Fly By Microwaves

BY GREGORY T. POPE, Science/Technology Editor

Exciting, albeit untried, technologies.

Take the propulsion system, for example. Instead of simply riding a wave of expanding plasma, the lightcraft would wield electromagnetic forces to whisk the plasma past itself.

The driving force begins as a shaft of pulsed microwave energy. This beam showers the lightcraft from an overhead satellite that converts sunlight into microwaves.

The energy hits two rectifying antennas, or rectennas, that lie beneath the vehicle’s microwave-transparent surface. These antennas, in turn, convert much of the microwave energy into electrical power. At the same time, they work like lenses to focus the rest to points outside the spacecraft.

Shaped like a shallow, curved lampshade, one of the rectennas rings the craft. This air-plasma rectenna drives the craft at subsonic speeds. It focuses the incoming microwaves into an ignition circle around the vehicle’s periphery. There, the microwaves blast air into plasma.

As the plasma expands, it gets caught up in electromagnetic fields from two superconducting magnets that encircle the craft. Their relative strengths being adjustable, these fields can form a magnetic nozzle that propels the plasma downward, imparting lift to the spacecraft.

Futuristic enough? Yet at supersonic speeds, an even more radical propulsion method takes over. In this mode, the other rectenna—located on the lightcraft’s upper face—joins in. It focuses part of the microwave beam back toward the vehicle, forming a conical reflection known as an air spike. Like the pointed nose of a fighter jet, this cone reduces aerodynamic drag, keeping a shock wave from hammering the vehicle’s flat upper surface. Instead, the shock wave arches around the air spike. In
addition, the shock wave ushers the airflow to the outer edges of the spacecraft, where a unique air-breathing engine operates.

Here's how the engine works. Around the rim of the craft cling a series of electrodes, between which arcs of current leap. Meanwhile, the two superconducting rings continue to radiate their own fields. And the air-plasma rectenna continues to ionize peripheral air. The confluence of the electrical current and magnetic fields causes the ionized air to accelerate downward, lending thrust to the vehicle.

This engine concept, known as a magnetohydrodynamic (MHD) fanjet, is similar to the submarine-propulsion systems now under development in the United States, Russia and Japan (see "Jet Ships," page 60, Aug. '90). In Myrabo's calculation, an air-breathing MHD engine could deliver unheard-of performance, zipping from Mach 1 to Mach 2.5 in 10 seconds.

If you think all of this sounds farfetched, you're not alone. NASA officials see promise in some of the component technologies, but envision no short-term payoff. Even Myrabo admits that microwave lightcraft won't fly for at least a generation.

On the other hand, Myrabo has already put elements of this system to the test. In 1991, at the Naval Research Laboratory, he added a magnetic field to his laser-induced propulsion apparatus to preview the MHD fanjet. It doubled the thrust. And just recently, in an experiment that won attention from NASA and the Air Force, he demonstrated the air-spark concept in a shock tunnel. The equipment consisted of a plasma torch, representing the air spike, mounted on a blunt body that resembled an Apollo capsule heatshield. Placed in a Mach 10 blast, the torch triggered an oblique shock wave well forward of the body's flat face.

These tests hint at eventual fruition for Myrabo's work. But they also invite speculation. Remember that the theory behind these technologies was first thrashed out more than 20 years ago. And remember that Myrabo represents the open side of the aerospace establishment. There is also a secret side, well funded and stocked with equally visionary engineers.

Glowing, highly energetic, disc-shaped aircraft with unearthly performance characteristics have long been associated with the secret side. Myrabo's concept may offer a terrestrial explanation for the night-sky sightings that rational people tend to dismiss or ignore. Perhaps. Or perhaps it's just a concept that looks good on paper, or is ahead of its time. You never know with visionaries.

THOUGH JACK DANIEL'S BIRTHDAY is celebrated in September, the exact day and year remain a mystery.

His statue at our distillery reads that he was born in 1850. Yet other sources state it was September of 1846. And as to which day, that may never be known. Still, all the confusion has never stopped anyone from celebrating Mr. Jack's birthday. The way we look at it, there's any one of 30 days to choose from.

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