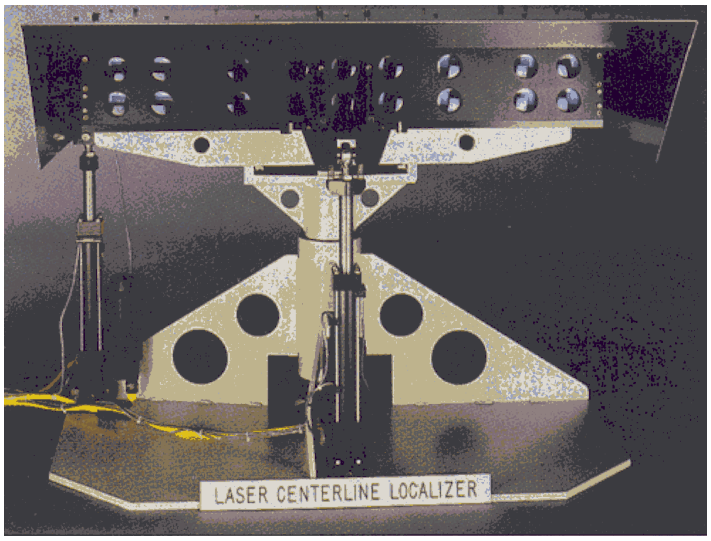
# LASERS IMPROVE NIGHT LANDINGS

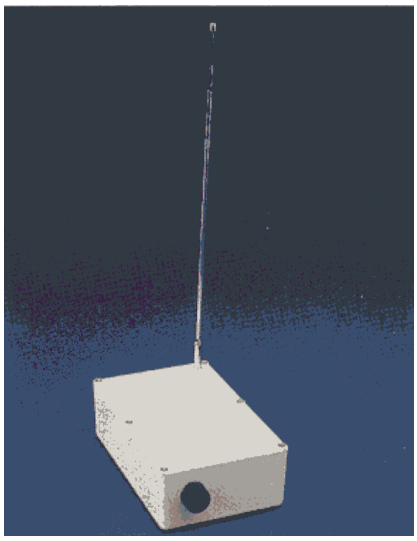
Bruce D. Nordwall/Washinton

Amber laser light below deck shows pilot approaching a carrier that he is lined up with the centerline.

Laser Guidance, Inc., of Bellevue, Wash., and teammate Raytheon Co. introduced the Laser Centerline Localizer to Carrier Air Wing 2. The long-range line-up system was used during training ashore before it was deployed on board the ship. The pilots' comments were favorable. With Navy approval, the system was installed on the USS Constellation last February for evaluation at the companies' expense.




**Laser Centerline Localizer, stabilized by electric actuators to compensate for roll and pitch of the carrier, has six amber lights flanked by green and red.**



**Radio-activated diode laser would show outlines of runway for covert landing. Box measures 2 X 7 X 5 in. and contains its own battery.**

**PILOT RESPONSES** to the system during eight months of training on the carrier also were positive. The air wing is now using it routinely during a six-month deployment to the western Pacific.

Landing on the centerline is critical on a carrier, and the margin for error is small. Pilots of smaller tactical aircraft must land within 20 ft. of centerline to avoid hitting aircraft parked on the right side of the landing area, or going off the left side of the deck into the water. An E-2 only has 10 ft. clearance from parked aircraft when landing on the centerline.

The pilot's problem is complicated because the landing area is angled 10 deg. from the ship's heading and moves to the right at about 10 kt. During daylight hours, pilots gain perspective on that movement from seeing the whole carrier and its wake in the water. In the dark, all a pilot sees is the centerline, a glideslope projected by a Fresnel lens and, when close to the ship, a "runway" outline. While a pilot may only be able to accurately discern the standard centerline 3-4 mi. out, the lasers provide guidance as far out as 11 mi. from the carrier, under clear conditions.

