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HELICOPTER RADIO COMMUNICATION GENERAL TRENDS

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HELICOPTER RADIO COMMUNICATION

GENERAL TREND

In modern conflict implementing all of the Armed Forces components, the capability to perform in real time the information exchange, for the command and coordination of units is a decisive factor required for the efficiency of armed forces.

Assure secured routing safety and protection of the information against threats related to Electronic Warfare, take into account the diversity and growth of information exchanges between Systems, assure faultless interoperability between Army and Air Forces and Navy, such are the requirements imposed to Communications of Army Aviation.

In such a context, the Communication system of Army Aviation helicopters relies on all of the HF, V/UHF frequency ranges, C/D band for MIDS, and satellite bands to perform voice, message and tactical data transmission services.

1. COMMUNICATION SYSTEMS

In the field of tactical Radiocommunications, the threat change related to Electronic Countermeasures, perceived by the year 2000, and the constant increase of needs in secure voice and data communications have led a number of Nations to study new systems designed to replace the existing equipment which are less suitable for such new operational requirements.

Frequency Hopping Communication Technique is one of the most commonly method used to resist to electronic countermeasures.

This technique consists in changing in a pseudo-random way the transmit frequency at the highest possible rate. The frequency generation algorithm is a TRANSEC-type (TRANsmission SECurity) algorithm which is initialized through ciphering key and reference time. For each system-defined time increment, a new frequency is calculated.

In addition to the aspect regarding the protection against Electronic Warfare effects, a fundamental characteristic required by military users consists in the system interoperability aspects. As a matter of fact, military actions are contemplated in a coordinate way, with either other Forces (Navy, Air Force) or NATO Allied Forces.

To achieve such actions, it is mandatory to be able to communicate in compliance with a common standard agreed by the different NATO countries.

1.1. PR4G SYSTEM

Selected by France and Netherlands Armies, PR4G system includes four transceivers sets (hand-held, manpack, vehicular and airborne), as well as many accessories among which the operating handset and the tactical terminal.

This system, operating in the 30 – 88 MHz band, enables all of the Army components to communicate in a secured way.

In particular, the Airborne transceiver provides the helicopters with a new transmission capability interoperable with ground units. This system allows all of the PR4G-family services:

- Voice transmission,
- Data transmission from 50 to 16000 bits/second,
- Alert transmissions,
- Priority call,
- Hailing frequency,
- Late entry in networks.

The signal transmission is performed either by an Automatic Link Establishment system, or in frequency hopping mode. Both operating modes are compatible with each other and selection of them is performed by the calling transceiver.

1.2. SATURN SYSTEM (Second Generation Anti-Jam Tactical UHF for NATO)

NATO military users have expressed the need in a new system of UHF transmission, in the 225 – 400 MHz, entirely interoperable and better adapted than the current standard (STANAG) with slow frequency hopping (Have Quick).

Analyzing the threat beyond the year 2000 has been performed by experts of each Nation. The analysis led to set up a system based on the technique using high speed frequency hopping. The so-defined waveform can be compared to the link layer in the ISO classification and includes, in particular, the frequency hopping rate and type of modulation.

SATURN system procedures have been designed to resist to jamming, particularly, the following should be mentioned:

- the end of communication,
- the priority call,
- the hailing assuring ascending compatibility with radio equipment operating at fixed frequency.

SATURN system is provided for performing the future NATO data transmissions in UHF range (225 – 400 MHz).

1.3. MIDS SYSTEM (Multiple Information Distribution System)

MIDS system is a radiocommunication system which is defined by two NATO standards, the one describing the system waveform and basic services, the other describing the link communication services.

MIDS system operates in the 960 – 1215 MHz band and uses the time division multiple access Technique (TDMA). To allow the information flow control, the system is organized in multiple networks.

Depending on the type of message used, the possible rate on a network may vary from 25 to 200 kbits/second.

MIDS system provides the following Communication services:

- Voice transmission,
- Formatted-data transmissions,
- Free-text transmission.

MIDS system, by its interoperability possibilities, its TDMA structure, its high resistance to jamming which permits transmitting tactical information in real-time, is particularly well suited to perform the Communications of the various components on the battlefield:

- Helicopters,
- Command post,
- Air defence of the battlefield,
- Surveillance aircraft (AWACS, ORCHIDEE, ...),
- Air defence ship and aircraft carrier.

2. GLOBAL APPROACH TO COMMUNICATIONS

Presenting the previous three Communication Systems is sufficient to demonstrate the diversity of provided services and the complexity growth for such services.

Communication Systems are characterized by:

- Resistance to Electronic Warfare:
 - New waveforms.
 - Radioelectric discretion.
 - Ciphering.

- New services:
 - Data transmission.
 - Automatic transmission of tactical information.
- New transmission media:
 - Satellite.
 - Millimetric and optical frequency range.
- Gateways between systems:
 - PR4G to MIDS.
 - MIDS to SATURN.
 - ...

In addition to these functional aspects, the Communication Systems for the future helicopters should also meet the following criteria:

- Ruggedness,
- Friendly Operating Interface,
- Adaptability,
- Versatility,
- Interoperability.

The growing importance of Communications in the future helicopters requires close co-operation between aircraft manufacturer (helicopter manufacturer) and Communication Industry so that the aircraft integrates under the best conditions the services provided by new Communications systems.