



# Worlds Leading Air Navigation Services Provider



AIRLINE COPTER AIRPORT UAM



OBSTACLE SURVEY – AERODROME CERTIFICATION



FLIGHT INSPECTION – NAVIGATION CERTIFICATION



NextGEN



# INTRODUCTIONS

## Presentation

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Chris Baur, FRAeS  
*President & CEO, Hughes Aerospace Corporation*

- Leading Hughes for 13 years
  - Worlds largest, most comprehensive 3<sup>rd</sup> Party ANSP
- MBA - Brown University & IE Business School Madrid
- 40+ years of diversified Aviation Experience
  - Military Service – Dual Rated Pilot/Aviator (3) Branches
  - Government Service – US Customs Pilot/Criminal Investigator
  - Corporate/Charter Pilot
  - Airline Captain – Line Operations, Management, Training, Security & Maintenance
  - Flight Test Pilot – B777, B757/767, B737
  - FAA Certificated Dispatcher
  - UAS Part 107 Remote Pilot in Command
  - FAA Certificated IFVP/PEP
- Fellow, Royal Aeronautical Society



# Global Leadership Integrated PBN Solutions

## ***Why HUGHES? ... High Customer Satisfaction!***

***HUGHES has always accepted challenges presented by our customers for innovative, effective airspace solutions.***

HUGHES is consistently first to market with practical solutions that leverage existing & emerging technology involving Vertical Flight & Fixed Wing Operations worldwide. Have been first to market with a variety of innovative satellite-based navigation products & services in:

- *United States*
- *China*
- *Middle East*
- *SE Asia & Western Pacific*

HUGHES is the largest full-service non-FAA Public Service Provider in the United States with the most Public IFP's outside of the FAA

HUGHES operates its own fleet of aircraft & UAS for Flight Inspection & Aerial Survey



**Hughes is the leading supplier of navigation in the Air Ambulance Industry**



# Global Leadership Integrated PBN Solutions

## About HUGHES

HUGHES is a Global 3<sup>rd</sup> Party Air Navigation Services Provider. HUGHES Designs, Validates and Maintains Instrument Flight Procedures for Helicopters & Airplanes. HUGHES also performs Heliport Evaluations and provides both IFPV & PEP Services – with our own aircraft.

HUGHES approved by the FAA as a CFR 14 Part 97 Public Service Provider as well as ICAO Endorsed, and certificated by many governments worldwide.

- \*FAA PEP – Procedure Evaluation Pilot
- \*FAA IFPV – Instrument Flight Procedure Validation Pilot



*Myanmar (BURMA) CAA PBN Implementation at Yangon & Mandalay Airports*



**HUGHES - ICAO certified PANSOPS  
Instrument Procedure Design Facility  
ICAO Endorsed 3<sup>rd</sup> Party ANSP  
MEMBER – ICAO PBN Go-Team**

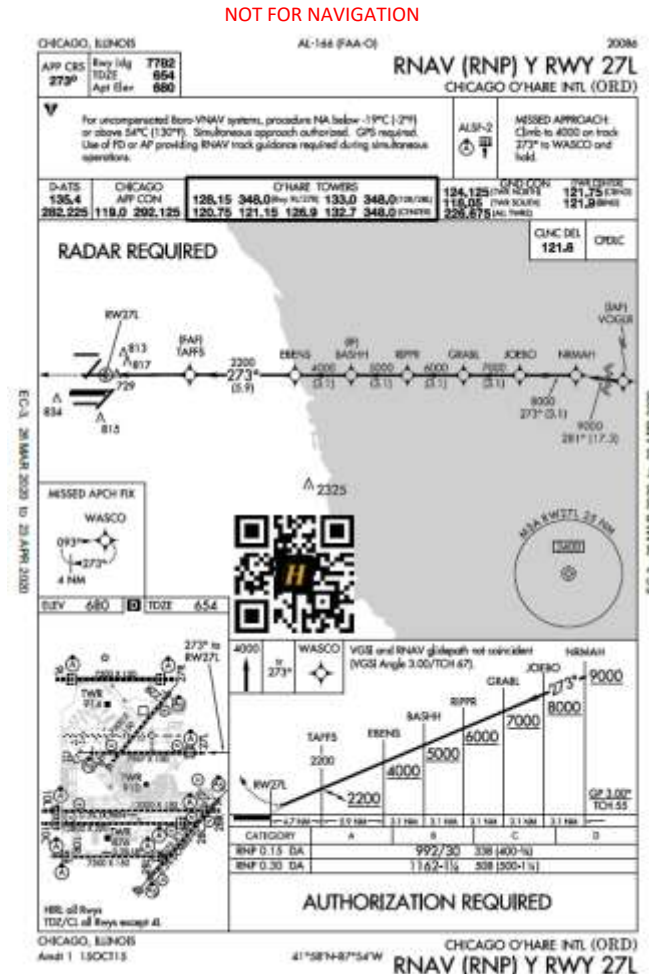


# Global Leadership Integrated PBN Solutions

- **Complete Third-Party Air Navigation Service Provider**
  - Instrument Flight Procedure Design –
    - FAA & ICAO Certified - PANSOPS and TERPS
  - Flight Inspection/Validation, Simulator Validation, Obstacle Validation
  - ICAO Annex 14 Obstacle Survey
  - WAAS – LPV/LP Approaches & Airways
  - COPTER Routes & Airways
  - GLS Approaches
- FAA Approved Instrument Procedure Maintenance
- Air Traffic Training & Engineering Services
- Digital Charting Products & App based SMS Tools
- AIP Maintenance & Charting
- Navigation Data Coding & Management
- FAA Airport & Heliport Certification, Survey & Inspection
- Terrain & Obstacle Analysis & Determination



**HUGHES is a certified FAA Public Service Provider under 14CFR Part 97, in the United States of America**



Chicago O'Hare's first RNAV (RNP)  
CFR 14 Part 97 Instrument Approach



# The HUGHES App Integrated Navigation Solutions SMS



**The HUGHES APP – NAVIGATION, WEATHER & COMMUNICATIONS on the go**  
Hughes is *the first Air Navigation Service Provider* to offer an App supporting Weather, Charting, NOTAMS, SMS (including Special Charting Can products) and field communications with our customers.



- Weather -METAR, TAF – Heads Up Display
- NOTAMS – Auto searched and flagged to your digital color charts *plus* Custom user NOTAMS!
- Special and NOAA charts – geo-referenced with own ship display!
- Instant notification status of current & procedures in development at your fingertips.
- File, activate or cancel FAA flight plans
- Risk Assessment
- SMS Reporting
- Built in QR Scanner & Theodolite!
- Receive Automatic Push notifications



## REPORT Feature for Obstacles, Nav Data, Charting issues & more!



4:47

Obstacle Issue

Reported Date: Apr 22, 2020 Status: Active

Obstacle Type: Power Lines

Description of Issue: Unmarked Wires

Capture Image:

Add Chart:

