Duke

FLYERS ASSOCIATION NEWS

Number 96-2 October 1996

LeRoy Milne's P-593 at Centennial Airport, Colorado with motel in background. Very convenient. Members brought 48 Dukes plus a Bonanza and King Air.

A great meeting thanks to Ron Knudsen, the Kooi's and Bacon's.

AVAILABLE

Three original Duke commercials from 1960 - 1980. Length 30 minutes. VCR copies are $11.95 postpaid in US or Canada. Contact Jim Gorman.

Duke Association has on hand:

1 - Generator
2 - Oil coolers
1 - Starter
1 - Magneto
1 - Step retract cable 152-102
1 - Pilot/Co-Pilot hydraulic seat control
4 - Brake carriers
2 - Brake Disc's
1 - Exhaust Pipe (Lycoming Part #77429)
1 - 5 x 6.0 Nose wheel tire
1 - 19.5 x 6.75-8 Main gear tire
1 - 19.5 x 6.75-8 Main gear tubes

Members at Centennial:

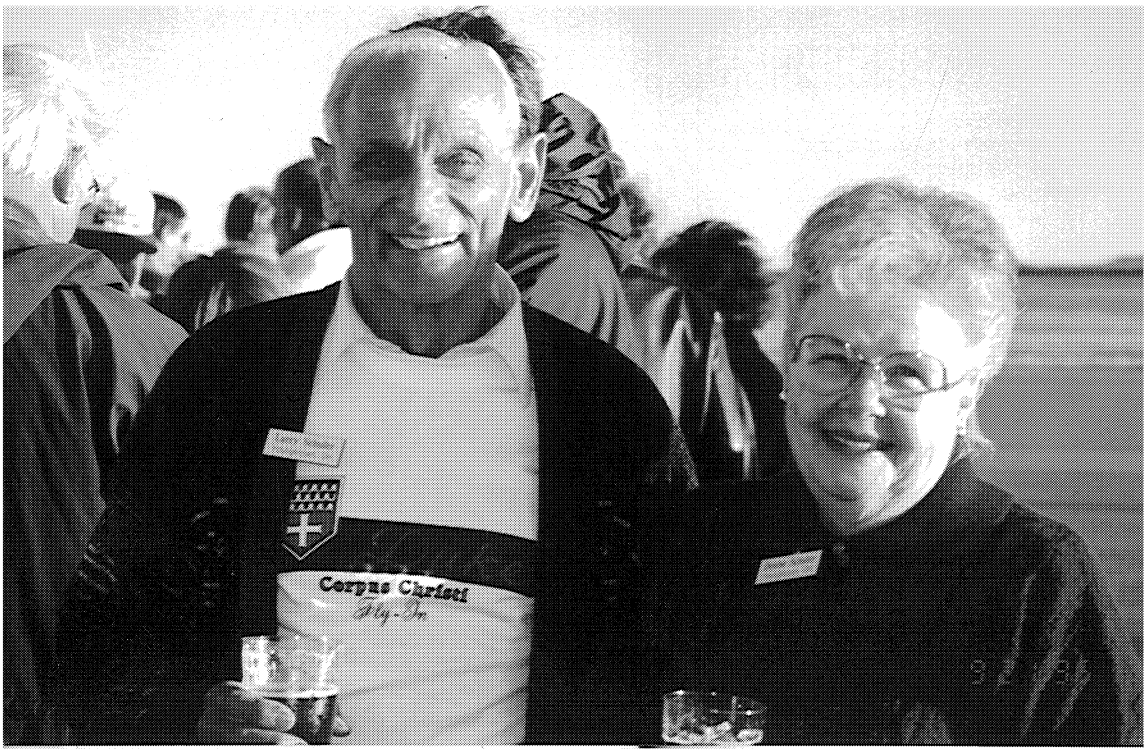
Angel's	P-292
Bacon's	P-127
Barrett's	P-247
Berry's	P-511
Bishop's	
Bongard's	P-365
Borden's	P-592
Bowdish's	P-529
Chilton's	V-35
Clements'	C-90
Cohen's	P-412
Cotter's	P-320
Desroche's	P-340
Feldman's	P-530
Fischer's	P-310
Goff's	P-444
Gorman's	P-596
Greenblatt's	P-590
Gulley's	P-525
Hoffman's	
Jellinek's	P-425
Kooi's	P-401
LeCount's	P-310

The arrangement we have with Aircraft Systems, 5187 Falcon Road, Rockford, IL 61109 is they will ship an O/H generator, starter or magneto to you by UPS or Federal Express. You return (same day) your part to them. They will overhaul, charging you for work done, and the item then becomes association emergency part. Phone number 815/399-0225. For oil coolers contact Bill Passey at 602/969-2291 (office). For other items contact Jim Gorman at 419/755-1223 (office).

