ALPS™ Lightning System

TOA Advanced Lightning Positioning System (ALPS™)“ “Covering N. America with real-time stroke detection and mapping.”

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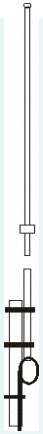
ALPS™ USPLN SENSOR DISTRIBUTION (106 SENSORS)

SENSOR DISTRIBUTION

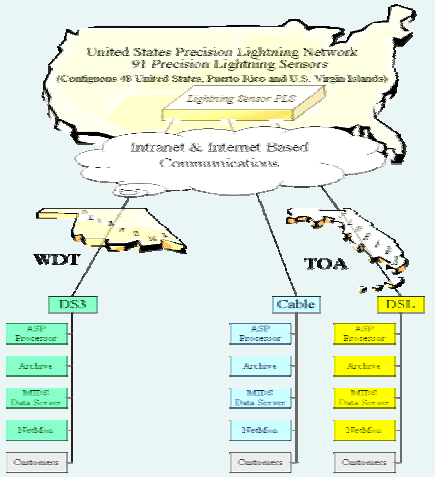
GPS Antenna

PLS Receiver
(Comm-interface, waveform digitizer, high-resolution timing device, processors and self test)



Stroke Detection Antenna
(Capacitive Probe)

USPLN COMMUNICATIONS, PROCESSING, REAL-TIME MONITORING, QUALITY CONTROL & ARCHIVE



USPLN INTERNET COMMUNICATIONS (SENSORS TO MULTIPLE NCCs)

- In most cases, Virtual Personal Networks are employed.
- During network design, tracer studies defined internet paths from individual PLS sites to each of the NCC locations.
- Almost all sensors are connected to separate internet back- bones and as such, paths used to deliver data to all NCC’s are very different.
- Time to deliver data from PLS sensor to the front-end of the NCC processors is typically less than one second.
- NCC’s operated by WDT and TOA provide for at least 8 different direct connections to the Internet.

ALPS™ Lightning System

SOME NOTEWORTHY FEATURES OF THE PRECISION LIGHTNING SENSOR *(PLS™)*

•Proprietary Sensor design, for enhanced signal-to-noise characteristics

- The *PLS* sensor provides the best lightning signal-to-noise characteristics of any lightning
- sensor available on the market today.
- High sensitivity permits the monitoring of large areas with fewer sensors.

•Point-of-Impact Stroke Location

- The *PLS* sensor utilizes proprietary low frequency detection methods and waveform discrimination in the sensor to enable the system to calculate and display the location where the stroke actually hits the ground.

•Improved Timing Accuracy and Resolution

- *The PLS timing resolution is 25 nsec. with an accuracy of about 40 nsecs.*
- The dead time can be as low as 200 microseconds.
- Timing is constantly monitored & corrected/adjusted automatically for temperature/aging effects

•Remote Maintenance Design

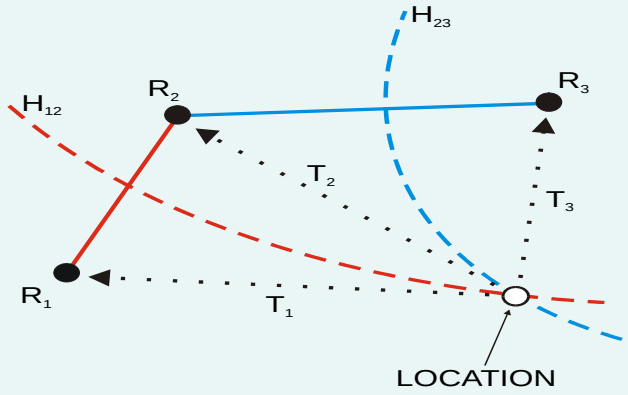
- Diagnosis and repair of software problems.
- Adjustment of sensor operating parameters can be made via land line or the Internet.
- Remote downloading of software
- Re-configuration of hardware via the Internet through use of the Advanced Stroke Processor.

