

The Introduction of Autonomous Vehicles

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Abstract

This paper, titled, “The Introduction of Autonomous Public Transport” will review some of the literature available about the social, economic and regulatory impacts of what has been described as part of a fourth industrial revolution (4IR); the introduction of autonomous public transport.

There is diverse opinion about the benefits of autonomous transport technology and trepidation at the regulatory requirements needed to meet that change, not only with the make-up of a new transport work force but with safety considerations.

The one certainty that this paper will highlight is that the introduction of an autonomous public transport system will happen, perhaps sooner than anticipated and that Australia is at the forefront in the development of the new transport technology.

To this extent, the paper will review the recommendations in 2017 of the Parliament of Australia’s Senate Select Committee’s on the “Future of Work and Workers” and the House of Representatives’ recommendations from their Inquiry into “the social implications from the introduction of driverless vehicles”.

The Bus Industry Confederation, as the peak Australian industry body, has provided input into the Inquiries and their position is enunciated.

The paper seeks to provide an overview of the advantages and risks surrounding the introduction of autonomous public transport.

Key Words: Autonomous public transport; social, economic and regulatory impacts; benefits and risks; work force

1. Background

1.1 Public Transport is an important part of urban mobility. Fully autonomous buses and trains are a part of public transport and are already on public roads and tracks. Australia is at the forefront of the development of autonomous public transport. The New South Wales and South Australian State Governments are conducting trials with autonomous electric vehicles and driverless trains already operate in Sydney in New South Wales. As one of only a handful of countries pioneering on-road driverless vehicle research, Australia can become a global leader in driverless vehicle technologies and invigorate its automotive and technology sectors.

1.2 The Australia and New Zealand Driverless Vehicle Initiative (ADVI) is the peak industry advisory body that services the wide ecosystem of automated vehicle activities across Australia and New Zealand. Its vision is to accelerate the safe and successful introduction of driverless vehicles to Australia and is supported by over 120 partners from across the automotive, insurance, transport, motoring, parking, communications, banking, logistics, defence, technology and research sectors, as well as local, state and national governments.

1.3 An autonomous public transport vehicle is a vehicle which can guide itself without human conduction. It is a vehicle operated solely by a computer. It is a robot driven vehicle.

1.4 Whilst the date for complete integration of autonomous public transport vehicles is mooted, some say 10 years, some say sooner, there can be little doubt that the introduction is occurring, as we speak, and that ultimate saturation of autonomous public transport vehicles is inevitable.

1.5 No doubt over that 10-year period, or shorter, partial autonomous vehicles will appear with a supervisor or conductor on board to address public anxiety and to act as a buffer in the event of a safety issue or loss of automation due to computer malfunction.

1.6 In theory, an automated vehicle system can only be termed as an “autonomous” system, when all the dynamic driving tasks, and all driving environments, can be performed by the vehicle’s automated system.

1.7 Some refer to the advent of autonomous vehicles as part of the fourth industrial revolution (4IR) and reflect on the significant impacts of the change in the same way as previous industrial revolutions.

(Reference: Impacts of the Fourth Industrial Revolution on Transportation in the Developing Nations - Adeniran, Adetayo Olaniyi, Department of Transport Management Technology, Federal University of Technology, Akure, Ondo State, Nigeria)

1.8 The Adeniran, Adetayo Olaniyi paper explains the industrial revolution concept as follows:

“First Industrial Revolution came at the end of the 18th century (1784). It came into existence through the introduction of mechanical production facilities with the help of water and steam power. The increasing use of steam power led to the development of steam engine came at the propelled machinery.

The Second Industrial Revolution commenced at the beginning of 20th century (1870) and came into existence through the introduction of mass production (assembly lines) with the help of electrical energy.

The Third Industrial Revolution came into existence at the end of 20th century (1970) through the application of electronics and information technology to further automate production. It was the era of automated and sophisticated technology lunching and testing or partial automation phase. In this phase there is more of human labour and less of automation.

The Fourth Industrial Revolution (known as 4IR) is gradually approaching on the basis of full automation and digitisations which will result into more automated devices in operation and less of human, but the human will be working in a highly complex and sophisticated technological environment and with the major work of programming through communication.

The Fourth industrial revolution is the era of linking the innovated existing first industrial revolution devices with the innovated existing second industrial revolution devices and innovated third revolution devices. The linking will be done with effective communication through programming.”

