Man's conquest of airspace was a great dream fulfilled through study and experimentation across the centuries, culminating in the epic flight of the Wright Brothers in 1903. New technologies in aircraft and engine design have since greatly increased payload capabilities, range and speed, reliability and comfort, bringing about indispensable public service in the carriage of passengers, freight and mail. In addition to generating economic activity through airline operations, aviation industry has become an integral tool to conduct much of the world business; it acts as an essential service, a major investment for capital and labour, a contributor to international trade in services and a catalyst for economic, social and political development. Airlines carry more than 1.5 billion passengers and 23 million tonnes of freight every year, which is expected to jump to 2.5 billion passengers and 28 million tonnes of freight in the next ten years.

The evolution of the aeroplane into a major instrument of transport across sovereign territories and oceans has, nevertheless, created technical, economic and legal problems for national aviation authorities; for, civil aviation has progressively become globally interdependent. Hence, international arrangements are needed to transcend national control over airspace as reflected in multilateral treaties and bilateral agreements. State regulations as well as international conventions on air travel have, over the years, witnessed fundamental changes. In the initial pre-World War I phase, state regulation over air transport was total and overbearing; but it has subsequently given way to deregulation and market orientation- with
market forces, not government agencies, running the industry on the basis of competition and service expansion.

One of the main objectives of the present study has been to analyse the regulatory mechanisms, state as well as global, over the operations of the aviation industry. In view of the progressive evolution of air travel, an attempt has been made to examine in detail, or explain, the transition towards the current deregulation of air transport since the beginning of this century.

The deregulation, started by the United States in the late 70s and gradually accepted by most countries worldwide, has resulted in the removal of state controls over domestic airline operations and changed the structure of the airline industry. Thus, market forces have begun to play a decisive role, spawning new concepts of ownership, financing, management and operation of air transport.

Most governments have embraced competitive policies in the domestic sector and expanded foreign equity in airlines. A significant growth has resulted a number of alliances in marketing, code sharing, and computer reservation. The market-driven airline industry thrives on competition in the aviation sector, offering reduction in air fares and expanding air services to benefit millions, who could not afford it earlier. The shift is characterised by greater market access, minimal capacity restrictions and reduced government control on airline operations and pricing (under open-skies bilateral agreements). On the negative side, however, lies the fact that deregulation has begun to augment the monopoly of a few major airlines, particularly from the developed world. These airlines have, through strategic alliances, code sharing and equity holdings, come to play a dominant role in aviation
the world-over, eclipsing and at times devouring small, local or even national airlines.

This study has focused on four main issues facing the aviation industry: air safety and security; air cargo regulations; aviation-related environmental problems and application of space technology in civil aviation; and emerging legal issues. An important reason why these issues have been identified for the study is because they have not so far received the attention they deserve, from the point of view of aviation law.

In the interest of public safety, all activities of civil aviation since its inception were once under the close control and strict supervision of national governments. For the past two decades, however, unprecedented air traffic growth, proliferation of civil aviation activities, and globalisation of world economies have triggered civil aviation deregulation.

Significantly, the Chicago Convention 1944 laid the foundation for the development of international civil aviation and established principles, structures and procedures for the working of the ICAO as the competent watchdog of civil aviation, to deal with all problems of aviation safety and security. The ICAO's main objective is to ensure a safe and orderly development of civil aviation throughout the world and promote flight safety and security. Annex 17 of the Chicago Convention on the security, and ICAO's recent safety oversight programme seek to strengthen safety and security in the context of the civil aviation liberalisation. The phenomenal rise in aerial navigation, globalisation of air transport, improvements in lifestyle, increasing liability limits and surging competition among airlines all have significant implications and point to an inexorable need for safety in the air.
The aviation community has, specially through the ICAO, developed legal rules to prevent acts of unlawful interference against civil aviation. The inadequacy of international customary law to coordinate a clampdown on terrorist acts against civil aviation has also resulted in specific undertakings by the states under international conventions, bilateral agreements, and national legislation. Significant among the conventions are: the Tokyo Convention 1963, the Hague Convention 1970, the Montreal Convention 1971, the Montreal Protocol 1988 and the Convention on the Marking of Plastics Explosives for the Purpose of Detection 1991.

