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REMOTE FLIGHT RECORDER AND TIMELY AIRCRAFT ADVISORY SYSTEM, RAFTS

ABSTRACT

Apparatus for a remote located flight crash recorder and a real time aircraft pilot crash avoidance safety advisory system is achieved by continuously monitoring aircraft sensors such as aircraft position, altitude, speed, control surfaces, engine revolutions per minute, temperatures, stress, and fuel. Then by radio frequency world wide transmission, such as via satellite communication links, sends these parameters along with any cockpit audio data, video data, aircraft identification and configuration to a central ground monitoring station where they can be continually and safely recorded and analyzed. The transmission of the aircraft data via the communication link permits the aircraft performance and cockpit communication data to be memorized in a ground based recorder for after crash analysis without the necessity of crash shock rugged and waterproof monitoring apparatus aboard the aircraft. Furthermore, in the advent of a pilot initiated pre-crash alert or a ground station initiated alert, based on the real time automated analysis of the aircraft's flight worthiness, a pilot crash avoidance safety advisory can be radioed back to the aircraft that provides the pilot with expert advise as to the safest approach for the operation of the aircraft. For rescue and aid in the event of a crash, the remote monitoring system would provide an accurate estimate of the downed aircraft's location based on the real time telemetry of the aircraft's navigation and an analysis of the recorded vehicle dynamics data.

The central ground based monitoring system can utilize the real time aircraft sensor data, aircraft configuration data and experts familiar with the aircraft in arriving at the best safety advisory. The computational analysis processors used to perform the safety analysis on the ground are not limited by the space and power restrictions that exist aboard the aircraft and thus can provide high fidelity simulation and analysis of the aircraft's problem. In this mode of operation, the central ground based monitoring site would maintain a communication, utilizing fiber optic ground or satellite links, with government flight controller facilities and with the aircraft manufacturers. It would distribute the aircraft sensor data to them in real time so as to solicit their expert analysis and help in the crash avoidance advisories. Real time analysis of the prior to take off, pre-flight, aircraft data along with other data such as weather, airport and its local area three dimensional digitized topographical map data, aircraft flight controller data, wind shear and aircraft configuration would also be used to provide a safe to take off advisory.

If an aircraft exhibits a mechanical equipment failure prior to take off this data would also be communicated back to the aircraft manufacturer in real time via the distribution of the aircraft's sensor monitoring telemetry. The aircraft

manufacturer then could provide an expert system for fault isolation that could save both time and money in getting a safe to fly aircraft back in service.

For aircraft that are equipped to receive the satellite constellation Global Positioning System (GPS) precision navigation signals, this real-time sensor data of aircraft location would also be sent to the Remote Flight Recorder Transmitter and then via telemetry to the Ground Based Processing Station. This very accurate aircraft position data would be utilized to augment the air traffic controllers in flight and airport taxi collision avoidance systems as well as to enhance the all weather landing systems. It would provide the air traffic controllers ground based radar systems with a level of redundancy as well as enhance the radar systems by providing high fidelity three dimensional world wide aircraft separation distances. An added economic benefit of utilizing this position data blended with other aircraft sensor information and world wide weather and destination airport traffic data available at the Ground Based Processing Station would be to provide the aircraft with a real time fuel conservation and economy of flight advisory. The world wide communication up link advisory to the aircraft during flight for fuel conservation and economy of flight operation would be based on the blending of the data sources in a ground based digital processor. Thus, for this additional function, there would be no need for added equipment to be carried aboard the aircraft.

