CINRAD Radar Operational Evaluation Based On ASOM

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Abstract: Atmospheric Observing System Operations and Monitoring (ASOM) is a real-time monitoring system of observation equipment’s running status and observational data. In this article, 4 operating indexes—Availability of Operation (Ao), Mean Time Between Failures (MTBF), Failure Duration (Tfd), Number of Failures (Nf) are evaluated on the basis of maintenance data of ASOM from 2009.12.01-2014.11.30, the failure distribution and replacement of radar spare parts in these fault cases and their trends are quantified and evaluated for different radar subsystem and each type of radar. The results, to some extent, make efforts to set up pertinent Spare Parts Supply Management, improve maintenance support capability of CINRAD, and finally promote efficiency of China’s meteorological observation equipment management.

Key words: CINRAD; Operational Evaluation; radar spare parts

Introduction

Early in 1996, the CMA (China Meteorological Administration) has already developed construction planning for new generation of weather radar (CINRAD Radar, hereinafter referred to as "radar"). By the end of 2014, a total of 171 radars put into business operation, forming a weather radar network which cover the whole country preliminarily, design scientifically and operate steadily. Since manufacturers, models and technical characteristics of those radars are not identical, it is necessary to use unified evaluation index to analyze their running situation. Atmospheric Observing System Operations and Monitoring (ASOM) is a real-time monitoring system of observation equipment’s running status and observational data. In this article, 4 operating indexes—Availability of Operation (Ao), Mean Time Between Failures (MTBF), Failure Duration (Tfd), Number of Failures (Nf) are evaluated on the basis of maintenance data of ASOM from 2009.12.01-2014.11.30.

1. CINRAD radar operation ability analysis

Annual results of Ao, MTBF, Tfd and Nf for CINRAD radar from 2010 to 2014 are shown in Fig1-4 below.

Average Ao for CINRAD radar from 2010 to 2014 is 98.39%, showing a trend of increasing year by year, indicates that the overall efficiency of China's new generation of weather radar maintains higher level.

Average MTBF for CINRAD radar from 2010 to 2014 is 1465.08h, showing slightly fluctuations, but overall a trend of increasing from the annual comparison.
Average $T_{fd}$ and $N_f$ for CINRAD radar from 2010 to 2014 is 13.15h and 4.68 times, showing slightly fluctuations, but overall a downward trend from the annual comparison. $T_{fd}$ declines from 22.40h in 2010 to 8.09h in 2013, and Slightly extends to 10.32h, the main reasons are: Wanzhou radar in Chongqing City switches off for 5 times due to 367 hours’ failure, Enshi radar in Hubei Province switches off for 3 times due to 255.16 hours’ failure. Average $N_f$ for CINRAD radar drops from 5.28 times in 2010 to 3.36times in 2014, illustrating that the maintenance capacity of CINRAD radar in our country is increasing year by year and fault duration and the number of failures greatly reduced.

![Fig1 annual comparison of Ao from 2010 to 2014](image1)
![Fig2 annual comparison of MTBF from 2010 to 2014](image2)
![Fig3 annual comparison of Tfd from 2010 to 2014](image3)
![Fig4 annual comparison of Nf from 2010 to 2014](image4)

2. Summary and discussion

In this article, 4 operating Indexes- $A_o$, MTBF, $T_{fd}$ and $N_f$ are evaluated on the basis of maintenance data of ASOM from 2009.12.01-2014.11.30, the conclusion is as follows:

From the annual comparison, $A_o$ and MTBF rises year by year, and $T_{fd}$ and $N_f$ decreases year by year, suggesting that CINRAD radar operation maintains at a high level of efficiency, reliability increases year by year, China's radar maintenance ability strengthens continuously, and maintenance support is more Timely and effective.