AIS and Beyond

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What I’ll cover...

• Quick overview of AIS
• New developments
• Integration, new devices, new functionality
• Things to keep in mind with AIS
What is AIS?

• AIS = Automatic Identification System
• Primary use: collision avoidance, secondary use: vessel tracking
• AIS is a broadcast transponder system, operating in the VHF maritime mobile band (channels 87B & 88B)
• Transmits ship information such as identification, position course, speed and more to other vessels and shore
• Uses 9 digit MMSI (Maritime Mobile Service Identity) as unique identifier
• Types of AIS devices
  • Class A: mandated for use on SOLAS and other types of commercial vessels
  • Class B: for use on recreational and small commercial vessels (CSTDMA & SOTDMA)
  • Other devices: AIS receivers, SART, MOB, EPIRB, AtoN, trackers
• Transponders use integrated GPS to fix own position and transmit info via VHF
• Approximate transmit range: Class A = 30+ miles, Class B CS = 5-7 miles, Class B SO = 15 miles, AIS MOB = ~2 miles
• Class B must be preprogrammed with vessel info by dealer
• NOT a replacement for radar or other watch methods
The yacht’s AIS (1) is exchanging info with a freighter (2)

receiving signals from a virtual AtoN (Aids to Navigation) (3)

receiving a signal from a channel marker (4)

displaying the distance and bearing to an MOB via an AIS beacon (5)

and calculating if on a collision course with a fishing boat (6)
Typical AIS Installation

• Most transponders today can interface with virtually any marine network
  • NMEA 2000, NMEA 0183, USB
  • Some also with Wi-Fi
• Some (e.g. Vesper XB-8000, AMEC B600W) can multiplex data from many sources / protocols and route to other devices
  • E.g. stream AIS & GPS plus wind, depth, heading to iPad or PC
Using AIS

**Kalfetan WSF (WY2512)**
- **MMSI:** 366772090
- **Passenger Ship**
- **Underway with engine at 16.7 kn**
  - CPA **0.18 NM** in **1 min 26 secs**
  - **121°** **0.82 NM from boat**
## Who is required to use AIS?

<table>
<thead>
<tr>
<th>TYPES OF VESSEL REQUIRING AIS</th>
<th>AIS CLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Towing vessels &gt;26 feet and &gt;600 HP</td>
<td>Class A</td>
</tr>
<tr>
<td>Passenger vessels</td>
<td>Class A</td>
</tr>
<tr>
<td>&gt;150 passengers</td>
<td></td>
</tr>
<tr>
<td>&gt;65 feet and &lt;150 passengers</td>
<td></td>
</tr>
<tr>
<td>Operate in VTS area or &gt;14 knots</td>
<td>Class A</td>
</tr>
<tr>
<td>Don’t operate in VTS area &amp; &lt;14 knots</td>
<td>Class B</td>
</tr>
<tr>
<td>Dredges</td>
<td>Class A</td>
</tr>
<tr>
<td>Operating near commercial channels</td>
<td></td>
</tr>
<tr>
<td>Operating outside shipping fairways</td>
<td>Class B</td>
</tr>
<tr>
<td>Vessels moving certain dangerous cargo</td>
<td>Class A</td>
</tr>
<tr>
<td>Commercial fishing vessels &gt;65 feet</td>
<td>Class B</td>
</tr>
<tr>
<td>All other commercial self-propelled vessels that are &gt;65 feet</td>
<td>Class A</td>
</tr>
</tbody>
</table>
Recent developments in AIS
Class B SOTDMA AIS Transponders

• New type of Class B AIS transponder now mainstream

• Different from existing CSTDMA* Class B
  • 5 watts vs. 2 watts
  • Therefore more transmit range (~10-15 miles)
  • Uses SOTDMA** (same as Class A)
  • Higher reporting rate, higher grade time management & priority over Class B CS
  • Supports message 27: long range / satellite AIS

• AMEC WideLink B600 AIS SOTDMA Class B
  • Black box with NMEA 0183, NMEA 2000, USB, NMEA multiplexing
  • Pricing: $629 (Wi-Fi version $755)