This invention relates to the automatic, real time, collection of aircraft data for safety of flight and then transmitting this sensor data to a world wide communication system for subsequent reception at a Central Ground Based Processing Station. The ground station's computers would analyze the sensor data and archival store it in it's memory system. The analyzed data can be transmitted back to the aircraft in order to provide an advisory for optimum safe performance. The Central Ground Based Processing Station could also distribute the aircraft information to the aircraft manufacture's facilities for expert timely advise as to how best to operate an aircraft that exhibits an in air equipment failure and how to best service an aircraft when it has ground problems. These advisories would be transmitted back to the aircraft. In addition to the above, the Central Ground Based Processing Station, would utilize the aircraft sensor data and world wide weather data, ground based traffic control radar and airport destination data to provide the aircraft with the safest and most economical way to operate the aircraft. In the advent of a crash the aircraft sensor data stored at the Central Ground Based Processing Station, which has a record of the operating condition of the aircraft at the time of the crash, would provide the best estimate of the downed aircraft's location for timely recovery and potential rescue operations as well as the parameters that may have caused the crash. Further-more, for operational aircraft experiencing an equipment failure or in a potentially over congested area of operation, the real time expert advisories communicated to the aircraft may well

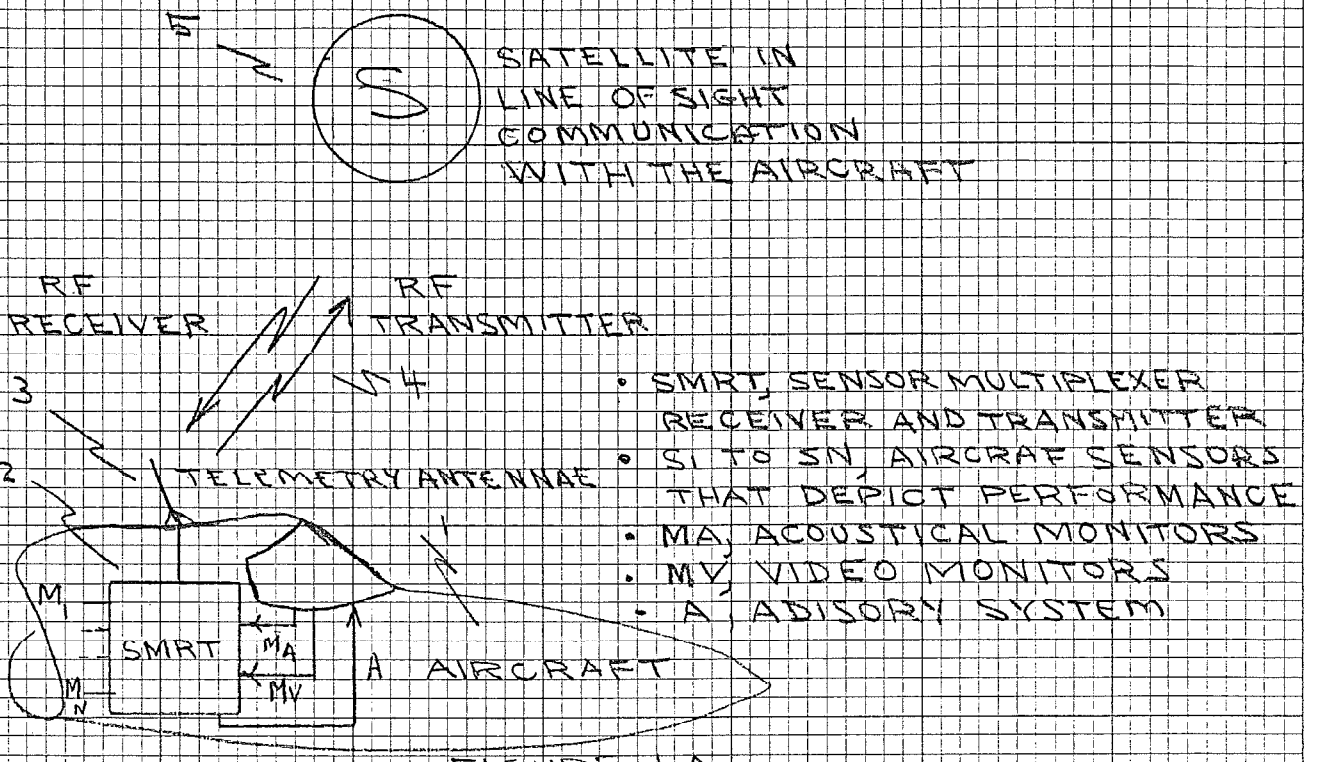

FIGURE 1A

FLIGHT CRITICAL ASSEMBLY MONITORING & ADVISORY SYSTEM

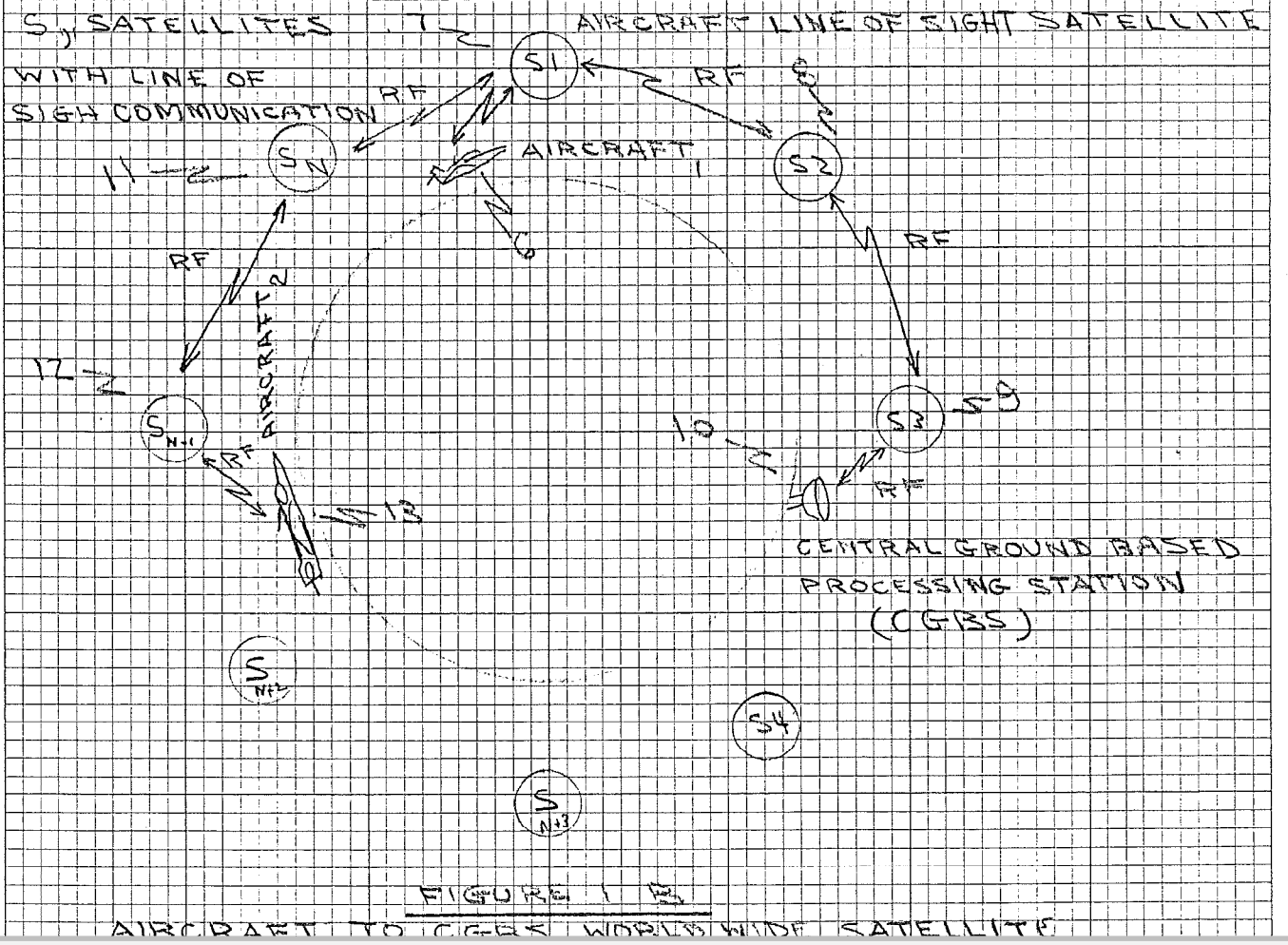

FIGURE 1B

AIRCRAFT TO CGBS WORLD WIDE SATELLITE

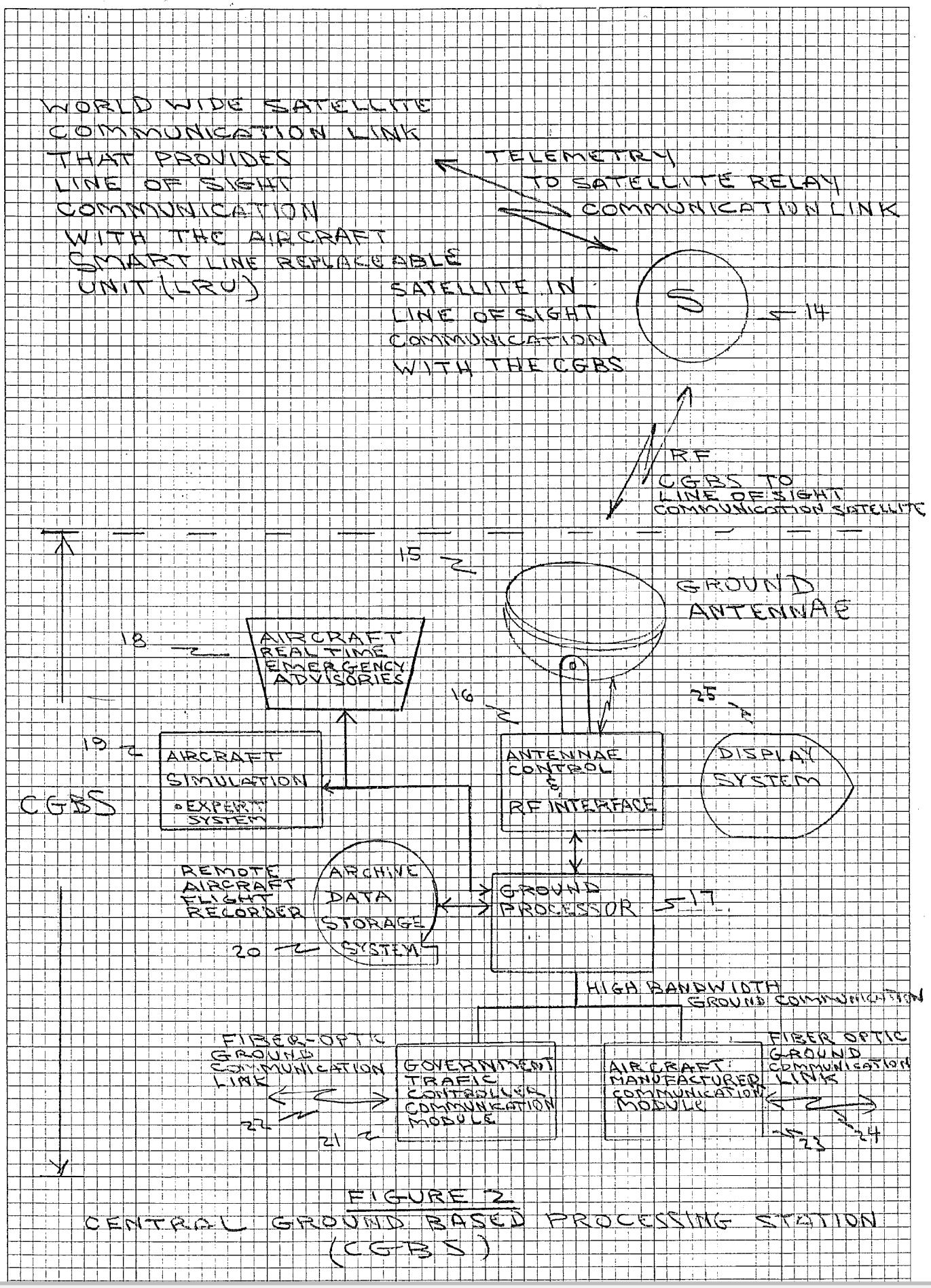

FIGURE 2

CENTRAL GROUND BASED PROCESSING STATION (CGBS)

