REPORT 1033-1

VHF RADIOTELEPHONE SYSTEMS WITH AUTOMATIC FACILITIES FOR THE MARITIME MOBILE SERVICE

(Question 73/8)

(1986-1990)

General

Several administrations have developed and operate VHF maritime mobile systems with automatic facilities for connection to the public switched telephone network (PSTN).

The major characteristics of the systems operating in France, Italy and Australia are given in Annexes I - III.

ANNEX I

THE FRENCH SYSTEM

1. General characteristics of the system

France has brought into service a system which permits semi-automatic operations from ship to shore using the channels in Appendix 18 to the Radio Regulations and fully automatic operation in both directions using channels adjacent to Appendix 18 channels that are available in France.

The semi-automatic or automatic mobile station retains all the existing facilities for calling and handling calls in the manual service.

2. Principle of operation

2.1 *Manual*

The principle remains the same for manual operation using the channels in Appendix 18 to the Radio Regulations.

2.2 *Semi-automatic*

Manual access to a channel in the shore-to-ship direction and automatic dialling for access to the PSTN by using Appendix 18 channels.

2.3 *Automatic operation in both ship-to-shore and shore-to-ship directions for access to and from the PSTN*

The carrier of the free channel is marked by a characteristic modulation. A shore-to-ship calling channel is also characterized by a particular modulation.

3. Modulation and coding

For dialling and signalling, use is made of the audio frequencies and the code in Appendix 39 to the Radio Regulations.

4. Characteristics of the mobile station

The mobile station may be operated either in the simplex mode with a push-to-talk switch or in the duplex mode. Operation in the manual service remains unchanged.

For semi-automatic ship-to-shore operations, the mobile station uses a control box which may be either external or built into the set. The user selects an Appendix 18 channel used for semi-automatic service and which is determined as being free by listening. The dial tone is obtained by pressing the * key. The wanted number is dialled on the keyboard. Charging is stopped at the end of the call by pressing the # key, which is also used in the event of error. The wanted number can also be recorded and sent when the dial tone is received.

For fully automatic operations, the mobile station is of the integrated type. The mobile station automatically scans the channels allocated to the fully automatic service. The only operation is to set the station to the "pre-call" position, after which operation is exactly the same as for an ordinary telephone.

Further details are contained in [CNET, 1985].

5. Fixed infrastructure

The fixed infrastructure consists of central stations and coast stations containing the radio equipment. One central station may control up to sixteen transceivers, each operating on one channel, and may be at any distance from the radio equipment. The central station has a computer for storing the lists of subscribers it administers and charges. There are facilities for itemized billing.

For a shore-to-ship call, the radio charge is charged to the ship.

6. Service area

The French coasts are almost entirely served by the semi-automatic system. Entirely automatic operation in both directions began in 1985. It is expected to be fully installed by 1990.

7. Ship station identities

The system, which uses a five digit identity, can be adapted to a nine digit identity.

8. Number of subscribers - traffic

Since the service opened in 1979, the number of subscribers has risen to 2 000 in 1983 and to over 4 000 in 1985 and 15 000 in 1989. In 1988, 50% of the total VHF traffic was handled by the semi-automatic system. It is expected that the combined semi-automatic and fully automatic systems will handle about 80% of the total VHF traffic by 1990. The corresponding traffic will be carried over 50 or so channels.

9. Particulars of the service

The service is continuously open for ship-to-shore traffic.

Payphones can be incorporated in the system. Charging information can be automatically transmitted to the mobile station.

REFERENCES

CNET, [1985] Technical specification ST/PAA/TPA/1478 – Technical specifications of radiotelephones in the band 156-174 MHz. Centre National d'Etudes des Télécommunications, 92131 Issy-les-Moulineaux, France.

ANNEX II

THE ITALIAN SYSTEM

1. General characteristics of the system

In 1985 Italy developed a system which offers an automatic direct dial facility for maritime radiotelephony. The general characteristics are:

- the system uses digital messages for ship-shore-ship signalling;
- the call is made directly on the working channel;
- the system offers commercial service for voice and data transmission and a voice encryption facility;
- the system can be used on VHF or MF/HF maritime mobile frequencies;
- the system can be easily extended to support DSC operation;
- the system allows manual or automatic operations on the same working channels;
- the on-board unit is low cost, simple to use, easy to install and can be interfaced with existing full-duplex or semi-duplex, VHF or MF/HF radio equipment.

2. Principle of operation

The system has been developed to work in conditions of heavy traffic load with an FSK modem, operating in full-duplex mode in accordance with CCITT Recommendation V.21, with a transmission rate of 300 baud which allows for operation in the VHF or MF/HF bands. The digital messages are the most simple and effective for the type of use and reduce to a minimum the possibility of error. The type of protocol is asynchronous using horizontal and vertical parity checking, with automatic repetition in the event of error detection or no response. Special techniques are used to shorten the signalling message length, which is not fixed, but varies according to the content of the data field (0.3 - 0.8 s).

An exchange of ship-shore-ship messages allows the on-board user to follow the status of his call via the alphanumeric display on the on-board unit.

All signalling ship-shore-ship falls within the telephony audio bandwidth. In order to monitor the connection ship-shore, a signal indicating continued connection is exchanged every 60 seconds. The signal is suppressed when a data transmission is in progress.

