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Tru Trak Document 305
Installation Guide for Vizion PMA Autopilot
Mooney M20
Rev B

Appendix H to
Tru Trak document 166

FAA STC: SA04231CH
FAA Project No. SA10462CH-A

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REVISION STATUS

Rev.	Description	Approval	Date
IR	Initial Release	T. Bailey	8/20/2021
A	Added Section 4 for ELA and W & B	L Wilding	11/29/2021
B	Table 3: Revised to add 12 V servos to ELA Section 3: Added PV.30 software settings.	L Wilding	2/15/2022

1 PREFACE

This document includes instructions that pertain to the installation of the BendixKing Vizion / AeroCruze 100 Autopilot on the specified Mooney M20 models.

The modification consists of installing one roll and one pitch servo, an autopilot controller unit, a pitch link sensor, a wiring harness, connections to the airplanes existing pitot/static, electrical systems, mounting brackets/hardware, disconnect switches, and includes several options for the installer.

The BendixKing AeroCruze 100 has been previously produced by TruTrak Flight Systems (hereafter referred to as TTFS or TruTrak) as the Vizion Autopilot system. Legacy references to the TruTrak name and Vizion system are synonymous with the AeroCruze 100 installed under this project.

The installation was tested to meet the applicable regulations of 14 Code of Federal Regulations (CFR) Part 23 for the Mooney M20.

1.1 Reference Documents

Table 1: Reference Material

Document		Title
TruTrak Flight Systems	TT-195	Master Document List
	TT-166	Vizion PMA Autopilot Installation Guide
	TT-186	Approved GPS and Software List for Vizion PMA Autopilot
	TT-176	Vizion AFMS
	TT-167	Vizion Operating Manual

1.2 Applicability

This document is applicable to the Mooney M20 models identified in Table 2.

Table 2: Approved M20 Models

Mooney M20 Models			
M20B	M20C	M20D	M20E
M20F	M20G	M20J	M20K
M20L	M20M	M20R	M20S

2 EQUIPMENT INSTALLATION AND ELECTRICAL INSTALLATION

2.1 Installation Details

This equipment should be positioned in a manner to ensure clearance from surrounding equipment, wire bundles and access panels.

Refer to TTFS 195, *PMA Vizion Master Drawing List*, for the applicable aircraft detailed Install Drawings.

Refer to listed installation drawings for appropriate materials list.

Conduct pitot / static check of aircraft system before opening any pitot/ static connections.

2.1 Roll Servo Installation

Install roll servo in accordance with drawing PA-201130-501.

2.2 Pitch Servo Installation

Install pitch servo in accordance with drawing PA-201130-503.

2.3 Controller Installation

Install autopilot controller in accordance with drawing PA-201130-505.

2.4 Wiring Installation

Install system wiring in accordance with drawing PA-201130-521.

2.5 Post-Installation Checks

2.5.1 With system power off, confirm all components travel freely throughout their range of motion with minimum .10” clearance between all fixed and moving components and no interferences.

2.5.2 Confirm electrical bonding of installed components performed per drawing notes.

2.5.3 Confirm all torqued fasteners have torque stripes applied per drawing notes

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3 MOONEY M20 ALL MODELS AUTOPILOT SETTINGS

Once all wiring is complete, verified, and the GPS setup has been completed (Approved GPS and Software List for Vizion PMA Autopilot (TT-186)), follow the steps below to verify proper autopilot settings.

THIS STEP MUST BE COMPLETED PRIOR TO GROUND AND FLIGHT CHECKS!

3.1 Lateral Autopilot Settings

For Vizion software version PV.30 follow the steps below:

- 1) PRESS and HOLD KNOB
- 2) Apply power to autopilot and GPS
- 3) Release KNOB.
- 4) PRESS KNOB to advance to min backlight
- 5) PRESS KNOB to advance to SETUP ENABLE.
- 6) ROTATE KNOB to select a value of **10**.
- 7) PRESS KNOB to exit.
- 8) PRESS and HOLD MODE button until LAT ACTIVITY is shown.
- 9) ROTATE KNOB to select a LAT ACTIVITY of **14**
- 10) PRESS ALT button to advance to next setup screen.
- 11) ROTATE KNOB to select a BAUD that matches the baud rate of the GPS (this will be either **4800** or **9600**, refer to Approved GPS List (Doc 186) for information about approved GPS units).
- 12) PRESS ALT button to advance to next setup screen.
- 13) ROTATE KNOB to select a BANK ANGLE of **MED**.
- 14) PRESS ALT button to advance to next setup screen.
- 15) ROTATE KNOB to select a MICROACTIVITY of **5**.
- 16) PRESS ALT button to advance to next setup screen.
- 17) ROTATE KNOB to select a GPSS GAIN of **16**.
- 18) PRESS ALT button to advance to next setup screen.
- 19) ROTATE KNOB to set ROLL REV to **N**.
- 20) PRESS KNOB to exit lateral setup and return to the home screen.
- 21) PRESS ALT AND HOLD ALT button until VRT ACTIVITY is shown.
- 22) WHILE CONTINUING TO HOLD ALT, PRESS MODE.
- 23) RELEASE MODE AND ALT.
- 24) PRESS MODE until MAC is displayed.
- 25) ROTATE KNOB to set MAC to **0**.
- 26) PRESS KNOB to exit menu and return to home screen.
- 27) Do not remove power from autopilot.

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Lateral Autopilot Settings (Con't)

For Vizion software version PV.40 follow the steps below:

- 1) PRESS and HOLD KNOB
- 2) Apply power to autopilot and GPS
- 3) Release KNOB.
- 4) PRESS ALT button to advance to min backlight
- 5) PRESS ALT button to advance to SETUP ENABLE.
- 6) ROTATE KNOB to select a value of **10**.
- 7) PRESS ALT button to exit.
- 8) PRESS and HOLD MODE button until LAT ACTIVITY is shown.
- 9) ROTATE KNOB to select a LAT ACTIVITY of **14**
- 10) PRESS ALT button to advance to next setup screen.
- 11) ROTATE KNOB to select a BAUD that matches the baud rate of the GPS (this will be either **4800** or **9600**, refer to Approved GPS List (Doc 186) for information about approved GPS units).
- 12) PRESS ALT button to advance to next setup screen.
- 13) ROTATE KNOB to select a BANK ANGLE of **MED**.
- 14) PRESS ALT button to advance to next setup screen.
- 15) ROTATE KNOB to select a MICROACTIVITY of **5**.
- 16) PRESS ALT button to advance to next setup screen.
- 17) ROTATE KNOB to select a GPSS GAIN of **16**.
- 18) PRESS ALT button to advance to next setup screen.
- 19) ROTATE KNOB to set ROLL REV to **N**.
- 20) PRESS KNOB to exit lateral setup and return to the home screen.
- 21) PRESS ALT AND HOLD alt button until VRT ACTIVITY is shown.
- 22) WHILE CONTINUING TO HOLD ALT, PRESS MODE.
- 23) RELEASE MODE AND ALT.
- 24) PRESS MODE until MAC is displayed.
- 25) ROTATE KNOB to set MAC to **0**.
- 26) Repeatedly PRESS ALT button until EFIS TYPE is displayed
- 27) ROTATE KNOB to set EFIS TYPE to:
 - 1** – if the autopilot is connected to an ASPEN
 - 2** – if the autopilot is connected to a G5
 - 0** – if the autopilot is connected to any other GPS source.
- 28) PRESS KNOB to exit menu and return to home screen.
- 29) Do not remove power from autopilot.

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3.2 Vertical Autopilot Settings

For Vizion software version PV.30 follow the steps below:

- 1) PRESS and HOLD ALT button until VRT ACTIVITY is shown.
- 2) ROTATE KNOB to select a VRT ACTIVITY of **13**.
- 3) PRESS ALT button to advance to next setup screen.
- 4) ROTATE KNOB to select a MIN AIRSPD of (Refer to aircraft POH and set a value equal to $1.3 * VS$ in knots).
- 5) PRESS ALT button to advance to next setup screen.
- 6) ROTATE KNOB to select a MAX AIRSPD of (Refer to aircraft POH and set a value equal to $0.9 * VNE$ in knots).
- 7) PRESS ALT button to advance to next setup screen.
- 8) ROTATE KNOB to select a PITCH REV of **Y**.
- 9) PRESS ALT button to advance to next setup screen.
- 10) ROTATE KNOB to select a STATIC LAG of **2**.
- 11) PRESS ALT button to advance to next setup screen.
- 12) ROTATE KNOB to select a MICROACTIVITY of **3**.
- 13) PRESS ALT button to advance to next setup screen.
- 14) ROTATE KNOB to select a HALF STEP of **N**.
- 15) PRESS KNOB to exit vertical setup and return to the home screen.
- 16) Cycle power on the autopilot.

