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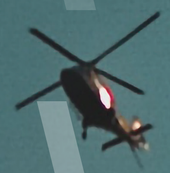

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PRELIMINARY TRIAL RESULTS OF INMARSAT SB HELO X-STREAM

NOVEMBER 2018

Introduction

There is increasing demand amongst government users and operators of rotary wing
platforms to not only remain connected, but to also enhance their capability through
the provision of simultaneous voice and data services to the airframe in flight.
This capability is becoming increasingly important for rotary wing operations, particularly in;

- Head of State transportation
- Medevac
- Search and Rescue
- ISR, and
- Utility missions

Traditionally, data service connectivity to rotary wing platforms has been negatively affected by the rotating blades interfering with satellite transmissions, impacting both the quality of service and achievable bandwidth. However, recent advancements in Inmarsat satellite technology, together with evolution of specialist streaming techniques, has effectively mitigated against this packet loss, ensuring resilient and reliable connectivity of services to and from the aircraft.

This paper introduces a new Inmarsat SwiftBroadband streaming solution, SB Helo X-Stream, currently been developed and tested by Inmarsat which will address these issues.

Please find contained within this document a summary of the functional performance of the solution, the solution features and basic system configurations, as trialled by Cobham on their Aviator SP series

SB HELO X-STREAM

Tailored specifically for rotary wing aircraft, SB Helo X-Stream is an Inmarsat streaming service, offering guaranteed on-demand streaming data rates over our L-band network. It is an enhancement of the existing X-Stream service, allowing an extra 1 dB in the link budget so as to mitigate the impact on data packets caused by the rotary blades. This enhancement effectively reduces the packet loss and jitter, improving the bandwidth and quality of service significantly.

This service achieves higher streaming performance on class 6.2 and class 7.2 terminals by conducting a change on the Link Condition Table (LCT) file to enable a more rotor resilient X-Stream service. This will allow helicopters fitted with a SB Helo X-Stream-capable terminals to realise better performance over existing services.

A successful proof-of-concept trial was conducted with Cobham, demonstrating a service enhancement that can be brought to market in order to meet the requirements of a sample sector of the rotary wing market. Feasibility assessment was carried out on test RNS 9 with access to several LCT configurations. These included testing the effects of various additional margins in link budget, and maximum data capture.

The field test was conducted on a Mi-8 platform in Hungary. During the testing, the class 6 terminal that was employed delivered extraordinary performance, achieving measured throughput speeds exceeding 430 kbps with minimal packet loss, when 1dB margin and no data capture are applied, as is shown in Table 1.

	BACKGROUND IP		SB HELO X-STREAM*	
	Return (TX)	Forward (RX)	Return (TX)	Forward (RX)
C/NO	56-57.5 dB		58-59 dB	
SPEED (UDP)	272 kbps	424 kbps	431 kbps	425 kbps
JITTER	18 ms	15 ms	6 ms	7 ms
PACKET LOSS	40%	6%	2.50%	0%

Table 1: Comparison Background and Streaming Data on a Class 6 Terminal in Field Test

* Throughputs figures are based on the current network configuration at the date and location of test. Actual throughputs experienced in the field will depend on the location, type of terminal, antenna installation, link conditions, type of traffic (UDP/TCP), application in use, encryption overheads etc

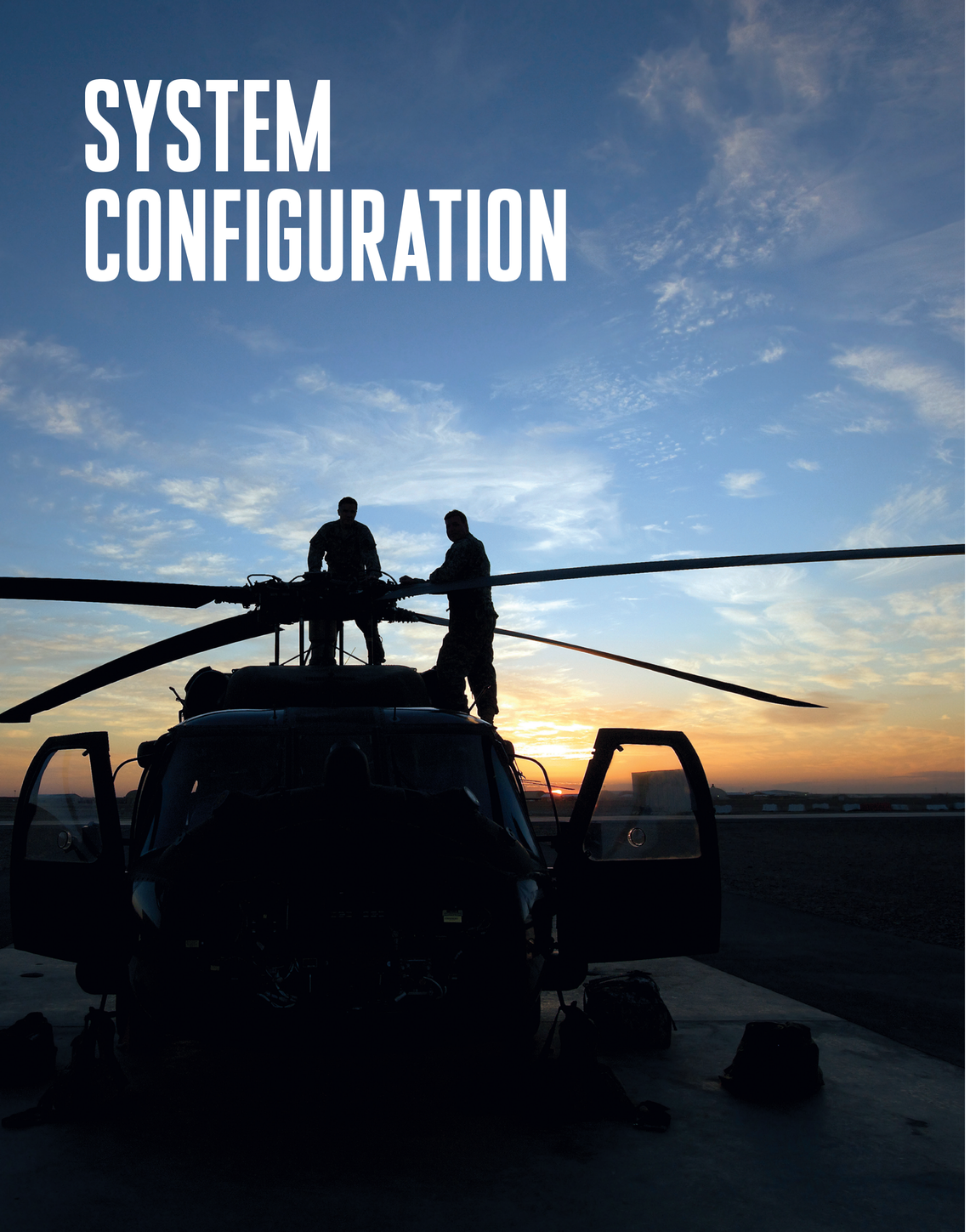
Cobham is currently the only terminal manufacture offering SB Helo X-Stream-capable terminals. A free of charge firmware upgrade is available for Cobham AVIATOR SP series product with IGA or HGA. Up to four channels can be connected simultaneously to support multi-link-capable applications in HGA (Class 6.2) deployments.

