FLIGHT MANUAL SUPPLEMENT S01

AUTOPilot DYNon

FOR THE POWERED GLIDER STEMME S10, MODEL S12

DOCUMENT NUMBER • L400-912811

DATE OF ISSUE • APRIL 18, 2016

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STAMP

SIGNATURE

AIRFRAME TYPE : STEMME S12
TYPE CERTIFICATE :
SERIAL NUMBER : 12-
REGISTRATION :

PAGE 0-1
This powered sailplane must be operated in compliance with the instructions and limitations contained in the associated Aircraft Flight Manual and this Supplement.

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0.1 RECORD OF AMENDMENTS

The following table documents all amendment for the supplement S01 to the Flight Manual for the aircraft STEMME S10, model S12.

Minor revisions to the S12 Aircraft Flight Manual are approved and countersigned by Design Organization DOA EASA.21J.250 based on its privilege.

All other amendments are approved by the agency stating the EASA approval number (countersigned by DOA EASA.21J.250).
In the table hereafter only the last approved revision must be countersigned.

New or corrected text sections of the revised page(s) will be marked by a vertical line on the outer side of the page. The newest revision number of all revisions on the page is mentioned in the footnote-section of the page, along with the date of the newest revision.

Compliance with the following information and the corresponding aircraft is documented by the signature of the correcting person in the table below.

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1. GENERAL

This supplement contains information and instructions for the STEMME S12 equipped with a non TSO’d autopilot system “Dynon”. The Dynon autopilot is an integrated part of the ELECTRONIC FLIGHT INFORMATION SYSTEM (EFIS) EFIS-D10A.

The Autopilot (AP) can be controlled and monitored by the following ways:

1. AP 74 Autopilot Interface Module (Optional): Set HEADING (HDG) or TRACK (TRK) and ALTITUDE (ALT) BUGS (AP targets), arm AP modes, engage/disengage AP - this is the recommended way.
2. Alternatively, (but more complex) it can be controlled by the EFIS menus: Set HDG or TRK and ALT bugs (AP targets), change AP modes, engage/disengage AP.
3. Red push button on stick: quick disengage of AP.
4. AP main switch: powers the AP 74 and the servos, disengages AP when switched OFF.

NOTICE

The Dynon autopilot is not a full certified flight control system. It is developed as a “Flight Support System” during cross country flight in powered condition.

The autopilot is able to control the aircraft in two axes. The two autopilot actuators are connected by pushrods for the elevator and aileron control system. Both actuators are equipped with weak links.

The autopilot equipment has the following functionalities:

- Heading hold (HDG-Mode),
- Tracking-Hold (TRK-Mode),
- Altitude hold (ALT-Mode),
- Descend and climb rate hold (ALT-Mode).

When the EFIS-D10A is connected to a GPS-navigation device the following additional functionalities are accessible:
- GPS-Track interception and hold (NAV-Mode),
- GPS flight plan navigation, (NAV-Mode).

**NOTICE**

Due to the incorporation of the actuators, the hand forces of aileron and elevator are slightly higher.

**WARNING**

The components of the autopilot system and its software level must be approved by STEMME AG before installation. (See STEMME Service Bulletin P062-980004 Rev. 00 or later approved revisions).

**WARNING**

The installation of other software level on the components in the autopilot system can cause malfunctions or unpredictable flight situations.

The individual Operating Manuals (OM) of the autopilot component and of the optional installed GPS-source provide the basic information for operation of these units.

This supplement extends the contents of the relevant sections of the basic S12 Aircraft Flight Manual where additional information or instructions are necessary for safe operation of the aircraft and a system description of the autopilot installed in the STEMME S12.

**NOTICE**

Altitudes in this manual may include a period instead of a comma to separate the thousands digit. For example, 2,000 ft = 2.000 ft.
1.3 ABBREVIATIONS

The following abbreviations are used for clarity:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFMS</td>
<td>Aircraft Flight Manual Supplement</td>
</tr>
<tr>
<td>DPUG</td>
<td>Dynon Pilot's User Guide</td>
</tr>
</tbody>
</table>
2. LIMITATIONS

The airspeed limitations and their importance to flight operations are listed below:

<table>
<thead>
<tr>
<th>SPEED</th>
<th>(IAS)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{AP+}$</td>
<td>Maximum speed for operation of the Autopilot.</td>
<td>137 kts/255 km/h</td>
</tr>
<tr>
<td>$V_{AP-}$</td>
<td>Minimum speed for operation of the Autopilot.</td>
<td>80 kts/148 km/h</td>
</tr>
</tbody>
</table>

⚠️ WARNING

The autopilot system is approved for support of the flight-controls in 2 axes under VFR-DAY only!