View

Type of Obstacle



# IFR Procedure Implementation & Maintenance

## Airport & Heliport Obstacle Survey

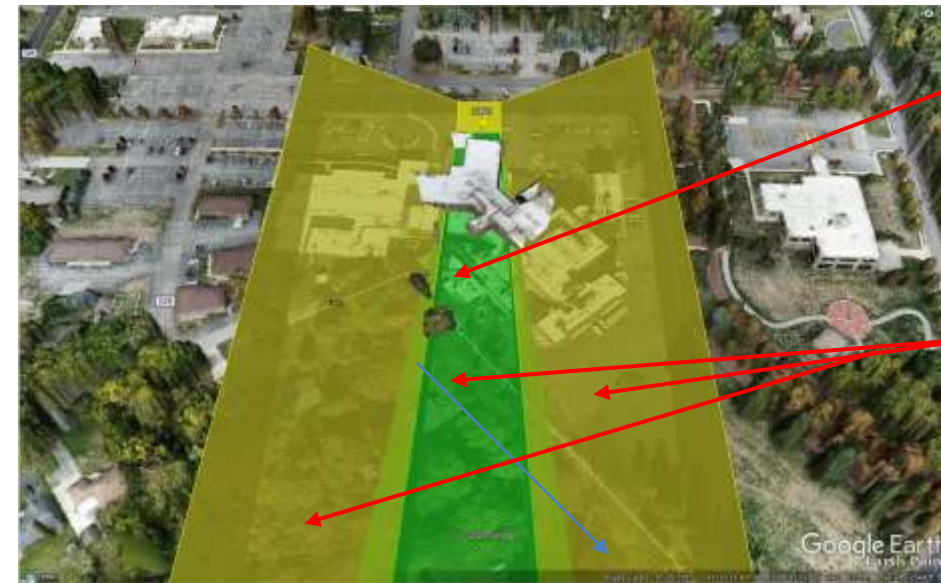
**HUGHES Runway 3D Relief Model**



HUGHES Survey Drone creating efficient & accurate orthophoto mosaics



**HUGHES Runway Digital Elevation Model**



Precise Identification of obstacle penetrations

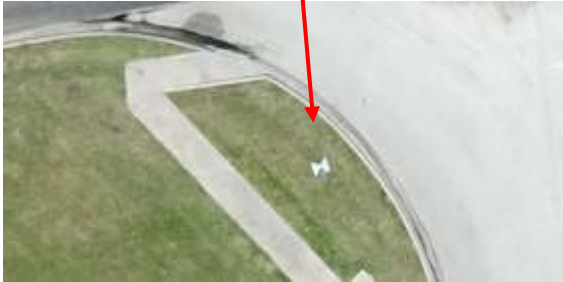
Post Process rendering of all Instrument Approach surfaces



# IFR Procedure Implementation & Maintenance

## Airport & Heliport Obstacle Survey

Deployment of surveyed  
GCP's in ~ 1cm accuracy





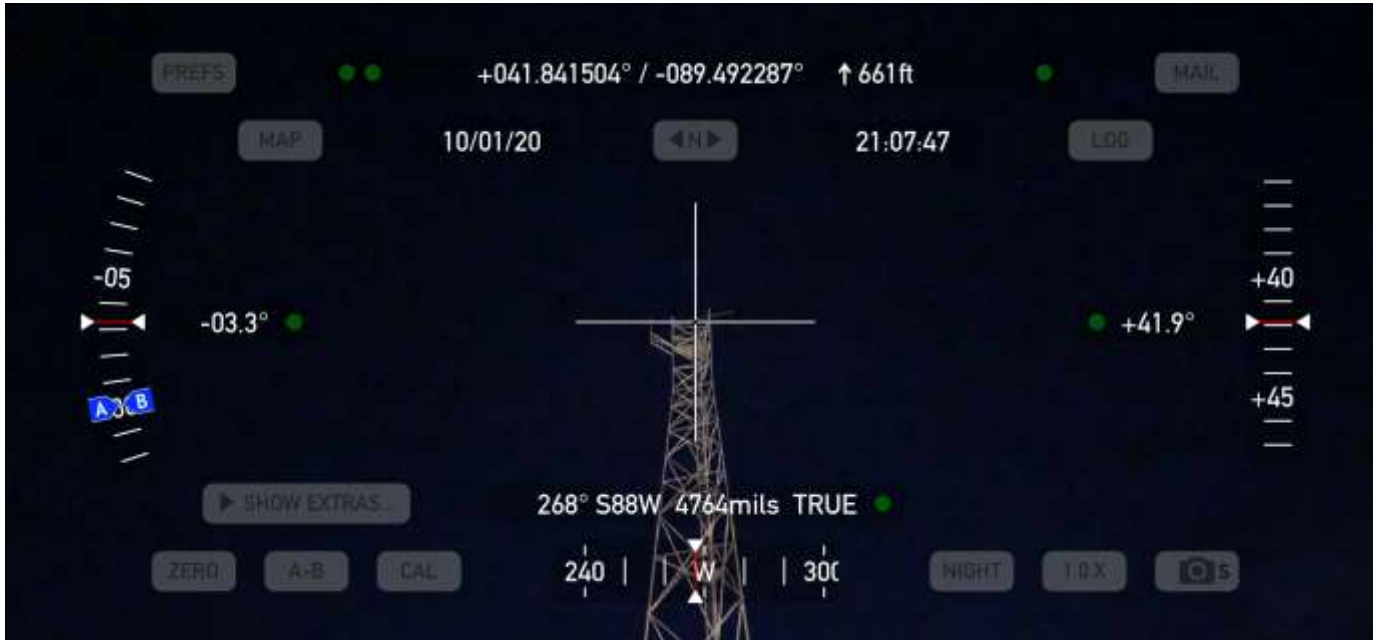
# IFR Procedure Implementation & Maintenance

## Airport & Heliport Obstacle Survey



# IFR Procedure Implementation & Maintenance

## Obstacle Survey & Determination



Name	48-039088	Locked	<input type="checkbox"/>
Description	<input type="text"/>		
MSL	177.00	AGL	0.00
Latitude	N 30° 4' 41.49"		
Longitude	W 95° 33' 17.08"		
Runway	Select Runway <input type="text"/>		
Location Distance (Feet)	0.00		
Offset Distance (Feet)	0.00		
Offset Direction	R <input type="text"/>		
<input type="button" value="Apply"/>			
Type	TREE <input type="text"/>	City	<input type="text"/>
State	TX <input type="text"/>	State Code	0 <input type="text"/>
Obstacle Number	1111 <input type="text"/>	Verification Status Y/O or N/U	<input type="text"/>
Frequency	0 <input type="text"/>	Strobe Indicator	<input type="text"/>
Lighted	<input type="text"/>	FAA Study Number	<input type="text"/>
Action Code	<input type="text"/>	Data Integrity Code	<input type="text"/>
Accuracy	1B (Horz = +20' Vert = +10')		
Set Accuracy Code	<input type="text"/>		
Horz Accuracy	1: +20' <input type="text"/>	Vert Accuracy	B: +10' <input type="text"/>
Select Color:	<input type="text"/>	Default Color:	<input type="text"/>
Label Settings:	<input checked="" type="checkbox"/> MSL	<input type="checkbox"/> AGL	<input type="checkbox"/> State Code
<input type="checkbox"/> Man-Made	<input type="checkbox"/> Ignore In RS	Acceptable Obstacle Type	<input type="text"/>



## Flight Inspection/Validation Services

- FAA & ICAO Certified Flight Inspection Pilots
- HUGHES operates its own Flight Validation Aircraft

