COMMERCIAL AVIATION: THE LEGAL TRAVAILS OF AUTOMATION , FUTURE SHOCK AND THE ZEN OF MACHINE TAKE OVER

BY: PROF K.P. SAMPATH KUMAR

About the author:

Prof Sampath Kumar is a BTech (Chem Engg) PGD International Trade (IIFT, New Delhi), LLM (Intellectual Property) (University of New Hampshire, Concord, New Hampshire, USA) is an Industry Fellow with University of Petroleum and Energy Studies, Dehradun, Uttarakhand teaching and researching on domain areas in law on Petroleum & Energy, Aviation law, Mining, Information Technology and Patents.

Abstract: This is a study of the problems at a human level vis a vis automation in the operation of Aviation law. The article addresses the various legal issues concerning automation in the context of pilot, airport tower managers, design and maintenance management, passenger ticketing, and cargo handling. Case laws and international conventions are discussed along with social paradigm of the more generic position of the entire field of automation and man's inability to cope with reference to Alvin Toffler's "Future shock". The question how much of automation is a balance with comfort levels and the probability of risk avoidance in the aviation industry. Negligence concepts both in warranty and torts are still evolving and remains in limbo at the level of international conventions. Future shock is revisited and man's possible redundancy in the face of automation is questioned. The article crescendos to the future of automation and into the Zen of machine takeover and leaves many questions still unanswered.

1. INTRODUCTION

Ever since Elvin Toffler's book "Future Shock"[1] the world has been concerned about man's ability to adapt to the pace of change in technology. Much of this comes as a shock to society unable to cope with its speed in terms of mental and physical interactivity. This seems to be the most prevalent in the case of the aviation industry that outpaces most other industries in automation for the critical operations of navigation, communication and airworthiness. The aforesaid parameters are the primary regulatory concerns of both the Director General of Civil Aviation in India (DGCA) and the International Civil Aviation Organization (ICAO) along with the several conventions that our nation is heir to by multilateral ratifications. The standards that are set are as per the market leaders in the manufacturing of commercial aircraft predominantly

[1] Alvin Toffler, Future Shock (1984) Bantam Books

in the west to name a few Boeing, McDonnel Douglass, Airbus, United Technologies and Lockheed Martin. As the telecommunication, GSP and Information technology systems get more and more sophisticated – the aircraft industry has most readily included automation at several levels of operation in the industry. This article features the pros and cons of such sophistication taking into account the factors that contribute to risk and legal liability exposure.

2. THE OPERATIVE CONCERNS IN AUTOMATION

The areas effected substantially by automation are the following[2] 1) Aircraft handling 2) Air Traffic control 3) Aircraft design, construction and maintenance 4) Passenger handling and 5) Cargo handling. Each of these concerns Vis a Vis is automation are discussed as under

The view at the cockpit of the Pilot:

The Pilot as per the Warsaw convention[3] is the commander of the aircraft under his control. In a given set of circumstances he is accountable for action or inaction as the case may be. The control however is not merely mechanical landing and smooth take off but also a complex maze of instrumentation and guidance systems that have to be reckoned in his inflight decision making. A broad recital of these activities that necessitate automation include among other things automatic pilot, navigation, correction of aircrafts course, collision avoidance, aircraft location pin pointer, automatic hijack alarm and automated landing in inclement weather and so on. In fact owing to the nature of the air traffic and its inherent risks such automation is not merely a novelty but a necessary prerequisite in the context of today's high density traffic. Instrument landing systems also include the "Enhanced vision system"[4]

Notwithstanding the fact that these instruments bring about a reduction in decisional making role of the captain yet it is only the captain under the Chicago convention that is primarily responsible for its consequences. Is it possible that the human pilot has become completely redundant apart from bearing the burden of such legal responsibility? Not at all - computers and instrumentation can fail and the human factor in taking over when events demand it seems not completely extinguished. Many cases of instrument faults have come to be noticed[5] which otherwise would have led to disaster. The case involved a Korean Airlines flight which inadvertently strayed into Soviet territory and got shot down. In fact the complex information and data provided by the automation may indeed prove overwhelming to the pilot and have caused a panic situation which

[2] Isabella Henrietta Philepina Diederiks-Verschoor & Pablo Mendes de Leon, An introduction to Air law (2006) Kluwer Law International, Eighth edition

[3] Available at https://www.iata.org/policy/Documents/MC99_en.pdf (As last seen on December 29th, 2015)

[4] Available at https://en.wikipedia.org/wiki/Enhanced_flight_vision_system (As last seen on January 3rd, 2016)

