TAG YOUR TARGETS—NO. 2!

Beacon Tracking and Alpha-numerics for High Altitude Positive Control

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The ATC Development Division is the "Lead Division" in SRDS for the SPAN program. Mr. J. W. Rabb, (L) Chief of the Data Processing Branch, and Mr. Albert R. Ridenour, (R) Chief of the Procedures Branch, are the technical and operational program managers, respectively, for SRDS responsibilities in the field trial of SPAN as well as ARTS.

The need for positive identification and aircraft altitude on radar displays has long been recognized. Early next Spring controllers in the Indianapolis ARTCC will get a preview of the future method for displaying such information on their scopes.

Pulses from beacon-equipped aircraft will be electronically converted into an alpha-numeric data block and tied to a small position symbol for all high altitude radar returns. Data displayed will consist of flight identity, assigned altitude, and actual altitude (on aircraft with Mode C transponder), plus a handoff and attention indicator. The new system, developed by the FAA's System Research and Development Service, has been labeled the SPAN (for Stored Program Alpha-Numerics) Beacon System.

Using bright display (RBDE-5) equipment, the beacon target alpha-numeric system will undergo live field tests, deriving data from multiple radars in the high altitude positive control sectors of the Indianapolis Center area. It has been designed to be operated like the beacon display function planned in the new National Airspace (NAS) ATC subsystem. For the sake of expediency, however, the system is being configured from the type of hardware designed for the Advanced Radar Traffic Control System (ARTS), now being set up in the Atlanta terminal area. ARTS is a single radar/beacon site alpha-numeric bright display system and will undergo field trials this fall. (See "Tag Your Targets" in the November, 1963 Journal.)

SPAN is, basically, a versatile subsystem addition to the current RBDE-5 scan converted displays. Regular radar/beacon PPI capability will not be altered in any manner, or be dependent upon SPAN when it is connected into the RBDE-5 equipment. There is no interconnection with the primary radar; consequently, it does not alter the display of non-transponder equipped aircraft.

Like ARTS, this system will be field tested to obtain the necessary factual information for developing operational specifications, procedures, computer programs, and display console configurations in future ATC systems. It will operate in conjunction with the Indianapolis, London, and Lynch radar beacon sites which are being upgraded with equipment to handle altitude reporting (Mode C and full 4096 codes for identity on Mode A).

SPAN has the potential of providing alpha-numeric data for all beacon targets from three antenna sites on a maximum of 10 RBDE-5 scan converters. Only the seven scan converted displays for the Indianapolis high altitude positive control sectors will be equipped initially with this system. Possibly later on some additional selected Indianapolis low altitude sector displays will also be interconnected and tested to gain further experience with the use of beacon target alpha-numerics, e.g., military scramble functions and vertical type handoffs between sectors.

The main features of the system are as follows:

Tracking on beacon video and decoding of beacon replies: A modified form of the ARTS tracking routine will be programed to insure continuity of target and track identification when beacon code returns are garbled and to eliminate ambiguities when more than one aircraft transponds on

