

# Dispersion in the Age of RNAV



Presented by:

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UC Davis Aviation Noise and  
Emissions Symposium

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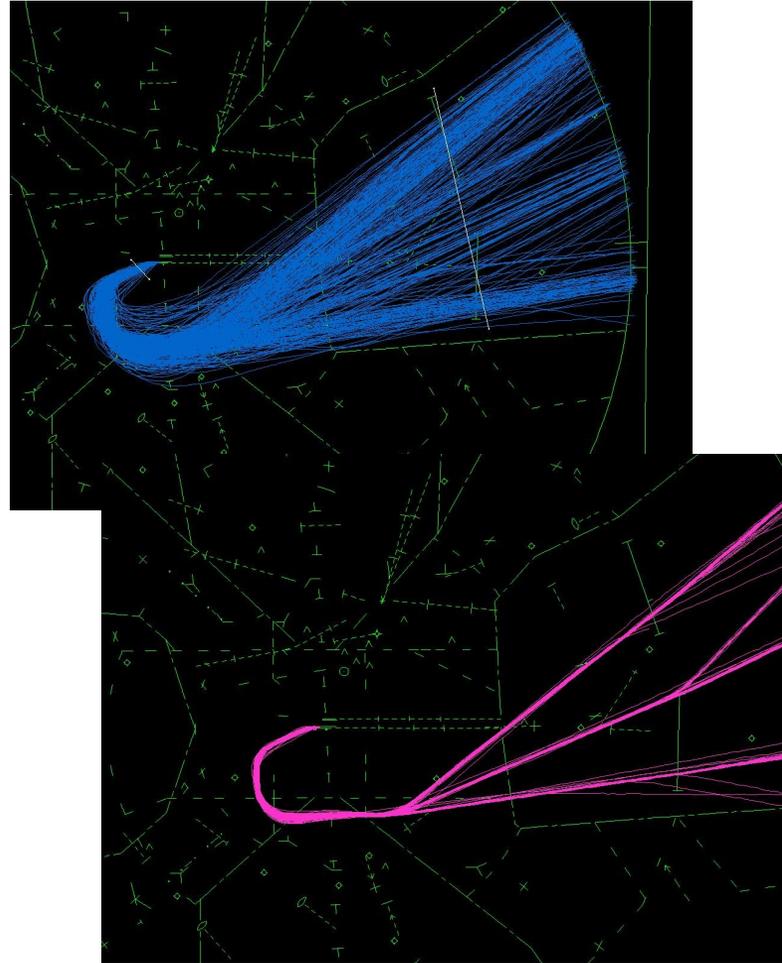
# What is dispersion?



- ▶ The process of introducing track variability by changing aircraft lateral position enough to spread out repetitive and intrusive noise events experienced by people living under highly concentrated flight paths.

# What types of dispersion exist?

- ▶ Natural (or random)
  - ▶ Associated with manually flown conventional procedures and ATC vectors
- ▶ Systematic
  - ▶ Aircraft use alternative flight paths with very precise and predictable trajectories but in a controlled manner
  - ▶ This type of dispersion is most associated with the use of satellite-based navigation capabilities
  - ▶ Examples
    - ▶ Radar Vectors to RNAV
    - ▶ Open SIDs
    - ▶ Additional departure tracks (e.g., Equivalent Lateral Spacing Operations - ELSO)





# Why does the FAA like PBN so much!?

- ▶ Safety
  - ▶ Communications Reduction
  - ▶ Pilot/Controller Workload Reduction
  - ▶ Situational Awareness Improvements
- ▶ Efficiency
  - ▶ Point-to-Point Navigation
  - ▶ ELSO - Equivalent Lateral Spacing Operations



# Why systematic dispersion?

- ▶ In our experience, FAA is most likely to entertain systematic dispersion concepts because of safety and efficiency benefits of satellite-based navigation
- ▶ However, systematic dispersion concepts do not always provide the same or as much track variability as natural (or random) dispersion
- ▶ “Once you’ve seen one airport, you’ve seen one airport.”
- ▶ Dispersion vs Concentration - Is concentration always bad?

