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# Increasing Airport Capacity is Easy; The Politics of Opposition is Another Matter

(October 2019)

*Prepared for*

**64th Annual ATCA Conference & Exposition**
**Washington, DC**

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# Our Mission

*"To Design and Build The World's Most Advanced Instrument Landing System (ILS) Antennas To Be Deployed Throughout The World."*

# Our Vision

Our company is dedicated to integrating Global Positioning Systems (GPS) and ILS to maximize their combined benefits to the National Airspace System (NAS).

To achieve our vision, we recognize the need for an integrated hybrid receiver where GPS and ILS serve as a monitor for each other during the approach and where GPS exclusively provides the service volume coverage outside of centerline.

FAA GPS/ILS receiver: https://faaco.faa.gov/index.cfm/announcement/view/34574

# Purpose of Presentation

The purpose of this presentation is to inform the viewer, whether political, financial, procedural, managerial or technical, of the effectiveness and advantages that Advanced ILS Antennas provide. We have included the history of opposition and the repeated cycle of freezing ILS funding in favor of newer technologies that have crippled airport infrastructure and undermines safety at airports throughout the United States.

# Disclaimer

The format of this presentation was selected to facilitate the dissemination of a large volume of material relating to advanced ILS solutions to prevailing NAS issues. Our format does not follow the short-bulleted presentation standards.

# Identifying the Problem (#1)
# The ILS Critical Area

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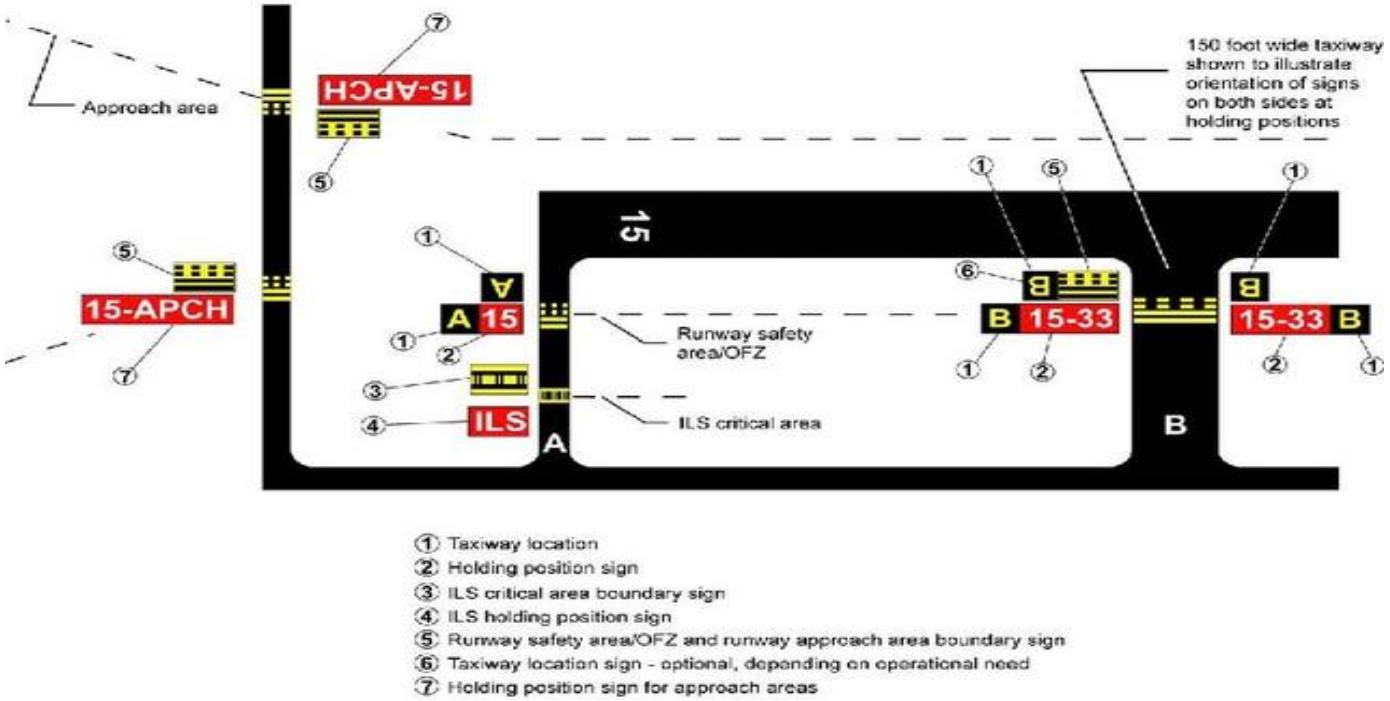
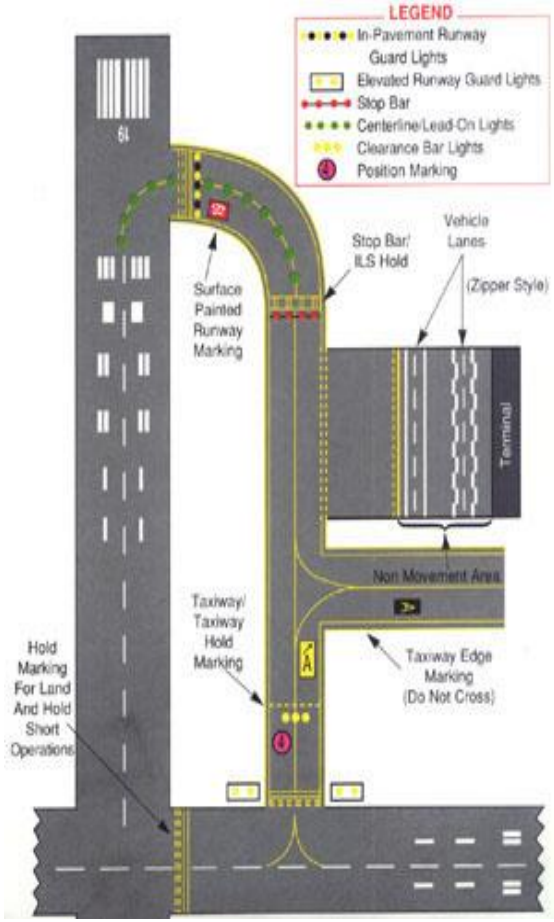
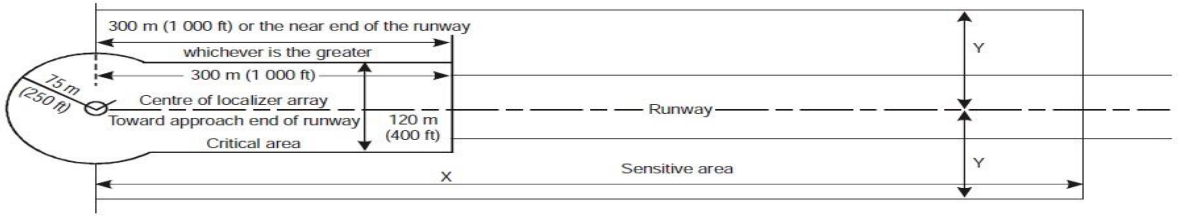


