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Constringo, Constrixi, Constrictum: Thorny Legal Issues When Restraining Unruly Passengers

*by Dr Sofia Mateou**

1. Introduction

In January 2013, an allegedly drunk passenger on board a flight from Reykjavik, Iceland to JFK, New York, became disruptive and belligerent, hitting, screaming, spitting, and swearing at other passengers. He was restrained in his seat with tape and plastic ties, with tape over his mouth. He was arrested when the plane landed at JFK[1]. The picture on social media of this passenger restrained in the manner he was restrained to his chair speaks volumes and at the same time, raises many questions.
There are many cases of unruly passenger behaviour, varying in degree of severity, but, importantly, also in the manner that such behaviour is being dealt with by the airlines.

2. Legal Framework

2.1. International Legal Framework

The 1963 Tokyo Convention is the relevant international legal instrument that deals with crimes on board an aircraft and lays down the framework for dealing with unruly passengers and the jurisdiction to prosecute them. It is the first international law giving the legal right and the corresponding legal duty to the pilot in command (PIC) of an aircraft to deal with persons who commit any criminal offence or endangering acts in an appropriate manner and that includes restraining anyone s/he believes was committing or is about to commit an act that could jeopardize the safety of the people onboard. In addition, the Commander can disembark and deliver the offender(s) into the custody and can also divert the aircraft when deemed necessary. The Tokyo Convention outlines the role and powers of the Commander and states that the Commander has the right to take any necessary measures, when s/he, subjectively, has "reasonable grounds" to believe that such an act has been or is about to be committed in flight (defined as from the moment power is applied for take-off until the moment when the landing run ends). The PIC also has the right to require or authorize the assistance of other crew members and can request, but not oblige other passengers to assist in imposing such restraint or any other necessary measures. The Convention also provides that the Commander, crew, and passengers are exempted from any subsequent legal proceedings for actions taken against the offender(s). The Tokyo Convention gives the Commander the right to land and hand over a passenger to the police authorities in countries which are contracting states, when the Commander judges that the passenger is a danger to flight safety or in some other way has committed a criminal act on board. In other countries, the right to land can be obtained but the assistance of the police cannot always be expected.

The Tokyo Convention was modernized by the Montreal Protocol in 2014 (MP 2014)[2]. Even though the MP was signed in 2014, it only entered into force on 1 January 2020 after obtaining the required twenty-second instrument of ratification, by the Government of the Federal Republic of Nigeria on 26 November 2019 (ICAO, 2019)[3]. Currently, currently 45

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1 BBC, "Who, What, Why: Is it legal to restrain air passengers?" 8 January 2013. Available at https://www.bbc.com/news/magazine-20940106.

2 Montreal Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft, done at Montréal on 4 April 2014, DCTC Doc No. 33 4/4/14. Available at https://www.unodc.org/documents/terrorism/News%20and%20Events/Consolidated_Text_1963_Tokyo_Conve ntion-2014_Montreal_Protocol_ENG.pdf.

3 ICAO, Entry into force of the Protocol to Amend the Convention on Offences and Certain Other Acts Committed on Board Aircraft. Available at: https://www.icao.int/Newsroom/Pages/Entry-into-force-of-the-Protocol-to-Amend-the-Convention-on-Offences-and-Certain-Other-Acts-Committed-on-Board-Aircraft-.aspx.

states[4] have ratified the MC 2014, which addresses the issue of rising incidents of unruly and disruptive behaviour on board aircraft.

The Protocol addresses the increasing incidents of unruly and disruptive behaviour on board aircraft and makes four key improvements with regards to unruly passenger behaviour. The Protocol clarifies what is meant by unruly behaviour. The MC 2014 states that an in-flight offence includes a "physical assault or threat to commit such assault against a crew member" and a "refusal to follow a lawful instruction given by or on behalf of the aircraft commander". It also gives the Commander the power to restrain passenger in such circumstances, and merely requires reasonable grounds to believe a "serious offence" has been committed. For the first time it extends legal recognition and protections to in-flight security officers by includes the role of the officer with respect to disruptive passengers. It extends jurisdiction to try unruly passengers by including States in which the operator is located and the State of destination, including the State to which a flight may be diverted. In addition, it includes provisions which recognize an airline's right to recover compensation for expenses incurred by unruly behaviour. The MC 2014 is an important legal instrument as it has made great inroads towards closing the jurisdiction gaps which will result in unruly passengers being prosecuted in accordance with global standardized rules and guidelines.

On an international level, clearly, the Tokyo Convention and the Montreal Protocol give both the power and the legal duty to the pilot in command to restrain any passenger that poses or may pose a threat to the safety of the passengers, the crew, or the aircraft. However, important legal issues arise when an aggressive or violent passenger is restrained with regards to how the passenger is being restrained, whether the passenger is restrained to his/her seat, how to manage a sudden emergency on the aircraft when a passenger has been restrained to his/her seat, and where a restrained passenger dies on board the aircraft or shortly after the aircraft has landed.

2.2. Domestic framework

In addition to the above, the national legal and regulatory framework must also be considered. State criminal laws define criminal behaviour, and passengers who behave unruly may also be committing a criminal offence in violation of domestic laws and the rules of the Civil Aviation Authority. Most Air Navigation Order and rules of the air have provisions which stipulate that a passenger who is drunk, under the influence of drugs, smokes on board, refuses a security check, uses threatening, abusive or insulting words or behaves in a threatening, abusive, insulting or disorderly way towards ground staff, passengers, crew or ground staff, endangers the safety of the aircraft or any person in it, disobeys a command given by the captain, or acts in a disruptive manner, will be committing a criminal offence.

3. Cases

A quick glimpse of the news headlines is indicative of the extent of unruly behaviour on board an aircraft, despite the measures to prevent, manage and deter such acts. People react to safety and security threats differently and the cabin and flight crew are trained on the measures to be applied to various disruptive passenger scenarios. There are many cases where unruly passengers have been restrained in one way or another after initial measures to calm down the passenger and defuse the situation have failed. In some cases, (like the one illustrated at the beginning) the passenger is completely restrained to his or her seat.

On 6 July 2021, an hour into a two-hour American Airlines flight from Dallas Fort Worth, Texas to Charlotte, North Carolina NC, a lady sitting in first class had an outburst, started screaming, and then assaulted and bit a flight attendant after she had attempted to open the forward boarding door. She was duct-taped to her seat and her arms and body

4 IATA, Unruly Passengers Fact Sheet, https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet---unruly-passengers/.

seemingly taped to the seat. The video showing her with silver duct tape over her mouth, restrained to her seat went viral. Law enforcement and emergency personnel met the flight on the ground in Charlotte and took her to hospital for a mental evaluation. In April 2022 she was fined $82 K, which is the largest fine handed out by the Federal Aviation Administration to date. American Airlines confirmed the incident and stated that she was restrained for the safety and security of the other passengers and crew.[5]

In September 2021, a man on board JetBlue flight 261from Boston to Puerto Rico became enraged a short time before the plane was due to arrive, after a phone call he tried to make was unsuccessful. He then jumped out of his seat and rushed toward the flight deck yelling to be shot. A flight attendant pushed himself into a space between the front row and the galley. When the passenger saw the pilot open the cockpit door, he grabbed the flight attendant by the collar and tie, grasped the overhead compartment for leverage and kicked the crew member in the chest. The flight attendant who was struggling to breathe managed to break loose from the man and prevented him from reaching the cockpit. The struggle continued until six or seven crew members finally managed to restrain him using makeshift restraints, including the flight attendant's tie, which they wrapped around his ankles, and seatbelt extenders they used around his torso and remained tied to a seat in the back of the plane for the duration of the flight.[6]

