

Integrated Remote Sensing for the Arctic (IRSA)



Paul Curlett

Boeing International
Strategic Partnerships

April, 2021

IRSA Development Group (IDG)

International Partners

- C-Core (Canada) – Paul Adlakh
- Andoya Space (Norway) – Tony Klæboe
- MDSI (Denmark) – Karsten Madsen

Meeting Objectives

- Informational /Alignment
- Decision

- IRSA Development Group
- IRSA Overview
- ArcticX21 Demonstration Campaign
 - Environment
 - Location/Schedule
 - Scenarios



	2020				2021								
	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	
Campaign Planning Meetings		IPC						MPC		FPC		EXE	
Mission Network Architecture		Mission Network Architecture Development											
System-of-Systems Integration Initiatives								■					
Development of Mission Center SOP								■					
Experiment #02A Integration RoC Drill									★				
Experiment #02B IDG Operations RoC Drill									★				
Deployment and System Integration												■	

IDG ArcticX 2021 Campaign

18-25 August 2021

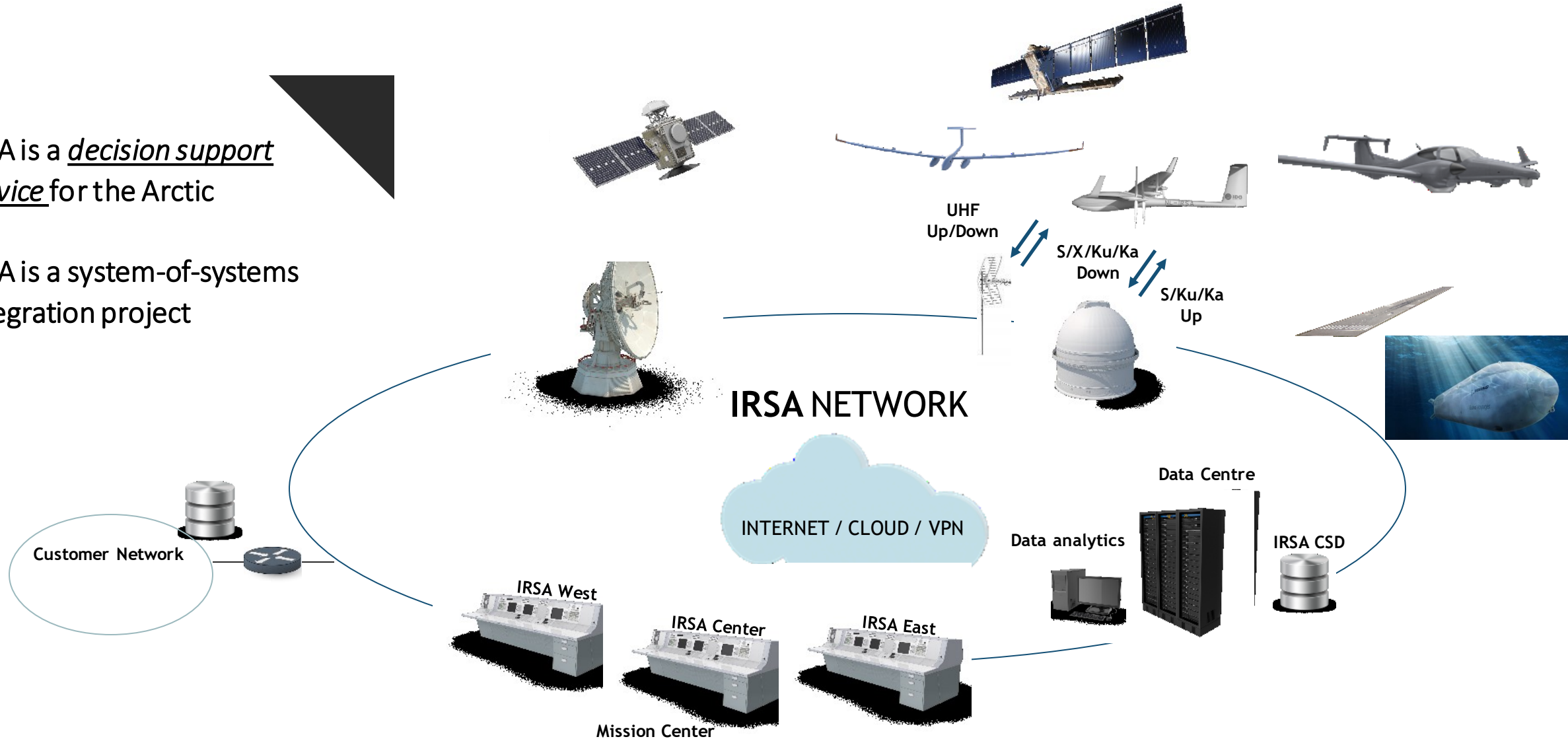


