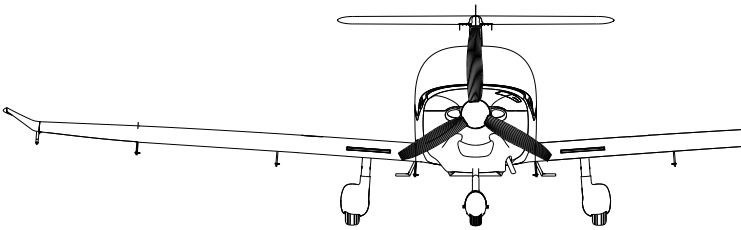
Elixir Aircraft

ELIXIR

Single EFIS – AFCS

Airplane Flight Manual Supplement – **SUP 01**



Supplement Number **01**

Supplement Title..... .....

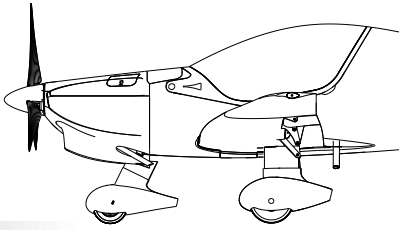
Garmin Automatic Flight Control System (AFCS)

This manual includes the information that the conditions of certification require to provide to the pilot.

THIS SUPPLEMENT MUST BE ATTACHED TO THE MAIN FLIGHT MANUAL WHEN THE CORRESPONDING SPECIFIC SYSTEM IS INSTALLED.

THE AIRPLANE MUST BE OPERATED ACCORDING TO THE INFORMATIONS AND LIMITATIONS CONTAINED IN THE HANDBOOK

LXR-AI-Rec-Manual-AFM SUP01 Garmin AutoPilot –
0001470 - Ed01 Rev02



SUP 01 - 0. Document Management

0.1 Record of revisions

Updates are classified as “Editions” and “Revisions”.
An Edition (Ed.) is a change of the AFM Supplement, with an impact on the approved chapters. Any new Edition is EASA approved and mandatory.
A Revision (Rev.) is an update of the AFM Supplement, providing additional information, on non-approved chapters. Update your aeroplane documentation with new revisions at your own discretion
The Revision number is re-set to 01 at soon as a new Edition is released.

Rev. N°	Revised pages	EASA Approval date	Description of Revision
Ed.01 Rev01	all	MINOR CHANGE APPROVAL 10081409 07/03/2023	Initial release
Ed.01 Rev02	all	MINOR CHANGE APPROVAL n°10083461 08/12/2023	General layout and cosmetic improvements

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0.2 AFM sections overview

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SUP 01 - 1. General information

The present AFM supplement provides all the appropriate information necessary to safely and efficiently operate the aeroplane when equipped with the Garmin Automatic Flight Control System (AFCS).

It is presented a self-contained, miniature Flight Manual following the same layout and sections as the basic AFM.

When the Garmin AFMS system implies some modifications to the basic AFM, they will be mentioned in the relevant section. If there is no change, a statement to that effect will be made : “unchanged” means that the instructions or limitations from the basic AFM remain valid

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SUP 01 - 2. Limitations

2.1 Systems & Equipment

The autopilot operation is not approved below 1 500 feet above the ground.
The autopilot operation is approved only with flaps retracted.
Approach mode (APPR) is not approved (nor available).

Note
Autopilot cannot be operated below 130 km/h *(70kts)* nor above 270km/h *(145 kts)*. If A/P is engaged when approaching these limits, the A/P will command pitch inputs to maintain airspeed within limits, regardless of activated A/P mode.
The autopilot may only be engaged within the following ranges:
Pitch 15° nose up to 10° nose down / Roll ±30°

SUP 01 - 3. Emergency Procedures

3.1 Introduction

This section provides instructions in case of autopilot malfunction or failure. It also provides instructions when the AP can be used as safety aids.

3.2 Aircraft does unwanted manoeuvres with AP engaged

Erratic behaviour of the autopilot

1.	Take over stick control	*The servomotors can be overpowered easily*
2.	AP disconnect	*Press to disengage AP*

3.3 Bad or no response from the AP in pitch or roll

Servomotor driving system failure

1.	Take over stick control	*The servomotors can be overpowered easily*
2.	AP disconnect	*Press to disengage AP*

3.4 Small increase of required pilot force, minor friction in controls

Cause : AP Servomotor clutch fail to disengage

1.	Fly the aircraft manually	*The servomotors can be safely back-driven*
2.	AP circuit breaker	*Try to reboot AP by disengaging-reengaging its circuit breaker*

3.5 Cannot disconnect AP with stick button

Fly the aircraft manually (override AP inputs)
Use AP menu on G3X touchscreen to disconnect
Or use AP circuit breaker
Or press any trim button (this should disengage the AP)

3.6 Loss of G3X display with AP engaged

Fly the aircraft manually
You cannot control the AP modes ➔ Use AP disconnect button or disengage AP circuit breaker

3.7 Inadvertent loss of visual references, loss of control

Press the mode **LVL** (Level) in the G3X touchscreen AP menu.
The AP will engage (if disconnected) and return the aircraft to a level flight:

- Wing leveled
- Climb rate to 0 ft/min.