In an earlier case, a restrained passenger died in his seat. On 5 December 1998, on a Malev Airlines flight which took off from Bangkok to Budapest with 190 passengers, a 33-year-old Finnish passenger became unruly, punched a pilot and tried to choke a flight attendant. The passenger was then restrained and strapped to his seat. A doctor on board then injected him with a sedative to calm him down. The passenger later died on board (in his seat) and the aircraft was diverted. The autopsy concluded that his death was caused by a mixture of the tranquilizer and some other drug or alcohol. Witnesses said that they had seen the passenger take a pill before he became violent. Police detained two pilots, four attendants and five passengers as well as the doctor.[7]

Fortunately, there are not many cases of unruly passengers who have died from being restrained or where the restraints have been a contributory factor to death. However, on 14 May 1999 an Air France flight took off from Dakar to Paris when a 31-year-old Senegalese passenger managed to get into the cockpit and attacked the pilot and co-pilot and attempted to touch the controls of the plane. With the help of two passengers, the staff managed to restrain him. According to the deputy prosecutor of Bordeaux, both passengers and crew determined that the passenger did indeed endanger the safety of the aircraft, and as a result, the captain enquired whether there was a doctor on board. Air France management stated that after the doctors' credentials were checked, the purser took out "the doctor's kit" and the doctor gave him a tranquilizer injection to sedate him. Soon after the injection, it became evident that the passenger was suffering from a severe medical problem and the plane made an emergency diversion to the Bordeaux-Mérignac airport. Emergency medical staff tried to revive the passenger for 45 minutes, but he died. The death was attributed to a heart attack.[8] The Air France management went on to state that the airline's procedures authorize a doctor to proceed with an injection if deemed necessary and that, contrary to the seemingly hesitant approach of doctors on board US airlines to come forward, in France, it is rare that French doctors would not identify themselves on Air France planes in the event of an incident, as they are obliged under French to do so.[9]

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5 Manno, A., 'American Airlines passenger who was duct-taped to her seat with her mouth sealed shut after she tried to open plane door and headbutted and spit at crew is hit with $82,000 fine - the largest to date,' Mail Online, 13 April 2022.

6 Yaron Steinbuch, Y., "Man tries to storm JetBlue cockpit, attacks attendant, asks to be shot", NYPost24 September 2021. Available at https://nypost.com/2021/09/24/crazed-man-runs-toward-jetblue-cockpit-asks-to-be- shot/.

7 L.A. Times Archives, 'Jet Passenger Dies After Injection', 6 December 1998. Available at https://www.latimes.com/archives/la-xpm-1998-dec-06-mn-51268-story.html.

8 Vincendon, S and Bensahel, S.,' Mortal tranquilizer for a Paris-Dakar passenger. After a tranquilizer injection, he could not be resuscitated', 15 May 1999. Available at https://www.liberation.fr/societe/1999/05/15/calmant- mortel-pour-un-passager-du-paris-dakarapres-une-piqure-de-tranquillisant-il-n-a-pu-etre-rean_273067/.

9 Ibid.

On 11 August 2000, Southwest Airlines Flight 1763 departed from Las Vegas, Nevada, scheduled to fly to Salt Lake City, Utah with 121 passengers and 5 crew members. Approximately 20 minutes later, a 19-year-old male passenger suddenly charged the cockpit door, kicked it open and put his head in. The FBI documents include the report of witnesses who state that about 15 minutes before the plane landed, the passenger began pacing the aisle and gesturing, he then ran up the aisle quickly and smashed through the door to the cockpit shouting that someone needs to fly the plane because the pilot was not doing so. Other passengers tackled him and walked him back to his seat. He then tried to leave his seat several times but was prevented from doing so by passengers sitting on either side. The report goes on to state that 'a flight attendant "exacerbated the situation by approaching him shaking her finger in his face and yelling at him". The same attendant then suggested that he be moved away from the emergency exit and that 'as he was changing seats, he swung his fists and kicked wildly, bloodying one man's face'. One passenger said he was "like a tornado." Eight passengers dragged him to the ground and stayed on top of him for several minutes until he lost consciousness.[10] When the plane landed, he was removed from the aircraft and taken to a Salt Lake City hospital, where he was pronounced dead. Initially it was thought that he had died of a heart attack, however, the autopsy ruled his death a homicide because it resulted from intentional actions by another individual or individuals as it found that he had been strangled and died of asphyxiation. His body had multiple bruises and contusions on his chest, legs, arms and face, the result of being struck with blunt objects, fists and feet. Federal prosecutors in Salt Lake City decided not to file any charges as they concluded that, while the death was a homicide, the passengers involved in the restraint were acting out of self-defence and did not show criminal intent. No charge were filed against the eight passengers.[11]

In March 2005 a 48-year-old passenger on board a B737 American Airlines Flight 4 from Los Angeles to JKF became belligerent, loud and disruptive during the last hour of the five-hour flight after being refused more alcohol. The purser tried to calm him down, but he pushed her aside in order to get to the aisle. According to the Transportation Safety Administration he was trying to force his way to the cockpit. Seven other male passengers who saw this restrained him, and, together with the crew they put flexible handcuffs on him and returned him to his seat. He seemed to calm down but shortly afterwards, he got agitated and got out of his seat again. Seven passengers held him on his back on the rear galley floor until the plane landed. It is noteworthy that the passengers were not seated during the landing phase. The passenger who suffered from asthma complained that he was having difficulty breathing while he was restrained on the floor. When the plane landed and the Port Authority police boarded the plane, he was unconscious. They administered CPR and gave him oxygen. He was removed from the plane on a stretcher and rushed to the hospital where he was pronounced died. It was not clear whether he died on board or at the hospital. Prosecutors investigated his death.[12]

In 2015, a 25-year-old Brazilian passenger on board an Air Lingus plane scheduled to fly from Lisbon, Portugal to Dublin, Ireland, became agitated approximately an hour into the two-hour flight. When another passenger attempted to restrain him, he bit them on the arm. The passenger was reported to have been restrained and then suffered an apparent seizure and lost consciousness. The pilot declared a medical emergency and the plane was diverted to Cork. He was pronounced dead when the plane landed. It was later confirmed that he had had swallowed 0.8kg of cocaine in 80 pellets, one of which burst in his stomach during the flight.[13]

10 LasVegasSun, FBI: Man enraged by flight attendant, then suffocated', 20 December 2000. Available at https://lasvegassun.com/news/2000/dec/20/fbi-man-enraged-by-flight-attendant-then-suffocate.

11 Thompson, T., Passenger 'mob' killed air rage man', 24 September 2000. Available at https://www.theguardian.com/world/2000/sep/24/tonythompson.theobserver.

12 Weiss, M., 'Death In The Air; Man Dies After Being Restrained On Plane', New York Post 20 March 2005. Available at https://nypost.com/2005/03/20/death-in-the-air-man-dies-after-being-restrained-on-plane/.

13 Eleftheriou-Smith, L-M., Aer Lingus passenger who died after biting fellow traveller 'had £41,000 worth of cocaine in his stomach' The Independent, 20 October 2015. Available at https://www.independent.co.uk/news/world/europe/aer-lingus-passenger-who-suffered-seizure-and-died-on-flight-had-ps41-000-worth-of-cocaine-in-his-stomach-a6700806.html.