⚠️ WARNING

Flights under IMC, approach procedures and flights below 2.000 ft AGL are prohibited!

Further Limitations are:

- Temperature: -30°C up to +50°C / -22 °F up to 122 °F
- Altitude: 2.000 ft AGL - 16.000 ft MSL
- Operation Mode: VFR-DAY
  - Only during Powered Flight
## 2.15 COCKPIT PLACARDS

<table>
<thead>
<tr>
<th>PLACARD</th>
<th>LOCATION/REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Autopilot Limitations:</strong>&lt;br&gt;VFR-DAY ONLY&lt;br&gt;Max. Airspeed for Operation: 137 kts / 255 km/h&lt;br&gt;Min. Airspeed for Operation: 80 kts / 148 km/h&lt;br&gt;Max. Altitude for Operation: 16,000 ft / 4870 m MSL&lt;br&gt;Min. Altitude for Operation: 2,000 ft / 600 m AGL</td>
<td>Left side of shaft tunnel.&lt;br&gt;(8)</td>
</tr>
</tbody>
</table>
3. EMERGENCY PROCEDURES

The Autopilot can have a malfunction because of:

- Failure of mechanical control (actuators or weak link)
- Failure of electrical system
- Failure of software

3.9.7 CONTROLS BLOCKED BY THE AUTOPILOT

In case of a mechanical, electrical or software problem an actuator could be damaged in a way were the associated control is blocked or not.

NOTICE

No emergency case occurs when the actuator is damaged and the control system is not blocked.

For the case of a blocked actuator the actuator itself is equipped with a mechanical weak link between the main axle and the turn lever connected to the control system.

The system can be easily overridden by hand-forces. The weak link will be cracked and the control is disconnected from the autopilot without any danger or conflicts for the manual flight control.

In case of a blocked actuator during a manually controlled flight, perform the following procedure:

- Weak Link Use hand-force to break weak link and continue flight manually controlled.
Continue VFR-Flight without autopilot control. Qualified maintenance staff (ref. chapter »8.1«) must replace broken weak link before next auto pilot operation.

In case of a blocked actuator during an autopilot supported flight, proceed as follows:

- Quick Disengage on stick PUSH
- Weak Link If controls are still not free, use hand-force to break the weak link and continue flight manually controlled.
- AP main switch OFF

Continue VFR-Flight without autopilot control. Qualified maintenance staff (ref. chapter »8.1«) must replace broken weak link before next auto pilot operation.

The sequence (see above) of this emergency procedure is not mandatory. In a critical emergency case the weak link can be broken at any time.

If the Autopilot Main Switch is switched OFF, the EFIS-D10A is still working and the display continues to display all available data.

**NOTICE**

The EFIS-D10A is not approved as a primary flight instrument. Refer to the non-electric Instruments for primary information.
3.9.7.1 OTHER MINOR FAILURE MODES

The EFIS-D10A continuously monitors the overall operation of the autopilot as well as the state of incoming GPS data. If an error is detected, the subsystem where the error occurred is restricted and reported. The system is able to recover itself from many minor failures.

Some examples:

- An error in the Pitch servo is detected, the autopilot reports an error in the Pitch servo, but continues operation of the Roll servo.
- While flying in GPS NAV mode, the user cancels the active waypoint or the GPS sends malformed navigation data, the autopilot fails over to TRK Mode.
- While flying in HDG mode and compass data is lost, the autopilot fails over to TRK mode (if valid GPS data is present).

In each case of a Displayed Alert Message proceed as follows:

- **Quick Disengage** Use red button on the stick to disengage the autopilot and continue flight manually controlled until the alert disappears.

- **Autopilot Main Switch** If the Quick Disengage fails, switch OFF the Autopilot by the independent “Autopilot Main Switch” immediately.
3.9.7.2 DISPLAYED ALERT MESSAGES

Any time a built-in or preconfigured alarm set point is exceeded, you are alerted to the fact via the alarm bar and menu at the bottom of the screen. For more detailed information refer to the Dynon D10-A Pilot’s User Guide.

In each case of a Displayed Alert Message proceed as follows:

- **Quick Disengage**
  
  Use red button on the stick to disengage the autopilot and continue flight manually controlled until the alert disappears.

---

**WARNING**

By using the “Quick Disengage Button” the aircraft can be mis-trimmed. Always keep hand on stick while disconnecting.
4. NORMAL OPERATING PROCEDURES

POWERING ON

The Dynon EFIS-D10A switches on automatically as soon as the main system master switch is ON.

