AFC WRC-15 PLANNING

Structure

This document is a guide for the AFC to review for the WRC-15 meeting on 2-27 November 2015. The text below provides a summary of the agenda items relevant to the AFC, and respective positions that the AFC will take to the WRC-15. Each agenda item discussed includes a summary of the work so far (full and executive), observations of administrations' positions for the agenda items during the study cycle, the proposed AFC position, and the expected outcomes at WRC-15. A summary of expected future agenda items for WRC-19 is also included.

WRC-15 Executive Summary

The position of the AFC at WRC-15 will broadly follow the ICAO, IATA & USA positions on the Agenda Items relevant to aviation. The WRC-15 work for the AFC will be prioritized for Agenda Items 1.1 and GFT, to protect aviation spectrum from modification by IMT, and provide a commercial aviation perspective in the GFT process.

- 1.1 is expected to be a political fight given the lack of agreement on technical studies, with potentially unexpected results that may affect aviation. Primary surveillance radars and the radio altimeters are the primary concern for the AFC.
- GFT did not complete its work during the previous ITU-R study cycle, and it is expected to carry-on the technical discussion. It is likely that a conditional AMS(R)S allocation will be given to ADS-B over satellite.

Important agenda items to the AFC and aviation as a whole will include: new allocations adjacent to aero HF (1.4), UAS over satellite (1.5), satellite interference levels from AeroMACS (1.7), and wireless aircraft networks (1.17).

It should be noted that given the co-existence of three highly charged agenda items for 1.1, 1.5, & GFT; there is a chance that political deals will be made between unrelated agenda items. Therefore other agenda items that appear to be straightforward may be complicated by administrations using them for advantage with bigger agenda items.

Introduction

As an AFC confidential document, the text below offers a more candid view on the subjects and positions of some administrations, including the options available to the AFC at the conference. This informal approach is intended to refine the AFC's internal opinion of the subjects, and therefore should not be shared outside the AFC membership, as views may be subjective or speculative.

The AFC's two representatives will be attending the WRC-15 as both a sector member, and on the US delegation. Given the limit of personnel, coordination with other administrations and organizations attending will be paramount to maintaining awareness of the work and any significant changes. Early coordination with attending airlines, IATA, and ICAO is also being worked to ensure greater coverage of topics.

The majority of WRC-15 positions from ICAO and IATA are defensive in nature, protecting existing aviation allocations of spectrum given aviation's large holding in certain bands. Furthermore, those agenda items that do seek additional aviation spectrum are repurposing existing aviation allocations, as seen with 1.17 and GFT. The AFC position is broadly in alignment with these positions, with some minor differences on implementation.

Up to 15 different agenda items of WRC-15 are directly, or indirectly, relevant to US aviation. Given the limit of personnel, these have been prioritized into three areas. Priority items will be the primary focus of the AFC's work and attendance due to their potential impact and importance to aviation. Secondary to these, but still of significance, are important items to aviation and US commercial operators. Lastly, the remaining agenda items are considered tertiary, and will be worked if resources are available. Only priority and important agenda items are detailed below with specific AFC positions. For tertiary agenda items, the AFC will follow the IATA and ICAO positions, and hence are not included in this document. These positions are broadly aligned with the USA, ICAO and IATA's positions already published, providing more specific detail or interpretations as required.

Positions on future agenda items are fluid depending on what direction they will take, and will need to be decided upon at the conference. A list of those items expected is included at the end for information and general thoughts. The attending AFC members will attempt to provide updates to the rest of the committee during the conference for information and feedback as necessary.

ITU-R Process Recap

The ITU-R WRC study cycle repeats every 3-5 years depending on when the WRCs are scheduled. Although the process is very detailed in areas, it can be simplified into the following steps:

- Each WRC study cycle begins at the previous conference, where new agenda items for the next WRC are developed and confirmed.
- The new agenda items are assigned to a relevant ITU-R Working Party (WP) as the responsible entity to contain any work that may be developed.[1].
- Each agenda item may spur several ITU-R Recommendations and Reports to support the development of the work, which will take several years to fully review and approve in the WPs.
- In the 12 months before the WRC, a Conference Preparatory Meeting (CPM) is held to develop text that provides recommendations for the conference based on the work done in the WPs, and different positions from administrations.

