, as well as crisis handling procedures.
- Aircrafts are equipped with emergency exit way and procedures for passengers.
- Airport areas are monitored by Closed Circuit TV cameras.
- A dedicated team of trained police force is employed for airport and aircraft safety.
- The security staff takes the help of sniffer dogs to detect any unclaimed object lying around the airport.
- The airports are equipped with fire-fighting alarm and fire-extinguishing systems.
- Sensitive airside areas in airports, such as ramps and operational spaces, are restricted from the general public.
- Every traveler who arrives at the airport needs to enter into the airport only from the Departure entry. The traveler can go in further only after showing a valid journey ticket, an identity proof, and a passport if required.
- Non-passengers need to obtain a gate pass and face security checking to enter the secure area of the airport.
- Traveler check-in baggage and handbags are strictly screened through X-ray machines.
- Travelers are screened by metal detectors before they board. But they can be subjected to later screening if required.
- Travelers are not permitted to enter the cockpit area of the aircraft.
- The food joints at the airport use containers and glasses made of plastic instead of those made of glass as they can be used as weapons.

- Dulles International Airport at Washington uses ***Fiber Optic Perimeter Intrusion Detection System*** that enables the airport security to locate and detect any intrusion on the airport perimeter, ensuring real-time, immediate intrusion notification. This further enables the security staff to carry out necessary security procedures.

A recent X-Ray technology is helping the airport safety and security staff to detect weapons and chemicals on passengers. This system has sensors to detect volatile compounds given off from explosives using gas chromatography.

Object Prohibited into Airport / Aircraft

Travelers are prohibited from carrying any personal stuff that can be harmful in the airport premises or in the aircraft. These objects are:

Personal Stuff − Razors, scissors, manicure kits, knives, ropes or strings
Liquids − Personal water-bottle, flammable or non-flammable liquids, fuels, gels
Explosives − Gas cans, fireworks or fire-extinguishers
Food Items − Jellies, soups, syrups, dips, salad dressings, vinegar, sauces, and alcohol
Tools − Crowbars, catapult, hammer, saw, drills and drill bits, screw-drivers, wrenches, pliers, metal or plastic wires
Sports Equipment − Hockey sticks, cricket bats, bows and arrows

Contingency Planning

The Air Navigation Service Provider (ANSP) needs to set up contingency strategies to handle future mishaps that may arise due to various risks and threats.

The contingency strategies are of two types:

- Alternate airspace strategies
- Alternate location strategies

Contingency Planning involves:

- Finding out if there is an already existing plan to manage the consequences of the
- incidents or accidents.
- Inventory of the units/services/functions of an Air Navigation Service Provider (ANSP).
- Identifying realistic events which increase the likelihood of the mishaps and lead to
- the loss of assets.
- Developing or changing contingency measures that meet safety and security
- requirements.
- Developing a plan for Contingency Assessment to ensure that contingency
- requirements are met.
- Developing plan and procedures to resume the normal operations.

Birds, Wildlife, and Snow Control

Collision with birds is one of the major challenges for aircraft safety. Aircrafts can sometimes damage themselves after colliding with birds. To avoid such mishaps, the airports need to install **Airport Bird Control System**, which is specifically created for repelling birds and other wandering animals away from airports and runways.

Some airports use **Bird Aversion Liquid** or Gas, which upon spraying creates an invisible barrier between birds and aircraft. This spray irritates birds' sensory system, which is harmless for their life but keeps them from flying near airport.

Some electronic bird repellent systems also have high-output amplifiers with multiple speakers installed in tower design. These systems are weatherproof and are capable of repelling birds up to 30 acres with a sound output around 125 DB.
It is not just the combination of a bird and an aircraft flying into each other that is dreadful. An animal on the runway also can cause a great hazard as flipping an aircraft while taking off or landing. There are chances of wild animals entering the runway if it is not properly secured. To deter animals' entry, the airports are surrounded with partially buried fencing.

4.3.Interagency Committee for Aviation Policy (ICAP)

In 2000, members of the Interagency Committee for Aviation Policy (ICAP) signed an agreement stating that they would adopt and adhere to a set of "Safety Standards and Guidelines for Federal Flight Programs" (22 December 1999). These guidelines provide Federal agencies that own and/or operate aircraft with a framework for developing their own comprehensive flight program standards. The ICAP's intent in developing these guidelines is to enhance operational safety and effectiveness. Each agency uses these guidelines to develop, implement, and maintain agency-specific aviation flight program standards. Each agency is solely responsible for managing its own flight program, for writing its own standards based on the Safety Standards Guidelines, and for instituting a self-oversight program that includes independent inspection services, obtained and managed by the individual agencies. The Guidelines were promulgated on November 6, 2002, into Chapter 102-Federal Management Regulation, Subchapter B-Personal Property, Part102-33 Management of Government Aircraft (FMR Part 102-33).

Definition: The ICAP Federal Aviation "Gold Standard" Program is a voluntary, self-certification program whereby the ICAP recognizes those agencies that have made the commitment to Federal aviation safety by implementing and actively supporting the ICAP Safety Standards Agreement, the Guidelines, and/or adhering to the FMR Part 102-33. Adherence to the FMR Part 102-33 will serve as a prerequisite for the issuance of an ICAP Federal Aviation "Gold Standard" Program recognition certificate.

Objective/Goal: The main objective of the ICAP Federal Aviation "Gold Standard" Program is to bring about a positive change in the aviation safety culture among those Federal agencies that own and/or operate aircraft. The awarding of a certificate will recognize a commitment on the part of the individual agencies to achieve a higher standard of safety through the adoption of aviation industry best practices. This recognition will be awarded to those agencies that verify that they are adhering to the FMR Part 102-33.

4.4.National Transportation Safety Board

The National Transportation Safety Board (NTSB) is an independent federal agency with a mandate to investigate accidents and promote safety in the transportation industry. With its reputation for independence and objectivity, the NTSB is widely regarded as an authoritative voice in transportation safety, and one of the most admired agencies in the federal government. Through its detailed accident investigations, direct and unequivocal recommendations for safety improvements, and plainspoken real-time communication with the public at the start of a major accident's media barrage, the NTSB has earned the public's trust and confidence in ways that few

other government agencies can match. The objective of this study is to understand the key factors underlying the effectiveness of the NTSB so as to derive lessons that may be profitably applied to other industries. Of course, we acknowledge at the outset that certain unique features of the transportation industry contribute to the NTSB's success. Transportation accidents are almost always limited in scope and time, which makes it possible to conduct in-depth forensic1 investigations that result in concrete conclusions and actionable remedies. Such accidents are also typically well-defined, with causes that are usually identifiable upon detailed examination, allowing the NTSB to be largely reactive yet still highly effective. Finally, and perhaps most significantly, no one benefits immediately from a transportation accident. Therefore, all stakeholders are united in their desire to improve safety. As Jeff Marcus, an NTSB safety specialist, put it, "You can trust people to be honest and moral about not killing themselves." This last point may seem obvious, but in other industries, certain parties may profit handsomely from crises that inflict enormous pain on others. Despite these features of transportation, the NTSB's enviable record of success deserves further study to determine which of its methods are applicable to other technology-based industries such as financial services, healthcare, and energy, all industries in which "accidents" arise from the failure of complex systems, i.e., systemic risk. This is the challenge we undertake in this article. By examining the structure and functions of the NTSB, and studying a specific accident investigation in detail, we observe five major factors that seem to characterize the agency's success: (1) the governance structures that give rise to the agency's impartiality and singular focus; (2) the investigative "Go Team" as a cohesive unit; (3) the collective intelligence of the NTSB's "party system"; (4) effective media relations; and (5) employee satisfaction. While some of the NTSB's practices are indeed specific to the transportation industry, we believe that the most important drivers of its success can be adapted to other industries and contexts. We begin in Section 2 by providing a brief organizational overview of the NTSB. In Section 3, we focus on the most important aspect of the NTSB: its accident-investigation process. To illustrate how this process works, we present a case study of the NTSB's investigation of the Minnesota I-35W highway bridge collapse in Section 4. Based on this example and other observations, we summarize the organizational factors that contribute the most to the success of the NTSB in Section 5. In Section 6, we consider some of the current challenges facing the NTSB, and we conclude in Section 7.