4. Restraining Passengers

Restraining a passenger not only requires training, it requires adequate and appropriate training in order to mitigate harming or seriously injuring the passenger. The mere fact that a person is being restraint entails some degree of force and physical contact. Not all airlines provide the depth and extent of training required and not all crew members are knowledgeable about specific holds and pressure points that can cause injury. A number of contributing factors have been identified that can result in injury or even death to the passenger being restrained, such as for example, restraining a passenger in a face-down position for a long period of time.[14] It is therefore important that the passenger be restrained face-down on the floor for as long as is absolutely necessary, and that when the passenger calms down, s/he should be seated. Heart failure due to the sudden and stressful event is also a possibility and crew members, who are also going through a stressful event, should attempt to calm and alleviate the anxiety of the passenger being restrained. Positional asphyxiation can occur when a person's body is in a position that impedes breathing, either due to restricting the movement of the chest wall and diaphragm or acute flexion of the neck, blocking the upper airway. Crew members must ensure that the passenger's neck is left in proper alignment and that the chest has room to expand, allowing breathing to continue as normal. Compressional asphyxiation can occur when weight is applied to the passenger's torso, impeding their ability to breathe. Often, other passengers 'pile on' and apply their weight on unruly passengers in an effort to control them. In the event that limbs are held in hyper-flexed positions, or where weight is applied to limbs, such as when a person is kneeling on the passenger's arm or legs, the substantial compression applied to skeletal muscle can cause large amounts of potassium to be leaked and result in what is termed crush syndrome.

Clearly the crew need to accurately assess the situation and the threat or potential threat, be it a safety or security threat, in order to make accurate and effective decisions on what specific actions to take to handle an unruly passenger. It is also imperative that the steps taken, and measures used be proportionate to the threat. Being alert at all times, proper communication and observing the behaviour of passengers may assist in determining the reason for the unruly passenger's behaviour which may in turn, be instrumental in de-escalating a situation by calming, outlining the rules and policies including possible consequences of a warning letter, restraining, being banned and penalties, before resorting to any physical intervention by the crew or other passengers. The possibility of having to take additional measures including restraining the passenger should be considered and planned for simultaneously.

Restraining a passenger should be used as a last resort, and only when other measures have not successfully calmed the passenger, defused or eliminated the safety risk or security threat. In addition, this measure must be in accordance with the behaviour of the passenger and proportionate to the level of the threat posed. In the event that a restraint passenger dies, either on board or shortly after the plane has landed, subsequent complex legal issues will largely be governed by the laws of the state of registration of the airline. Any potential liability will be determined by at least two factors, firstly, was the death caused by the restraint, or would the passenger have died anyway? and secondly, if the restraint caused, or contributed to the death, was the restraint reasonable under the specific circumstances? Here, one would have to consider factors such as inter alia, the exact means of restraint, how it was applied, the duration of the passenger being restraint etc., Going beyond the use of reasonable force which causes injury may expose the crew to potential legal responsibility.

A further legal issue may arise in cases where a passenger is restrained during a flight and an emergency situation occurs which requires passengers to put on their oxygen masks, adopt a brace position or evacuate the plane. In the event that a passenger in such a situation suffers injury or any additional injury as a result of being restrained, airlines and crew may

14 Saunders, J., 'Unruly Passenger Restraint: Mitigating the Risks', 27 June 2020. Available at https://www.tsi mag.com/unruly-passenger-restraint-mitigating-the-risks/.

be faced with legal action alleging negligence on their part. To avoid possible liability and accountability it is crucial that if a passenger is restrained, a specific a cabin crew member should be designated and assigned with the duty of releasing the passenger in case of an emergency.

Aviation is international, however, there is no one single superseding, comprehensive international convention that is uniformly applicable to all airlines with regards to dealing with unruly passengers. The Tokyo Convention and Montreal Protocol set the broad legal framework on an international level as outlined and discussed earlier. However, how to deal with passenger behaviour is largely centred around, and subject to, the laws of the country in which the plane is registered, and even though the PIC and the crew are afforded powers to deal with such behaviour, the specific measures and actions they can take are largely defined by the national laws of that country, the rules and regulations of the regulatory body, (the CAA) of that country, as well as the policies and manuals of airlines approved by the CAA.

Countries and airlines have different approaches to dealing with unruly passenger behaviour, varying policies and guidelines dictating what action to take and which measures to use, and also have different levels of training. Many airlines and regulators adopt a strict approach to unruly passenger behaviour, however, there are many cases where the crew do not restrain passengers, partly because that is not the company policy or company cultures or for fear of legal ramifications.

In India, for example, subsequent to a number of recent cases of unruly passenger behaviour and inappropriate conduct by passengers on board flights bound for India, in January 2023 the DGCA of India issued an advisory to all the head of operations of all scheduled airline, outlining their respective responsibilities with regards to handling unruly passengers and stated that restraining devices such as zip-tie handcuffs must be kept on board all aircraft and airlines should therefor use the restraining devices as a last resort to restrain unruly passengers of level 3 type, namely abusive physically violent, after warnings have been given and when the passenger poses a safety threat. Some recent cases include incidents of a male passenger allegedly urinating on a female co-passenger, smoking in the lavatory, as well as an incident on an Indigo flight where a drunk passenger was arrested for attempting to open the emergency exit mid-air, an Air India flight from Delhi-London Heathrow that returned back to Delhi when an unruly remained unruly after verbal and written warnings, causing physical harm to two cabin crew members. In these cases, the unruly passengers were not restrained on board but were arrested on landing.[15]

In the advisory, the DGCA of India emphasised that the responsibility for dealing with unruly passengers has been specified under various provisions of Aircraft Rules, DGCA regulations, circulars and manuals of airlines approved or accepted by DGCA. It stressed the overall responsibility that the PIC has for the safety of the flight, and the responsibility of the cabin crew for handling unruly passengers and defusing a critical situation, and also noted that post holders, pilots and cabin crew have failed to take appropriate actions when faced with incidents of unruly behaviour and inappropriate conduct by passengers. It is reported that out of all the Indian operating airlines, Air Asia India is the only airline that has these restraining devices on board the aircraft.[16]

15 Livemint, 'Air India deboards unruly passenger at Delhi airport, lodges FIR', 10 Apr 2023. Available at https://www.livemint.com/news/india/air-india-delhi-london-flight-turns-around-due-to-unruly-passenger- onboard-11681103471130.html.

16 Economic Times, GCA recommends 'handcuff-like device' to control unruly passengers on board,"6 January 2023. Available at https://economictimes.indiatimes.com/industry/transportation/airlines-/-aviation/dgca-issues-guidelines-to-heads-of-all-airlines-to-handle-unruly-passengers/articleshow/96796830.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cpps t.

5. Conclusion

The PIC and of course, the cabin crew are the last line of defence when it comes to ensuring the safety and security of the passengers, the crew, and the aircraft. Moreover, they have the right, afforded by the Tokyo Convention and the MP, but also the legal duty to take appropriate measures to fulfil their legal responsibility.