[1] E.g. WP 5B is responsible for all aviation and radar based agenda items.

- The WRC will begin with the CPM text as a template, but has the authority to go whichever direction it chooses, including decisions not based on agenda items or previous work.
- Once the WRC completes its work, the ITU-R Radio Regulations are updated with the agreed output.

Highest Priority Agenda Items

Agenda Item 1.1 - To provide new allocations for IMT shared with existing users between 400 MHz to 6 GHz

ITU-R Text. *To consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution 233 (WRC-12).*

Executive summary

Agenda Item 1.1 is intended to increase mobile broadband spectrum between 400 MHz and 6 GHz, and is the largest agenda item of WRC-15 given the number of frequency bands being discussed. This agenda item is expected to dominate WRC-15 given the number of frequency bands and industry sectors affected. Although a new set of meetings were specially created to address the work in the previous 3 years (the JTG), no studies produced could agree that sharing was possible, and therefore preparation for the conference has no particular direction. Aviation has some bands of note that may be affected (primary surveillance radars and radio altimeters).

Summary

This is the largest agenda item of WRC-15, focusing on how International Mobile Telecommunications (IMT) can share with systems in the 400 MHz to 6 GHz range. The IMT sector is seeking as much mobile broadband spectrum as possible (both cellular and Wifi) to meet expected traffic growth, while trying to standardize worldwide allocations to allow economies of scale for baseband chips in new mobile devices.

To address the issue, the ITU-R setup a dedicated meeting outside the normal WPs called the JTG 4-5-6-7 (JTG), which was to address how IMT could share with incumbents within the frequency range. The resulting studies showed that it was not possible to share co-frequency, or sometimes even in the adjacent frequency band, given the effects of high power cellular systems on current users; however a large political push did try to show it was possible. Neither IMT nor the incumbents walked away from the JTG process with what they wanted, and the resulting CPM report was conflicting in its tone. The stalemate has created a risk that the overwhelming pressures to create more IMT spectrum could move in an unexpected manner at WRC-15.

Most administrations have been largely supportive of more IMT spectrum given the high prices charged to commercial cellular companies for spectrum, and the lobbying for a digital economy by the IMT sector. However, the process has not been fully coordinated, and therefore each administration has its own priorities given existing spectrum allocations in their respective countries. Furthermore, the Wifi and cellular providers are beginning to come into competition at higher frequency ranges, and are unable to agree on the allocations that would be used (though they both do agree that they need more spectrum).

Aviation as a whole has seen a small-to-moderate attempt on its spectrum that occupies the 400 MHz to 6 GHz range. This has been in 2 distinct areas, directly affected systems, and indirectly/secondary systems.

- Those directly affected are the 1.3-1.35 GHz (long range PSR), and 2.7-2.9 GHz (PSR). IMT has made a hard push for both these bands, attempting to acquire either the whole band, or just a part of it. Although direct sharing is not possible, the IMT sector has tried to reduce the required separation distances, and the needed guard band between adjacent allocations.

- The 5.35-5.47 GHz aeronautical weather radar band is a main contender for a new wifi band (linking up the existing wifi frequency ranges above and below the band)[2]. This has been a stalemate given the support for IMT in the band, coupled with strong defense by the military and weather users for their radars.
- The secondary aviation support systems affected include the 3.4-4.2 GHz (FSS), 4.4-4.5 GHz (AMT), and indirectly the 4.2-4.4 GHz (radio altimeters). AMT provides support to aviation manufacturers, and the 4 GHz band is one of the few options left to them after the loss of L-band spectrum. Although the band has a large military usage, civilian applications also use the band for testing of new systems.

During the JTG process the radio altimeter band was never actively discussed, however studies in ICAO showed that it could be affected by power from IMT transmitters in the adjacent bands. Unfortunately, the altimeter manufacturers have yet to formally confirm the results of the studies, but concern in aviation is high enough to actively protect the adjacent bands. It should be noted that until the radio altimeters' adjacent band parameters are fully confirmed, it is unknown how much spectral separation is required to achieve full protection.

