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MANNED
ISR AIRCRAFT
WHITE PAPER

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COMMUNICATIONS MADE CERTAIN

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1. INTRODUCTION

This document is intended to give the reader a perspective on providing mission critical tactical and strategic Push to Talk (PTT) voice communications to and from an airborne ISR aircraft, operating beyond a traditional RF radio communications range or coverage area. The provision of enhanced BLOS tactical voice communications provides the aircraft flight commander a seamless interface that will easily interface to any type of radio network, agnostic to radio type, frequency and modulation. It will also provide seamless integration into the smart device domain.

2. BACKGROUND

One of the challenges that Inmarsat, and in particular the Global Government team have in fulfilling customer expectations, is ensuring that innovative solutions are incorporated at the scoping stage. This ensures that a customer is made aware of the global Inmarsat satellite capabilities across land, sea or air. Having these "solution" conversations with an end user or partner allows Inmar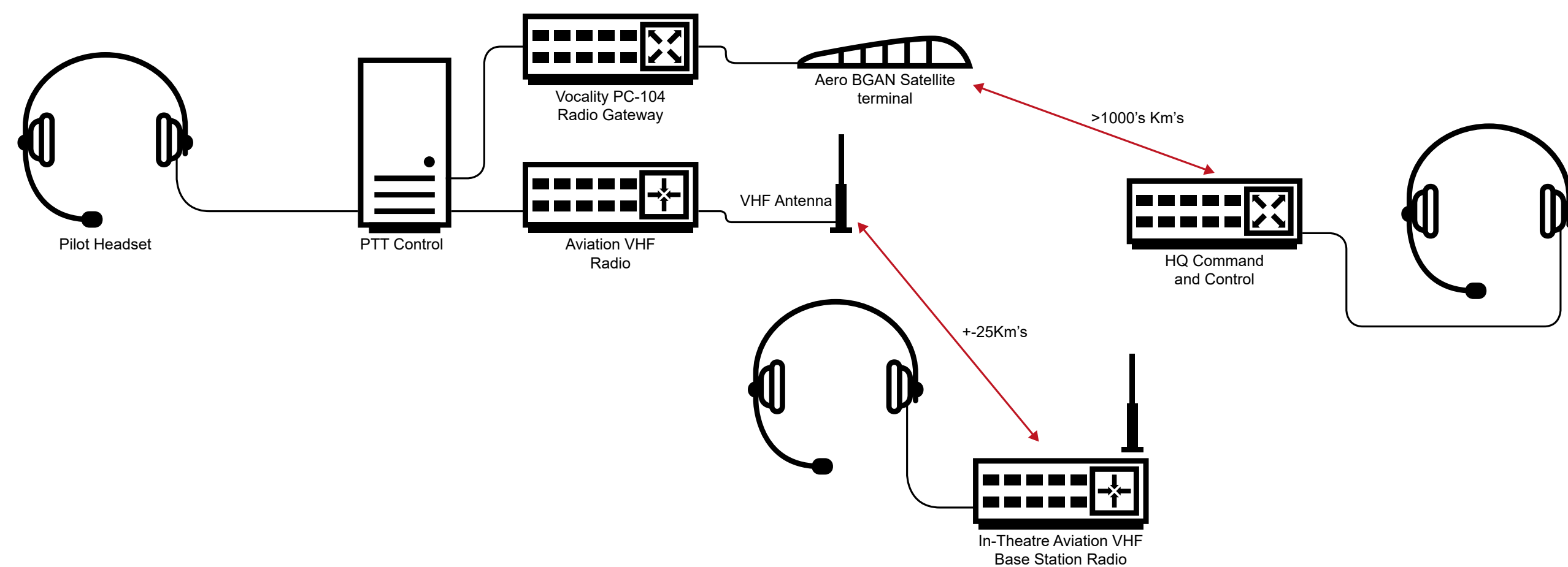sat to understand the modus operandi of the end user and thus allows Inmarsat to recommend bolt on solutions that are relevant to user requirements, as uncovered in these scoping conversations.