Despite a number of legal issues that may arise when restraining an unruly and belligerent passenger, flight and cabin crew must exercise their legal duties and should undergo special training, including recurrent training, on assessing the level of unruly behaviour and the level of the threat posed in order to use proportionate reasonable force, and if that entails restraining a passenger, on how to safely restrain a passenger and to correctly use the restraining devices to perform their duties and discharge their legal responsibilities. To flip the coin, and provide food for thought, one must also consider the situation that the other passengers on board may take legal action against the airline and crew alleging that they did not exercise their duties to effectively deal with an unruly passenger, and that this resulted in some injury, loss or damage for which they seek compensation and accountability.

A Regulatory Framework for the Prospective Commercial Aerospace Transportation Operations in Italy

*by Marco Di Giugno**

1. Introduction

Several operators have started their commercial operations with spaceplanes: in particular, on July 20, 2021, Blue Origin successfully completed its first crewed mission, Blue Origin NS-16, into space using its New Shepard launch vehicle. The flight was approximately 10 minutes and crossed the Kármán line. New Shepard performed six crewed flights between July 2021 and August 2022, taking a mix of sponsored celebrities such as Wally Funk, William Shatner as well as paying customers.

Virgin Galactic conducted its first commercial SpaceShipTwo suborbital flight June 29, 2023. Virgin Galactic's SpaceShipTwo vehicle VSS Unity, separated from its VMS Eve mothership aircraft at about 11:29 a.m. Eastern above cloudy skies in southern New Mexico. The vehicles took off from Spaceport America at 10:30 a.m. Eastern.

Italy – also thanks to the ENAC-FAA Memorandum of Cooperation of 12 March 2014, recently renewed and extended to Agenzia Spaziale Italiana - ASI and with the valuable support of Italian Air Force - ITAF – has the potentiality to allow this kind of operation from its territory under an ad hoc regulatory framework that can be set out in accordance with the Italian Air Navigation Code.

According to recognized definitions (e.g. the ICAO definition) a spaceplane involved in commercial space-flight operations must be considered an aircraft; moreover it appears clear, that in an European environment future commercial space-flights design, production, maintenance, operations and licensing activities shall be carried out under the EU and EASA legal and regulatory framework, that in any case, for the time being, has not yet been set up.

Meanwhile, in order for operators to be allowed to start space-flight operations from Italy in a (relative) short term, ENAC envisages the possibility that sub-orbital spaceplanes shall be considered as "aircraft specifically designed or modified for research, experimental or scientific purposes, and likely to be produced in very limited numbers" and therefore operated, under the Italian national rules, as provided in Annex I of the present EU Basic Regulation (EU) No. 1139/2018. In this respect, due to the fact that experimental aircraft are not normally allowed to conduct commercial operations, specific exemptions could be issued for spaceplanes and, as an example, flight crew and participants should have to be duly informed, before flight, of the inherent risks of the operations and acknowledge receipt of this information in writing as informed consent. In doing so, these paying participants will also acknowledge and accept that they will not benefit from the normal safeguards expected for commercial transport (they are therefore not considered passengers in the traditional sense).

It is of paramount importance to be clear about the risks with the involved people. In fact, spaceplanes cannot currently achieve the same safety standards as commercial aviation (if never they will be able to do it); therefore, before allowing spaceplanes to operate from Italy, the Government should be aware of and accept that these kinds of operations carry a higher degree of risk than most consolidated aviation operations, at least for the people on board.

On the other hand, the risk for the uninvolved general public (i.e. the thirds and the goods on ground) should be pro-

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tected against the risks coming from this kind of operations at the same (accepted) level of the current commercial aviation or, at least, at the same level of the corresponding segment of manned aviation (a similar approach has been following by ENAC about the risk for thirds parties on ground coming from unmanned aircraft operations, based on the ICAO equivalence principle).

One of the most important factors in protecting the uninvolved general public is the choice of a launch site for space-planes – a spaceport, with adequate characteristics. These consist first of all by easy access to the sea and low population density in the region of the spaceport.

There is a possibility of using military infrastructures at least at the beginning waiting for the definition of a national regulation for civil spaceports that could allow the conversion of the actual civil aerodromes into spaceports or built new ones.

Another solution could be an airport already designated for experimental unmanned aircraft activities complying with spaceport ad-hoc requirements, like the Taranto-Grottaglie airport which has been already set up as a "test bed" for this purpose.

So considering the development of commercial space travel with winged vehicles having take-off and landing capabilities potentially from a consistent number of locations within a same country, engaging aviation space with sub-orbital paths and trajectories impacting the consolidated commercial and general aviation traffic and providing services for human and good transportation, ENAC, the Italian Civil Aviation Authority, has considered it necessary to start a progressive involvement in the aerospace sector.

The above has led to the signing of a non-binding "Memorandum of Cooperation on Commercial Space Transportation Development" between ENAC and the FAA on March 12, 2014 and a number of valuable meetings and workshops among ENAC, FAA AST (Office of Commercial Space Transportation) and ITAF (Italian Air Force), the latter under an additional agreement for cooperation with ENAC for the scope of developing procedures and standards to support flight test activities of commercial sub-orbital flights within Italian National Air Space.

The renewed Memorandum of Cooperation FAA-ENAC-ASI signed in Rome last 30 June 2016, and the associated continuing cooperation with ITAF, provide further impulse to ENAC to become a qualified reference point for the perspective (initially experimental and subsequently operational) activity of suborbital space vehicles in Italy.

2. The legal regime applicable to spaceplanes

The legal regime applicable to spaceplanes depends on the definition of "Outer Space" and the boundary for where it begins.

A useful instrument would be to consider outer space the region above and outside the Karman line (100km or 1,57% of Earth's radius) but the issue whether it is possible or useful to establish a legal boundary between airspace and outer space has been debated in the doctrine since the beginning of space missions. The conventional and informal limit of 100 km, indeed, is often referred to as separating air and space operations: some States have included it in their national legislation[2] but there is no consensus at global level. For the space community, space operations seem to relate to operations aimed at going to or placing an object in orbit, the lowest circular unpropelled orbit being at around 150 km

2 E.g. Australia, Denmark.

altitude (at this altitude, a space object only makes a few 90-minute orbits before the drag and fast orbital decay makes it re-enter)[3].

The ICAO Legal Committee[4] and the UN COPUOS have suggested to look at the purpose or intent of the flight ('functionalist approach') to determine whether it is a space or aviation operation: flights which would be passing merely in transit through (sub)orbital space in the course of an earth-to-earth transportation would remain subject to air law.

The implication of a strict outer space delimitation on sovereign rights and national security against progress of space technology reflected on the fact that no agreement still exists on a fixed airspace-outer space boundary, while a large consensus has been reached on the five space treaties[5].

Although spaceplanes are not mentioned in the above treaties, it seems appropriate that, for the portion of mission where a spaceplane behaves as a spacecraft (namely when it cannot derive support from interaction with the surrounding air) the space law is applicable.

This implies, briefly, that each State is responsible that space activities carried out by State citizens or organisations are consistent with the international obligations of the State and do not jeopardise public health or the safety of persons or property. Moreover, the State must provide and update a register of space objects launched and accept liability for third party damage.

Besides, according to the ICAO definition of "aircraft", spaceplanes can undoubtedly be considered aircraft for the portion of mission where they derive support in the atmosphere from the reactions of the air; therefore, the existing set of civil aviation safety regulation (aviation law) would also apply to them and, generally speaking, to spaceplanes commercials operations because involving paying participants or goods on board.