Power the autopilot by switching the Autopilot main switch ON.

**NOTICE**

As long as the AP main switch is not switched ON, a warning “NETWORK CONFIGURATION ERROR” will appear on the EFIS-D10A screen.

Acknowledge this by pressing the most right button on the EFIS-D10A.

4.1 INTRODUCTION

Dynon Avionics’ Autopilot (AP) system is a standalone AP system, Dynon’s AP is an enhancement to the Dynon Avionics EFIS-D10A products (beginning with firmware version 5.0). The Dynon Avionics AP provides roll (aileron) and/or pitch (elevator) control, leveraging the proven sensors, algorithms, and display systems of Dynon’s modern EFIS products.

Another innovative element of the Dynon Avionics AP is that the servomotors (servos) responsible for actuating the control surfaces are “smart” devices. Dynon’s servos not only accept commands from the AP but also report “health,” resistance to commanded movements, motor override (or “slip”), and many other data elements back to the EFIS.

This level of communication between AP control and motors provides the pilot with an unprecedented degree of awareness of the overall performance of the AP.
4.1.1 EFIS AP MENU AND STATUS INDICATORS (LEFT LOWER CORNER)

An AP menu is available on the D10-A, replacing the standard menu - EFIS without AP installation - BUGS menu on the EFIS main menu (BUGS is now available below the AP menu).

The Autopilot status indicator is always displayed at the lower left side of the EFIS page. (See figure 4.1.1.a.) The left indicator displays the state of the roll servo, and the right indicator displays the state of the pitch servo.

Figure 4.1.1.a.
Indicator Display

When either the roll or pitch axis is engaged, the entire indicator has a black background:

AP: HDG–ALT (AP engaged in HDG + ALT mode).

When the AP is disengaged the status indicator shows:

AP: OFF–OFF (AP disengaged)

The following table describes the different states for each axis and the relevant text descriptions in the AP status indicator.

<table>
<thead>
<tr>
<th>AP STATUS INDICATOR MODES</th>
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<tr>
<td>AP STATE</td>
</tr>
<tr>
<td>Status: Servo disengaged</td>
</tr>
<tr>
<td>Status: Heading Hold Mode; AP uses HDG Bug as target magnetic heading</td>
</tr>
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</table>
## AP Status Indicator Modes

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<tr>
<th>AP State</th>
<th>Roll Display</th>
<th>Pitch Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status: Track Hold Mode; AP uses HDG Bug (colored magenta) as target</td>
<td>TRK (magenta text)</td>
<td>N/A</td>
</tr>
<tr>
<td>Status: Currently in middle of 180 degree turn</td>
<td>180</td>
<td>ALT</td>
</tr>
<tr>
<td>Status: GPS Horizontal Navigation Mode</td>
<td>GPS (magenta text)</td>
<td>N/A</td>
</tr>
<tr>
<td>Status: Altitude Hold Mode; AP uses Altitude Bug as target altitude</td>
<td>N/A</td>
<td>ALT</td>
</tr>
<tr>
<td>Warning: Servo slipping</td>
<td>Mode display with yellow background</td>
<td>Mode display with yellow background</td>
</tr>
</tbody>
</table>

## AP Status Indicator Errors

<table>
<thead>
<tr>
<th>AP State</th>
<th>Roll Display</th>
<th>Pitch Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning: Servo has been calibrated but not tested</td>
<td>TST (red text)</td>
<td>TST (red text)</td>
</tr>
<tr>
<td>Warning: Airspeed outside min or max airspeed.</td>
<td>SPD (red text)</td>
<td>SPD (red text)</td>
</tr>
<tr>
<td>Warning: Servo error condition detected, or servo not found. Check DSAB configuration, wiring, and servo power.</td>
<td>ERR (red text)</td>
<td>ERR (red text)</td>
</tr>
</tbody>
</table>
4.1.2  EFIS BUGS DISPLAY (RIGHT LOWER CORNER)

Whenever either the heading or altitude Bug is toggled ON (via the BUGS menu or the AP 74) its current value is displayed in the lower right corner of the EFIS page. (See figure 4.1.2.a.)

![Figure 4.1.2.a. EFIS BUGS Display](image)

Example: 005°/2250FT (HDG bug toggled ON, set to 005° and ALT bug toggled ON, set to 2250 Feet). The heading bug is toggled ON (i.e., displayed on the heading tape), but the AP HDG mode is currently disengaged.

