# AIS and TimeCaster Accuracy
## Whitepaper

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# AIS and TimeCaster Accuracy

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### About Maerospace Corporation

Maerospace is a Canadian company that created and delivers the TimeCaster™ service which uses patent-pending algorithms to provide a comprehensive view of the current location of all AIS ships with a tenfold accuracy improvement. Using this current knowledge, TimeCaster™ provides mitigation and predictive alerting on many of the factors described in this paper.

# 1   Introduction

Wide area AIS displays are subject to significant error due to the spread in times of receipt of messages. For example, two ships shown near each other on a map will both be shown in the "wrong" location if significant time has passed since they were each detected. The average age of messages shown on an AIS display is typically several hours.  Worse still, if Ship A is shown in position as reported 2 hours ago and Ship B is shown in its location as reported 8 hours ago, then the two ships *have never been in the positions shown relative to one another.*

TimeCaster™ was designed to address this problem by creating an accurate position for all ships as of "now" and updated every 10 minutes. TimeCaster™ has demonstrated exceptional improvements in the accuracy of wide area AIS displays.  Table 1 shows the results obtained on June 13, 2016 in the Indian Ocean region.

We have conducted these analyses using raw data from several vendors and we find that today, no one vendor of raw AIS data dominates in terms of accuracy. All sources can benefit from the addition of TimeCaster™.

This white paper explains how AIS and TimeCaster™ accuracy are measured.

| | Chennai | Jamnagar | Indian Ocean | Global |
|---|---|---|---|---|
| **Accuracy** | | | | |
| AIS Accuracy (nm) | 25 | 84 | 111 | 169 |
| TimeCaster Accuracy (nm) | 3 | 7 | 7 | 9 |
| Average age of messages displayed (hrs) | 2 | 4 | 4 | 5 |
| Improvement in Accuracy | 7X | 12X | 16X | 19X |

*Table 1 - Accuracy figures for June 13, 2016*

# 2   Calculating Accuracy

## 2.1   AIS Display Accuracy

Typically, both coastal and satellite AIS data are used in operational systems. Coastal AIS is often considered to be real-time; in fact, this is true only within line-of-site from a coastal tower. As a ship goes beyond about 20 miles or is in the RF shadow of buildings or land, the probability of the base station receiving a message is reduced significantly.

Accuracy of AIS displays is considered from the point of view of the user.  An operator watching a screen display needs to know the accuracy of the positions of the vessels that are shown. With no better source of truth, this must be calculated from the available information.

Every AIS position report includes vessel speed. A simple calculation can estimate the current distance from the ship's last position on the map:

**Reported Speed X Time Since last AIS Message = Display Error**

This error is can be calculated for all ships and then averaged to obtain the display error.

Note that this approach neglects changes in speed that may have occurred. On the other hand, no information is available about such changes. Applied consistently, this metric can be applied to all ships world-wide and provides a figure of merit for a positioning system. This metric has the advantage that it can be computed by any user of the data.

## 2.2  TimeCaster™ Accuracy

Computing the accuracy of our predictions is simpler. Every ten minutes, TimeCaster produces an estimated position for tracked vessels. Each time a new AIS message is received, we compare this new "truth" with the most recent TimeCaster forecast. The result is the accuracy of our forecasted position. This calculation is illustrated in figure 1.
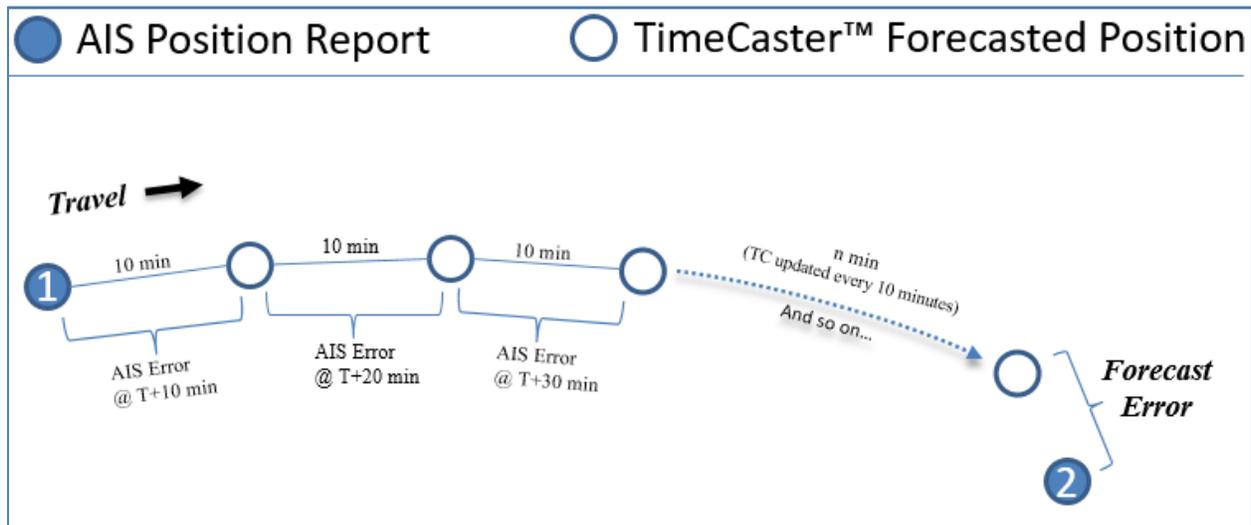


*Figure 1-TimeCaster Accuracy Calculation*

# 3   The Current Situation

Using various data sources, we find the typical AIS display error for a global system ranges from 120 to 170 nautical miles. TimeCaster™ accuracy places a vessel within 10 nautical miles of the true position, 90% of the time. We monitor these key performance indicators regularly and provide clients with periodic reports to show the benefit they receive from TimeCaster.

# 4   Conclusion

AIS and Satellite AIS systems delivers "big data" with great value. That value, however, is compromised by the inherent inaccuracy due to ship detections being spread in time. This problem, although severe, can be rectified though the use of TimeCaster™, which provides a picture of maritime domain with accuracies an order of magnitude better simply through analytics.