# Identifying the Problem (#1)
# The ILS Critical Area




| | | Example 1 | Example 2 | Example 3 |
|---|---|---|---|---|
| *Aircraft type* | | B-747 | B-747 | B-727 |
| *Localizer antenna aperture* | | Typically 27 m (90 ft) (Directional dual frequency, 14 elements) | Typically 16 m (50 ft) (Semi-directional, 8 elements) | Typically 16 m (50 ft) (Semi-directional, 8 elements) |
| *Sensitive area (X, Y)* | | | | |
| *Category I* | X | 600 m (2 000 ft) | 600 m (2 000 ft) | 300 m (1 000 ft) |
| | Y | 60 m ( 200 ft) | 110 m ( 350 ft) | 60 m ( 200 ft) |
| *Category II* | X | 1 220 m (4 000 ft) | 2 750 m (9 000 ft) | 300 m (1 000 ft) |
| | Y | 90 m ( 300 ft) | 210 m ( 700 ft) | 60 m ( 200 ft) |
| *Category III* | X | 2 750 m (9 000 ft) | 2 750 m (9 000 ft) | 300 m (1 000 ft) |
| | Y | 90 m ( 300 ft) | 210 m ( 700 ft) | 60 m ( 200 ft) |

**Figure C-3A. Typical localizer critical and sensitive areas dimension variations for a 3 000 m (10 000 ft) runway**

# Identifying the Problem (#1)
# The ILS Critical Area

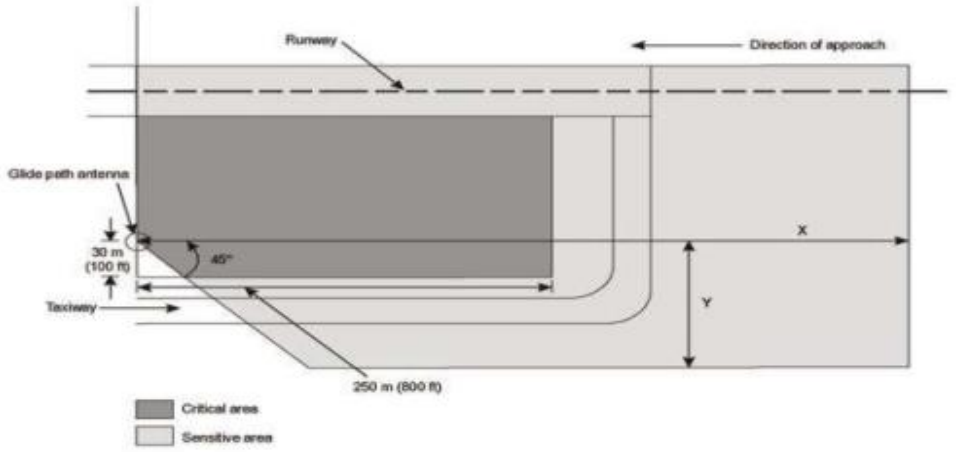



**Figure 8.0(2)**(From ICAO Annex 10). **Typical glide path critical and sensitive areas dimension variations**

| | | Example 1 | Example 2 | Example 3 |
|---|---|---|---|---|
| **Aircraft Type** | | B-747 | B-727 | **Small & Medium*** |
| **Category I** | X | 915 m (3 000 ft) | 730 m (2 400 ft) | 250 m (800 ft) |
| | Y | 60 m (200 ft) | 30 m (100 ft) | 30 m (100 ft) |
| **Category II/III** | X | 975 m (3 200 ft) | 825 m (2 700 ft) | 250 m (800 ft) |
| | Y | 90 m (300 ft) | 60 m (200 ft) | 30 m (100 ft) |

* Small and medium aircraft here are considered as those having both a length less than 18 m (60 feet) and a height less than 6 m (20 feet)

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# Identifying the Problem (#2)
# The Lack of FAA Support

In 1987, the Federal Aviation Administration (FAA) was directed by the United States Congress to end a 5-year moratorium on ILS installations. The article indicates 200 airports awaited ILS.

*New-York-Times-Article-FAA-Lifts-Bar-on-Airport-Landing-Systems (20 May 1987)*

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# Identifying the Problem (#2)
# The Lack of FAA Support

After the U.S. Microwave Landing System (MLS) program was cancelled in June of 1994 , GPS was soon to acquire the FAA's attention and the bulk of all funding.  At one point the FAA stated there would be no ILS's in the U.S. by the year 2000.

# Identifying the Problem (#2)
# The Lack of FAA Support

Today, other than computerized electronics and minor changes that do not improve performance, the FAA has not produced an advanced localizer in over 20 years and an advanced glide slope in nearly 30 years.

# Identifying the Problem (#2)
# The Lack of FAA Support

The interrupted development of the ILS produced antenna designs with broad radiation patterns. Their broad patterns, while sufficient to land aircraft, constrained construction opportunities in and around the airport in order to preserve the ILS approach.

As airports grew, ILS designs capable of limiting the radiation pattern to within the service volume, while preserving the approach, were ignored in favor of newer technologies.

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# The Good News and the Solution!

Although federal funding for research and development of ILS antennas was stopped before full maturity, Watts Antenna Company continued to self fund the development of this new generation of ILS antennas.

The ILS remains the Gold Standard and the most reliable all-weather landing system in the world. Watts Antenna Company considers the FAA's most modern ILS antennas in use to be operationally insufficient in a high percentage of cases.

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# Watts Model 201 Localizer Critical Area Plots & Legend