4.1.3  BUGS GRAPHICAL APPEARANCE

When the Autopilot is not engaged for a given axis, the respective bug is hollow (see figure 4.1.3.a.). When the Autopilot is engaged for a given axis (HDG, TRK, ALT), the respective bug is solid, or “filled in.” Because the Autopilot does not currently have a settable airspeed mode, the IAS Bug is always displayed as a hollow outline.

![Figure 4.1.3.a. Bugs Graphical Appearance](image)
4.1.4 AP MODES

HDG: HEADING MODE – ROLL SERVO

When the AP is engaged in Heading Mode, it uses the roll servo to control the aircraft’s magnetic heading, with the goal of following the heading bug. You may adjust the heading bug, causing the AP-controlled aircraft to turn toward the new target heading. The AP’s goal in the roll axis is to align the triangle of the numeric magnetic heading box with the inverted triangle of the heading bug.

TRK: GROUND TRACK MODE – ROLL SERVO

When the AP is engaged in Track Mode, it uses the roll servo to control the aircraft’s GPS ground track, with the goal of following the heading bug (colored magenta to signify GPS mode). You may adjust the heading/track bug, causing the AP-controlled aircraft to turn toward the new target ground track. In Track Mode, the AP’s goal in the roll axis is to align the magenta ground track triangle with the inverted triangle of the heading bug.

180: 180° TURN MODE – ROLL AND PITCH SERVOS

This special mode is a way to initiate a “quick turnaround.” When 180 Mode is initiated, the AP immediately engages in Altitude and Track Hold modes with the heading bug set to 180° from current ground track. (If a GPS is not connected or available, it engages in Heading Hold Mode.) The AP then turns the aircraft to the left until it is flying in the opposite direction, and then remains in Track and Altitude Hold Modes.

NAV: GPS NAVIGATION MODE – ROLL SERVO

To use the GPS-based NAV mode, your connected GPS must have an active waypoint. Additionally, the EFIS’s HSI screen must have the GPS selected as the current NAVSRC (i.e., the CDI and other HSI information is colored magenta). When the AP is engaged in GPS Navigation.
ALT: ALTITUDE MODE - PITCH SERVO

When the AP is engaged in Altitude Mode, it uses the pitch servo to control the aircraft’s altitude. You may adjust the altitude bug, causing the AP-controlled aircraft to climb or descend toward the new target altitude at the average vertical speed of 300ft/min. In Altitude Mode, the AP’s goal in the pitch axis is to align the triangle of the numeric altitude box with the inverted triangle of the altitude bug.

During AP-controlled altitude changes, the AP causes the aircraft to climb or descend at 300 ft/min. When the AP is engaged and aircraft airspeed rises above the maximum, the AP enters an airspeed hold mode, pitching the aircraft up to prevent exceeding the maximum airspeed. When the aircraft’s altitude rises above the target ALT bug and the AP cannot pitch the aircraft down without going above the maximum airspeed, the EFIS presents the prompt:

MAX AIRSPEED – REDUCE POWER.

Likewise, when the AP is engaged and aircraft airspeed drops below the minimum, the AP enters an airspeed hold mode, pitching the aircraft down to prevent dropping below the minimum airspeed. When the aircraft’s altitude drops below the target ALT bug and the AP cannot pitch the aircraft up without going below the minimum airspeed, the EFIS presents the prompt:

MIN AIRSPEED – ADD POWER.

When the Autopilot is flying the aircraft in Altitude Mode, an out-of-trim indicator can appear to the right of the AP Status Indicator. This alerts you when the pitch servo detects excessive load on the elevator which would result in a large pitch excursion when the AP is disengaged. The indicator instructs you in the direction to trim the nose to produce more neutral trim. In the figure 4.1.4.a., the indicator appears until the pilot trims the aircraft nose up until neutral trim. During turbulence and small bumps the trim indicator may flash on and off. Do not take action based on the trim indicator until it remains on for several seconds.
4.1.5 AUTOPILOT CONTROL METHODS

The AP can be controlled and monitored in two ways (described in detail in the sections below):

- EFIS menus: Set HDG or TRK and ALT bugs (AP targets), change AP modes, engage/disengage AP
- AP 74 AP Control Panel: Set HDG or TRK and ALT BUGS (AP targets), arm AP modes, engage/disengage AP
- Disengage pushbutton on control stick: disengage AP

EFIS AUTOPILOT CONTROL

This section describes the various AP control functions available via the EFIS > AP menu (third main button from left below the display). (See picture below)

Figure 4.1.5.a.
EFIS Menu bar

Figure 4.1.5.b.
AP Menu bar
The AP menu includes the following buttons and functionality:

- **BUGS**: Works as the BUGS menu has in previous firmware versions and is documented on page 5-2 of the DPUG. The HDG or TRK (note that this bug will display as either HDG or TRK depending on autopilot’s mode of operation) and ALT bugs now control the targets for the autopilot’s HDG/TRK and ALT modes, respectively.