		SB HELO XSTREAM
TERMINAL CLASS		6 and 7
COMPONENT		SDU-7315/7320/7330 HPA-7450 DAU-7070 HGA-6000/6500/7001 or IGA-5001
SERVICE	No. of channels	1/2/4**
	Voice	Yes
	Background Data	Up to 332 kbps (Class 7) Up to 432 kbps (Class 6) (with significant packet loss)
	Streaming Data	431 kbps under test (Class 6)*

Table 2: System components and service capability of SB Helo X-Stream terminals

** 4 simultaneous channels can be supported when a HGA is used.

SYSTEM CONFIGURATION



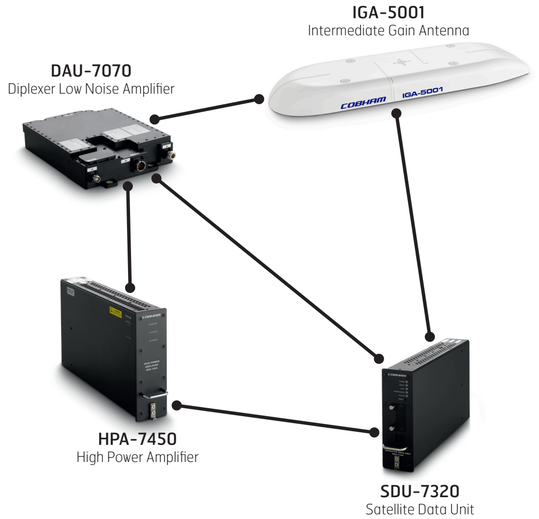


Figure 1: System configuration of 1 / 2 channel system employing an IGA (Subclass 7.2)

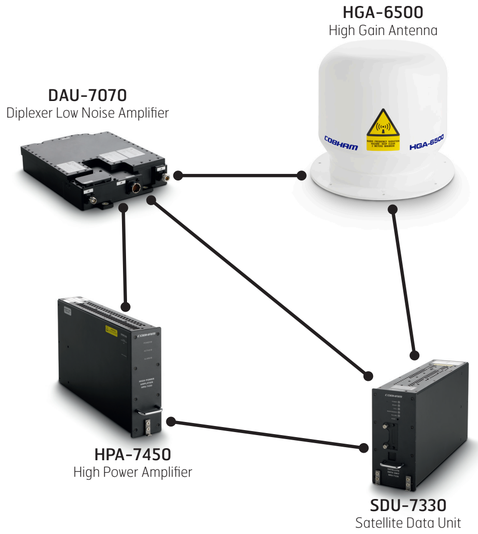


Figure 2: System configuration of 1 / 2 / 4 channel system employing an HGA (Subclass 6.2)

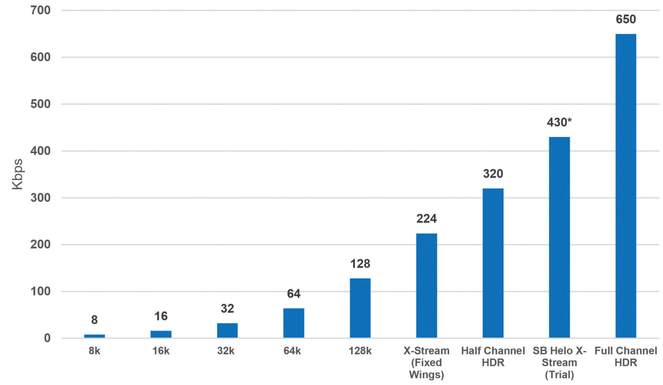


Figure 3: Data Rate of SwiftBroadband Streaming Services

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