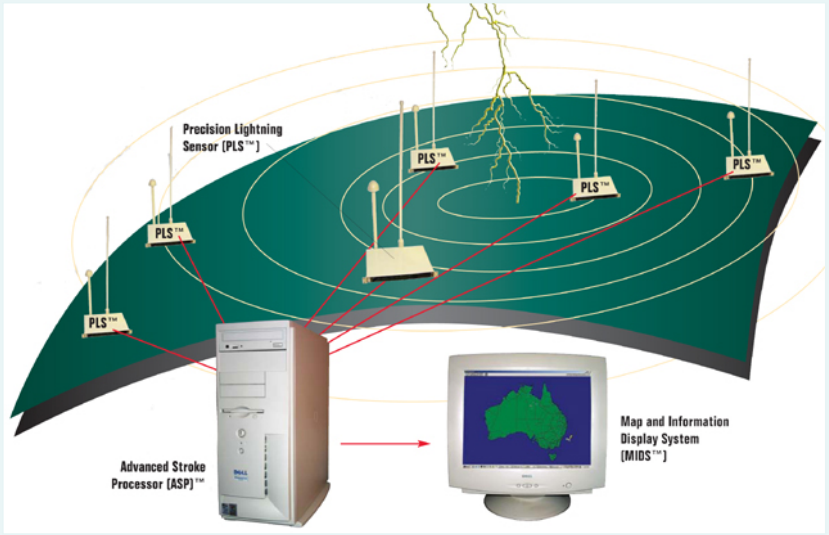
•Greater Sensitivity Than Old LPATS Technology

- High sensitivity permits the monitoring of large areas with fewer sensors.

•Lightning Event Detection and Analysis

- *PLS* analyze the radio wave produced by each lightning stroke and digitize the signal @ a rate of forty (40) nanoseconds.
- PLS accurately monitors the precise time of the received signals, especially certain time sensitive characteristics such as rise time and fall time.





ALPS™ Lightning System **Locates lightning over very long ranges (1000's of kms) using ionospheric sky wave propagation.**

Advanced Stroke Processor (ASP™)

- **Provides Lightning Analysis & Location Processing**
- **Programmed with site data mathematical & physical coefficients.**
- **Using all data, the ASP computes a position for each lighting strike or rejects it as noise**
- **Solution data is output in both binary and ASCII text format**
- ***ALPS™* lightning system can also locate lightning over a great distance (1000's of km) using ionospheric sky wave propagation.**
- ***ALDA™ Lightning Data Base Functions***
- **An SQL Database subsystem, the ALDA will archive the USPLN data plus allow for automatic offline archiving to CD or DVD ROM.**

ASMS™ Performance Monitoring and Maintenance

- **The central data processing system includes comprehensive system performance monitoring and maintenance tools called ASMS. These applications run on separate processors and support the following functions:**

  NetMon™ Network Monitor

  - **NetMon displays real time information on the status of all network sensors.**
  - **Data includes # of times each sensor reports activity & takes part in a solution.**
  - **NetMon can also access the database server for historical analysis.**

RSD™ Remote Sensor Diagnostics

- **RSD allows access to the complete system via a communications link to the ASP to communicate directly with any of the active sensors.**
- **Download software & firmware, monitor oscillator frequency, power supply levels, read the sensor internal temperature and scores of other parameters.**

