Conference Preparatory Meeting for WRC-15
Geneva, 23 March - 2 April 2015

INTERNATIONAL TELECOMMUNICATION UNION

PLENARY MEETING

Source: Document CPM15-2/TEMP/32

Revision 1 to
Document CPM15-2/217-E
1 April 2015
Original: English

Working Group 5

PROPOSED MODIFICATIONS TO THE DRAFT CPM REPORT

CHAPTER 5, AGENDA ITEM 9.1, ISSUE 9.1.1

AGENDA ITEM 9.1

9 to consider and approve the Report of the Director of the Radiocommunication Bureau, in accordance with Article 7 of the Convention:

9.1 on the activities of the Radiocommunication Sector since WRC-12;

NOTE: Eight issues have been identified by CPM15-1 under this agenda item.

5/9.1.1 Resolution 205 (Rev.WRC-12)

Protection of the systems operating in the mobile-satellite service in the band 406-406.1 MHz

(**WP 4C** / **WP 5A, WP 5B, WP 5C, WP 7B, WP 7C**)

5/9.1.1/1 Executive summary

In accordance with Resolution **205 (Rev.WRC-12)**, ITU-R undertakes to conduct appropriate regulatory, technical and operational studies with a view to ensuring adequate protection of MSS systems operating in the frequency band 406-406.1 MHz as required by RR Nos. **4.22**, **5.267** and Appendix **15** (Table 15-2), taking into account the current and future services operating in the lower adjacent frequency bands (390-406 MHz) and upper adjacent frequency bands (406.1-420 MHz) or in separate parts of these frequency bands.

Permissible levels of interference for narrowband and wideband emissions were developed for three space segments (low Earth orbit (LEO), medium Earth orbit (MEO) and geostationary-satellite orbit (GSO)) in operation within the frequency band 406-406.1 MHz. Specified spurious emission levels indicate that the data collection platforms operating in the EESS do not produce in-band emissions exceeding the narrowband interference criteria. In addition, operation of radiosondes in the MetAids will not exceed the broadband measured sensitivity levels of the search-and-rescue receivers for LEO, MEO or GSO satellites.

Simulations run assuming deployment scenarios typical from CEPT countries show that the LEO component experiences interference due to mobile deployment from 406.1 to 407 MHz, while the

MEO component receives interference up to 410 MHz depending on the constellation.
The geostationary component shows severe interference due to mobile deployment within the 406.1-406.2 MHz frequency band.

Increased deployment of land mobile stations in the 406.1-420 MHz range may cause performance degradation for the LEOSAR Search and Rescue (SAR) processor, according to simulations run using characteristics of Canadian systems, which may not be representative for other Region 2 countries. The hypothetical deployment and growth rate scenario used, are not representative for current and may not represent future deployment in Region 2 countries. According to this study, MEOSAR (Galileo) within its larger footprint may be also affected by an increase of land mobile systems in the 406.1-406.2 MHz frequency band.

Concerning the impact of the mobile service in Region 3, one administration made dynamic simulations based on realistic land mobile deployment that show that interference levels in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz provide a significant amount of noise that will be detrimental to the reception of distress signals in the 406-406.1 MHz frequency band.

In order to ensure the protection of MSS systems operating in the frequency band 406-406.1 MHz, it is proposed adding a footnote to the Table of Frequency Allocations of RR Article **5** and modifying Resolution **205 (Rev.WRC-12)**.

5/9.1.1/2 Background

The 406-406.1 MHz frequency band is exclusively allocated to the MSS, which is currently used by the Cospas-Sarsat system for search and rescue space segment instruments. Since the introduction of the first elements of the Cospas-Sarsat system in 1982 (the LEO and GSO components), more than 36 900 persons (end of 2013 data) have been rescued worldwide with the assistance of the information provided by the Cospas-Sarsat system.

Receivers for search and rescue signals are carried on satellites with three distinctive orbits: LEO, which are generally polar orbits for Cospas-Sarsat, MEO, at an orbit of about 20 000 km, and GSO. Satellite footprints vary (LEO, MEO and GSO): 6% of the Instantaneous Field of View (IFOV) of Earth for LEO (LEO satellites only pass over a beacon a limited number of times a day), 38-40% IFOV of Earth for MEO/GSO footprints.