However, conventions have not fulfilled even their basic objectives. The Tokyo Convention on offences and other acts committed has done precious little to bring offences to prosecution or the extradition of the offender it does not solve the problem of competing claim to litigation and lacks jurisdiction. Under the Hague and Montreal Conventions, the host state a which receives hijacker or a saboteur, is not obliged to extradite him, only to submit his case to its competent authorities for prosecution. But there is no guarantee that prosecution will ever follow, and also no provision exists for any follow-up under the two conventions. The Hague and the Montreal Conventions have uniform provisions on the jurisdiction, custody, prosecution and extradition of alleged offenders and cooperation in respect of criminal proceedings, but, then, why are two conventions needed?

The ICAO has been working continuously over the past 50 years to make air travel safe. A zero level of aircraft accident incidents can be achieved through more co-operation among the states, international and intergovernmental organizations, barring of course accidents caused by
the failure of the human element. In view of various causes of aircraft accidents, Article 26 and Annex 13 of the Chicago Convention 1944 set out procedures for aircraft accident investigation. The ICAO, though admirable for its work in the field of technical co-operation, training and financial assistance to the member states, should give a higher priority to the Third World countries, which are facing unprecedented problems in the wake of technological revolution.

Nevertheless, as this study finds, there is a lacuna in the existing aircraft accident investigation methods, both technical and legal. On the technical side, the scarcity of experts and other problems hinder the collection and analysis of information; on the legal side, the countries have different aerial codes, so impeding the inquiries. The ICAO, thus, should further update its Annex 13, Manual of Aircraft Accidents Investigation, so as to use state-of-the-art technology in aviation accident investigation. Of liability, two major problems arise: one on the determination of jurisdiction; and the other, on the limits of liability. The current airline liability limit for passengers ranges from about US$ 10,000 under the Warsaw Convention 1929, to a maximum of US$ 1,50,000, depending on circumstances such as where the ticket is brought. This has resulted in a grave confusion for the traveling public; some effort has been made by the ICAO and the IATA at standardization, but they lack commitment. The major problem is the low level of passenger liability limit, which has been made to look ludicrous by inflation and a high standard of living.

In India, the major causes of aircraft accidents, apart from human failure, are the non-implementation of the several recommendations of various inquiry committees, and the lack of satellite-based technology.
Air cargo regulations, as this study suggests, have been influenced by the development of prompt distribution techniques, exports of intermediary goods and the expanded shipment of perishable commodities. The more recent development in air cargo traffic is the huge expansion in courier and express mail package business groups, offering door-to-door services for time-sensitive documents and small packages. This surge has, however, caused problems in air cargo movement: cargo aircraft development and operation; the mechanical system of cargo handling; storage, loading and unloading; insurance; customs and emigration clearances, etc. International freight movements are regulated through airway bill registration, goods checking, customs and entry reporting, delivery of documents, customs clearance, etc.

Legal rules and regulations are essential for the smooth operation of air cargo in both domestic and international spheres. The entry of new operators, prising policy, the rights to fly, frequency and capacity have all to be well defined. Some of these controls are self-imposed as a result of inter-airline operations, but the principal agents of regulations are independent sovereign states. In order to bring about necessary standardization among the countries, the powers of civil aviation regulation have been delegated to the ICAO, and the IATA. The ICAO enforces economic regulations and the IATA tariff rules; both play a significant role in regulating air mail, courier services and the transport of dangerous goods and live animals.

Carriers operating in air transport are subject to different rules governing their liability to damage, loss, or delay of Cargo. The current legal regime governing the international carriage of cargo by air is enshrined in the Warsaw Convention 1929 as amended by the Hague
Protocol 1955, and supplemented by the Guadalajara Convention 1961. Montreal Protocol No. 4 of 1975 has extensively amended the Warsaw Hague regime and introduced new cargo regulations. Complex problems involved in the Warsaw system have led a ICAO Legal Committee to approve the text of the Draft Convention for the Unification of Certain Rules for International Carriage by Air 1997. The draft convention aims to modernise and consolidate the Warsaw System on air carriers' liability, consistent with present day requirements. It incorporates the provisions of Montreal Protocol No.4 permitting the use of electronic airway bills for air cargo shipments. Similarly, the provisions of the Guadalajara Convention have been incorporated into the draft to take into account the airline practice of code sharing and related liability terms.