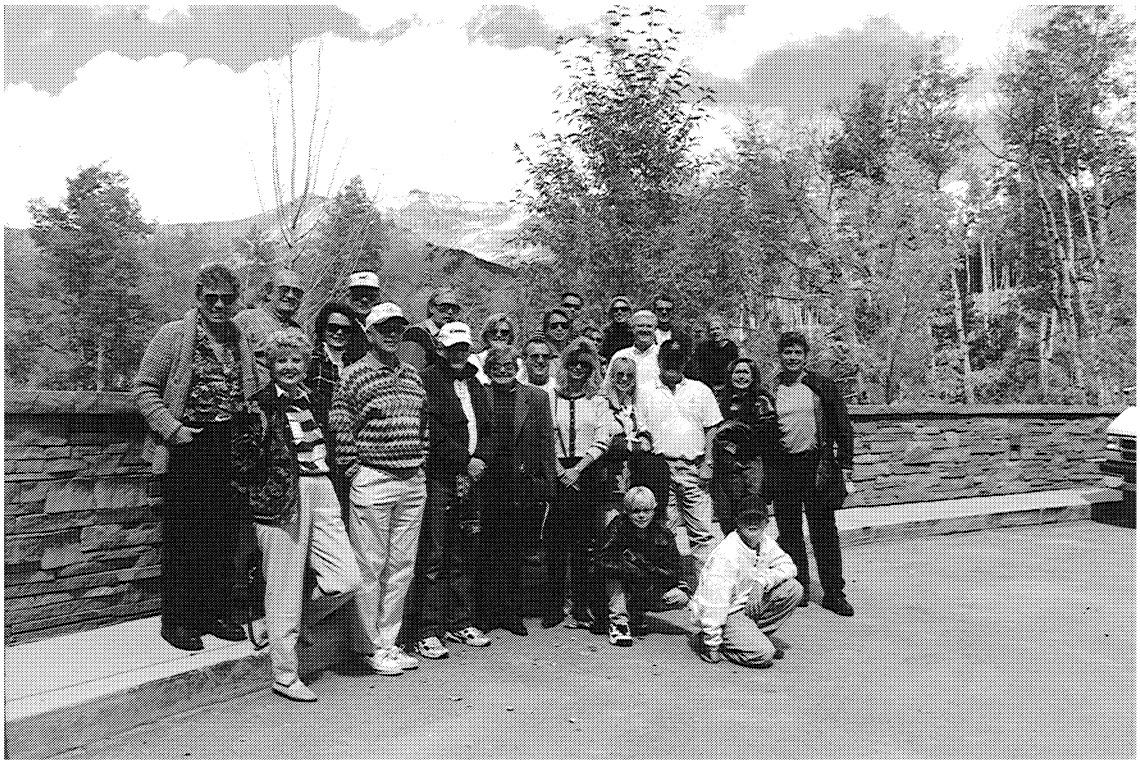
Next year's fly-in will be at Tullahoma, TN (80 miles southeast of Nashville). A former B-24 base in WWII, home of Staggerwing Museum, a unique and interesting display of Beech artifacts (Walter was born a few miles away). One of each Model 17 is displayed including Serial #1 and a Travel Air Mystery ship. Jack Daniels Distillery is only eleven miles and conduct interesting tours. Our hosts are Stan McNabb P-595, Jack Anthony P-591, Mike Greenblatt P-590 and Museum President John Parish, a former Duke owner.

