

## NX-FCU

### Flight Control Unit



## Features

### Overview

- Integrated navigation, flight control and mission management unit
- Unparalleled processing power, memory and onboard storage for its aircraft class
- Optional integrated multi-constellation GNSS and inertial sensors
- Unparalleled wide range of configurable I/O (Serial, Ethernet, GPIO, PWM, CAN, ADC)
- Optional integrated communication links
- Available in various flexible configurations, including redundant and non-redundant
- DO-254 Design Assurance Level C build variant and environmentally qualified for safety and certification

### Applications

- Fixed and rotary wing UAS
- Civil and military Tactical / Mini UAS
- SWaP sensitive unmanned systems

### Key Advantages

- Rugged and environmentally qualified (DO-160G) design
- Small, lightweight, and low power (SWaP sensitive)
- Safety-critical software and hardware (DO-254, DO-178)
- Highly reliable with redundancy and dissimilar hardware
- Customisable electrical and mechanical interfaces
- Very wide input voltage range

## Overview

The NX-FCU is the Small Form Factor (SFF) variant of S-PLANE's renowned X-FCU, a state-of-the-art flight control, navigation, and communication unit for fixed and rotary wing UAS. The NX-FCU was specifically optimised for Size, Weight and Power (SWaP), without compromising ruggedness, reliability or certifiability of the solution. The result is a highly functional yet physically compact design able to meet strict unmanned aviation regulations.

The NX-FCU is ideally suited to Tactical and Mini UAVs for both civil and military applications. Integrated navigation sensors, a wide range of highly configurable I/O and embedded communication links, provide it with the flexibility and capability of meeting almost any automation requirement. The NX-FCU is designed for reliability (a safety-centric approach), and offers optional redundancy, a rugged hardware design and a safety critical software architecture, making it the responsible choice for UAS system integrators aiming at system certification.

The NX-FCU is available in various build variants, ranging from dual redundant to non-redundant versions and can be applied as a Self-Checking Pair (SCP) or in a Dual Modular Redundancy (DMR) architecture. Contact S-PLANE for further information and support in selecting and configuring an NX-FCU for your system.

# NX-FCU

## Components

## NX-FCU CSMC

### Redundant FCU with Integrated Comms

The NX-FCU CSMC offers a tightly integrated dual redundant navigation, flight control, navigation and communication solution for UAS. Ideal for high-end Tactical and Mini UAS, this rugged, fault-tolerant and certification-ready unit, with dissimilar integrated communication, provides the ultimate in automation reliability in a SWaP sensitive design. C2 communication reliability is ensured through redundant LOS data links. Video streaming, archiving and retrieval is provided to round off this complete avionics solution.

#### Features

- Available as target hardware with Board Support Package (BSP), or as a complete appliance with flight software
- Fault-tolerant, SWaP sensitive FCU for Tactical/Mini UAS
- Rugged, highly reliable and safety certifiable (RTCA DO-178/254/160)
- Unrivalled processing power, RAM and SSD options
- Integrated redundant LOS communication
- Integrated redundant and dissimilar IMUs and GNSS (incl. RTK)
- An unparalleled range of software-configurable I/O

## NX-FCU CSC

### Redundant FCU without Integrated Comms

The NX-FCU CSC offers the ideal navigation, flight control and mission management solution for Tactical and high-end Mini UAS. Rugged, reliable and certification-ready, this highly functional unit provides unparalleled performance in a SWaP sensitive design. With integrated sensors, a wide range of highly configurable I/O, and dual redundancy the NX-FCU has both the flexibility and capability of meeting almost any automation requirement.

#### Features

- Full-envelope fixed and rotary wing navigation and flight control
- Rugged, reliable, SWaP sensitive and certification-ready (RTCA DO-178/254/160) Redundant flight control, integrated GNSS (multi-constellation), and inertial sensors
- Configurable I/O (Serial, Ethernet, GPIO, PWM, CAN, ADC)
- Ideal for civil/military Tactical and high-end Mini UAS

## NX-FCU Custom Variants

### Custom Configured Flight/Mission Controller

The NX-FCU is also available in various custom configured build variants, including:

- **CM:** Non-redundant control unit with integrated communication solutions. Ideal as rugged and reliable ground data terminals in mobile ground stations.
- **CSM:** Non-redundant control unit with integrated sensors and communication solutions.
- **CS:** Non-redundant control unit with integrated sensors. Ideal as rugged and reliable simplex controllers for smaller Mini UAS that do not require redundancy.
- **VSM:** Alternative Vehicle Specific Modules (VSM) such as single-board OEM solutions without enclosures. Ideal for rugged and reliable Mini UAS with tight SWaP and cost margins.

These units remain rugged, reliable and safety certifiable, and draw from the hardware and software building blocks of the NX-FCU to provide a responsible and highly functional automation solution for small SWaP sensitive systems and compact ground stations.