Aviation is a huge growth area within the government sector. As the size of both the aeronautical vessels and the suitable satcom equipment has decreased, so too has the capability which can be achieved off these platforms increased. By working closely together to understand the operational requirements, bespoke and COTS solutions can be applied to help increase these operational efficiencies. One such example is the provision of a Tactical Push to Talk voice solution that allow for the communication of mission critical information in real time amongst various stakeholders, within the theatre of operation, be it on land, at sea or on the airborne platform.

3. CHALLENGES

During a tactical manned ISR operation there is typically a need for the aircraft to report findings and receive mission changes and directions and these are often required beyond the line of sight of the on-board RF radio.

In order to achieve real time in-theatre communications with stakeholders on the ground, it is essential that these stakeholders carry a similar radio to that installed on the ISR aircraft. This would entail a typical having to carry their traditional Military radios as well as a second radio so as to receive the aircraft transmissions. As this is not always practical, a more efficient solution is needed to provide seamless tactical voice communications.

Pilot Headset

PTT Control

Vocality PC-104 Radio Gateway

Aviation VHF Radio

VHF Antenna

Aero BGAN Satellite terminal

>1000's Km's

HQ Command and Control

+-25Km's

In-Theatre Aviation VHF Base Station Radio

4. THE SOLUTION

In order to enhance the tactical voice capabilities of a manned ISR aircraft within its theatre of operation, whilst also providing BLOS strategic voice capabilities, the aircraft should be fitted with an Inmarsat SwiftBroadband satellite IP terminal and a Vocality PC-104 Radio Relay gateway, at the minimum.

This will give the aircraft the capability of integrating tactical voice communications into the global IP infrastructure by utilising Radio over IP (RoIP).

RoIP will provide the aircraft with the capability to send and receive radio-type transmissions to and from any point on the earth, thus allowing the aircraft to operate well beyond line of sight of traditional radios. RoIP will also integrate with any type of radio that is located in the theatre of operation, such as security and civil agencies using traditional VHF radios, or defence forces using UHF military radios. This provides seamless integrated Radio network.
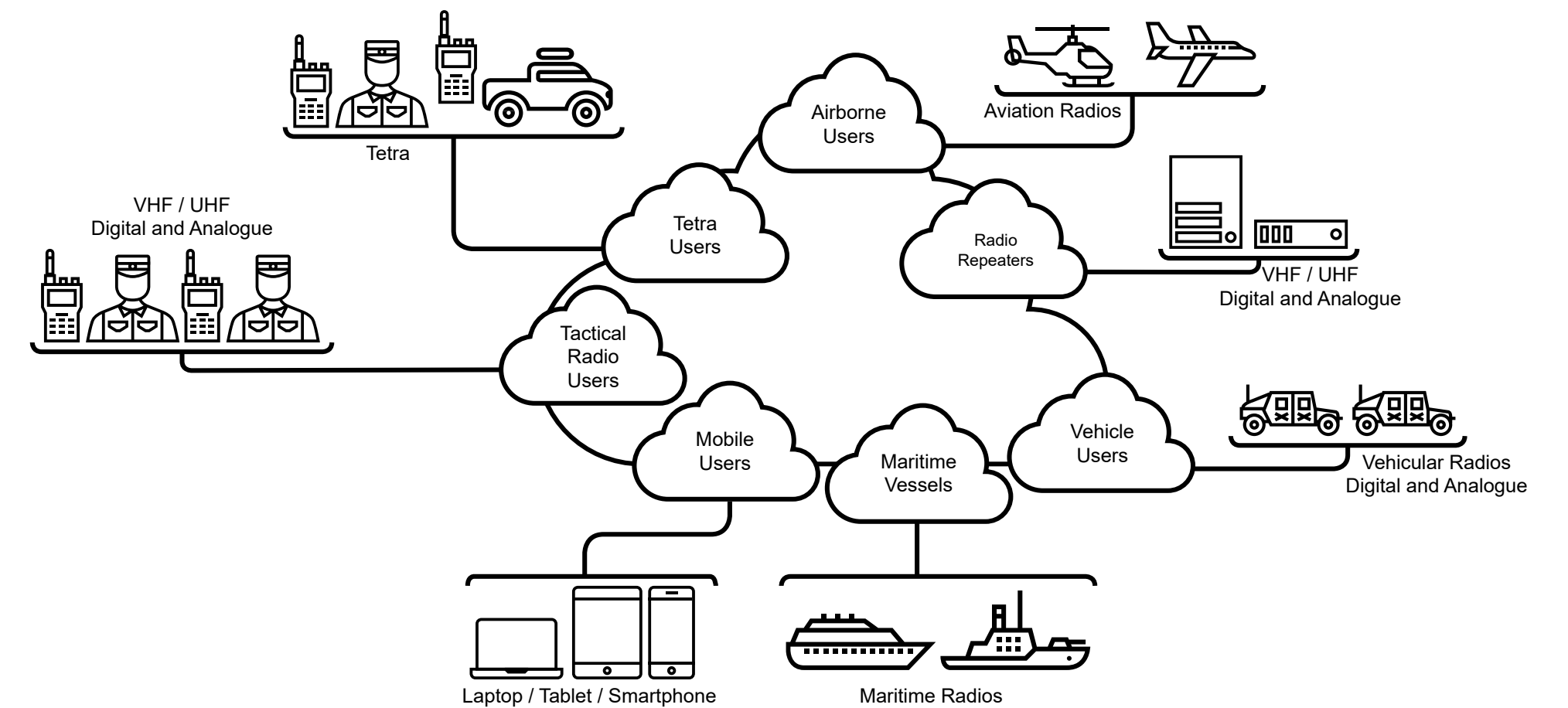
5. EXTENDED CAPABILITY USING ROIP