>25.0% >50.0% >75.0% >100.0%

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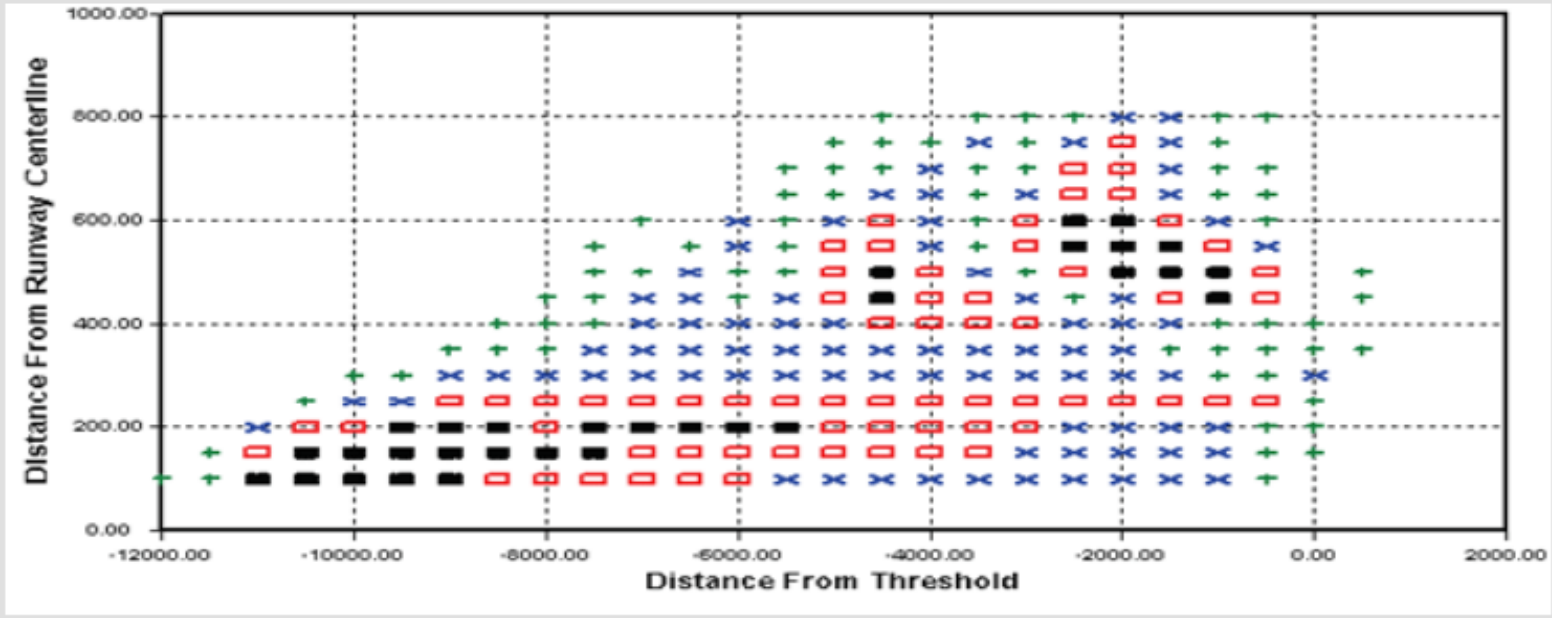
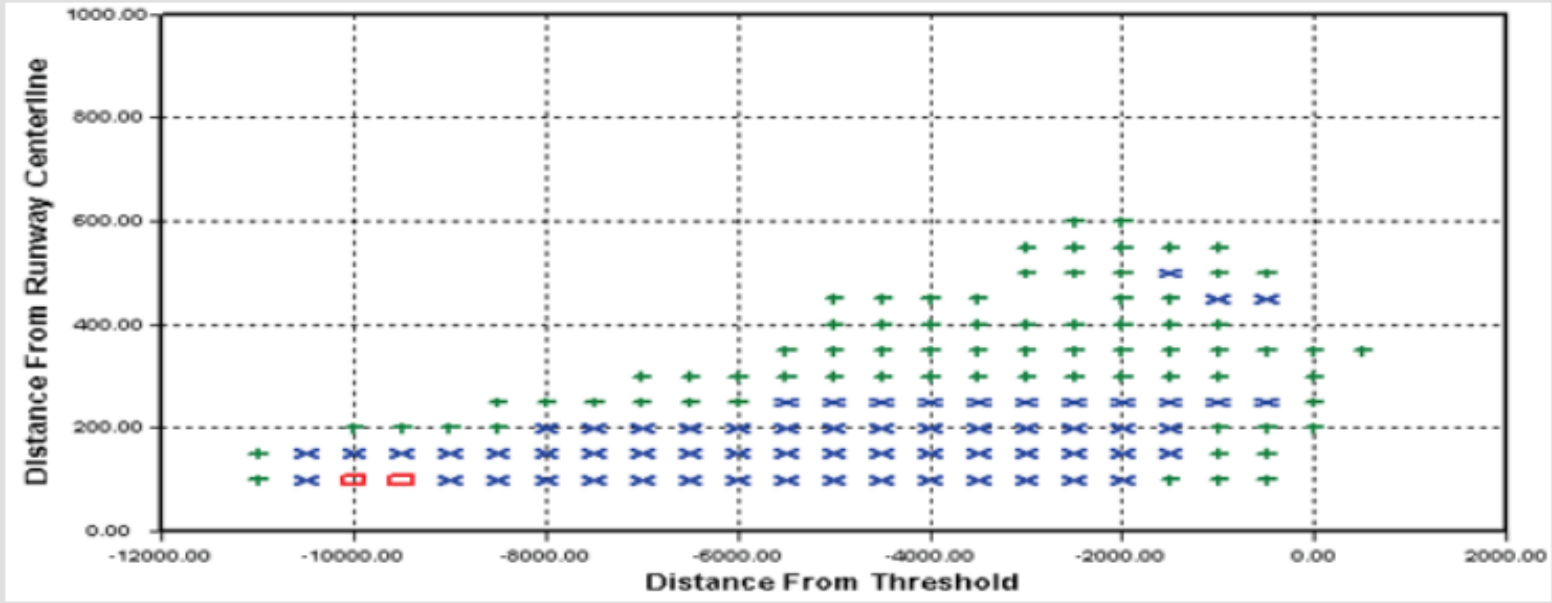



Typical 150 Feet Antenna Array Aperture (Course Only)




Watts 278 Feet Antenna Aperture (Course Only)