4.4.1.The NTSB organization:

The NTSB can be traced back to the Air Commerce Act of 1926, which eventually led to the establishment of the Civil Aeronautics Board's Bureau of Safety in 1940. Beginning in 1967, the NTSB emerged as an independent agency within the Department of Transportation (DOT), and was later reestablished as a completely independent entity outside of DOT by Congress through the Independent Safety BoardAct of 1974 (see Appendix A.1 for key facts and figures of the NTSB). A lean organization of about 400 employees, the NTSB is charged with investigating every civil aviation accident and all significant highway, marine, railroad, pipeline, and hazardous-materials accidents. From these investigations, the NTSB first identifies the cause of the accidents and, thereafter, develops safety recommendations for preventing similar accidents in the future. Significantly, the NTSB has no regulatory authority; the Federal Aviation Administration regulates the airline industry, the National Highway Traffic Safety Administration and the Federal Motor Carrier Safety Administration regulate motor vehicle transportation, the United States Coast Guard regulates civil waterborne transportation, and the Pipeline and Hazardous Materials Safety Administration regulates pipelines and hazardous materials. The NTSB is primarily responsible

for conducting investigations to determine the causes of accidents and making safety recommendations. This lack of regulatory powers may seem to be a disadvantage; after all, how can an agency have impact without the authority to carry out its recommended courses of action? In fact, the absence of rule-making responsibilities preserves the NTSB's objectivity in its investigations, allowing it to identify regulatory gaps and failings as well as engineering flaws, and can therefore issue the most objective recommendations to improve safety. This important feature is described explicitly in the NTSB's strategic plan. In 1974, Congress reestablished the NTSB as a completely separate entity, outside the DOT, reasoning that 'No federal agency can properly perform such (investigatory) functions unless it is totally separate and independent from any other agency of the United States.' Because the DOT has broad operational and regulatory responsibilities that affect the safety, adequacy, and efficiency of the transportation system, and transportation accidents may suggest deficiencies in that system, the NTSB's independence was deemed necessary for proper oversight. The NTSB, which has no authority to regulate, fund, or be directly involved in the operation of any mode of transportation, conducts investigations and makes recommendations from an objective viewpoint This paradox of less regulatory authority yielding greater influence is one of the most striking characteristics of the NTSB, and in this section we shall attempt to deconstruct and explicate the mechanisms by which this small agency has been able to achieve so much.

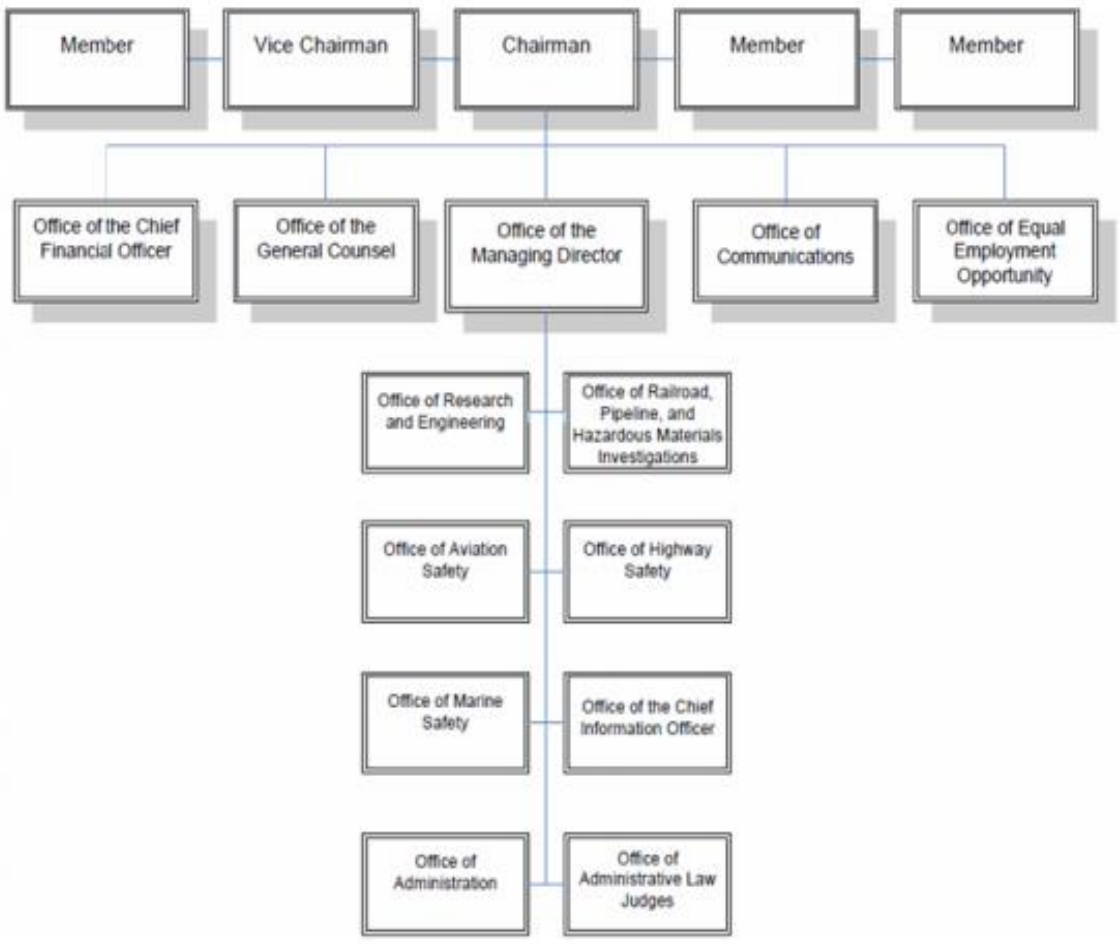

Fig 4.1 Organizational chart of the NTSB. Source: NTSB website http://ntsb.gov/Abt_NTSB/orgchart/org.htm.

4.4.2.The NTSB's Role in Aviation Safety

- Whenever there is an aviation crash involving civil aircraft in the US, the National Transportation Safety Board (NTSB) is called upon to investigate. The NTSB is an independent federal agency, charged by Congress to investigate transportation accidents, determine probable cause, and issue safety recommendations to prevent similar accidents. The agency's scope extends beyond aviation crashes, as it also investigates selected rail, marine, highway, and pipeline accidents, as well as those involving transportation of hazardous materials.
- NTSB was founded in 1967 and originally had ties to the US Department of Transportation (DOT). Because accident causation may sometimes involve issues of inadequate oversight by DOT modal agencies, however, such as the Federal Aviation Administration (FAA), questions arose regarding NTSB's ability to investigate and remain entirely impartial. In response to those concerns, Congress passed the Independent Transportation Safety Board Act of 1974; as the name implies, that Act severed NTSB's ties to DOT and made it a completely independent agency. Independence is one of the Safety Board's greatest virtues – it allows the agency to conduct investigations and explore safety issues without being encumbered by actual or perceived political pressures.
- The primary role of NTSB is improving safety of our nation's transportation system. The agency determines the probable cause of accidents and issues safety recommendations to prevent similar occurrences. It does not determine fault or liability. In fact, according to 49 U.S.C. § 1154(b), "No part of a report of the Board, related to an accident or an investigation of an accident, may be admitted into evidence or used in a civil action for damages resulting from a matter mentioned in the report."
- With headquarters in Washington, DC, the agency employees approximately 400 workers. Around 250 of these employees are assigned to headquarters, while the remainders are stationed throughout the country in one of four regional offices. Of the 400 employees, about 125 work in NTSB's office of aviation safety; the remaining employees are devoted to investigating accidents in other transportation modes, along with a host of employees who provide administrative support functions.
- The actual Board consists of five board members who are appointed by the President and confirmed by the US Senate. The Board provides oversight of the investigative staff's products. At the completion of an investigation, the investigative staff presents their report, findings, and proposed recommendations to the Board for its approval. This approval may come in the form of the board members holding a publicly-noticed board meeting, or they may read the report and vote individually via an electronic ballot.
- Since its inception in 1967, NTSB has investigated nearly 140,000 aviation accidents, and issued over 5000 aviation-related safety recommendations. The agency has no regulatory authority; when a deficiency is noted, NTSB cannot enact a law or regulation to "fix" the problem. What it can do, however, is issue safety recommendations to the appropriate organization(s). The agency tracks the status of each recommendation and follows up periodically on those that have not been implemented. Over the history of the agency, approximately 82 percent of its safety recommendations have been successfully

implemented.

Responding to an Accident

The NTSB's 24/7 Response Operations Center holds vigil over a score of television monitors and computer screens. Often, the news media provides NTSB with the first notification of a major transportation crash. At other times, notification comes through FAA or from state or local officials.2 NTSB defines an aircraft accident as "an

The occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage."3 There are approximately 1500 aviation accidents in the US each year.

Once notified, the Response Operations Center notifies the duty officer for that particular transportation mode (e.g., aviation, highway, marine, rail). To determine the appropriate level of response, NTSB management makes a rapid assessment of the number of casualties and the anticipated complexity of the investigation. For aviation accidents, NTSB will respond in one of four ways.

- **C Form Investigation:** This type of investigation, also known as a data collection accident, is one in which the operator self-reports the circumstances through submission of a statement and a 6120 Accident Reporting Form. 4 It is used for a non-injury general aviation accident in which no airworthiness issues are apparent. Examples of such accidents would be a ground loop in a Cessna 150 in which substantial damage is done but there are no injuries, or a bounced landing in a Cessna 172 by a student pilot that does substantial wing damage but results in no injuries.

- **Limited Investigation:** A limited investigation may occur if the accident does not involve fatalities. For limited investigations, NTSB investigators do not travel to the scene; instead, the on-scene phase of the investigation is delegated to FAA. Personnel from local FAA offices respond to the accident and take photographs, document the wreckage, conduct interviews, and collect other pertinent information. Once they have completed these activities, FAA forwards the information to the NTSB's Investigator-In-Charge (IIC) for that accident. Although the FAA documents and collects on-scene information related to the accident, NTSB still retains the authority to conduct analysis and determine probable cause of the accident.