Ron Knudsen and Friends

Kooi's Duke and their immaculate hangar



Schuler's - Note his "T" shirt



Those who braved landing at Telluride's 9000' elevation

Thanks to Howard Chilton, Amy Finnegan for photos

Members at Centennial:

Lyons'	P-582
Martin's	P-369
Milne's	P-593
Moskoff's	P-420
Nichols'	P-245
Norton's	P-415
O'Connor's	P-546
Ohlmann's	P-231
Paquette's	P-261
Passey's	P-594
Patton's	P-334
Rhude's	P-443
Rice's	P-491
Ronger's	P-254
Ross'	P-457
Scag's	P-524
Schuler's	P-234
Sigman's	P-448
Simmons'	P-251
Singer's	P-583
Stanwyck's	P-568
Strisower's	P-41
Thompson's	P-249
Tye's	P-263
Vollman's	P-349
Wasson's	P-557
Wilson's	P-288
Woods'	P-428

WELCOME NEW MEMBERS:

Winfield Cooper III
Flint, MI

Glen Ward P-133
Grass Valley, CA

Mike Branch P-289
Dothan, AL

Ricardo Sol-Meza P-418
Miami, FL

Steve Wilkerson P-517
Greenfield, IN

Robert Giebeler P-8
San Jose, CA

Raymond Gassmann
Geneve, Switzerland

Tim Brookshire P-291
Tyler, TX

Walter Gislason
Willmar, MN

Larry Leininger P-321
Scottsdale, AZ

David Stoller P-384
Long Grove, IL

Keith Christian
Odgen, UT

Tom Baum
Kaufman, TX

Ed Lemco P-452
Denver, CO

Terry Beismer
Vandalia, OH

Andrew Heller P-494
Austin, TX

Roberto Salis Monsanto P-450
Guatemala City, Guatemala

Richard Sheperd
Vienna, VA

Harold Patton P-334
Denver, CO

Casey Cotter P-320
Harper Woods, MI

Ron Gross
Wichita, KS

Michel Gendreau
Vilie St. Georges, QUE

Stephen LaTour P-384
Wilmette, IL

Dane Scag P-524 has developed a low engine oil pressure warning system he will be glad to share with any member. Write him at Scag Engineering Company, P.O. Box 765, Elm Grove, WI 53122, Tel: 414/544-4090.

Tom Clements of Flight Review offers the following operating tips on the Century IV autopilot.

AUTOPILOT OPERATING TIPS

(BEECHCRAFT DUKE)

EDO-AIRE MITCHELL CENTURY IV

OVERVIEW

The Century IV, manufactured by Edo-Aire Mitchell (which became Century Flight Systems, Inc.), is one of the most common autopilots on Dukes from about 1973 to 1980. It has also been installed by the Beech factory on many King Air C90's and some E90's, and we believe that a few A90's and B90's have been retrofitted with it. Barons, and Bonanzas often contain this system. It is a big step-up over many autopilots that were previously available, such as the Honeywell H-14, the Bendix M4C, and the Century III. It offered a lot of features which were not available before, in a relatively simple-to-use package which provided lots of value for the dollar spent.

> Some of the first installations of this system were of an earlier model which had not yet become the Century IV. This version is officially called the "FD/AP 282-318." It contains no Pitch Sync button nor master AP/YD disconnect switch.

Although the Century IV is only a two-axis autopilot, options include a separate third axis of control (the yaw damper), autopilot electric pitch trim (which can also be activated by the pilot when hand-flying,) and a flight director display. Invariably, Beech always included these options during factory installation.

> Beech did not certify this particular autopilot/flight director installation in their airplanes. Instead, they installed the system under the provisions of an STC (Supplemental Type Certificate) obtained by Edo-Aire. The supplement which must be in the airplane's flight manual is for the STC. Consequently, that is why you will not find this system listed in the standard Supplements chapter of your Pilot's Operating Manual. Nevertheless, your flight manual *must* contain the STC supplement. If it has been accidently misplaced over the years, obtain a new one from Beech immediately.

The Century IV is an integrated autopilot/flight director system, with one computer providing data to both the flight director command bars and to the autopilot servos. With the autopilot disengaged, the flight director shows you how to accomplish the tasks you ask of it by the movement of the command bars on the ADI (Attitude Director Indicator, a fancy artificial horizon or attitude indicator). The bars bank left and right, for example, showing you how much to turn to follow an assigned heading. They also pitch up and down, showing you

how to adjust attitude to maintain an assigned altitude. When the autopilot is engaged, it merely provides the muscle to make the airplane follow the command bars.

> Since the autopilot will always attempt to align the airplane with the attitude displayed on the flight director, be certain that you have manually maneuvered the airplane into good alignment with the commands before engaging the autopilot. That way, there will be no unexpected change in attitude when the autopilot takes control.