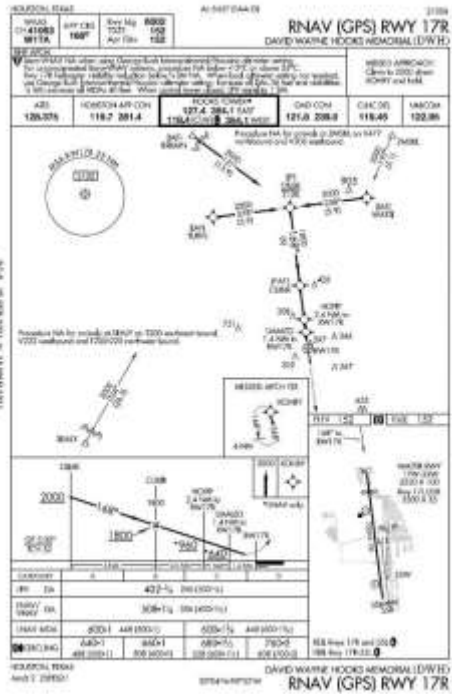


HUGHES FLIGHT INSPECTION  
RECORDING – Mojave Space Port -  
Edwards AFB



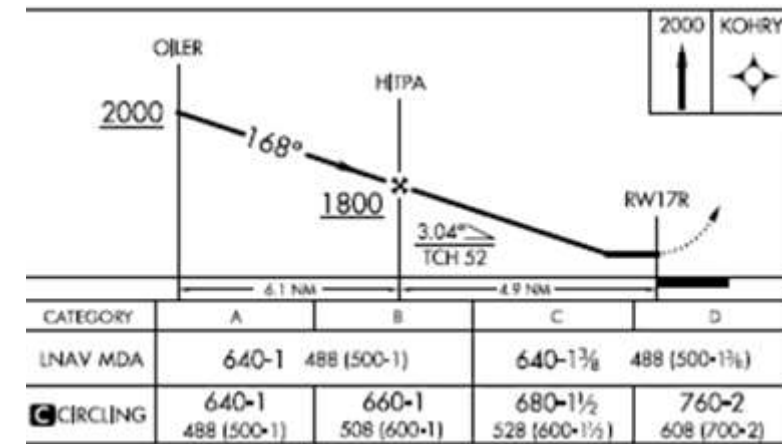
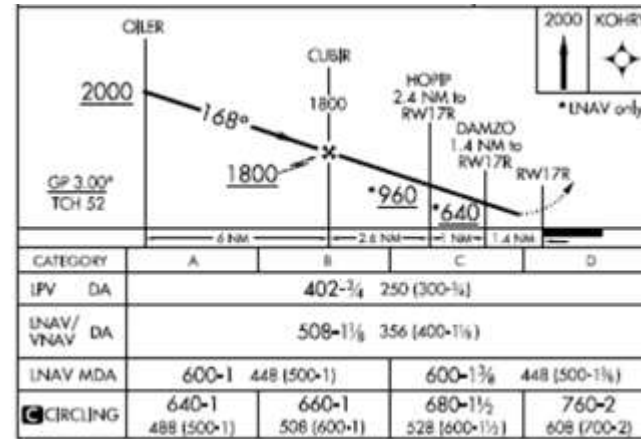
HUGHES is FAA certified for Flight, Sim & Obstacle Validations & PAPI Inspections (pending)

## New 14 CFR Part 97 Procedures at KDWH – David Wayne Hooks Airport



New Hughes Developed Approaches, Effective 2/25

Current FAA Developed Approach



- Significantly lower minimums
- Both LPV + Baro VNAV Vertical Guidance
- Reduced Track Miles = Fuel Savings

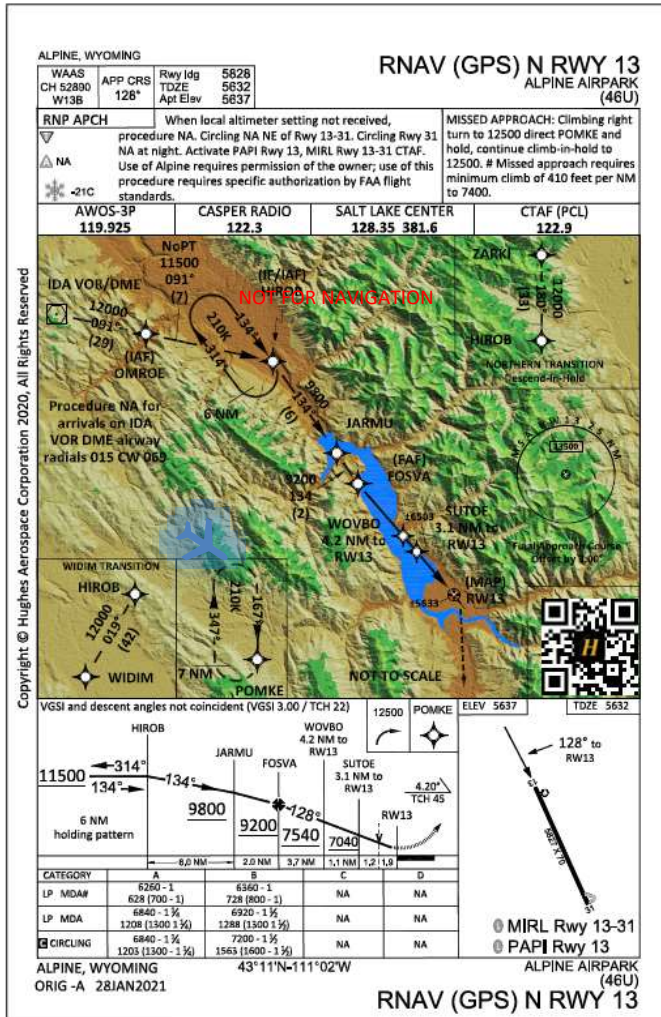
New Hughes Developed Approaches, Effective 2/25

Current FAA Developed Approach



HUGHES is FAA certified for Flight, Sim & Obstacle Validations & PAPI Inspections (pending)

### LP+V



### SMALL AIRPORTS

### Challenging Terrain





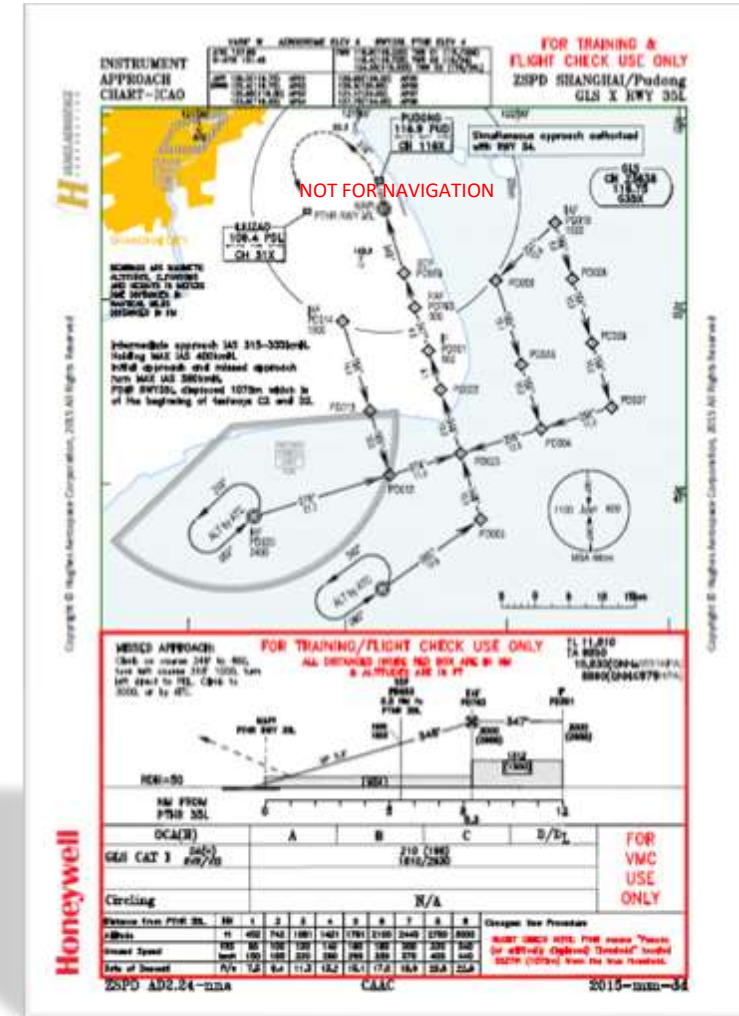
# Global IFR Innovator Integrated Navigation Solutions



HUGHES was one of the original architects of China's PBN Airspace Roadmap to ICAO.

Shanghai Pudong  
1<sup>st</sup> GLS Approaches in China  
1<sup>st</sup> xLS Approaches  
1<sup>st</sup> Variable Geometric Path