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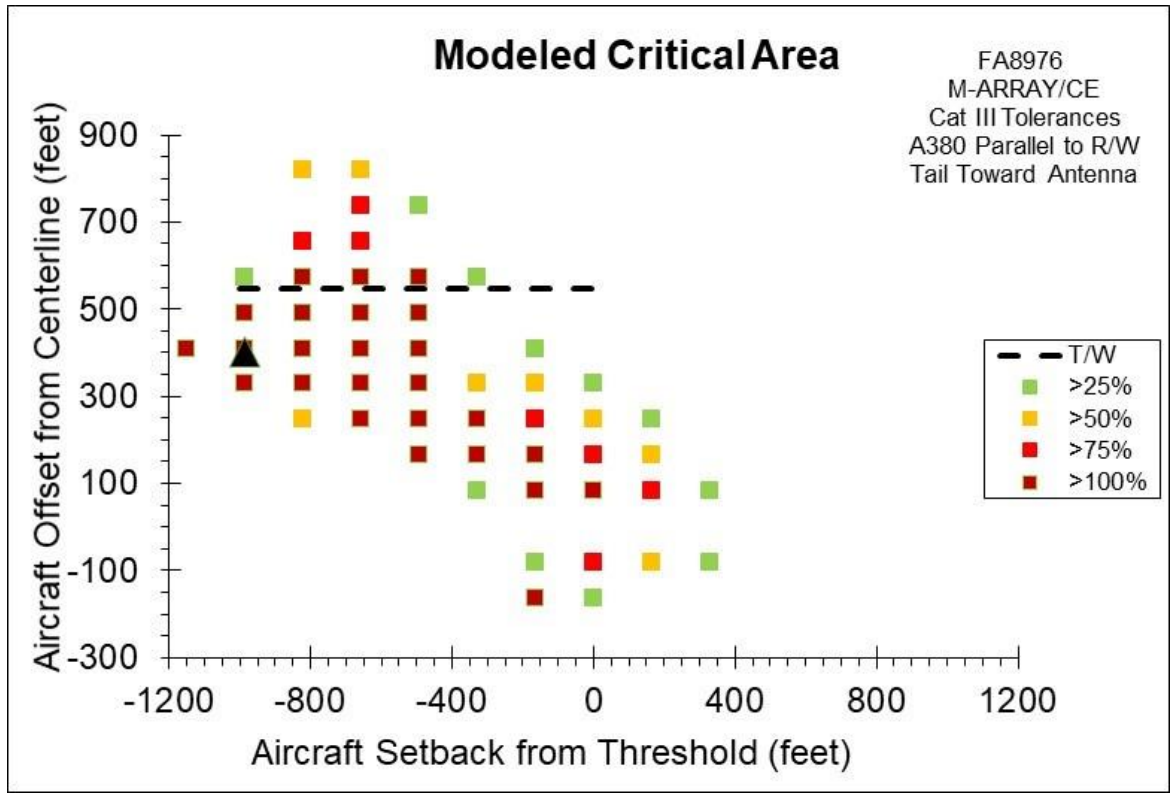


## FA8976 M-Array/CE

**Computed ILS Glide Slope Critical Area for an Airbus A380 Parallel to the Runway Using the FA8976 Antenna in M-Array Configuration, also referred to as Capture Effect (CE). The Dashed Line on the Plot Represents a Taxiway Offset Distance Where the Tower to Wingtip Separation is Only 5 Meters (16.4 Feet). The Black Triangular Shape Represents the Location of the Glide Slope Tower.**

