5.4 *Winding up session*

1. Lessons learned
2. Course assessment

Bistatic radar

- The first radars were bistatic (till T/R switches were invented)
- First resurgence (1950 – 1960): semi-active homing missiles, SPASUR, ….
- Second resurgence (1975 – 1985): SANCTUARY, hitchhikers, multistatic measurement system (Kwajalein), …
- Third resurgence (1995 – present): Passive Coherent Location (PCL): SILENT SENTRY, TV bistatic radar, bistatic SAR, cellphone radar (Roke Manor), …

Willis, N.J., 'Bistatic radars and their third resurgence: passive coherent location', IEEE Radar Conference, Long Beach, USA, April 2002.

LESSONS LEARNED
Part 1: Programmatic

- **Identify special roles (*niches)* for bistatic radar---and even more importantly, the competition for these niches.**

- **Solicit the end-user and get his endorsement before you start. Even better: Get them to help structure the program.**

- **Invite the monostatic radar mafia early in the program for their review, critique and *toleration*. (You're going to get it whether or not you ask for it, so make it on your terms.)**

- **Avoid dedicated transmitters whenever possible, since a major bistatic cost/complexity advantage is lost.**

- **Shun pronouncements such as:**

  Bistatic radars will replace monostatic radars.

EXAMPLES OF SPECIAL NICHES

- Satellite tracking (*The legacy niche*)
- Air surveillance gap filling
- Short range intel surveillance
- Attack warning and cueing
- Low cost scientific measurements:
  - Planets
  - Ionosphere
  - Wind
- Counter-ARM / ECM*
- Stealth adjunct*

*In theory but not in practice.

LESSONS LEARNED
Part 2: Analytical

- Try not to invent a new coordinate system, just adapt one of the 6,000 existing ones.

- The bistatic triangle must be established to estimate target state. Don't attempt work-arounds. And in particular, don't rely on Doppler data, except in very special cases.

- Do not even think about manipulating the range equation (monostatic or bistatic) for any purpose. They now have the verisimilitude of scripture.

- Whenever in doubt about a bistatic equation, exercise the sanity check: $\beta = 0$, $L = 0$.

- Use ovals of Cassini only with its caveats---and never when Merrill Skolnik is present.

LESSONS LEARNED
Part 3: Testing

- **Double the time and funds that you would normally allocate for monostatic tests whenever you have multiple sites, all of which will (not can, but will) cause you grief.**

- **Triple them if any site is airborne.**

- **Make sure that the transmitter (illuminator) is available *and controllable* during both checkout and tests.**

- **Don't concentrate only on the challenging problems, because the simple ones will *always* rise up to bite you.**

  ---The classic example: simple beam sync vs complex phase/time sync.

LESSONS LEARNED
Part 4: The Third Resurgence

- **This time it's for real!**

- **What is different now?**
  - **For PBR: greater spectrum occupancy; digital transmissions**
  - **better and better processing power**
  - **better communications**
  - **GPS**

- **PBR: digital modulation is better than analog; performance is limited by direct signal and interference environment, so significant effort should be expended in suppressing these.**

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