

Guidelines for a Permitted Limit of a Prosthetic Limb into the Flight

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Abstract

A South African disabled shot-putter was prevented from boarding with his prosthetic leg after 2016 Rio Paralympic. Also, on 2015 a checking luggage containing a \$250,000 leg prosthesis of a professional disabled dancer was lost during the flight. With these two happenings, there is a controversy over the permissible range of the prosthetic arm or leg into the flight. Currently, the related safety agencies or airlines do not provide accurate judgment criteria for the allowance of bringing the prosthesis into the cabin. The battery, sensors, networks, biological and mechanical technologies are supporting the up-to-date prosthesis but the appropriate regulations are not provided yet. This study is intended to discuss the permissible range of a prosthesis into the flight and discuss the guidelines.

Keywords: *Powered prosthesis, Arm prosthesis, Leg prosthesis, Tyrone Pillay, Carry-on baggage, Flight*

1. Introduction

On 20th September 2016 BBC reported that the South African airways refused to allow South African Paralympic shot-putter Tyrone Pillay to board with his prosthetic leg. The bronze medalist at Rio de Janeiro Paralympics, Tyrone Pillay says he was prevented from boarding an internal flight from Johannesburg to Durban as he made his way back from Brazil. Tyrone Pillay tweeted that “Terrible treatment of a Paralympic athlete as the staff refuse to allow my prosthetic leg on board”, and “Can't believe I get treated like this after winning a medal for our country. Totally disrespectful”. Then the South African Airways’ spokesperson answered that Tyrone Pillay should have been allowed on board with the prosthesis and is investigating. Also the spokesperson added that their policy makes provision for passenger assistive devices to be carried into the cabin [1].

The next day, the Guardian reported that SAA was the official carrier of the South African team to the Games and added that Tyrone Pillay had been allowed to board an SAA international flight from São Paulo to Johannesburg with his prosthetic leg as his carry-on luggage, but after transit he was refused to bring his prosthetic leg into the flight. Also the Guardian reported also the airlines had made a contact with Mr. Pillay and apologized to him. The spokesperson said the prosthesis should have been treated as carry-on luggage or an assistive device and the incident had left all of them with a terrible aftertaste [3].

Occasionally handling these artificial arm and leg as a checked luggage not as a carry-on luggage causes problems. On 11th Nov. 2015 the New York Post reported that a professional

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dancer who lost a leg in the Boston Marathon terror bombing on 15th April 2013 said American Airlines lost her luggage containing her prosthetic. The dancer named Adrienne Haslet-Davis also tweeted that American Airlines lost her luggage with over \$250k of leg and dance parts so she couldn't dance. American Airlines' spokesman Joshua Freed said the airline was "terribly sorry" for losing the bag and is working to get it back to Haslet-Davis as soon as possible. Haslet-Davis tweeted after that 'her bag went to a country she has never been to' and said the airline was trying to find it. Later, she returned to Twitter with the good news that the bag had been found [5]. If she could have carried her leg prosthesis into the cabin without putting it in the checked luggage, she might not lose her leg prosthesis.

On the other hand, as technology advances, these prostheses are evolving recently with help of batteries, sensors, networks, screens, biological and mechanical technologies. The high-tech powered prosthesis that works like sophisticated electronics is featuring. The powered prosthesis can be compared to a notebook or a smartphone. The notebook and smartphone have also battery, network interface, sensors and input/output technologies. Many airlines ask their passenger to turn off their cellphones and notebooks when a plane takes off or lands. Also they ask the 'flight mode' during the flight to disable Bluetooth, GPS, telephony and WLAN.

The Verge, a US American IT magazine reported that Southwest Airlines flight 994 from Louisville to Baltimore on 5th October 2016 was evacuated while still at the gate because of a smoking Samsung Galaxy Note 7 smartphone. All passengers and crew exited the plane via the main cabin door and there were no injuries, but more worrisome was the fact that the phone in question was a replacement Galaxy Note 7, one that was deemed to be safe by Samsung.[6] On 10th October 2016 the Ministry of Land, Infrastructure and Transport of South Korea recommended customers to stop using Galaxy Note 7 and a restricted use in the flight. Finally on 11 October 2016, Samsung announced that it would permanently end production of the Galaxy Note 7. Samsung asked all Note 7 users to power down the device and return it to the point of purchase immediately.[7]

In addition to the electrical risks such as ignition and explosion of powered prosthesis, some artificial implants could have threatening form to maximize athletic performance or to enhance particular functions. A representative disabled sprint runner, Oscar Pistorius, received a five-year prison sentence for culpable homicide and a concurrent three-year suspended prison sentence for a separate reckless endangerment conviction [8], had sharp and elastic artificial implants looks like a blade on his both legs. This specially engineered implants maximized the runner's performance. He competed at both the Paralympic Games and Olympic Games with the prosthetic legs.