- **MODE-(H, T, or N)**: The MODE button is followed by the currently active lateral mode: H (HDG), T (TRK), or N (NAV). When the roll axis of the AP is engaged (by pressing button 3, the lateral engage button), it flies in the mode set in this menu. Pressing this button brings up another menu where you can select the armed AP mode. As soon as you select a mode, the AP menu is immediately displayed again.

- **(HDG, TRK, or NAV) OFF/ON**: The menu label also reflects the currently active lateral mode, and whether or not the AP is engaged in that mode. Pushing this button toggles between ON and OFF, activating and deactivating the roll servo in the specified mode. ALT and HDG or TRK modes can be enabled independently of each other. When the Autopilot is engaged in HDG or TRK mode, the heading bug is synchronized to the current heading or ground track, respectively. The heading or track bug can then be adjusted while the AP is engaged.

- **ALT OFF/ON**: The menu label reflects whether the AP is currently engaged in Altitude Mode. Pushing this button toggles between ON and OFF, activating and deactivating the pitch servo in altitude mode. When the Autopilot is engaged in ALT mode, the altitude bug is synchronized to the current altitude. The altitude bug can then be adjusted while the AP is engaged. When ALT mode is deactivated, the altitude bug is toggled off.

- **180**: Puts the AP into 180 Mode TRK (or HDG, if no GPS available) and ALT modes, and sets the heading bug to 180º from the current ground track. While in 180 Mode, the 180 button is highlighted, and the AP Status Indicator displays “180” in the roll axis position.
AP 74 Autopilot CONTROL (OPTIONAL)

This section describes how to control the Autopilot via the AP 74. When an AP 74 is installed, the Autopilot can still be controlled via the EFIS-based AP menu. The AP 74 has all the functionality of the EFIS > AP menu, while providing a more efficient way to interpret and use the Autopilot. It also provides some additional features, such as the ability to arm modes prior to engagement, and easy adjustment of AP targets via its dedicated knob.

The AP 74’s button indicators (red lights) have the following meanings:

- **AP button indicator**: ON when any Autopilot axis is active.

- **VALUE Knob**: The VALUE knob changes the BARO, ALT bug, and HDG bug settings.

- **HDG button indicator**: ON when lateral/roll servo is armed or active in Heading Mode. If the AP button indicator is on, the roll servo is active in Heading Mode. If the AP button indicator is off, the roll servo is armed in Heading Mode.

- **TRK button indicator**: ON when lateral/roll servo is armed or active in Track Mode.

- **NAV button indicator**: ON when lateral/roll servo is armed or active in Navigation Mode.

- **ALT button indicator**: ON when vertical/pitch servo is armed or active in Altitude Mode.

The mode buttons and indicators correspond to the Autopilot modes described in chapter 4.1.4.
AP BUTTON

When its indicator is off, pressing the AP button engages the AP in the pre-armed mode(s) indicated by the Horizontal and Altitude Mode button indicators below. Depending on how you have configured bug synchronization, the AP may synchronize the bugs for pre-armed HDG, TRK, or NAV modes upon pressing the AP button. Read Pre-select Configuration on page 7-14 of the DPUG for more details on configuring this behavior for your needs. If no mode is armed, pressing the AP button engages the AP in HDG mode only.

When the AP button’s indicator is on, pressing the AP button disengages all axes of the AP, but leaves the last-used modes armed (unless configured to clear modes in setup). If you push and hold the AP button for 2 seconds, the AP engages in 180 Mode.

VALUE KNOB

When no menus are displayed, the VALUE knob changes the BARO, ALT bug, and HDG bug settings. When in any EFIS menu which adjusts a numerical value, turning the VALUE knob adjusts the selected parameter.

Pressing the VALUE knob when in any menu exits the menu system completely. Pushing and holding the knob while changing a bug synchronizes the bug to the current value. Pushing and holding the knob while changing the BARO sets the barometer to 29.92 inHg. Further behavior can be configured, as described on page 7-13 of the DPUG.