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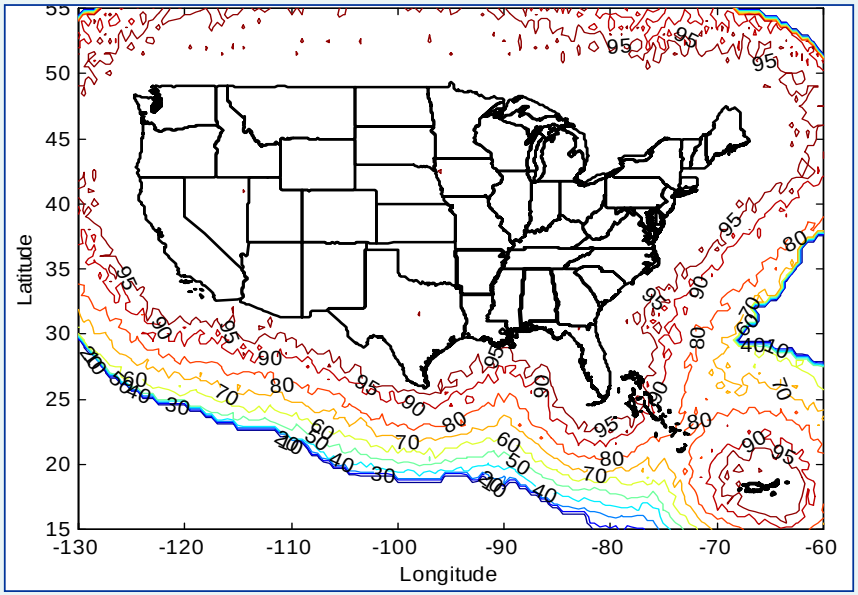
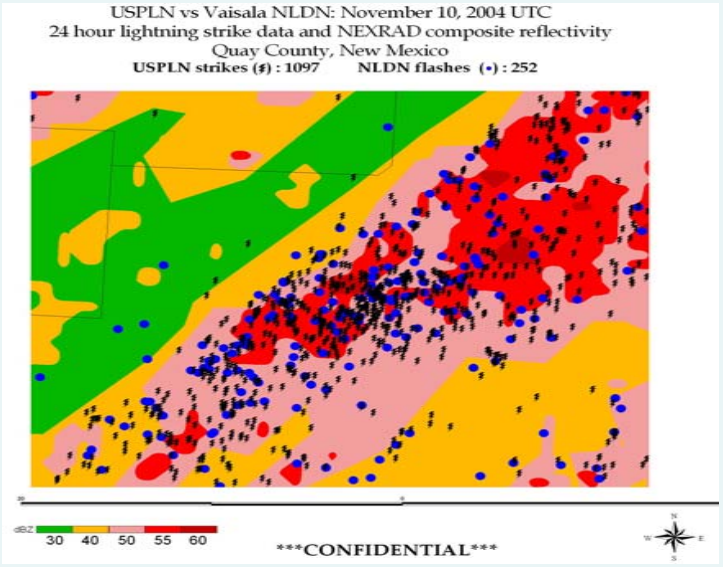
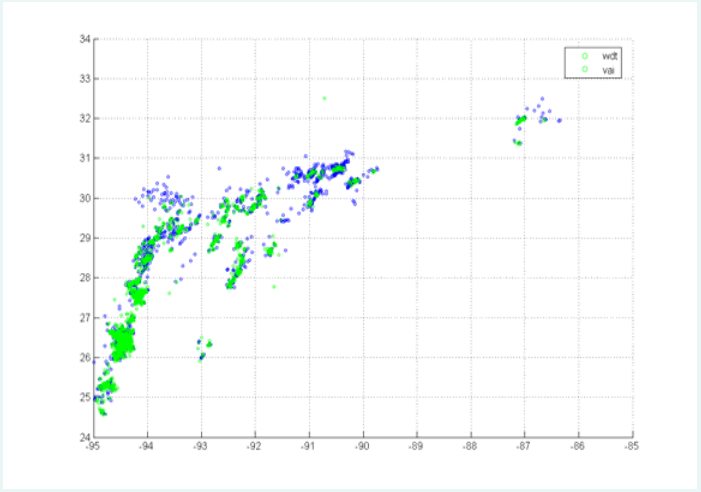
ALPS™ Lightning System

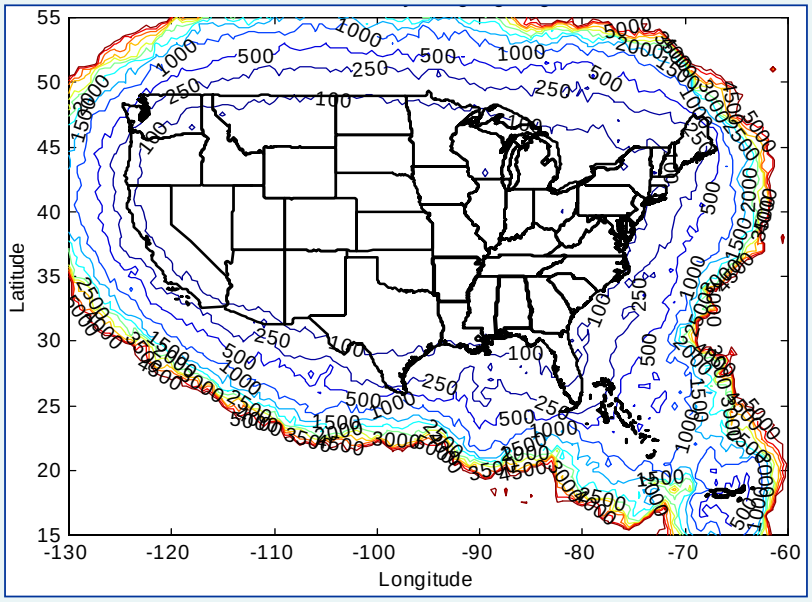


Cloud-to-Ground Detection Efficiency (≥95%)
Contiguous 48 United States, Puerto Rico, and the U. S. Virgin Islands





Note: USPLN detected strokes (green) are tightly clustered due to better location accuracy, whereas NLDN flash data (blue) are more dispersed. Analysis performed by The Weather Channel.



