

REPORT 588-1

**BLACK AND WHITE FACSIMILE TRANSMISSIONS OVER COMBINED METALLIC
AND RADIO CIRCUITS IN THE MARITIME MOBILE SERVICE
AND IN THE MARITIME MOBILE-SATELLITE SERVICE**

(Question 20/8)

(1974-1978)

1. Introduction

Interest in maritime public correspondence facsimile continues to be small, although there are indications that it will develop in the future. It is therefore desirable that the preferred characteristics of a system are identified and specified. It is necessary to note that a maritime facsimile service might take place over MF/HF, VHF and satellite radio circuits and that in formulating any set of technical characteristics it is necessary to take into account the specific requirements of these different frequency bands.

2. Uses of facsimile and operational aspects

2.1 It is considered that facsimile transmissions can have special advantages for the safe and efficient operation of ships. In addition to the already existing WMO meteorological transmissions, facsimile could be used for broadcasting navigational warnings. The transmission of documents in both the shore-ship and ship-shore directions makes possible the rapid and accurate interchange of technical information and diagrams.

2.2 Several administrations have stressed the operational advantages of being able to carry on telephone conversations between ship and shore, changing over as required for the interchange of documents by facsimile without the need for intervention by the coast station operator. Ideally there is a need to permit the transmission of both emissions on the same radio channel. However, several administrations had strong reservations about this and, indeed, reservations about the general development of maritime public correspondence facsimile services, bearing in mind the further overloading of the already congested maritime frequency bands that would ensue. This limitation does not apply to the maritime mobile-satellite service.

2.3 In Norway, facsimile transmissions are performed both as broadcast of news to ship stations and as part of ordinary correspondence between ship stations and subscribers in the public network, with equipment operating in accordance with the CCITT system specifications. The United States transmits information on the state of ice to ships on the Great Lakes, using standards similar to those of the WMO, but has also identified a need for public correspondence ship-to-shore and ship-to-ship facsimile communication utilizing 8½ inches by 11 inches (21.6 cm by 28 cm) pages in association with radiotelephone calls. For this purpose, it is not practicable to employ WMO standards which accommodate continuous-roll paper of 19 inch (48.3 cm) width. Technical standards for this facsimile communication system would have some common parameters with both WMO and CCITT standards, but there are also some important differences which make it incompatible with either.

Some other administrations, including the United Kingdom, have carried out trials of facsimile, but do not operate a service at the present time.

3. System characteristics**3.1 General**

There is general agreement that, as far as possible, all maritime public correspondence facsimile should adopt a single set of standards. However, there are two sets of characteristics in international maritime use at the present time: that specified by the World Meteorological Organization* for the transmission of weather maps and that specified by CCITT** for transmission over metallic circuits.

* WMO Manual on the Global Telecommunications System 1974, Volume 1, Part III.

** CCITT, Volume VII, Recommendation T.10 *bis* (revised 1976).

3.2 *Centre frequency and "black" and "white" frequencies*

It was noted that the centre frequency in general use for the transmission of meteorological charts was 1900 Hz in accordance with CCIR Recommendation 343. However, this Recommendation is generally concerned with transmissions over fixed radio circuits and would not normally include extension into the public telephone networks. It was considered, therefore, that it was not strictly appropriate to a maritime public correspondence facsimile service. It was also noted that, in accordance with Opinion 24 (Kyoto, 1978), weather chart transmissions intended for reception by ships use, in principle, direct frequency modulation of the assigned radio frequency. This Recommendation would also be inappropriate to a public facsimile service. It was agreed that whilst the adoption of a single centre frequency for the weather chart and public correspondence facsimile services was operationally desirable, the use of two different values would not pose insuperable problems and could be allowed for by slight adjustment to the tuning of radio receivers.

It was noted that whilst the WMO uses the lower frequency for "black" and the higher for "white" which is in opposition to the CCITT Standard there is no pressing need to standardize on this particular characteristic because most facsimile recorders are fitted with a polarity reversal switch.

3.3 *Index of Cooperation (IOC)**

The Index of Cooperation recommended by CCITT is 264 whilst that used by the WMO is 288. There are very strong reasons why neither of these specifications can be aligned to the other in regard to this characteristic. The Study Group considered that the CCITT value should be adopted as the maritime standard although one administration (United Kingdom) suggested that the slight distortion of picture aspect ratio that would be caused by the adoption of the WMO value of 288 could be tolerated in the public correspondence service.