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Vertical Autopilot Settings (Con't)

For Vizion software version PV.40 follow the steps below:

- 1) PRESS and HOLD ALT button until VRT ACTIVITY is shown.
- 2) ROTATE KNOB to select a VRT ACTIVITY of **13**.
- 3) PRESS ALT button to advance to next setup screen.
- 4) ROTATE KNOB to select a MIN AIRSPD of (Refer to aircraft POH and set a value equal to $1.3 * VS$ in knots).
- 5) PRESS ALT button to advance to next setup screen.
- 6) ROTATE KNOB to select a MAX AIRSPD of (Refer to aircraft POH and set a value equal to $0.9 * VNE$ in knots).
- 7) PRESS ALT button to advance to next setup screen.
- 8) ROTATE KNOB to select a PITCH REV of **Y**.
- 9) PRESS ALT button to advance to next setup screen.
- 10) ROTATE KNOB to select a STATIC LAG of **2**.
- 11) PRESS ALT button to advance to next setup screen.
- 12) ROTATE KNOB to select a MICROACTIVITY of **3**.
- 13) PRESS ALT button to advance to next setup screen.
- 14) ROTATE KNOB to select desired DEFAULT VS of (this is the vertical speed setting that the autopilot will use as the value to determine whether or not to synchronize to current vertical speed or synchronize to zero vertical speed, as well as the default vertical speed for altitude pre-select). For example, if the DEFAULT VS is set to 300 fpm, if the aircraft is climbing at 200 fpm, the autopilot will select zero VS upon engagement. If the aircraft is climbing at 400 fpm, the autopilot will select 400 fpm upon engagement. **We suggest using 300-400 feet per minute. CAUTION!** Do not select a DEFAULT VS that is too high, or autopilot performance may be adversely affected.
- 15) PRESS KNOB to exit vertical setup and return to the home screen.
- 16) Cycle power on the autopilot.

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4 PLANNING INFORMATION

4.1 Electrical Bus Loading Changes

Table 3 lists the power requirements for all equipment allowed to be installed by this STC. These values are to be used in updated the subject aircraft Electrical Loads Analysis (ELA) at the time of installation.

Table 3: Equipment Electrical Load Requirements

Installed Equipment	Part Number	Description	Electrical Demand @ 28V dc
AeroCruze 100 Equipment	8000-175	Control Head/Computer	< 5A
	8100-065	Servos (roll & pitch) 28 Vdc	
	or 8100-064	12 Vdc	
	8000-177	Link Sensor	
	8100-113	Level Switch	
	MTL106D	Master Switch	
	SC628	2.9k Hz Sonaalert	

4.2 Weight & Moment

Record any equipment changes and update the aircraft's equipment list as applicable.

Weights of the installed AeroCruze components are listed below in Table 4 for reference. If the associated equipment is not listed, then the installer should obtain the equipment's data from the manufacturer's documents.

Table 4: Equipment Weights Specifications for All Equipment

W & B	Dwg Ref	Weight (lbs)	Arm (in)	Moment Arm
AeroCruze 100 Flight Deck Installation	PA-201130-505	1.2	21.00	25.20
Roll Servo Installation	PA-201130-501	4.20	62.00	260.40
Pitch Servo Installation	PA-201130-503	4.10	97.00	397.70

Notes:

1. Aircraft weight and balance records shall be adjusted to account for any removed equipment upon installation of the above items. Changes shall account for the specific configuration of the installed equipment listed above.
2. Aircraft weight and balance records shall account for the exact placement of equipment on the aircraft.
3. Aircraft equipment list shall be adjusted to account for addition of the above components.

It is the installer's responsibility to document any weight and balance changes to the aircraft for all added equipment by performing a weight and balance tabulation (Table 5) and documenting the results in the aircraft records.

Table 5: Weight and Balance Table

Equipment (added or removed)	Weight (lbs)	Station	Calculated Moment Arm