SUB-COMMITTEE ON NAVIGATION, COMMUNICATIONS AND SEARCH AND RESCUE
1st session
Agenda item 13

NCSR 1/13/2
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REVIEW AND MODERNIZATION OF THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS)

Improvement of the EPIRBs to reduce inadvertent activation

Submitted by the Islamic Republic of Iran, New Zealand and the International Maritime Rescue Federation (IMRF)

SUMMARY

Executive summary:	The ICAO/IMO Joint Working Group on the Harmonization of Aeronautical and Maritime Search and Rescue (NCSR 1/19) and the IMO/ITU Experts Group on maritime radio communication matters (NSCR 1/17) noted that the method to reduce false alerts of EPIRBs, to be proposed by a report by the Islamic Republic of Iran, might be intensively interesting to IMO. It is a proposed improvement of the EPIRB to reduce inadvertent activation.
Strategic direction:	5.2
High-level action:	5.2.5
Planned output:	5.2.5.2
Action to be taken:	Paragraph 14
Related documents:	Resolution A.814 (19); MSC.1/Circ.861; COMSAR 6/7/1; COMSAR 5/7/3; COMSAR 15/INF.4, COMSAR 15/3/7, COMSAR 15/3/8; (MSC 86/23/11); COMSAR 14/WP.5/Add.1; COMSAR 15/WP.1; COMSAR 17/6, COMSAR 17/4, COMSAR 17/5/3; NCSR 1/17 and NCSR 1/19

Introduction

1 The Islamic Republic of Iran proposed methods to reduce false alerts at the twentieth session of the ICAO-IMO Joint Working Group on Harmonization of Aeronautical and Maritime Search and Rescue (NCSR 1/19, annex, paragraph 2.3.4), which is a proposal to improve the EPIRBs to reduce inadvertent activation. However, the Joint Committee noted the Islamic Republic of Iran shared information with the JWG on a system used on ships to monitor transmission of 406 MHz signals, with the ultimate goal of

reducing inadvertent transmissions of EPIRBs, also proposed a method to reduce the effect of human error through a structure to control and monitor release of distress alerts (COMSAR 16/3/6).

2 The Chair of the Joint Committee reminded participants of relevant guidance on false alerts provided in:

- Resolution A.814(19): *Guidelines for the avoidance of false distress alerts*; and

- MSC.1/Circ.861: Measures to reduce the number of false distress alerts.

INADVERTENT ACTIVATION:

- Switch beacon OFF
- Inform RCC
- If not able to switch beacon OFF, take measures to prevent or inhibit transmission of signal (e.g. shielding of transmission, battery removal, etc.).

3 Also in the report of the ninth meeting of the Joint IMO/ITU Experts Group on Maritime radio communication matters, with regard to the issues related to the Detailed review of the GMDSS, the need to consider the installation of "a device on the bridge to indicate when an EPIRB transmits" has been included (NSCR 1/17, appendix 3, paragraph 1.2.1.3).

4 Distress radio beacons, also known as emergency beacons, EPIRB, are tracking transmitters which aid in the detection and location of boats, aircraft, and people in distress. Strictly, they are radio beacons that interface with worldwide offered service of Cospas-Sarsat, the international satellite system for search and rescue (SAR). When manually activated, or automatically activated upon immersion, such beacons send out a distress signal. The signals are monitored worldwide and the location of the distress is detected by non-geostationary satellites, and can be located by trilateration in combination with triangulation, respecting the varying quality of the signal received. In this document, an approach towards improving the EPIRBs is presented. For this purpose, after identifying the weak points of the current systems, following points were discussed:

- analysing and inspecting the level and amount of false signals received by the system; and

- identifying and inspecting the reasons behind receiving false emergency signals in the system.