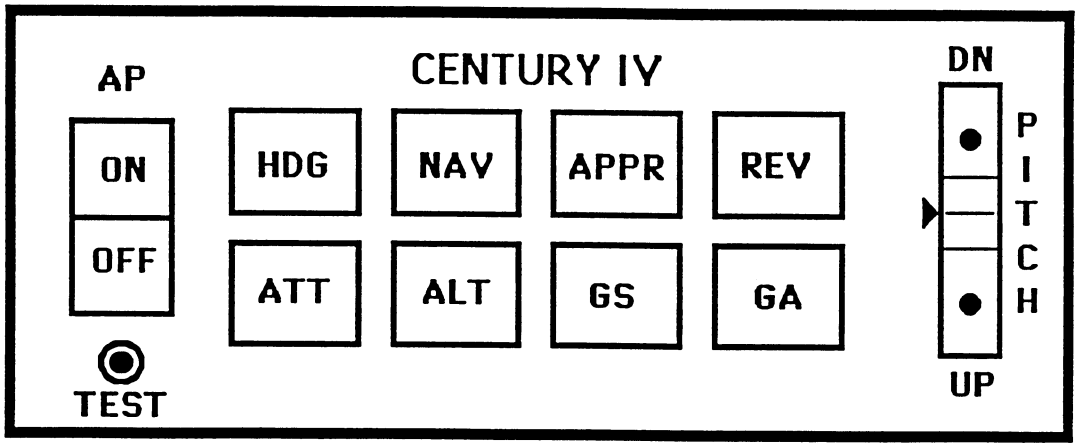
THE FLIGHT DIRECTOR DISPLAY

The flight director commands are presented by a single cue, V-bar display, incorporated into an air-driven ADI. The airplane symbol on the ADI may be adjusted up or down with a knob on the instrument's face.

> It is not uncommon to find it impossible to align the airplane symbol, the command bars, and the horizon display all together when the airplane is holding altitude in level flight. In that case, until the avionics shop can make a proper adjustment, it is better to align the airplane symbol with the command bars, even though they will be a little off when compared to the horizon. For quick results, align your airplane symbol with the V-bar while depressing the Pitch Sync button on the control wheel.

FLIGHT DIRECTOR/AUTOPILOT COMMANDS

The flight director/autopilot control panel is located on the pedestal and looks like this:



FD/AP ON	FD/AP OFF

The four buttons on the top row control *lateral* modes, banking of the airplane. The four bottom row buttons control *vertical* modes, pitching of the airplane. The buttons are push-on type, and contain an integral annunciator. When the mode is on, the label in the button is illuminated. (Usually a remote

annunciator containing these same mode lights is installed on the instrument panel, for easy viewing by the pilot.) A particular mode can only be turned off by selecting another button in the same row or by turning the whole system off, it cannot be turned off by hitting the button a second time.

With a few exceptions, only one button in each row can be active at any one time. For example, pushing the ALT button cancels the ATT (attitude) mode, selecting GA (Go Around) cancels ATT, HDG cancels NAV, etc. A couple of exceptions to this rule need to be noted, however. First, by depressing both APPR and HDG at the same time, the HDG mode stays active, allowing the pilot to set up his own intercept angle to the desired course. Only when the airplane nears the proper course, and the computer decides that it is time to stop following the selected heading and to begin tracking the navigational aid, does the HDG mode finally disengage. Second, as we will discuss in more detail later, it is common for both ALT and GS to be illuminated during an ILS approach, prior to glideslope capture.

Except when HDG and APPR are depressed simultaneously, the Century IV system chooses its own intercept heading to a navigation course. We recommended using this "variable angle intercept" capability while completing a procedure turn or while being vectored for an ILS, within about 30° of the localizer course, so that you can comply with the vectors and yet not worry about overshooting the localizer. However, what about intercepting a VOR course? Can we hit HDG and NAV together and achieve the same result? Yes and no. No, you cannot hit HDG and NAV together and get variable angle intercept. NAV will always select its own intercept heading. But yes, you can achieve the desired result by hitting HDG and *APPR*, even though you are intercepting a *VOR* course. You will be hard-pressed to notice any difference in how the system tracks a VOR course in APPR mode versus NAV mode. (It is one of sensitivity.) Nevertheless, to be correct, hit NAV after the interception has occured.