(International Journal of African and Asian Studies ISSN 2409-6938 An International Peer-reviewed Journal Vol.26, 2016 p.68-69.)

1.9 Opinion is very much divided over whether the progression to autonomous public transport is a benefit or non-benefit to society. There are competing views i.e. that which opposes changing a system which has shown itself to be an essential public service, efficient and provides unique employment to an aged population, with a view that change occurs as it has over other industrial revolutions with dislocations and renewal and which embraces, in the case of autonomous public transport, cost and safety efficiencies not available under the current system.

1.10 In Australia in 2018 it was reported that some 43,000 persons were employed in the public transport space. By 2023 it is anticipated that this figure will increase to 44,600

persons. Unemployment in the industry is below the national average with the average age of passenger transport drivers being 56 years of age. 67.3% of all employees are fulltime employees. It is anticipated that automation would substantially reduce the existing work force.

(Reference: ABS Labour Force Survey, Department of Jobs and Small Business trend data to May 2018 and Department of Jobs and Small Business projections to 2023.)

1.11 The paper reviews how industry in Australia and the Federal Government has sought to identify impacts of the proposed changes and how best to ensure a proper and effective transition to a new industrial environment.

1.12 In 2017 the House of Representatives in the Australian Parliament undertook an inquiry through its Committee on Industry, Innovation, Science and Resources into the social implications of driverless vehicles. The Bus Industry Confederation (BIC) in Australia made representations on behalf of its members who include State Bus and Coach Associations, Chassis suppliers and Body manufacturers along with associated provider groups to the industry.

(Reference: Parliament of Australia:

www.aph.gov.au/Parliamentary_Business/Committees/House/Industry_Innovation_Science_and_Resources/Driverless_vehicles/Report)

1.13 Similarly in 2017 the Senate in the Australian Parliament launched an inquiry into the future of work.

(Reference: Parliament of Australia

www.aph.gov.au/Parliamentary_Business/Committees/Senate/Future_of_Work_Workers/Future_of_Work)

1.14 Both of these inquiries and the recommendations from them are an attempt by the Parliament in Australia to ensure that the impacts of the introduction of autonomous vehicles and the subsequent regulations that follow, as a consequence, are considered well before the substantial introduction of the new technology.

1.15 This paper does not seek to provide solutions that may flow from a disruptive technological change to the way in which public transport is operated. This paper seeks to identify both the benefits and risks associated with the technology from which further debate is required to ensure that the benefits eventually outweigh the risks.

2. What are the benefits and what are the risks?

2.1 The worldwide web is alive with pages relating to the introduction of autonomous vehicles. Most of these pages spend a lot of time reflecting the opportunities (benefits) and risks involved in the introduction of autonomous vehicles.

2.2 The work of Adeniran, Adetayo Olaniyi, referenced above, was completed in 2016 and is reviewed for its uniqueness in relating the broader changes in technology which he relates to a fourth industrial revolution (4IR).

2.3 The paper delivered by Messrs Patrick M. Bosch, Felix Becker, Henrik Becker and Kay W. Axhausen in 2017 is also chosen for review because it provides a succinct and realistic cost benefit analysis of the impact of the introduction of autonomous mobility services and more particularly as it relates to passenger transport services.

2.4 Adeniran, Adetayo Olaniyi claims that the digital transformation to an industry, dominated by automation in the fourth industrial revolution (4IR), brings in new opportunities. Such as:

- *“The provision of collision avoidance of vehicle from static objects*
- *The reduction of unskilled transport employees*
- *The flexibility of customer integration and the quality and efficiency of service will be boosted*
- *The reduction in operational costs of transport operators*
- *Resources that will be efficiently allocated, be it man, material, money and machinery*
- *Reductions in the level of damage caused by risks*
- *Higher productivity and safety to be maximized*
- *Data analysis and records will be free from errors, free from damages and losing and will also be sustained for future researches.”*

(Reference: International Journal of African and Asian Studies ISSN 2409-6938 An International Peer-reviewed Journal Vol.26, 2016 p.71)

2.5 At the same time Adeniran, Adetayo Olaniyi identifies risk that can be defined as the effect of uncertainty on objectives, whether positive or negative.

