Aerospace Notes

SPACE DYNAMICS

Weightless Fuel Sloshes, Too

An 18-month study of the effects of liquid rocket fuel sloshing around in the weightlessness of an earth orbit is being made for the space agency by Lockheed Aircraft Corp., Sunnyvale, Calif.

A liquid-fueled rocket in orbit, Lockheed observes, is simiilar to a bucket of water hanging by a rope in a well. Slapping the rope will start the bucket vibrating. The vibrations set up wave motion in the water, which will contribute force to the bucket's motion, and so on, in a cycle.

Baffles can prevent most fuel slosh while the rocket is climbing through the atmosphere, but when gravity disappears the problem is different, requiring some kind of control system to keep the sloshing from building up in the first place.

NASA POLICY

Space Safety Group Formed

The National Aeronautics and Space Administration has appointed an interim working group to review NASA safety procedures and work out a plan for a permanent Aerospace Safety Advisory Panel.

Created as an after-effect of the launch pad fire that killed three astronauts in their Apollo spacecraft at Cape Kennedy on Jan. 27, the group consists of Dr. Alfred J. Eggers, NASA deputy associate administrator for advanced research and technology; Dr. Floyd L. Thompson, director of the space agency's Langley Research Center in Hampton, Va., who was previously chairman of the Apollo accident review board; and Gen. Jacob E. Smart, assistant administrator for policy.

AVIATION LAW

First Anti-sonic-boom Ordinance

Sonic booms have been outlawed in Santa Barbara, Calif. The ordinance is believed to be the first such municipal code in the United States.

The regulation includes no penalty, but makes it unlawful "to pilot any aircraft over and in the vicinity of Santa Barbara at supersonic speeds so as to cause loud, sudden and intense sonic boom impacts in the city of Santa Barbara."

Past court decisions have ruled that the Federal Government, through the Federal Aviation Agency, has sole jurisdiction over aircraft movements. Santa Barbara's mayor Don MacGillivray, who cast the only vote against the local ordinance, says "I do not believe the law is enforceable."

PROPULSION

Liquid-solid Improves Hybrid Rocket

A new type of liquid-solid rocket engine has been successfully tested over a 10-to-1 thrust range varying from 2,500 down to 130 pounds by Lockheed Propulsion Co., Redlands, Calif.

Known as the RSVP (Restartable Solid, Variable Pulse) rocket, the engine differs from a conventional hybrid rocket, which uses a solid fuel and liquid oxidizer that ignite on contact. Instead, both fuel and oxidizer are solids, while a liquid third element, called the control fluid, is added in varying amounts to produce ignition and varying amounts of thrust.

The propellant has a pressure-sensitive burning rate, and the rocket nozzle is deliberately sized too large to sustain combustion. Injection of the control fluid then builds up the pressure in the combustion chamber to a point at which combustion will take place.

The liquid-solid rocket provides a 10 percent increase in total impulse over an all-solid rocket, due to the energy-packed fluorine control fluid, Lockheed says. It also has a three to five percent mass advantage over previous hybrids, because a greater portion of the propellant-oxidizer system is packaged efficiently as a solid, eliminating large liquid tanks.

WORK IN ORBIT

One-man Space Station

A self-propelled space work platform, or one-man space station, for astronauts based aboard a mother spaceship has been designed by the Bendix Corp.'s Missile Systems Division, Mishawaka, Ind.

Intended for rescue missions, assembling structures in space and transferring objects from one space vehicle to another, the unit has a three-mile range and is equipped with two servo-operated mechanical hands, as well as three telescoping anchors with adhesive pads that can hold other space objects.

Interchangable modules that could be attached for special tasks include a long-range rendezvous module with guidance computers, an extended propulsion module with fuel for long range or heavy loads, a payload module with special tools or rescue gear, and an extended communication/telemetry module for data exchange with the mother ship. The total platform would weigh about 1,500 pounds, Bendix says, including the suited astronaut, a 65-pound pack and a maximum 200-pound payload.

A full-scale mockup is now being studied by the National Aeronautics and Space Administration.

MISSILES

Lasers to Harden Warheads

A new hardened laser fiber-optics system that resists X-rays may be used to replace some circuitry to help U.S. missiles reach their targets.

Developed by Space Ordinance Systems, Inc., El Segundo, Calif., the new system can withstand very high temperatures and the tremendous bursts of X-rays from high-altitude thermonuclear explosions that might be used to destroy incoming ballistic missile warheads.

If, while still in their high energy state, the X-rays strike a solid object such as a warhead, their energy is rapidly converted into heat which can shatter the warhead's outer casing and create a shock wave that could damage interior mechanisms. The new system, called LEED, for Laser-Energized Explosive Device, resists premature explosion or dudding by using laser pulses sent along non-metallic fiber-optic conductors, instead of relying on electrical signals and conventional metal cables, bridgewires and spark gaps.