HDG BUTTON

When its indicator is off, pressing the HDG button arms the roll servo in Heading Mode and turns on the indicator. Depending on how you have configured bug synchronization, the heading bug may be synchronized to the current heading value upon pressing the HDG button. Read Pre-select Configuration on page 7-14 of the DPUG for more details on configuring this behavior for your needs. The heading bug can always be adjusted while the AP is engaged.

When its indicator is on, pressing the button disarms/deactivates the roll servo and turns off the button’s indicator.
TRK BUTTON

When its indicator is off, pressing the TRK button arms the roll servo in Track Mode and turns on the indicator. Depending on how you have configured bug synchronization, the heading/track bug may be synchronized to the current GPS ground track upon pressing the TRK button. Read Pre-select Configuration on page 7-14 of the DPUG for more details on configuring this behavior for your needs. The heading/track bug can always be adjusted while the AP is engaged.

When its indicator is on, pressing the button disarms/deactivates the roll servo and turns off the button’s indicator.

NAV BUTTON

When its indicator is off, pressing the NAV button arms the roll servo in Navigation Mode and turns on the indicator. If the AP is already engaged, pressing the NAV button activates the roll servo in Navigation Mode. In Navigation Mode, the AP flies the aircraft based on the navigation information displayed on the HSI page.

When its indicator is on, pressing the button disarms/deactivates the roll servo and turns off the button’s indicator.

ALT BUTTON

When its indicator is off, pressing the ALT button arms the pitch servo in Altitude Mode and turns on the indicator. Depending on how you have configured bug synchronization, the altitude bug may be synchronized to the current altitude value upon pressing the ALT button. Read Pre-select Configuration on page 7-14 of the DPUG for more details on configuring this behavior for your needs. The altitude bug can then be adjusted while the AP is engaged.

When its indicator is on, pressing the button disarms/deactivates the pitch servo and turns off the button’s indicator. When ALT mode is deactivated, the altitude bug is toggled off, disabling the altitude alerter.
4.4 PRE-FLIGHT INSPECTIONS (AUTOPilot)

NOTICE

Verify that a GPS is connected and provides valid data. Otherwise TRK and NAV modes are not available.

Test the controls for proper operation of the control surfaces. The controls should feel normal; the servos add little resistance.

- **Button AP on AP 74** PUSH
  Verify D10-A Status indicator shows:
  AP: OFF: OFF.

- **Button HDG** PUSH
  Verify D10-A Status indicator shows
  AP: ON: OFF.

- **Button TRK** PUSH
  Verify D10-A Status indicator shows
  AP: ON: OFF.

- **Button NAV** PUSH
  Verify D10-A Status indicator shows
  AP: ON: OFF.

- **Button ALT** PUSH
  Verify D10-A Status indicator shows
  AP: ON: ON.

- **Quick Disengage**
  Disengage by “Quick-Disengage-Switch” on Control stick; Verify D10-A Status indicator shows
  AP: OFF: OFF.

- **Autopilot Main Switch**
  OFF
  Verify impossibility to switch on the Autopilot with the “AP” button
  (Actuators shall be in-active and control stick shall be movable easily).
NOTICE

As long as the AP main switch is not switched ON, a warning “NETWORK CONFIGURATION ERROR” will appear on the EFIS-D10A screen.

Acknowledge this by pressing the most right button on the EFIS-D10A.

- Autopilot Main Switch Switch ON again.
4.5 NORMAL OPERATION PROCEDURES AND RECOMMENDED AIRSPEEDS

4.5.3.2 POWERED FLIGHT

After the Autopilot is engaged it can be used e.g. for automatic controlled horizontal flight. To set the requested parameters perform as follows:

- **Altimeter setting**
  Set QNH or Standard on Dynon D10-A or Press the VALUE-Knob on the AP 74 shortly until BARO appears in the display, set the correct altimeter setting by turning the knob.

- **Set Autopilot Altitude**
  Set ALT on Dynon D10-A or Press the VALUE-Knob on the AP 74 shortly until ALTITUDE appears in the display, set the Altitude by turning the knob.

- **Set the Course**
  Set the HDG, TRK or Flight plan depending of the chosen Mode.

⚠️ CAUTION

Cross-check attitude, altitude and speed regularly using primary flight instruments!

⚠️ CAUTION

STEMME recommends the use of GPS-based navigation modes for cross country flights. The GPS-modes are precise enough to control the aircraft within very small deviations.

⚠️ NOTICE

The HDG mode, based on the compass module information, can cause slowly oscillating deviation in course of maximal +/- 10° from selected course. This deviation is coupled with a stable permanent fluctuation around the longitudinal axis.
CLIMB

After the Autopilot is engaged it can be used e.g. for automatic controlled climb. To set the requested parameters perform as follows:

- **Set Altimeter setting**
  - Set QNH or Standard on Dynon D10-A or Press the VALUE-Knob on the AP 74 shortly until BARO appears in the display, set the correct altimeter setting by turning the knob.