In order to guarantee the on-board user security of use of his equipment and to facilitate billing, it is necessary to insert a personal password upon switching on the equipment. Direct dial connection is effected only when the computer has verified that the inserted password is valid for the identification code of the vessel (MMSI) which is automatically included in all messages. Once connection has been terminated, the coast station indicates the duration of the call in minutes/seconds and the reason for disconnection (e.g. end of call, out of range etc.).

The confidentiality of communication is assured by means of voice encryption. A dedicated switch on the on-board unit allows activation or deactivation of the encryption function.

The coast station equipment allows existing radio channels to be used in manual or automatic modes: the equipment recognizes the type of call being effected, and when the call is manual, the unit renders itself "transparent" towards the radio channel. In this way the system constitutes a stand-alone automatic unit which can be integrated with existing systems without disturbing the manual procedures.

There is provision for the on-board user to select data transmission and service (e.g. fax). It is also possible to address the call to a predetermined coast station.

The system is capable of being expanded to effect automatic and semi-automatic shore-to-ship connections. By means of one or more local or remote operator consoles, it is possible to monitor automatic traffic, direct calls to on-board users and provide manual service.

3. Billing system

The recording of information for billing is carried out by the system computer which stores the archives of users and accounting authorities. This computer, as well as recording all traffic connections, controls and records all operations which are effected on the system by an operator. The local computer can be linked to a central host computer for billing data transfer and archive updates. All data regarding traffic remains stored in the computer's memory.

4. Service area

In 1986 the system was fully tested at the coast station at Porto Cervo in Sardinia, and this system has subsequently been installed and opened to commercial traffic along the entire Italian western seaboard and elsewhere (11 coast stations). The automatic system is currently being extended to the remaining Italian coast stations and the network will be completed within the first quarter of 1990. It is foreseen that the service will be extended also to the MF/HF frequencies.

ANNEX III

THE AUSTRALIAN SYSTEM

1. General characteristics of the system

Australia operates a system which permits automatic operations from ship-to-shore, and semi-automatic operation from shore-to-ship, utilizing the channels designated in Appendix 18 to the Radio Regulations for public correspondence.

All coast and maritime mobile stations retain full manual operation capability for handling itinerant traffic.

2. Principle of operation

2.1 Manual

The principle remains the same for manual operations using the channels in Appendix 18 to the Radio Regulations.

2.2 Semi-automatic

Manual access to a channel in the shore to ship direction. This service includes a facility for automatic redialing of shore to ship calls, if initially unsuccessful, to the ship in question on a fully automatic basis.

Automatic access in the ship to shore direction to the PSTN is provided after selection of an available VHF channel on a manual basis .

3. Modulation and coding

For dialling and signalling, use is made of standard DTMF audio tones.

4. Characteristics of the mobile station

Any mobile station of any manufacture complying with Appendix 19 to the Radio Regulations can be used in either the simplex or duplex mode for manual service.

For semi-automatic service, only an inexpensive replacement microphone is required. The mobile user selects a free VHF maritime public correspondence channel as determined by listening, and then enters the number required on the keypad. The complete information regarding the ship station identity is held in microprocessor read-only memory (ROM) and this, together with the number required, is sent to the coast station for processing and the connection of the call to the PSTN.

Several check systems operate during the establishment of the call, these include: valid subscriber check, valid number check, and valid sequence check. Stages of the call are responded to by synthesized voice announcements, e.g. "Thank you for calling Sydney Radio, your call is being dialled now".

Vessels may also interrogate the system for waiting shore to ship calls by simply selecting a channel and pressing the "#" key. This causes the computer to check the traffic list for any calls for that vessel. If calls are present, a recorded message will advise that a call is waiting. The system then automatically dials the call as if it were a semi-automatic ship to shore call, except that the call is billed to the shore subscriber.

An additional feature is the capability of extended area ship-to-ship calling. By sending a special code the vessel can change the channel configuration of the coast station from two frequency duplex to two frequency repeater operation. Once this is accomplished the ship required is voice called by the originating ship, thus enabling extended distance communications.

If any ship dials "999*" then this is registered as an emergency call, and all of the ship's vital information, i.e. type, construction, mode of power etc., is automatically displayed at the coast station. This signal can be sent on any active channel, including channel 16.

5. Fixed infrastructure

Any existing VHF coast station hardware can be utilised. There are two master computers, each containing duplicate information at the major coast stations in Sydney and Perth. These contain the entire system database of programs and subscriber information. Smaller cities have their own databases which communicate with the master database by modem when required. The maximum number of stations serviced is only dependent on the size and type of computer utilised. Currently Australia has in excess of 30 public correspondence channels in operation.

The computer infrastructure is capable of handling transmitter control at three levels of service: manual, semi-automatic and proposed DSC operations, all from the same operator's console, by means of software/hardware enhancements.

6. Service areas

The Australian coast is covered for all populated areas with semi-automated service.

7. Ship station identities

The system uses a seven digit ship station identity code. This is software addressable to any other configuration including the DSC 9 digit system.

8. Number of subscribers - Traffic

The service commenced operation in 1988. The current subscriber level stands at 3700 units. Projected use by 1995 is 10000, by the year 2000 subscriber level is expected to be 20000.