• em-trak AIS B400
  • Integrated color screen, C-MAP support, Wi-Fi
  • Pricing: $1,079

• Garmin AIS 800
  • Integrated splitter
  • Pricing: $849

* CSTDMA = Carrier Sense Time Division Multiple Access  ** SOTDMA = Self Organized Time Division Multiple Access
AIS Classes:
- Class A
- Class B/SO
- Class B/CS

<table>
<thead>
<tr>
<th>Shipboard</th>
<th>Class A</th>
<th>Class B/SO</th>
<th>Class B/CS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmit Power (Watts)</td>
<td>12.5 W / 2 W (low-power)</td>
<td>5 W / 2 W (low-power)</td>
<td>2 W</td>
</tr>
<tr>
<td>Primary Access Scheme</td>
<td>Self-organizing Time-Division Multiple Access (SOTDMA)</td>
<td>SOTDMA</td>
<td>Carrier-sense TDMA non-competing with SOTDMA units</td>
</tr>
<tr>
<td>Position Reporting Rate</td>
<td>Either every 2, 3 1/2, 6 or 10 s based on speed and course change. Every 3 min. when ≤ 3 kts.</td>
<td>Either every 5, 15 or 30 s based on speed (2-14, 14-23, &gt;23 kts) Every 3 min. when ≤ 2 kts.</td>
<td>Every 30 s Every 3 min. when ≤ 2 kts.</td>
</tr>
<tr>
<td>Static Data Reporting Rate</td>
<td>Every 6 min</td>
<td>Every 6 min</td>
<td>Every 6 min</td>
</tr>
<tr>
<td>Frequency Range</td>
<td>25 kHz bandwidth between 156.025 MHz to 162.025 MHz</td>
<td>25 kHz bandwidth between 156.025 MHz to 162.025 MHz</td>
<td>25 kHz bandwidth at minimum between 161,500 MHz to 162.025 MHz</td>
</tr>
<tr>
<td>Dedicated DSC Receiver for Channel Management</td>
<td>Yes</td>
<td>Yes</td>
<td>Time-shared</td>
</tr>
<tr>
<td>Position Source / WGS-84 to 1/10,000 of minute of arc</td>
<td>Internal Global Navigation Satellite System &amp; connection to an External Electronic Positioning System (EPPS)</td>
<td>Internal GNSS</td>
<td>Internal GNSS</td>
</tr>
<tr>
<td>Digital Interfaces</td>
<td>2 Input-Output &amp; Multiple Presentation Outputs</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Display</td>
<td>Multiple Keyboard Display (MKD)</td>
<td>MKD</td>
<td>Optional</td>
</tr>
<tr>
<td>Safety Text Messaging</td>
<td>Receive &amp; Transmit</td>
<td>Receive &amp; Transmit</td>
<td>Receive &amp; Transmit</td>
</tr>
<tr>
<td>Application Specific Messaging</td>
<td>Receive &amp; Transmit</td>
<td>Receive &amp; Transmit (up to 3 slots)</td>
<td>Receive Optional, cannot Transmit</td>
</tr>
<tr>
<td>Transmit Data</td>
<td>All</td>
<td>No Rate of Turn, Navigation Status, Destination, ETA, Draft, or IMO#</td>
<td>No Rate of Turn, Navigation Status, Destination, ETA, Draft, or IMO#</td>
</tr>
</tbody>
</table>
AIS Satellite tracking

Courtesy of exactEarth
Satellite AIS

- AIS is not designed for tracking but boaters want to track using AIS
- AIS VHF transmission limited to line of sight but satellites have the potential to receive AIS transmissions
- AIS Message 27: long-range automatic identification system broadcast message for Class A and Class B “SO”
- Consider Class B SOTDMA (5 watt) or even Class A (12.5 watt) if going offshore and want satellites (and friends and family) to see you
- MarineTraffic: track a single vessel for $14.83 per month
- Other options might make more sense for offshore tracking (SPOT, SkyMate)
- Are people using this and does this work??
USCG Update

