Archer N8074T Systems

Sundance
Flying Club

Outline

- Airplane Overview
- Aspen PFD
- Autopilot
- Fuel Flow
- GNS 430W
- Other …

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Airplane Overview

- N8074T is a 1980 Piper Archer
  - PA28-181
  - S/N 28-8090062
- Engine is a 180 hp Lycoming
  - O-360-A4M
- Prop
  - Sensenich 76EM8S5
  - Diameter 76”
- Type Certificate
  - 2A13

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Some Differences from N2865M

- Type Certificate
- Panel layout
- Avionics
- Aspen
- Autopilot
- Fuel flow measurement

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Type Certificated Differences

- Max Power
  - For takeoff – 5 min
    - 2700 rpm (180 hp)
  - Max continuous
    - 2650 rpm (178 hp)
- Max weight
  - Ramp weight
    - Normal – 2558 lb
    - Utility – 2138 lb
- POH
  - VB1120

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Panel Layout

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Panel Changes

- Avionics Master in different location
- Aspen master in different location
- Trim switch is different
- STEC-50 Autopilot
- FS-450 Fuel Flow meter
- NAV/Comm 2 is KX155
- KN64 DME
- PS1000 Intercom
- No Cabin Fan!!!

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Avionics

- Most of the Avionics are familiar
- DME will remote to either NAV receiver
  - NAV 1 is GNS 430W
  - OMNI head is NAV 2
- The main changes come from the interactions between
  - GNS 430W
  - Aspen
  - STEC-50
  - FS-450

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Aspen PFD

- Most operations are the same as for 65M
  - New active button is GPSS
    - This controls Autopilot operations
  - New software adds true wind calculation to GNS 430W map display
  - NAV 2 frequency is not displayed on Aspen

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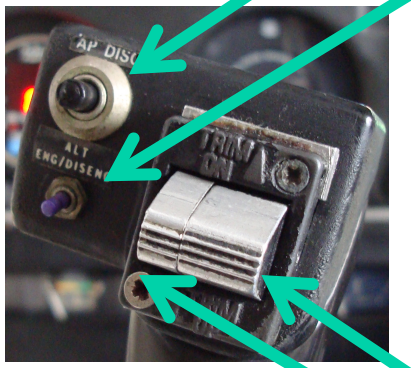
Autopilot

