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REMOTELY PILOTED LTA VEHICLE FOR SURVEILLANCE

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ABSTRACT: This paper deals with the various aspects of a remotely piloted mini-LTA vehicle for surveillance, monitoring and measurement for civilian and military applications. Applications, operations and economics are discussed.

INTRODUCTION

The remotely piloted mini-LTA vehicle offers a flexible, safe and economic airborne surveillance, measurement, and monitoring system. These systems have application in urban and rural environments as well as at military installations, harbors, and other key installations. Typical applications are cited below.

- Traffic Monitoring (see Figure (1))
- Urban Land Use Planning
- Law Enforcement Surveillance
- Search and Rescue
- Emergency and Disaster
- Harbor and Lake Monitoring
- Industrial Security

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- Pollution Surveillance and Monitoring
- Ice Formation in Seaways
- Fish and Animal Migration Observation
- Perimeter Surveillance
- ASW
- Command Post Data Link - Forward Theater TV-IR
- ECM, Jammer

TECHNICAL DISCUSSION

Initial calculations and RPV experience have resulted in the selection of an RPLTA Vehicle size of about 5,000 ft^3 being 55 ft long and 13 ft in diameter (see Figure (2)).

A typical blimp shape with fineness ratio of 4.1 has been selected. Conventional aerodynamic control systems are to be utilized. Internal and external catenary systems will be used to attach the payload. Propulsion system and associated equipment to the blimp envelope since this technique has been operational for some time. Typical construction methods of earlier Non-Rigid Airships will be utilized which have never had a failure in flight from structural or materials causes.

The catenary curtain distributes the loads in the suspension cables into the envelope material in a precise and uniform manner. The rudder/elevators are typical aircraft fabric covered metal frames for low weight. The central ballonet permits control of envelope pressure during altitude and temperature variations. A continuously running fan will provide ballonet air. Ballonet pressure will be controlled by an automatic airship-type, low pressure-high volume, relief valve.

A film/fabric laminate material will be used for envelope construction consisting of mylar film and dacron cloth impregnated with an elastomer. A white hypalon surface coating will be applied externally to provide scuff resistance and desirable thermal properties. Lightweight stretched fabric will be used in the tail fin construction to conserve weight and enhance design simplicity.

The low internal helium pressure of about 2.5 inches of water and the rip-stop fabric make minor punctures or holes of little significance. Many airships have been operated for a full week with 1-inch holes in the fabric.

The RPV blimp inflated with helium is judged to give the proper buoyance with the following initial estimated weight distribution:

	Weight, Lbs.
Envelope, empennage, controls, ballonet pressure system, suspension system	148
Car, propulsion, payload, associated equipment	160
Fuel	32
	340 lbs.

Using a lift factor of 0.063 lbs/ft^3, a buoyancy of 300 pounds can be realized. For efficient performance it is anticipated that blimp takeoff under the heavy condition is realistic.

A nose down attitude is indicated during the landing condition to allow controlled landing under near-buoyant conditions. Use of landing skids rather than wheels is representative for RPV application. It is desirable for the airship to fly heavy even when the fuel load is expended to facilitate the landing. Permitting the maximum heaviness to go to 40 pounds allows the fuel-expended case to be 8 pounds heavy.

The blimp provides a stable platform for the miniaturized DSI equipment presently available. The distinct advantages of near-hoverability and long endurance particularly make the blimp attractive for surveillance RPV applications. The blimp is a rugged structure which can experience overload conditions due to winds and gusts and still retain structural integrity. This feature has been proven by Goodyear in operation and maintenance of the advertising blimps. RPV-Blimp size being smaller than these representative blimps will simplify launch and recovery operations. Use of small engines to propell the buoyant RPV will conserve energy and minimize pollution. Lower operator skill may be achieved for the blimp RPV compared to heavier-than-air RPVs primarily due to the slower speed of the blimp, buoyancy conditions and slower response time of the blimp controls.

Earlier airship envelopes were found to be radar transparent; therefore, it is expected that the RPV Blimp will have a low radar cross section. A noise level in the range of less than 85 db seems achievable. Flight endurances of up to 24 hours appear reasonable.

System payloads will be modular depending on the application. Black and white or color TV system can be used. The B&W can be fitted with light enhancement for night time operation and zoom lens (10:1) can be fitted on both B&W and color TV systems. Photographic equipment, IR and other payloads could also be used as the RPLTAV system will have a 400 watt alternator on board.

DSI in conjunction with Goodyear Corporation conducted some tests last spring - the L.A. basin. DSI hitched a ride on the Columbia airship and stowed in the car a colored TV system with a 10:1 zoom lense as well as a super 8 camera. For this flight an on-board video tape recorder was used to store the video output. The flight covered freeway, industrial, and harbor surveillance at a function of altitude and zoom setting. DSI also staged in concert with the Aerospace Corporation and the Gardena Police Department a mock robbery, chase, and apprehension of two suspects in their get-away car. This colored video tape is available for viewing by workshop participants and other interested parties.

A ducted fan propulsion system and associated fuel system is incorporated at the opposite end of the payload assembly. A 35 HP engine and pusher-type propeller arrangement is proposed.

An autopilot system will permit flying the LTA vehicle at a given altitude and also provide maneuver capability*.