3.4 *Scanning line frequency*

There was a consensus of opinion that the CCITT recommended scanning line frequency of 180 lines per minute** could be adopted since it would provide a reasonable compromise between rapid transmission of messages and protection against the effects of multi-path propagation over long-distance circuits.

It is understood that WMO weather transmissions over radio circuits do not normally use a scanning line frequency greater than 120 lines per minute although a speed of 240 lines per minute is also available on WMO equipments. However, some administrations favour the adoption of a value of 240 lines per minute, as permitted by the CCITT, since it would speed up transmission of messages and would permit reception on existing weather chart equipments operating on 120 lines per minute and is claimed to provide a satisfactory performance under multi-path propagation conditions. The Study Group considered therefore that a decision on this factor should be deferred pending further study of the problem. It is possible that a choice of scanning speed should be made operationally available to speed up transmissions when conditions are favourable.

3.5 *Start/stop control signal*

Some administrations considered that the CCITT type start/stop control signal used over metallic circuits might not be sufficiently reliable for general use over MF/HF radio circuits. It was therefore proposed that the WMO type start/stop signals*** that had been developed specially for radio circuits might be better for all maritime uses. Further study of this problem is required.

* The index of cooperation is defined as $1/\pi$ times the ratio between the line length and line spacing.

** The CCITT Recommendations do permit the use also of 240 lines per minute and other scanning speeds.

*** The *start signal* consists of alternate black and white signals repeated at a frequency of 675 Hz for a period of 5 seconds. The *stop signal* consists of alternate black and white signals repeated at a frequency of 450 Hz for a period of 5 seconds followed by 10 seconds of continuous black.

3.6 Choice of characteristics

It is considered that neither the CCITT nor WMO characteristics fully meet the requirements for HF/MF transmissions in all respects. The United Kingdom has suggested that WMO specifications be adopted as a whole for the maritime public correspondence facsimile service, save for the scanning speed which should be 180 lines per minute, because of the radio propagation problems to be encountered on the MF/HF frequencies and in the interest of compatibility with the weather map service.

However, although it was accepted that there was a need to have special control signals on the HF/MF service, it was felt to be premature to adopt the full WMO Standards at this stage for public correspondence services. It was also noted that transmission over VHF and satellite radio circuits would be sufficiently good to permit the use of the CCITT standards in full.

Nevertheless, there was general agreement on a number of characteristics as listed below:

| | |
|----------------------------|-------------------------------------|
| Modulation of sub-carrier | frequency modulation |
| Centre frequency (f_0) | 1700 Hz |
| "Black" frequency | $f_0 + 400$ Hz |
| "White" frequency | $f_0 - 400$ Hz |
| Frequency stability | ± 32 Hz over a 15-minute period |
| Index of cooperation | 264. |

4. Conclusion

The Study Group considered that either CCITT or WMO type of signals could be used satisfactorily for VHF and satellite communications.

Special control signals are probably required for HF/MF transmissions. These are likely to be incompatible with existing CCITT Recommendations.

Further work is required to determine the precise nature of these control signals and also the preferred value(s) of the scanning speed(s) for maritime use. It is, however, highly desirable that a single standard be established for use in the maritime mobile-satellite service.

Note 1. — Attention is also drawn to CCITT Recommendation T.3, on a 3-minute facsimile apparatus for use over the general switched telephone network and on the CCITT studies of a digital facsimile apparatus requiring a transmission time below one minute. These two apparatus might be of special interest for application on maritime mobile satellite and VHF connections.

Note 2. — The Director, CCIR, is requested to bring this Report to the attention of IMO, WMO and the CCITT.

REPORT 743-1

TRANSMISSION QUALITY ASSESSMENT OF DIGITAL CHANNELS IN MARITIME MOBILE SERVICES

(Question 42/8)

(1978-1982)

1. Introduction

Modern requirements with regard to the transmission quality of digital maritime HF channels raise a number of complex problems. The increasing requirements imposed on the maritime radiocommunication system can only be met by automation of message preparation, transmission and recording processes and of call set-up and error detection and correction procedures.

The CCIR has already made some progress in this direction:

- it has recommended a direct printing system with error detection and correction which has already been used by a number of countries for several years;
- valid solutions are being found to problems of establishing a digital selective-calling system designed to meet future requirements in the maritime mobile service.