Some of the risks identified in the paper include:

- *“Industry data may be attacked by hackers, cyber-attacks, and viruses which will lead to data lost, data manipulation and data theft. This is referred to as data insecurity.*

- *Infrastructure supporting the present state of information technology may not be readily available to support digital transformation.*
- *In the area of networking, there might be challenges in various business segments such as research and development, procurement and purchasing, facility management, production, warehousing, and logistics, market sales and services.*
- *Research conducted towards the acceptance of full automation, reveals that human showed several attitudes towards full automation. Some have the idea that they will lose their jobs while others assume that the coming of the Lord is at hand and that is an end time symbol. According to Taiwo (1998) attitudes are inclinations and feelings, prejudices or bias, preconceived notions, ideas, fears and convictions about any specific topic.”*

(Reference: International Journal of African and Asian Studies ISSN 2409-6938 An International Peer-reviewed Journal Vol.26, 2016 p.71)

2.6 Adeniran, Adetayo Olaniyi makes some very interesting observations about how to address some of the risks and concerns relating to a 4IR, including:

- *“Protection from hackers can be managed by ensuring appropriate data security strategy and backing up every sensitive and important data*
- *As to infrastructure companies will need to harmonize and network their existing information technology infrastructure systems and be integrated such that each area will not be negatively affected by limited installation*
- *As to the loss of jobs it is quite obvious that robots will replace human workers in the public transport industry that is why they must be afraid of losing their jobs.*
- *Some human workers do not have the capacity to learn and embrace changes of information technology.*
- *it should also be noted that where we have many aged ones, they might be too old to adapt to the flexibility of changes in information technology and might even lack innovative concepts.”*

(Reference: International Journal of African and Asian Studies ISSN 2409-6938 An International Peer-reviewed Journal Vol.26, 2016 p.72)

2.7 The paper concludes:

“The fourth industrial revolution lies directly ahead and will likely prove to be a source of huge opportunities for developed countries; developing countries will also benefit much from technology transfer and transportation. For the sake of developing countries, the fourth

industrial revolution will improve their standards on building efficient and reliable transport modes as well as investing more on technology transfer which will aid the local manufacturing sector and agriculture.”

(Reference: International Journal of African and Asian Studies ISSN 2409-6938 An International Peer-reviewed Journal Vol.26, 2016 p.72)

2.8 A cost-based analysis of autonomous mobility services was also undertaken in 2017 by Messrs Patrick M. Bosch, Felix Becker, Henrik Becker, Kay W. Axhausen in their paper titled; “Cost-based analysis of autonomous mobility services”

2.9 Patrick M. Bosch, Felix Becker, Henrik Becker and Kay W. Axhausen provided a pragmatic account of the impact of the introduction of autonomous vehicles, such as:

- *“The technology to allow a passenger transport vehicle to be autonomous with the necessary technology would increase vehicle price by an average of 20% leading to higher acquisition cost, interest cost and depreciation*
- *However due to more balanced driving, it was assumed that automation of passenger transport vehicles lowers fuel costs by 10%*
- *It is expected that autonomous vehicles would, due to more considerate driving need less maintenance for traditional car components. However, due to the need for periodic maintenance of new sensors it cannot be assumed that there would be different cost figures for the total maintenance costs*
- *It was also assumed that safer driving would lower insurance rates by 50% and reduce fuel costs due to electric propulsion by up to half. It is expected that the total kilometre cost would decrease by up to 5.5%*
- *With bus driver's salary assessed at up to 55% of the total cost it is assumed a substantial cost decrease by this share through automation*
- *Automation technology and electric propulsion are not expected to have substantial impacts on the fixed and variable cost of public bus and train services because automation technology is already pre-installed (in trains) or would not represent a substantial increase in the purchase price of a vehicle (for buses). Moreover, it is assumed that systems will continue to be operated in the same manner as today, so that impact on administration costs will be minimal.”*

(Reference: Cost-based analysis of autonomous mobility services; Transport Policy 64 E2018 (74-92) Elsevier)

2.10 In general Patrick M. Bosch, Felix Becker, Henrik Becker and Kay W. Axhausen identified three effects to be in play.

- (i) Autonomous vehicle technologies will raise the vehicle purchase price.
- (ii) Autonomous vehicle technologies will reduce operating cost through lower insurance Fees.
- (iii) Autonomous vehicle technologies will reduce maintenance and fuel costs.

