

PATHFINDER:

The Building-Block Autopilot

■ Most pilots and aircraft owners have desires that are larger than their pocketbooks, particularly when it comes to nav/com equipment. Economy items are frequently selected, only to be traded later at a loss when finances permit purchase of a more complete system.

A "first" in the general aviation field is Astronautics Corp. of America's concept of the "building block" autopilot. The company's Pathfinder system comprises a six-step package, ranging from a basic two-axis wing-leveler (P-1) with heading memory to a complete three-axis autopilot (P-3B) with unlimited angle-intercept, altitude hold, electric

pitch trim, and glideslope capture and tracking.

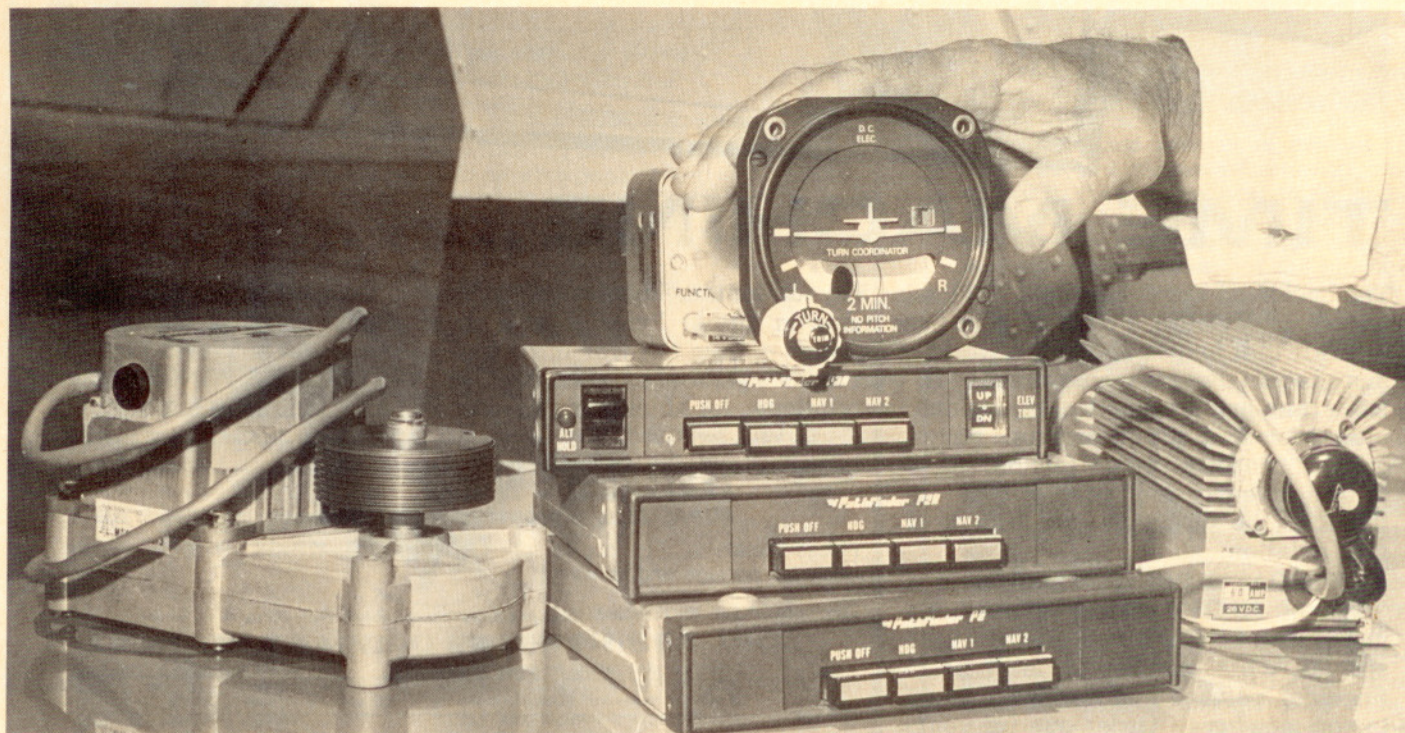
The Astronautics Pathfinder systems are available as factory-installed options on all new Mooneys, and will be factory-installed options on other upcoming 1975 models. (The simplest form of the two-axis unit can replace Mooney's "PC" (positive control) wing-leveler, but at present Mooney is still offering the PC unit in addition to the Pathfinder systems.