# What does dispersion look like in the age of RNAV?

## Case Study 1

Equivalent Lateral Spacing Operations (ELSO) at San Diego International  
Airport (SAN)

# ELSO at SAN

- ▶ The San Diego County Regional Airport Authority is conducting a Part 150 study update for SAN. Alternatives recommended by the Part 150 consultant and are in draft form. The Airport Authority has not accepted the study yet.
- ▶ ABCx2 was asked by one of the affected communities to provide an alternative flight procedure design that would reduce noise exposure for communities north of the airport and along the ocean while preserving the safety and efficiency of SAN Airport.
- ▶ ABCx2's proposal involved the use of ELSO to provide some track variability while at the same time providing a safe and efficient design for ATC (next slide)
- ▶ ABCx2's proposal reduced the total number of housing units exposed to 65 CNEL by 342 or 572 (depending on the track loading model used). However, since the proposal "shifted" noise and put new housing units inside the 65 CNEL contour, the Airport Authority required unanimous consent of the CAC for acceptance, which it did not receive.

# SAN SIDs Current

Write a description for your map.

Existing Tracks

JETTI

Google Earth

Data SIO, MOAA, U.S. Navy, NGA, GEBCO  
Data USGS  
© 2021 Google  
Data CSUMB SFML, CA OPC



# SAN SIDs Part 150

Write a description for your map.

Part 150 Proposed flight paths Option 1 & 2

Existing Track

JETTI



# SAN SIDs ABCx2

Write a description for your map.

ABCx2 proposal

Keep Existing Track

JETTI



# SAN SIDs All Tracks

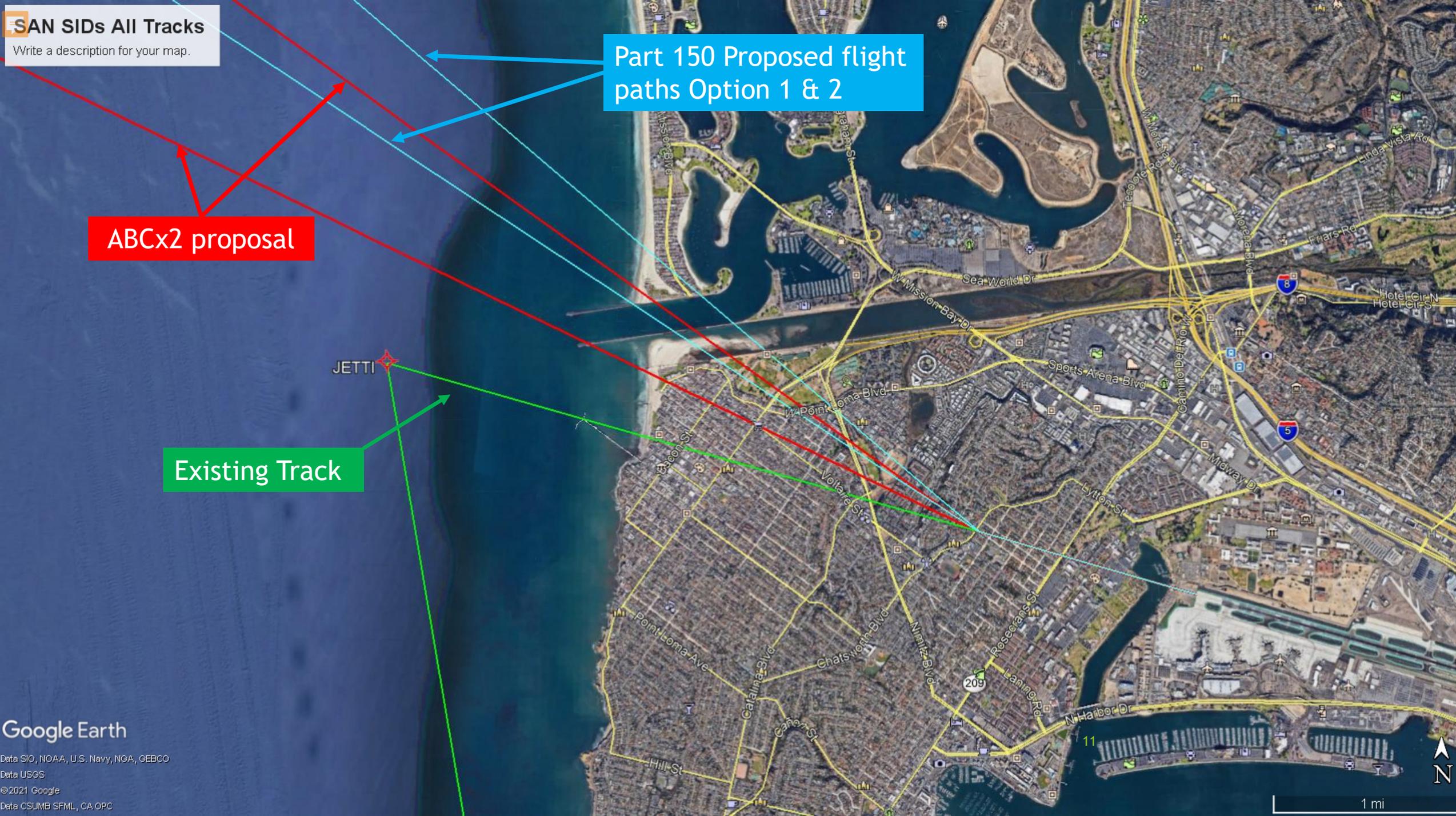
Write a description for your map.