In the EU, safety aviation rules are prepared by EASA and issued by the EU Institutions (Parliament – Council - Commission) in the form of regulations covering aeronautical product certification, continuing airworthiness, personnel licensing, aircraft operations, aerodrome and airspace/air navigation. Within this framework, since spaceplanes used for spaceflight experience would be providing air transport, they would be expected to comply with the standards for air commercial transport which are generally more demanding than those for general aviation or light aircraft. During last year, following a mandate by the European Commission, and with the support of a Task Force of Member States, EASA explored the preparatory actions required for a future regulatory framework on higher airspace operations (HAO) above FL 550. These operations which do not yet exist on a large scale in Europe can initially be defined as 'air transport operations carried out by various types of aircraft or vehicle systems in the volume of airspace above altitudes where the majority of air services are provided today (i.e. above FL 550)'.

Building on the work done in parallel by the ECHO project (SESAR JU/Eurocontrol), the Task Force identified 27 catego-

3 The new US Space Regulation Part-450 provides that no LCOLA (launch collision avoidance) analysis is needed for missions that do not exceed 150 km in altitude because orbital objects below this level are exceedingly sparse and usually are not present for long durations.

4 ICAO Legal Committee LC/36 WP/3-2.

5 There are five United Nations treaties and agreements applicable to space:
1. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, 1967 ("Moon Agreement');
2. Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies ("Outer Space Treaty");
3. Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space, 1968 ("Rescue Agreement");
4. Convention on International Liability for Damage Caused by Space Objects ("Liability Convention");
5. Convention on Registration of Objects Launched into Outer Space ("Registration Convention").

ries of future HAO vehicles and operations, some of which fall under the applicability of the Chicago Convention and of the EU Regulations on civil aviation. This is the case for instance of HAPS, supersonic and hypersonic aircraft operations. Other vehicles and operations qualify as space operations and remain under the competence of Member States, while others present hybrid characteristics that will deserve further assessment.

Following an initial analysis of the impact of future HAO on the existing EU regulatory framework from a total system perspective, it can be concluded that while the EU Treaties and Basic acts allow for some of these operations and give a shared competence to the EU to regulate some of them, notably those qualifying as civil aviation operations performed by aircraft under the scope of the EU regulations, most of the current implementing rules would have to be adapted and/or new ones adopted; for instance in the domains of airworthiness, operations, ATM/ANS, environment, aerodromes, personnel licensing, etc. Since some of these operations will be unmanned, synergies with the drones' regulations will also have to be further assessed. This Roadmap summarises the findings of the Task Force as well as the reflection of the various services of the Agency, and presents them in the format of a pre-impact assessment, for delivery to the European Commission in order to support its decision on the follow-up of this file.

A further option derives from the possibility for spaceplane operations to be exempted from EASA regulation. As a matter of fact, although the EU has legal competence, it has not exercised that competence so far because no regulation specifically applicable to spaceplanes has been issued, yet. In this framework, and similarly to aircraft, personnel and operations excluded from applicability of EASA Basic Regulations (ref. Reg. (EU) No. 1139/2018, Annex I (b) "aircraft specifically designed or modified for research, experimental or scientific purposes, and likely to be produced in very limited numbers"), Member States may consider to be entitled to regulate spaceplane operations nationally.
In other words, in the transition period until the EU would issue specific regulations for spaceplanes and their operations, Member States might classify spaceplanes as experimental aircraft and therefore apply national standards.

3. Italian regulation for spaceplanes as experimental aircraft

To build up a national legal and regulatory framework allowing suborbital flights in Italy, a three phases approach is envisaged:

- **Phase I** – Experimental flights (short-term)
- **Phase II** – Flights with participants on board (mid-term)
- **Phase III** – Routine transport (long-term).

It should be mentioned that the Italian Air Navigation Code does not provide any altitude limitation for air navigation of the objects defined as aircraft, nor include a definition of spacecraft (or spaceplanes) as flying objects different from aircraft. A formal legal approach to the future scenario of commercial space transportation, in particular for sub-orbital vehicles performing horizontal take-off and landing, will be a need in the future, but the present content of the Air Navigation Code is not considered as a legal obstacle for the development of Phase I i.e. experimental sub-orbital activity of spaceplanes.

For this purpose, a lift-supported spaceplane could be considered an aircraft i.a.w. ICAO definition – "Any machine that can derive support in the atmosphere from the reaction of the air".

In the framework of current Italian national aviation regulation, experimental aircraft are not allowed to conduct commercial transport operations; however, exemptions might be granted that, subject to specific conditions and limitations, permit occasional sub-orbital spaceplanes flight experience for paying participants and cargo.

The proposal of exemptions and the definitions of conditions and limitations should be based on and should take into account the following considerations:

1. Spaceplanes operations should not imply a risk to uninvolved persons and properties higher than the one caused by current aviation traffic.
2. Presently, spaceflight is an inherently high-risk activity, where both technology and operational experience are under development. Each person directly involved in spaceplanes operations on board (e.g.: flight crew, cabin crew, participants) or at ground (e.g.: during launching, take-off or landing phases) and any customer under contract for cargo transportation should have been aware of such a risk (potentially affecting health and properties on board) by the operator and should be in condition of understand it. A written acknowledgement of such a risk should be signed for each operation (informed consent).
3. Informed consent does not absolve the operator from liability claims brought by involved parties, their families or legal represent ant in the event of death or serious injury following a spaceplane accident or serious incident. Nor informed consent does absolve the operator from adopting policies aiming at constantly improving the overall safety of the operations.
4. Modern aeroplanes in commercial operations achieve a catastrophic failure rate better than 10-7 per FH, general aviation standards are better than 10-4 per FH: a figure of 10-4 per FH should be established as the acceptable target for short term spaceplanes sub-orbital operations.
5. In the short term, due to the fact that spaceplanes operations most likely to start in the coming years will be by USA operators and developed in accordance with US standards, any national regulation proposed should take into consideration and possibly be compatible with those standards. The option to adopt entirely or part of the USA (FAA AST) regulation for all commercial spaceplane activities should be taken into consideration, as well.
6. In the longer term, the aim of National regulation for commercial spaceplane operations will be to arrive at a risk-based regulatory framework and to encourage an acceptable level of safety without constitute an unnecessary burden for the development of this new industry. Adequate flexibility to allow for future regulatory development in the EU should be the target, also.

3.1. The Suborbital and Access to Space Operations (SASO) Regulation

All these issues are handled in the Suborbital and Access to Space Operations (SASO) Regulation adopted by ENAC on the 14 December 2023.

The SASO Regulation contains the requirements a vehicle system operator has to comply with in order to be authorised to conduct suborbital operations or operations for access to space (e.g. launching into orbit) or re-entry from orbit. Crewed and uncrewed operations, with or without occupants on-board, are in the scope.

The regulation is composed of five sections from Section I to Section V. Scope, applicability, definitions and general requirements valid for each type of operations are set forth in Section I and II. Suborbital operations requirements are set forth in Section III, while launching into space and re-entry from orbit requirements are set forth in Section IV and V respectively. Performance based flightworthiness requirements are set forth in Annex 1 of this regulation and are applicable to vehicles with occupants on-board, irrespective of the type of operation carried out. Orbital operations after the entry into orbit or before deorbit are not in the scope of this regulation.

For the time being only Sections I, II and III, and Annex 1 are available. Sections IV and V are under development and will be added into the regulation in a later stage.

This regulation follows a risk-based and operation-centric approach aimed at issuing to the vehicle system operator a single authorization, either a licence or an experimental permit, that considers the operation as a whole and covers all the relevant domains. Moreover, the requirements are performance-based wherever possible.

