

## TIMING SYSTEMS PANEL DISCUSSION

### PANEL MEMBERS

**Ronald Beard, Joe White (Moderator)**  
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**James Bleich**  
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The purpose of this panel was to discuss practical issues of designing, building, operating and maintaining remote precise timing systems. Mr. Beard's organization has been a leader in designing and fielding precise timing systems. Mr. Cimafonte's experience has been high level military operation of systems requiring precise time. Mr. Butterline comes from the civil telecommunications industry as a user of these systems. Mr. Bleich represents the operations and maintenance side of the technology.

The panel began the discussion with the issue of documentation for new systems and upgrades. Mr. Cimafonte started the discussion with the comment that any new system or upgrade must start with a requirement. Upgrades driven by these needs may start from well-documented systems, but in at least some cases, the quality and quantity of documentation drops in the process of the upgrade. Mr. Cimafonte made the point that involvement of the user and maintainer community in the development of the upgrade is essential to making the process work. It was agreed that while the commercial instruments (clocks, receivers, etc.) were usually well covered by the manufacturer's operation and service manuals, the overall systems and specially made instruments often were not well documented. This was particularly true where only a few of the systems were built. The problem is worst for the maintainer. Mr. Beard pointed out the need for the developer to describe not only the details of the system hardware, but also to describe how the system is supposed to work. This gives the maintainer a "feel" for the system that gives insight into the operations and maintenance aspects.

The other key issue discussed was the problem created by the rapid technology turnover in

modern instruments. The panel felt that many devices used in timing systems were obsolete soon after the systems were designed. The problem comes in deciding whether to try to preserve the integrity of the system, freezing the design, or to allow system "upgrades." Mr. Butterline said that his experience had been that freezing the design was an effective way of dealing with the problem. It meant that all of the systems always looked the same to maintainers and the inventory of replacement parts was smaller and better defined. This allowed the carrier to provide maintenance with a small core technical staff. Mr. Cimafronte responded that the downside of freezing the configuration was that systems as a whole became obsolete much quicker and that replacement parts for the obsolete components become very hard to find. It often becomes more expensive to maintain antiquated equipment than to replace it. Mr. Beard described an NRL-designed system that was built with the latest model computer. The computer was obsolete before fielding of the system was completed. All agreed that there were no clean solutions to the problem.