• Big issue with AIS? Transponders with incorrect information!
  • AIS with bad encoding on Jan 22: 50% of Class A, 46% of Class B
  • Includes MMSI, IMO Number, Call Sign or Name differences, vessel length
  • Class B must be programmed by the dealer!
  • See https://www.navcen.uscg.gov/pdf/AIS/AISGuide.pdf
  • Check your vessel here: https://www.navcen.uscg.gov/aisSearch/index.php
  • You can’t change your MMSI but other info can be changed

• Make sure you are using an USCG approved AIS
  • See: https://cgmix.uscg.mil/Equipment/EquipmentSearch.aspx

• Warning on LED lights causing AIS/VHF interference
  • Has been an issue for years
  • Most LED manufacturers have fixed the issue
  • Check before installing LED anchor light near VHF antenna
See how the USCG sees you...

Make sure your AIS is USCG approved


<table>
<thead>
<tr>
<th>Approval Number</th>
<th>Manufacturer</th>
<th>Approval Status</th>
<th>Item Description</th>
<th>EC/US MRA Approved</th>
</tr>
</thead>
<tbody>
<tr>
<td>165.156/11/0</td>
<td>ALLTEK MARINE ELECTRONICS CORP.</td>
<td>EXPIRED</td>
<td>Alltek Marine Electronics, Camino-101 Class B, Automatic Identification System.</td>
<td></td>
</tr>
<tr>
<td>165.156/13/0</td>
<td>ALLTEK MARINE ELECTRONICS CORP.</td>
<td>EXPIRED</td>
<td>Alltek Marine Electronics, Camino-201 Class B, Automatic Identification System.</td>
<td></td>
</tr>
<tr>
<td>165.156/20/0</td>
<td>ALLTEK MARINE ELECTRONICS CORP.</td>
<td>APPROVED</td>
<td>Alltek Marine Electronics Corporation, Camino-106 and Camino-100W Class B, Automatic Identification System</td>
<td></td>
</tr>
<tr>
<td>165.156/25/0</td>
<td>ALLTEK MARINE ELECTRONICS CORP.</td>
<td>APPROVED</td>
<td>Alltek Marine Electronics Corp., VedeLine, BRS-6000W Class B, Automatic Identification System</td>
<td></td>
</tr>
</tbody>
</table>

4 Records found.

Last Update:
Tuesday, January 22, 2019
FCC Update

• Major crack down on AIS Buoy trackers

• Going after non-FCC certified AIS equipment
  • Must have an FCC ID and label

• Beware of cheap, non-FCC certified AIS on Amazon and eBay
  • They are illegal! Remember - USCG & FCC know who you are & what you are using
Integration, new devices and new functionality
The free Vesper Marine WatchMate App configures and monitors a Vision² or XB-8000 transponder

- Duplicates Vesper Vision functions on mobile device
- View & prioritize target info
- Set alarms based on profiles
- Remote control of transponder settings
- Switch in and out of Silent mode
- Anchor watch
- Get man overboard alerts
- Check the operational status of the AIS transponder
- Perform configuration & firmware upgrades
The free Vesper Marine deckWatch gives you the ability to monitor all critical information straight from your wrist with a Vision² or XB-8000 transponder.

*Available on Android Wear 2.0

- View AIS Targets
- Receive collision warning alarms
- Control and view the Anchor Watch alarm.
- View own GPS Position, Course, Speed and more!
- Manage and receive MOB alarms.
AIS Mobile Apps

Plus hundreds more on iOS, Android, Windows, Mac

TARGET TRACKING
RADAR VIEW

iNavX on iPad

MarineTraffic on iPhone

OpenCPN on Android
AIS with enhanced displays

- Vesper Vision² has integrated color touchscreen and more
- Coastal outlines, safety messages (including MOB)
- Alarms with intelligent filtering
- Plus NMEA 2000, NMEA 0183, Wi-Fi, USB
- DSC calling

- Em-trak A400 & B400 AIS Transponders
- Class B SO (5 W) or Class A (12.5 W) models
- Color screen supports C-MAP charts
- Wi-Fi, NMEA 2000, NMEA 0183, opt. USB
Vesper smartAIS anchor watch solution

Wind direction/speed alarms at anchor
Get alerted with change in wind direction or wind speed.

