EXECUTIVE SUMMARY

This paper provides information on the additional radio spectrum capacity necessary for the aviation community to develop new applications ……
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1. Historical context, aviation requirements

1.1 Mobile communication Traffic Growth

Air traffic has been seen to grow at an average of 7% throughout Europe for the last few years. Despite recent events, this trend is expected to continue for the foreseeable future with a consequential direct effect on the demand for additional Air-Ground and Ground-Ground communication capacity.

1.2 aviation requirements

- Increase communication capacity
- Diminish controller work load, provide future data links
- Alleviate in Europe the VHF congestion in the aviation communication 118-137 MHz band
- Support new applications to enhance safety, particularly to avoid runway incursions and to support ground movements
- Support new application to enhance security, such as tele-control of cockpit
- Cater for changes in technology with the frequency efficient merits they may bring (e.g. 3G radio systems and CDMA techniques)

1.3 Aviation communication VHF band (118-137 MHz band) Congestion in Europe

Expansions in air traffic in the last 50 years has lead to an operational necessity for increasing the available VHF channels available to aviation communication. This has been done by increasing the overall spectrum available (from 14 MHz in 1947 to the present 19MHz implemented in 1979) together with reducing the separation bandwidth between channels (by channel splitting from 200 KHz in 1947, to 100 kHz in 1965/66, to 50 kHz in 1972 to 25 kHz in 1979 to 8.333 kHz in 1996)

Today, the number of available aviation communication VHF channels has hit a ceiling. It is unlikely that the aviation communication VHF band will be further widened and practically the minimum channel width limit has been reached at 8.333 kHz for audible voice channels. It is estimated that the available VHF communication channels will run out in about 2010, despite the extension of 8.33 mandatory carriage.

The only solution to alleviate congestion in the VHF spectrum is to consider moving some of the services currently operated in the aviation communication VHF channels to other more available bands. For example, particular applications of short range or bandwidth intensive (data) applications could be moved to significantly higher candidate bands where bandwidth for ‘wider’ bandwidth applications is more readily available.
2. Trend, aviation development

1) Optimise the VHF short rang systems with data links (VDL)

2) Long haul communication with data link in the HF services

3) Long haul communication on existing and new satellite technologies in the band 1.5/1.6 GHz

4) Airport Gate link applications in 2.4 Ghz

5) UAT
   Considering the viability of UAT systems in the DME Band (960 - 1215 MHz band)

6) Wide band (UMTS-like) systems. EUROCONTROL is caring out preliminary studies on alternative applications to the congested VHF applications. It is proposed to look at field trials using easily adaptable 3G mobile equipment. Simulation studies from this are due in the end of October 01. Flight trials are planned to follow this with preliminary reports/conclusions expected late march 2002. It is proposed to co-share the band from 5150-5250.

7) USA, New Zealand with the support of IATA are planning new service ANLE (Airport Network and Location Equipment) which is designed to reduce runway incursions and provide more information to the pilot/cockpit. It is proposed to co-share the band from 5150-5250.

8) New aeronautical Telemetry applications for enhancing security
Australia supports development of tele-control of flights, such as interrogation of "black-boxes" and video monitoring of cockpit.

The list of candidate bands below represents only the result of preliminary investigation.