- **Regional Investigation:** For accidents that involve a small number of fatalities, NTSB will respond by sending an investigator – as IIC – from one of its four regional offices. The NTSB's IIC will be joined by parties to the investigation, as discussed below. The small investigation team will generally stay on scene two or more days while documenting wreckage, conducting interviews and collecting other pertinent information. Of the 1500 or so aviation accidents investigated each year, roughly 225 to 250 are handled as field investigations.

- **Major Investigation:** For larger-scale accidents – those with multiple fatalities or national public interest – NTSB will launch a "Go Team" from Washington, DC. This team is headed by an IIC, and will be supplemented by NTSB experts in a variety of disciplines such as powerplants, structures, operations, human performance, survival factors, and airworthiness. Remaining behind at headquarters are data specialists who read-out flight data recorders and cockpit voice recorders (CVRs); meteorological specialists; and, experts in material science who can examine aircraft components to determine possible failure modes. Major investigation Go Teams are usually accompanied by an NTSB board member who will serve as the spokesperson for the on-scene phase of the investigation. Additionally, joining the Go Team will be a representative(s) from NTSB's office of transportation disaster assistance, who will interface with victims and their families.

4.5.Parties to the Investigation

- NTSB rules allow organizations that can provide technical expertise to the investigation to obtain party status. Party status allows organizations to actively participate in the NTSB's investigation, working alongside NTSB investigators to gather factual information pertinent to the investigation. By statue, FAA is always afforded party status. Other party members typically include the aircraft operator, aircraft and engine manufacturers, and labor organizations such as pilot, air traffic controller, and mechanic unions.
- To become a party to an NTSB investigation, a representative of the organization seeking party status should request it from the IIC. Party status is a privilege – not a right – and as such, it can be revoked. This can occur when a party does not adhere to NTSB rules, the directions of the IIC, or otherwise takes actions that are prejudicial to the investigation. NTSB rules are clearly delineated in writing and are required to be acknowledged by all party participants
- NTSB rules preclude extending party status to persons occupying a legal position or representing claimants or insurers. A party representative must also certify that his or her participation is to assist the NTSB safety

2. NTSB AND AVIATION SAFETY 2

The investigation and is not for the purposes of preparing for litigation. This is because NTSB investigations are focused on finding and correcting the cause of the accident, not on determining liability or fault. 6 Each party participant must sign a form stating: "I certify that my participation is not on behalf of either claimants or insurers, and that, although factual information obtained as a result of participating in the NTSB investigation may ultimately be used in litigation … my participation is to assist the NTSB safety investigation and not for the purposes of preparing for litigation."The advantages of the party system are numerous. It ensures the board has access to technical expertise in the fact-finding phase of the investigation, that all viewpoints are heard, and that the investigation itself is transparent. When you have FAA, airframe manufacturer, engine manufacturer, operator, and unions all participating, the fact that everyone is looking over each other's shoulder has an amazing effect: in addition to tremendous synergies created by the process, it ensures that all perspectives are considered, and no stone is left unturned. After the factual portion of the investigation is completed, each party is invited to make a party submission

regarding facts, analysis, findings, probable cause, and proposed recommendations. Although parties do assist NTSB in the fact-finding phase of the investigation, the analysis is the sole work product of NTSB.There are other, ancillary advantages to NTSB's party system. In addition to the synergistic and transparent effects of the party system, it also ensures safety deficiencies that need immediate corrective action are expeditiously known by those who can effect that change. As an example, in 2011, a 5 foot by 8 inch section of a a B737-300's fuselage opened up inflight at Flight Level 340. Following a rapid decompression and emergency descent, the crew made a safe landing in Yuma, Arizona. 8 On the first day of the investigation (a Saturday), Boeing representatives on site assisted NTSB in quickly identifying substandard manufacturing with that fuselage section. FAA, Boeing, and the airline – as well as the other parties – were all present in the room when that discussion occurred. That set wheels in motion: Boeing immediately began work on a service bulletin to increase inspections in the subject area of the fuselage, and this bulletin was released on Monday. Meanwhile, the airline voluntarily grounded their B737-300s to ensure none had the same problem. On Tuesday, FAA issued an Airworthiness Directive to mandate the inspection. These actions would not have been taken as quickly or as effectively without a well-functioning party system.

Conduct of an NTSB Investigation

When investigators arrive on scene, one of the first things they do is conduct a "walk-through" of the scene to get a general idea of what they are facing. The first day they arrive, often the first evening, the IIC will hold an organizational meeting to designate parties and form investigative groups. For regional investigations, the investigative group will likely be one single group; for major investigations, various investigative groups will be formed. These groups are headed by NTSB specialists known as group chairmen and are populated with representatives from the respective parties. For example, the operations group would be chaired by an NTSB investigator with a strong background in aircraft operations. Party members on the operations group might typically consist of representatives from FAA, the company that operated the aircraft, the aircraft manufacturer, as well as other parties that can provide technical expertise to further the group's work. The on-scene portion of the investigation may last anywhere from two days to a week, and in some cases, longer. During the on-scene investigation, the investigative groups fan out in different directions to collect information in their respective disciplines. Each evening, the groups gather – usually in a hotel meeting room – for a progress meeting to share what they have found during the day and organize plans for the following day. This process is extremely transparent, with each party knowing what has been found and where the investigation is headed. The on-scene portion of the investigation is strictly a fact-gathering process: no analysis is performed during this portion of the investigation. As each investigative group completes their on-scene activities, each party member signs "field notes" to indicate they agree (or don't agree) with the activities that were conducted.

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After leaving the scene, there may be follow-on group activities. A group may reconvene at the engine manufacturer's facilities, for example, to perform a teardown of the engine. Another group may meet at NTSB headquarters in Washington to audition the CVR, while another is traveling to conduct interviews with surviving crew members, family members, and company personnel. As the fact-finding phase of the investigation concludes, the IIC will request that parties provide a party submission. Party submissions are not mandatory, but their importance should not be discounted. They are the parties' opportunity to formally tell NTSB what they believe are the facts, analysis, and findings, and to offer any suggested recommendations. They are carefully reviewed by NTSB investigators and board members to ensure the investigation has considered all differing viewpoints. The investigative process often takes at least a year – sometimes longer. There are numerous management reviews and checks and balances along the way, which prolong the process. However, these reviews ensure the report is accurate and logical. The majority of aviation reports are signed off by NTSB's director of the office of aviation safety. For accidents that have widespread safety implications or received high public interest, however, NTSB staff will forward the report for Board deliberation in a formal board meeting. Board meetings are publicly announced in the Federal Register, through NTSB press releases, and on the NTSB webpage (www.ntsb.gov). Board meetings are open to the public and are webcast.Several weeks prior to the public board meeting, board members receive a draft copy of the accident report. They meet individually with staff to discuss concerns and ask clarifying questions. During the board meeting, the investigative staff presents details of the accident and is then questioned by board members. The Board then deliberates – potentially offering and voting upon amendments to the report – and then votes to accept the findings, probable cause, recommendations, and the overall report. Due to the Government in the Sunshine Act,board members are not permitted to meet in a quorum (three or more board members) to discuss agency business except in publicly-noticed meetings. Because of this, the board meeting is the first time the full Board will have the opportunity to discuss the accident; thus, the audience is afforded a window to see inside the actual deliberations of the Board. Petition for Reconsideration NTSB rules provide for a petition for reconsideration if the petitioner can show that the investigative report contained erroneous information, or can provide new information that was unavailable at the time the Board adopted its findings. Safety Studies, Hearings, and Testimony Congress has also vested NTSB with authority to conduct safety studies and investigative hearings. Hearings are distinct from board meetings, as discussed above, although board meetings often are mistakenly referred to as hearings. For safety issues on which the Board desires to gather information using sworn testimony, the Board will convene an investigative hearing. As with the fact-finding portion of accident investigations, Federal regulations provide for the designation of parties to NTSB investigative hearings; parties are chosen for their ability to provide technical expertise in their respective disciplines. Hearings can be accident-specific or may focus on more general transportation-related issue areas. For example, in 2009, the Board held a four-day public hearing on the safety of helicopter emergency medical services (HEMS).In this issue area hearing, the Board explored nearly every facet of the HEMS industry, including large and small companies, hospital programs, and those who oversee them.