The FSS sector has tried very hard to defend the C-Band space to earth link in 3.4-4.2 GHz, fighting a protracted battle with IMT companies. Although the last WRC managed to prevent significant use of IMT in the band, the work continued in this WRC under agenda item 1.1. For the satellite providers, loss of any C-band spectrum is doubled, as the spectrum is paired with earth to space allocations in the 6 GHz band. The separate agenda item 9.1.5 (protection of VSATs in region 1) is therefore indirectly linked to this work, and will be supported where possible. Aviation relies on the C-band for reliable ATM network backhaul in the tropics, and Inmarsat feederlinks, therefore the AFC will provide support where possible.

Observations of administrations' positions for the agenda item during the study cycle

Strong support

- Almost all administrations support some of the frequency bands being discussed in some manner
- Sweden has supported every band.

Moderate opposition

- Russia
- Iran

AFC Position

- To actively oppose the changes to the primary surveillance radar bands by supporting multiple country CAAs in their opposition to it.
- Support FSS or AMT users in their opposition to changes in those bands, and therefore indirectly protect the radio altimeter from adjacent band interference.
    - Ensure that the importance of the radio altimeter band is understood to prevent opportunistic attempts on the 4.2-4.4 GHz frequency band.

Expected progress at the WRC

- L-band PSR will be protected given radar requirements and RNSS limitations in the band.
- S-band PSR will be close given the interest by IMT, and the size/propagation benefits. However, it will probably be looked at again for WRC-19 instead.

[2] However, a survey of the US based operators in 2014 revealed that almost all 5 GHz radars have been replaced with 9 GHz weather radars. Therefore commercial aviation has been involved in these protracted discussions.

- C-band FSS will have a hard fight to retain the lower part of the band (3.4-3.6 GHz), but there is less interest for the upper part of the band (3.6-4.2 GHz).
- C-band radars in 5.35-5.47 GHz will be postponed until the WRC-19 meeting.
- 4.4-4.5 GHz AMT users will be safe in region 1 and 2 due to established usage and support from larger administrations. Region 3 may have some issues given support from CHN and JAP.

Global Flight Tracking (GFT) - Suitable regulatory support/allocations to support tracking of aircraft

ITU-R Text: *Consideration of options to support global flight tracking, possibly including appropriate spectrum allocations and/or future agenda items*.

Executive summary

Late agenda item resulting from the political aftermath of MAH370 has only had three meetings to be considered in the WPs. Almost all administrations involved agree that something should be done, but consensus on what to do has not been achieved. ADS-B over satellite is the candidate being pushed by multiple administrations linked to Aireon, the Iridium spin off developing the system. Opposing administrations want a delay until WRC-19 for more study and incorporation into ICAO's GADSS concept, citing a lack of time studying the issue, concerns that the MAH370 situation is being exploited, and possible affects to military aircraft using IFF. The conference seems likely to award an AMS(R)S allocation, but with some conditions attached on protection of other L-band systems.

Summary

Introduced late into the agenda list after ITU-R Resolution 185 was issued in November 2014, GFT is a combination of a politically charged topic, with worldwide focus, and a short timeframe to complete. The prime candidate appears to be ADS-B over satellite, modifying the existing 1090 MHz ADS-B downlink allocation to allow for reception by a satellite system. Although the system would be using existing ADS-B signals from aircraft in the AM(R)S allocation on 1090 MHz, the AMS(R)S Earth-to-Space (ES) satellite allocation would be needed to recognize the satellite's reception of the signal, and therefore allow the satellite to claim protection from any interference.

ADS-B over satellite has actually been worked on since the start of the WRC-15 cycle, primarily to support ATC for oceanic air traffic control. But for reasons unknown an agenda item was not asked for at WRC-15, and it was hoped that a minor editorial change could be made to the radio regulations to accommodate it. This was a long shot until MAH370 occurred, and then the wider topic of GFT gained publicity and momentum in the ITU-R. ADS-B is now considered the primary system to meet the political and technical requirements of GFT, but the need for a primary safety allocation for tracking only is being questioned[3].