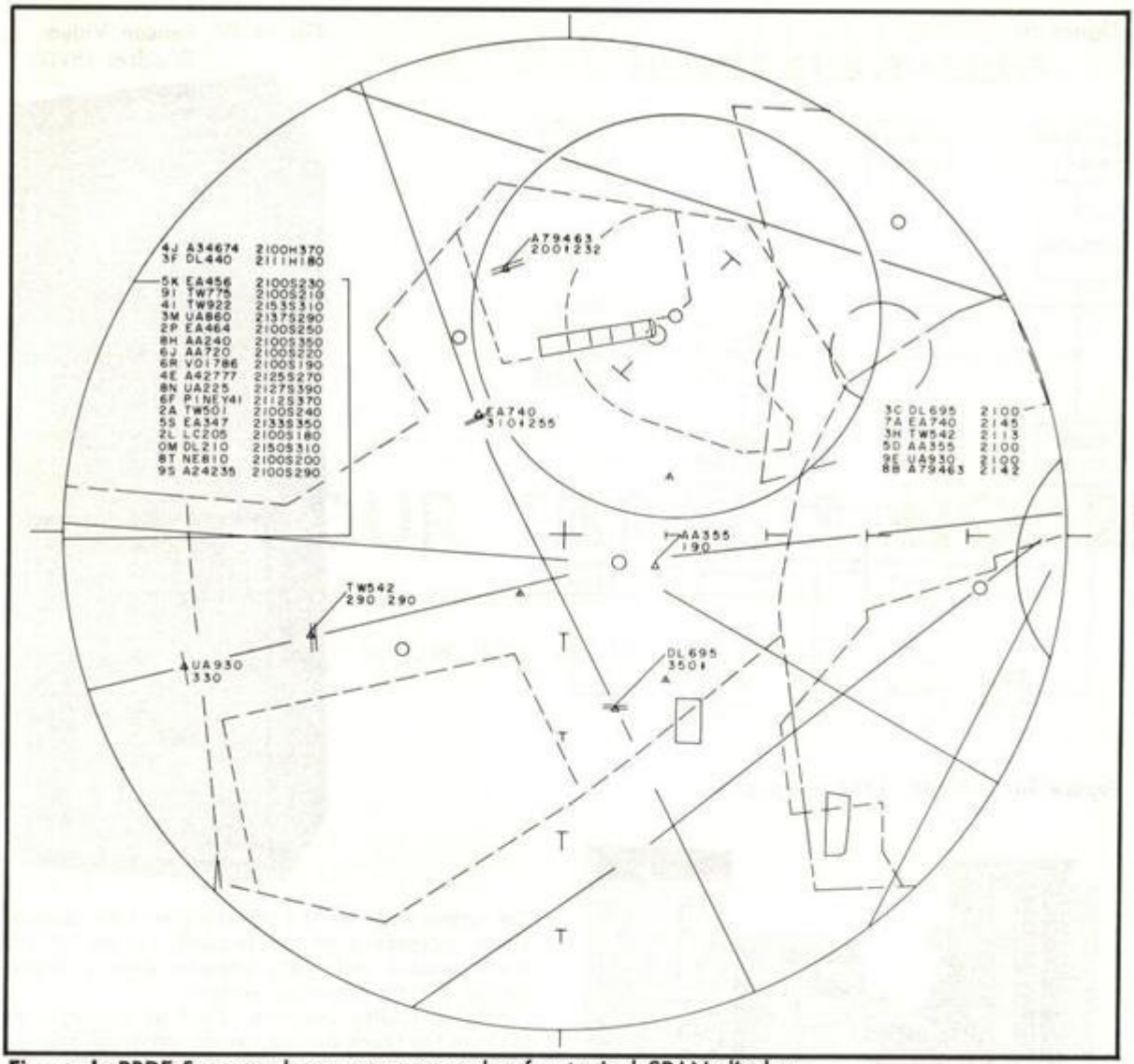

Figure I: RBDE-5 scope close-up, an example of a typical SPAN display.

the same non-discrete code (basic 64 codes) in the same general area.

Automatic target acquisition on discretely coded replies: Track formats for aircraft assigned a discrete code will be positioned at the target video when the corresponding discrete code is first received by the processor. Manual correlation of target and track format by a slewing action will be required for non-discrete codes only.

Decoding of Beacon Modes A and C: The system will decode Mode C beacon replies to provide altitude data and will decode 4096 codes for identity in Mode A.

Display Formats: Each controlled target in an active status will have a track format (alpha-numeric data block) and a companion tabular format. (See Figure I). The track format may contain any or all of the following:

a. Aircraft identification (up to seven characters).
b. Assigned altitude (three characters and a climb or descent arrow if appropriate).
c. Mode C altitude (if available).
d. Leader (Controller's request).
e. Sector track symbol (discrete symbol for each sector's targets).
f. Handoff indicator.
g. Coast bar.
h. Attention indicator.

Figure II:

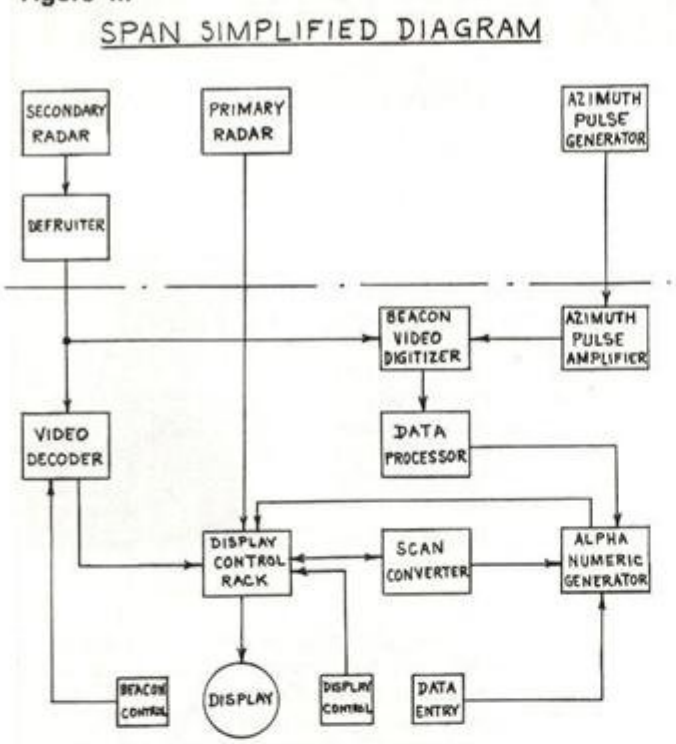

Figure III: UNIVAC 1218 computer

The tabular format, positioned in a sterile area of the display, may contain:

a. Track number (computer assigned).
b. Aircraft identification.
c. Assigned beacon code.
d. Store or hold symbols (on inactive tracks).
e. Altitude (on tracks in a store or hold status).

Semi-Automatic handoff of target position symbol and track format: Upon controller initiation of a handoff action the track format including the discrete sector track symbol will be positioned at the target video on the receiving sector's display. Upon acceptance of the handoff, control of the track format and alpha-numeric data is transferred to the receiving sector.

Inhibit display features: Each of the separate fields in the track format can be independently inhibited by controller action. Track symbols, leaders, or alpha-numeric identity and altitudes can be suppressed or displayed at the controllers selection.

The SPAN system was designed and developed in direct response to the Air Traffic Service (ATS) request for an early field trial of electronic alpha-numerics as a replacement for the shrimp boats on center displays. Since its inception, this program like ARTS, has been planned in detail by SRDS personnel in close coordination with ATS, I&M, SMS, and Regional/Facility representatives. This intra-Agency team concept will be maintained throughout the program and the live operational tests will be jointly planned and conducted by veteran Air Traffic Specialists within these Agency organizations.

Figure IV: Beacon Video Digitizer (BVD)