The hearing featured 41 expert witnesses, representing eight HEMS operators, 12 associations, six manufacturers, and four hospitals. It examined flight operations procedures including flight planning, weather minimums, and preflight risk assessment, as well as safety enhancing technology such as terrain awareness and warning systems (TAWS) and night vision imaging systems

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Flight recorders and associated flight operations quality assurance programs were discussed, as was training, including the use of flight simulators. After completion of the hearing, staff pored over transcripts of the hearing and brainstormed ways to improve HEMS safety. Sevens month after the gavel fell on the hearing, staff presented 21 safety recommendations to the Board for approval; in a public board meeting, the Board unanimously adopted those recommendations. Ten were issued to FAA; five to public operators, such as local law enforcement agencies that perform HEMS missions but are not obligated by comply with FAA regulations;four to the US Department of Health and Human Services; and, two to the Federal Interagency Committee on EMS (FICEMS). The NTSB also conducts safety studies using transportation and accident-related data. In 1988, NTSB conducted a safety study of commercial EMS helicopter operations.That study evaluated 59 EMS helicopter accidents and resulted in NTSB issuing 19 safety recommendations. Following implementation of these recommendations, the number of HEMS accidents decreased. As time progressed and the number of HEMS aircraft increased, however, so did the number of accidents. Prompted by this rise in EMS accidents, in January 2006, NTSB adopted a special investigation report analyzing 41 helicopter EMS and 14 fixed-wing EMS accidents that had occurred in the previous three years, claiming 39 and 15 lives, respectively.In that report, the Safety Board identified the following recurring safety issues: • less stringent requirements for EMS operations conducted without patients on board; • a lack of aviation flight risk evaluation programs for helicopter EMS operations; • a lack of consistent, comprehensive flight dispatch procedures for EMS operations; and • no requirements to use technologies such as TAWS and NVIS to enhance EMS flight safety. NTSB determined that 29 of the 55 accidents may not have occurred had any of these safety measures been in place. At times, the agency is also asked to testify before Congress on areas of interest. On the heels of NTSB's HEMS hearing, Congress held its own hearing on HEMS and asked NTSB to testify. In his testimony, the NTSB representative acknowledged the important role played by HEMS in our nation's healthcare system, but also expressed NTSB's longstanding interest and concern with such operations.Serving as Court of Appeals for Certificate Enforcement Actions For those certificate holders against whom FAA brings an enforcement action, a right of appeal lies with NTSB. It is important to note, however, there are actually two levels of appeal within NTSB. The first level involves one of the four NTSB administrative law judges (ALJs) empowered to hear cases. Each case is adjudicated in a fair, impartial manner, applying formalized rules of practice.The second level of appeal, distinct from ALJ decisions, involves NTSB board members themselves. In emergency cases – those in which FAA believes an imminent threat to the safety of air commerce and the public exists – the certificate holder must immediately surrender his or her certificate to FAA, and any appeal hearing

must be held before an ALJ within 30 days.Of the 311 incoming enforcement cases in 2013, 124 were designated as emergency cases. In such cases, if the certificate holder challenges FAA's underlying determination of an emergency, there will be a preliminary inquiry by an ALJ. This is the only instance in which NTSB relies on information from FAA and assumes it to be true – for the sole purpose of ruling whether or not the case should be classified as an emergency, and thus subject to expedited timelines. In 2013, such cases represented 10 percent of all enforcement appeals before NTSB. Once a case proceeds to a hearing before an NTSB ALJ, FAA has the burden of proof to establish the violations charged by a preponderance of the evidence.The certificate holder has the right to cross-examine FAA witnesses, provide the testimony of his or her own witnesses, and furnish documentary evidence to disprove FAA's charges or assert affirmative defenses. Thus, in all cases – emergency and non-emergency alike – the certificate

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The holder has full adjudicative rights and FAA must prove its case by a preponderance of the evidence before any charges may be sustained. Following an ALJ hearing, the second level of NTSB appeal is directly to the full Board. To ensure impartiality, board members maintain a firewall between their offices, NTSB ALJs, FAA, and the involved certificate holder.Board members undertake a fresh examination of the factual evidence and arguments made on appeal, and – in cooperation with NTSB's Office of General Counsel – issue their decision. They may uphold the ALJ's order, reverse it, or remand the case back to the ALJ for further proceedings. As provided by the recently-enacted Pilots Bill of Rights, judicial review of any final Board action may be sought in any federal district court or court of appeals, within 60 days of the Board's order.Summary As an independent federal agency, NTSB is free to conduct accident investigations and "call it the way they see it." The agency's primary mission is improving safety, and its investigations are neither motivated nor influenced by political pressures or litigational interests. By carefully investigating accidents, NTSB seeks to determine what happened so that lessons can be learned and applied to prevent future accidents. NTSB investigations utilize a party system, whereby organizations that can provide technical assistance to NTSB are able to participate in the fact-finding phase of the investigation. The party process ensures that the investigation remains transparent, and ensures that all viewpoints are expressed and heard.

4.5 AIRCRAFT DRINKING WATER RULE

The primary purpose of the Aircraft Drinking Water Rule (ADWR) is to ensure that safe and reliable drinking water is provided to aircraft passengers and crew.

Both the Safe Drinking Water Act (SDWA) and the National Primary Drinking Water Regulations (NPDWRs) were designed for stationary public water systems. Using a collaborative rulemaking process, EPA developed ADWR to address aircraft public water systems. The ADWR establishes barriers of protection from disease-causing organisms targeted to the air carrier industry.

Drinking water safety on airlines is jointly regulated by:

- EPA,
- Food and Drug Administration (FDA),
- and Federal Aviation Administration (FAA).

EPA regulates systems that supply water to airports and onboard aircraft. FDA regulates water used in food and drink preparation and water supply lines for the aircraft. FAA oversees airline operation and maintenance programs, including the potable water system.
The regulatory structure for all public water systems, including aircraft, relies upon self-monitoring and reporting of results to the primacy agency. The primacy agency for aircraft public water systems is EPA.

Table4.1 Aircraft Drinking water Rule

Overview of the Rule	
Title	Aircraft Drinking Water Rule (ADWR) 74 FR 53590. October 19, 2009
Purpose	To ensure that safe and reliable drinking water is provided to aircraft passengers and crew by amending and consolidating National Primary Drinking Water Regulations for aircraft public water systems (PWSs).
General Description	To protect against disease-causing microbiological contaminants through the required development and implementation of aircraft water system operations and maintenance plans. The plans include routine disinfection and flushing of the water system, air carrier training requirements for key personnel, and periodic sampling of the onboard drinking water, as well as self-inspections of each aircraft water system and immediate notification of passengers and crew when violations or specific situations occur.
Aircraft Covered by the ADWR	The ADWR applies only to aircraft with onboard water systems that provide water for human consumption through pipes and regularly serve an average of at least twenty-five individuals daily, at least 60 days out of the year, and that board only finished water for human consumption. Human consumption includes water for drinking, hand washing, food preparation, and oral hygiene.
Components of an Aircraft Water System	Aircraft water systems include the water service panel, the filler neck of the aircraft finished water storage tank, and all finished water storage tanks, piping, treatment equipment, and plumbing fixtures within the aircraft that supply water to passengers or crew.

4.6 AVIATION SAFETY RESPONSIBILITIES OF THE FEDERAL AVIATION ADMINISTRATION

A primary mission of the Federal Aviation Administration (FAA) is the assurance of safety in civil aviation, both private and commercial. To accomplish this mission, the FAA has promulgated a large number of regulations and has established a major division, the Office of Aviation Safety, to enforce and maintain the regulations and effectively promote safety in aviation. Within the office there are several subordinate organizations (see Figure). This study is concerned with two of them (highlighted in the figure): the Flight Standards Service (called AFS), charged with overseeing aviation operations and maintenance, as well as other programs, and the Aircraft Certification Service (AIR), charged with ensuring the safety of aircraft through regulation and oversight of their design and manufacture.

The present study was commissioned to examine the models and methods that have been used to determine the staffing needs for aviation safety inspectors for these two units, who are responsible for ensuring the safety of nearly all critical functions of the aviation industry. Currently there are between 3,000 and 4,000 FAA inspectors in these two organizations, as well as a large number of what are called designees, who are

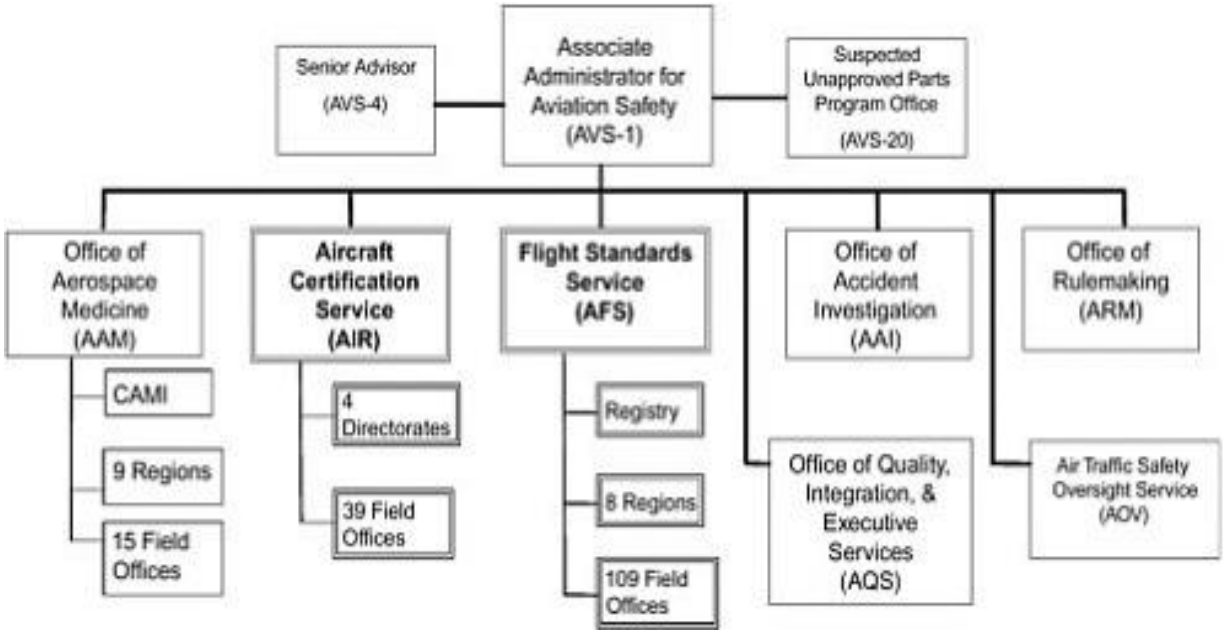

Fig4.1 FAA Safety Office (AVS) Organization Chart.