Part 150 Proposed flight paths Option 1 & 2

ABCx2 proposal

Existing Track

JETTI



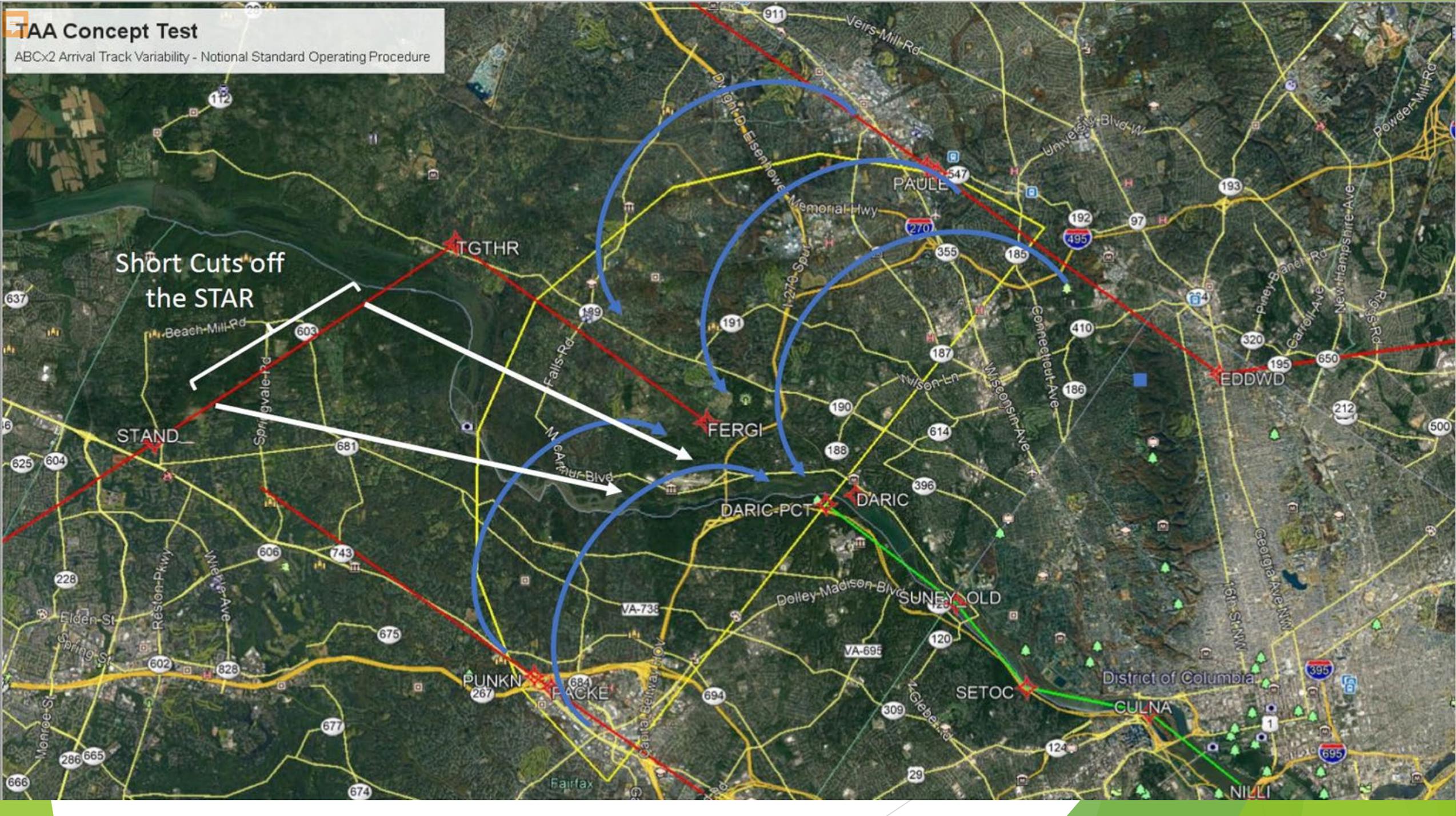
# Case Study 2

Terminal Arrival Area (TAA) at Ronald Reagan Washington National Airport (DCA)