The emerging boom in the air cargo sector has, however, sparked many infrastructural and regulatory problems. The effective control of air cargo operations needs infrastructure development; it is essential for governments and industry to build new airports and expand / introduce new navigational facilities and upgrade technologies like the electronic data interchange ( EDI). There is also a strong need for intense cooperation among national governments and international organisations the ICAO, the IATA, the UPU and the Customs Co-operation Council on customs clearance, simplification of consignment note and delivery of documents and dangerous goods by air.

Of the legal regime, the original Warsaw Convention 1929 applies to the claims of damage, loss or delay of cargo, without modification even after nearly seven decades. The liability of a carrier, if it cannot prove any of the exceptions which could absolve it of the damage partially or wholly, is limited to 250 francs per kilo of checked in
baggage and goods. The Warsaw Convention 1929 does not increase the limits of air cargo liability. On the passenger side, the protocols have increased liability limits many fold. Montreal Protocol No.4 of 1975 exclusively deals with cargo and introduces new cargo regulations; its contribution is limited only to the extent that it replaces the currency 250 francs with 17 SDRs. The draft convention of 1997 should, it is noted, increase the cargo liability limits, keeping in view the current economic condition.

India, under the influence of global developments, too, has liberalised (under the open-skies policy) civil aviation and cargo sector. The main problems facing the air cargo sector include: airport infrastructure and maintenance facilities, safe and inadequate storage and a lack of uniformity in customs clearance. However, the government should adopt a clear-cut cargo policy, improve basic aviation infrastructure and revise the Indian Aircraft Act 1934, and the Indian Aircraft Rules 1937, apace with the changing global aviation scenario.

Aviation-related environmental problems need effective intervention by the ICAO and the IATA. The problems are: aircraft noise, aircraft engine emissions, air pollution near airports, en route air pollution, transboundary air pollution, global warming, ozone depletion, airports/infrastructure construction, water/soil pollution near airports, aircraft waste management, cabin air quality, smoking in aircraft and aircraft accidents and incidents. The global nature of air transport requires that environmental risks should be combated through a constant exchange of data and expertise. The ICAO’s environment-related activities are largely undertaken by its Council through its Committee on Aviation Environmental Protection, Annex 16 of the
Chicago Convention and the Airport Planning Manual. Annex 16 establishes the basic regulatory procedures for the control of aircraft noise and engine emissions; it sets worldwide standards for measuring and classifying noise and engine exhaust emissions produced by aircraft and engine types and models. The IATA, a global, non-profit, trade association, has been playing a decisive role in environmental protection in the recent past; its environmental policies over aircraft noise are enforced by its environmental task force.

On the basis of customary and conventional law, the study examines various provisions of international law relating to aviation-related environmental protection. With regards to customary law, it examines some of the important cases in this field. The most important conventions addressed are: the Long-range Transboundary Air Pollution 1979, the Sofia Protocol 1988, the Vienna Convention for the Protection of Ozone Layer 1985, the Montreal Protocol on Substances that Deplete the Ozone Layer 1987, the United Nations Framework Convention on Climate Change 1992 and the UN Commission on Sustainable Development 1992.

Objective and concerted efforts at battling against environmental hazards involve not only airlines and aircraft manufacturers but also airport administrations, governmental authorities, general aviation, military authorities, air traffic control agencies, tourist and travel organisations, academia and a host of other organisations providing airport and airline products and services. The commitment of national governments to environmental protection is essential for global conventions on ecology. In the years to come, it is expected, rigorous environmental legislation will have a profound influence on airline and airport operations and their profitability. To this end, airlines and
airports should establish environmental objectives and policies and conduct regular environmental audits in the drive against ecological crises.