IRSA Network Architecture

Integrated Remote Sensing for the Arctic



- IRSA is a decision support service for the Arctic
- IRSA is a system-of-systems integration project



2019

IRSA Use Cases

- Search and Rescue
- Broad Band Communication
- All Domain Situational Awareness

CONOPS

- ISR Collection Plan
- Mission Center Planning Cycle
- Mission Center Organisation
- Mission Center Tasks and Responsibilities

2020

Architecture study
Overall analysis of the IRSA network

Modeling and Simulation

- Validation of the architecture
- Number of assets required
- Sensor coverage
- Geographic location of airborne assets
- Radio-borne architecture/ Bandwidth modelling
- GPS coverage

2021

Concept Demonstration

- IRSA Cloud & Network
- Mission Centers
- Satellite Integration
- UAS Integration
- SATCOM Communication
- Common Operating Picture

Virtual Range

Live Range (Andoya Space Defence (Norway))

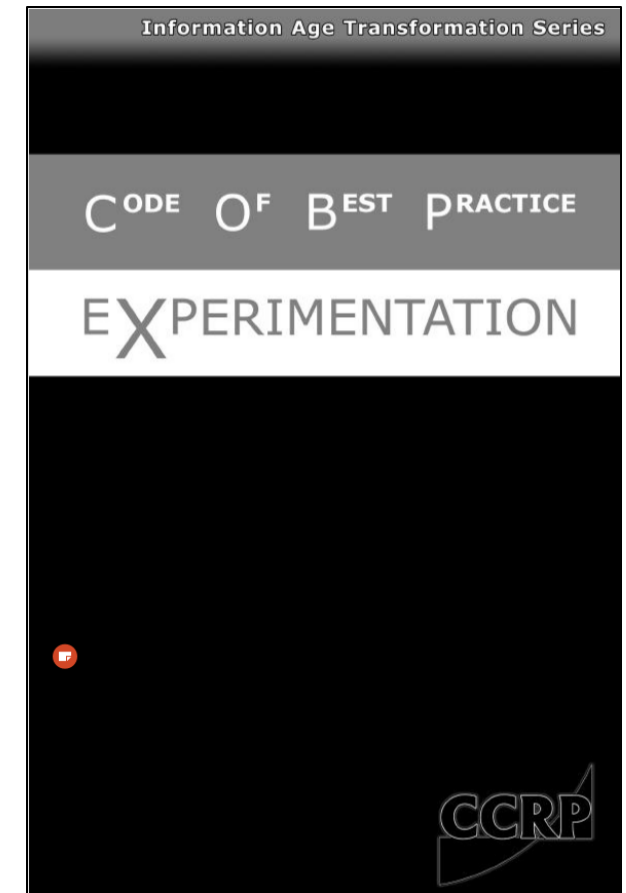
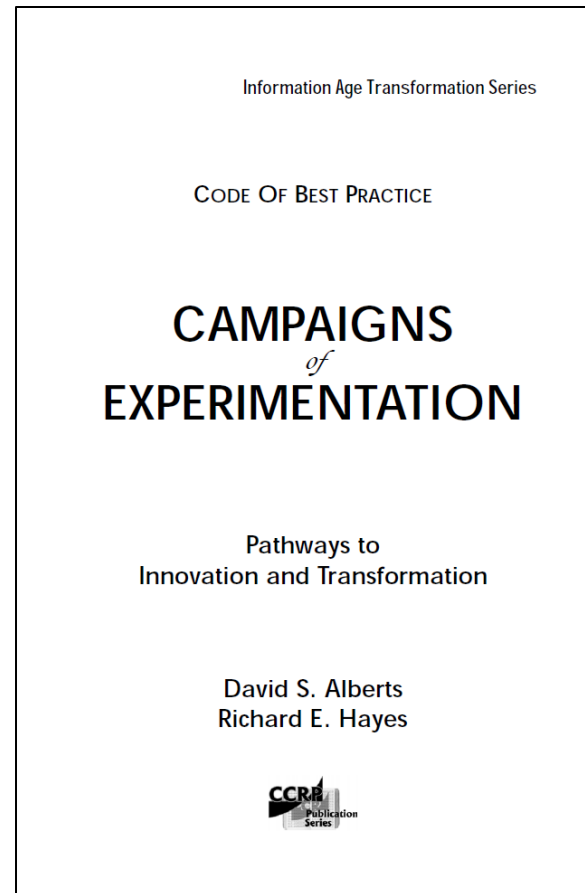
Asset integration
Test of integration