Depth alarm at anchor
 Warns you if the water depth falls below a certain level.

**Plus** the benefit of letting others know where you are and collision alarms.
Furuno Wireless Radar + AIS on iPad

Finally a complete solution for navigation, AIS and radar for the iPad

- FURUNO 1st Watch Wireless Radar
- TimeZero (Nobeltec) TZ iBoat app for iPad
- AIS transponder with Wi-Fi and multiplexing
  - Vesper XB-8000
  - AMEC B600W
- Heading sensor
  - E.g. from autopilot
- Total HW/SW solution cost around $2000
AIS MOB: Ocean Signal MOB1 – AIS & DSC

Graphic provided by Ocean Signal
AIS SART & EPIRB

- SART (Search and Rescue Transponder) required on 300+ ton vessels
- Traditional SARTs use radar
- Now AIS SARTs are certified for use
- Great rescue solution coupled with EPIRB
- Priced from $500
- McMurdo have a combo AIS+GPS+EPIRB
- Priced about $600
AIS trackers

• Fishing nets / buoys and other small floating objects can be hazards for boaters
• Plus boaters want to track tenders
• New type of AIS device can be used to track and alert other boats of their existence and position
• AIS trackers are self-contained AIS transponders with integrated battery, VHF and GPS antennas, SOS button
• Commercial solutions exist (AMEC, em-trak) and are in use in every country except the USA
• Illegal units sold on Alibaba etc.
• Getting a legal MMSI in the US is not possible
  • AtoN MMSIs not available for non-official use
  • Using a Class B MMSI is illegal
• Bottom line: DO NOT USE THESE IN US WATERS!
AIS Computer!?!?

- Comar SLR350Ni: network based AIS receiver with integrated computer
- Based on popular land station SLR350N
  - Widely used for setting up a MarineTraffic monitoring station
- Dual channel AIS receiver
- Built-in computer running Raspberry Pi 3
  - 4 USB, HDMI, microSD, Ethernet & Wi-Fi (client and server)
  - Runs open source software such as OpenCPN
  - Fully programmable for virtually any local / remote AIS monitoring scenario
- Just add monitor, keyboard, mouse, USB power, VHF antenna
Other AIS considerations
VHF Antenna Considerations

• AIS devices require VHF antenna
• Any good VHF antenna will work
• Position is #1 factor – by far
• Antennas need separation
  • At least 4 feet from other VHF
  • GPS antenna less critical
  • Consider combo antennas
• Any metal causes multi-path interference
  • E.g. stays, masts, arches, bimini
• Cable & connectors also important
• Antenna splitters are a great solution
• AIS can be poor in marinas – test in open water

Don’t do this!
MarineTraffic ≠ Real-time AIS

AIS should not be relied on for vessel tracking, especially with MarineTraffic
Every day, for a decade, we get the call: “I no longer see myself on MarineTraffic…”

MarineTraffic?
• Started as a university project in Greece
• Volunteer amateur unpaid AIS receiving stations
• Randomly placed
• No guaranteed quality of service
• No predictability
• Often a delay – not real-time
• Have added satellite-based reception options
• Currently trying to morph into a professional service
• Similar issues with other AIS tracking site
Same time but different information
Turn Off AIS While Away

- Volume of Class B transponders is now having a negative impact on AIS
- Safety issue: so many targets, you can’t see other nav features
- Especially a problem on older chartplotters e.g. Garmin 3000 series, even Raymarine new models
  - Limited targets, some not visible
- Also notice lack of vessel info (MMSI only displayed)
- Turn off your Class B AIS transponder when you are in a marina PLEASE!!!
Questions?

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Thank you and safe boating!