A tattoo artist, who is based in Lyon, France, lost his arm 22 years ago by an accident. He received the prosthetic courtesy of French artist JL Gonzal, who modified an existing arm prosthesis to accommodate the tattoo machine. This powered machine has a sharp tattoo gun and works like a kinetic sculpture. [9]

The series of articles and episodes presented above gives us thought-provoking questions. Should airlines allow their passengers to bring a smartphone-like powered prosthesis, which has battery, sensors and networks functions? How do other passengers feel, if Oscar Pistorius is on board with sharp prosthetic legs or a tattoo artist with a tattoo gun prosthesis is in the flight. In this study we will research the related regulation of the prosthetic leg and arm from each airlines and security administration. While sufficiently guaranteeing the right of the disabled who use body prostheses, the appropriate guidelines of powered prosthetic arms and legs for ensuring safety of the aircraft are described and discussed.

2. General conditions of carriage

Each airline offers the terms, conditions and legal notices of passengers and luggage according to the international and domestic laws or regulations. There could be a lot of discussions if a prosthetic leg and arm belongs to the category of “baggage” or “passenger”? However, you may notice that each airline is treated it as a carry-on “baggage”. There are hundreds of airlines' terms, conditions and legal notices. Among them, the noteworthy rules are in [Table 1].

Table 1. Terms, conditions and legal notices about a prosthetic arm and leg

Airlines/Organization	Terms, Conditions and Legal Notices								
Transportation Security Administration (TSA) USA	<p>In addition, TSA does allow the following if declared and for travelers with disabilities and medical conditions: Items used to augment the body for medical or cosmetic reasons such as mastectomy products, prosthetic breasts, bras or shells containing gels, saline solution, or other liquids, and frozen items.</p> <p>The following devices are permitted through security but may require additional screening: Wheelchairs, Prosthetic devices, Support braces, Support appliances, Orthopedic shoes, Assistive/adaptive equipment, Exterior medical devices, Augmentation devices, Tools for wheelchair dis assembly/reassembly, Any other disability-related equipment and associated supplies etc.</p>								
Air New Zealand (NZ) New Zealand	<p>Artificial limbs (prosthesis)</p> <p>All artificial limbs are accepted for carriage and use on Air New Zealand aircraft. Due to limited stowage space in the cabin, you may be restricted to carrying only one spare limb as part of your cabin baggage, additional limbs may be stowed as checked baggage. Please be aware that longer items (legs for above-knee amputees for example) may not be able to be accommodated in the cabin of the aircraft. Please package longer prosthesis' sufficiently for protection should they need to be checked-in, if required to be checked in there will be no charge.</p> <p>Aviation Security</p> <p>Aviation Security may want to see a medical certificate for your prosthesis from your physician or medical specialist. We encourage you to carry one of these certificates that can be shown to Security staff if requested.</p>								
Korean Airlines (KE) Asiana Airlines (OZ) Korea	<p>Passengers who have trouble moving due to illness, injuries, or age are supported with wheelchair and golf cart (Incheon Airport only) as well as assistance for boarding process, departure procedure and boarding.</p> <p>To help passengers who have trouble moving in-flight to move freely, all aircraft are equipped with wheelchairs.</p>								
China Southern Airlines (CZ) China	<p>Tips on storage of disabled-aid devices</p> <p>(1) We provide your disabled-aid devices with storage facilities and space on a first-come, first-served basis. If storage facilities and space are not available, the disabled-aid devices will be checked free of charge, with an additional out-of-list piece for the qualified disabled. The storage should conform to relevant provisions on security and air transport of dangerous goods by civil aviation administration.</p> <p>(2) Carry-on disabled-aid appliances are as followed</p> <table border="1" data-bbox="505 1486 1339 1654"> <thead> <tr> <th data-bbox="505 1486 808 1514">Special groups</th> <th data-bbox="808 1486 1339 1514">disabled-aid appliances</th> </tr> </thead> <tbody> <tr> <td data-bbox="505 1514 808 1570">Physically disabled</td> <td data-bbox="808 1514 1339 1570">Walkers: Crutches, collapsible wheelchairs, artificial limbs</td> </tr> <tr> <td data-bbox="505 1570 808 1598">Deaf</td> <td data-bbox="808 1570 1339 1598">Hearing-aids: Cochlear implants, hearing aids</td> </tr> <tr> <td data-bbox="505 1598 808 1654">Blind</td> <td data-bbox="808 1598 1339 1654">Tactile sticks: Multifunctional and simple visual aids, blind glasses</td> </tr> </tbody> </table>	Special groups	disabled-aid appliances	Physically disabled	Walkers: Crutches, collapsible wheelchairs, artificial limbs	Deaf	Hearing-aids: Cochlear implants, hearing aids	Blind	Tactile sticks: Multifunctional and simple visual aids, blind glasses
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TSA(Transportation Security Administration) in the USA, the principles are provided. The most airlines in the USA and even in other countries follow the TSA's rules. The Prosthetic devices are permitted through security but may require additional screening. The screening procedures are also presented. TSA also gives information about what they need to know before going through security to individuals wearing prosthetic devices. For example,

