THE SPECIALIST RADIO SYSTEMS

History:

Bob Dunham of Orbit fame, sold his facility to Datatron. reserving to still shoot the plastic parts in Havasu, Arizona. After several years and some $1.5M expenditure on having parts made in Mexico - yield of only 35% - they decided that the radio business was not for them. Charlie Speer came along, offered to take it off their hands for almost nothing down, and a big note payable in installments.

Charlie proceeded to have a good time, yanked all the good out of the plant and equipment and spent it 'who knew where'! Notes came due and he pleaded the inability to pay up. So Datatron recovered all that remained and put it on the market in two pieces - (1) the plant, materials and inventory, and (2) the name, copyright, designs and literature. Ted Hollow picked up the latter hoping to get the former for a song.

Unfortunately for him, a friend and I came along, made an offer and got the plant complete with benches, typewriters, fire extinguishers besides all the inventory and work in progress! We took on the three best techs that had been working there since Dunham's day, so we had history and capability. We then proceeded to provide service to all Orbit owners. Kept us busy but not overly rewarding. We could not manufacture Orbits, of course, as we did not own that right. Hollow even tried to prevent us from providing service!

So, of course, we decided to build our own, based on the visible faults of the radios of the day. Took note of seasoned fliers' 'druthers' and finalized on a new design on a clean sheet of paper.

Corporation:

Business began as a corporation in California in 1976, but in 1991 we decided to move it to Idaho where minimum corporate taxes were MUCH lower, $30 vs $800! Could not move the techs - they wanted to stay in sunnier climes. So operated by myself, still incorporated but now in Idaho.

Besides the radio and the joysticks, Millcott provided a great deal of electro-mechanical design to several California companies. Mainly using computer software, such as Autocad, Easycad, Tango-2 and Orcad-SDT-III. Electronic transfer greatly assisted communications in this area. Millcott was responsible for design, and fabrication was undertaken by the various companies concerned.

Design:

The first major decision was whether to stay AM or to go with the flow to FM. Extensive airborne tests with both types, available at that time, demonstrated that when 'glitches' occurred, FM had a tendency to stay locked out after the glitch cleared. But AM always came back in strong and active. The RF board was thus designed to obtain as clean signal as possible, utilizing toroidal coil coupling. It resulted in the 'cleanest' transmitter that our FCC has ever been asked to approve! Although the regs allow 1.5 KHz spread on channel setting, we were able to ship all units with closer than 60 Hz.

The encoder utilized 556 timers and 324 op-amps to meet the multiple needs of operation. Servo center was decreed to be 1440 microsecs, throw +/- 400, allowing for a reasonable rep rate when using eight channels. We found, by the way, in the early flight tests of AM vs FM, that the servos commonly only received 60% of the transmitted signal anyway! Decision reached to not use any such thing as pulse-coding, cutting down OD servo signal time! And servo reversing of at least the four main channels was mandatory.

Servo electronics started with a variant of the Orbit design. Finally devolved to using a development of the 544 chip to operate across the ambient temperature range. Quite a bit of 'drift' had been experienced in the earlier designs.

The new radio system had to have up to at least eight channels, be available as a single stick and also meet all two-stick modes. To have mixer capability, expanded-scale voltmeter on the Tx, incorporate a missing pulse detector to keep all other channels operative in the event of losing one in the train. Dual rates were desirable, especially exponential. Of course, both end point and rate adjustment was mandatory. We threw in the use of maneuver buttons for ease of operation in complex maneuvers. Goodies such as being able to check the airborne's full capability without using the RF and to check the a/c battery condition at the Tx were accommodated.

Then again, we decided to use only conductive plastic pots in all equipment, for better life, resolution and much less 'dirt' generation. Servo mechanics used Dick Rehling's Bantams (Kraft KPS-14 size), Goldberg's 60/1 units and various types of Bill Cannon's miniatures. Connectors were a mix depending on the use in the airborne. Deans for power transmission, ITT Centilok for servos, and used up some Orbit for non-critical leads such as ground test connections. All wiring was selected to be 19/38 BU of mainly 26 gage, but to use 24 gage for power leads.

Gimbals, all along, had been a source of trouble to all manufacturers. Orbit had a metal unit but two-stick only; Proline was not too bad, but the single stick was clumsy! So we designed our own and the result gained the plaudits of the industry. It became a huge 'bread and butter' support when Calcomp decided to use a version of the single stick with their CAD

systems, for X, Y and Z control. All were specially wired for easy installation and service use. Sold well over 2000 units and became the sole source for service and repair. Wear and tear from 24 hour a day, 7 days a week use meant that a lot were coming back - to our benefit! Surprising how much damage an operator can do to a stick assembly, if he is unhappy for any reason, it being the only thing he can attack in the computer system! We never needed to scrap a single unit, managed all repairs on a per unit basis. We spent a lot of time up-grading the pots from Bours to Spectrol (at Calcomp's bidding) to increase life expectancy from about 8 months to better than 3 years. Needless to say, all radios also got the better pots!

Receivers remained single conversion, being based on the older Orbit design but with a much raised threshold and improved sensitivity.

System cases were to be of vinyl-covered aluminum for handling and shielding. In the eight-channel units, the nameplate was removable, exposing the gain adjustment pots, servo reversing switches, maneuver button pots and mixer switch. The large single-stick case allowed the operator to rotate the stick assembly up to 30 degrees ccw in the case, for ease of operation. Because of the design of the single-stick assembly, the case thickness remained the same as the original Orbit unit, quite unlike the 'clumsy' Proline one.

Components:

At the outset and as the systems were aimed at the top end of the market, it was decided that all commercial components would be chosen based on quality and reliability. Top fliers would demand the latter. As examples:

Resistors	Allen Bradley	RC05GFxxxJ and RC07GFxxxJ
Capacitors	Kemet, KCK etc	
Crystals	Cal Crustal Lab	3rd & 5th overtone, .001%, series resonance
Pots	Bourns, Spectrol, Clarostat	
Switches	C & K, Alcoswitch, Noble	
Connectors	Deans, ITT, Amphenol	
Coils	Artted	In-house wound toroids
Motors	Tokyo, 16 mm	