In the LEOSAR system, localization of distress radio beacons[30] depends on Doppler processing, which is based on successive measurements of the beacon transmit frequency via one LEO satellite at a time. For the MEOSAR system, which is currently under deployment, localization depends on measurement of Time Difference of Arrival (TDOA) and Frequency Difference of Arrival (FDOA). These measurements will significantly reduce the latency associated with the location of distress signal and increase the accuracy of the location provided but require simultaneous detection of the same beacon transmissions via multiple MEO satellites, and good C/No transmissions between the beacon and the satellites in order to get accurate TDOA and FDOA measurements. Emissions from systems operating in the frequency bands adjacent to the 406-406.1 MHz frequency band cannot be entirely filtered by the Cospas-Sarsat space segment and therefore add noise to the signal received. The resulting reduced C/N_0 obtained at the satellite receivers reduces the detection rates of the beacon transmission of all LEO, MEO and GSO systems (increasing the time required to provide a location to search and rescue operators) and the accuracy of the locations obtained for MEO systems (increasing the time required to perform search and rescue operations). Hence, in order to

[30] "Distress radio beacons" refers to emergency position indicating radio beacons (EPIRBs) for watercraft, emergency locator transmitters (ELTs) for aircraft, or personal locator beacons (PLBs) for individuals.

ensure reliable SAR performance, it is necessary to establish protection criteria for all types of existing and future MSS satellites operating in the frequency band 406-406.1 MHz from wideband and narrowband emissions from adjacent frequency bands.

Many administrations have deployed commercial land mobile systems operating near the 406-406.1 MHz frequency band, and other terrestrial operators are expected to request for additional capacities near this frequency band in the future. The emissions in adjacent frequency bands, if not adequately controlled, could raise the level of noise captured by the Cospas-Sarsat systems and hinder their abilities to detect and/or relay signal, from beacons and/or degrade the accuracy of the positions reported for the distress signals. It is anticipated that land mobile systems will be more densely deployed in the future with higher powers than with previous analogue deployments in the frequency range between 300 MHz and 3 GHz. This densification and higher power levels enhance the concerns regarding possible harmful interference caused by adjacent frequency band emissions. RR No. **5.267** and Appendix **15**, Table **15-2** apply.

The set of paired frequency bands 380-385 MHz/390-395 MHz are dedicated to Public Protection and Disaster Relief (PPDR) and the corresponding systems have been extensively implemented in many European countries. PPDR radio solutions are essential for public safety operations. PPDR systems need to be effective and adequate in their operation, nationally, cross border and regionally.

For most of the locations on the Earth (mainly over oceans), a distress beacon can be correctly received. Spectrum monitoring activity as required by Resolution **205 (Rev.WRC-12)** indicates a significant level of radio noise within the satellite footprint, especially over Europe and Asia, where the level of noise is quite high. The spectrum monitoring data showed that interference near the 406-406.1 MHz frequency band originated in multiple regions of the world has impacted both the transponder automatic gain control (AGC) or automatic level control (ALC) as well as adversely affecting the effective noise floor for distress radio beacon transmissions. These measurements highlight the need for protection of the 406-406.1 MHz frequency band in order to ensure that distress signals from all 406 MHz beacons (including weaker signals which are sometimes generated in challenging environments) could continue to be detected and successfully processed by the Cospas-Sarsat system.

5/9.1.1/3 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

The relevant ITU-R Recommendations: ITU-R F.758-5, ITU-R M.478-5, ITU-R M.1478-2, ITU-R M.1808-0, ITU-R M.1823-0, ITU-R M.2014-0, ITU-R M.2015-0, ITU-R SA.1627-0.

The relevant ITU-R Reports: Report ITU-R M.319-7, PDN Report ITU-R M.[AGENDA ITEM 9.1.1].

Permissible levels of interference for both narrowband and wideband emissions have been developed for the three space segments (LEO, MEO and GSO) in operation within the frequency band 406-406.1 MHz. Those levels represent the maximum amount of narrowband and wideband emissions within the frequency bands 390-406 MHz and 406.1-420 MHz. Those levels do take into account the passband filtering capabilities on board, valid for each of the space components of the Cospas-Sarsat system.

The background noise of the SAR receivers is the aggregate from several services in the adjacent frequency bands. The contribution of these services has been assessed separately.

Analyses have shown that for data collection platforms operating in the EESS within the frequency band 401 to 403 MHz, the aggregate transmitter power does not exceed the broadband interference threshold, assuming a maximum load of the EESS systems. The operation of these systems would

contribute only with a small fractional to the wideband interference budget for the LEO satellites (0.01564%). It contributes as much as 0.673% to the geostationary satellite receiver.