- **Set Autopilot Altitude**
  - Set ALT on Dynon D10-A or Press the VALUE-Knob on the AP 74 shortly until ALTITUDE appears in the display, set the Target-Altitude by turning the knob. The aircraft will climb with 300 ft/min.

- **Set Power/Trim**
  - Set power/trim as required in accordance with the announcement on Dynon D10-A.

---

**WARNING**

All announcements displayed on the Dynon EFIS-D10A must be accomplished promptly, otherwise the aircraft will attain flight situations (i.e. “autopilot - OFF” – reaching of autopilot limit “speed to low”), where the pilot must act manual immediately.

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**CAUTION**

The announcement on the Dynon D10-A for trim nose down is displayed as “DN”. This announcement may be misunderstood as “ON”.

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**CAUTION**

Cross-check attitude, altitude and speed regularly using primary flight instruments!
DESCEND

After the Autopilot is switched ON it can be used e.g. for automatic controlled descend. To set the requested parameters perform as follows:

- **Set QNH**
  
  Set QNH on Dynon D10-A or
  Press the VALUE-Knob on the AP 74 shortly until BARO appears in the display, set the correct QNH by turning the knob.

- **Set Altitude**
  
  Set ALT on Dynon D10-A or
  Press the VALUE-Knob on the AP 74 shortly until ALTITUDE appears in the display, set the correct Target-Altitude by turning the knob. The aircraft will descent with 300 ft/min.

- **Set Power/Trim**
  
  Set power/trim as required in accordance with the announcement on Dynon D10-A.

---

**WARNING**

All announcements displayed on the Dynon D10-A are mandatory otherwise the aircraft will attain flight situations (i.e. “autopilot – OFF” – reaching of autopilot limit “speed to high”), where the pilot must immediately take the controls and manually fly the aircraft.

---

**CAUTION**

Cross-check attitude, altitude and speed regularly using primary flight instruments!

---

**POWER OFF - IN FLIGHT**

At altitudes below 2000 ft AGL and especially for landing the autopilot must be deactivated.

In order to save battery power, the pilot may elect to shut down the AP while soaring.
To deactivate the full system execute the following procedure:

- **Quick Disengage**
  Disengage by “Quick-Disengage-Switch” on control stick verify Status indicator shows AP: OFF: OFF

  or

- **AP Button on AP 74 or EFIS-D10A**
  PUSH; verify Status indicator shows AP: OFF: OFF

- **Autopilot Main Switch**
  OFF

- **Optional:**
  Most left button on EFIS-D10A
  PUSH follow instructions on screen to switch off the Dynon system completely.
WARNING

The Autopilot Main Switch must be switched OFF at altitudes below 2.000 ft AGL, for landing and for gliding!

POWER ON - IN FLIGHT

To power on the Dynon system in flight proceed as follows:

- Most left button on EFIS-D10A (if EFIS-D10A is OFF) PUSH

- Autopilot Main Switch ON verify Status indicator shows AP: OFF: OFF

- AP Button on AP 74 or EFIS-D10A PUSH; verify Status indicator shows AP: HDG: OFF

Choose any desired AP mode.
5. PERFORMANCE

- No change to the basic S12 Aircraft Flight Manual. -
6. WEIGHT AND BALANCE

The weight of the AP installation and its influence to the Empty Weight CG-position has been entered in the basic S12 Aircraft Flight Manual, chapter »6.«

6.5 EQUIPMENT LIST

All components of the auto-pilot system are listed in the Equipment List of the S12 Aircraft Flight Manual, section »6.5«.
7. SYSTEM DESCRIPTION OF THE S12 AND ITS EQUIPMENT

7.1 INTRODUCTION

The Dynon Avionics Autopilot system is a non-TSO’d product that has been certified for use in STEMME S12 for VFR-DAY-Flights only.

The autopilot system provides roll (aileron) and/or pitch (elevator) control, leveraging the proven sensors, algorithms, and display systems of Dynon’s modern EFIS products.

Dynon’s servos report “health,” resistance to commanded movements, motor override (or “slip”), and other data elements back to the EFIS. This communication between the Dynon EFIS-D10A and the servos provides the pilot with a high degree of awareness of the overall performance of the AP.

⚠️ WARNING

This AP has a wide range of capabilities that are not covered in the Aircraft Flight Manual Supplement (AFMS). Capabilities that are not described here are not approved for use!