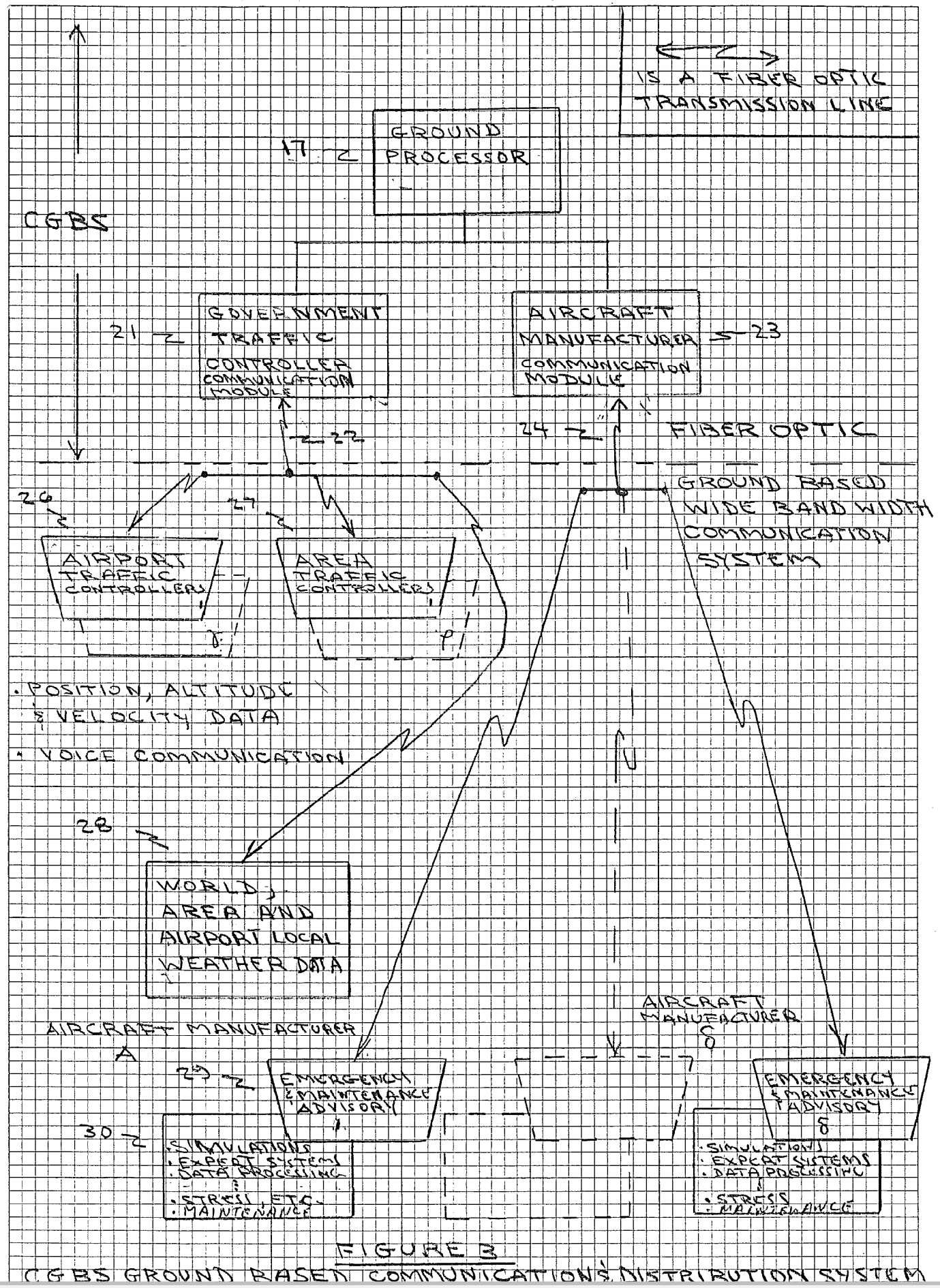

FIGURE 3

CGBS GROUND BASED COMMUNICATIONS DISTRIBUTION SYSTEM

DOCKET ALARM

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts

Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research

With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

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API

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LAW FIRMS
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Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS
Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS
Sync your system to PACER to automate legal marketing.