Two main domains are addressed, namely the public safety (aka third-party safety) and the occupants' safety, while occupants' safety requirements are performance-based, due to the need to cover different classes of vehicles, the public safety requirements are more prescriptive and quantitative.

In order to allow innovation and to take into account different vehicle system architectures and solutions, the Annex 1 of this regulation provides flightworthiness performance-based requirements for the design of vehicle system intended to carry occupants on-board, which shall be used to develop detailed consensus standards tailored to the specific categories of vehicle systems. In other words, occupants' safety requirements are objective requirements whose aim is to provide mandatory guidance to develop the consensus standards that may be used by the applicant to design the vehicle, provided they have been approved by the authority. In general, consensus standards will be approved by the authority if they are recognized in compliance with the objective requirements of this regulation.

The regulation would like to be adaptive in principle, and as such it will be updated as necessary following the evolution of the sector and based on the data and experience coming from the operations and also gathered from the regulatory sandboxes that may be implemented for possible specific types of operations that may not completely fit the current regulation.

3.1.1. Space crew requirements and licensing

Historically, space crew started being selected from military services and have continued this way for the majority of missions; therefore, the majority of spacecraft crew to date have been highly trained and physically fit, even before selection for a space mission.

As operations have evolved, longer missions with larger crews have become possible and specialised roles with different skills for crew members have developed. Depending on the spaceflight programmes, the responsibility to ensure that crew members were appropriately trained and competent has been managed by the respective national space agencies. As the spaceflight scenario will progressively move from experimental to commercial operations, it can no longer be assumed that either space agencies or military administrations take responsibility for commercial flight crew training and competence and, as for general and commercial aviation, either national aviation Authorities or EASA are expected to set their own regulation.

Since, as in aviation, the safety of the operations depends also on the skills and knowledge of the spaceflight crew and, specifically for spaceflight operations, on the ability to cope with the unique stresses of spaceflight, spaceflight crew licensing model would need to address both technical competence and physical ability.

Since that all the operators candidates for experimental or commercial spaceflight operations in the near term are from the USA, the ENAC regime for, both spaceplane and its crew is inspired by FAA AST requirements.

In particular, US FAR Part 460, places a responsibility on operators to ensure that all members of the flight crew: have appropriate experience; are appropriately trained for their craft; and have demonstrated an ability to withstand the stresses of spaceflight in sufficient condition to safely carry out their duties so that the vehicle will not harm the public. The option to validate FAA AST process is probably the most convenient and suitable for the near term. In accordance with Annex III to Regulation (EU) No. 1178/2011 (the Aircrew Regulation), this should be accomplished by a validation process, which requires the pilot to hold a valid ICAO-compliant licence; hold at least a Class 1 Medical Certificate issued in accordance with Annex IV to Regulation (EU) No. 1178/2011 - Part-MED; - have successfully completed a skill test on the appropriate aircraft or in a synthetic training device designed to replicate the operation of the aircraft, with an examiner designated by the competent authority.

In case operations will be conducted on spaceplanes classified as experimental aircraft under Annex I of the EASA Basic Regulation, ENAC as the competent authority could add further requirements.

3.1.2. Medical requirements and assessment for space crew.

Like in aviation, the fitness and performance of commercial space crew clearly has to be assured not only for their and any participant's protection, but also to protect, as far as possible, the uninvolved general public.

Since space environment and spaceplane operations imply additional issues and constraints than those in aviation, aviation standards for flight crew could be conveniently considered as a baseline from which specific standards needs to be developed and established.

So far, although specific standards have been established for the International Space Station astronauts[6] and some draft policies begin to address the issue for shorter space experiences[7], there are currently no common standards that apply to sub-orbital operations.

The ENAC Regulation requires an adequate medical standard for space crew and commitment the relevant assessment to a medical national network are mandatory steps in order to set a system similar to the one for commercial aviation. While the latter can be conveniently provided by the current established aviation national network of aeromedical centres with some additional information and training, the former needs adequate European or even worldwide harmonisation.

3.1.3. Medical requirements and assessment for participants

At the current state of the art and technology, spaceplane flights will expose both participants and flight crew to hazards at levels not usually encountered in commercial air transport, such as reduced ambient pressure, a reduced oxygen level, high G, microgravity, high noise levels, increased radiation exposure, vibration and thermal extremes.

Not only the above conditions may have consequences on the affected participants, even the safety of entire space or sub-orbital mission might be in danger due for example to an anomalous/unwanted behaviour or illness of a participant if no adequately managed.

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6 E. MESSERSCHMID, J. P. HAIGNERE, K. DAMIAN AND V. DAMANN, *EAC training and medical support for International Space Station astronauts, 2000*.

7 Federal Aviation Administration (FAA), Office of Commercial Space Transportation (AST), *Draft Established Practices for Human Space Flight Occupant Safety,* 2013; J. B. MARCIACQ AND A. RUGE, *Sub-orbital and orbital pilots licensing and passengers medical screening/training,* International Astronautical Association (IAA) 19th Humans In Space Conference, Cologne, 2013; Aerospace Medical Association Commercial Spaceflight Working Group, *Position paper: sub-orbital commercial spaceflight crewmember medical issues*, 2011.

SASO Regulation at point HUM.160 identify medical requirements for participants inspired by what aviation commercial operations do for the screening of passengers with medical conditions who could potentially suffer from a commercial aviation flight.

The ENAC regulation will have to be consolidated by national legislation which will have to codify the aspects relating to the operator's liability (in particular will be explored the possibility to introduce a regime of cross-waiver of liability) as well as the insurance profiles, identifying a limit above which the launch status will guarantee compensation for any damage that may exceed this limit.

The draft of the Space Law, based on the study carried out by the Fondazione Leonardo in collaboration with Bocconi and La Sapienza University is currently being discussed at the ministerial level (Ministry of Business and Made in Italy). This law will have to identify the competent authorities for regulatory activity for pure space activity and for the so-called "space access" activity. Through publication of the SASO Regulations and the new Edition 3 of the coordinated "Construction and Operation Regulations of Spaceports" this regulation, along the lines of what already happens at an international level, and ad example in the USA[8] in the UK and in Norway, in particular, ENAC can strengthen its recognition candidate to be recognized, also legislatively, as a regulatory authority for spaceports, the suborbital flight, access to space and return from orbit, also taking into consideration regulatory activity already done.

3.2. Spaceports management and requirements: ENAC Regulation on Construction and Operations of Spaceports (Ed. 3 14 December 2023)

The identification of a suitable spaceport is a necessary condition to allow spaceplane operations from Italy. The needs for a suitable spaceport location are related to operations, safety, meteorological conditions and economic factors, therefore a trade-off is necessary.

The spaceport is a strategic infrastructure essential to implement suborbital transportation operations and access to space, in order to ensure a sustainable development of the sector of commercial suborbital flights, pursuant the directives of the Minister of Infrastructure and Transport (MIT).

The spaceport is a site that includes infrastructures, buildings, equipment, plants and systems which are used to execute the launch, the landing and the related ground and flight operations of a suborbital HOTOL vehicle (horizontal take-off and horizontal landing), where the launch and landing of which can be, respectively, compared to the horizontal take off and the landing of an aircraft (Horizontal Spaceport).