SOURCE: Federal Aviation Administration (2006). on government personnel authorized by the FAA to perform some inspection functions.

4.7.Aviation Safety Inspectors

- The AFS employs more than 3,400 personnel in the aviation safety inspector (ASI) job series 1825. These are the people who work with the aviation community to promote safety and enforce FAA regulations. These inspectors include specialists in operations, maintenance, and avionics, and some of them are also responsible for oversight of cabin safety and dispatch functions.
- Their duties are extremely diverse, as are the sectors of the aviation industry they oversee. For example, one operations inspector may be responsible for a number of air taxi services, agricultural applicators (crop dusters), and flying schools, while another may have responsibility for a portion of the operations of a major airline. One maintenance inspector may have primary responsibility for a very large airline overhaul facility, while another may be tasked with overseeing a number of small repair stations. Many of the AFS inspectors are also responsible for oversight of designees, the non-FAA inspectors to whom inspection and approval authority may be delegated. The use of designees is intended to expand the capability of the inspection system without increasing the number of FAA inspectors or increasing their workload, but it imposes a workload of its own on those tasked with monitoring the designees.
- The AIR has fewer than 175 series 1825 inspectors, but their responsibility is great. In cooperation with the greater number of aviation safety engineers employed by AIR, they must ensure the safety and compliance of aircraft design and manufacturing, from the smallest safety-related components to entire airplanes. AIR personnel are supplemented by a large number of designees, who may be employed by manufacturers of aircraft or aircraft components or may be self-employed.

4.8.Roles and Duties

- The traditional role of the ASI is to be the frontline FAA regulatory contact with the aviation industry. The industry includes aircraft operators (e.g., air carriers of all sizes, air taxi services, general aviation operators, agricultural applicators), pilots, flight attendants, dispatchers, flight and maintenance schools, maintenance facilities and their personnel, aircraft and component manufacturers, and other aviation-related facilities and personnel. ASIs historically have been both enforcers, seeing that the aviation industry complies with all Federal Aviation Regulations (FARs), and advisers, helping the firms for which they are responsible to operate safely and efficiently. Their work thus involves more than policing the industry. ASIs are expected to work with their aviation customers to inform them of new requirements and help them interpret and comply with the regulations, to troubleshoot problems that involve compliance with the regulations, and to educate industry personnel in safe practices and procedures.

- Until recently, the typical ASI spent much of his or her time in handson inspection duties, observing and assessing the performance of the people and aviation businesses for which he or she was responsible and ensuring that they met the requirements of the FARs. ASIs have been expected to have experience in and technical knowledge of the aviation industry as qualifications for employment, and most AFS inspectors are required to have certification and experience as mechanics or pilots at the time of hiring (U.S. Office of Personnel Management, 1999).

- Stresses imposed by the sustained growth in both the sheer volume of air travel and the complexity of the industry's operations have forced significant changes on the inspection system, including these traditional ASI roles. The FAA is working in a number of areas to maintain safety and performance in the face of growing demands. Among the changes confronting the agency are new technologies in airframes, propulsion systems, and avionics; altered manufacturing and maintenance operations and management systems; and revamped airline operations and business models. Specific examples include the emergence of low-cost airlines and the increased outsourcing of aircraft maintenance tasks to subcontractors, many of them outside the United States. In response to such changes, the FAA is moving to a "system safety" approach to oversight, with less emphasis on direct physical contact with individual equipment and operators and greater emphasis on the oversight of programs and processes to ensure safety. Box 1-1 presents a capsule description of system safety from the FAA's *System Safety Handbook* (Federal Aviation Administration, 2000b).

- Many of the data on which the system safety approach rests now come from automated data capture systems maintained by the aviation industry. They are collected in database systems designed to help FAA inspectors detect and flag trends that might indicate incipient safety problems. One prominent example is the Air Transportation Oversight System now being phased into use for monitoring

4.8. FAA System Safety Definition

The application of engineering and management principles, criteria, and techniques to optimize safety within the constraints of operational effectiveness, time, and cost throughout all phases of the system life cycle. A standardized management and engineering discipline that integrates the consideration of man, machine, and environment in planning, designing, testing, operating, and maintaining FAA operations, procedures, and acquisition projects. System safety is applied throughout a system's entire life cycle to achieve an acceptable level of risk within the constraints of operational effectiveness, time, and cost of major airlines. To use this and other system safety tools effectively, the FAA must have ASIs who are sophisticated database users, with knowledge of system safety principles and processes and an analytic approach to their work. This is a different skill set from the one that supports on-site inspection. Other FAA initiatives, like Flight Operational Quality Assurance (Federal Aviation Administration, 2001) and the Aviation Safety Action Program (Federal Aviation Administration, 2002a) have similar skill requirements. The increasing emphasis on the use of system safety methods also means that many ASIs will interface less with frontline operational personnel in the aviation industry and more with technical professionals and managers, and they will need to understand the jobs of those personnel. They also will have increasing responsibility for interpreting the regulations and working cooperatively with aviation industry personnel.

Origin of the Study

The number of ASIs employed by the FAA has remained nearly unchanged over the past several years, while aviation industries, especially the commercial air carriers, have been expanding and changing rapidly. Increasingly, the FAA has used designees to assume some of the responsibilities formerly assigned to ASIs. There is concern in several communities, including the labor union that represents many of the ASIs, Professional Airways Systems Specialists (PASS), that the ASI staffing levels may not be adequate to the tasks the inspectors face. The Aviation Subcommittee of the U.S. House of Representatives' Committee on Transportation and Infrastructure responded to these concerns by including the current study in the Vision 100—Century of Aviation Reauthorization Act of 2003. The aviation subcommittee and others have some specific concerns: The overall ASI staffing level may be too low for the current and expected near-term workload, and it may preclude effective responses to peak or quick-response requirements.

- The FAA may be relying excessively on designees to perform work that should be done by FAA employees.
- Designees may be subject to pressures and incentives that could affect the integrity of their work performance.
- The workload involved in the oversight of designees may be greater than is recognized in the staffing models now in use.
- The FAA's ability to monitor outsourced work, especially maintenance, may be insufficient for emerging requirements.
- The distribution of ASI staff across FAA regions, districts, and facilities may not be consistent with the distribution of the workload, especially in the face of the aforementioned growth in volume and complexity.
- Some offices may experience work overload while others are slack, resulting in wide variation in workload across the inspector workforce.

- The FAA may not have geographically redistributed its inspector resources in response to industry changes.

The Congress requested the U.S. Government Accountability Office to address the use and management of designees (see GAO 05-40, October 2004) as well as issues associated with ASI training (see GAO 05-728, September 2005), and asked the National Academies to address only ASI staffing issues.

4.9. The Committee's Task

The objective of the study is to determine the strengths and weaknesses of the methods and models that the FAA now uses in developing staffing standards and projections of staffing needs for ASIs and to advise the FAA on potential improvements. The term "staffing standards," as used by the Aviation Safety organizatoin (AVS) for manpower planning, does not imply any measure of skill level or qualitative differences in knowledge, skills, or abilities beyond those implied by published qualifications for hiring or promotion as a particular type of inspector at a particular level.

This distinction is important for present purposes, in that it represents a long-standing functional division that persists in the professional human resources and staffing community. Determining and providing the number of personnel in various categories that an organization needs to accomplish its goals (the current AVS focus) is a *manpower planning and management* function, whereas describing and classifying jobs and establishing the knowledge, skills, abilities (KSA) requirements for each are considered *human resource* or *personnel management* functions. To maintain this distinction, we have used the word "staffing" to refer only to manpower issues and functions throughout this report.

Although the committee's formal charge is focused explicitly on manpower planning and management functions, it was clear from the outset that any improvement in the FAA's approach to staffing would need to begin by addressing human resource and personnel management deficiencies—notably the accuracy and currency of job descriptions and KSA requirements, along with the establishment of sound performance measures. Although expertise in these functional areas was well represented on the committee, actually addressing such deficiencies (i.e., by identifying the extent and nature of specific shortcomings) was clearly well beyond the scope of this limited study. Consequently, attention was directed primarily toward the FAA's staffing systems and models, along with comparative manpower and staffing practices from other organizations, under the assumption that any changes would be preceded by investment in the human resource prerequisites.

The formal task statement from the FAA's contract with the National Research Council (NRC) reads:

- Critically examine the current staffing standards for FAA Aviation Safety Inspectors and the assumptions underlying those standards. The committee will confine its study to ASIs only; other inspector jobs will not be considered. The committee will not consider issues of compensation, work rules, or similar labor relations matters.
- Gather information about the ASI job series and about the specific factors that may characterize the FAA as an organization and the ASI job series that would influence the choice of methods that might best be used to develop staffing standards; for example, it will compare engineered to performance-based staffing standards.
- Review the staffing models, methodologies, and tools currently available, and some of those in use at other organizations with important similarities to the FAA, and determine which might be applicable or adaptable to the FAA's needs.