**CHINA CAAC  
RNP2GLS  
Variable Geometric Path  
Air China A321  
First GLS Approaches in China**

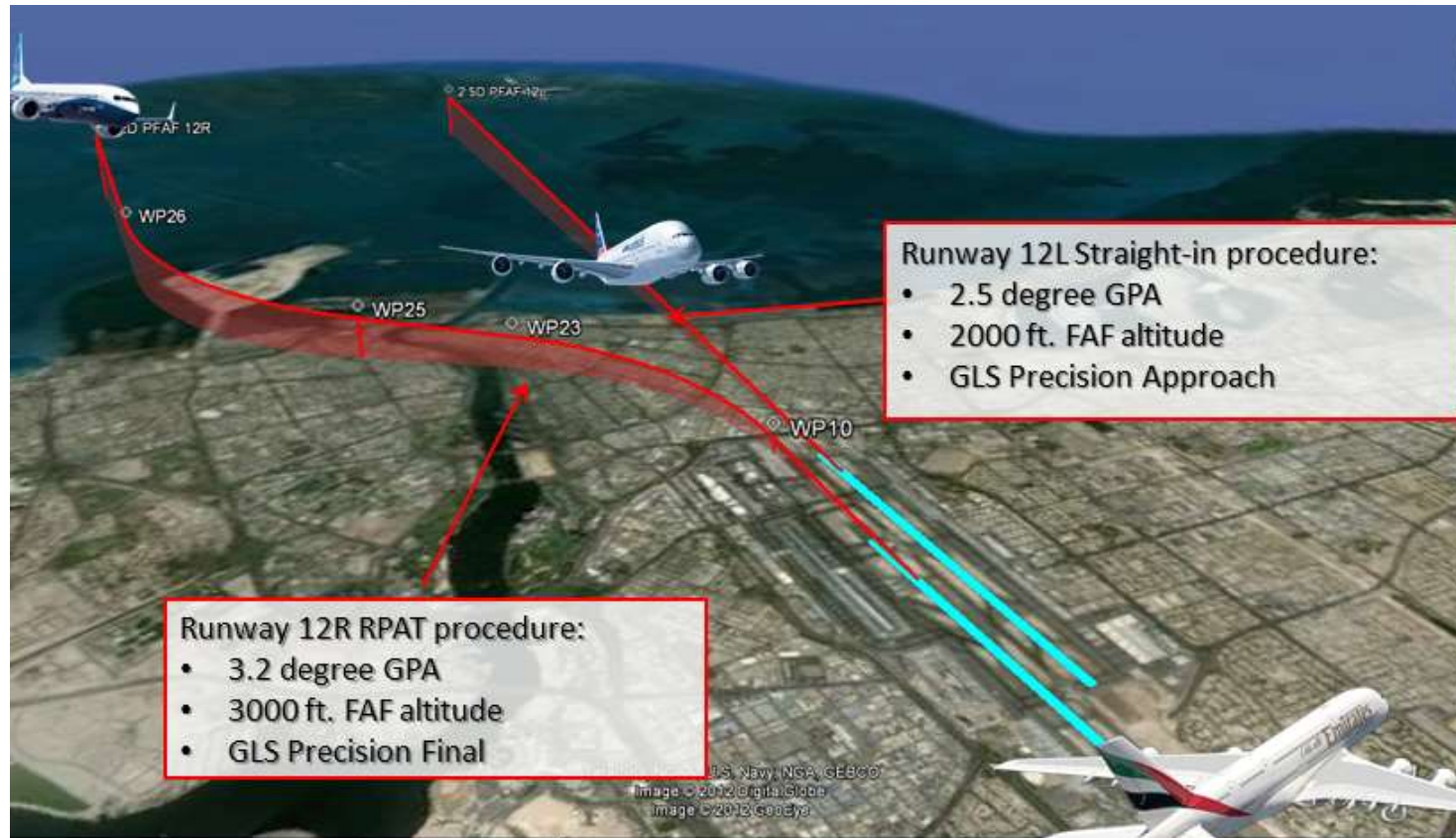


**HUGHES is endorsed by ICAO as a 3<sup>rd</sup> Party Air Navigation Services Provider**

### Dubai International Dual-Stream Capacity Program

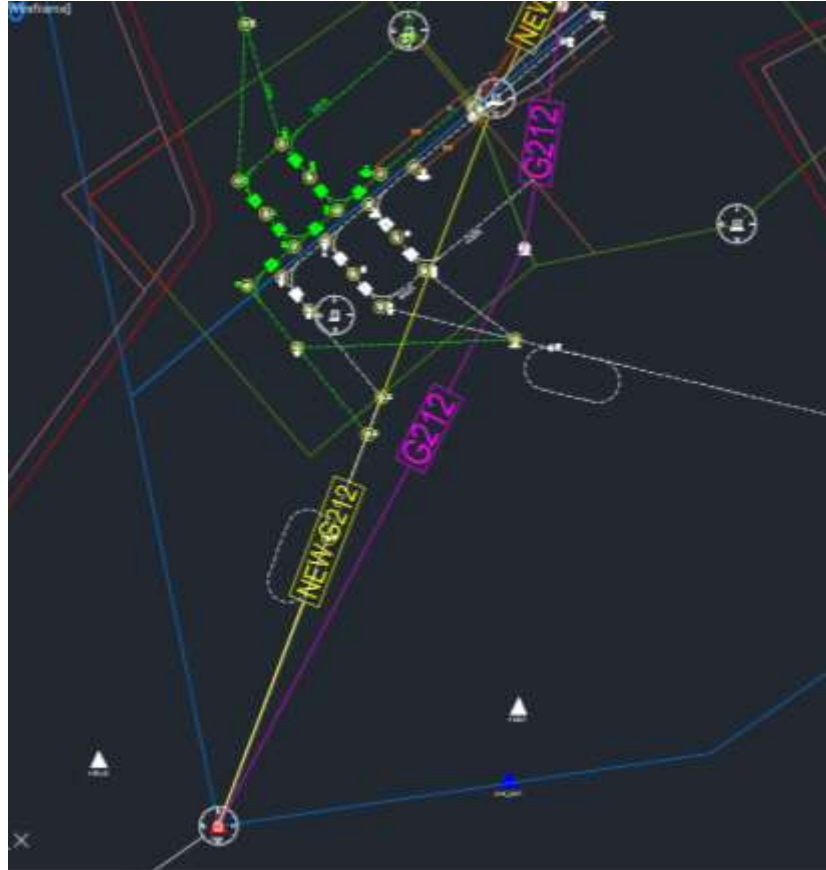
#### Emirates

#### Dubai Air Navigation Services



HUGHES is a certified 3<sup>rd</sup> Party ANSP in United Arab Emirates

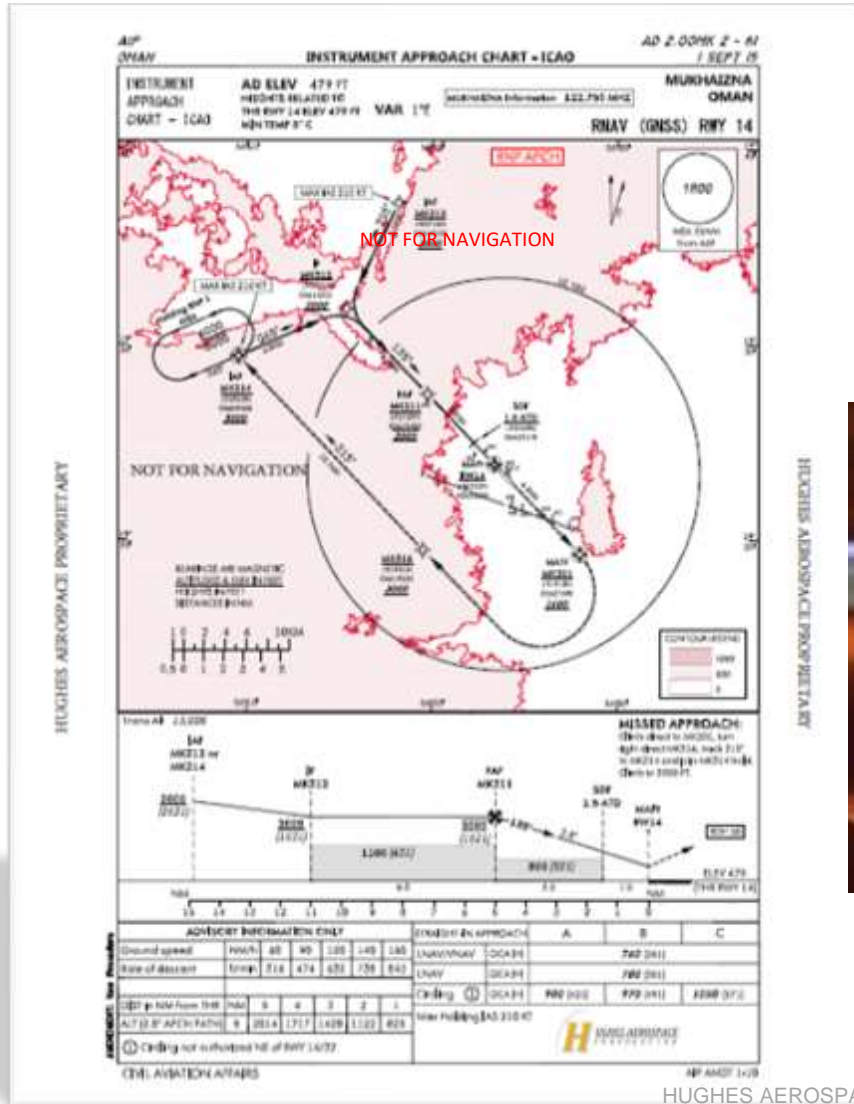
### Xi'an International Airport Capacity Study