3. Bus Industry Confederation

3.1 The Bus Industry Confederation outlined to the Parliament of Australia in 2017 the views of its members to the introduction of autonomous public transport which included a number of issues.

3.2 Safety concerns:

- In vehicles laden with technologies, even with a human at the controls, technology companies have conducted tests by hacking into a car's computing system to take over the control of the vehicle from the driver.
- Can such systems be hacked into and what are the safety measures when you multiply the number of people in a vehicle by 50, for example if it is a bus?
- With issues such as security, especially national security, a major concern in the modern political and geopolitical atmosphere, what measures are there to protect passenger safety when vehicles may run on a uniform operating system platform?
- How is the safety of passengers on board driverless vehicles protected against safety concerns other than technological, such as violence, abuse (both physical and verbal), from other passengers. If there is no one on a bus how can a passenger be protected against unacceptable conduct of another passenger or assured that they can depart safely from a vehicle that is in distress?
- As far as technological advances our unique nothing can compare to the training, experience and most importantly common sense of a human operator, especially when operating a moving vehicle transporting people.

3.3 Social costs

- Companies providing goods and services might view the rise of driverless vehicles as a cost-effective means that can boost profit and allow them to pass on saving measures to consumers
- The social costs however may be more costly as a whole because as a country that has a great welfare system it may see a major spike in welfare dependency from former drivers of heavy vehicles. If the Government is driven to drive people off welfare but not provide adequate relief
- The fear is that like the car industry worker will be laid off due to technological advances that has minimised the need for human contributions to the production process
- These people who lose their jobs may go through a phase where they will struggle with unemployment, struggle to provide for their family. Long term unemployment will lead to self-doubt regarding one's ability to find suitable employment
- If parents lose their jobs, the people who will be impacted first will be their children. If parents send their children to a 'good school' to receive a 'good education', they may be forced to relocate their child's education to affordability. Parents may not be able to provide for their children as best as they would like;

3.4 Retraining workforce:

- It is reasonable to assume that a company should take the responsibility to retrain their employees who have been taken out of their usual role, but this is only if the employee chooses to stay with the company.
- It is also reasonable to assume that it would be in the interests of the company and their employees if the employee remain with the company whilst retraining, due to familiarity.
- As we know this is often not the case if employees are made redundant. This responsibility should shift to the government or society at large to provide those who have lost their jobs with opportunities to move into other employment options.
- Older employees may find it hard to retrain for a different profession if they have been in a certain job for 20 years plus i.e. they might feel that they are too old to learn something new, might not be able to understand new concepts and might not be able to do certain tasks due to physical exertion.
- Job opportunities might become in short supply versus high demand for 'stable' employment.

- Stable means full/part time but most importantly it must be permanent. Casual or seasonal work is not an option if people have a family to support.
- Age discrimination is also a factor. It is easy to say that an older person can transition into different industries, but the reality is that some industry sectors do not view older employees as a viable option.

3.5 Regulatory change:

- What regulation will be required to deal with the cost of a work force which is reduced to half or more employees from a redundancy point of view?
- Who has the responsibility to retrain those employees who are no longer needed and what regulations will be needed to give an advantage and opportunity for re-employment?
- Will the advent of driverless busses require a different type of employee i.e. maintenance, mechanical and security i.e. more fleet management type roles, vehicle security, cleaners, on road maintenance, IT, etc. What types of accreditation and registration will occur?
- Given the loss of jobs is there a health and safety responsibility placed upon an existing employer to ensure that the nature of change is properly transitioned and explained? What type of system will need to be on place to protect these workers?
- Will a different type of employee arise, and will the current Industrial system adequately cover the type of work i.e. will there be shift work? Most employees will be covered under different industrial provisions as there will be a shift to needing more Administration / Fleet / Operations Staff, Mechanical Staff, Security Staff. Vehicle cleaning will increase and while the vehicle may operate itself, students of special needs, for instance, will need supervision by a responsible adult. How will regulation deal with such changes?
- What sort of regulatory requirements will be needed if jobs change from drivers to another type of employee i.e. supervisor or conductor? Will there be a new accreditation system?

4. House of Representatives Inquiry into “Social Implications into the introduction of driverless vehicles.

4.1 To answer some of the questions raised in the previous paragraph the Australian Parliament, House of Representative initiated an inquiry into the introduction of driverless vehicles.