Extended capability of tactical and strategic RoIP voice communications now allows the ISR platform to be in constant real-time contact with forces both on the ground, in the immediate theatre of operations, as well as BLOS Head Quarters and Regional Command centres. It also provides the capability for interoperability with foreign forces, should the need arise.

Once this solution is included into the aircraft communications platform, this provides the aircraft with the capability to be seamlessly connected to any radio network or Digital RoIP platform. It also includes the interconnection of 3G/LTE smart devices when the need arises.

HOW DOES THE ROIP SOLUTION WORK?

RoIP means Radio over Internet Protocol, RoIP. RoIP is the process whereby the audio stream/audio feed from the microphone is intercepted by the Vocality Radio Gateway and compressed into a digital IP stream. This output, the IP stream, is transmitted over an IP carrier of any sort - BGAN Terminal, ADSL, 3G carrier. This is received by the recipient's radio gateway, uncompressed back into an analogue signal and sent to the speaker input. It is played either as audio or transmitted by the radio transmitter connected to the Gateway.

As this Gateway provides the compressed IP packets, these packets can now be transmitted over any carrier. The packets can also be repeatedly transmitted, so that if the packets need to be sent over a 3G network, ADSL and Satellite terminal, this can be done simultaneously with no degradation to the voice quality.

In the case of the illustrated solution (Figure 1) being fitted into an aircraft, an audio PTT (Push-to-Talk) controller will be utilised to either have solo communications to the fitted aero radio, or split audio between the fitted aero radio and the Vocality radio gateway, or just audio directly to the Vocality Radio Gateway. This will allow the pilot to be in control of what information he sends and on what medium.

The advantage of the RoIP solution being fitted into the aircraft is that it also allows the HQ command and control station to be programmed with various RoIP inputs from a variety of sources Military, Police, Border Guard, etc are all able to patch these directly into the aircraft communications system, as required during joint operations. No configuration changes need to be made on the aircraft at any time as all change inputs are done at the central HQ command centre.

If additional, foreign radio networks or RoIP networks need to be connected, this again can be done at the Command and Control centre, thus making Configuration, Change Control and Management simpler.

6. ADDITIONAL ADVANTAGES

Once the aircraft is fitted with the SwiftBroadband IP Terminal, this will allow the aircraft to add additional features such as file transfer of ISR images, video, and other sensor information back to controllers on the ground, even if these sensors make use of various different control stations located around the world. As the information is in IP format, it can be transmitted globally.

Live aircraft tracking will also be possible as the satellite terminal provides GPS tracking points and these points can be transmitted to any back office tracking portal or integrated into military C4 centres.

As the Satellite terminal also provides for a telephone connection, it is possible to make calls to any telephone number while in flight as well as receiving in-flight telephone calls.

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