#### Supporting:

**CAAC**  
**USTDA**  
**Air China**  
**American**  
**FedEx**  
**United**  
**Honeywell**  
**Jeppesen**

### 1st RNP, GNSS and RNAV Visual Approaches in Oman

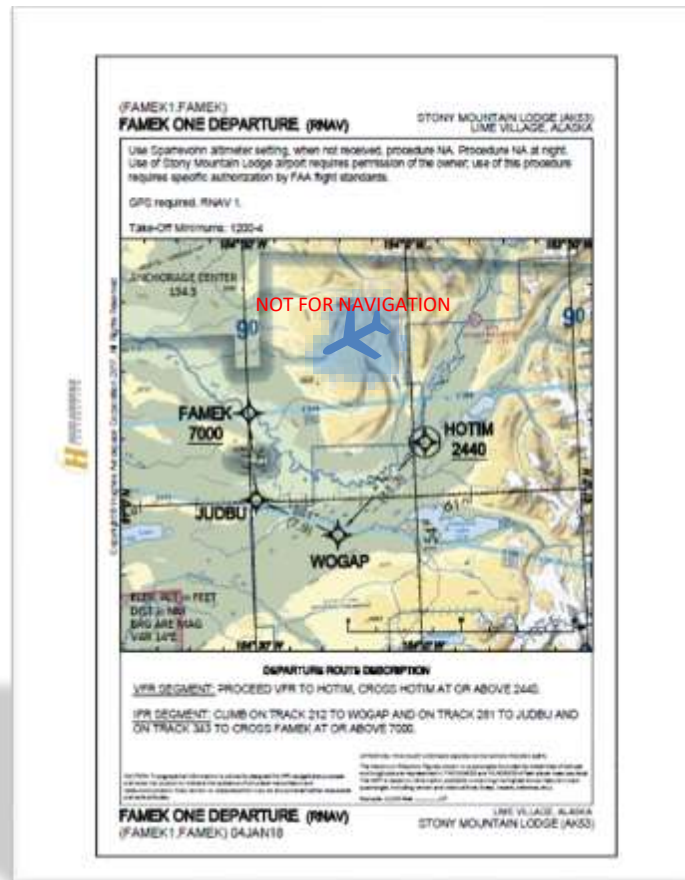


HUGHES is a certified 3<sup>rd</sup> Party ANSP in Sultanate of Oman

### HUGHES developed & implemented 1<sup>st</sup> Performance Based Navigation Instrument Procedures in Myanmar



### 1<sup>st</sup> PinS Airplane Instrument Approach & Departure Procedures Lime Village, Alaska



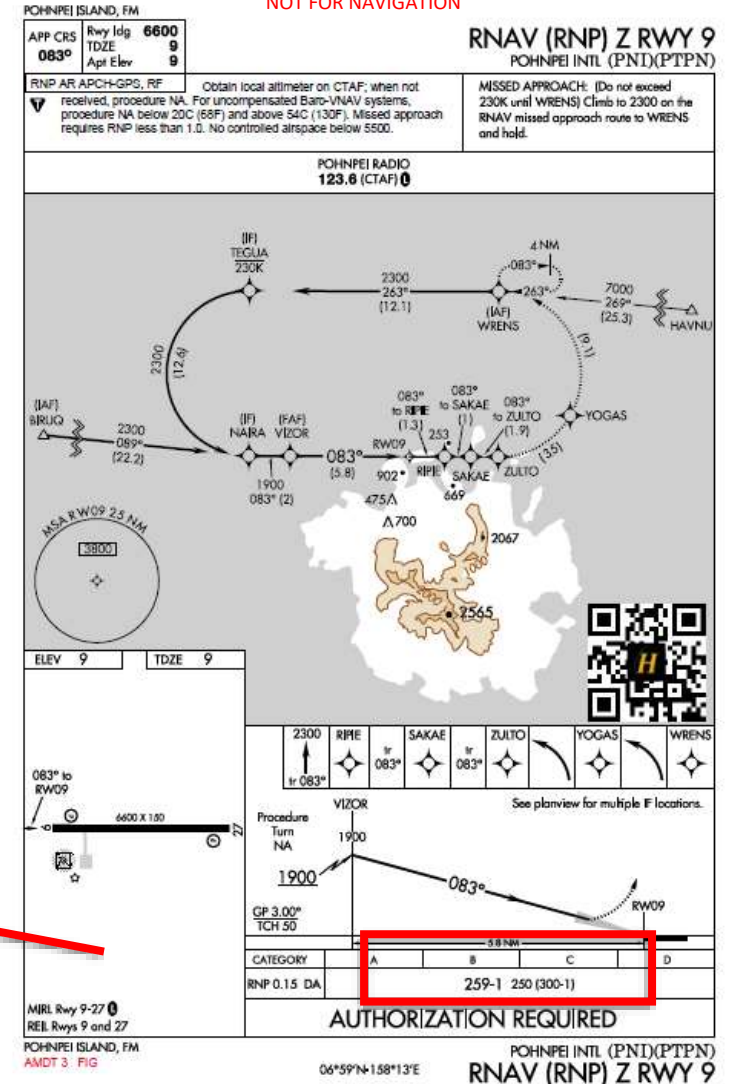
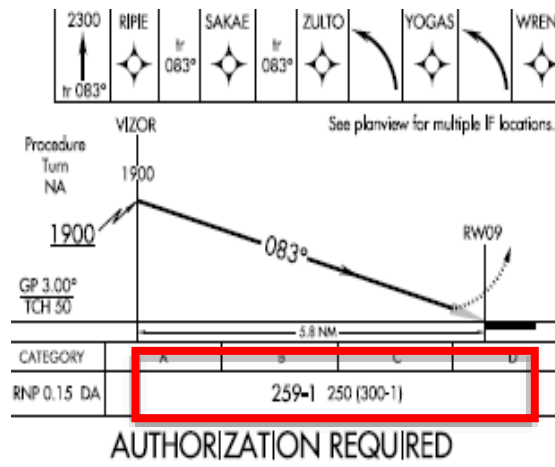


# Integrated Navigation Solutions

## PTPN – FSM Pohnpei International



**RNP = SAFETY**  
**Lower Minimums**  
**Runway Alignment**  
**Reduced Track Miles**  
**Fuel Savings**  
**Missed Approach**  
**Alternate**



