Could aging wine become the first major space manufacturing business?

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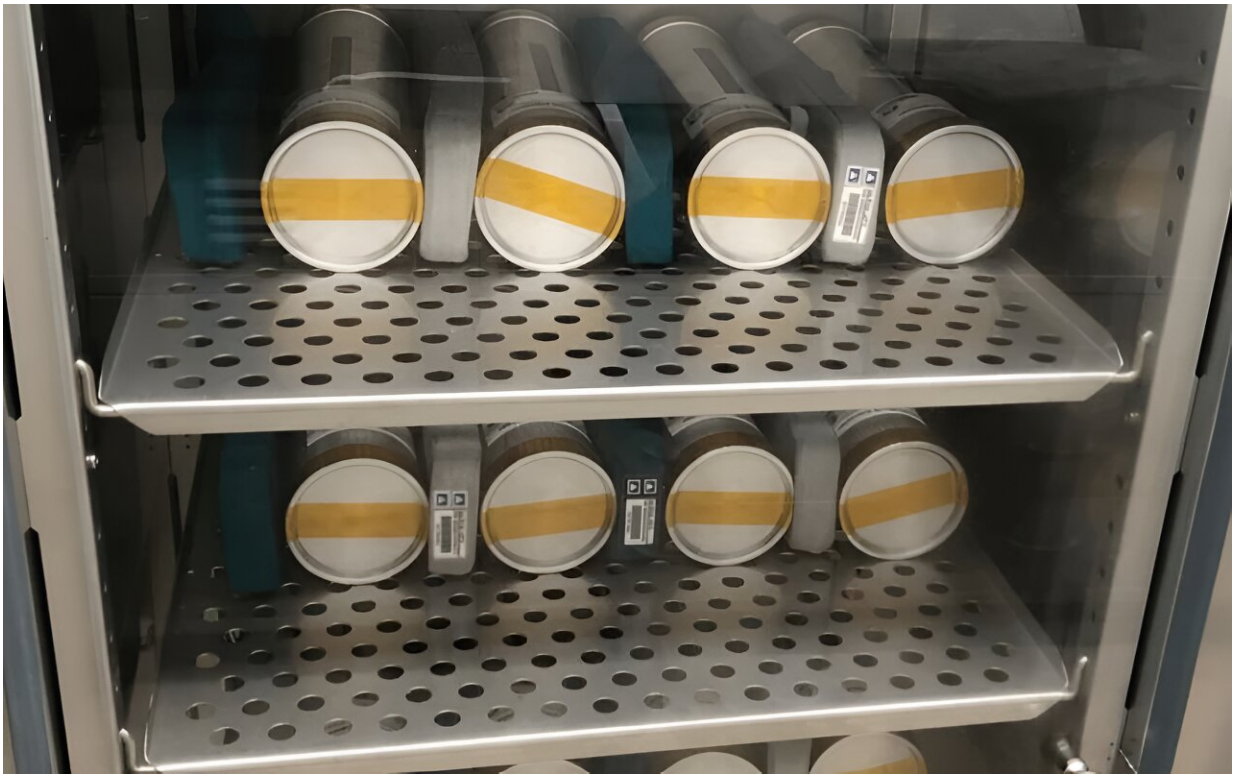

Wine bottles stored in metal cylinders for the experiment. Credit: Space Cargo Unlimited

In capitalist societies, resources are primarily directed at solving problems, and one of the biggest hurdles facing space development is its ability to directly solve the problems of the majority of humanity back

on Earth. So far, we've taken some cautious commercial steps, primarily through satellite monitoring and communication technologies.

Some think that space tourism is the "killer app" that will kickstart the commercialization of space. But to really have a sustainable business model, humans need to make something in space that they are unable to make on Earth. This article is the first in a series where we will look at what those possible first manufactured goods are. And in this case, the good isn't something that might immediately be thought of as high-tech.

Wine is one of humanity's oldest products. We have been drinking it for thousands of years and likely will continue to do so for thousands more. But one of the secrets of wine is that it is primarily considered to get better with age. What that means for winemakers is that they could potentially dramatically profit from simply holding a large inventory of a good stock for longer. Some investors even buy wine as a store of value, as, in general, its price increases over time.

One obvious difficulty with this process is that it simply takes time, and despite humanity's best efforts, we haven't developed a fool-proof way to speed up the "aging" process. Hence the interest generated when an experiment on the ISS hinted at a potential way to do so.

The experiment, which was actually one of a series called MISSION WISE. In a step up in sophistication to match its sophisticated subject matter, the space acronym for the mission stems from Latin—Vitis Vinum in Spatium Experimentia (WISE), or in more humble English, the "grape wine in the distance experiment."

MISSION WISE consists of six planned missions, all supported by private research funding and managed by a European company called Space Cargo Unlimited. The first of the six missions involved flying twelve bottles of Bordeaux to the ISS back in 2019. There it stayed in

Low Earth Orbit for 438 days and 19 hours, then returned to Earth on a Dragon capsule in January 2021.

Even simply getting the bottles onto the space station took some doing, as a typical wine bottle contains two things that are typically forbidden on the ISS—glass, and alcohol. So the bottles of Bordeaux were locked away in sealed metal containers.

Without controls, it wouldn't be much of an experiment, so similar containers were kept here on Earth to age normally. And then finally, the results of the taste test were released in May of 2021. Surprisingly, the wine left in space differed from its counterpart in both color and taste. And very importantly, it seemed to have aged at least 2-3 times more than the wine left on Earth, according to at least one of the experts on the tasting panel.

There are plenty of caveats to go along with this experiment. The experts only got to taste one bottle of the wine that was aged in microgravity, and being sealed in a metal cylinder might have affected the aging process for both the earth-bound and space-bound wine. But that aging acceleration process is a potential game-changer for the winemaking industry.

That was only the first step, though—Space Cargo Unlimited have been busily following up with subsequent missions, including one where they put some grape vines on the ISS to see what effect microgravity had on them, if any. They're currently replanted in greenhouses spread throughout France, with the first batch of grapes planned to be harvested from them later this year.

Additionally, Space Cargo Unlimited plans to perform three further experiments on bacteria, yeast, and the fermentation process, to try to understand how microgravity, and space radiation, affect that part of the

winemaking process. That hints at the company's underlying goals with all this research.

Space offers a combination of stressors for living things that aren't available elsewhere in the natural world. Radiation has a known impact on DNA and, when used correctly, can force changes to organisms—sometimes for good, sometimes for ill. And there is plenty of radiation in space, without having to induce it in a laboratory environment like some plant breeders do on Earth.

But microgravity is where this idea really shines. The current theory that Space Cargo Unlimited is basing its business model around is that those stresses would increase the resiliency of plants that are exposed to it, thereby increasing their viability in a changing climate back on Earth. And their plans are not limited to just wines and grapes, though that is the bespoke focus of MISSION WISE. In the long run, the company plans to use microgravity and space radiation to work on numerous other plant types to see what beneficial changes this novel environment can introduce.

It remains to be seen if their efforts will turn a profit. Still, the preliminary experiments of MISSION WISE prove that there are unknown changes in how biological processes operate on the ISS. For now, research is ongoing, so it might be a while before you can buy a bottle of space-aged wine. But, if you can eventually do so, that could provide an economic reason to invest more in space infrastructure—even if it is just to improve one of the oldest things humans know how to make.

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