- Propose models, methods, and tools that would enable the FAA to more accurately estimate ASI staffing needs and allocate staffing *resourc-*
- *es* at the national, regional, and facility levels, particularly in light of the occasional but urgent need to reallocate resources on short notice.
- Estimate the approximate cost and length of time needed to develop the appropriate models.

From the task statement, it should be clear that the committee's task, rather than directly addressing the stakeholders' concerns outlined earlier, was to help the FAA identify and implement methods and models to support sound staffing decisions responsive to those concerns.

The National Academies' Response

The Division of Behavioral and Social Sciences and Education of the NRC, an operating arm of the National Academies, entered into a contract with the FAA in June 2004 to perform the present study. A committee of nine experts was appointed to perform the study, following the procedures mandated for all NRC committee appointments. These procedures are designed to ensure that committee members are chosen for their expertise, independence, and diversity and that the committee's membership is balanced and without conflicts of interest. The appointments were finalized after the discussion of sources of potential bias and conflict of interest at the committee's first meeting in January 2005. Brief biographies of the committee members appear in Appendix C.

The Committee's Approach

We developed our approach to the task at the first meeting. The committee identified information needs in several domains, including the FAA and its safety inspector staffing history, methodologies, constraints, and requirements; the technical and scholarly literature on manpower and staffing methodology; the experience of other organizations in their approach to manpower and staffing; and the perceptions of individuals and organizations that have a stake in ASI staffing. We developed plans for obtaining and analyzing the needed information and for organizing the report. The committee also discussed the scope of its task and determined what would and would not be attempted.

The committee's charge was to examine the manpower planning methods and models currently used by the FAA for establishing ASI staffing standards or levels and to suggest approaches aimed at improvement. We were not tasked to develop an ASI staffing model for the FAA

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UNIT- V – AVIATION MANAGEMENT - SAE1403

5.1.Air Transport Industry

Aviation sector brings enormous benefits to communities and economies around the globe. It is a key enabler of economic growth, social development and tourism providing connectivity and access to markets. Air transport currently supports 56.6 million jobs in India and over US$2.2 trillion of global GDP. It is a strategic contributor to economic growth and development.Air transportation industry has climbed to an important stage and has been one of the fastest growing industries in the regional, national and global level. The average annual growth of air passenger and freight traffic was showing an increase of 6.0 % & 7.0 % respectively during the last one decade. However, the economic and political interruptions (11^{th} September) have temporarily destabilized and slowed down the air traffic growth. Nevertheless, recovery was seen after one year and the air transport planners assessed that the air traffic would grow tremendously for the next two decades by forecasting the demand, which demonstrates that the average growth would be 4-5% for passengers and freight transport by 5.5 – 6.5% globally. Among the other region, Asia Pacific is projected to be high growth region in the world during the next 10 years (AIC, ICAO & IATA, 2011).The growth of air transport has produced number of advantages on economic and social impacts at the local and global scale. The first and foremost is generating employment opportunities directly and indirectly and this stimulated the regional and global economy. Air transportation helps in integrating different regions for cultural co- ordination to attain social progress. Further it helps in environmental protection by prudent use of natural resources. The economic regulation of international air transport is going through a dynamic change as a result of increasing competition, trans-nationalization of business, globalization of the world economy and the emergence of regional economic groups, privatization and liberalization of service industries. In this scenario, the increasing air traffic demand reveals the shortage of airport infrastructure capacity as the crucial one.

5.2 Global Aviation Industry/Global Economic Scenario

(India has surpassed Japan & likely to surpass China by 2020)

Paris-based think-tank Organization for Economic Cooperation and Development (OECD), in its recent Economic Outlook report said that India has probably surpassed Japan to become the world's third largest economy after the US and China. China is likely to surpass the United States as the world's largest economy in the next few years.

Until around 2020, China is set to have to highest growth rate among major countries, but could be then surpassed by India, it further said.

OECD also said that by early 2030s, the BRIICS' (Brazil, Russia, India, Indonesia, China and South Africa) combined GDP should roughly equal that of the OECD (based on current membership), compared with just over half that of OECD now.

"Between now and 2060, GDP per capita is seen to increase more than 8-fold in India, and 6-fold in Indonesia and China," it added.

Till 2031, economic forecast for the world regions are as below:

- India – 6.8 %
- China – 7.1%
- Asia Pacific – 4.6%
- Latin America – 4.2%

- Europe – 2.4%
- World – 3.3%

According to Air Bus Industries forecast, share of regional GDPs contribution to world's GDP by 2030 will be as follows:

- 40% by advanced economies (31 Countries)
- 39% by BRIC economies (4 Countries viz., Brazil, Russia, India & China)
- 21% by other emerging & developing economies

The above economic forecast indicates that Asian and Asia Pacific economies will be better than western and world economy; Indian economy will surpass the Asia Pacific economy.

5.3 Indian Aviation Industry/Indian Economic Scenario Brief Introduction

The Indian aviation sector is growing steadily. Passenger output rose from 73 million in FY 2006 to 144 million in FY 2011, according to a study by FICCI–KPMG (2012). The high growth path can be credited to the 11^{th} Five Year Plan (2007–2012). This period saw the completion of four international airport projects through the public–private partnership (PPP) mode, and also witnessed five Indian carriers functioning on international routes. Air transport in India presently supports 56.6 million jobs and generates over US$ 2.2 trillion of the global gross domestic product (GDP). Air passenger traffic is also growing at a rapid pace, a development driven in no small part by modern infrastructure and facilities. "The world is focused on Indian aviation – from manufacturers, tourism boards, airlines, global businesses to individual travelers, shippers and businessmen… If we can find common purpose among all stakeholders in Indian aviation, a bright future is at hand," as per Mr Tony Tyler,Director General and CEO of International Air Transport Association (IATA).

With the advent of economic liberalization during 1991 there has been increase in the economic activities and with the resultant economic boom, disposable income of individuals has reached the new peak. The real GDP per capita of India which was growing at a CAGR of 3.9% during 1992-2001, started growing at an accelerated CAGR of 5.9% during 2001-2011.

Even during the recent global meltdown, India's economy was least affected and then recovered very fast than any other country which explains the strong economic fundamentals of India. India is expected to be on the high growth trajectory during the 12^{th} plan period (2012- 2017) also.

5.4 Market Size

- India is one the fastest growing aviation markets and currently the ninth largest civil aviation market in the world, according to Mr K N Srivastava, India's Civil Aviation Secretary. The sector is projected to be the third largest aviation market globally by 2020.
- Currently, India's aviation market caters to 117 million domestic and 43 million international passengers.
- Over the next decade that market could reach 337 million domestic and 84 million international passengers.Air transport (including air freight) in the country attracted foreign direct investment (FDI) worth US$ 456.84 million in the period April 2000–July 2013, according to data released by Department of Industrial Policy and Promotion (DIPP).

5.5.Key Developments and Investments

- Singapore-based Tiger air has entered into an interline agreement with Spicejet, India's second largest low-cost carrier. Tiger air is a low-cost airline in which Singapore Airlines has a 33 per cent stake. Under this agreement, customers commuting on Spicejet's domestic network from 14 Indian cities can connect to Tiger air's Singapore-bound flights through the Hyderabad airport, from January 6, 2014.
- Inter Globe Enterprises and CAE, a Canadian civil and military aviation simulation training firm, have jointly launched India's largest pilot simulation training facility in Greater Noida, Uttar Pradesh. The move will cater to India's demand for aviation training facilities. The 50–50 joint venture will set up the centre with an investment of US$ 25 million. "There is a growing need for trained pilots. This centre will help address the requirement," said Mr Rahul Bhatia, Managing Director, Inter Globe Enterprises Group.
- Mahindra Aerospace plans to make an 8-seater aircraft at its manufacturing base in Bangalore. The 8-seater GA8 aircraft will have a range of over 1,100 km and will facilitate connectivity between small towns and cities, and is particularly of help to domestic tourists. "Through our utility aircraft, we will get into areas where no one has reached yet," said Mr Anand Mahindra, Chairman of Mahindra & Mahindra Ltd.
- India's aviation ministry is looking at small and medium airports to set up centers for maintenance, repair and overhaul (MRO) of aircrafts. Some officials see the airport at Surat as a viable option in this regard. The airport as of now has just three scheduled landing and take offs in a day, by Air India and SpiceJet. Various tests can be carried out in the day within a 1,000 feet and 5 nautical mile area. Currently, India's MRO market is worth US$ 800 million with the likelihood of touching US$ 1.5 billion by 2020.
- US companies, encouraged by the growth of the India aviation sector, are keen to invest in the various fields associated with the industry, such as building new airports or security, according to American officials. "Indian aviation is experiencing dramatic growth across the board, from the emergence of new carriers to a growing middle class ready to take travel by air," said US Transportation Secretary Mr Anthony Fox.