# Integrated Navigation Solutions

## PTKK – FSM Chuuk International

### VIDEO

### Air Niugini Flight 73 Crash

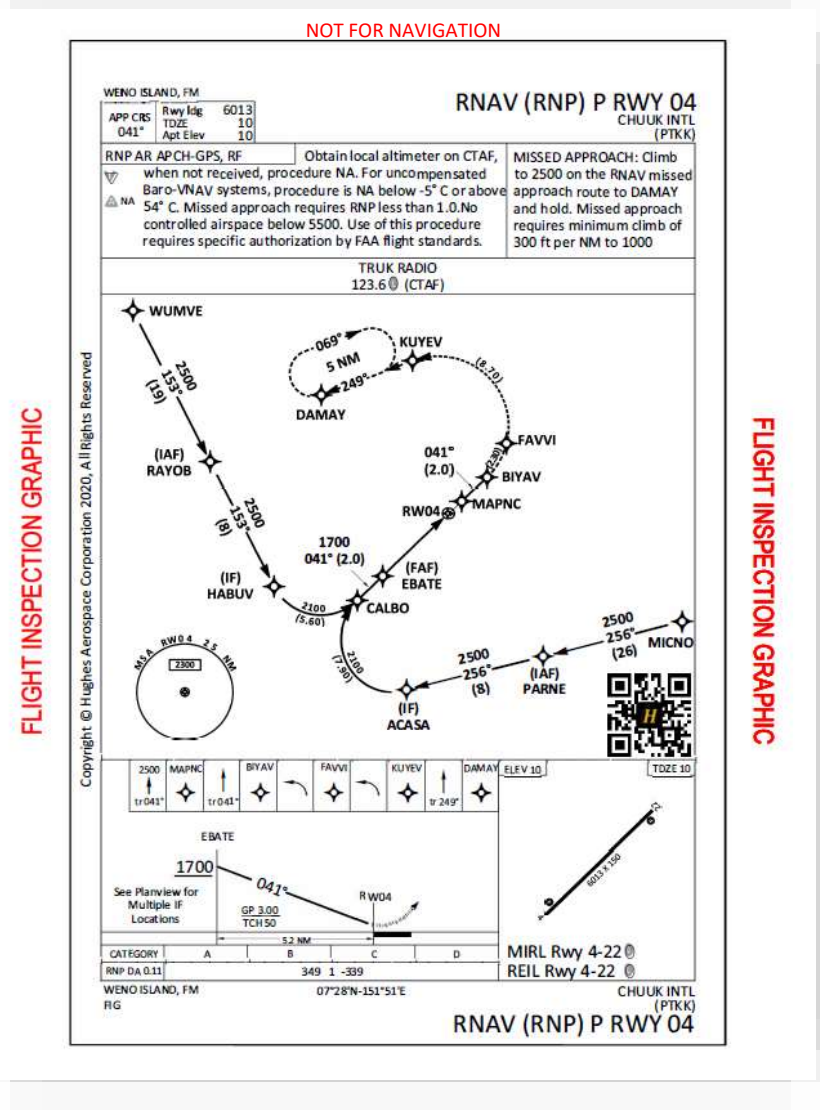


# Integrated Navigation Solutions

## PTKK – FSM Chuuk International

### RNAV (RNP) RWY 04

## RNP – Runway Alignment & Vertical Path Stabilized Approach

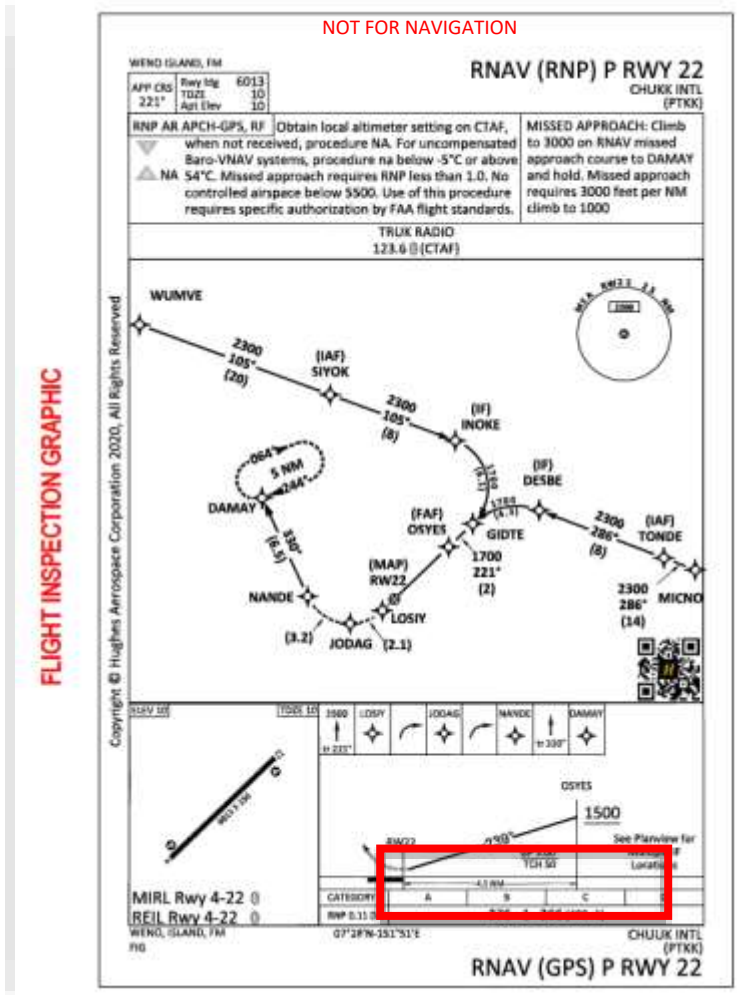
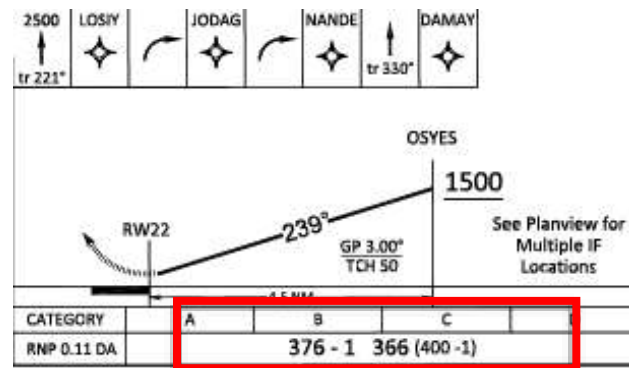


# Integrated Navigation Solutions

## PTKK – FSM Chuuk International

### VIDEO DEMONSTRATION

**RNP = SAFETY**  
**Lower Minimums**  
**Runway Alignment**  
**Fuel Savings**  
**Reduced Track Miles**  
**Missed Approach**  
**Alternate**



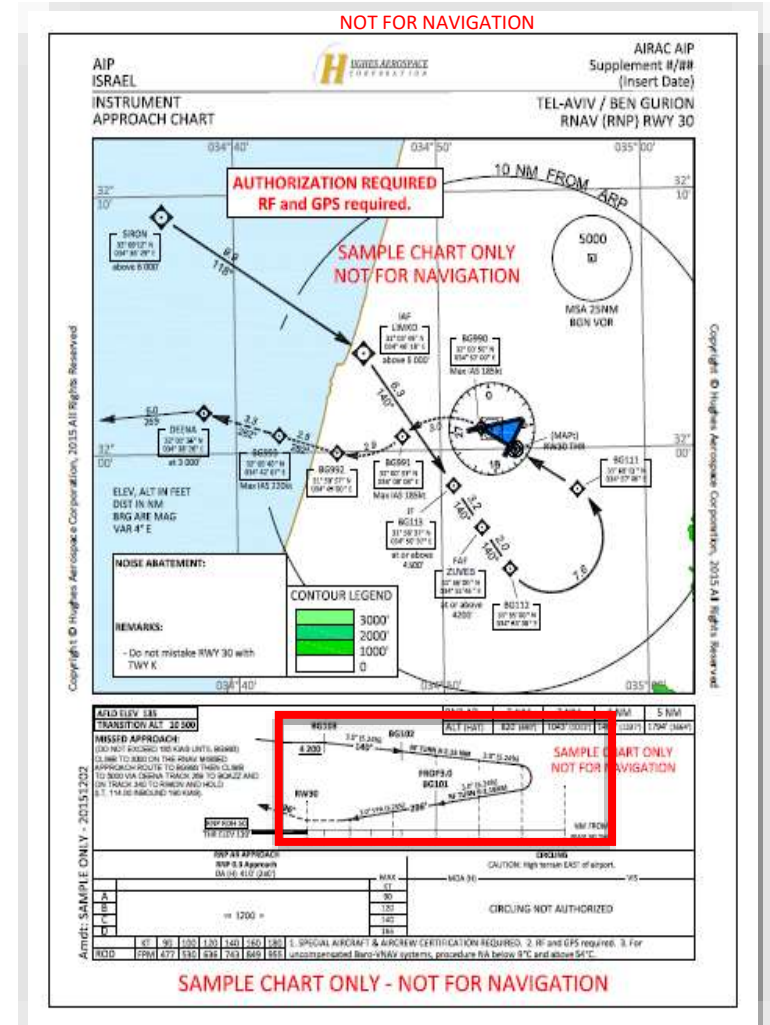
# Integrated Navigation Solutions

## LLBG – Ben Gurion International

### RWY 30 - First RNP Approach in Israel



**RNP = SAFETY**  
**Lower Minimums**  
**Eliminate Un-stabilized Approaches**  
**Fuel Savings**  
**Reduced Track Miles**  
**Avoids MANPADs & Iron Dome**