Methods of research

5 In this study, the procedure of analysing and inspecting the emergency signals in EPIRB was as follows: firstly, all distress signals received over 10 years worldwide were collected, false signals were identified and the percentage of false signals was calculated. The next step was to investigate the reasons behind the transmission of false distress signals. Based on our inspections, these errors were categorized in five types of beacon mishandling, beacon malfunction, mounting failure, environmental condition and errors arising due to others. In addition to identify false alert reasons, it is interesting to have an approximate figure for search and rescue costs incurred by these EPIRB false alerts. For this purpose, required data were provided by Shahid Rajaee Maritime Rescue Coordinator

Centre. Fuel and communication costs, as the considerable costs of each SAR operation, are used in cost calculations. In this document cost risks of the personnel's lives participating in rescue operations and maintenance charges are neglected. Finally, analysing the costs using the below:

Relation is conducted:

X= (the fuel cost of ship and helicopter used for the operation) × (the number of operations performed after receiving false signals)

Y= (telephone costs for each pulse × call duration) × (the number of telephone contacts) the total costs incurred after receiving a false signal cost = Y + X

6 The research team investigated and evaluated the EPIRB for 50 ships as samples in Shahid Rajaee Port, Iran, to detect the main factors which may cause EPIRB false alerts in the strategic area of Strait of Hurmoz, and determined the percentage of false alerts from ships for all mission coordinator centres worldwide for the period of 1999-2009. Figure 1, (COSPAS–SARSAT report) shows the percentages of EPIRB false alerts, received by the mentioned stations worldwide. In this document, a questionnaire on reasons for sending EPIRB false alerts was prepared and the feedback from all the SOLAS Conventional ships such as cargo ships, container ships and Ro-Ro ships was obtained.

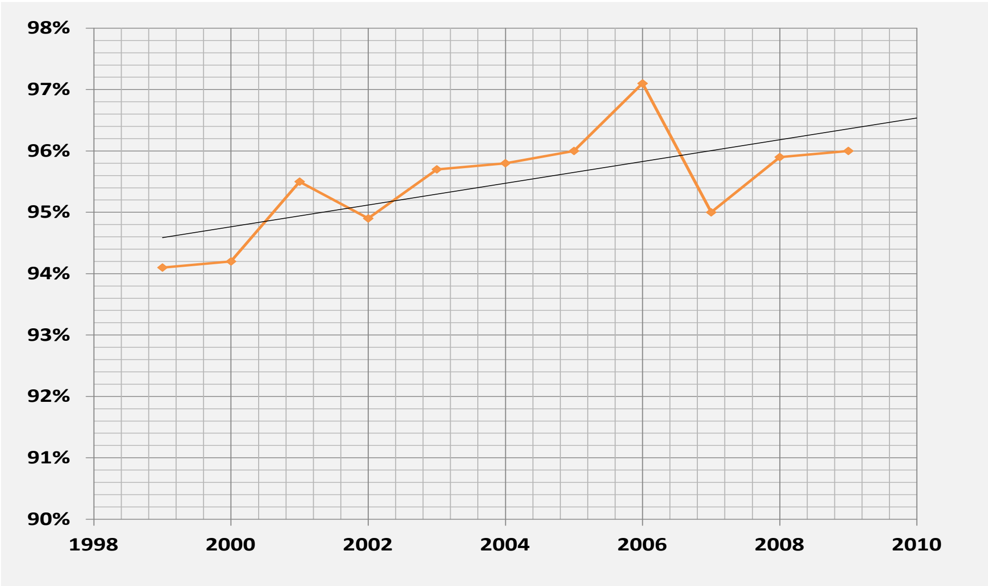

Figure 1: Percentage SAR false alerts rate for EPIRB

7 The most questions on EPIRB false alerts should be about beacon mishandling, beacon malfunction, mounting failure, environmental condition and errors arising due to others. Figure 2 shows the percentages for these results. Percentage for each main important factor causing EPIRB false alerts in the categories others and environment is also shown in figure 3. According to these figures, the categories others and environment was identified as the most important error in sending false alerts. It can be said approximately that in every ten distress messages from EPIRBs, only one message is quite true and nine messages are false. Therefore, according to actual and forecast of 406 MHz of EPIRB beacon population in figure 4, when it exceeds 1 million beacons in 2017 it would be significant that more than almost 90% of these beacons will be false according to SAR false

alert rate in the world. If we expand this factor (growth of false alerts) in EPIRB, we will find a critical point endangering maritime safety, and that is why we have to consider solving this problem. At the end, analysing the total cost of operations performed on receiving false distress signals and generalizing the amount for the world, we obtain an enormous amount of money wasted only for operations which should not have been done in the first place.