5.6.Government Initiatives/Aviation Policies

The Cabinet Committee on Economic Affairs (CCEA) has given the approval to Abu Dhabi-based Etihad Airways for buying a stake in Jet Airways. The Rs 2,058-crore (US$ 332.77 million) deal is the largest FDI in Indian aviation. Etihad will hold 24 per cent equity in Jet Airways, Jet Airways will own 51 per cent, and the rest will be floating shares. Tata Group's proposal to set up a full service airline in collaboration with Singapore Airlines has been given the green signal by the Foreign Investment Promotion Board (FIPB). The US$ 100 million venture will see Tata Group hold a 51 per cent stake in the Tata SIA Airlines with an investment of US$ 51 million; Singapore Airlines will have a stake of 49 per cent with an initial investment of US$ 49 million. Government of India and Ministry of Civil Aviation is not leaving any stones to un-turn to spur the Indian aviation growth. Following are some of the recent initiatives of the Government to boost the Indian Aviation sector. Government is encouraging to establish regional airlines and development of aerodromes to connect Tier-II and Tier-III towns/remote areas and interior areas.

Government is encouraging the development of low-cost airports at tier II / tier III cities to activate the second spell of aviation boom.Government envisages regional connectivity as the panacea for the aviation sector and is planning to make around 90 small airports in the country zero-cost for airlines, in addition to providing subsidy to carriers flying on those routes.

Government is encouraging the development of General Aviation to connect the hinterland. Helicopter and Seaplane services can be put into use for

- For corporate Use
- Offshore purposes especially helicopters
- Pilgrim Tourism
- Leisure Tourism
- Regular Passenger Services
- Election Campaigning and other Political Meetings
- Emergency Medical Services (EMS)
- Disaster Management
- Movement of Forces in Naxal Affected Areas

As a result of MOCA's initiatives as discussed above, recently Kerala government has launched the seaplane services to promote tourism in the state.

Investment on Airport Infrastructure during XI five-year plan was Rs. 36,371 Crores and an investment of Rs.70,000 Crores is envisaged on airport infrastructure during XII Five Year Plan.

5.7.Highlights of Government Aviation Policies

The following are government's policies relating to Indian civil aviation which effect the air traffic growth.

- 100 per cent FDI under automatic route is permissible for Greenfield airports.
- For existing airports, FDI up to 74 per cent is permitted through automatic approvals and up to 100 per cent through special permission (from FIPB).
- Private developers encouraged for setting up of private and public Aerodromes.
- 100 per cent tax exemption for airport projects for a period of 10 years.
- 49 per cent FDI is permissible in domestic airlines under the automatic route, but not by foreign airline companies. 100 per cent equity ownership by Non- Resident Indians (NRIs) is permitted.
- 74 per cent FDI is permissible in cargo and non-scheduled airlines.
- Indian government has already set up a regulatory authority viz., Airport Economic Regulatory Authority (AREA) to provide a level playing field to all players.

Road Ahead

The potential of the Indian aviation industry is enormous. The market already has about 150 million travelers passing through its airports, with the capacity to grow further. By 2020, traffic at Indian airports is projected to touch 450 million. Furthermore, India's aviation industry supports about 0.5 per cent of the Indian GDP and close to 1.7 million high-productivity jobs. The annual value added by an employee in air transport services in the country is nearly 10 times greater than the Indian average.

Exchange Rate Used: INR 1 = US$ 0.01616 as on May 24, 2014

Need & Importance of Study

Global comparison of air travel penetration shows that India (at 0.04 air-trips per capita per annum) stands far behind the developed countries like US and Australia (2 air-trips per capita per annum). China's domestic traffic is five times the size of India's despite having a population just

10% larger. There is significant growth potential for the Indian civil aviation industry as economy grows, disposable incomes rise and the value of time becomes more precious. In order to facilitate this significant growth potential, India will need more airports, higher capacity, supporting infrastructure, finance and human resources.

Hence there is need for capacity assessment keeping in view level of service being provided vis-à-vis recommended by regulating authorities.

Indian Aviation Industry – An Overview

1. Why Investment in Airport Infrastructure

It is now increasingly recognized that aviation is not only a mere mode of transportation for an elite group but is crucial for sustainable development of trade. The ICAO estimated that $100 spent on air transport produce benefits worth $325 for the economy and 100 additional jobs in air transport result in 610 new economy wide jobs. The ICAO study attributes over 4.5% of global GDP to the air transport component of civil aviation.

There is direct correlation between economic development and air travel. Therefore as Indian economy grows, Indian Civil Aviation is expected to grow significantly. As result of increasing real GDP per capita and with the associated value of time or leisure time, demand for air travel is on rise. Airports facilitate business tourism, medical tourism, educational tourism, ethnic tourism, leisure tourism etc. Manufacturing and service sector activities get escalated with development of airports. In a nutshell, modern airports are engine for growth and economic development of the nation.

Therefore, airports are being viewed as commercial enterprises rather than public service organization. Any progressive commercial enterprises require additional investment to sustain the future demand.

Indian Aviation Growth Scenario

Before economic liberalization and introduction of open sky policy in 1991, Aviation was traditionally viewed as an elite activity. The two government airlines Air India (long haul international) and Indian Airlines (domestic and short haul international) were the only Indian carriers. With the advent of open sky policy, private airlines entered into the Indian sky, first as air taxi operators and then as scheduled operators. Indian Aviation witnessed an unprecedented change and the resultant growth after 2003. During this period, the importance of aviation for the development of business, trade and tourism was recognized and the industry saw dramatic reforms across the aviation value chain.

In 2003, there were just 3 private carriers viz., Jet Airways, Air Sahara and Air Deccan, all operating full service models. The private carriers in those days were limited to operating domestic routes only. In 2011, there are 5 private carriers viz., Jet Airways, Kingfisher, Spice Jet, Indigo and Go Air are operating under 8 brand names and 3 of them are permitted to operate on international routes.

During the 11th Plan, domestic carriers embraced to the Low Cost Carrier (LCC) model. The market share of Low Cost Carrier during 2010-11 has reached 41.5% of the total Domestic

Traffic. As a result, Indian carriers catered to 54 million on board domestic passengers and 13 million on board international passengers during 2010-11 and earned total revenues of around Rs 36,000 crores.

During the 11th Plan period, the domestic traffic for Indian carriers grew at a healthy average annual rate of around 12%. The traffic growth has resulted in increased capacity utilization of domestic carriers with average passenger load factor having reached the new peak of 76% mark during 2010-11.

To cater the increasing demand, the domestic carriers have doubled their fleet size from around 200 to 430 during the 11th plan period.

Economic activity and trade are closely connected and interlinked and therefore the fruits of India's impressive growth in international and domestic trade during the 11th plan has been well reaped by the Indian air-cargo industry.

Total freight traffic handled by Indian airports increased at a CAGR of 10.9% in last five years to reach 2.33 MMTPA by 2011. International cargo, which accounts for two-thirds of the total cargo handled, is mainly concentrated at metro airports like Mumbai, Delhi, Chennai, Kolkata, Bangalore and Hyderabad. During the 11th Plan period, these international airports witnessed entry of global players such as Celebi, CSC, Menzies, etc. as cargo terminal operators.
Ground handling business at Indian airports has grown to reach a size of approximately Rs 2,000 Crores. This segment also witnessed increased participation of private players such as SATS, Celebi, Bird Group, Menzies, etc. in JVs AISATS is a JV between national carrier Air India and Singapore Air Transport Services. In 2011, MOCA announced a new ground handling policy under which only three ground handlers would be allowed at each of the six metro airports in the country. One would be an Air India subsidiary, the other a subsidiary of the airport operator and the third one, an entity selected through competitive bidding.

Airports Authority of India (AAI) continued its leadership in creating air connectivity across the country by incurring an expenditure of the tune of Rs 12,500 crores during the 11th Plan period. AAI is upgrading and modernizing 35 non-metro airports in the country, at an estimated cost of about Rs 4,500 crores. Of these 35 airports, 25 have already been developed, while the remaining are likely to be completed by end of 2011-12. AAI is enhancing air connectivity in the Northeast by way of greenfield airports at Pakyong (Sikkim), Itanagar (Arunachal Pradesh) and Cheitu (Nagaland).

The private sector played a major role during the 11th Five Year Plan in the development of airports through PPP model. These include development of greenfield airports at Bangalore and Hyderabad international airports and modernization of Delhi and Mumbai international airports. Total investment made by private airport operators in the last five years being about Rs 30,000 crores which includes investment of Rs.12,857/- crores for commissioning of the 34 mppa capacity Terminal 3 (T3) at the Delhi International Airport.

India has become the 9th largest civil aviation market in the world. The Passenger handling capacity has grown from 72 million during 2005-06 to 233 million during 2010-11, resulting

threefold increase. The cargo handling capacity also grown from 0.5 million MT during 2005-06 to 3.3 million MT during 2010-11 i.e more than 6 fold increase.

Connectivity to North Eastern region has gone up from 87 flights per week to 286 flights per week, a 3 fold increase.
Government of India has formed Airport Regulatory Authority of India (AERA) to safeguard the interests of the users and service providers at Indian airports.

Air Traffic Growth Experience – Detailed Analysis

Based on the above discussion, growth experience has been analyzed in two different periods. The first period from 1995-96 to 2010-11, which is considered as normal growth period. The second period pertains to 2004-05 to 2010-11 which is considered as high growth period except for one year i.e., 2008-09 in which traffic dipped due to global meltdown.