[5] See Bin Cheng, The destruction of KAL flight KE007 and article 3 bis of the Chicago convention in Air worthy, pp 47-74, (1994)

otherwise would have enabled him to react intelligibly based on gut instinct . In general human travel by air has never been supported genetically by our evolution and is not the same as Sea travel from which life originated. Flying has always been the exclusive premise of the birds and this is perhaps the reason for the humans to feel strange at the subliminal level. Mostly such skills are acquired without genetic support. In plain words flying does not come natural to man but is an acquired ability. Another Medico physical phenomenon which is worth discussing here is the aspect of 'Vertigo'[6] . Vertigo even to the most well trained pilot results in the aircraft to be envisioned as tilted to one side while actually this is an optical illusion. The pilots in such cases are advised to trust their instruments while landing. Many an accident has been caused by such distortion in vision. The automation has reduced the burden of the pilot but has the legal responsibility shifted from pilot to the burgeoning instrumentation? The answer is a resounding No! The legal onus still rests with the captain and the conventions and ICAO has yet to come to to a consensus among nations for addressing the vexing uncertainty.

Air traffic control

From its early inception in the west and the early part of the twentieth century air transport and with it the commerce of airline activity has come a long way. In its wake, air traffic density has increased to gargantuan proportions bringing unimaginable conditions in Airports and their tarmacs if not for the facilitating automation. Airports like Chicago's O' hare airport, New York and London boast traffic rates around 1.5 to 1.7 operations per minute[7] both landing and takeoff. In such dense conditions the role of the control tower for orderly movement is paramount and is not less complicated than that of the pilots on flight. The automation and GSP systems in place is perhaps even more complicated then at the cockpit. The Chicago convention annex 2 "Rule of the Air" specifies that the pilot is bounden to obey the instructions of the traffic controller except on emergency conditions. Here the term "emergency" is still a grey area in many a situation to fix the legal liability. The role of the air traffic controller becomes additionally onerous considering that these are nationally controlled by government personnel. There are international cases that have penalized the negligence of Air controllers such as the mishap in the infamous Milan- Linate Airport disaster in 2001 when two aircrafts one a Scandinavian airlines (SAS) and the other a corporate aircraft which collided on the runaway during a foggy day resulting in the death of several passengers. The air controllers were booked for negligence for keeping faulty equipment and were sentenced to jail imprisonment. As in most government organizations a strict regimen of penalization lead to a' Cabal' of organized cover ups of incidents that require to be brought to the notice of the management as a matter of

[6] Available at http://www.airspacemag.com/military-aviation/the-disorient-express-474780/?no-ist (As last seen on December31st, 2015)

[7] Refer to http://aviation.stackexchange.com/questions/11575/at-what-intervals-do-planes-land-and-take-off-from-chicago-ohare (As Last seen on January 9th, 2016)

preventive proactivity in safety procedures. The cover up that surfaced in Schiphol airport [8] for instance brought to light such cover ups and on discovery controllers were prosecuted. A safety case oriented airport is a feature indispensable for a modern aviation. Such cover ups would not further the development safe commercial air travel.

It is almost axiomatic that following the rapid growth of the industry need based technology is concurrently developed. Airport traffic management received its first attention in the ICAO in 1963 in the form of 'Future Air Navigation systems' (FANS). FANS was the use of navigation systems based on satellites for navigation, control and communications. FANS was renamed as ICAO CNS/ATM systems (Communication, Navigation and Surveillance / Air Traffic Management systems).

Further other systems developed such as the US (GPS) Global Positioning system and the Russian GLOSNASS. Both the systems were developed during the cold war between the USA and USSR which later became imbibed into the lore of Airport traffic management systems . Other mutations of the above systems were the European EGNOS, MSAS (Japan) and WAAS (USA). However the ICAO has to streamline all of such systems into one common system under the GNSS (Global Navigation Satellite systems). The liability of negligence in the absence of multilateral agreements by nations is still in a limbo as to a common standard for legal audit.

Aircraft Design and Maintenance issues

Computer aided design or CAD has become the norm in engineering design and the aviation industry is no exception. Taking into account the complexity of aircraft manufacture, maintenance and avionics in particular automation was almost inevitable. To the manufacturing assembly line was brought in the extensive use of robotics.