Cloud-to-Ground Location Accuracy (Contours are in meters RMS)

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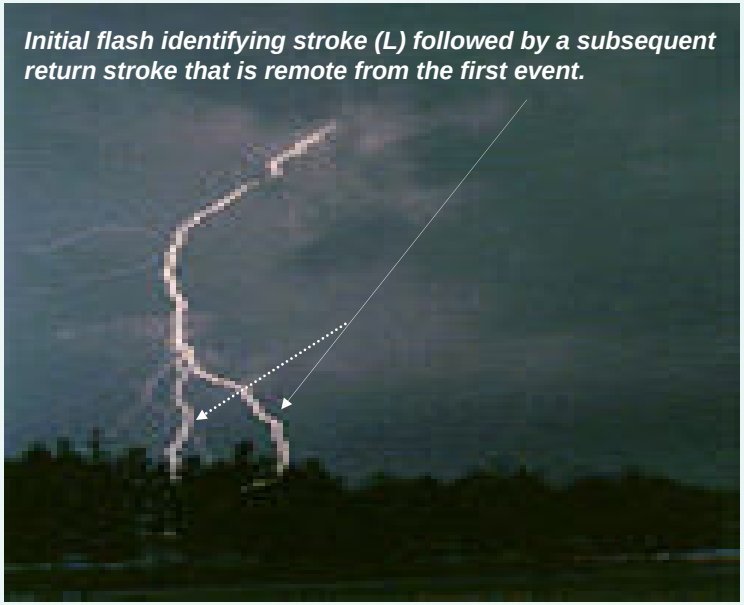

Initial flash identifying stroke (L) followed by a subsequent return stroke that is remote from the first event.

Why Stroke Data

• Stroke data provides a clearer and concise view of the CG lightning distribution as it relates to the storm.

• CG stroke reports are ideally suited to define the presence of a thunderstorm within both synoptic and METAR operations in a timely fashion.

• Stroke data provides a clearer picture of the overall cycle of air mass thunderstorms and also serve as an early indicator of storm decay.

• Lack of stroke data can have a major impact on safety & sensitive ops. Research by Dr. Martin Uman of the University of Florida has shown that on occasion a return stroke can be initiated at a point remote to the initial point of attachment and that such events can occur up to 7 km from such point within a half-second time. In situations such as this, the INPACT could be a misinterpretation of the extent of the storm and possibly the premature or unnecessary delays in setting local warnings or to return to normal operations.

• In areas where radar coverage is rather sparse access to cloud stroke data, as well as a reasonable number of cloud reports, can provides sufficient coverage of the area as well as define the extent of thunderstorm activity as well effectively gauge their trajectory and speed of movement.

Flash #1

Date	Time (UCT)	Lat	Long
6/10/2004	*01:04:30.880*	*034.0828*	*-100.0382*
6/10/2004	*01:04:30.915*	*034.0849*	*-100.0393*
6/10/2004	*01:04:30.944*	*034.0850*	*-100.0383*
6/10/2004	*01:04:30.967*	*034.0851*	*-100.0388*
6/10/2004	*01:04:31.098*	*034.0852*	*-100.0387*
6/10/2004	*01:04:31.198*	*034.0851*	*-100.0396*

Flash #2

Date	Time (UCT)	Lat	Long
6/10/2004	***01:04:38.073***	***030.8194***	***-096.8339***
6/10/2004	*01:04:38.436*	*030.8178*	*-096.8327*
6/10/2004	*01:04:38.540*	*030.8178*	*-096.8329*

Flash #3

Date	Time (UCT)	Lat	Long
6/10/2004	***01:09:03.109***	***030.8652***	***-096.8507***
6/10/2004	*01:09:03.158*	*030.8665*	*-096.8497*
6/10/2004	*01:09:03.247*	*030.8670*	*-096.8529*
6/10/2004	*01:09:03.295*	*030.8694*	*-096.8513*
6/10/2004	*01:09:03.422*	*030.8660*	*-096.8559*
6/10/2004	*01:09:03.763*	*030.8697*	*-096.8516*
6/10/2004	*01:09:04.028*	*030.8696*	*-096.8514*

•If ALPS™ technology was in use, and even if the first event was missed, the system would still report the location of the other 6 CG strikes and the presence of the storm.

•I forestry is your business, why spend time and money to investigate a lightning flash with a multiplicity value of 6 that is based on the assumption that they all occurred in the same location. By using the ALPS™ technology , you can view the location of each stroke and as such, base your decision on fact not fiction.

• *The consistency and accuracy of the individual calculations produced by the APS™ for each of the strokes within a flash is essential to the effective & efficient application of such data.*

• Research has shown that most CG flashes contain 1 to 3 return strokes. Why limit yourself to looking at only 25% of the picture when you can see the whole thing with access to individual stroke data from ALPS™

• If this flash defining event was missed by a system that used directional technology as an essential part of its operating scheme, then for all intent and purposes, the IMPACT would be that the event and possibly the presence of lightning would not have been reported

• When your operations are lightning sensitive, whether they involve personnel, facilities or productivity, there can be no margin of error when it comes to making the right decision in a timely fashion. Why limit yourself to a subjective solution answer, when you can nave a number of objective ones..