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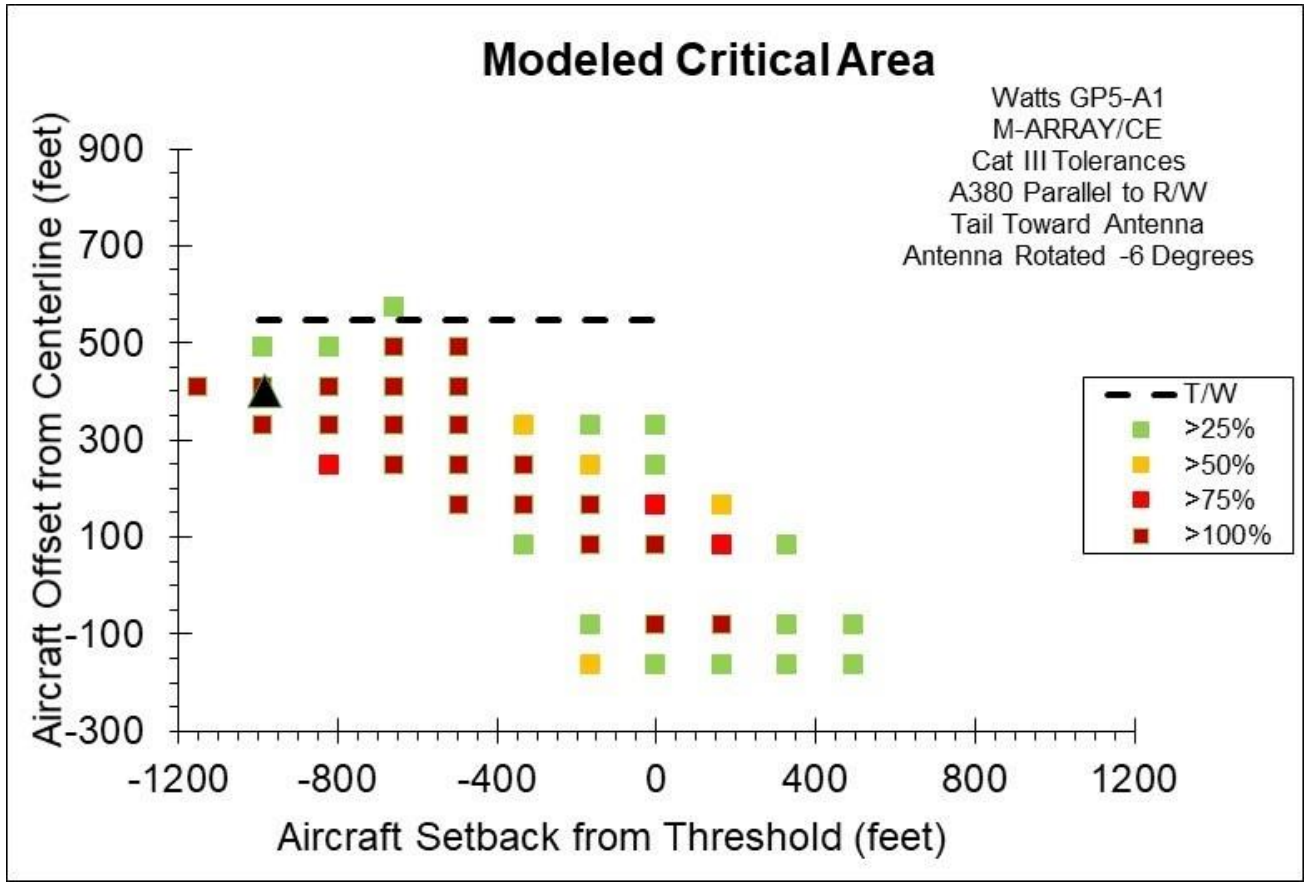


## GP5-A1 M-Array/CE w/Additional -6 Degree Rotation

**Computed ILS Glide Slope Critical Area for an Airbus A380 Parallel to the Runway Using the Watts Model GP5-A1 Beam Steered Directional Antenna in M-Array Configuration, also referred to as Capture Effect (CE). This Figure Shows the Addition Critical Area Reduction Achieved by Mechanically Rotating the Already Canted Beam by an Additional 6.0 Degrees Toward the Runway. (*The Dashed Line on the Plot Represents a Taxiway Offset Distance Where the Tower to Wingtip Separation is Only 5 Meters (16.4 Feet). The Black Triangular Shape Represents the Location of the Glide Slope Tower.)***

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# The Modern Watts Model GP5-A1

## Directional Beam Steered Image Glide Slope Antenna

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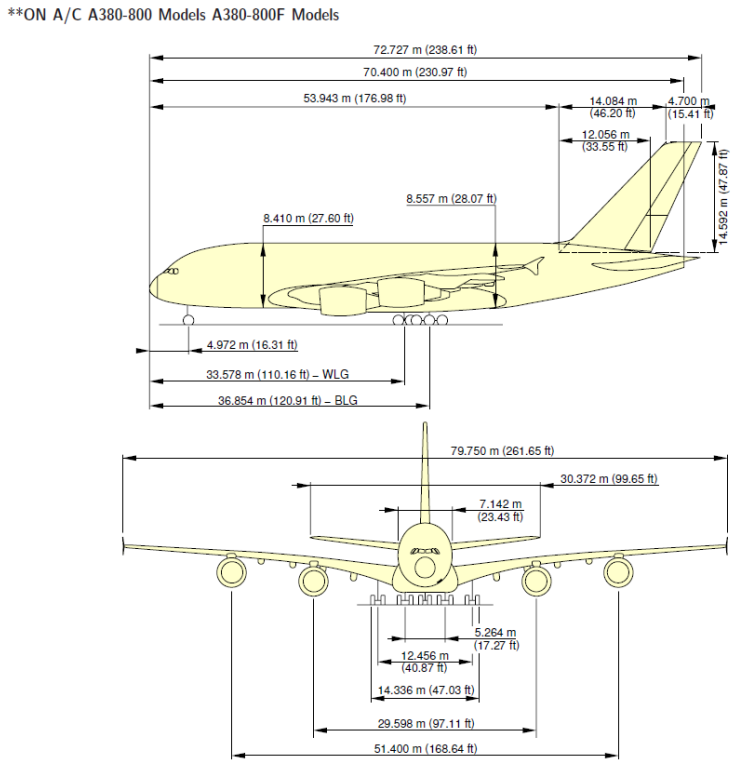
# Critical Area Assessment



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# Evidence of U.S. Airports Falling Behind

Evidence shows that U.S. airports are falling behind international airports in efficiency by continuing to utilize standard ILS antennas. Several European airports have recently installed wide aperture ILS localizer antennas to increase their throughput capacity. They are attempting to emulate the ILS Critical Area reduction capabilities of our Model 201 Localizer Antenna, that we installed in Geneva, Switzerland in 2006. We expect this trend to continue.