In order to avoid improper use of land and to make the best use of the infrastructural resources present, the spaceport is identified in the area of an aerodrome certified under the Regulation (EU) no. 139/2014 and owning an ICAO code of flight infrastructure suitable for the characteristics of the suborbital vehicle that will operate there. The use of the main infrastructures, primarily the runway, will be shared and, normally, it will not be simultaneous.

In the ENAC Regulation there are legal requirements regarding the specificity of the suborbital transport operations that characterise the spaceport if compared to an aerodrome, which, similarly, need to be respected by the spaceport operator in order to be allowed to operate. From the point of view of the security, the same European and national aerodrome access rules for goods, operators and both means of the spaceport operator and external, as well as flight crews, are

8 In the USA, the authority responsible for evaluating and issuing permits and licenses to non-governmental operators of launch vehicles and launch sites is the Office of Commercial Space Transportation (AST), established in 1984 and which since 1995 has been a body within the Federal Aviation Administration (FAA) which reports to the Department of Transportation (DoT).

applied also to the spaceport. The occupants of a suborbital flight others than crew which, for any reason, participate to the flight, are allowed to enter the security restricted area after specific and dedicated screenings, as defined in the Regulation. The certification as spaceport is issued by ENAC to the operator (applicant for certification) prove that in the spaceport is possible to safely operate at least one typology of suborbital transport with at least one typology of suborbital vehicle. Excluding the operations whose responsibility is shared between the Airspace Operator and the providers of the Air Navigation Services, all the operations that are carried out in the spaceport are under the responsibility of the spaceport operator. This is because it represents *"the subject entrusted with the task of administering and managing the aerodrome infrastructures, together with other activities or exclusively, in accordance with criteria of transparency and non-discrimination, under the control of ENAC"*. At the same time the spaceport operator is responsible of the spaceport infrastructures and to *"coordinate and control the activities of the different private operators in the aerodrome"* and, consequently, in the spaceport, as stated in the art. 705 of the Air Navigation Code.

The Regulation defines the conditions to issue, maintain, modify, limit, suspend and cancel the spaceport certification and the related obligations and responsibilities of the spaceport certification holder, with regard to the safety of the suborbital horizontal take-off and horizontal landing transport operations. Furthermore, this Regulation determines the general conditions of applicability, implementation and regularity of rescue and fire prevention services. The technical requirements to set up the services are reported in the regulation of the Ministry of Interior - National Department of Fire Brigades.

ENAC issues this Regulation in line with the guiding act of the 10 July 2017 n. 354 of the Minister of the Infrastructure and Transport about the sustainable development of the commercial suborbital flights sector.

ENAC strongly believes Italy has the potential and the capability for hosting one or more spaceports that could meet the necessary requirements, even if, at this moment, only one site (Grottaglie Airport) has been identified.

In order to allow spaceplanes operations in Italy, this work may be initially done in cooperation with ITAF and the Italian MoD so ENAC founded "Criptaliae Spaceport" (from the ancient name of Grottaglie), to allow ENAC, Aeroporti di Puglia and the other public entities involved (the Italian Air Navigation Services Provided - ENAV and the Military Aviation Authority), in order to manage the spaceport and to intercept the demand for innovative services in the aerospace sector, of a public and private nature, within the central institutional framework (Government, ENAC) and local (Puglia Region). Even if the first location of a spaceport is in a coastal area in the South of Italy. In the future, with a better understanding of sub-orbital spaceplane safety performance and the possibility of the development of suitable certification codes, it may be possible to relax the coastal location requirement (that is directly linked to the low-population density requirement), even if a coastal location shall, in any case, help to meet some environmental requirements.

Case Note – Case C-54/23, WY v. Laudamotion and Ryanair

by Andrea Trimarchi

On 25 January 2024, the Court of Justice of the European Union (CJEU) released its decision in the Case C-54/23 *(Laudamotion and Ryanair v. WY)* on the interpretation and application of certain provisions of Regulation (EU) No 261/2004. The case concerns a dispute between a passenger and two airlines (Laudamotion GmbH and Ryanair DAC) in an event concerning delay on a flight operated by Laudamotion.

The passenger had booked a return flight between Düsseldorf (Germany) and Palma (Spain) with Ryanair. He was informed by Laudamotion, the operating carrier, that the flight departure had been delayed by six hours and that he was automatically rebooked on another flight, which arrived at destination within three hours delay as compared to the original arrival time. As a result of such disruption, the passenger claimed compensation under the Regulation (EU) No 261/2004. The claim, dismissed in first instance, was appealed to the German *Bundesgerichtshof,* which suspended the proceedings and brought the matter to the attention of the CJEU.

The referring court raised the question of the interpretation of Articles 5 to 7 of the Regulation. In that regard, the CJEU observed that while it is true that the origin of the dispute in the main proceedings is the delayed departure of an aircraft, its subject matter rests in the repercussions that that delay may have caused on arrival. Indeed, the applicant in the main proceedings claims compensation owing to the probable delay in the arrival of the flight at issue at the final destination, which would have prevented him from arriving on time for a business appointment, which was to take place in Palma de Mallorca. However, as the Court argued, Article 6 is concerned solely with the delay in a flight beyond its originally scheduled time of departure. It follows that the fixed compensation to which a passenger is entitled under Article 7 of that regulation, when his or her flight reaches the final destination three hours or more after the scheduled arrival time, is not dependent on the conditions laid down in Article 6 being met. As the Court has underlined in multiple occasions, in fact, Passengers encountering long delays, like those passengers whose original flights have been cancelled, suffer an irreversible loss of time and, hence, a comparable inconvenience. That inconvenience materialises, with regard to delayed flights, on arrival at the final destination, with the result that a delay must be assessed, for the purposes of the compensation provided for in Article 7(1) of Regulation (EU) No 261/2004, in relation to the scheduled arrival time at that destination.

In deciding the case, the Court of Luxembourg found that Article 5(1) and Article 7(1) of the Regulation must be interpreted as meaning that the right to compensation, within the meaning of those provisions, cannot be enjoyed by a passenger who, on account of a risk of a long delay in arrival at the final destination of the flight on which he or she has a confirmed reservation, or even on account of sufficient evidence of such a delay, has himself or herself booked an alternative flight and has reached the final destination with a delay of less than three hours after the originally scheduled arrival time of the first flight.

Miscellaneous Material of Interest

Priority One: Space Sustainability

by Lucio Bianchi

Priority One: Space Sustainability

*by Lucio Bianchi**

Abstract

The increase in space activities will make it necessary, on the long term, to develop rules supporting sustainability in orbit as well as advanced systems for the detection and removal of space debris. This article analyzes and comments on the Thematic Report "Space sustainability" published by analytics and consulting company GlobalData, which therein outlines the risks and opportunities of growth in the space sector.

1. Introduction

Space is suffering from a vague and generalist regulatory system that is the result of the times in which it has been elaborated. Today, the boomimg space economy offers food for thought on the importance of developing up-to-date space policies that are consistent with the innovations coming from the industrial sector.

The challenge concerning space sustainability arises from the issue labeled as "*tragedy of the commons*" [1] and pursuing it is now a necessity rather than a choice. That's the incipit of GlobalData's Report *"Space sustainability"*: after having analyzed the whole context in quantitative and qualitative terms, it dwells on the opinion of a number of scholars regarding the most important obstacles to the implementation of real efforts aimed at mitigating the effects of the indiscriminate use of space resources.