The results are significantly different between the two MEO satellites systems. It was calculated that the data collection platforms only contribute up to 1.84% of the wideband interference threshold for the Galileo satellite. The data collection platforms contribute 93.48% of the wideband interference value of the GLONASS receiver, which has a higher sensitivity.

In addition, it should be noted that if the threshold value of interference density is taken into account for the entire frequency range, then, the percentage of interference of the total allowable level will be the following: 0.258% of the threshold power value in the frequency band 390-405.05 MHz for Galileo; 0.00068% of the threshold power value in the frequency band 390-402.05 MHz and 10.91% of the threshold power value in the frequency band 402.05-405.05 MHz for GLONASS. These values are valid only when there is no interference from other systems operating in these frequency bands.

In addition, specified spurious emission levels indicate that the data collection platforms will not produce in-band emissions exceeding the narrowband interference criteria.

Operation of radiosondes in the MetAids will not exceed the broadband measured sensitivity levels of the search and rescue receivers for LEO, MEO or GSO satellites. In all cases the percentage of interference power to the SAR receivers is less than 6×10^{-3} per cent of the interference threshold.

Older, less-stable, radiosondes operating above 405 MHz could have the carrier drift into the SAR receiver band. However, this does not contribute to the overall increase in the SAR receiver noise background.

The impact of the operation of mobile systems in operation above 406.1 MHz has been assessed performing simulation using realistic deployment within the CEPT countries. Simulations show that the LEO component experiences interference due to mobile deployment from 406.1 to 407 MHz, while the MEO component receives interference up to 410 MHz depending on the constellation. The geostationary component shows severe interference due to mobile deployment within the 406.1 to 406.2 MHz frequency band. Concerning the impact of spurious emissions in the 406-406.1 MHz frequency band, no impact has been demonstrated.

The effect of increased land mobile system deployment in the 406.1-420 MHz band on the Cospas-Sarsat systems was studied by assuming land mobile system characteristics from Canada. Although the Canadian land mobile system characteristics are not representative of other Region 2 countries and the hypothetical baseline deployment and growth rate scenario are not representative of current deployment and may not be representative of future deployment and growth rate in Canada or other parts of the Americas, this study provides an estimation of potential increase of interference levels in the 406-406.1 MHz band due to increased deployment of land mobile systems under the hypothetical scenario. LEOSAR would receive unwanted emissions in excess of the maximum permissible level from land mobile stations as simulated (i.e. uniform distribution with 122 base stations and 3 096 mobiles) operating in the 406.1-407 MHz frequency band. Stations in the 406.1-406.2 MHz band in this simulation were most likely to exceed the maximum permissible levels. MEOSAR within its larger footprint may be affected by an increase of land mobile systems in the 406.1-406.2 MHz band.

Concerning the impact of mobile service in Region 3, one administration made dynamic simulations based on realistic land mobile deployment, that show that interference levels in the frequency band 405.9-406 MHz and 406.1-406.2 MHz provide a significant amount of noise that will be detrimental to the reception of distress signals in the 406-406.1 MHz frequency band. In the other frequency bands, the filtering pattern is sharp enough to eliminate all the out-of-band emissions.

In addition, observations made through MEOSAR payloads (GLONASS, GPS and GALILEO) have shown that there are strong interferers very close to 406 MHz, in particular at the lower part of the MSS band. Examples illustrate how adjacent-channel interference can increase the effective noise floor for reception of beacon transmissions within the 406 MHz band. These adjacent-channel emissions, although having lower amplitude than at frequencies higher than 406.1 MHz, can have a harmful impact on the reception of effective distress beacons in the 406 MHz band.

5/9.1.1/4 Regulatory and procedural considerations

5/9.1.1/4.1 General considerations

In order to protect the MSS systems in the 406-406.1 MHz, the following protection measures and mitigation techniques may be required:

– Concerning radiosondes (operated under the MetAids allocation, see RR No. **1.109**), it is recognized that they are not a significant contributor to the broadband interference levels to Cospas-Sarsat receivers. However, it is acknowledged that a frequency drift of older less stable radiosondes could be a cause of narrowband interference to the SAR receiver for radiosondes operating above 405 MHz. It is therefore proposed that administrations have to take into account frequency drift characteristics of radiosondes when selecting their operating frequencies above 405 MHz to avoid transmitting in the 406-406.1 MHz frequency band.