# TAA at DCA

- ▶ ABCx2 was asked to address community impacts associated with PBN arrival procedures to determine if there was a way to introduce some track variability for DCA arrivals to Runway 19
- ▶ ABCx2's proposal involves utilizing the Terminal Arrival Area (TAA) Concept to bypass the FERGI waypoint and initiate an approach to DCA over DARIC waypoint in a more random manner (next slide)
- ▶ Introduction of the TAA concept will mitigate the concentration of noise by allowing ATC to clear aircraft to the DARIC waypoint from multiple directions thereby reducing the number of aircraft on the FERGI transition
- ▶ Residents representing communities from Arlington and Montgomery Counties were directly involved in the procedure design process using the Vianair Airspace Information Modeling (AIM) software
- ▶ Proposal is currently being finalized for submission to the FAA through the Community Working Group (Roundtable).



Short Cuts off  
the STAR



# Conclusions



- ▶ Every airport is different
  - ▶ Location of noise-sensitive communities determine what can and cannot be done.
  - ▶ Operational constraints
    - ▶ Airport Configuration
    - ▶ Terrain & Obstructions
    - ▶ Airspace complexity
    - ▶ ATC Needs/Requirements
    - ▶ Other ...
- ▶ Agreement on a design philosophy is essential to achieve successful outcomes!
- ▶ Every dispersion concept should be designed and evaluated against the priorities (i.e., design philosophy) established.
- ▶ Collaboration between communities and the FAA is vital! (Win-Win)

# Thank You

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# Backup material

# Vianair AIM

Samples from the Vianair, Inc. Airspace Information Management Software

# Vianair Inc company profile.



Vianair develops the next generation modeling platforms to transition aviation into the future.

We have developed our solutions in close collaboration with the industry with the goal of improving our customers' day-to-day operations. To better address their needs all our products are customizable, modular and extensible.

## Product line

- Vianair AIM - Procedure design & evaluation
- Vianair PLUS - Holistic airport system performance evaluation
- Vianair SIM - Next generation fast-time simulation

## Vianair in a snapshot

- US software company founded in 2017
- Airspace design & planning methodology in development since 2013
- Collaboration with Port Authority of New York & New Jersey since 2015
- 2019 National Science Foundation grant
- 2018 Lloyd's Register Foundation grant
- 2 USPTO patents pending
- 6 research paper & conference publications

Headquarters, R&D: New York, NY USA  
 +1.862.867.6311, +1.646.403.4705  
[www.vianair.com](http://www.vianair.com), [info@vianair.com](mailto:info@vianair.com)

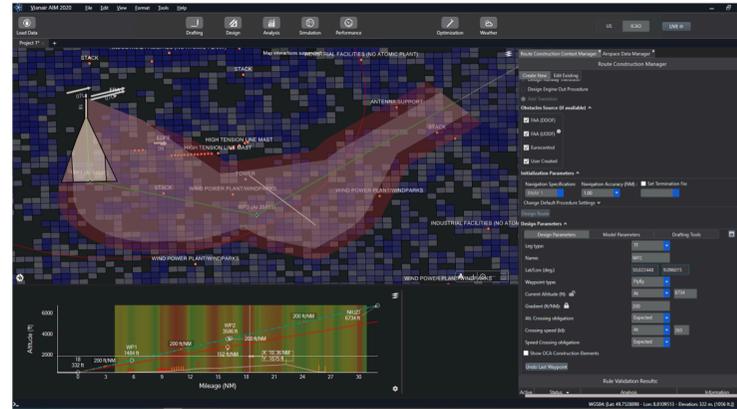
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## Airspace design made easy.