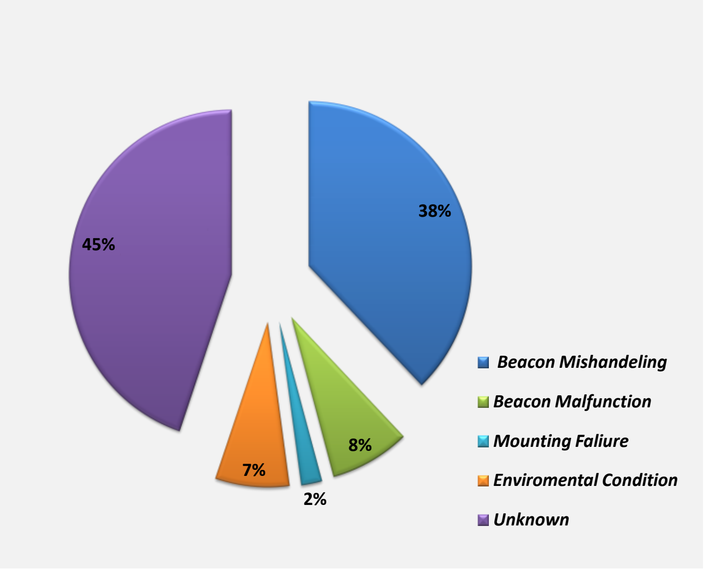

Figure 2: category of root cause of EPIRB false

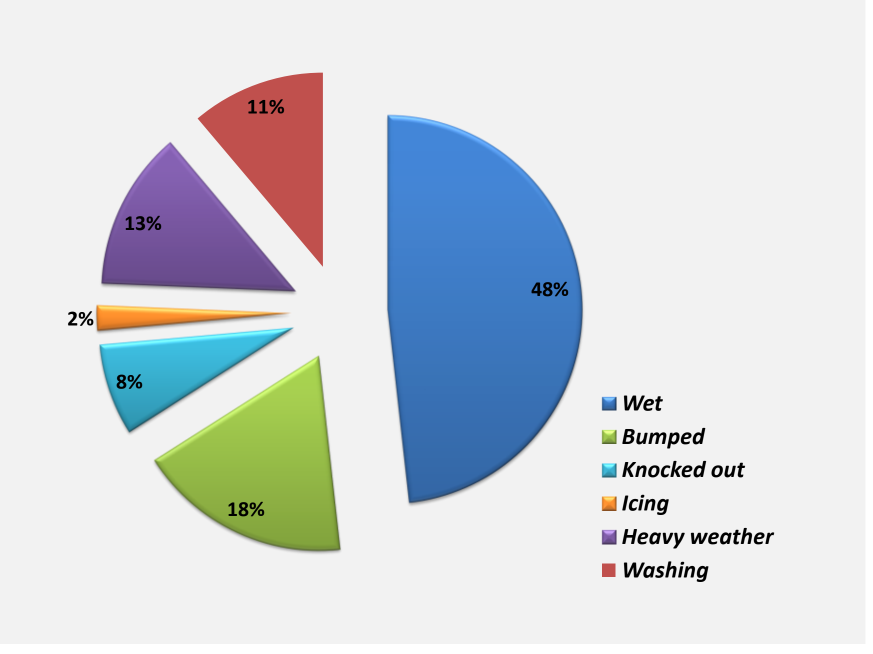

Figure 3: category of root cause of unknown and environment factors for EPIRB inadvertent activation