The use of robotics has created precisions both in terms of manufacture and specification compliances hitherto unknown to handcraftsmanship. In this regard the product liability standard comes in two variants, the first is through warranties which is a relationship between seller and buyer and the other is through the medium of tortious liability. The first is the outcome of contracts but the other is more about fulfilling the role of social obligation to the unwary passenger or lay public. Product liability under tort is the remedy for social contracts to the consumer or public at large that has no knowledge of the implicit requirement of professional craftsmanship in the aviation industry. Despite the automation and its precision yet there is always the aspect of defects. Automation creates its own level of encountered failure which has to be accounted both for intended as well as unintended effects. The law has not really stretched

[8] See details available at http://www.skybrary.aero/index.php/B763,_Delta_Air_Lines,_Amsterdam_Schiphol_Netherlands,_1998_(Legal_Process_-_Air_Traffic_Controller) (As Last seen on December 28th, 2015)

itself to take into account all failures. The history of tort liability has also undertaken sea changes taking into the nature of the business of aircraft design that pass through several contractual joint ventures involving many parties which then has the effect of diluting third party strict liability. In this regard ever since the landmark case in the United States in Kaiser Steel Vs Westinghouse Electric[9] has impacted also the aviation industry. The case exemplifies the limitation or even obfuscation of product liability in cases where there are joint agreements on design involving parties of equal economic strength in a commercial setting bargain on specifications and their risk assessment. Such joint assemblies or Joint ventures are almost a common feature in the aviation industry as between seller and buyer. The legal position therefore is still effected by warranty clauses that specify the penalty for defect contractually rather than to a third party liability. The other feature effecting aircraft manufacture is that of the role of the underwriter insurance that are now willing to quantify the liability on quality assurance to the manufacturer and thus transferring some of the onerous duties on quality control to less than 100 percent sampling. The manufacturer would normally check whether the product does not have any inherent defects prior to leaving the factory premises and there is no negligence in its production. These have also been diluted to some extent by insurance covers that now enable manufacturers to cut costs on an otherwise rigorous inspection. Where does this leave the grand stand of safe travel for the aviation industry in general taking into account such hedges provided by insurance coverages? The aspect of safety controls gain some mitigation in the compliance mechanisms both enforced through ICAO conventions and the routine maintenance under "Routine Maintenance and overhaul" (MRO) that are enforced through national agencies DGCA (Director General of Civil Aviation).

Aircraft maintenance and the assembly line

As in design, routine aircraft maintenance is both regulatory in compliance and includes among other things Engine line management, Engine overhaul, Rotable components maintenance (Attrition parts tyre, brakes, landing gear etc), Avionics (Instrumentation, electronics navigation et al), and other non-critical items such as paint and cleaning. These are preventive based maintenance of the aircraft which have to take place on time line pressures and schedules. There are dwell times at the hangar having competing interests both in time and qualitative workmanship on various aircrafts of diverse manufacture and Airline schedules. The regulative mechanism s is enforced through national regulations (DGCA) as well as international agreement (ICAO). The ICAO on the other hand has its own check list of compliance documents to pass muster on vehicle safety namely written manuals on fixing operator maintenance responsibility on deeming an aircraft airworthy, mobilization of requisite emergency equipment and finally a certification for airworthiness for the intended voyage. Maintenance records are kept for inspection as airport hangar activity and MRO operations also have to be endorsed by approved independent third party inspectors as satisfactory compliance to standards prior to their

[9] Kaiser Steel Corp. v. Westinghouse Electric Corp., 55 Cal.App.3d 737; Cal. Reptr. 838 (1976)

subsequent release for actual functioning of the Aircraft. Whether due to compulsions of pressure or in terms of meeting deadlines that tends to feature the "Business as usual" syndrome rather than the qualitative effort is priority is a matter of conjecture from Airport to airport. In this context automation of the maintenance function may tend to a certain complacence and an over dependence on support mechanisms such as automation.

Passenger Handling

The internet world of today has created jurisdiction problems where air ticketing is concerned. Take the case of Polanski Vs KLM Royal Dutch Airlines[10] when a KLM ticket purchased from a home computer at Los Angeles through KLM website for a flight from Los Angeles to Warsaw by redeeming mileage coupons. A dispute as to this ticket and the jurisdiction sought by KLM was Netherlands and the passenger sought Poland. Ultimately the jurisdiction fell on the United States considering that the issue of ticket was done on the basis of KLM's partner Northtwest Airline . The no cost tickets taxes that were paid in the United States was the clincher as to the jurisdiction of the dispute -the meeting of minds that constitute contract took place in Los Angeles. The internet booking can therefore jurisdictional problems in the context of litigation. The internet may also be a source of biased information generation by leaving out rival airlines schedules out of the loop of information on flights.

Cargo Handling

The problems of cargo handling is not as simple as the handling of passengers which involve only two parties the passenger himself and the other the carrier. The cargo on the other hand involves the sender (Consignor), the carrier and the Consignee. Further operationally three more elements are included the consolidator, break bulk agent and the customs authority. Each of these requires exacting details and electronic air cargo handling systems have been successfully used to provide a central resource from which the cargo are not only tracked but information is available as to its shipped out locus. Information is also made available to the customs authorities and systematizes the cargo handling operations at all stages. Cargonaut [11] a cargo handling system evolved in Netherland has been successfully being operated for several years. Such modern data exchange systems makes for instantaneous communications complete in all ways. Allows corrections to the systems flow and avoids paperless transactions.