3.1 Bands already allocated to aviation on a primary basis.

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Primary Allocation</th>
<th>Bandwidth Available</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>108-118</td>
<td>Navigation (VOR and ILS)</td>
<td>10 MHz</td>
<td>Potential option subject to negotiation with Aeronautical Navigation, minimal equipment adaptation required makes it attractive. VOR use is expected to reduce 2005-2010. GBAS and GRAS requirements will be added to this band. Band partitioning between ARNS and AM(R)S maybe possible, but will need studies and ITU agreement.</td>
</tr>
<tr>
<td>960-1215</td>
<td>DME / SSR</td>
<td>275 MHz</td>
<td>The US foresee installing UAT in this band. This band will continue to be heavily used by DME/SSR in Europe with introduction of RNSS.</td>
</tr>
<tr>
<td>1535-1660.5</td>
<td>Mobile Satellite Radionavigation (Space radio astronomy)</td>
<td>25.5 MHz</td>
<td>Potential – this band is currently allocated for mobile-satellite. Study is on-going in ITU-R, to assess the feasibility of spectrum capacity for AMS®S.</td>
</tr>
<tr>
<td>1670-1675</td>
<td>TFTS services Meteorological Satellite Mobile TFTS services Satellite Mobile Fixed</td>
<td>5 MHz</td>
<td>Potential. These bands currently on primary equal basis by Mobile, (Meteorological only on lower band) and fixed services (only on higher band). Retaining this band and using it for a safety aviation service is of strong interest. However, It is expected that satellite operators are very interested in obtaining these bands through WRC.</td>
</tr>
<tr>
<td>1800-1805</td>
<td>5 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5030-5150</td>
<td>MLS</td>
<td>160 MHz</td>
<td>Potential option between 5090 and 5150 co sharing with MLS primary. This band is only suitable for short range communications (upto a few km) Aviation 3G trials are proposed.</td>
</tr>
<tr>
<td>5150-5250</td>
<td>MLS</td>
<td>100 MHz</td>
<td>Potential option but unlikely for safety-of-life service</td>
</tr>
<tr>
<td>1215-1350</td>
<td>Radionavigation</td>
<td>115 MHz</td>
<td>Potential option to coexist with radar systems as primary, exploiting redundant part of radar duty cycle. This option would be complex to co-ordinate (synchronise), however the potential bandwidth is ideal for wideband communications. Lower frequency band is of</td>
</tr>
</tbody>
</table>
Frequencies for new aeronautical Communication systems

<table>
<thead>
<tr>
<th>Frequencies (MHz)</th>
<th>Primary Allocation</th>
<th>Bandwidth Available</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>13250-13400</td>
<td>Doppler radar</td>
<td>150 MHz</td>
<td>Potential for ultra short range systems to coexist in the radar bands (or be incorporated in the ASDR system), high frequency makes application limited to ultra short range.</td>
</tr>
<tr>
<td>15400-15700</td>
<td>Airport Surface detection Radar (ASDR)</td>
<td>300 MHz</td>
<td></td>
</tr>
</tbody>
</table>

3.2 Candidates in Non aviation bands

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Primary Allocation</th>
<th>Bandwidth Available</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>47-48</td>
<td>Broadcasting and Land Mobile</td>
<td>1 MHz</td>
<td>Unlikely, but should question opportunities through CEPT and ITU.</td>
</tr>
<tr>
<td>48-87.5</td>
<td>PMR and fixed defence Broadcasting</td>
<td>12.3 MHz</td>
<td>Unlikely, but should question opportunities through CEPT and ITU.</td>
</tr>
<tr>
<td>225-242.95</td>
<td>Defence and Broadcast</td>
<td>17.95 MHz</td>
<td>Unlikely, national defence mobile allocation with broadcasting under the Wiesbaden agreement, this is unlikely to be an opportunity but CEPT, ITU. and military should be approached regarding viability.</td>
</tr>
<tr>
<td>433.05-434.79</td>
<td>ISM</td>
<td>1.75 MHz 50 MHz</td>
<td>Unlikely, arguable not a suitable band for safety of life systems due to non protection afforded, however, could be considered for some short range applications.(2.4 Ghz is a candidate for Gatelink application)</td>
</tr>
<tr>
<td>2400-2450</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

3.3 Bands investigated by the telecommunications community for MS

TBD
4. **Proposed work programme for ITU-R in the period up to 2006**

4.1 **Allocation of Radio Frequencies at the World Radio Conferences (2003 and 2006)**

In WRC 2003 and WRC 06 there are opportunities to open discussion on additional bands to aviation:

- 5 GHz band (5090 to 5750 MHz)
- Introduction of UAT in DME band
- Passengers communication in 14-14.5 GHz band
- Sharing between radar and mobile service
- Allocation for GAS (and possibly VDL4) in 108-117.975 MHz
- Definition of the agenda for future WRCs

4.2 **Schedule in ITU/CEPT**

- Preliminary aviation input required on future spectrum for agenda item 7.2 before mid 2002
- April 2002 CEPT CPG
- End 2002 ITU CPM
- ITU WRC 2003
- Aviation input required on future systems required 2004/2005
- ITU WRC 2006

4.3 **Schedule in ICAO**

- ICAO AMCP WG C proposes preliminary new requirements and new systems – mid-2002
- ICAO AMCP WG C delivers new requirements and new systems – End-2002
  Air Navigation Commission adopts new systems – start 2003

4.4 **Work programme for ITU**

- Request to identify suitable radio bands
  TBD

- Request to make compatibility studies
  TBD

- Request to open agenda “to provide additional spectrum capacity to aviation” for WRC 2006
  TBD