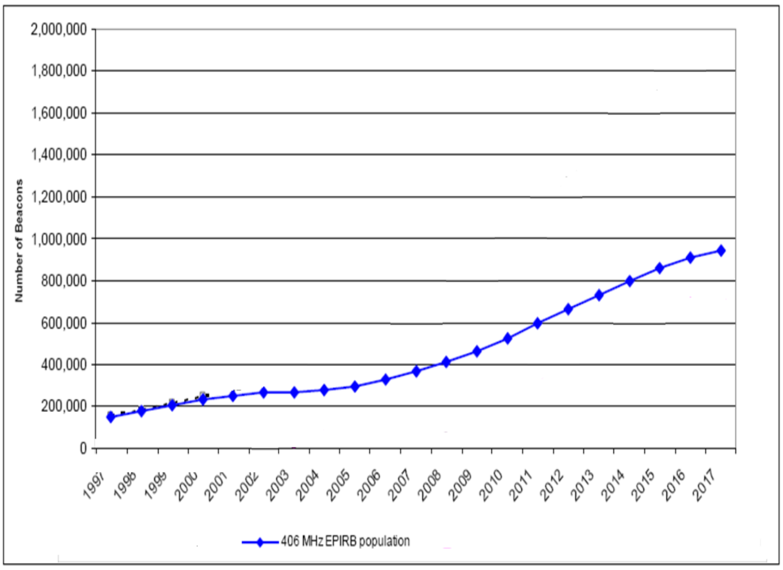

Figure 4: actual and forecast of 406 MHz of
EPIRB beacon population

Cost of operations fulfilled after receiving false signals

8 After receiving a distress signal sent from EPIRB, the receiving centre transmits it to the main or sub-centre for search and rescue operation coordination. This centre takes actions for identifying the distressed ship and afterwards proceeds to send rescue teams by ships, helicopter or planes. On many occasions, the centre sends rescue team to the location which incurs heavy costs. It is noted that, search and rescue services, according to SAR Convention, are given by the governments at no cost. Therefore, on receiving a distress signal, while there is no proof on the emergency situation of the distressed ship and the risk for its crew, the coordination centres proceed to send search and rescue teams and if the signal was a false one, a heavy cost is incurred to the centre. In this document, the research team works on evaluating this heavy cost.

Investigations show that over the 10-year period considered for this study, around $10 million of costs had been resulted from the reception of false signals, and the operations that were initiated and conducted afterwards. The calculations had been conducted bearing global rates of fuel, services, etc. in mind. There are 705 centres for search and rescue operations worldwide. Thus, taking into account the amount of costs incurred per centre and the number of centres worldwide, we would find out that an enormous amount of money is spent each year for inquiring and analysing false distress signals sent from EPIRBs worldwide. As another example, cost of EPIRB false alerts in US Coast Guard in 2007 and 2008 amounted to between $4 to $4.5 million.

9 Generally, it can be said that the research team came up with idea which is exploited, based on scientific studies on the existing systems after being faced with several problems, such as transmission of false distress and alert failures to respond appropriately and also spending lots of money for detecting false distress alerts. Therefore, designing new equipment could EPIRB operation as it is designed according to the latest technology in the field of data transmission. In this design must say that have not a change in the structure and protocols of EPIRB been passed in IMO and ITU regulation. This device is separately installed on board a ship and oversees on performance EPIRBs. We have designed and made a device that can provide revolutionary in EPIRBs and cause a large decrease in the rate of false alerts. It can be very important for the shipping industry, in this system, to have

also used a satellite mobile phone technology. The only way to make it financially viable is for it to be fitted to all merchant ships and in step 2 mandatory for SOLAS ship.

