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## Experience

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For our clients who require a more detailed listing of our experience we provide the list below. We have included all the details our disclosure agreements allow. Specific project names and some project details have been withheld by request of our current and past clients.

### Competitive Advantages

- Experience and expertise with low level firmware
- Experience in various industries allowing us to bring fresh and innovative ideas to each project
- Familiarity working as a sub to a primary military contractor
- Familiarity and experience with many systems – allowing for “cross pollination”
- Multi-skilled staff: hardware, firmware, software, and mechanical engineering
- Experience with both design and integration of systems

### Summary

- Remote control systems / robotics
- Consumer product electronics
- Unmanned / RC vehicles for: air, land, hover, water, and underwater
- Remote monitoring and control
- Electronic toys (educational, entertainment)
- Communication protocols: USB, RS232, GPIB
- Test data processing
- Military electronics
- Technology research
- Medical devices
- PC software

### Reconnaissance Blimps (work completed by Logic Plus, detailed according to system)

#### Primary Control

- Developed control panels for user interface
- Integrated autopilot's user interface
- Integrated L-Band microwave communication system
- Integrated autopilot
- Developed control electronics
- Integrated actuators
- Integrated power supplies

#### Backup Control

- Developed control panels for user interface
- Integrated P-Band radio communication system
- Developed control electronics; including fail-safe smart switching between primary and backup control using data error rates
- Integrated actuators
- Developed power supplies

#### Flight Termination

- Developed control panels for user interface
- Integrated P-Band radio communication system
- Developed control electronics
- Integrated actuators
- Developed power supplies

#### Primary Telemetry

- Integrated video and computer displays
- Developed telemetry display and logging software
- Integrated L-Band microwave communication system
- Developed multi-camera video system with pan and tilt
- Developed primary sensors and data acquisition electronics
- Integrated autopilot telemetry

### Backup Telemetry

- Integrated backup data and audio monitors
- Integrated P-Band radio communication system
- Developed backup sensors and data acquisition electronics, included electrical system voltage, magnetic heading, air pressure altimeter, and backup data text via video link simultaneous with data on P-Band telemetry link

### Ground Station

- Developed power system for charging and testing airship while moored
- Integrated all primary, backup and flight termination systems into a single rack mount S-280 shelter ground control station
- L-Band system included integrating short range omni-directional and long-range (100 km) autotracking dish antennas
- P-Band system included integrating manual remote control of high-gain Yagi antennas

### Portable Control Station

- Integrated all backup and flight termination systems into a portable control station
- P-Band system included integrating omni-directional antennas

### Pressure Controller (designed and manufactured)

- Air temperature sensor
- Ballonet blower control, included soft-start motor control to extend operation in low battery conditions
- Helium dump valve
- Helium dump valve status
- Communications with primary telemetry
- Control input from primary, backup and flight termination
- Temperature compensated Helium and ballonet pressure sensing
- User interface for calibration
- Calibration and pre-flight user set points

### Payload

- Provided power and ensured electromagnetic compatibility
- Payload included: FLIR, high resolution video, and advanced radar
- Assisted Payload Contractor with integration and testing on airship

### Actuators

- Flight Controls: Rudder, elevator, thrust-vector, and recovery rope servos
- Twin Engines: Carb heat servos, choke servos, throttle servos, magneto disable switches, starter, and fuel pumps
- Remote Lighting Control: Nav, strobe, fin, and envelope
- Water Pumps: Main and flight termination
- Fuel Dump Valves: Main and flight termination
- Video: pan and tilt servos, camera selectors
- Other: Flight termination hotwire, primary transceiver power, backup transmitter enable, payload enable, transponder

### Sensors

- Engine: RPM, cylinder head temp, exhaust gas temperature, oil pressure, main fuel tank level, surge tank, and fuel flow (2)
- Video cameras
- Microphone
- Air speed
- Electrical System Monitoring; voltage and current: reserve bus, reserve bus charging, non-vital power bus, vital power bus, alternators, and main battery
- Signal strength for L & P Bands for both primary and backup telemetry
- Flight termination system status
- Avionics bay temperature

### Power System

- Control Stations: developed with multiple power sources and backups to maximize reliability
- Airship
  - Developed with multiple parallel power sources to maximize reliability and isolate potential single point failures
  - Distributed power supplies were used to minimize single point failures
  - Electrical system was designed around a single point ground design philosophy to maximize electrical compatibility between sub-systems

## Medical Devices

### Cosmetic Surgery Devices

- Modification to existing design: identified design error in production models and made corrections
- Modified existing power supply for use in Europe

### Eye Surgery Device

- General design of embedded systems
- General design of motor control
- Designed communication protocols for extremely high reliability
- Developed design documentation
- Developed large portions of the document control system

### Drug Infusion Pump

- Hardware and Firmware development
- Motor control
- User interface
- Test fixtures
- Development tools
- Development done within existing documentation standards and document control systems

**Electronic Consumer Devices** (Logic Plus has completed over 30 electronic consumer device projects. For a majority of projects, Logic Plus designed the entire systems. For brevity, experience is listed by category instead of by project.)

### Motion Control

- High resolution close-loop position control
- Discrete point close-loop position control
- Close-loop speed control
- Limited feedback speed and position control
- Open-loop speed control
- Multi-horsepower DC motor control

### Communications

- Custom IR protocols; including error detection and anti-collision features
- Standard IR protocols
- Touch tone dialing
- Timex Data Link
- RF data communications
- Reverse engineering of complex, proprietary error-detection and bandwidth-limiting coding
- RFID tags
- Proprietary inter-microcontroller serial and parallel interfaces, both master-slave and peer-to-peer
- Standard inter-processor serial and parallel interfaces

### User Interface

- Voice recognition
  - Speaker independent
  - Speaker dependent
  - Speaker identification
- GUI: Developed PC applications
- LCD
  - Custom multi-segment
  - Custom dot-matrix
  - Standard LCD modules
- Push buttons
- Encoders

## Audio

- Voice playback
- Concatenation
- Multi-voice music synthesis
- Compression and decompression (multiple types)
- Formats: PCM, ADPCM,  $\mu$ -LAW, CELP and multiple proprietary aggressive compression formats

## Project Support (our methodology)

- Project Management
  - Requirements documentation
  - Project definition
  - GANTT charts
  - Project planning
  - Resource scheduling
  - Interfacing with manufacturing
  - Coordination of multiple teams
  - Balance of cost, quality, and schedule
- Quality Control
  - Requirements based testing
  - Independent evaluation and verification
  - Accepted standards and procedures
  - Peer reviews
- Manufacturability
  - Designed for manufacturability
  - Self test
  - Cost minimization
  - Component selection based on available supplies
- Development tools
  - Test fixtures
  - Custom script engine
  - Numerous audio-file data bases
  - Audio tools

**Consumer Video Device** (Work specific to the video needs of the device is listed below; other engineering tasks are included in the list above.)

## Video

- Image acquisition
- Scaling
- Video encoder output

## High Speed Digital Design

- FPGA
- Verilog
- SDRAM
- Multiple microcontroller interfaces

## Real-Time Image Processing

- Blue screening
- Exposure
- Multiple special effects