













| Reference Navigation: Determine position in relation to other reference points   |   |  | Signals of Opportunity (SoOps): Anything with a transmitter can be connected. Not necessarily designed for navigation, but useful for determining range or bearing. |   |   |   | Autonomous Navigation: No reference or spoofing possible  |   |  |   |
|--|---|--|---|---|---|---|---|---|--|---|
| <p><b>GPS</b></p> <p>Weak signal but ubiquitous in open sky, most accurate</p>  | <p><b>Loran</b></p> <p>And other special transmitters like Locata</p>  | <p><b>Celestial Navigation</b></p>  <p><b>Vision Systems</b></p> <p>Inhibited by smoke, fog, clouds, precipitation and other reference points where visible</p>  | <p><b>VORTAC/ DME/ILS</b></p> <p>Traditional aircraft navigation today</p>       | <p><b>Cellular</b></p> <p>Plus commercial broadcast like TV and radio; ubiquitous but inaccurate</p>  | <p><b>WiFi</b></p> <p>Spotty coverage, inaccurate; Skyhook + E911 requirements</p>  | <p><b>Active Tx</b></p> <p>Radar, Lidar, Sonar</p>  | <p><b>IMUs</b></p> <p>Self-contained but not accurate over the long term</p>  | <p><b>Crowd-Sourcing</b></p> <p>Via a network, location and proximity data is shared</p>  | <p><b>Map Matching</b></p> <p>Database must be constantly updated to be current</p>  | <p><b>RFID</b></p> <p>Low cost, place sensors where needed — warehouse</p>  |