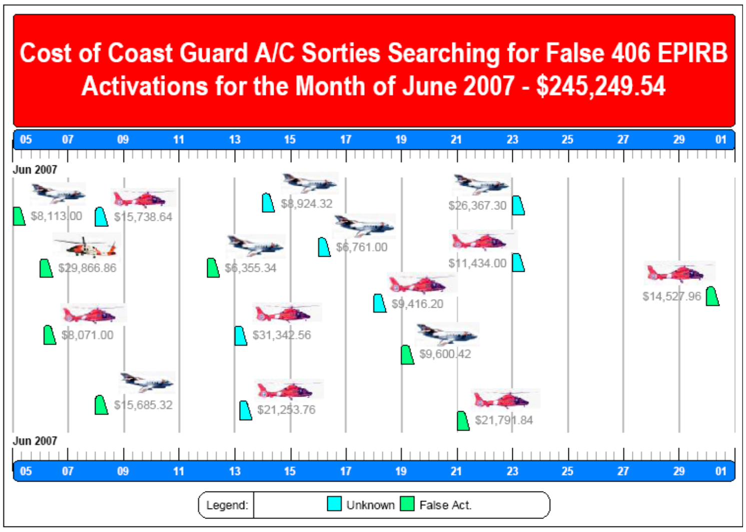

Figure 4: cost of EPIRB false alerts 2007 in US Coast Guard

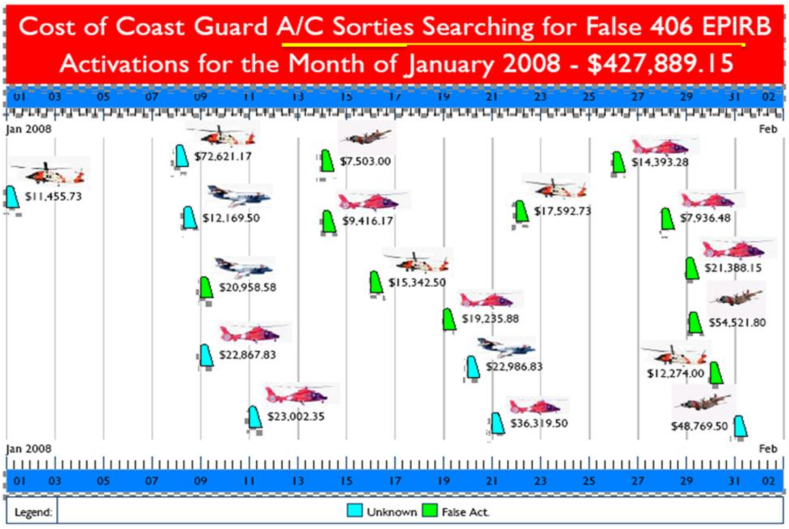

Figure 5: cost of EPIRB false alerts 2008 in US Coast Guard

10 The following new features have been included in the new device:

.1 Until now, none of the crew would know about the activation of an alarm system that was not visible by the officer on watch. This caused a huge unnecessary cost for the land forces that proceeded to deploy a unit for the vessel whose alarm system had been falsely activated, or else contact the vessel through costly satellite connections in order to inform it to deactivate that system. Now we have designed a system that informs the vessel crew the moment alarm system is activated.

.2 In the past, there was no method for the vessel crew to inform the MRCC of the status of the alarm system, and announce the release of a false alert. The system we have designed contacts the MRCC immediately after the transmission of an alert and fully supervises it through a management monitor.

.3 Small, non-convention sized vessels did not have a system for releasing distress alerts through satellite. With the new system, even such vessels can press a button to transmit distress alerts to MRCCs through commercial satellites.

.4 The distress alerts released by larger vessels could only be received by MRCCs and not any vessels at sea. The new system enables these vessels to receive distress alerts too and rush to assistance if they are in the vicinity of the vessel in distress. The new system also has the following advantages:

- decreased chance of false alerts from EPIRBs;
- significantly reduced role of humans in the activation of alarm systems and thus minimized the release of false alerts (Studies have shown a 70% role of human error in the transmission of false alerts.);
- user-friendlier interface through seeing and controlling all the stages of on an LCD display, while removing the unnecessary diversity systems used on EPIRBs; and
- special attention to the other causes of false alerts and exerting modifications for their minimization. This is more tangible in case of SAR Beacons that function similarly to EPRIBs, since numerous hardware and environmental problems have been observed on EPIRBs that lead to false alerts. The new design is planned to reduce the above problems by 90%.

11 The most important advantage of this new system is its efficiency in saving lives at sea as its initial purpose and design, by reducing interferences in this regard, and promoting the certainty of the rescue centres about the authenticity of distress alerts and which would result in their higher dedication to the provision of the necessary assistance .