– LEOSAR, GEOSAR and MEOSAR systems space receivers could be designed with improved filters, which are planned for future generation of satellites.

– The use of more efficient forward error-correction (FEC) in the data transmission from the beacons is a possible mitigation technique. However, this technique has its limitations and implies longer distress messages leading to higher collision rates and decreasing of the overall system capacity. More efficient FEC in the data transmission will nevertheless be implemented on the next generation of 406 MHz beacons currently under development. The new beacons should have more resilient beacon-to-satellite transmissions which will potentially reduce the impact from systems operating in adjacent frequency bands. This mitigation technique cannot be envisaged for the 1.4 million beacons currently deployed and of which many are expected to remain in service for the next decade or so.

– A mitigation technique is to establish guardbands of 100 kHz right below 406 MHz and right above 406.1 MHz, and this mitigation technique provides protection according to calculations and observations provided in the PDN Report ITU-R M.[AGENDA ITEM 9.1.1]. The implementation of these guardbands would likely require regulatory measures and administrations should consider applying the guardband to new frequency assignments under the fixed and mobile services.

– Reduction in e.i.r.p. to space from terrestrial FS and MS systems in adjacent frequency bands may, in some limited cases, be another measure to protect Cospas-Sarsat. If possible and with respect to terrestrial systems, the method would be to adjust antennas or to reduce the power at the antenna port. However, taking into account that there are already thousands of terrestrial systems already in use in adjacent frequency bands to 406-406.1 MHz, it is not realistic to expect that the operators/users of these systems would/could modify their existing networks. Thus, this mitigation measure is not feasible due to the high number of existing systems operating in the 406.1-410 MHz frequency band, but might be considered for existing systems operating over a very limited portion of that frequency band such as 406.1-406.2 MHz in geographical

locations where terrestrial deployment is low. Depending on the design of adjusted antenna pattern, the Cospas-Sarsat system may not entirely benefit from the e.i.r.p. reduction, since this mitigation technique may not be applied in every direction, so some MSS systems may still receive interfering signals from other directions that do not take advantage of the antenna pattern improvement.

– Mobile systems in the adjacent frequency bands may be able to operate in other mobile channels nearby but with sufficient frequency separation from the 406-406.1 MHz frequency band. Therefore, there may be some regulatory measures that could be further explored. These measures could include voluntary temporary measures, such as encouraging administrations to authorize new stations starting from channels that are further away from the frequency band edges of 406-406.1 MHz or reducing the power at the antenna port of mobile systems, using mobile antenna patterns having reduced antenna gains at high elevation angles, or more permanent and stable measures through regulation.

5/9.1.1/4.2 Regulatory considerations

Resolution **205 (Rev.WRC-12)** could be revised with a view of having an adequate protection of the MSS in the frequency band 406-406.1 MHz in order to detect and successfully process 406 MHz distress signals, taking into account the current and future deployment of services in adjacent frequency bands.

ARTICLE 5

Frequency allocations

Section IV – Table of Frequency Allocations
(See. item **2.1**)

MOD

335.4-410 MHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
403-406	METEOROLOGICAL AIDS Fixed Mobile except aeronautical mobile ADD 5.A911	
406-406.1	MOBILE-SATELLITE (Earth-to-space) 5.266 5.267 ADD 5.A911	
406.1-410	FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY 5.149 ADD 5.A911	

ADD

5.A911 In the frequency band 403-410 MHz, Resolution **205 (Rev.WRC-15)** applies.

MOD

RESOLUTION 205 (REV.WRC-1~~2~~5)

Protection of the systems operating in the mobile-satellite service in the band 406-406.1 MHz

The World Radiocommunication Conference (Geneva, ~~2012~~2015),

considering

a) that WARC-79 allocated the frequency band 406-406.1 MHz to the mobile-satellite service (MSS) in the Earth-to-space direction;

b) that No. **5.266** limits the use of the frequency band 406-406.1 MHz to low-power satellite emergency position-indicating radiobeacons (EPIRBs);

c) that WARC Mob-83 made provision in the Radio Regulations for the introduction and development of a global distress and safety system;

d) that the use of satellite EPIRBs is an essential element of this system;

e) that, like any frequency band reserved for a distress and safety system, the frequency band 406-406.1 MHz is entitled to full protection against all harmful interference;