The actuators are equipped with a weak link that will crack in emergency cases. The actuators have an internal slipping clutch, so the motors can be overridden in standard operation.

The autopilot control panel AP 74 is an enhancement to the Dynon Avionics EFIS EFIS-D10A. The AP 74 Dedicated Autopilot Interface Module adds panel-mounted controls and LED light status indicators to your autopilot.

A multi-purpose value knob allows quick adjustment of the BARO setting and the bugs used with the Autopilot. The AP 74 adds the ability to pre-arm which modes will be flown upon autopilot engagement and pre-select the target altitude and heading/track. Additional features include a built-in light level sensor to automatically adjust the screen brightness.
Components of the Autopilot System AP 74

Figure 7.1.a.
EFIS-D10A including Display

Figure 7.1.b.
AP 74 Autopilot Interface Modules (optional)

Figure 7.1.c., 7.1.d.
Actuators (pitch and roll)
EFIS-D10A

The EFIS-D10A is the center part of the Autopilot System. It provides complete ADAHRS (Air Data, Attitude and Heading Reference System) capabilities. All the ADAHRS sensors are built inside the EFIS-D10A instrument housing. The design is tolerant to any flight maneuver, automatically corrects itself anytime; its gyros' capabilities cannot be exceeded or damaged by flight maneuvers or unusual attitudes.

The EFIS-D10A utilizes a multi-processor design that delivers real-time performance and stability. It is able to display the correct attitude within a few seconds of being powered on while in flight.

The EFIS-D10A requires between 10 and 30 volts DC for operation and has inputs for an external backup power supply and a "keep-alive voltage". The "keep-alive" input provides the power to charge the internal battery even if the unit is switched off. It is acceptable to have the EFIS-D10A turned on during engine start.

The EFIS-D10A is equipped with an internal battery which allows the instrument to continue to operate in the event of an external power failure. This lithium-ion battery is rechargeable and is managed by the EFIS-D10A. When new, a fully charged internal battery is rated for a minimum of 2 hours of normal operation with the EFIS-D10A.

Attitude information is obtained from 3 solid-state gyro-meters, 3 solid-state accelerometers, and the airspeed pressure sensor. Heading information is obtained from 3 solid-state magnetometers housed in the EDC-D10A. Airspeed, altitude and angle of attack are obtained from three separate pressure transducers.

The EFIS-D10A artificial horizon display (attitude) is generated via a complex algorithm using a multitude of sensors. The EFIS attitude is not reliant on any single external system. It can provide an accurate attitude - even in the event of airspeed loss (due to icing or other blockage) - via a redundant GPS aiding source. In normal operation the instrument uses airspeed to provide superior attitude accuracy. If a problem develops with your airspeed reading, the configured GPS source acts as a substitute. When in this mode the instrument continues to provide accurate attitude.
OPERATION OF THE EFIS-D10A

All necessary information for operation of the Dynon EFIS-D10A is described in the Pilots User Guide (DPUG) “EFIS-D10A Electronic Flight Information System (Dynon Avionics Inc. P/N 100349-000 Revision K or later approved revisions).

WARNING

This AP has a wide range of capabilities that are not covered in the Aircraft Flight Manual Supplement (AFMS). Capabilities that are not described in this supplement are not approved!

AP 74 AUTOPILOT INTERFACE MODULES (OPTIONAL)

The Autopilot Interface Modules are configured to control the EFIS-D10A. Its VALUE-knob changes values in various EFIS menus. When no menu is displayed the AP 74 can adjust the barometer, altitude bug, and heading bug.

The AP 74’s buttons control the Autopilot operation mode (Heading Hold, Track Hold, GPS horizontal navigation, altitude hold), and allow you to engage and disengage the Autopilot.
OPERATION OF THE AP 74

All necessary information for operation of the AP 74 are described in the Pilots User Guide (DPUG) “EFIS-D10A Electronic Flight Information System” (Dynon Avionics Inc. P/N 100349-000 Revision K or later approved revisions).
7.3 INSTRUMENT PANEL

Figure 7.3.a.
Typical STEMME S12 panel with autopilot equipment
8. HANDLING, MAINTENANCE AND SERVICE

8.7 DYNON SERVO SHEAR SCREW REPLACEMENT

In the event that a servo’s weak-link breaks or untightens, action must be taken to service the screw. The replacement of the screw is classified as a repair.

Repairs on the autopilot system must only be carried out by using approved maintenance procedures (according to the S12 Aircraft Maintenance Manual).