# Integrated Navigation Solutions

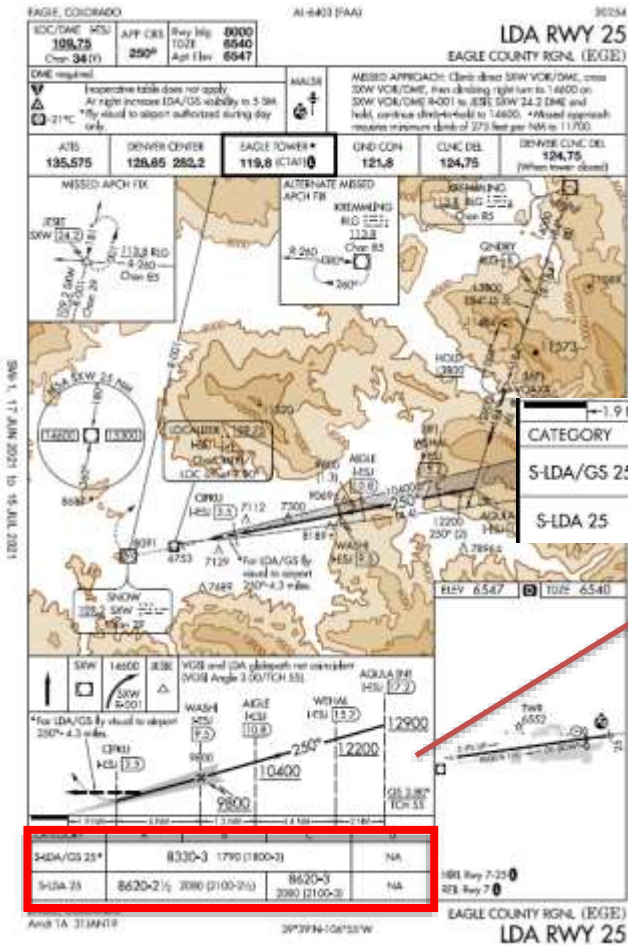
## KEGE – Eagle Colorado

### RWY 25 - Lowest Minimums

NOT FOR NAVIGATION

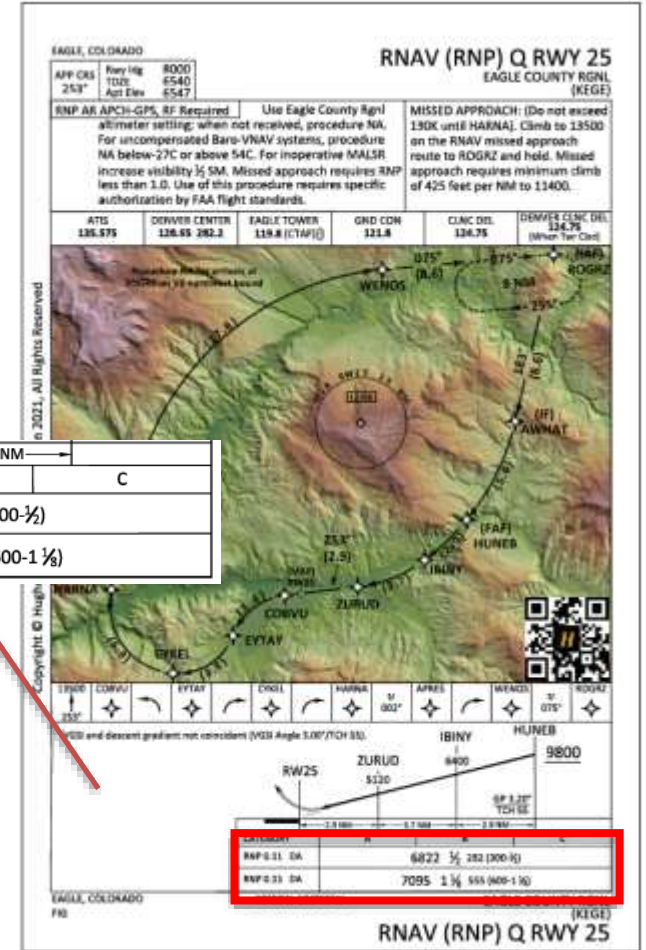
Higher level of safety  
 Significantly Improved Minimums  
 Fewer Diversions  
 Reduced Holding/Missed Approach  
 Fuel Savings  
 Eliminate Special Airport Training Costs  
 Reduced Environmental Impacts

NOT FOR NAVIGATION



	1.9 NM	6 NM	1.3 NM	4.4 NM	2 NM
CATEGORY	A	B	C	D	
S-LDA/GS 25*		8330-3	1790 (1800-3)	NA	
S-LDA 25	8620-2½	2080 (2100-2½)	8620-3 2080 (2100-3)	NA	

	2.9 NM	3.7 NM	2.9 NM
CATEGORY	A	B	C
RNP 0.11 DA		6822 ½	282 (300-½)
RNP 0.13 DA		7095 1 ⅞	555 (600-1 ⅞)

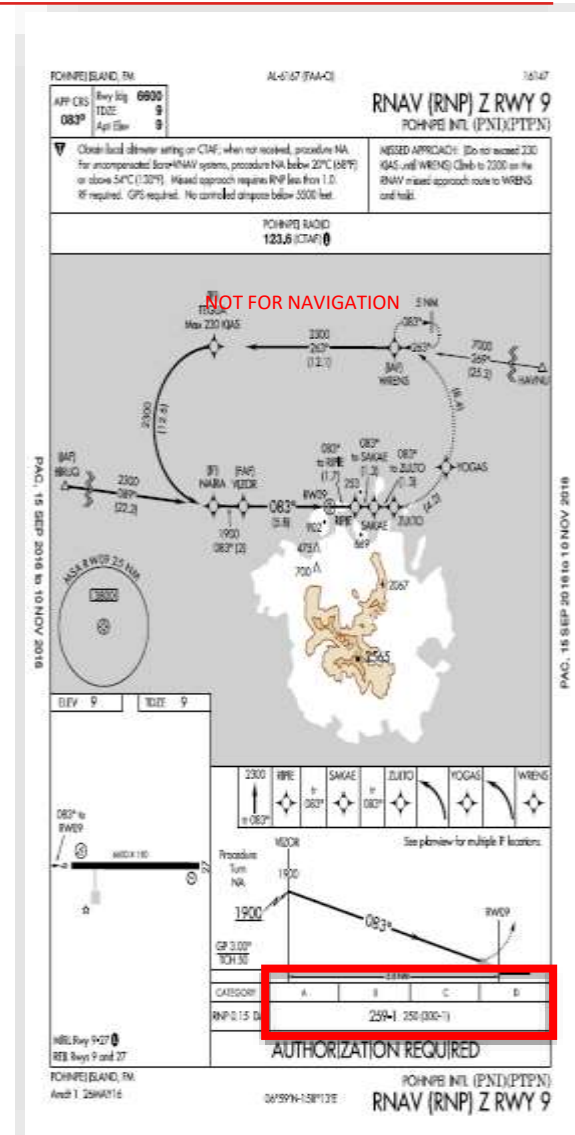
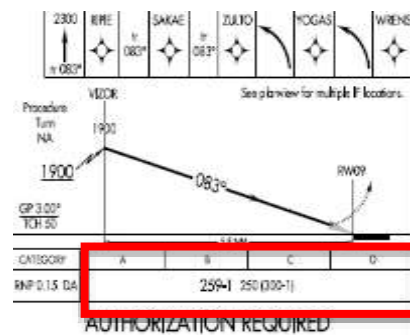


# Global IFR Innovator

## Integrated Navigation Solutions



**RNP = SAFETY**  
**Lower Minimums**  
**Runway Alignment**  
**Fuel Savings**  
**Reduced Track Miles**  
**Missed Approach Alternate**



