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**Country:** Ireland

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As temperatures continue to rise and climate change and global warming continue to be an issue, solutions to these problems, specifically the rise in CO2 emissions and the production of soot through combustion becomes necessary. Ireland is committed to lowering CO2 emissions and its ecological footprint it leaves behind. Ireland has seen a 17% decrease in CO2 emissions from 2005-2014. Although soot from spacecraft is not the most pressing issue at the moment, by considering how quickly the industry is evolving, keeping in mind the possibility of commercial space travel, one can easily realize how quickly the production of black soot from spacecraft becomes a serious issue. Soot is absorbed very easily, especially by snow and polar ice caps, causing the ice caps not to reflect sunlight back into space, rather absorb it into the icecaps themselves or into oceans. “Rockets emit up to one thousand times more soot per amount of fuel burned than aircraft[s]” due to their specific chemical makeup. Ireland recognizes that this is a problem that must be solved. Another issue posed by the use of the most common rocket fuel, RP-1, a highly refined form of kerosene, is its emission of chlorine gas into the stratosphere. This chlorine gas reacts with the oxygen in the stratosphere to produce “ozone-destroying chlorine oxides.” The decrease or elimination of the emissions of both soot and chlorine gas (along with CO2 and carcinogens) is what Ireland, as a part of the European Space Agency, is working towards.

Although effort and financial support must go towards it, liquid hydrogen, along with liquid oxygen rocket fuel, produced by NASA, is a solution to the problem of pollution. Since both pure hydrogen and oxygen are cryogenic, it is difficult and complicated to produce this form of rocket fuel. Beginning in 1973, the European Space Agency (at the time still divided as the European Launch Development Organization and the European Space Research Organization) began operations for the first Ariane rocket. Many Ariane rockets now use liquid hydrogen and oxygen rocket fuel. Hydrogen especially is a very useful source of rocket fuel because it is extremely light, burns intensely, and has the highest efficiency versus consumption relation of any fuel known so far. Liquid hydrogen and oxygen rocket fuel allows for the lowering of soot and chlorine gas emissions because once burned, it produces either Hydrogen ions or O2 molecules or, most likely evaporates into H2O; none of these byproducts are pollutants or toxic. NASA regards “the taming of hydrogen [as] one of the most significant technical advancements of [the] twentieth century…” As mentioned, hydrogen and oxygen are cryogenic meaning they must be stored at a precise frigid temperature to retain their liquid state. Along with this, to keep the hydrogen and oxygen from evaporating from its chambers, it must be kept well insulated from any form of heat or change in pressure. Much more research must be done in this field to ensure that the common use of liquid hydrogen is properly studied, and security precautions are put in place for this highly challenging task but overall, as space aviation increases, the decrease in emitting pollutants into the atmosphere will be significant.

Since the production of soot is not a critical dilemma at this moment, it should be easier to incrementally allow nations and space agencies to lower use of rockets fueled by RP-1 and hybrid rockets which use a multitude of carcinogenic and toxic materials. Although not urgent, nations must keep in mind that this has not thoroughly been researched yet and the possibility of soot being a much larger contributor to climate change is feasible. As part of the ICAO, nations should turn their attention and focus on the common use of and further research on liquid hydrogen and oxygen fueled rockets; this will have a significant and positive impact on both climate change and global warming.

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