4.2 the Terms of Reference included:

(i) What social issues are relevant-such as?

- general social acceptance levels
- passenger and non-passenger safety
- legal responsibility and insurance
- potential impacts on employment and different industry sectors (such as the taxi industry)
- access and equity issues (such as increasing individual mobility for the elderly and people with disabilities)
- potential public transport applications
- How each social issue is being handled- including the opportunities and challenges for each issue?
- Recommendations to progress action on the social issues identified

(ii) When undertaking this Inquiry, the Committee was requested to have regard to:

- non-social aspects relating to driverless vehicles - such as regulatory status, infrastructure, technological readiness, data management and cyber security issues
- the experience of other jurisdictions and nations
- how Australia might best position itself to contribute to global driverless vehicle initiatives
- the respective roles of the Australian government, the Australian Parliament, other jurisdictions and other stakeholders
- how issues identified from this inquiry might inform work on other emerging technologies

(Reference: Parliament of Australia:

www.aph.gov.au/Parliamentary_Business/Committees/House/Industry_Innovation_Science_and_Resources/Driverless_vehicles/Report)

4.3 The Bus Industry Confederation responded to the Inquiry and made the following points about the ageing demographics of the industry and the need to manage the employment effects.

“The introduction of driverless buses in the Mass Transit Trunk Services segment if accepted by the community will cause a reduction in the existing driver work force. The transition to new driverless technology will need to be managed in a way that provides for an ageing workforce to be naturally retired from the workforce or retrained to take on new roles that will emerge. Drivers may become attendants on the bus for example.”

(DRIVERLESS VEHICLES AND SOCIAL IMPLICATIONS ON THE TRANSPORTATION INDUSTRY: Submission by the Bus Industry Confederation (February 2017) p:6)

4.4 However, the BIC noted that retraining and redeploying older workers, particularly a smaller total workforce in the sector, is likely to pose challenges for both the individuals involved and employers.

“Whilst it is probably not possible to get a clear picture as to what a driverless bus system would look like in the short term future, nevertheless with trials of driverless buses already being conducted it seems that a driverless bus system might not initially, anyway, take the form of a comprehensive network capable of providing door to door on call services. Driverless buses may not even be able to negotiate point to point services without some form of dedicated road network available to them. In Australia there just aren’t that many dedicated bus roadways.”

(DRIVERLESS VEHICLES AND SOCIAL IMPLICATIONS ON THE TRANSPORTATION INDUSTRY: Submission by the Bus Industry Confederation (February 2017) p:8)

4.5 As part of recommendation 5 the Parliamentary recommended that the Commonwealth Government establish a working party with industry and academic stakeholders to identify industry needs regarding the development of automated vehicles and support services and implement a strategy to ensure that Australia is best placed to exploit emerging opportunities.

5. Senate Inquiry into the ‘Future of Work’

5.1 Following the House of Representatives Committee inquiry into the introduction of driverless vehicles and reference to the impact upon future employment came the Senate Inquiry into the future of work. The terms of reference for this Inquiry included:

- an overview of the future earnings, job security, employment status and working patterns of Australians;
- the different impact of that change on Australians, particularly on regional Australians, depending on their demographic and geographic characteristics;
- the wider effects of that change on inequality, the economy, government and society;
- the adequacy of Australia’s laws, including industrial relations laws and regulations, policies and institutions to prepare Australians for that change;

- international efforts to address that change; and
- any related matters.

(Reference: Parliament of Australia

www.aph.gov.au/Parliamentary_Business/Committees/Senate/Future_of_Work_Workers/Future_of_Work)

5.2 The Transport Workers Union of Australia, who represents a proportion of all employees within the public transport space, provided submissions to the Inquiry and with respect to the issue of new technologies stated:

“Further, new technologies - for example, in the transport industry - are being used as an excuse to undermine standards and extract more from working people for less. There is nothing to say that new technologies cannot be the drivers of quality jobs and lead to innovation in a way that spreads prosperity. However, technological innovations are currently largely being viewed as happenings that the community has no control over, with an inevitability that they will negatively impact the organisation of work.”