### Complete parametric model of an airspace and airport(s) system

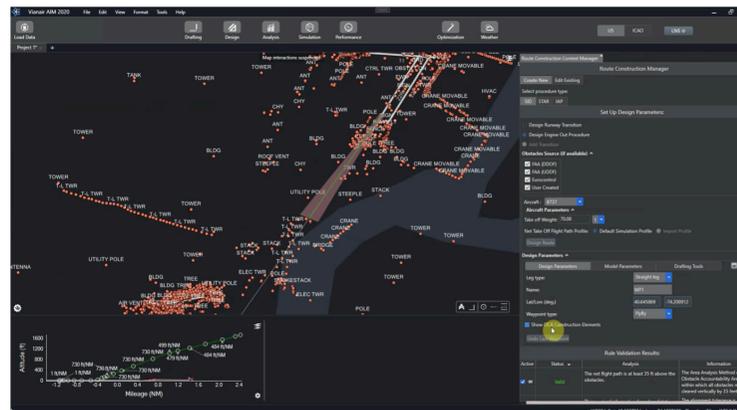
- Airspace modeling (SIDs, STARs, IAPs, Fixes, NavAids, 3D Sectorization, SUAs, etc.)
- Airport modeling (Runway, taxiway, gates, de-icing, parking, etc.)
- Complete GIS (obstacles, terrain, population, satellite map, etc.)



\* ICAO PANS-OPS SID design - Frankfurt Am Main Airport.

### Seamless procedure design parameterization & evaluation

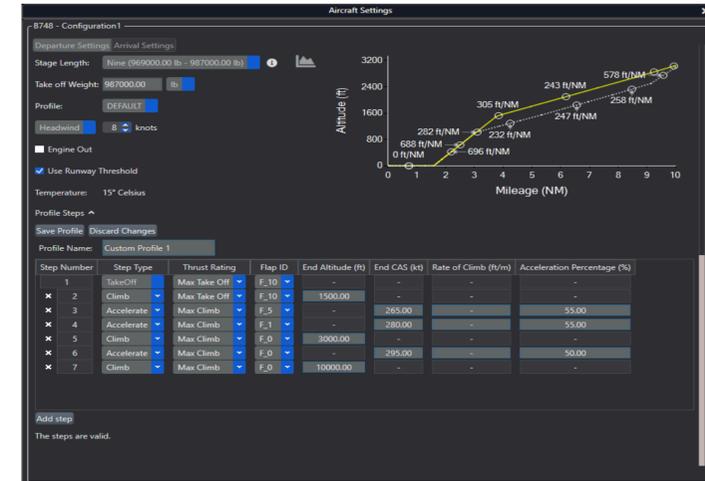
- SID / STAR / IAP procedure design (TERPS / PBN, PANS-OPS)
- Obstruction & terrain evaluation (DDOF, UDDF, SRTM-90)
- Engine-Out procedure design (Advisory Circular 120-91A)
- Seamless export of 8260 forms & publication charts creation
- Environmental performance evaluation (ANP + BADA)



\* Example for Engine-Out procedure design - Newark Liberty Airport.

### Custom aircraft performance profile creation

- Manipulate almost any performance-related aircraft parameter (step type, thrust rating, flap ID, end altitude, end CAS, rate of climb, acceleration %).
- Compare default, noise abatement and custom profiles



\* B748 departure profile.

## Performance that takes off.

- 20% of the time for the complete design & performance evaluation of a procedure vs. leading alternative
- SRTM-90 & UDDF data model creation in seconds
- Dynamic evaluation of procedures “on-the-fly” for truly optimal design
- US & ICAO criteria in a single platform

# Operational data in a snapshot.

## Real-time & historic flight tracking + analysis

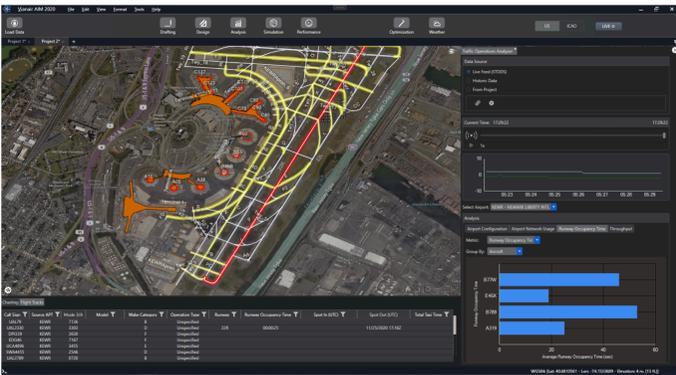
- SWIM + sensor-based
- Integrated airport & airspace flight tracking
- Multiple-airport view
- Past data playback capabilities



\* Flight track analysis - NY Metroplex (N90).

