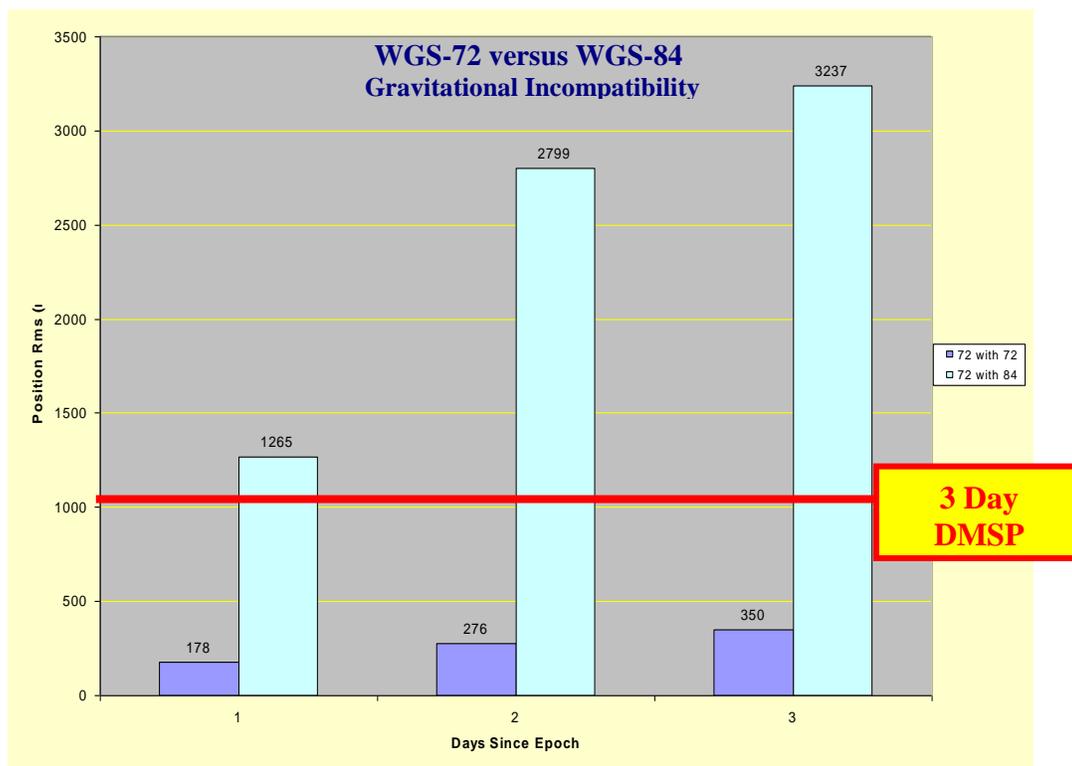


## Why Should You Use AFSPC Astrodynamic Standards?

The Astrodynamic Standards were developed to ensure interoperability for users of the JSpOC satellite catalog. In order to obtain the most accurate prediction, users need to use the same propagator models that were used to generate the satellite catalog. The accuracy of an astrodynamic algorithm is primarily a function of its underlying physics model and the accuracy and compatibility of the data it uses. It is easy to understand that the "better" the underlying physics model or the more accurate the data, the more accurate the algorithm's calculation. However, it is not as intuitively obvious that the prediction model must also be compatible with those models generating the orbital data that it uses as input.

If the data products (either Two-Line Elements (TLEs) or Vector Covariance Messages (VCMs)) produced by the JSpOC orbit determination algorithms are used by a customer with a compatible propagator, they will make the "most accurate" prediction possible. However if the same JSpOC TLE or VCM is used by a customer with a non-compatible propagator, they will get a "less accurate" prediction.



**Figure 1. Predictions with JSpOC vectors using WGS-72 versus WGS-84**

Figure 1 gives an example of an actual operational incompatibility when predicting the location of a satellite. A user wanted to upgrade their WGS-72 geopotential model to the more accurate WGS-84. However, they were still receiving their data input in the form of WGS-72 produced vectors from the JSpOC. They had an accuracy requirement for DMSP satellites that a prediction would still be within one kilometer after three days, which they met with their old WGS-72 model (as shown in dark blue in the table above). However, if they had decided to upgrade to the incompatible, "but more accurate,"

geopotential model they would have failed to meet this requirement even after one day, let alone three (as shown in light blue in the table above).

The bottom line is, that if you are a user of the JSpOC satellite catalog (either Two-Line Elements (TLEs) or Vector Covariance Messages (VCMs)) you need to use the same propagators that were used to generate the TLEs or VCMs in order to get the most accurate prediction.