The agenda item work has separated into two draft reports, the original ADS-B, and a new GFT report that defines all the available technologies and concepts for GFT. These where not completed for the WRC given their short timeframe and controversial nature, and the CPM text output was a confusing mess given the very broad resolution text and lack of consensus.

Opposition to the agenda item has been for several reasons:

- Concerns that studies have not been completed in a fully peer reviewed manner, and therefore all data is being based only on the service providers opinion.
- That aviation may be seen to be taking advantage of the MAH370 crash, and that a precedent may be set by for introducing last minute agenda items into a WRC.

[3] ELTs operating on 406.1 MHz currently do so in an MSS allocation.

- Several military and aerospace manufacturers are concerned about the impact on IFF operations should the ADS-B satellite receivers claim protection from interference.
- Competing providers of tracking services opposing potential competition.

Given the above, there is still a lot of support for making an AMS(R)S allocation at WRC-15. Many administrations support this for the potential operational and safety benefits, with both ICAO and IATA have supported an AMS(R)S allocation. Furthermore some administrations view the situation as not ideal, but at the same time aviation should use the opportunity given to it, and support a WRC-15 allocation.

Work on GFT within ICAO has resulted in the creation of a Global Aeronautical Distress And Safety System (GADSS) concept, which ICAO is positioning for a future agenda item at WRC-19. The concept does not call out for any specific system or spectrum yet, and so it is unsure how an agenda item would support it without being overly broad.

Observations of administrations' positions for the agenda item during the study cycle

Strong support
- Canada
- Ireland
- Italy
- Denmark
- Kenya

Moderate support
- USA

Moderate opposition
- UK
- Germany
- Netherlands

Strong opposition
- China
- France
- Russia
- Iran

AFC Position

- An AMS(R)S allocation at 1090 MHz should be supported provided it demonstrates compatibility with existing systems and it follows the correct ITU-R procedures.
- Support the inclusion of all available tracking systems in any GFT concept to demonstrate the safety of commercial aviation.

Expected progress at the WRC

WRC-15 seems likely to award an AMS(R)S allocation for ADS-B over satellite, but with some conditions attached on protection of other L-band aviation systems. Should the allocation not be agreed at WRC-15, then it is likely to be incorporated into the expected WRC-19 for GADSS. Many countries are undecided on the issue given its late entry, and this could tip the balance at the conference when they see the results of the work. It is also possible that positions could change before the meeting due to internal discussions and political influence. Whatever the outcome, there will be a strong political push for something to be done, both from administrations, and the ITU-R itself given the public profile of GFT.

Important Agenda Items

Agenda Item 1.5 - Use existing FSS allocations for control of UASs

To consider the use of frequency bands allocated to the fixed satellite service not subject to Appendices 30, 30A and 30B for the control and non-payload communications of unmanned aircraft systems (UAS) in non-segregated airspaces, in accordance with Resolution **153 (WRC-12)**

Executive summary

Progress on the agenda item's key ITU-R report was stalled into an unfinished state due to political opposition, while the CPM text became a mess of different opinions by administrations. The resulting confusion is likely to make the agenda item a political football in the meeting and it may be deferred until WRC-19.

Summary

The spectrum for UAS has a long history in the ITU-R, as the issue has been partially addressed at previous WRCs without total success. The 1.5 agenda item for WRC-15 is a more comprehensive look at allowing existing FSS allocations for controlling UAS (the link is called Command Non-Payload Communications (CNPC)) in non-segregated airspace. These new satellite links would support the previous terrestrial allocations assigned at WRC-12 in the 5030-5091 MHz, providing remote or oceanic coverage. Although significantly far off for serious consideration by commercial aviation, industry and military proponents want to ensure suitable spectrum exists without constraining the growth of UAS (and allowing easier coordination when transiting between administrations airspace).

Work in WP 5B has been focused on a single ITU-R report detailing the performance and mechanisms needed to achieve the concept. However, very strong political opposition has halted the progress of the key ITU-R report, which was unable to reach a final draft stage the end of the ITU-R study cycle. Similarly, the CPM text's progress was also impeded by political opposition by several administrations who disagree with the UAS concept in principal. .

