RECOMMENDATION ITU-R RS.1165-2

Technical characteristics and performance criteria for systems in the meteorological aids service in the 403 MHz and 1 680 MHz bands

(1995-1997-2006)

Scope

This Recommendation gives the technical characteristics and performance criteria for systems in the meteorological aids service in the 403 MHz and 1 680 MHz bands.

All the various metaids systems are covered: radiosondes, dropsondes and rocketsondes.

The ITU Radiocommunication Assembly,

considering

a) that upper-air meteorological measurements carried out by radiosondes are an essential element of the World Weather Watch Programme of the World Meteorological Organization (WMO);

b) that many defence services deploy radiosonde systems in order to support a variety of operations, independent of the World Weather Watch Programme;

c) that many radiosonde systems are used for local and regional monitoring of atmospheric pollution conditions and also for tracking the trajectories of hazardous discharges from natural or man-made disasters;

d) that radiosonde systems operating in the meteorological aids (MetAids) service have unique radiocommunication requirements;

e) that radiosonde, dropsonde, and rocketsonde systems under MetAids service mainly operate in the bands 400.15-406 MHz (called the 403 MHz band) and 1 668.4-1 700 MHz (called the 1 680 MHz band) with limitations as per the provision No. 5.379E of the Radio Regulations (RR);

f) that radiosondes in the MetAids service are flown on balloons and rockets and may operate with stations located on land or ships;

g) that other types of radiosondes in the MetAids service are dropped from aircraft and operate with stations located on aircraft;

h) that performance objectives for transmissions to and from radiosondes must be consistent with the attendant functional requirements and with the performance limitations associated with the systems and frequency bands in which the requirements will be fulfilled;

j) that performance objectives for representative systems operating in the MetAids service are intended to provide guidelines for the development of actual systems that must operate in a frequency sharing environment;

k) that performance objectives for particular systems may be determined using the methodology similar to that described in Recommendation ITU-R SA.1021;

l) that performance objectives are a prerequisite for the determination of interference criteria;

m) that Recommendation ITU-R RS.1263 provides the interference criteria for systems in the meteorological aids service operating in the 403 MHz and 1 680 MHz bands,

recommends

1 that the technical and operational characteristics in Annex 1 should be considered as typical for meteorological aids in the 403 and 1 680 MHz bands;

2 that the performance criteria specified in Table 3 should be considered when developing interference criteria and conducting sharing studies with other services.

Annex 1

1 Introduction

1.1 Daily meteorological operations

Meteorological aids[1] are mainly used for *in situ* upper air measurements of meteorological variables (pressure, temperature, relative humidity, windspeed and direction) in the atmosphere up to an altitude of 36 km. The measurements are vital to national weather forecasting capability (and hence severe weather warning services for the public involving protection of life and property). The meteorological aids and associated tracking systems provide simultaneous measurements of the vertical structure of temperature, relative humidity and wind speed and direction over the full height range required. The variation of these meteorological variables in the vertical contains the majority of the critical information for weather forecasting. The MetAids systems are the only meteorological observing systems able to regularly provide the vertical resolution that meteorologists need for all four variables. Identification of the heights where sudden changes in a variable occur is vital. Thus, it is essential that continuity of reliable measurements is sustained throughout the ascent of the radiosonde.

The MetAids observations are produced by radiosondes carried by ascending balloons launched from land stations or ships, dropsondes deployed from aircraft and carried by a parachute, and rocketsondes lifted into the atmosphere by rocket and descend under a parachute during data collection. Radiosonde observations are carried out routinely by almost all countries, two to four times a day. The observation data are then circulated immediately to all other countries within a few hours via the WMO Global Telecommunications System (GTS). The observing systems and data dissemination are all organized under the framework of the World Weather Watch Programme of WMO.

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[1] This Recommendation addresses radiosondes, dropsondes, and rocketsondes operated in the meteorological aids (MetAids) service. The term MetAids is used when the discussion applies to all three types of systems. The specific system name (radiosonde, dropsonde and rocketsonde) is used when the discussion applies to one or two of the specific types of systems.

The radiosonde network provides the primary global source of real-time *in situ* measurements. WMO Regulations (Manual on the Global Data-Processing System (GDPS)) require that radiosonde measurements should be made and circulated to all GDPS centres worldwide at national, regional and global levels for numerical weather prediction. The observation stations are required, worldwide, at a horizontal spacing of less than or equal to 250 km, during the first decade of the twenty-first century, with a frequency of observation of from one to four times per day. However, the numerical weather prediction models for small scale meteorological phenomena (e.g. thunderstorm, local winds, tornadoes) and environmental emergencies will actually require local upper air observations every one to three hours at a horizontal resolution from 50 to 100 km. Observations are to be provided from a variety of observing systems, chosen according to the needs of the national administration, including MetAids measurements, wind profiler radar measurements or satellite measurements.

The radiosonde observations are essential to maintain stability in the WMO Global Observing System (GOS). Remotely sensed measurements from satellites do not have the vertical resolution available from radiosondes. Successful derivation of vertical temperature structure from these satellite measurements usually requires a computation initialized either directly from radiosonde statistics or from the numerical weather forecast itself. In the latter case, the radiosonde measurements ensure that the vertical structure in these forecasts remains accurate and stable with time. In addition, the radiosonde measurements are used to calibrate satellite observations by a variety of techniques. Radiosonde observations are thus seen to remain absolutely necessary for meteorological operations for the foreseeable future.

1.2 Monitoring climate change

Large worldwide changes have occurred in atmospheric temperature and ozone in the last 20 years, with many of the largest changes taking place at heights between 12 and 30 km above the surface of the Earth. The changes are large enough to cause concern about safety of future public health. Routine daily radiosonde observations to heights above 30 km identify the distribution in the vertical of the changes that occur and hence allow the causes of the changes to be evaluated. Ozonesonde measurements to similar heights determine the vertical distribution of the ozone depletion that now appears to be occurring in both Southern and Northern Hemisphere winter and spring. Many countries fly ozonesondes at least three times per week during these seasons to monitor developments.

Successful sampling of climate change requires the use of radiosondes with established systematic error characteristics. The requirement for continuity in the time series of upper air measurements worldwide means that new radiosonde designs are only introduced into operation after several years of intensive testing, that occurs both in the laboratory and in the free atmosphere.

1.3 Other users

Other MetAids systems may be deployed independently of the main civilian meteorological organization by national research institutes and other users. Specific investigations will include environmental pollution, hydrology, radioactivity in the free atmosphere, significant weather phenomena (e.g. winter storms, hurricanes, thunderstorms, etc.) and investigation of a range of physical and chemical properties of the atmosphere. This use is not decreasing with time, since with modern automation it is now much easier to successfully operate mobile systems and shipboard systems without highly skilled operators and a large amount of supporting equipment. MetAids operations have to accommodate these users, and this expands the radio-frequency spectrum required for MetAids operations. This is particularly critical when launch sites of these other users are within 150 km of the meteorological organization launch sites.