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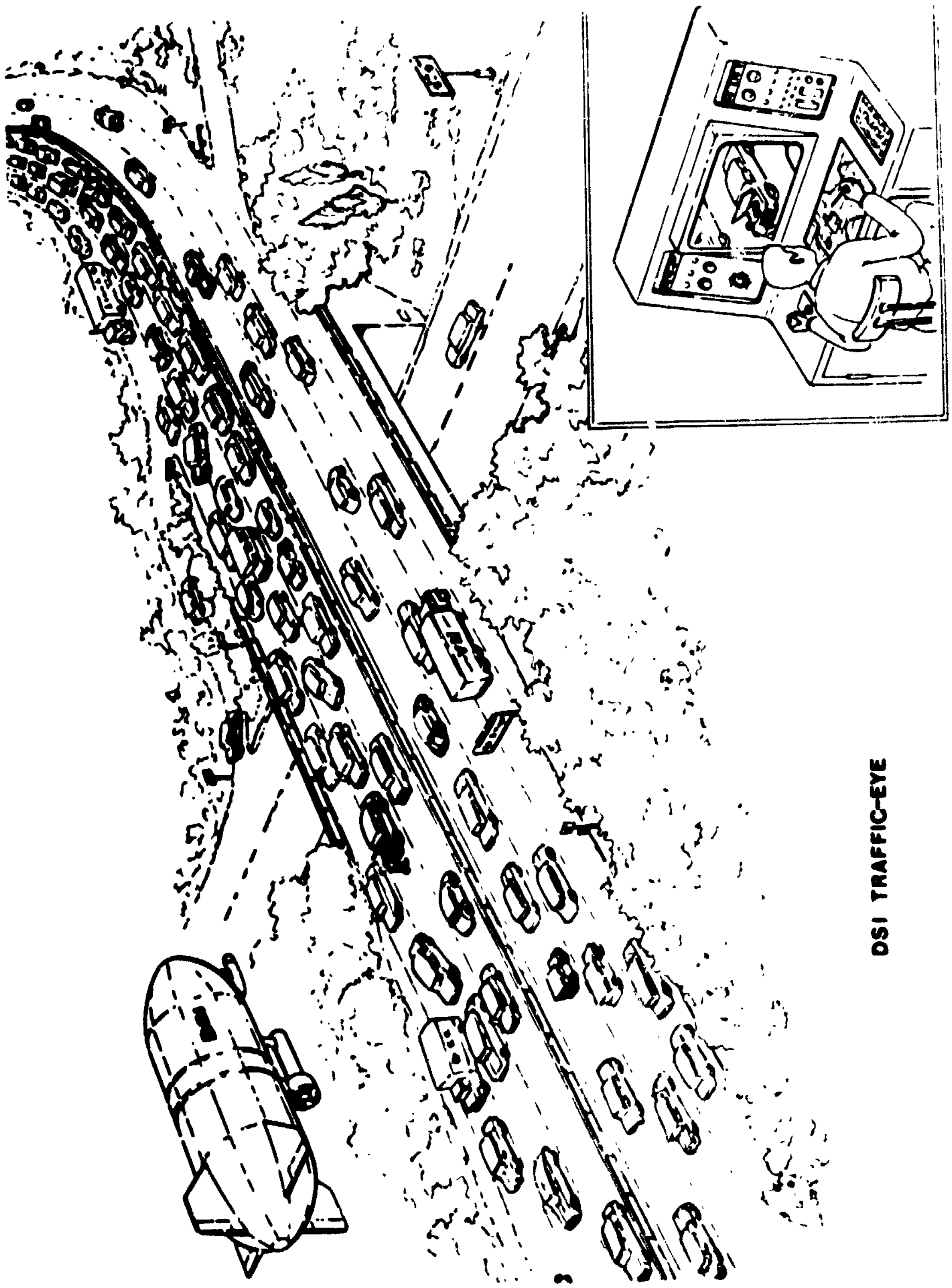
*For other system details see Seemann, G.R. et al "A Technology Tool for Urban Applications the Remotely Piloted Blimp", AIAA Paper 73-981, September 26, 1973.



DSI TRAFFIC-EYE

FIGURE (1)

The proposed RPLTAV will have a top speed of about 60 mph.

The advantages and features of the remotely piloted mini-LTA vehicle are cited below:

- Excellent Endurance
- Good Top Speed
- Low Pollution
- No Minimum Speed
- Low Vibration Levels
- Low Maintenance
- Stable Platform
- Safety to Ground Personnel and Property
- Flexibility - Multi Use
- Economical - Capital and Operational
- Low Operator Skill Required
- Low Radar X-Section
- Ease of Launch and Recovery

Capital costs in production for a complete system will be considerably under $100,000.00 including ground station. Operation and maintenance costs will be only a few dollars per hour.

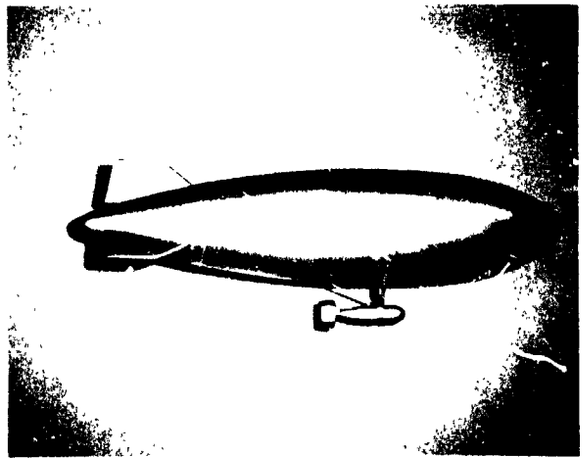


FIGURE (2)