The GA mode can be selected with a push button on the left power lever (sometimes, this button is on the control wheel) as well as with the GA button on the controller. When the system goes into GA mode, the command bars display a 7° pitch up attitude. Unlike many other systems, selecting GA *does not* disengage the autopilot.

For a localizer back course approach, the REV mode should be selected while the HSI course needle is set to the ILS's *front course* bearing. Now, all displays will show proper, fly-to-the needle commands.

Beneath the control panel is a separate push-on, push-off type of switch which controls power to the whole system. If this switch is pushed off, the label "FD/AP OFF" should illuminate in the button and the command bars will disapppear from view on the ADI. Pushing it again turns the system on, shown by the "FD/AP ON" label illuminating and by the appearance of the command bars. The system will always turn on with the HDG and ATT modes selected. Now the flight director may be programmed and the bars may be followed, to aid in flying the airplane by hand.

Pushing the AP (autopilot) button on the left side of the control panel cycles it between OFF and ON, and illuminates the appropriate annunciator in the button. Whenever the autopilot is on, it follows the command bars to accomplish whatever task they are displaying.

The yaw damper button is usually located just below the autopilot controller. Another push-on, push-off switch, it illuminates when the yaw damper is on.

On the outboard grip of the pilot's control wheel, activated by your left forefinger, is a master disconnect button for the system. When depressed and released, it disengages both the yaw damper and the autopilot.

On top of the grip, readily activated by your thumb, is the electric pitch trim switch. This is a switch that requires two separate actions to activate: the top of it must be held down while the switch is rocked forward (for nose down trim) or aft (for nose up trim). By requiring two actions to make the trim operate, there is less chance that a single failure could cause a trim "runaway".

Depressing the top of the trim switch is another method of disengaging the autopilot. However, the yaw damper is not affected. Since the yaw damper can be kept on for ride comfort, and since you can keep your hands on the flight controls without reaching to the AP button on the controller, using this trim switch to disconnect the autopilot is the preferred method.

The pitch wheel on the controller is only capable of changing the aircraft's pitch attitude when the ATT mode is selected. When another vertical mode is on, the wheel is disabled.

There is a small push button on the left of the controller labeled "Test." This button tests the integrity of the annunciator lamps both on the controller and on the remote annunciator. Since the system always powers up in HDG and ATT modes, these lamps need not be tested with the button. They should be on before the button is depressed. Consequently, the designers made the test circuit turn *off* the HDG and ATT lights during the test.

There is another item to test with this button. When held, the ATT lamp should be off if the pitch wheel on the controller is anywhere in the nose-up position from neutral. On the other hand, if the pitch wheel is rotated anywhere in the nose-down range, the ATT annunciator should flash on and off. This checks the operation of an ILS warning feature which will be discussed later.

THE PITCH SYNC BUTTON

On the the control wheel's outboard grip, activated by the flying-hand's thumb, is the Pitch Sync button. When the button is depressed and released, any other vertical mode is canceled and the ATT mode is selected. The command bars synchronize to the airplane's currently existing pitch attitude. When you want to change from one altitude to another, hitting Pitch Sync will disengage the old altitude and allow the desired climb or descent attitude to be set on the command bars.

> Remember that when the Pitch Sync button is held, the command bars should align with the airplane symbol. If they do not, adjust the airplane symbol up or down with its knob. If not enough adjustment is available, you need the help of an avionics technician to cure the problem.

With the autopilot engaged, the Pitch Sync button, when held depressed, causes the pitch servo to disengage. Thus, you may now manually set the desired pitch attitude, release the button, and the autopilot will hold the new attitude.

TYPICAL AUTOPILOT OPERATION

> Remember that the modes we describe for autopilot operation are programmed and used just the same when the airplane is being *manually* flown to satisfy the flight director commands. When you engage the AP button, you are simply saying, in effect, "You take it, George, and keep on following those flight director bars."

For takeoff, depress GA and HDG, with the heading bug set on runway heading. You should make the initial rotation attitude slightly higher than the GA attitude: usually about 10° , instead of the 7° setting of the command bars. After passing at least 400 feet AGL, with the airplane clean, align the pitch attitude into the command bars, engage the autopilot, and move the heading bug to the various assigned or desired headings.

> The autopilot won't know which way to turn if it finds the heading bug 180° out of position with the current heading, and it may begin to reverse its roll direction. When you are making a 180° or greater turn, never move the heading bug past the 135° right or left relative bearing positions on the HSI (which are usually indicated by a small mark). After the airplane has turned 45° or more, then continue moving the bug as desired, but avoid crossing the 135° relative position.