## Tacloban (RPVA) Airport Leyte Philippines



Philippine CAAP  
PBN Implementation



HUGHES is a certified 3<sup>rd</sup> Party ANSP in Republic of Philippines



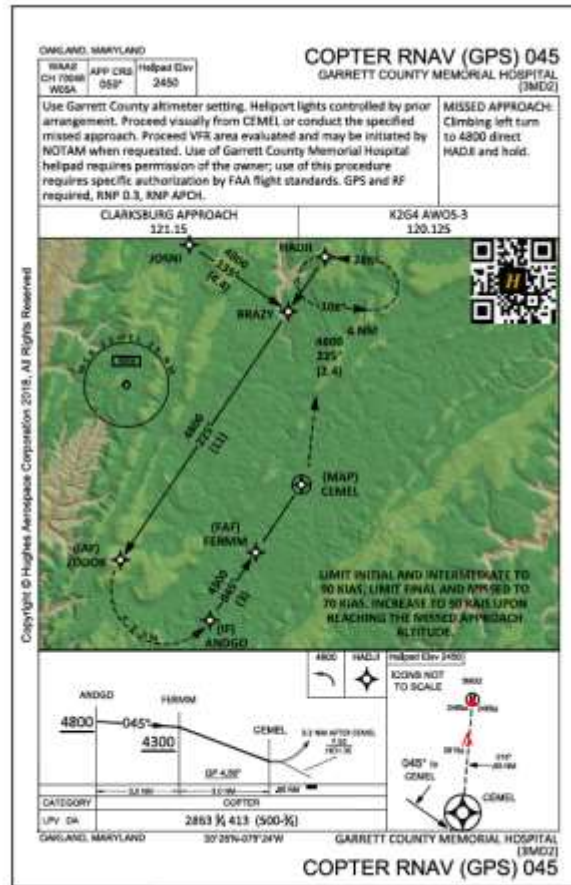
HUGHES developed 1<sup>st</sup> RNP SID/STAR in Philippines

# COPTER LPV with RF Segments

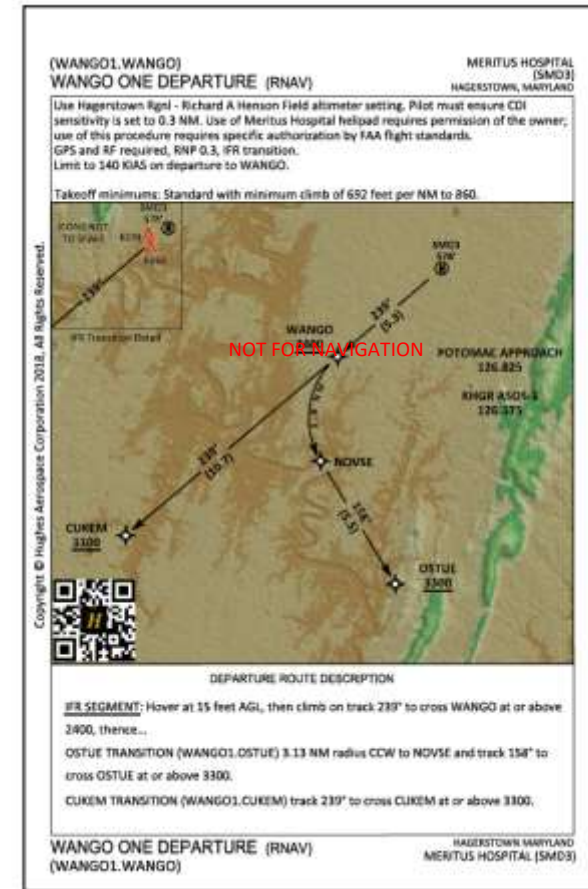
## COPTER PBN



NOT FOR NAVIGATION



NOT FOR NAVIGATION



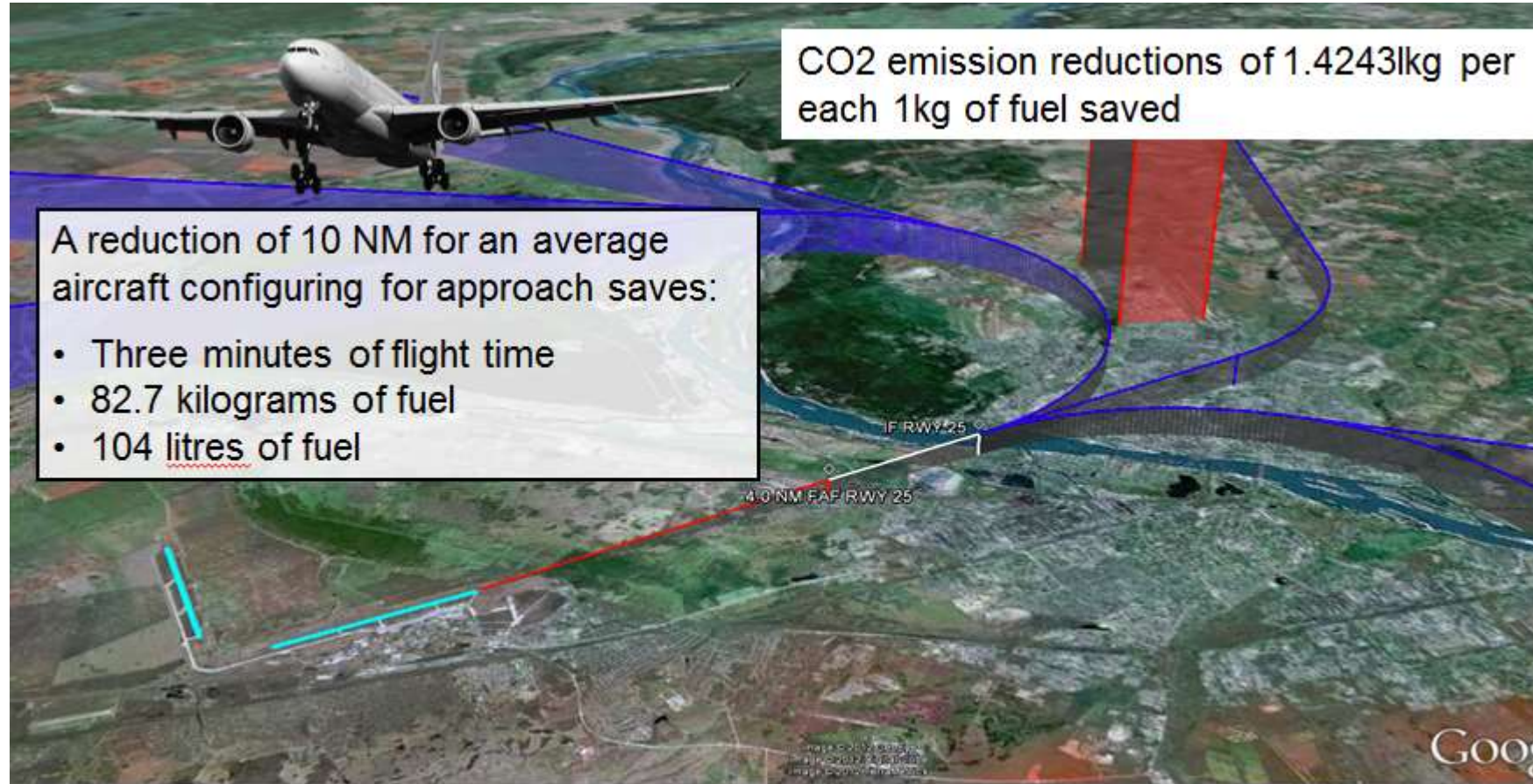
# COPTER RNP 0.3 ROUTES with RF Segments

## COPTER PBN



COPTER RNP 0.3 ROUTE

There is a significant benefit to the vertical flight community who utilize COPTER RNP 0.3 Low Altitude Airways and are unable to safely operate in icing conditions that are often encountered at higher altitudes, particularly in areas of mountainous and precipitous terrain. The optional application of RF segments to COPTER RNP 0.3 airways will allow the vertical flight community to laterally manoeuvre around terrain & obstacles at a safer, lower altitude.



RNAV (RNP) can curve the final approach to begin on the downwind leg and provide lateral and vertical guidance to the runway end or to a GLS intercept.

- A PBN approach with a 4 NM final would **save 10.6 NM per flight.**



THANK YOU