f) that Nos. **5.267** and **4.22** and Appendix **15** (Table **15-2**) require the protection of the ~~mobile-satellite service (~~MSS~~)~~ within the frequency band 406-406.1 MHz from all emissions of systems, including systems operating in the lower and upper adjacent frequency bands ~~(390-406 MHz) and in the upper adjacent bands (406.1-420 MHz)~~;

g) that Recommendation ITU-R M.1478 provides protection requirements for the various types of instruments mounted on board operational satellites receiving EPIRB signals in the frequency band 406-406.1 MHz against both broadband out-of-band emissions and narrowband spurious emissions;

h) that ~~studies are needed to adequately address the consequence of aggregate emissions from a large number of transmitters operating in adjacent bands and the consequent risk to space receivers intended to detect low-power distress beacon transmissions~~the PDN Report ITU-R M.[AGENDA ITEM 9.1.1] provides the results of studies covering various scenarios between the MSS and other relevant active services operating in the frequency bands 390-406 MHz and 406.1-420 MHz or in separate parts of these frequency bands~~,~~;

i) that unwanted emissions from services outside 406-406.1 MHz have the potential to cause interference to the MSS receivers within 406-406.1 MHz;

j) that long-term protection against harmful interference of the Cospas-Sarsat satellite system operating in the MSS in the frequency band 406-406.1 MHz is vital to the response times of emergency services;

k) that in most cases, the frequency bands adjacent or nearby to Cospas-Sarsat will continue to be used for various service applications,

considering further

a) that some administrations have initially developed and implemented an operational low-altitude, near-polar orbiting satellite system (Cospas-Sarsat) operating in the frequency band 406-406.1 MHz to provide alerting and to aid in the locating of distress incidents;

b) that thousands of human lives have been saved through the use of spaceborne distress-beacon detection instruments, initially on 121.5 MHz and 243 MHz, and subsequently in the frequency band 406-406.1 MHz;

c) that the 406 MHz distress transmissions are relayed through many instruments mounted on geostationary, low-Earth and medium-Earth satellite orbits;

d) that the digital processing of these emissions provides accurate, timely and reliable distress alert and location data to help search and rescue authorities assist persons in distress;

e) that the International Maritime Organization (IMO) has decided that satellite EPIRBs operating in the Cospas-Sarsat system form part of the Global Maritime Distress and Safety System (GMDSS);

f) that observations of the use of frequencies in the frequency band 406-406.1 MHz show that they are being used by stations other than those authorized by No. **5.266**, and that these stations have caused harmful interference to the ~~mobile-satellite service~~MSS, and particularly to the reception of satellite EPIRB signals by the Cospas-Sarsat system~~,~~;

g) that the results of spectrum monitoring and ITU-R studies contained in the PDN Report ITU-R M.[AGENDA ITEM 9.1.1] indicate that emissions from stations operating in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz have the potential to severely impact the performance of the MSS systems in the frequency band 406-406.1 MHz;

h) that the results of ITU-R studies indicate that increased deployment of land mobile systems operating in the vicinity of the 406-406.1 MHz frequency band may degrade the receiver performance of the mobile-satellite systems operating in the frequency band 406-406.1 MHz;

i) that the maximum permissible level of interference in the 406-406.1 MHz frequency band may be exceeded due to frequency drift of the radiosondes operating above 405 MHz,

recognizing

a) that it is essential for the protection of human life and property that frequency bands allocated exclusively to a service for distress and safety purposes be kept free from harmful interference;

b) that ~~the deployment of~~ mobile systems near the frequency band 406-406.1 MHz ~~is~~are currently deployed and more systems are envisaged ~~in many countries~~;

c) that increased ~~this~~ deployment raises significant concerns on the reliability of future distress and safety communications ~~since the global monitoring of the 406 MHz search and rescue system already shows a~~due to the increases in ~~high level of~~ the noise level measured in many areas of the world for the frequency band 406-406.1 MHz;

d) that it is essential to preserve the MSS frequency band 406-406.1 MHz free from out-of-band emissions that would degrade the operation of the 406 MHz satellite transponders and receivers, with the risk that satellite EPIRB signals would go undetected,

noting

a) that the 406 MHz search and rescue system will be enhanced by placing 406-406.1 MHz transponders on global navigation satellite systems such as Galileo, GLONASS and