More crucially, global efforts should be made to reduce disturbance from airport operations; improve air and water quality; increase energy efficiency; minimise the use of environmentally-sensitive materials; promote recycling and use of recycled materials where they are cost-effective; minimise waste and consumption of material resources; develop environmental standards and practices for worldwide application; enforce the compliance of standards and procedures for noise, water quality, waste management and energy use; and construct environment-friendly buildings and facilities to reduce progressively the adverse impact of airline operations on environment. Lastly, the creation of a comprehensive and effective air space management is essential to mitigate environmental problems and achieve sustainable development.

India adopted various provisions of the Chicago Convention for its municipal laws. It also implements Annex 16 of the Chicago Convention, which sets standards for noise evaluation of subsonic aircraft, airworthiness of supersonic aircraft noise, smoke and gas emissions and measurement techniques. Yet, India faces the urgent need to bring in a separate Noise Pollution (Control) Act.

Air transport has gained a new dimension from satellite-based communications navigation and aircraft surveillance. This has a great potential for global airspace management, solving the problems of airspace congestion—particularly at terminal areas and over airports. The PICAO, the ICAO and other agencies have played a crucial role in the introduction of new technologies such as satellite technology. The
continuous growth in air traffic and the need for global uniformity for air traffic services have necessitated the future air navigation system (FANS) in the 1980s. FANS has helped develop modern air transport, which faces new problems, nevertheless: range limit, the non-coverage of oceanic airspace and limited surveillance capabilities. In its early study, the FANS committee has concluded that the exploitation of satellite technology is the only viable solution to overcome the shortcomings of the present terrestrial system, on a global basis in the foreseeable future.

The FANS comprises of two hi-tech components: the CNS and the ATM. The communication navigation and surveillance (CNS) envisages infrastructure, on the basis of which the air traffic management (ATM) seeks to perform its functions. The Global Navigation Satellite System (GNSS) has been developed by the US Global Positioning System (GPS), and the Russian Federation’s Global Orbiting Navigation Satellite System (GLONASS).

The potential operation of the aeronautical CNS/ATM system by satellites in future is one of the most challenging aspects of civil aviation. It combines access to airspace with that of outer space and telecommunications. Its regulations will not only have an impact on avionics but will influence the structure and contents of civil aviation. The major legal issues of this future system are: the rights and obligations of states currently engaged in civil aviation; the claims of sovereignty over air space vis-à-vis navigational controls from space; the financing of large capital investments; the sharing of benefits from those investments; the protection of intellectual property rights over technologies; problems in the application of air law and space law; satellite communications and regulations; states, obligations to provide
air navigation facilities; universal accessibility of the ICAO's CNS/ATM system; the determination of liability issues; and the institutional framework of the CNS/ATM system.

The ICAO's future satellite-based CNS/ATM system is the key to worldwide improvements in communications, navigation, surveillance and air traffic management. The major shift is from ground-based to satellite-based systems, individual to global orientation, and analogue to digital technology. The land-based systems, in use at the present, have the limitations of poor time response, quality communications, range limitations and ineffective airspace utilisation.

The satellite-based CNS/ATM system will prove beneficial in various ways. The airborne GPS, combined with satellite communications, will substantially reduce route distance, cut down the operational costs and improve accuracy, safety, reliability, and flight management. It could provide on-board reservation, access to diverse information services, telephone networks and expanded cabin service to the consumer. The new technology will also allow passengers to transmit personal computer information through the worldwide public telephone/data network. The implementation of this new system, however, suffers from lack of finances and technical know-how. The situation calls for more co-operation; it, thus, requires careful global planning with appropriate institutional arrangements, as well as unprecedented co-operation among the states, international organizations and users to implement this technology in a cost-effective time-frame acceptable to all regions.

The protection of states’ right to full and exclusive sovereignty over their airspace is crucial, for, small states may not be able to exercise
sovereignty due to the technological dominance of technologically advanced nations, or the CNS/ATM system controlled by the latter.

India, a member of both the ICAO and the FANS committee, has developed a national CNS/ATM blueprint to implement global satellite technologies. It is implementing the new technology in transition from the existing terrestrial-based CNS system to the satellite-based CNS system. In the beginning, however, only developed countries will benefit in a major way by the introduction of this CNS/ATM technology. At any rate, the global application of new technologies must be regulated by equity and justice. It should not usher in an era of aviation imperialism.