Additionally, some in aviation have also disagreed with using FSS, stating that an AMS(R)S allocation should be used for safety when controlling aircraft[4]. The satellite industry and proponents disagreed, saying an AMS(R)S allocation was not feasible with the satellite coordination requirements that would be placed on an already congested area. This discussion was halted half-way through the study cycle after a legal clarification by the ITU-R stated that the resolution for the agenda item did not allow for an AMS(R)S allocation, only FSS. It did note however, that the WRC had the authority to implement whatever it sees fit, and discussions at the conference on AMS(R)S allocation should be expected.

Observations of administrations' positions for the agenda item during the study cycle

Strong supporters:

- US
- Germany
- Satellite industry

Moderate opponents

- France

Strong opponents

[4] The ICAO position supports a UAS allocation, but can be interpreted several ways, as the identification of a safety service could be with an AMS(R)S, or FSS allocation with suitable footnote.

- Russia
- Iran

AFC Position

- To support an allocation for UAS
    - To express a preference for an AMS(R)S allocation compared to using an existing FSS allocation

Expected progress at the WRC

Not good given current progress as an indication. It seems likely that the current countries opposing will filibuster the issue into a no change result, unless they are opposed on other issues and a compromise is traded. It looks set to consume a lot of time for those involved without much progress, and will probably be deferred until WRC-19.

Agenda Item 1.4 - New amateur secondary allocation in 5250-5450 kHz

To consider possible new allocation to the amateur service on a secondary basis within the band 5 250-5 450 kHz in accordance with Resolution 649 (WRC-12).

Executive summary

The Amateur radio users are looking for a key 5 MHz frequency range to operate in ITU-R region 2. Opposition has come from non-region 2 administrations due to concerns of interference, and aviation community for possible adjacent band interference to aero HF ground stations. Expected a reduced allocation of approx. 50-100 kHz somewhere in the band.

Summary

The amateur radio users are in need of a good 5 MHz allocation to ensure good propagation conditions in ITU-R region 2 (the Americas). Aiming for a secondary status, the intent was to secure a new allocation in a safe manner with existing users. The resolution driving the agenda item also specifically called for studies into the adjacent aeronautical AM(R)S band (5450-5480 kHz), to ensure aviation is not affected.

The sharing study conducted for 1.4 considered sharing with the existing users of the band and the adjacent Aero HF users. Administrations in other regions have voiced opposition due to the potential propagation of unwanted signals around the globe. Additionally, AFC has expressed concerns about the possible co-site interference from Amateur ground stations operating close the 5450 kHz allocation boundary[5]. Initial comments from HF CSPs had stated that approx. 10 kHz of separation for a 10 mile physical separation would be needed[6]. .

Observations of administrations' positions for the agenda item during the study cycle

Moderate supporters:

- US
- Australia

Strong opponents

- Russia

AFC Position

[5] The adjacent band study only considered interference to an airborne aircraft from amateur users on the ground, and not the potential co-site interference to HF ground stations

[6] Until the HF ground station receiver parameters have been confirmed, a working assumption of 20 kHz guard band is being used.

- To oppose any secondary amateur allocation within 20 kHz of the AM(R)S allocation at 5450-5480 kHz.
    - There would be implicit support of the amateur allocation below 5430 kHz by meeting this requirement.

Expected progress at the WRC
It seems unlikely a secondary allocation for the whole 5250-5450 kHz band would be given without burdensome limitations being placed on the amateurs. More likely is a compromise of a 50-100 kHz sub-band allocation that can be used by the amateurs without restriction.

Agenda Item 1.7 - Raising FSS satellite receivers' tolerance to AeroMACS interference

To review the use of the band 5 091 – 5 150 MHz by the fixed-satellite service (Earth-to- pace) (limited to feeder links of the non-geostationary mobile-satellite systems in the mobile-satellite service) in accordance with Resolution 114 (Rev.WRC-12).

Executive summary
GlobalStar satellite receivers will be granted a permanent allocation in exchange for allowing a higher level of interference from AeroMACS in the same frequency band. This agenda item has unanimous support from those involved.

