The IP Space – Edition 2

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Greetings once more Earthlings…!... Welcome back to this new series of short articles reporting on the latest challenges and successes in the Space Industry.

The Space Industry takes inspiration from all areas of life, including the way we eat our food it seems! If you enjoy eating food the Asian way, then this Edition is for you. But first, as a quick reminder, these articles will be posted every week or two and are primarily aimed at bringing you quickly up to speed with some of the most recent and significant technical developments in the world of Space technology. If you would like a better understanding of what is going on in this exciting area of tech, then keep reading. We will not only keep you updated with the latest news but also provide wider background context around the various players and projects driving the Space Industry forwards… or should we say… upwards and sideways – more on that soon! And given the writer **Adrian Bennett** is not only a mechanical/aerospace engineer, but a patent attorney as well, we will do our utmost to squeeze in some brief comment on any relevant IP matters as and when we can.

So, in Edition 1, we introduced you to SpaceX and their ambition to colonise our nearest planetary neighbour, Mars. The secret to their success in this endeavour is to develop a fully reusable spacecraft known as Starship - mentioned last time as having a potentially game-changing payload cost of just $2k per kilogram. The Chief Engineer of SpaceX (Elon Musk) has adopted a snappy five step design philosophy which can be seen characterising the current development of Starship. This five step approach merits an article in its own right, but of relevance to this particular Edition is Step 2, which requires effort from the design team to “delete” or remove a part of a product in contrast to trying to make it better. So, rather than working on improving or optimising a larger engineering system, Musk places significant emphasis on removing large parts of it if at all possible. A dramatic example of this design approach can be seen at the SpaceX production and launch site, known as “Starbase”, located at Boca Chica in Texas, USA.

We are all familiar with reusable aircraft, and thankfully they are equipped with undercarriage which allow them to land undamaged and to immediately take-off again with little or no maintenance. In light of this, you might expect a reusable space vehicle to have similar undercarriage allowing a return to earth without sustaining damage. That was the case with the NASA space shuttle, which landed on wheels like a conventional aircraft, and was also the case with other space vehicles (or parts of them) which have landed on retractable legs following a vertical descent, for example, the boosters of the SpaceX Falcon Heavy rocket. But rather than attempting to further optimise these undercarriage systems for the new and fully reusable Starship, Elon Musk set his engineers the task of eliminating the need for an undercarriage system altogether. This would reduce the weight of Starship and remove the need for maintenance of an undercarriage system and the possibility of it failing.

At the Starbase launch site you will find the innovative solution to landing a reusable space vehicle without an undercarriage system - two mechanical robotic arms mounted to move rapidly up and down a 400 foot tall launch tower using an arrangement of cables. These arms are truly colossal and yet despite their size they can be moved laterally from side to side, and in a coordinated fashion in a

precise opening and closing gripping motion. Conventional launch towers do not have arms of this type, so what are they for?

In August 2021, Musk provided an explanation. He announced on Twitter that "SpaceX will try to catch largest ever flying object with robot chopsticks. Success is not guaranteed, but excitement is!". He also posted a video clip showing characters from the move "The Karate Kid" attempting to catch a flying insect with chopsticks. Musk further Tweeted that the "Starship booster … will be caught out of sky by launch tower. Big step forward, as reflight can be done in under an hour".

Flight testing at Starbase in Boca Chica has been on hold this year pending the outcome of a FAA (Federal Aviation Administration) environmental assessment regarding the impacts of orbital launches on the environment and the public. But FAA clearance for Starship launches was finally given on 13 June 2022, so perhaps we will see the chopsticks in action for the first time within the next few months – watch this IP Space!

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Next time we will provide more detail about the Starship vehicle as a general concept, and perhaps briefly look at the SpaceX approach to IP…!

If you have any questions about IP protection for your own products, or about the IP protection of others, please do not hesitate to contact us at aat@aathornton.com to see how we can help.