GPS, relaying search and rescue emissions at 406 MHz, in addition to already operational and future low-Earth orbiting and geostationary satellites, thus providing a large constellation of satellites relaying search and rescue messages;

b) that this enhanced constellation of spaceborne search and rescue instruments ~~will~~ was designed to improve geographic coverage and reduce distress-alert transmission delays because of larger uplink footprints, ~~and an~~ increased number of satellites and improvement in the accuracy of the location of the distress signal;

c) that the characteristics of these spacecraft with larger footprints, and the low power available from satellite EPIRB transmitters, means that aggregate levels of electromagnetic noise, including noise from transmissions in adjacent frequency bands, may present a risk of satellite EPIRB transmissions being undetected, or delayed in reception, or lead to reduced accuracy of the calculated locations, thereby putting lives at risk,

noting further

a) that the mobile-satellite systems contributing to the emergency location system "Cospas-Sarsat" provide a worldwide emergency location system that benefits all countries, even if those mobile-satellite systems are not operated by their country;

b) that many Cospas-Sarsat satellites implement efficient out-of-band filtering, which would be further improved in upcoming satellites,

~~*resolves to invite ITU-R*~~

~~1 to conduct, and complete in time for WRC-15, the appropriate regulatory, technical and operational studies with a view to ensuring the adequate protection of MSS systems in the frequency band 406-406.1 MHz from any emissions that could cause harmful interference (see No. **5.267**), taking into account the current and future deployment of services in adjacent bands as noted in *considering f)*;~~

~~2 to consider whether there is a need for regulatory action, based on the studies carried out under *resolves* 1, to facilitate the protection ofMSS systems in the frequency band 406-406.1 MHz, or whether it is sufficient to include the results of the above studies in appropriate ITU-R Recommendations and/or Reports,~~

resolves

1 to request administrations not to make new frequency assignments within the frequency bands 405.9-406.0 MHz and 406.1-406.2 MHz under the mobile and fixed services;

2 that administrations take into account frequency drift characteristics of radiosondes when selecting their operating frequencies above 405 MHz to avoid transmitting in the 406-406.1 MHz frequency band and take all practical steps to avoid frequency drifting close to 406 MHz,

instructs the Director of the Radiocommunication Bureau

~~1 to include the results of these studies in his Report to WRC-15 for the purposes of considering adequate actions in response to *resolves to invite ITU-R* above;~~

1~~2~~ to continue to organize monitoring programmes in the frequency band 406-406.1 MHz in order to identify the source of any unauthorized emission in that frequency band~~,~~;

2 to organize monitoring programmes on the impact of the unwanted emissions from systems operating in the frequency bands 405.9-406 MHz and 406.1-406.2 MHz on the MSS

reception in the frequency band 406-406.1 MHz in order to assess the effectiveness of this Resolution and to report to subsequent world radiocommunication conferences,

encourages administrations

to take measures such as making new assignments to stations in the fixed and mobile services in priority in channels with greater frequency separation from the 406-406.1 MHz frequency band and ensuring that the e.i.r.p. of new fixed and mobile systems at all but low elevation angles is kept to the minimum required level,

urges administrations

1 to take part in monitoring programmes referred to in the *instructs the Director of the Radiocommunication Bureau* above~~requested by the Bureau in accordance with No. **16.5**, in the frequency band 406-406.1 MHz, with a view to identifying and locating stations of services other than those authorized in the band~~;

2 to ensure that stations other than those operated under No. **5.266** abstain from using frequencies in the frequency band 406-406.1 MHz;

3 to take the appropriate measures to eliminate harmful interference caused to the distress and safety system;

4 to take all practical steps to limit the levels of unwanted emissions of stations operating within the 403-406 MHz and 406.1-410 MHz frequency ranges in order not to cause harmful interference to mobile-satellite systems operating in the 406-406.1 MHz frequency band;

5 when providing Cospas-Sarsat satellite receiver payloads in the 406-406.1 MHz frequency band, to make possible improvement of out-of-band filtering of such receivers, in order to reduce constraints to adjacent services while preserving the ability of the Cospas-Sarsat system to detect all kinds of emergency beacons and to maintain an acceptable rate of detection, which is vital to search and rescue missions;

~~4~~6 to ~~work~~ actively cooperate with the administrations participating ~~countries of the system~~in the monitoring programme and ~~ITU~~ the Bureau to resolve reported cases of interference to the Cospas-Sarsat system~~;~~.

~~5 to participate actively in the studies by submitting contributions to ITU-R.~~