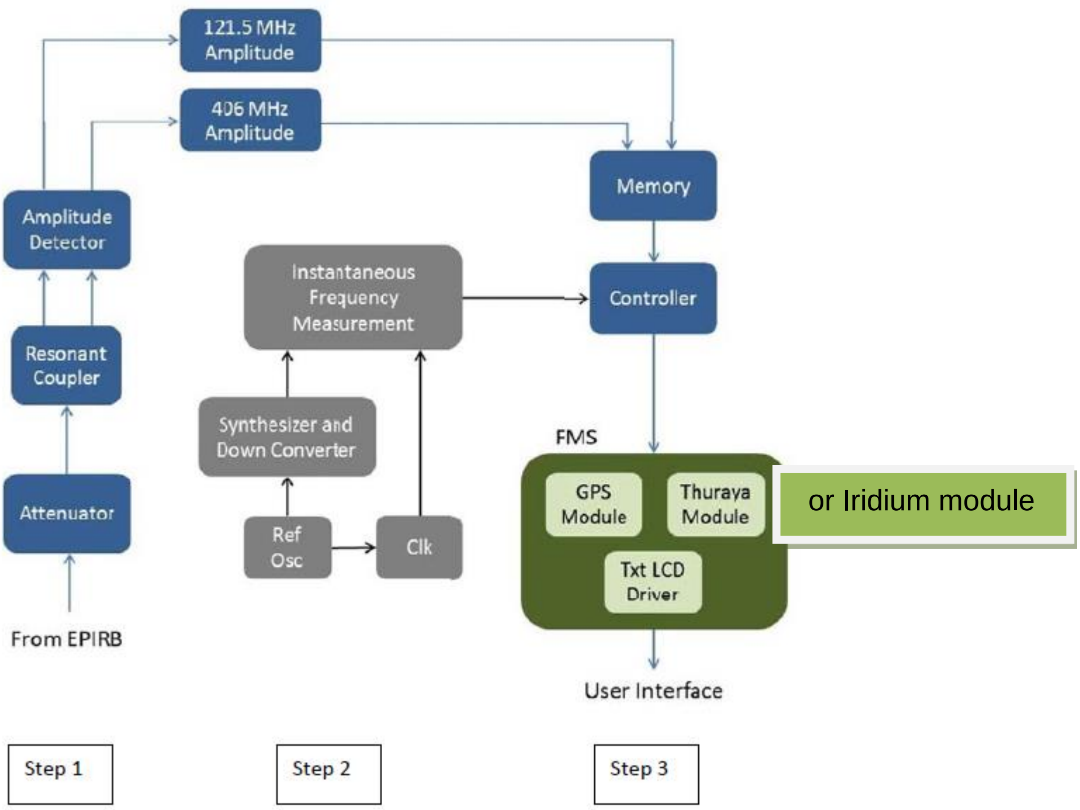

Figure 6: description of module

Procedure I: Conventional vessels with EPIRB

Phase I:

The frequency is first received through the installed antennae and is classified into 121.5 and 406 MHz, meaning that only these two frequencies can be received.

Phase II:

The related data is analysed based on the received frequencies, and it becomes evident whether the distress belonged to one of our vessels or others.

Phase III:

A software has been integrated into the system, which includes contact information of the related MRCCs and nautical charts. Once a frequency is received through phase I, an alarm is activated and if the alarm is confirmed within three minutes (by pressing a special button in the system), that would mean it had been a false alarm. The alarm would be construed as a real distress case if not rejected through the above method, and a distress alarm would be then sent to the nearest MRCC and the shipowner(s).

In case of a false alarm, the software uses the data it has for the ship position (through GPS) and the location of MRCCs defined for it in order to identify the closest MRCC to that area, which is then the notification is conducted by sending a text message on the Thuraya satellite telephone system, which needs to be present at the both sides of the mentioned message. Since the message would also include the contact information of the vessel, the MRCC may contact the vessel directly and confirm the message.

Procedure II: Non-conventional vessels

For these vessels, only phase III would be activated. The software would include contact information of the related MRCCs and nautical charts. The alarm would be announced by pushing the related button, and the name, position, and cell phone number of the vessel, as well as time of distress would be informed to the nearest MRCC, which would contact the vessel directly for further information.

In cases of distress, the EPIRB would be activated to send a distress alert on the 406 MHz frequency. The receiver of that frequency would identify the EPIRB's Hex Number Code and would activate an alarm on the bridge, displaying the information of the vessel on the chart (an LCD display showing the nautical charts of the region, location of the nearest MRCC and the position of the vessel). The alarm could be cancelled as false within three minutes, in which case the MRCC and ship owner(s) would be notified that the alarm had been false. The alarm would be construed as a real distress case if not rejected through the above method within five minutes, and a distress alarm would then be sent. The satellite systems used for this purpose would be Iridium or Thuraya.

12 Considering the above, we would like to propose that a new paragraph 1.6.6 be added to regulation 7, chapter IV of SOLAS as follows, while taking figure 6 module into consideration:

"*6.6 install a device on board a ship (in bridge) to monitor EPIRB activation.*"

13 It is also proposed that resolution A.814(19) or MSC.1/Circ.861 include measures for reducing beacon false alerts by adding figure 6 module.

Action requested of the Sub-Committee

14 The Sub-Committee is invited to consider the above proposal and take appropriate action.

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