## Ground operations analysis

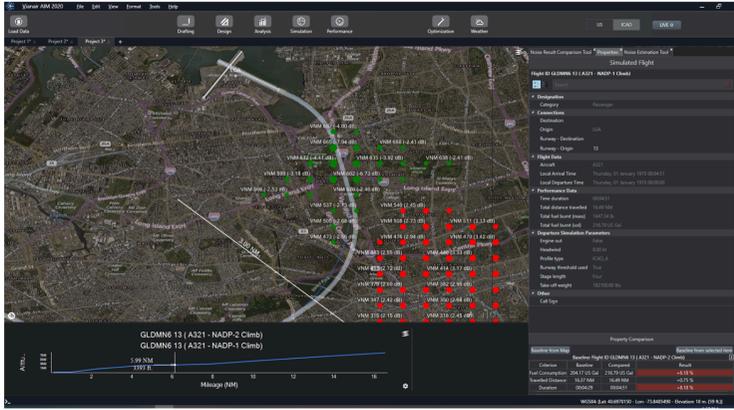
- Historic or live data analysis (airport configuration, network usage, runway occupancy time, delays, etc.)
- Airport configuration (runway, taxiway, gates, aprons, etc.)
- Network usage (by operator, aircraft type, etc.)
- Runway occupancy times
- Ground & airborne delay analysis



\* Surface modeling - NY Newark Liberty Airport.

## Efficiency & environmental analysis

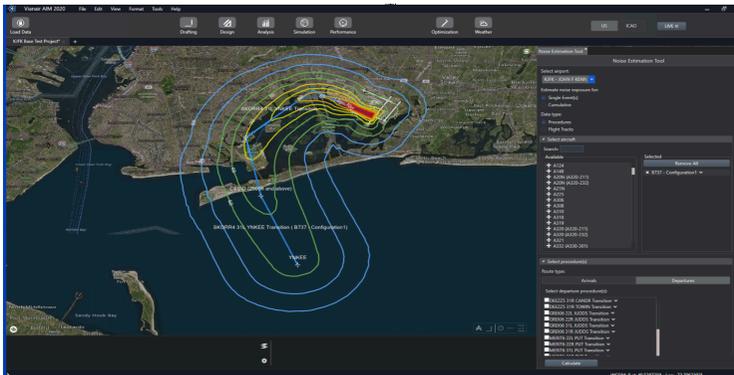
- Track miles
- Fuel consumption
- Flight duration & delays
- Noise exposure (LAmex, SEL, DNL, LAeq, etc.).



\* Noise impact comparison for A321 operation, NADP-2 vs. NADP-1 - NY.

## For the Noise Office...

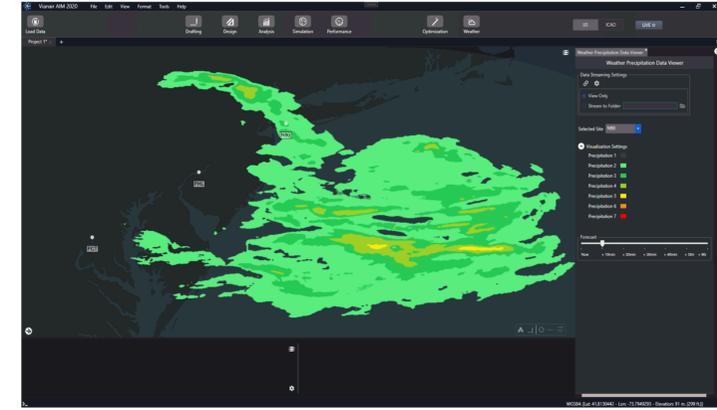
- Geofencing (gates, corridors)
- Non-compliance alerts + analysis
- Match flown tracks to procedures (during the day + historic)
- Virtual Noise Monitors (real-time + historic)
- Current vs. proposed procedure profile comparison (noise impact)
- Queryable database (operator, date / time, etc.)



\* LAmex noise contours - NY JFK Airport.

## Weather data integration

- SWIM ITWS (Integrated Terminal Weather System)
- Graphic & textual formats
- Wind, storm cell information, etc.
- Fix balancing (load + weather impact)



\* Precipitation data, 10 min forecast - NY N90 TRACON.