2006 International Flight Inspection Symposium (IFIS) presentation evaluating our Model 201 Super-Wide Localizer array (The Worlds First)

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# Evidence of U.S. Airports Falling Behind *(continued)*

## First of four new ILS localizers installed at Heathrow – (2015)

First-of-4-new-landing-systems-installed-at-Heathrow

## Additional 32 Element Localizer Installs in Norway, Qatar & Colombia:

Indra-Navia-as_Normarc-ILS-OSL-activity

Qatar-opts-for-Normarc-navigational-aids

Indra-to-provide-Qatar-Caa-with-latest-generation-Normac-nav-aids

INTELCAN 34 element localizer in Bogotá Columbia (video)

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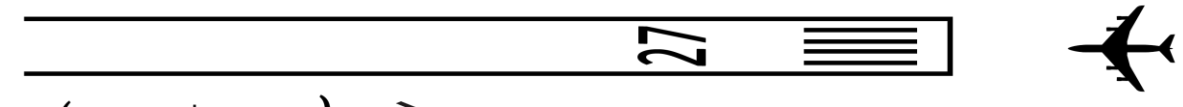


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# Evidence of U.S. Airports Falling Behind *(continued)*

- Zurich International Airport CAT III runway was able to Increase numbers of movements in low visibility conditions by approximately 17% starting in October 2016.
- Zurich Airport and the Swiss Navigation Services Provider, Sky-Guide were credited with installing a new Instrument Landing System (ILS) 32 element localizer antenna.
- The antenna is credited with increased capacity, reduced holdings, and increased safety in low visibility conditions.
- It also enables optimization of airside land usage allowing buildings to be built on land previously deemed non-constructible without disrupting the facility's ILS signal.
- NAVBLUE and ELISE Zurich 32 Element 17% Increase in Capacity
- NORMARC Localizer installed in Zurich

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# Currently

A new generation of ILS antennas is available from Watts Antenna Company that will effectively minimize the ILS Critical Area (CA). These advanced ILS antennas have been scrutinized, modeled, measured, flight tested and proven to operate as designed. This advanced antenna technology provides a smooth transition to Performance Based Navigation (PBN) and is the most robust backup to future navigation technologies. This will be the last real improvement in ILS beam-shaping technology necessary.

To envision the benefit for your sites, consider the freedom of aircraft movement made possible by reducing ILS Critical Areas (regardless of aircraft size) and removing ILS hold short lines from the airfield. This will minimize the changes in procedures required when transitioning from VFR to IFR operations and will increase throughput capacity, especially when operating under IFR conditions.

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# Currently *(continued)*

Within the FAA however, there has been minimal efforts to evaluate or embrace these innovative Advanced ILS Antennas for inclusion into the NAS. This would require a reinvestment in an ILS improvement program to upgrade ILS Antennas throughout the United States. The result of which could impact funding to existing GPS / GNSS programs.

Given the substantial benefits that can be achieved today, we believe this reinvestment should not be reason enough to continue opposing the certification of needed Advanced ILS Antenna designs. It is our belief that our antennas will facilitate GPS / GNSS programs rather than harm them. NEXTGEN NOW!

# Safety

Ensuring safety is everyone's responsibility. The current level of pressure on airports to reduce delays and the lack of support to implement advance ILS antenna designs is impacting safety by allowing the ILS Critical Area to be violated while aircraft are on an ILS approach.

Our Advanced ILS Antennas resolve this issue by shrinking the ILS Critical Area from the taxiway to allow outbound aircraft to advance to the Runway Safety Area (RSA) hold line. Our antenna systems can virtually eliminate the operational impact of an ILS protected area. Not only will this increase operational safety, but it will allow emergency services to be staged closer to runways, saving valuable time reaching aircraft needing assistance.

# **Safety** *(continued)*

Minimizing the ILS Critical Area increases operational safety and substantially reduces delays when transitioning from Visual Flight Rules (VFR) to Instrument Flight Rules (IFR) by essentially normalizing IFR ground holding procedures to VFR procedures.

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# Advantages of Advanced ILS Antenna Systems

Our Advanced ILS Antennas reduce the ILS Critical Area to the absolute minimum.