5.3 The TWU submission further sought to address the specific issue of autonomous vehicles:

“In the transport industry, analysis of ‘crash optimisation’ algorithms in automated vehicles that decide who will get killed in the event of an unavoidable crash highlights that leaving these decisions to technology and its programmers is unacceptable. There is a need to regulate this space early and decisively in Australia to ensure that we are not led down this dangerous and morally hazardous path. Humans must be in control of these critical decisions. Appropriate and enforceable ethical guidelines, similar to those explored in Europe, will be critical.”

(Reference: Parliament of Australia

www.aph.gov.au/Parliamentary_Business/Committees/Senate/Future_of_Work_Workers/Future_of_Work)

5.4 The recommendations of the Senate have particular implications for the vexed questions for public transport industry disruption due to the introduction of autonomous vehicles.

“Technological change is clearly not a new phenomenon. The automation of work in various guises has been taking place since the industrial revolution. Technological advancements such as the steam engine, internal combustion engine, computers and the internet have

transformed our societies and our workplaces. Invariably they have displaced former industries and professions. Simultaneously, they have created significant new enterprises and new occupations that have increased economic and productivity benefits as well as generated a multitude of new workforce opportunities.”

5.5 The Senate further concluded:

“It is therefore critically important that we carefully plan for and then guide the direction of technological change so that the benefits are maximised and equitably distributed across Australian society and potential negative impacts are minimised. This includes ensuring that the Australia public are well informed of any potential impacts technological change may have on the workforce. Allowing technological change to occur in an unplanned fashion risks creating a range of unintended consequences and will diminish the potential economic and societal benefits that can be derived from such change. 3.94 The committee notes that the disruption”

5.6 In a similar way to the House of Representatives the Senate stated:

“The committee therefore strongly urges the government to devise an overarching plan for actively preparing Australian workers, business and the economy for the future, and calls for a new body to be established which will have responsibility for coordinating analysis, forecasting and policy development in relation to: occupational and labour market change; the employment opportunities and challenges arising from emerging technologies; and future skills and knowledge requirements and the capacity of education and training institutions to meet them.”

5.7 The Senate had its final say in its recommendations in shaping Australia’s future with the technological changes introduced in 4IR.

“The committee recommends that the Australian Government should position Australia as a leader in the development and ethics of artificial intelligence, and in other emerging fields.”

(Reference: Parliament of Australia

www.aph.gov.au/Parliamentary_Business/Committees/Senate/Future_of_Work_Workers/Future_of_Work/Report)

6 Conclusion

6.1 The challenge for Government, Industry and Public Authorities is to facilitate exploration learning while ensuring that new (digitally enabled) transport services contribute toward policy objectives. To do this is to recognise what issues are raised by the technological

growth whilst at the same time recognising that Australia and the world is in the grips of a new age, a fourth industrial revolution (4IR).

6.2 Public Authorities need to learn how to tackle potential trade-offs in this space such as between social and environmental sustainability and between the risk and return of achieving short term results and meeting long term ambitions or between efficiency and the equity of the transport system.

6.3 Public Authorities will need to consider a change in the regulatory environment to deal with the substantial change in employment and the consequential social issues that arise from that change.

6.4 The two Inquiries undertaken by the Australian Parliament shows the commitment of the Australian Government to be at the cutting edge of the new technology. The recommendations which basically call for further consideration and broad consultation with all stakeholders is the right approach so that technology and society can reach their goals with much closer symmetry than the advent originally of the internet, where technology landed much earlier than regulation.

6.5 There is a substantial risk that opportunities will not be taken up and many currently severe problems will be exacerbated. Social acceptance of the new technology should not be an issue if the system is introduced with the points of concern adequately addressed prior to their introduction.

6.6 The role of the public authorities is to try and find a delicate balance between addressing the challenges that this technology poses not just for legislation and regulations, together with the social implications, but also to be seen not to be standing in the way of innovation.

6.7 As a final aside, on January 15, 2009 US Airways Flight 1549 experienced a bird strike, after a flock of geese had knocked out the engines of the US Airbus A329. When the on-board automation algorithms could not provide a safe landing for the disable aircraft Captain Chesley Sullenberger took control of the aircraft and landed safely on the Hudson river in New York city, later to become known as 'the miracle on the Hudson'. This prompted the Vice President of Production Development at aircraft manufacturer, Boeing to state that automation would not be applied to any of its aircraft until such time as it was as adept at handling a mid-air crisis as Captain Chesley Sullenberger.

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