Summary
The current FSS allocation in the 5091-5150 MHz band is used by GlobalStar on a time limited allocation. The proposal of Agenda Item 1.7 is to make these allocations permanent, while also allowing an increase to the interference level that the co-band AeroMACS system can produce to the satellite receiver. Given that the agenda item is mutually beneficial to both users, there has been very little opposition to the work being completed.

Observations of administrations' positions for the agenda item during the study cycle
Moderate supporters

- USA

AFC Position

- To support the FSS allocation, on the condition that the thermal noise limit for AeroMACS is increased.

Expected progress at the WRC
The Agenda item should be agreed and completed within the first week.

Agenda Item 1.17

To consider possible spectrum requirements and regulatory actions, including appropriate aeronautical allocations, to support wireless avionics intra-communications (WAIC), in accordance with Resolution 423 (WRC-12).

Executive summary
New internal wireless network for aircraft safety systems that would share spectrum with the radio altimeters in 4.2-4.4 GHz. Technical studies show that sharing is possible, and caveated that the radio altimeter would have priority for operation in the spectrum. This agenda item has unanimous support from those involved.

Summary

The aerospace manufacturers' project for an internal wireless network onboard an aircraft is intended to minimize wiring requirements, and increase redundancy for onboard safety systems[7]. The agenda item required assessment of existing terrestrial aeronautical safety allocations below 15.7 GHz before looking at other ranges. After an initial assessment, 3 aviation bands were studied in detail (2.7-2.9 GHz, 4.2-4.4 GHz, & 5.35-5.47 GHz) and one scientific study band (22-22.5 GHz).

After some initial skepticism from some parts of aviation, studies showed that it was possible to co-exist with the radio altimeters in 4.2-4.4 GHz with certain mitigations. After opposition in the other three bands, this view has gone into a unanimous CPM text proposal with the condition that radio altimeters have priority over the new WAIC system.

Observations of administrations' positions for the agenda item during the study cycle

Strong supporters

- USA
- France
- Germany

Moderate supporters

- New Zealand

AFC Position

- To support an allocation in 4.2-4.4 GHz for WAIC systems provided radio altimeters have priority in the frequency band.

Expected progress at the WRC

Studies for the agenda item were well developed, and it is effectively an internal aviation issue. The agenda item should be completed in the first week.

Options for Future Agenda Items

These agenda items are expected, but are not confirmed until discussions agree them at the WRC-15.

Space planes

As a cross between a space vehicle and a terrestrial aircraft, the spectrum use for space planes is a legal grey area in the existing ITU-R allocations structure. With new commercial enterprises using the new systems, there has been a debate in WP 5B on how a space plane will be implemented in the current regulatory environment. A formal ITU-R question has already been raised, and this may lead to an agenda item for WRC-19. It is unknown how this would be accommodated within the ITU-R radio regulations, either a new allocation type, or expansion of the applicability of the existing aeronautical or space allocations.

AFC tentatively supports a new agenda items for space plane spectrum provided it would not affect current the AM(R)S spectrum allocations.

GADSS

Proposed by a panel of ICAO experts, the GADSS concept goes beyond GFT to allow a more comprehensive mechanism to support the response to aviation accidents. The concept is still not defined, and therefore the spectrum requirements are unknown. However, ICAO has pre-empted the requirement

[7] The new system would not carry communications of non-safety applications such as IFE and passenger communications.

with a proposed agenda item at WRC-19 to provide suitable support to the concept to enhance aviation safety.

AFC would support an agenda item for a GADSS.

IMT above 6 GHz

It is expected that WRC-15's agenda item 1.1 will be built on at WRC-19 with an agenda item seeking new IMT spectrum above 6 GHz. Given how much work would be needed within the ITU-R if every band was considered, there have been discussions on limiting the work to existing mobile service bands up to 100 GHz. Above this threshold, all band would be considered for a new IMT allocation.

AFC would oppose such an agenda item if any aviation bands were considered or affected.

C-band IMT

The lack of agreement over the 5.35-5.47 GHz band in agenda item 1.1 has resulted in discussions that more time is needed to study the options, and therefore a WRC-19 agenda item is likely.

AFC would oppose such an agenda item, supporting aviation users of the allocation.