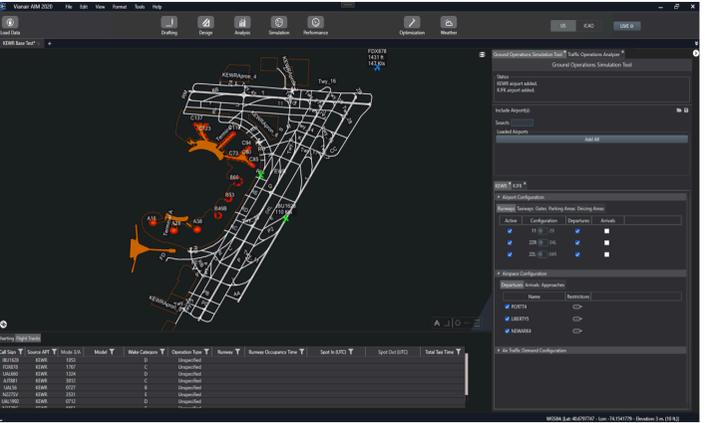
## Do more for less.

- Ground & airspace operations performance monitoring... **in a single platform**
- **25% of the cost** vs. mainstream alternatives
- Streamlined **Part 150 studies modeling**
- **Holistic assessment** of system efficiency
- **Seamless SWIM data** viewer & manager

# Planning the operations of tomorrow.

## Seamless simulation set-up

- Automated set-up of air traffic demand scenarios from real data
- Streamlined airport and airspace configuration set-up
- Easy air traffic demand scenario creation
- Innovative temporal navigation & playback



\* Surface operations monitoring - NY Newark Liberty Airport.

## New operational concept evaluation

- What-if scenario analysis
- Large-scale scenario performance comparison
- Model runway closures, taxiway system improvements, etc.
- Create future air traffic demand scenarios
- Evaluate novel operational concepts (e.g. end-around taxiways)



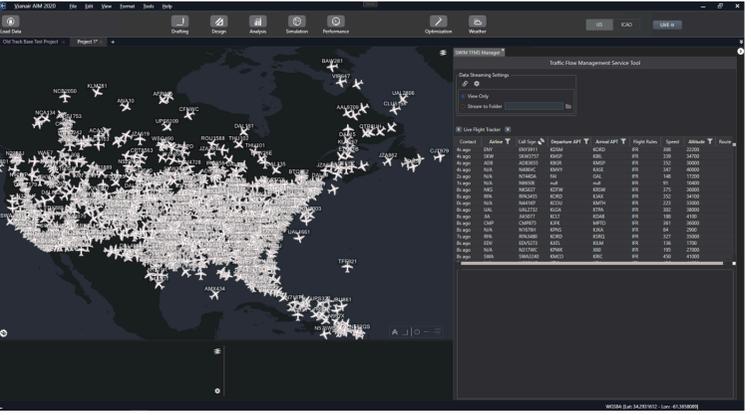
\* Surface operations fast-time simulation - NY JFK Airport.

# One seamless experience.

- A simulation platform **you can actually use**
- Automated simulation scenario set-up **in minutes**
- Easy **new operational concept** creation & evaluation
- Realistic **what-if scenario analysis**
- **At a fraction of consulting costs** for unlimited projects

## State-of-the-art simulation engine

- Multi-agent based
- Rule-based
- Modular & extensible



\* Complete network operations monitoring - NAS, US.

# Select clients

## Airport authorities



## Airlines



## Aviation consultants



## Cities



PLAN. DESIGN. VALIDATE. IMPLEMENT.





# ABCx2, LLC - Company Brochure



ABCx2, LLC

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## ABOUT US



ABCx2 is an award-winning team with a unique combination of talent. The knowledge, skills and abilities offered represents decades of Air Traffic Control, Airspace and Flight Procedure Design, Airport Operations and Aircraft Noise Mitigation expertise with a focus on serving communities, which is uncommon in the field. As you will see in our company information and respective resumes (available at [www.abcx2.com](http://www.abcx2.com)), ABCx2 brings an abundance of expertise in noise abatement and mitigation, airspace redesign, Performance Based Navigation, Terminal Procedures, Flight Validation, Terrain and Obstruction Evaluation, Unmanned Aircraft Systems (UAS), Traffic Flow Management, Safety Risk Management, stakeholder engagement, community advocacy and program management. All with an outstanding record of success while being fiscally responsible and environmentally conscious.

ABCx2 is a community-focused company capable of providing solutions to airport noise issues through community and industry engagement. Services include providing end-to-end support from baseline analysis to strategy development to implementation and post-implementation monitoring. We address airport noise issues by engaging with industry and communities to find compatible solutions that are meaningful, measurable, and sustainable. Solutions may include short-term, local procedures and/or long-term flight procedure design and implementation, from a single PBN procedure to an entire airspace system redesign.