WARNING
Flight in IMC is not approved.

3.8 Autopilot annunciations

3.8.1 AP

Red AP annunciation or  means autopilot failure, autopilot is inoperative.

- Fly the aircraft manually
- Try to reboot the autopilot with AP breaker.

Amber AP annunciation means the autopilot has been disconnected.

- Fly the aircraft manually.

3.8.2 AFCS

Red AFCS annunciation means flight director and autopilot failure, autopilot is inoperative.

- Fly the aircraft manually
- Try to reboot the autopilot with AP breaker.

3.8.3 MIN SPEED

Amber MIN SPEED indication indicates aircraft is approaching minimum autopilot airspeed (130 km/h), AP will lower aircraft nose to increase airspeed.

- Reconsider AP vertical mode setting

3.8.4 MAX SPEED

Amber MAX SPEED indication indicates aircraft is approaching maximum autopilot airspeed (270 km/h), AP will raise aircraft nose to decrease airspeed.

- Reconsider AP vertical mode setting

3.8.5 ↑ TRIM UP ↑

As autopilot includes auto-trim feature, amber TRIM UP annunciation may only appear in case of auto-trim failure. In this case:

- Check Trim breaker is engaged
- Manually trim up the aircraft according to instruction
- Manual trimming may disengage the AP, be ready to fly manually the aircraft

3.8.6 ↓ TRIM DOWN ↓

As autopilot includes auto-trim feature, amber TRIM DOWN annunciation may only appear in case of auto-trim failure. In this case:

- Check Trim breaker is engaged
- Manually trim down the aircraft according to instruction
- Manual trimming may disengage the AP, be ready to fly manually the aircraft

SUP 01 - 4. Normal procedures

4.1 Holding point check

1.	Autopilot	*ENGAGE (using AP touch button)*
2.	Flight controls	*CHECK*
Verify autopilot can be overpowered in both pitch and roll		
3.	AP DISC button	*PRESS to disengage*
Verify autopilot disengages and audio alert is heard		
4.	Flight controls	*CHECK*
Verify autopilot servos are disengaged from pitch and roll controls, and all controls move freely		
5.	Elevator and aileron trim control	*SET FOR TAKEOFF*

SUP 01 - 5. Performance

No change.

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SUP 01 - 6. Weight & Balance

No change.

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SUP 01 - 7. Airplane & Systems Descriptions

7.1 Autopilot system description

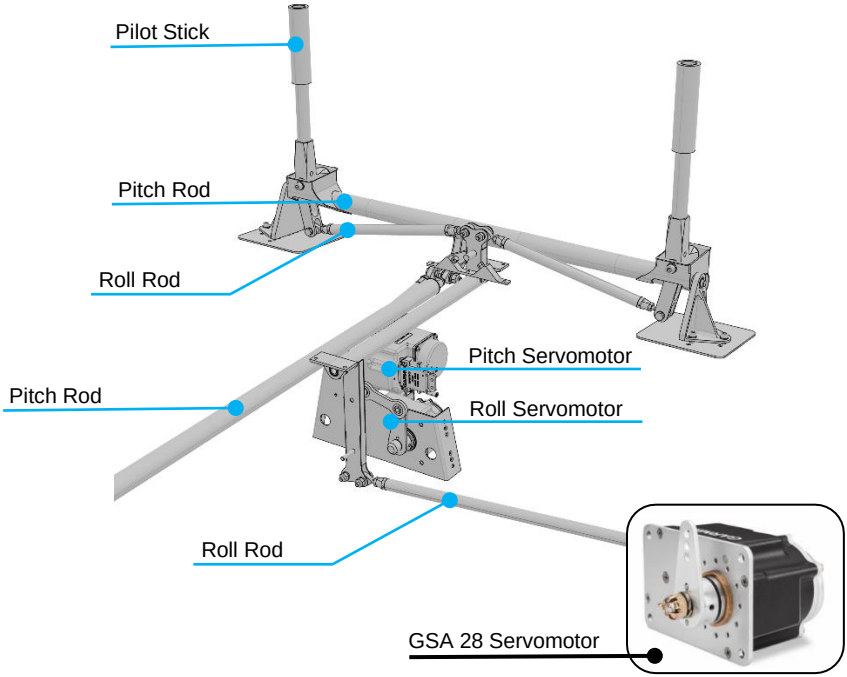
7.1.1 General description

The autopilot system is part of the G3X system. The following elements play a role in the autopilot functions:

- Two Garmin GSA 28 servomotors for pitch and roll control
- Pitch and roll trims: can be controlled by autopilot
- GDU 460: G3X display for autopilot interface with pilots
- AP disconnect switch(s) on pilot(s) stick grip(s)
- AP circuit breaker

Note
The system sends audio information to the pilot's headsets. VHF should always be switched ON and headsets worn when using AFCS.