# NX-FCU

## Technical Specifications

	NX-FCU CSMC	NX-FCU CSC	NX-FCU CM
<b>GENERAL</b>			
Navigation	GNSS/AD-Aided INS (EKF)	GNSS/AD-Aided INS (EKF)	GNSS/AD-Aided INS (EKF)
Control	Fixed & Rotary Wing	Fixed & Rotary Wing	Fixed & Rotary Wing
Mission	Waypoint, Loiter, Follow	Waypoint, Loiter, Follow	Waypoint, Loiter, Follow
Health Monitoring	PBIT, CBIT, IBIT	PBIT, CBIT, IBIT	PBIT, CBIT, IBIT
Redundancy	Dual Redundant	Dual Redundant	Simplex Computer
Certification & Qualification	DO-254 & DO-178 & DO-160G	DO-254 & DO-178 & DO-160G	DO-254 & DO-178 & DO-160G
OS Support	Linux and PikeOS (other options available)	Linux and PikeOS (other options available)	Linux and PikeOS (other options available)
<b>SENSORS</b>			
GNSS Receiver	Redundant & Dissimilar	Redundant & Dissimilar	No
Internal Receiver Options	Novatel, Trimble, uBlox and Custom	Novatel, Trimble, uBlox and Custom	N/A
GNSS Heading	Yes	Yes	N/A
GNSS Accuracy: Differential	<2 cm	<2 cm	N/A
GPS & GLONASS	Yes	Yes	N/A
GALILEO & BEIDOU	Yes	Yes	N/A
IMU	Yes	Yes	No
<b>INPUT / OUTPUT</b>			
Software-configurable Multi-protocol Serial Ports	16x	16x	16x
GPO / PWM	16x	16x	16x
GPI / Input Capture	16x	16x	16x
Dedicated HILS Support	Yes	Yes	Yes
Ethernet	2x 1000BASE-T	2x 1000BASE-T	2x 1000BASE-T
CAN	1x CAN v2.0b	1x CAN v2.0b	1x CAN v2.0b
ADC	8x 16 bit	8x 16 bit	8x 16 bit
Dedicated Configuration / Console Ports	Yes	Yes	Yes
<b>TELEMETRY / C2</b>			
Internal Modem Options	Microhard, Satel, Silvus and Custom	N/A	Microhard, Satel, Silvus and Custom
Frequencies	UHF, L, S and C bands	N/A	UHF, L, S and C bands
Data Rate	Link dependent	N/A	Link dependent
LOS Range	30km to 100km for internal links	N/A	30km to 100km for internal links
Redundancy	Yes	N/A	Yes
Iridium Satellite	Optional	N/A	Optional
<b>VIDEO STREAMING</b>			
Video Input	2x 100BASE-TX	2x 100BASE-TX	2x 100BASE-TX
<b>MECHANICAL &amp; ELECTRICAL</b>			
Dimensions H x W x D	100 x 110 x 94 mm	100 x 110 x 94 mm	100 x 110 x 94 mm
Mass	1 360 g	1 090 g	860 g
Input Voltage	6.4 VDC to 32.2 VDC	6.4 VDC to 32.2 VDC	6.4 VDC to 32.2 VDC
Power (Typical)	35 W	25 W	25 W
Processors	Arm 1.4 GHz or Intel x86 1.2 GHz	Arm 1.4 GHz or Intel x86 1.2 GHz	Arm 1.4 GHz or Intel x86 1.2 GHz
RAM	4 GB DDR3 per computer	4 GB DDR3 per computer	4 GB DDR3 per computer
Data Storage	Dual 32 GB SSDs per computer	Dual 32 GB SSDs per computer	Dual 32 GB SSDs per computer

\*Number of ports indicated is maximum and depends on overall configuration. Specifications subject to change without notice.

# NX-FCU

## Environmental Qualification

BASIC	
Operational Temperature	DO-160G, Section 4 -40°C to +71°C at the conduction interface (cold plate surface)
Storage Temperature	DO-160G, Section 4 -40°C to +105°C
Operational Vibration	DO-160G, Section 8 0.04g <sup>2</sup> /Hz from 20Hz to 1kHz, dropping off at -6 dB/octave from 1kHz to 2kHz
Vibration Transport	MIL-STD-810G, 514.7, Procedure I (Cat 4, 5-500Hz)
Operational Shock	DO-160G, Section 7, Category B 20 g/11 ms
Certification	DO-160G, Section 6, Category B
INGRESS	
Fluid Susceptibility	DO-160, Section 11
Waterproofness	DO-160G, Section 10 (>IPx6)
Fungus Resistance	DO-160G, Section 13
Salt Fog	DO-160G, Section 14
Sand and Dust	DO-160G, Section 12 (>IP5x)
ELECTRICAL	
Magnetic Effect	DO-160G, Section 15, Category Z
Power Input	DO-160G, Section 16, Category B (Momentary Interruption: 25ms)
Induced Signal Susceptibility	DO-160G, Section 19
Radio Frequency Susceptibility	DO-160G, Section 20
Emission of RF Energy	DO-160G, Section 21

# S-PLANE X-KIT

## UAS Subsystems

The NX-FCU is used to automate mini and tactical UAS, while S-PLANE's X-KIT is used to convert certified piloted aircraft and HALE/MALE airframes into UAS or OPS. Comprehensive system-level functionality is enabled by the X-KIT, including S-PLANE's proven flight and mission automation, communication, ground control and simulation solutions. The X-KIT is used to automate both cargo transport and ISR systems. Software is seamlessly transitioned between the NX-FCU and the X-KIT and the NX-FCU is compatible with a host of X-KIT appliances (including ground control consoles, HILS, etc.).



### Contact Details

9B Cyclonite Road, The Interchange, Somerset West, South Africa, 7130  
 Phone: +27 21 851 9282, Fax: +27 86 298 4587  
 Email: [info@s-plane.com](mailto:info@s-plane.com), Web: [www.s-plane.com](http://www.s-plane.com)