# WHO WE SERVE

Aviation is complex, and managing the relationship between the industry and community can be challenging and often frustrating for all sides. Understanding, respecting, and advocating for the interests of all stakeholders is at the heart of our success. We seek compatibility through service to both industry and communities.



## State and Local Government

We support local, regional, state governments and public agencies. We help our clients navigate the complexities of the National Airspace System, aviation operations and federal aviation regulations. We also help develop and deploy effective engagement strategies that encourage collaboration among industry and community stakeholders.



## Communities

Minimizing the negative impacts of aviation on communities is at the heart of what we do. We work with community groups, neighborhood associations, airport roundtables, advisory groups, and individual residents. With decades of experience, we've developed an approach founded on "Bridging the gap between aviation and the community." This commitment is based on incorporating education, collaboration, engagement strategy and technical expertise to identify strategies enabling aviation and the community to co-exist.



## Airport Operators

Airports are important regional economic engines attracting business development and creating jobs. They also enable convenient access to air travel, air cargo services, and support emergency services. While enhancing regional quality of life for many, noise and other impacts can have a negative effect on nearby residents. We work with airports, heliports, and other facilities to help maximize the benefits of aviation while minimizing the negative impacts to communities.



## Aircraft Operators

While safety is the top priority, aviators often want to minimize their impacts on others. ABCx2 works with airlines, corporate aviation, general aviation, flight schools, fixed-based operators, public agencies, law enforcement, emergency services, and the military. We can help develop strategies to reduce community impacts as well as effective engagement programs to strengthen relationships with the public.

# WHAT WE DO



## Noise Office Management

Whether you need support establishing a Noise Management department, training staff, solving a specific noise issue, or you want to outsource these functions, ABCX2 can help. Our experience includes establishing new noise offices and noise programs, enhancing existing programs, and developing policies and procedures to support or supplement staff on a part-time or on-demand basis.

### Services include:

- Outsourced noise office functions
- Policy and procedure development
- Noise complaint processing: Investigation, response, reporting
- Recruiting, education and training



## Noise Abatement Programs

Aircraft noise programs address community concerns associated with aircraft operations and noise. Effective noise programs include operational policies and procedures while incorporating education and engagement to encourage compliance with program elements and the public's understanding of what can and cannot be mandated. This also includes education and engagement strategies to ensure pilots and air traffic controllers participate in the program.

### Services include:

- Pilot and air traffic control engagement and education
- Flight tracking systems and support
- Fly Quiet and Fly Friendly programs
- Advisory committees and roundtables



## Outreach and Engagement

Stakeholder engagement is a critical element to the success of any program aimed at addressing adverse aviation impacts on the community. We deliver expert engagement strategy experience, people skills, and a thorough understanding of stakeholder roles and interests to assist stakeholders in establishing, maintaining, and strengthening their relationships with the goal of transforming stakeholders into partners.

### Services include:

- Advocacy, outreach, and engagement strategy
- Outreach materials, web content, social media
- Industry Engagement: airports, regulators, aircraft operators
- Public engagement: community, community groups, local government

# WHAT WE DO



## NextGen / Performance Based Navigation

NextGen solutions for NextGen challenges. NextGen is coming; in fact, for many airports and their communities, it's already here. Are you prepared for Performance-Based Navigation (PBN) and Area Navigation (RNAV), along with the benefits and potential challenges it may bring to your airport or community? ABCX2 helps airports and communities navigate the NextGen planning and implementation process by identifying potential benefits and impacts for all stakeholders, and encouraging the development of procedures that balance the interests of both the industry and community stakeholders.

### Services include:

- Advocacy, education, engagement
- Flight procedure design and regulatory support
- Document review and analysis



## Unmanned Aerial Systems (UAS)

Unmanned aircraft systems or "drones" represent a new era in aviation. This rapidly evolving technology offers many benefits but at the same time, raise privacy, safety, and other public concerns. ABCX2 supports airports, UAS operators, local governments, and communities providing clarity about the regulatory requirements for UAS operations. We support the establishment of policies and procedures that enable businesses to leverage this new technology while addressing the concerns of local communities.

### Services include:

- Industry and community education and outreach
- Organizational policy and procedure development
- Regulatory support



## Technical & On-Call Support

ABCX2's expert technical support is available when you need it by phone, text, email, or at your location. We provide on-demand expertise and offer flexible, cost-effective options. We're there when you need us.

### Services include:

- Advocacy, outreach and engagement
- Education and training
- Regulatory support



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