Garmin GSA 28 servomotors are installed in the central tunnel of the aircraft. The roll servo is connected to the central bell crank and the pitch servo is connected with a rod to the pitch control rod as shown on the picture below:



The servomotors are powered by the main BUS and can be shut down with a circuit breaker on the instrument panel. They communicate through the CAN bus with G3X system.

The A/P is factory-set so that servomotors can be easily overpowered by pilots.

7.1.2 AP interface

Apart from AP disconnect switch (on top of pilots stick grips) and AP circuit breaker (on instrument panel RHS), the autopilot is fully operated with the G3X touchscreen display.

Autopilot controls are displayed in a pop-up window when AutoPilot status box is touched.

A/P is comprised of a Flight Director (FD), which controls pitch and roll servomotors. When FD is active, it is displayed on the G3X, aircraft can be hand flown to follow A/P modes.
When A/P is active, the A/P servos drive the pitch and roll flights controls so that aircraft follows FD commands.

Autopilot display: FD mode and default ROL and PIT engaged
Servomotors do not drive flight controls.

Autopilot display: AP mode and default ROL and PIT engaged.
Servomotors drive the flight controls to follow FD commands.

Autopilot modes:
AP Engages/disengages the autopilot.
FD Activates/deactivates the flight director only
LVL Engages the autopilot (if the autopilot is disengaged) and brings the aircraft back to a steady level attitude

Horizontal modes:
HDG Selects/deselects heading mode
TRK Selects/deselects track mode
NAV Selects/deselects navigation mode.
APPR Selects/deselects approach mode ***(Not available)***

Vertical modes:
IAS Selects/deselects Indicated Airspeed Mode
ALT Selects/deselects Altitude Hold Mode
VS Selects/deselects Vertical Speed Mode
VNAV Selects/deselects vertical navigation Mode

ESP:
When selected, ESP engages automatically when the aircraft approaches or exceeds one or more predetermined airspeed or attitude limitations. Stability protection for each flight axis is provided by the autopilot servos, which apply force to the appropriate control surface(s) to discourage pilot control inputs that would cause the aircraft to exceed the normal or "protected" flight envelope.

An aural alert can be heard in the headset to signal ESP activity.

> Note
> Disable ESP by holding AP disconnect button for 5 seconds

Nose Up / Nose Down:
Adjusts the vertical mode reference in Pitch Hold, Vertical Speed, Indicated Airspeed, and Altitude Hold modes.
As soon as AP status is an AP green, the autopilot servomotors are coupled with FD.
Touch screen and knob controls are directly accessible to the pilot.
Touch screen controls are labeled directly on the buttons with the direction of motion:

Left knob allow to control heading, altitude and track bugs. Knobs are labeled at bottom left and right of the screen. The direction of motion is clearly indicated by bugs motion on the HSI for TRK and HDG, on altitude scales for ALT.

The horizontal and vertical mode boxes indicate in green the current modes of operation. Modes indicated in grey are armed modes.

7.1.3 Autopilot Disconnection means

There are three different possibilities to disconnect autopilot when necessary. Those three means are totally independent.

Disconnection Mean	Action On System
AP disconnect button on pilots stick grips	Disengage autopilot, Command is sent directly to servomotors
AP button on touch screen	Disengage autopilot, Command Autopilot servos to disengage sent to servomotors via CAN bus
AP breaker on instrument panel	Switches off servomotor electrical power, servomotors declutch when not powered
A pressure on any TRIM button on both control sticks	Disengage autopilot, Command to disengage is sent to servomotors from the GAD27 via the CAN bus

All four means are easily accessible from both pilot's seats.

7.1.4 Detailed operation instructions

The G3X Touch Pilot's guide (section 9) details capabilities and functions of the optional Garmin ACFS autopilot system. This guide is available from Garmin's website or authorized dealers.

WARNING
Always refer to the present approved AFM for limitations (section 2) and emergency procedures (chapter 3).

SUP 01 - 8. Airplane Handling, Servicing & Maintenance

8.1 Autopilot handling, servicing and maintenance

Caution

If the autopilot servos are physically disconnected, specific electronic removal adapter dongles must be connected to the appropriate D-SUB connector plugs. Please refer to the Aeroplane Maintenance Manual and Garmin documentation. This operation must be logged in the maintenance records by authorized personnel only.

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SUP 01 - 9. Supplements

Non applicable

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SUP 01 - 10. Supplemental procedures

No change.

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