“Security Officers will need to see and touch your prosthetic device, cast or support brace as part of the screening process.”, “Security Officers will not ask nor require you to remove your prosthetic device, cast, or support brace.”, or “During the screening process, please do not remove or offer to remove your prosthetic device.”.[10]

Air New Zealand does allow all artificial limbs, but the additional prosthesis will be stowed as checked baggage. Aviation Security may want to see a medical certificate for the prosthesis from a physician or a medical specialist.

Korean Airlines and Asiana Airlines, the two both South Korean Airlines provide wheelchair or golf cart(Incheon Airport only) for walk disabilities, but there was no specific regulation about prosthetic arms and legs.

China's Southern Chinese Airlines provides disabled-aid devices with storage facilities and space on a first-come, first-served basis. If storage facilities and space are not available, the disabled-aid devices will be shipped in checked baggage.

The most airlines allow wearing of an artificial arm or leg, but the additional one is mostly checked. Normally there were rules about powered wheel chairs but there were no rule about the powered prosthesis. The airline industries are not responding properly to changes in development of prosthetic technologies.

3. Guidelines

Basically, an artificial arm or an artificial leg which is not powered by a motorized method should be allowed into the plane. However, if the section of the prosthesis is too sharp or the tip has jagged or pointed shape, it may not be allowed. The criteria for sharpness and jagged or pointed shapes should be clearly presented.

A more complex judgment is needed in case of a powered prosthesis. No airline is provided for the permitted limit for powered prosthetic in the flight. However, we could find some clues from a powered wheelchair. For the most airlines, the electric wheelchair must be sent to the luggage compartment after the battery is disconnected due to battery hazards. Also in the case of powered prostheses, batteries should be sent to the checked luggage compartment when the battery is separable.

In the boarding process, first, prosthetic device users can be informed before leaving home via online or offline brochure which the airlines suggests if they could bring their own prosthesis into the cabin. If they needed they can prepare a new prosthesis for boarding. However many airlines, as shown in the case in the above chapter 2, haven't provide enough information on their website nor the regulations are still not clear.

Second, the user can inquire at the airlines' check-in counter at the airport if their prosthesis is optimal to bring into the flight or not. The airlines should have a clear reference and announce their passenger immediately. If the prosthesis is not feasible to bring into the flight, the airlines should ship it as a checked-luggage and may give the passenger an alternative method, such as a wheel chair, a golf cart, a crutch or a staff who can help the passenger till boarding.

Finally in many cases disabilities must have taken off their prosthesis at the security check for screening. The user should have the right to refuse taking off their prosthesis. The Security Officer should make an effort to check the prosthesis without separation. TSA gives an option to the user to choose between public screening and personal screening. If the passenger choose private screening, a companion, assistant, or family member accompany could assist the passenger and two Security Officers of the same gender as the passenger may screen the prosthesis. [8]

4. Conclusion

In this study, we reviewed the happenings of a disabled athlete Tyrone Pillay who was refused to boarding with his prosthetic leg and a disabled dancer Adrian Haslet-Davis, who lost her custom-made prosthetic leg during the flight. Also we found two special cases, one is Oscar Pistorius who has two sharp prosthetic legs and the other was a tattoo artist who has a tattoo gun in his prosthetic arm.

With those cases we made guidelines about permitted limit of prosthetic devices as a carry-on baggage. Currently, the safety administrations and the airlines give inadequate, ambiguous and too general rules and the detailed judgment criteria of artificial arms and legs are not properly provided. Advanced body implants with a battery, sensors, networks, and biological and mechanical technologies are wide-spreading but the terms, conditions and legal notices of the airlines are not set yet.

In this study, we have discussed the permitted limit of the prosthetic arms and legs in the cabin. The importance of the Airline's online and offline notice about prosthesis was also presented. The procedures at the check-in counter was explained and in addition, it was also discussed the procedures when carrying out a security check.

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