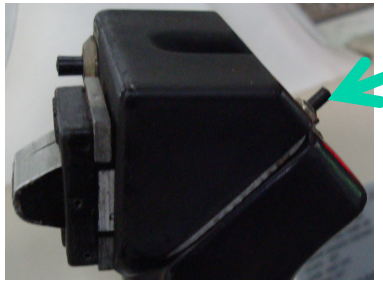
Left Yoke Horn



A/P Disconnect

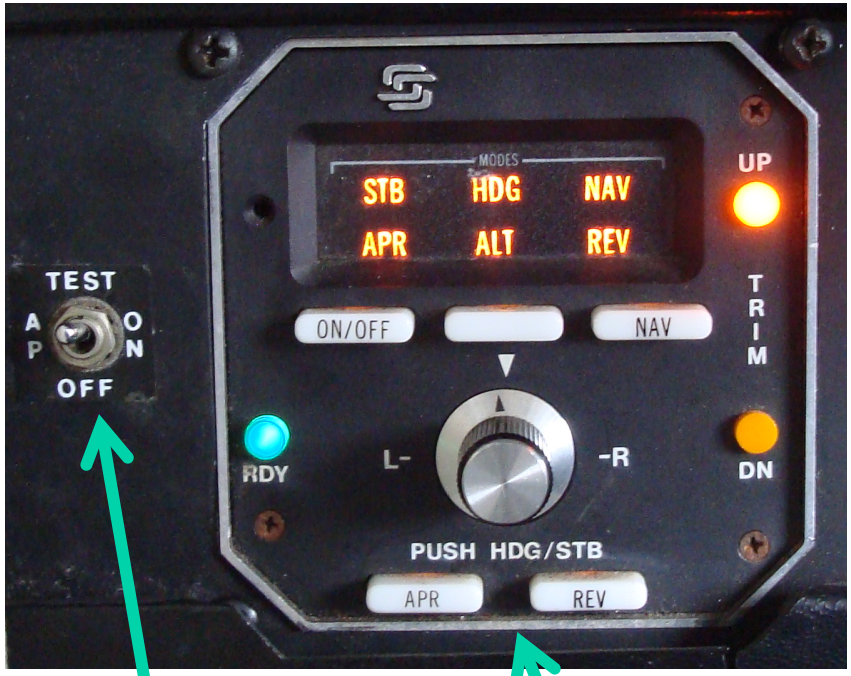
ALT Hold

Electric Trim. Split.
R is direction
L is power



PTT

Autopilot Control Head



Power/Test Switch

Annunciators Controls

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STEC-50 Autopilot Modes

- This is how the A/P USED to work in the Roll axis!
  - Wing leveler mode (**STB**).
    - Just keeps the wings level and can be used by the pilot to turn the aircraft left or right. There is no navigation interface to this mode.
  - Heading mode (**HDG**).
    - Allows the pilot to select a heading on a DG or HSI and the autopilot will hold the heading. There is no navigation interface to this mode.
  - NAV mode (**NAV**).
    - Track (but not intercept) a course. The pilot will usually use heading mode to intercept a course and align the aircraft with the course once it is intercepted. To keep the course centered, the **NAV** mode uses the left/right indication of the CDI or HSI which is output by the GPS or VOR/Localizer receiver.
  - Approach mode (**APR**).
    - Same as **NAV** mode, but more sensitive. It is intended for flying approaches, particularly tracking the localizer. It can also be used to do a better job of tracking a GPS CDI output due to its increased sensitivity.
  - Reverse sensing mode (**REV**).
    - Same as **APR** mode, but uses reverse sensing and is typically used to track in the outbound direction of the localizer or when flying a Back Course approach.
  - The **NAV**, **APR**, and **REV** modes are the only ones that are designed to track a course. They interface to the 430W on the CDI left and right outputs. **They can only be used to track a straight course.**

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Altitude Mode

- The STEC-50 can hold altitude.
- **It cannot capture a glideslope**
- Altitude hold is engaged by
  - Pushing the unmarked button on the Control Head
  - Pushing the ALT button on the Pilot's yoke
- If the airplane becomes untrimmed
  - Either the UP or DN annunciator will light
    - Use the electric trim switch in the direction indicated to extinguish the light.
- Climb or descend by cancelling ALT and pitching appropriately.

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Roll Steering

- The GNS 430W also provides digital data to the Aspen. One block is intended to be used for roll steering. It defines a precise angle of bank the aircraft should fly in order to follow the course as understood by the 430W. Unlike the CDI output, it can command a curved path or lead a turn.
- The STEC-50 was designed long before roll steering. A GPSS converter (in the Aspen) converts the bank angle into a heading error signal. The heading error signal is the signal generated by the DG or HSI heading bug. Up to a limit, this signal commands a bank angle that is proportional to the heading difference.
- The GPSS simply converts the bank angle input from the GPS into a heading error of the same amount.
- So to use the GPSS roll steering, the autopilot must be put into HDG mode, and not one of the three NAV modes. Besides getting the autopilot to follow the curved courses such as holds, procedure turns, and DME arcs, it will also lead the turns, and follow the flightplan and immediately roll out on the correct wind corrected heading. In addition, it will intercept courses, which is a function the Stec 50 never had.
- When the heading bug on the Aspen is to be used instead, GPSS on it is simply deselected.

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Using the A/P in N8074T

- Wing leveler mode
  - No change in operation.
- Heading mode
  - When GPSS is deselected, no change in operation.
  - When GPSS is selected will fly a GPS flight plan.
- NAV mode
  - No change in operation, except that it will also follow a GPS course
  - Too insensitive for normal use
  - No roll steering
- Approach mode
  - Will fly an approach course
  - No roll steering
- Reverse sensing mode
  - Do not use this mode
  - If reverse sensing is needed, the Aspen will provide this.