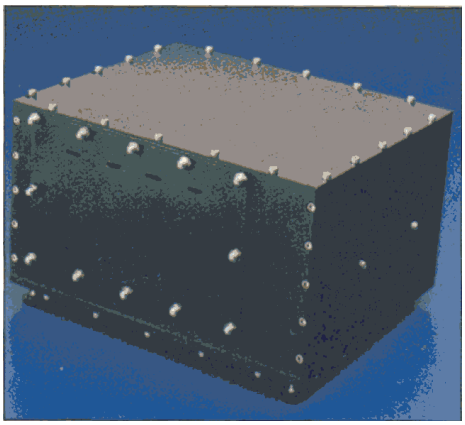
The laser colors follow the convention of sidelights on ships — green for starboard (right) and red for port (left). A pilot on centerline sees an amber light coming from the localizer. If he is off slightly to the right or left, he sees a steady green or red light, respectively. Moving away from centerline, he sees a slow, flashing green or red light, which becomes a rapidly flashing light farther from the extended centerline.

The lasers are mounted in a 36 X 32 X 4.5-in. box installed on the stern, below the flight deck, and were stabilized to com pensate for pitch and roll of the ship. At 3/4 mi. from the ship, which is the time that a pilot flying instruments is supposed to transition to a visual approach, the pilot loses sight of the laser beams and shifts to the conventional Fresnel lens glideslope and centerline lighting.

The system evolved from one developed by Humbug Mountain Research Laboratory in Duarte, Calif., under Navy contract, and tested at Naval Air Warfare Center, Lakehurst, N.J. (AW&ST Nov. 19, 1990, p. 46). Inventors David M. Shemwell and Alan A. Vetter are now at Laser Guidance. They formed the new unit to sell commercially but plan to offer products to the military as commercial off-the-shelf.

The team would like the Navy to buy its system as a sole-source, commercial off-the-shelf product. Shemwell said the Navy could outfit all its carriers for $12 million. He estimated that a system to military specifications would cost $50 million.

**BUT A NAVY OFFICIAL** said the service wants to give industry a chance to respond to generic requirements for fleet needs. The Naval Air Systems Command plans to release a request for proposals about March for a long-range line-up system.



**Diode laser glidesiope indicator for covert operations is 8 X 9 X 5 in., with battery.**

The service also would like to improve its glideslope system over the current Fresnel lens. Shemwell developed a laser glideslope that functions like the centerline system. It is not in use on the Constellation but was tested at Lakehurst and offers longer range than the Fresnel lens, under good weather conditions. The remaining issues are laser performance in moisture-laden air and whether lasers offer significant improvements for pilots over the current lights.

Another option for the Navy would be to improve the Fresnel lens. One proposal would increase the number of cells that define the "meatball" from 5 to 10. Doubling the cells would greatly increase resolution and should help pilots spot incipient glideslope deviations earlier, when they are easier to correct.

Another laser guidance application is for covert landing aids, compatible with night-vision goggles, and small enough to be carried in backpacks and deployed at remote strips. The glideslope and centerline systems use diode lasers that project light about 10 mi., using the some coding as the shipboard system. A series of 15-25 fist-sized, 2.1 lb. laser lights would outline a 3,000-ft. strip, Shemwell said.

**FOR COVERT OPERATIONS**, a person on the ground would turn on the glideslope and centerline lights, which could be de- tectable only by someone in the small cones of the glideslopes and centerline lights. On short final approach, the pilot would key his radio, turning on the 670-nanometer runway lights, which would be visible only through night vision goggles. The company is considering adding a laser that radiates at 800 nanometers, so a pilot could key a different frequency and have a visible light option.

Each of the lights is powered by batteries and solar cells. The 6-v. lead-acid gel cells currently used provide 6-12 operating hours without sunlight. The lasers only draw about 60 milliamps.

Laser Guidance expects that portable airstrips for disaster relief will be a bigger market than the military. Roads are frequently used as landing strips when floods or earthquake relief is needed, but they are only usable during the day unless generators and fuel are brought into power the lights. For this use, night vision compatibility would not be required, and the runway lights might use light-emitting diodes instead of lasers to give omnidirectional visibility.