

Beer In Space

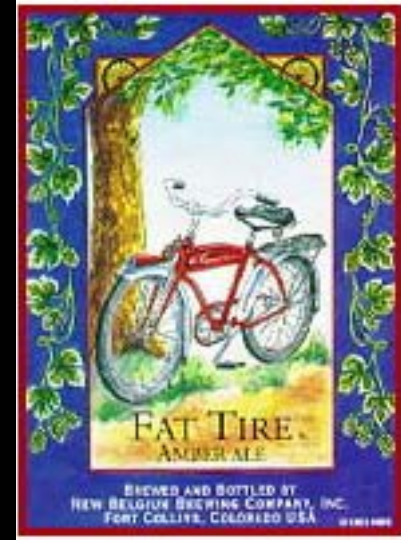
Blake Benedict

Presented Tuesday 12-9-03



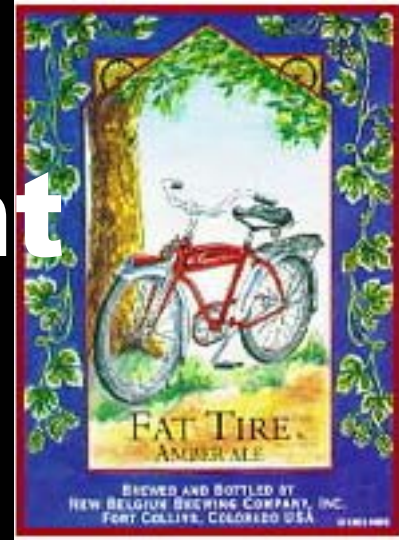
Overview

- **Problem Statement**
- **Relevance**
- **Potential Problems**
- **Background**
- **State of the art**
- **Experiments**
- **Lesson Learned**



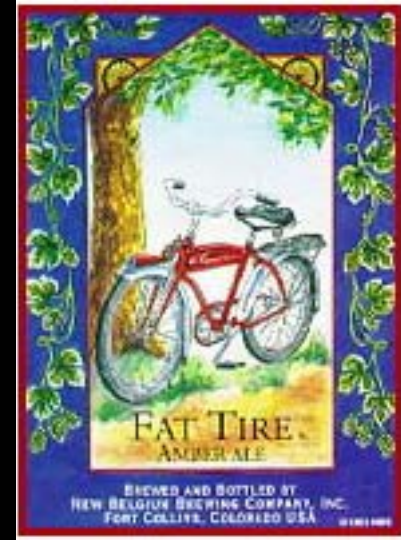
Problem Statement

- **To brew and serve beer to astronauts while in a microgravity environment to help them relax and feel like they're at "home"**



Relevance

- **Beer has been a mainstay of human culture for millenia**
- **Astronauts will want comforts such as a beer after a long day of work if they are stationed in space for long periods**



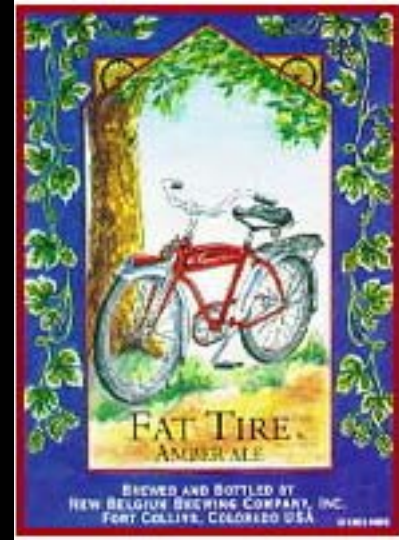
Potential Problems

- **Lack of atmosphere**
 - Carbonation problems
 - No “head”
- **No gravity**
 - Difficult to burp...could cause drinker to explode
 - Settling and pouring problems