2. The growth of the Space economy

GlobalData predicts that the value of the space economy will reach 1,000 billion dollars by 2040. In addition to the economic value associated with the launch of satellites and the space economy generated by civil activities on Earth, the space economy will receive a significant boost from activities in cislunar space, as well as from space mining and the exploration of the solar system.

Such estimates are associated with the consideration that, despite the related costs and factors that limit the entry of new players into the sector - inter alia, those associated with the launch, operation and management of space vehicles as well as with the risks of any activities in space -, outer space will become increasingly accessible, allowing even industrial activities such as the extraction of natural resources on asteroids, generating extraordinary economic returns. Mining gold, cobalt, platinum, palladium, tungsten and iron from an asteroid, and then transporting them for reuse on the Earth or, better yet, processing and using them directly in space, would radically reshape the pace and scope of space activities, since the need to constantly launch objects out of the Earth's gravity would be surpassed, thus drastically reducing both the heaviest costs in the space economy and a remarkable limiting factor in designing spacecraft.

The Globaldata Report also refers to estimates from Asterank – a database that measures the potential value of resources mined from the asteroids tracked by NASA: the ten asteroids orbiting closer to the Earth (Near-earth asteroids, Nea) could generate profits in today's economy equal to around 1.5 trillion dollars… mind-boggling figures.

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* Retired Airforce Lt General of the Italian Ministry of Defense. The opinions expressed in this article are purely the views of the author, and thus may not in any circumstances be regarded as an official position of the institution the author belongs to.

1 In the 'commons' example, shepherds lacking a shared social structure allow their sheep to eat all the grass, https://www.globaldata.com/store/report/esg-governance-factors-theme-analysis/.

3. The biggest obstacles to sustainability

The above-mentioned prospects would be at risk, if the industrial sector does not develop a sustainable framework; to do that, it is necessary to address what in the Report is indicated as a twofold great obstacle for the development of the main industry segments involved in space sustainability: the commercialisation of dedicated services – such as the active removal of debris (ADR) – and the present vague and inconsistent regulatory context.

Regarding the first category, the scenario is under development. Operators and institutions will unlikely stipulate contracts for ADR services, unless their resources in orbit are under a direct threat; moreover, the complexity of ADR can entail high overhead costs over a long period of time, with maintenance and repair operations in orbit limited also by the design of existing satellites. In fact, almost all of the objects currently in orbit were not designed according to a half-life maintenance approach, so that the provision of such services will initially be very complex and expensive, if not even not viable in most cases.

As to the regulatory context, the vast majority of international coordination in terms of sustainability in space is currently focused on - not mandatory - guidelines and standards, with only a few binding laws intended to deter groups from polluting and damaging the space environment; but this seems to be the only feasible approach at the moment.

4. Current leaders in the sector

The Report is based on data collected to predict how space sustainability will evolve and who the probable main players will be. The scenario was worked out by using approximately 145 million signals generated by Globaldata's thematic engine, which processes data on mergers and acquisitions, venture financing deals, patents and mentions by workforce and social media. While the space sector as a whole covers a wide spectrum of activities, some companies indicated in the Report are leap-frogging in such sustainable practices as ADR, additive production, reusable launch vehicles and other in-orbit services. The document does not include any Italian company, but we know that Italy is doing its part, also in this sector.

5. Towards a sustainable outer space

The Report ends with a categorisation (that in my opinion can definitely be agreed with) of the measures to be taken in order to promote and guarantee the sustainability of outer space activities in the future. The main ones regard the development of reusable launch vehicles on one side, and ground operations (crucial for starting, controlling and tracking operating assets) on the other. Two additional measures, consequent to the previous ones, regard on-orbit production and maintenance, as well as the operations for the active removal of debris.

Focusing on ground operations - a key enabling sector in which Italy already plays its role as an international player - it must be said that the support from Earth to activities in outer space largely depends on two intertwined kinds of operations: the use of space observation equipment to perform the crucial task of tracking and recording moving objects in orbit – active satellites, in transit spacecraft or debris – and "G*round stations as a service*" or Gsaas. The Gsaas also includes tech giants like Microsoft and Amazon - which are exploiting their presence in the existing market - and even players such as Telespazio - the joint venture between Leonardo (majority) and French company Thales - which, by leveraging on the experience gained in the defense sector, has a strong presence in such segment.

As to the "*sustainability value chain*", Globaldata positions Telespazio as a unique major global player both in the segment of detection/tracking equipment and in the Gsaas one, recognising to this company an important role as Champion in managing and supporting the activities related to space sustainability.

In summary, any operation related to space sustainability will play a fundamental role in ensuring that the expectations ensuing from the space economy are fulfilled. The study also helps us to understand the need and urgency for Italy to adopt any possible measures in order to - given its potentially highly relevant and enabling industrial sector - develop a modern and adequate national space law, as well as an enlightened technological vision and a coordinated and integrated space policy, possibly based on a dual approach.

Events

European Air Law Association (EALA) 36th Annual Conference
Barcelona (Spain), 7-8 November 2024

ICUAS Association, International Conference on Unmanned Aircraft Systems 2024 (ICUAS 2024)
Chania, Crete (Greece), 4-7 June 2024

European Air Law Association (EALA) 36th Annual Conference

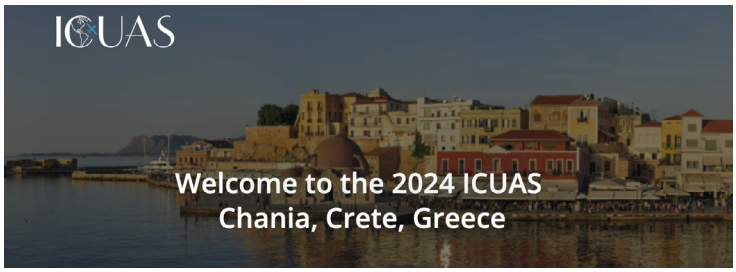
Barcelona (Spain),
7-8 November 2024

Prof. Pablo Mendes de Leon, President of the European Air Law Association (EALA), announced during his closing remarks at the very successful 35th EALA Conference in Stockholm that the venue of the next EALA annual conference will be Barcelona (Spain). More details will follow in 2024.

Sign up HERE to remain updated on the next news about the event.

ICUAS Association, International Conference on Unmanned Aircraft Systems 2024 (ICUAS 2024)

Chania, Crete (Greece),
4-7 June 2024



The 2024 International Conference on Unmanned Aircraft Systems, ICUAS '24, will take place on 4-7 June 2024. It is organized for the first time in the historical Center of Mediterranean Architecture (KAM), which is hosted in the Great Shipyard (Megalo Arsenali) of Chania.

ICUAS '24 focuses on civil and public domain applications and on the societal impact of unmanned aviation, and its effect on everyday quality of life. Topics of special importance are:

- Bioinspired aerial platforms
- Hybrid platforms
- Design for resiliency
- Human factors
- Framework and regulations for integration into the national airspace

ICUAS '24 brings together, under one forum, national and international organizations, federal agencies, industry, the private sector, authorities, end-users, and practitioners, who work towards defining roadmaps of Unmanned Aircraft Systems/Remotely Piloted Aircraft Systems (UAS/RPAS), they set expectations and technical requirements and standards that are prerequisite to their full utilization and integration into the national airspace. Special emphasis will be given to research opportunities, and to 'what comes next' in terms of the tools and support technologies, and standards, which need to be utilized and implemented to advance the state-of-the-art.

More information on the Conference is available HERE.

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