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Flying Approaches

- GPS
  - A GPS approach is the same as a GPS course
    - GPS flight plan in the GNS 430W
    - GNS 430W CDI button in GPS mode
    - GPSS selected on Aspen
    - A/P in HDG mode.
    - Vertical course flown manually
  - RNAV approaches are flown in the same way
- ILS
  - The initial segments are flown as a GPS course
  - When established on the localizer the GNS 430W will switch its CDI mode to VLOC
    - A/P in APR mode
    - Vertical course flown manually
- VOR
  - The initial segments are flown as a GPS course
  - Where possible, fly it as a GPS overlay approach
  - If the VOR is to be used, when established inbound
    - GNS 430W CDI to VLOC
    - A/P to APR mode

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Missed Approach

- On the missed
  - Fly runway heading and clean up the airplane
  - Climb
  - Check A/P is in
    - HDG mode
    - ALT hold is off
  - Check Aspen has GPSS selected
  - On GNS 430W
    - Set CDI to GPS
    - Cancel SUSP on OBS
  - Fly the missed

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Fuel Flow

- The JPI-450 fuel flow gauge is an accurate means of measuring fuel flow.
  - It will show fuel burned and fuel remaining
  - It is linked to the GNS 430W and so will show fuel needed to waypoints and to destination.
- The JPI does not measure the fuel on-board.
- The JPI does not know about multiple tanks

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The FS-450

- The FS-450 has 3 lines of display
  - Top line is current fuel flow
  - Second line is the parameter value indicated by the lit position on the 3rd line
- It has 2 buttons which are used to control the display and to enter parameters
  - STEP
    - steps to the next parameter
  - AUTO has 2 modes
    - In display sequencing, it enables automatic cycling through the line 2 parameters.
    - In parameter setting mode it steps to the next value of a parameter

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Using the FS-450

- AFTER engine start
  - The unit will display FILL? n
    - Press AUTO. It will display FILL? 34
      - If the fuel is to the tabs, press STEP
    - If the tanks are full to the collars
      - Press AUTO again. It will display FILL? 48
      - Press STEP
  - The FS-450 is now in manual mode
    - You can press AUTO to start parameter cycling
    - After 1 minute in manual mode it will cycle anyhow.

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Parameters Displayed

- With no GPS flight plan
  - The parameters displayed are
    - USD – gallons used to date
    - REM – gallons remaining
    - H.M. – time to fuel exhaustion
- With a GPS flight plan
  - Additional parameters displayed are
    - REQ – gallons required to next waypoint
    - RES – gallons in reserve at next waypoint
    - MPG – nautical miles per gallon
- Important Notes
  - REM is only accurate if you have set the initial fuel correctly
  - REM is total fuel remaining. It does not indicate the amount in any single tank
  - RES is only accurate if you have set the initial fuel correctly

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Fuel Management

- Standard strategy is to switch tanks at timed intervals
  - For example, take off on left tank
    - After 30 min, switch to right
    - After 60 min, switch to left
    - After 60 min, switch to right
- Consider instead a strategy based on USD
  - For example, take off on left tank
    - When USD = 7, switch to right tank
    - When USD = 14, switch to left tank
    - When USD = 19, switch to right tank
    - When USD = 24, switch to left tank
  - This way you know how much fuel is in each tank

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Power Management

- Use the AFM
- Best power is 100°F rich of peak
- As an example
  - Fuel flow at 75% power is 10.5 gal/hr
  - Cruise altitude – 5500 msl
  - Set rpm for 75% power – 2575
  - Lean to 10.5 gal/hr
  - Readjust rpm and mixture as needed
  - You should now be 100°F ROP and 75%
- Why do this?
  - If you don't lean, at 3000ft you could be burning 15+ gal/hr!

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GNS-430W GPS

- Added features
  - True wind speed and direction is displayed on the map page
  - AUX group, page 1 calculators are fed from Aspen and FS-450
    - Fuel Planning
      - In addition to the next waypoint you can see fuel required for the remaining flight plan, or any intermediate waypoint
    - Trip Planning
      - You can see current ETA at destination etc.
    - Density Alt/ …
      - Independent calculation of TAS etc using Aspen raw data

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Other …

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Reference Material

- Avionics
  - http://www.wpaviation.com/html/n8074t_manuals.html
- POH
  - Piper VB 1120