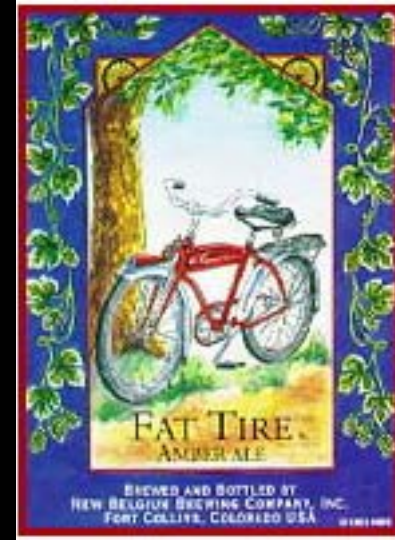
Background

- **Coca-Cola was distributed and drank onboard MIR in 1985**
- **Coca cola was taken aboard the space shuttle and dispensed into a “bottle”**



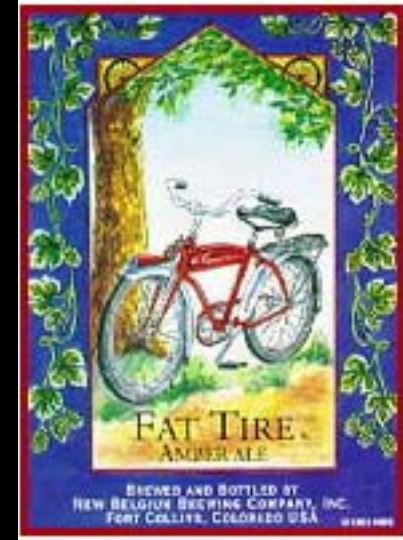
State of the Art

- **Dutch scientists have developed a beer distribution system**
 - **Air instead of CO₂ for pumping**
 - **Membrane inside barrel**
 - **Membrane pushed by air**
 - **Balls of beer come out**



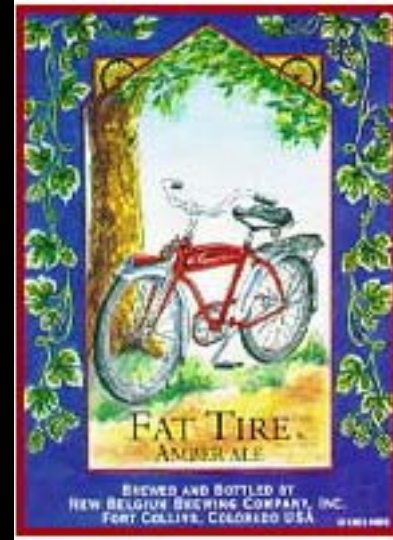
State of the Art

- **Russian Academy of Science is developing a non-alcoholic beer**
 - **Herbs and vitamins added to make it healthier**
 - **Will help alleviate stress**



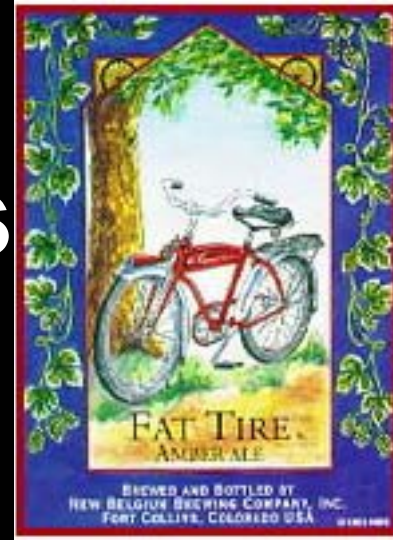
State of the art

- **Many pharmaceutical companies are researching the increased fermentation efficiency in space**
 - **Could save the beer manufacturers millions of dollars**
 - **Beer would have higher alcohol content**



Past Experiments

- **Kirsten Sterrett wrote her masters thesis on how beer would brew in space**
 - **Protein analysis on beer and yeast**
 - **Measured beers specific gravity**
 - **“repitched” yeast in new batches**



Experimental Results



- **Space beer appeared to be the same as beer on earth**
- **Yeast had some problems**
 - **Cell count was lower than average**
 - **Very interesting b/c theoretically the cells would have easier access to nutrients and would be more abundant**
 - **Facing similar problems with pharmaceuticals in space**
 - **Live cell % lower**
 - **Overly abundant proteins**

References

- **Suds in Space**
<http://science.nasa.gov/headlines/y2001/ast21sep1.htm>
- **Beer in Space**
<http://www.realbeer.com/news/articles/news-001433.php>
- **Space beer**
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- **Beer**
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