A substantial benefit of reducing the ILS Critical Area is to normalize the operational benefits of Performance Based Navigation (PBN) to ILS when considering ILS as a future backup system  The current ILS in use in the U.S. are not ready!

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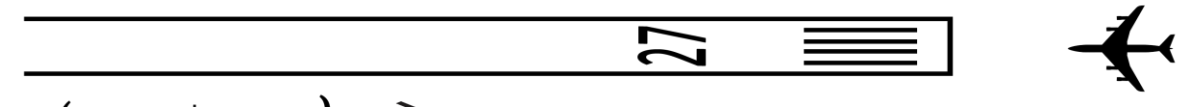


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# Benefits of Advanced ILS Antenna Utilization

- Enhanced Operational Safety
- Increased Construction Opportunities Within Airports Where Previously Restricted (such as for hangers, taxiways, cranes, buildings)
- Reduced Flight Delays
- Lower Greenhouse Gas Emissions
- Smoother Approach Paths
- Reduced Fuel Consumption
- Reduced Noise
- Increased Airport Capacity
- Shorter Landing & Takeoff Cycles (LTC)

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# Model 201 Super-Wide Aperture Localizer Antenna (Oct 2006)

https://wattsantenna.com/model-201

https://www.wattsantenna.com

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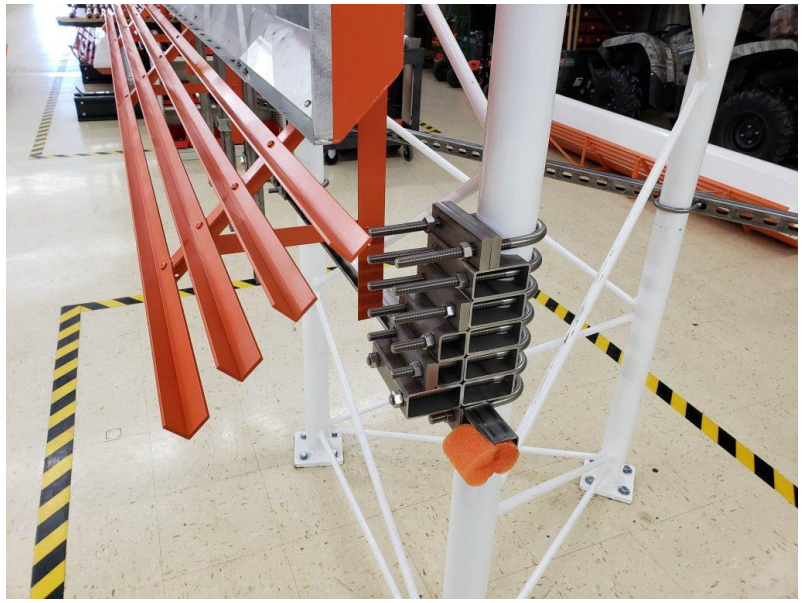
## Advanced ILS GP Series Glide Slope Antennas



**FEATURES**

- **Directive, narrow beam produces optimum pattern in airport multipath environments.**
- **Asymmetric radiation pattern provides greater use of all taxiways in the vicinity of the GP mast.**
- **Rejects sources of both static and dynamic multipath on the side of the runway containing the tower.**
- **No shim adjustment necessary.**

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## Advanced Non-Imaging End-Fire Glide Slope Antennas

https://wattsantenna.com/end-fire

**End-Fire Antennas Can Offer Numerous Benefits Over Conventional Image Systems:**

- **Significant Cost Savings by Avoiding Expensive Ground Plane Conditioning.**
- **Provide ILS Service where Previously not Possible or Cost Effective due to Terrain.**
- **Proven Frangible Low-Profile Design Permitting "Next to Runway" Installation.**
- **Save the Wetlands or Avoid High Wetland Relocation Costs.**
- **Waterside Installations Since the Signal is not Degraded by Tidal Variations.**
- **Precision Glide Path Guidance is Achieved with Narrow Lateral Radiation**
- **Patterns that Reduce Multi-path Signals from Buildings or Mountainous Terrain**

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# Conclusion

Watts Antenna Company has designed and manufactured uniquely effective Advanced ILS Antennas capable of increasing throughput capacity, reducing delays and mitigating environmental issues of many types. These designs will significantly relieve airspace congestion throughout the National Airspace System while enhancing airport construction opportunities and reducing harmful emissions.

The staff at Watts are committed to bringing the benefits of the very best wide aperture Advanced ILS Antennas to the United States.

**Designed and Made in the USA!**

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# Closing Remarks

On behalf of Watts Antenna Company, in has been our absolute pleasure for the opportunity to present this information to you.

We welcome you to contact our Company Vice President, William M. Johnson III, at bill.johnson@wattsantenna.com to arrange a meeting or for additional information.

Furthermore, we invite you to review our website if you have not done so already at https://wattsantenna.com where you can download a copy of this presentation.

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