4. CONCLUSION OR THE ZEN OF MACHINE TAKEOVER

The Warsaw convention has put a lid on the aspect of the liability of the carrier through maxima minima monetary liability payable for death or injury to passenger or the loss of on board and checked in baggage during transit. Having effectively contained the issue it paved the way for

[10] Polanski v. KLM Royal Dutch Airlines, US District Court, SD Callfornia, 378 F. Supp. 3d 1222 (2005)

[11] Available at https://www.schiphol.nl/B2B/Cargo/NewsPublications/CargoNews5/Cargonaut1.htm (As Last seen on December 28th, 2015)

commercialization and proliferation of the industry despite inherent risk at all stages of the supply chain from design to manufacture and service to the consumer. However a reigning equation of the application of the tort of negligence still remains unaddressed. The issue connected with the uncertainties in particular of automation in the industry underpins central areas of jurisprudence. The concluding para of this article highlights some of these concerns that have emerged from the technology.

The first discussion is whether twenty first century has matured the initial infantile enthusiasm of its new toys of invention / technology to a more rational use of them? In this regard the environment is one example of how years of abuse of the natural ecosystem have stretched the limits and now the world seems to wake up to its reality by cutting down use or modifying technologies that create greenhouse gases. We are in fact talking about the Brunt Land sustainability of saving the environment for future generations[12]. Reaching maturity levels? Henry Ford's assembly heralded as the great administrative operative system for mass production was later decried as a human rights abuse. Today its avatar is about the use of robotics for manufacture of all kinds of mass production. The question today of the assembly line has mutated to asking not about human rights but whether the human effort has been rendered redundant. The answer to this question is if we consider the scenario of unmanned rockets that travel to outer space man seems to be comfortable. But would the scenario be the same for unmanned tramcars / automobiles traversing the pedestrian in city traffic? How would humans like to Air travel by a robotic pilot instead of a human? More so would such a replacement be trusted by human society? Time will tell, but there is lurking suspicion of its efficacy. The movie Space odyssey 2001 [13] enumerates the point when a computer is discovered to have made a fault and astronauts in their attempt to shut it down have to resist the onslaughts of the takeover from a vengeful computer. The point here is that computers that rely on mathematical equations are really unsuitable as far as the human social situations are concerned. The problem really is about the options that we get from the automaton namely great precision or complete failure. This is not really an Hobson's choice but more a trading for either human leisure or one of a time total disaster due to failure. The central problem is that society is not built on precision. One of the outstanding criticisms on Operations research based Management Science is about its mathematical precision as an unfit tool for executive decision in the human context. As an example of ineptitude of modern robotics is to recreate the multifarious functions of say a human hand -this is still an insurmountable problem. Hence the high end of unimaginable complexity would be recreating the functions of the human brain. It will take eons before cybernetics actually manages to replicate it. In that sense the human brain may be far superior to any computer that human scientific society had or will be able to make. The contrary

[12] Gro Harlem Brundtland, Our Common Future (Report of the World Commission on Environment and Development, submitted by the World Commission on Environment and Development) 1987, Available at http://www.channelingreality.com/Documents/Brundtland_Searchable.pdf (As Last seen on December 28th, 2015)

[13] Watch Space odessy stanley kulbrick, available at http://www.tft.ucla.edu/wp-content/uploads/pdfs/Mamber-Kubrick-in-Space.pdf (As last seen on December 28th, 2015)

view is that man is not to be judged in isolation from nature. Automaton is also the product of a nature constructed through the medium of the "Collective scientific and engineering mind".

In this scenario we have to revisit the futuristic premonitions of the Alvin Toffler model of "future shock" which puts Man in a position of a sitting duck on the receiving end rather than in a brave new world Darwinian evolutionary mode. Hard to believe that man is unable to cope. Certainly some humans may fall behind but it is really farfetched to think that all human beings fail to reach their promised zenith as supermen as postulated by Nietzsche[14]

Whatever may be the outcome, time will tell. Interestingly the economics of wealth of Thorsten Veblen[15] that proclaims that increasing leisure is the measure of effluence. The auto pilot, the automation and take over by machines, may yet succeed due to the overwhelming power of commercial interests that rest upon profit maximization and the end is efficiency or human leisure at its cheapest costs.

[14] See http://www.britannica.com/topic/superman-philosophy (As Last seen on December 28, 2015)
[15] See http://www.britannica.com/biography/Thorstein-Veblen (As Last seen on December 28th, 2015)