At press time, more than 90 makes and models of popular general aviation aircraft had supplemental type certificates from the FAA for one or all of the

Pathfinder units.

The best way to find out how any "black box" works is to fly it. George Butler, director, civil aviation, for Astronautics, gave me a detailed briefing on the various systems before we climbed aboard a customer's Cessna 172, at Torrance (Calif.) Municipal Airport, for a demonstration. An STC had just been received for the Pathfinder installation in the 172 series, and the four-placer was to be returned to its owner later in the day.

The unit installed in the 172, the P-2A, has not only wing-leveling and heading-memory capability, but also a



The owner of a basic Pathfinder unit can upgrade his equipment by adding modular components. Shown here: P-1 turn coordinator and P-3A, P-2A, and P-2 control units (center, top to bottom); servo unit (left); servo amplifier (right). Photo by Don Downie.

Astronautics' Pathfinder Series*

- P-1** Wing-leveler with heading hold and roll trim; \$1,050.
- P-2** Wing-leveler with heading hold, roll trim, and VOR/LOC tracking with 40° crosswind compensation; \$1,295.
- P-2A** Wing-leveler with heading select and automatic VOR/LOC intercept and tracking; \$2,500.
- P-3** Same as P-2, plus altitude hold and pitch command; \$3,397.
- P-3A** Same as P-2A, plus altitude hold and pitch command; \$4,495.
- P-3B** Same as P-3A, plus automatic electric pitch trim and automatic glideslope coupling; \$5,870.

*Prices include brackets, mounting hardware, wiring harnesses.

compass-heading select, and automatic intercept and tracking on VOR and localizer. The P-2A will work from either of two VOR receivers and is designed so that electrical input from each set can easily be adjusted. The package works comfortably with any combination of make or model.

As soon as the 172 broke ground, Butler turned on the Pathfinder as we continued on our runway heading of 290 degrees past the Pacific shoreline. Then he twisted the "turn" knob to the left, and we swung into a standard-rate turn. A small, trim knob kept the ball centered as power-setting changes were made.

We climbed out over the Catalina Channel, working a series of turns as Butler demonstrated the memory-heading capability of the Pathfinder. (This feature was previously incorporated in only the P-2 and P-3 building blocks. Recently it has been added to the basic P-1 unit at no increase in price.) The memory circuitry will bring the aircraft back to its original heading after deflections up to 20 degrees caused by manual override or turbulence. Addition of this memory system upgrades the basic Pathfinder unit from a mere wing-leveler to what it is: for all practical purposes, a full two-axis autopilot.

Butler pointed out that the basic unit can be factory-installed, or retrofitted on used aircraft, with a packaged wiring kit that enables the owner to install

add-on packages with little or no additional wiring, since the added modules have a plug-in capability.

We tried the override system on the Pathfinder package and found that it had a surprisingly light touch. About one or two pounds of force, on a standard Cessna 172 control wheel, was all that was required either to stop or to start a turn against the wishes of the Pathfinder. This smooth override is based on a simple electric "force" servo unit, an electrical motor with a direct drive to the appropriate control linkage. This motor doesn't turn until it is told to by the sensing unit of the Pathfinder, and then the turn rate is always a standard three degrees per second. There is no fast-turning, geared-down motor to give excessive control pressures.

The Pathfinder has a unique fail-safe system, in the cable linkage, that is just about as simple as they come. There's a breakaway weak link in the system: a ball-and-spring slot arrangement that will open and disengage at 15 pounds of force. Thus, in case of a complete malfunction, the "weak link" disengages without overcontrolling the aircraft.

We tuned in the Seal Beach VOR at 3,000 feet, well above the Long Beach glideslope, and watched the Cessna take up an intercept angle of 40 degrees to the 060-degree radial cranked in on the number one VOR. At intercept, the ship rolled smartly into a standard-rate turn, and we zeroed in on the station.

Turning back toward Torrance, Butler tuned the localizer to 109.9 MHz, and the autopilot drove us right down the slot. We crossed the numbers on 29R well within the boundary of the 100-foot-wide runway.

The Astronautics building-block concept seems to be proving successful. The 50-man work force at Torrance is split between a production facility, just three blocks from Torrance Municipal, and a 60- by 125-foot research and development hangar. The company has purchased 2½ acres on the Torrance airport and plans construction of a complete under-one-roof facility before the end of this year.

—D.D.