If the GA attitude does not yield the type of cruise climb that you want, hit ATT and use the pitch wheel to adjust the pitch as desired.

When the airplane approaches the altitude for level off, use the pitch wheel to smoothly stop the climb at the proper altitude, then engage ALT. When you are cleared to a higher altitude, hit the ATT button and begin the climb by again using the pitch wheel to set a proper climb attitude.

For the enroute descent, just like the climb, depress ATT and start down using the pitch wheel. Alternate between ATT and ALT for intermediate level-offs.

For an ILS approach, use HDG and ALT or HDG and ATT to follow the radar vectors or published terminal routes until near the localizer. When you are close enough to the localizer to avoid receiving false signals (usually, within 30° of the localizer course), depress the HDG and APPR buttons simultaneously. Keep using the heading bug to set up the proper intercept. At the correct time, HDG mode will automatically disengage as the localizer is captured. If we are *below* the glideslope, and if ALT and APPR modes are engaged, after about twenty seconds the GS light will illuminate to indicate that the system has been automatically armed for glideslope capture. When the glideslope centers, it will be automatically captured, indicated by the ALT light extinguishing and the airplane leaving its last altitude and beginning to follow the glideslope.

Edo-Aire has provided a clever safety feature during ILS operation. As you know, the ATT mode and the pitch wheel are disabled when the GS mode is active. The designers were concerned about the potential danger that might occur if the pilot were to hit ATT during the ILS, while the pitch wheel were set to command a nose-down attitude. When the glideslope disengages and the airplane pitches down to the new attitude, an altitude deviation could result that might bring the airplane uncomfortably close to terrain. So, whenever the pitch wheel is in a nose-down position during GS operation, the ATT annunciator flashes. This tells the pilot to rotate the pitch wheel nose up until the light extinguishes.

If the approach controller (or our own poor planning) has put us above the glideslope before the APPR mode has captured the localizer, we must use ATT and the pitch wheel to set up a sufficient descent attitude which will dive us onto the glideslope. When that occurs, hit the GS button to cause immediate capturing of the glideslope.

When on the localizer, the airplane will immediately try to climb or dive to the glideslope when the GS button is depressed. This can be quite abrupt, and can cause an altitude "bust." If you must hit the GS button yourself (instead of allowing for an automatic intercept from the ALT mode when below the glideslope), be certain you are reasonably centered on the glideslope *before* hitting the button.

For a non-precision approach, alternating between ATT and ALT works well to control the descents, while adjusting power and configuration to hold the proper speed, usually 120 knots. The APPR, HDG, or REV modes can be used for lateral guidance.

In the event of any missed approach, either from a precision or non-precision approach, make certyain that MIXTURES and PROPS are fully forward, then hit the GA button on the left power lever as you add THROTTLES. The command bars will show a 7° pitch up attitude and the autopilot will follow them. Next, retract FLAPS and pitch up to climb attitude. When a climb is verified, retract GEAR. (Mixtures, props, throttles, flaps, gear - there it is again!) You may now select the desired flight director modes - probably HDG and ATT - and proceed with the missed approach navigation.

Since the Century IV system *will* fly a coupled go-around, it is *imperative* that sufficient power be added when the GA mode is selected. Otherwise, the airspeed can decay rapidly to a dangerous value as the pitch attitude comes up to 7° with approach power still set. Also, take care not to hit the GA button accidently in cruise. A major altitude deviation can occur very rapidly if this is not immediately recognized and corrected (by re-hitting ALT or disconnecting the autopilot and manually nosing back down).

When you disconnect the autopilot and are maneuvering visually to the airport - we're not talking about 200 feet above touchdown on an ILS, but rather a few miles from the airport - we advocate getting rid of the command bars. When your attention should be directed more outside of the airplane, scanning for traffic and planning your arrival to the airport, it is a poor idea to waste effort in programming the command bars for various turns and descents. If the bars are not removed from view, there will be a good deal of time when disagreement exists between the bars and the airplane symbol. We believe it is a poor procedure to have the bars in view while intentionally ignoring them. (Someday, they might be telling you something very important - such as how to stay on the glidepath - but you are so used to ignoring them that their significance goes unheeded.) To remove the bars, remember, merely push off the master FD/AP switch.