Passengers
It is seen that, total passengers' movement had registered a maximum growth of 11.6% YOY basis, during 1995-96 to 2003-04 whereas YOY basis growth rate various between 21.2% to 31.4% during 2004-05 to 2007-08. Though during global meltdown, i.e., during 2008-09, total passengers traffic registered a negative growth of 6.9%, in the subsequent years, growth rate bounced back to 13.7% and 15.9%.

The following Table No. 1 gives the Passengers Traffic at all Indian Airports for 1995-96, 2003-04 and 2010-11.

Table No 1 Indian Airports

Year	Passengers (in millions)		
	Int'l	**Dom**	**Total**
1995-96	11.45	25.56	37.01
2003-04	16.64	32.14	48.78
2010-11	37.91	105.52	143.43
CAGR (1995-96 TO 2010-11)	8.3%	9.9%	9.5%
CAGR (2003-04 TO 2010-11)	12%	18.5%	16.7%

Passengers Traffic at Indian Airports

In absolute terms also, during 1995-96 to 2003-04(Seven years), total passengers increased by 1.3 times, whereas during 2003-04 to 2010- 11(Seven Years) total passengers has increased by 2.9 times.
Compounded Average Growth Rate (CAGR) during the last 15 years (1995-96 to 2010-11) was 9.5% whereas CAGR during the last seven years (2003-04 to 2010-11) was 16.7% in respect of total passengers.

Freight

The following Table No.-2 gives the Freight Traffic at all Indian Airports for 1995-96, 2003-04 and 2010-11.

Table No. 2 Freight Traffic at Indian **Airports**

Year	Freight (in '000 MT)		
	Int'l	Dom	Total
1995-96	452.85	196.52	649.37
2003-04	693.22	375.08	1068.30
2010-11	1496.24	852.20	2348.44
CAGR (1995-96 TO 2010-11)	8.3%	10.3%	8.9%
CAGR (2003-04 TO 2010-11)	11.6%	12.4%	11.9%

From the Table No.CIPII-2 , it is seen that, in absolute terms, during 1995-96 to 2003-04, international freight had increased by 1.5 times, whereas during 2003-04 to 2010-11 international freight has increased by 2.2 times.

Compounded Average Growth Rate (CAGR) during the last 15 years (1995-96 to 2010-11) was 8.3% whereas CAGR during the last seven years (2003-04 to 2010-11) was 11.6% in respect of international freight.

Aircraft Movement

Aircraft movement registered a maximum growth of 14.4% YOY basis, during 1995-96 to 2003-04 whereas YOY basis growth rates various between 11.9% to 28.6% during 2004-05 to 2007-08. Though during global meltdown, i.e., during 2008-09, total aircraft movement registered marginal negative growth of 0.1%, in the subsequent years, growth increased to 1.9% and 4.7%.

The following Table No 3 gives the Aircraft Movement at all Indian Airports for 1995-96, 2003-04 and 2010-11.

Table No.C1 3- Aircraft Movement at Indian Airports

Year	Aircraft Movement (in '000 MT)		
	Int'l	Dom	Total
1995-96	92.52	314.73	407.25
2003-04	136.19	505.20	641.39
2010-11	300.20	1093.66	1393.86
CAGR (1995-96 TO 2010-11)	8.2%	8.7%	8.5%
CAGR (2003-04 TO 2010-11)	12.0%	11.7%	11.7%

In absolute terms, during 1995-96 to 2003-04, total aircraft movement increased by 1.6 times, whereas during 2003-04 to 2010-11 total aircraft movements has increased by 2.2 times.

Compounded Average Growth Rate (CAGR) during the last 15 years (1995-96

to 2010-11) was 8.5% whereas CAGR during the last seven years (2003-04 to 2010-11) was 11.7% in respect of total aircraft movement.

1. **Major Trigger Points**

Demand drivers contributing to the air traffic growth can be broadly classified in to:-

- Economic factors
- Government interventional Policies
- The following economic factors have been identified for the exceptional growth in the Indian Aviation from 2004-05.
- India has become the fastest growing economy after China due to liberalization since 1991.
- Fast expansion of all sectors of the economy in consonance with economic reforms resulted in robust and sustained GDP growth well above 9% expect 2008-09
- Rapid expansion of higher income and middle income group
- Market dynamics helped in the emergence of low cost airlines and APEX fare system which in turn helped the middle income group also to travel by air.

The following government interventional policies have been identified as a major cause for the exceptional growth in the Indian Aviation.

- Open sky policy and liberal policy of license to new scheduled operators.
- Waiver of landing charges in respect of aircraft with maximum certified capacity of less than 80 seats operated by domestic scheduled operators and helicopters of all types.
- Liberal permission to acquisition of new aircraft
- Domestic carriers, including private operators are permitted to operate on international sectors including UK and USA.
- Private investment is encouraged in both airlines and airport infrastructure development including FDI.
- Liberal bi-lateral relation and agreements.

2. Forecasting Growth Rates

I. Passengers

The following Table No 4 and Graph No CIPII-4G give the traffic forecast of Passengers till 2031-32.

Table No 4 –Traffic Forecast of Passengers

YEAR	Passengers(in millions)		
	International	Domestic	Total
2010-11 (Base Year)	37.91	105.52	143.43
Growth Rate	8.0%	12.0%	11.0%
2016-17	60.16	208.28	268.44
Growth Rate	7.0%	10.0%	9.4%
2021-22	84.38	335.43	419.81
Growth Rate	6.0%	8.0%	7.6%
2026-27	112.91	492.86	605.77
Growth Rate	6.0%	8.0%	7.6%
2031-32	151.10	724.18	875.28

Table No 4 reveals that international and domestic passengers are forecasted to grow at the rate of 8% and 12% respectively during 12th plan period. During 13th plan period international passenger is likely to grow at the rate of 7% and thereafter at the rate of 6% till 2031-32. Similarly domestic passengers are forecasted to grow at the rate of 10% during 13th plan period and thereafter at the rate of 8% till 2031-32. In absolute terms, Indian Aviation will be facing about four fold increases in the international passengers while domestic passengers' traffic will encounter with about seven fold increases in the next 20 years.

II. Freight

Table No. 5 –Traffic Forecast of freight

YEAR	Freight (in '000 MT)		
	International	Domestic	Total
2010-11 (Base Year)	1496.24	852.20	2348.44
Growth Rate	10.0%	12.0%	10.7%
2016-17	2650.68	1682.09	4332.77
Growth Rate	9.0%	11.0%	9.8%
2021-22	4078.40	2834.42	6912.82
Growth Rate	8.0%	10.0%	8.8%
2026-27	5992.51	4564.87	10557.37
Growth Rate	7.0%	9.0%	7.9%
2031-32	8404.80	7023.61	15428.41

Table No C1PII-5 reveals that international and domestic freight are forecasted to grow at the rate of 10.0% and 12.0% respectively during 12th plan period. The following Table No. C1PII-5 and Graph CIPII-5G give the traffic forecast of freight till 2031-32.International freight is likely to grow at the rate of 9.0%, 8.0% and 7.0% respectively during 13th, 14th and 15th Plan period while domestic freight is likely to grow at the rate of 11.0%, 10.0% and 9.0% during the same period under study. In absolute terms, international cargo is likely to witness 5-6 fold increases while domestic cargo is likely to witness about 8 fold increases.

III. Aircraft

The following Table No 6 and Graph No 6 give the traffic forecast of aircraft till 2031-32.

Table No C1PII-6 –Traffic Forecast of Aircraft

YEAR	Aircraft (in '000)		
	International	Domestic	Total
2010-11(Base Year)	300.20	1093.66	1393.86
Growth Rate	7.4%	8.7%	8.4%
2016-17	460.72	1804.10	2264.82
Growth Rate	6.0%	8.0%	7.6%
2021-22	616.55	2650.81	3267.35
Growth Rate	5.0%	7.0%	6.6%
2026-27	786.89	3717.90	4504.78
Growth Rate	5.0%	7.0%	6.7%
2031-32	1004.29	5214.54	6218.83

Table No 6 reveals that international and domestic aircraft movements are forecasted to grow at the rate of 7.4% to 8.7% respectively during the 12th plan period. International aircraft movements are likely to increase at the rate of 6.0% during 13th plan period and thereafter at the rate of 5.0% till 2031-32. Similarly domestic aircraft movements are likely to increase at the rate of 8.0% during 13th plan period and thereafter at the rate of 7.0% till 2031-32. In absolute terms, Indian airports will witness about 3 fold increases in the international aircraft movements while the domestic aircraft movements will witness 4-5 fold increases in the next 20 years.

3. Indian Air Traffic Forecast by International Agency

Though India is the fastest growing economy after China, India's civil aviation sector is the fastest growing ahead of China. According to Airports Council International (ACI) data, India's civil aviation growth rate (15%) has surpassed China's Growth rate (14%) for the year 2010. ACI has projected that India will be the third largest aviation market in the world within 12 to 15 years. Airbus projects that the domestic aviation market in India will be the fastest growing market in the world over the next 20 years. In 12th Plan, provision of Rs. 50,000 Crores through private sector investment and Rs. 20,000 Crores through AAI investment is kept for Airports development. In view of the above there are tremendous opportunities for Investment & Business Opportunities in Airport Infrastructure Projects in India.