Exercises

- Network
- Tasking
- Collection
- Processing
- Exploitation
- Dissemination
- Information Assurance (Future)
- Resilience (Future)

Campaign Topics

- IRSA Network
- Tasking
- Collection & Communication
- Processing
- Exploitation
- Dissemination
- Information Assurance (Future)
- Resilience (Future)



Location: Andøya Space: Andøya, Norway

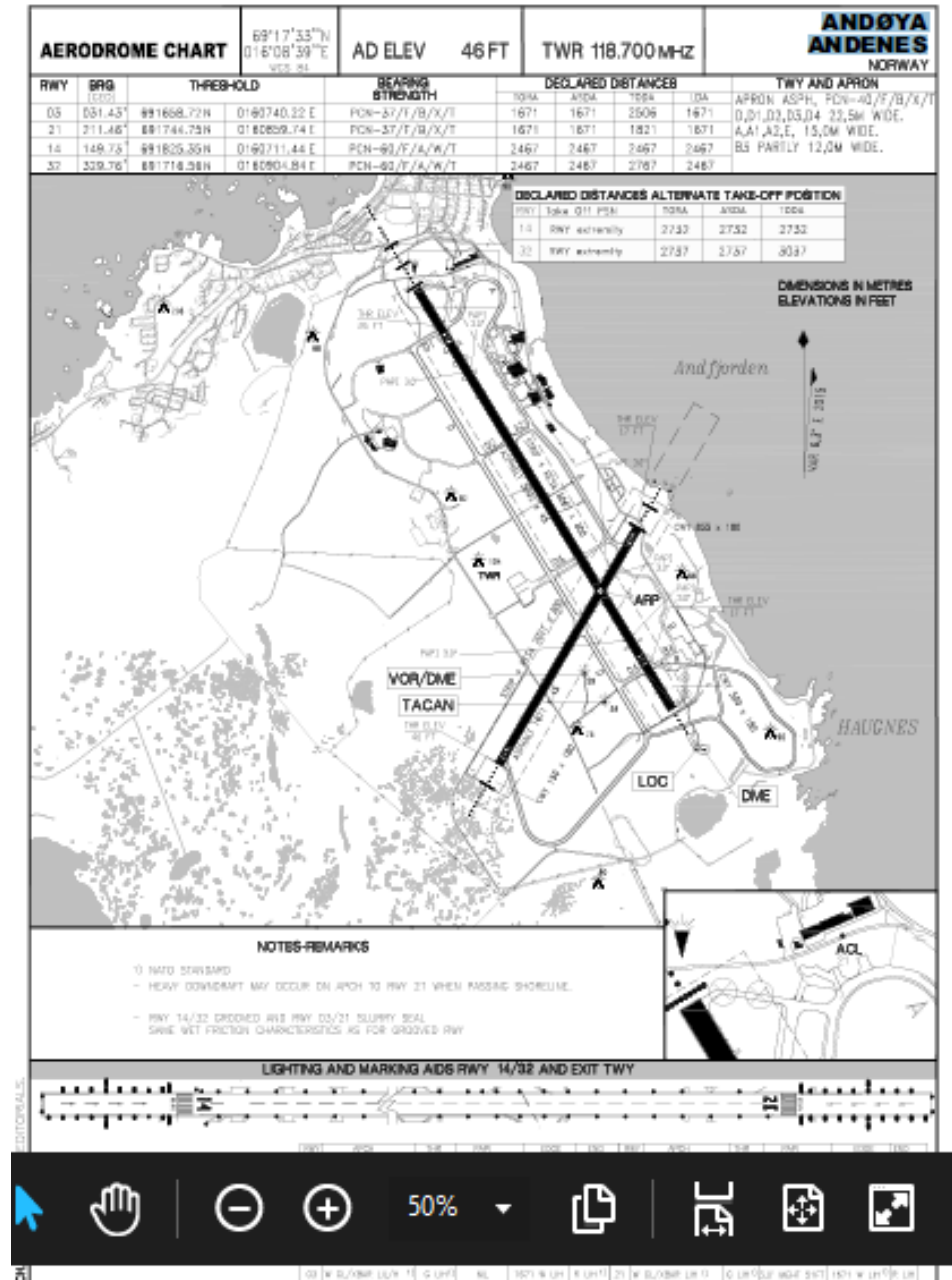
Dates: 18-25 August 2021

Boeing Participants:

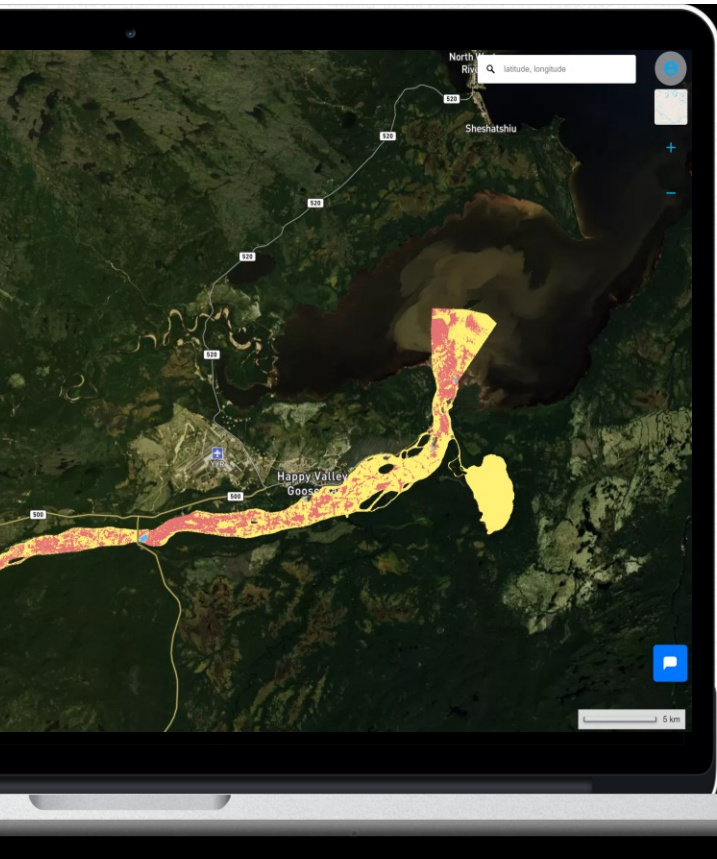
- Phantom Works (COMC2-GE)
- BCSS (SATCOM)
- Insitu (Scan Eagle/Integrator & Integrator ER)
- Maritime Undersea (Wave Glider)
- Aurora Flight Sciences (Centaur)

Note: ArcticX21 will take place at Andøya in Northern Norway. Andøya Test Range is a versatile and cost-effective test range for test and validation of aerospace- and ship-based applications. The range is 24,000 km², secure, and instrumented for independent validation of activities.

([link to ATC website](#)).



	IRSA Network IRSA Command and Control		Situational Awareness		COMC2 GE Control		UAS Experimentation		Wave Glider	Communication
Experiment	EXP#02A MC RoC Drill MDSI	EXP#02B MC Norway Andøya	EXP#03 Surface SA C-CORE	EXP#08 Data Fusion C-CORE	EXP#09 USV CTRL Andøya	EXP#09 UAS CTRL Andøya	EXP#05 HALE MDSI	EXP#06 MALE MDSI	EXP#12 Wave Glider Andøya	EXP#11 GEO SATCOM Boeing/Andøya
	Mission Center Development Command & Control		Data fusion and processing to develop a Common Operating Picture		VSM Development for COMC2 STANAG 4586		Requirement Development		IRSA Integration	IRSA Integration
	Tabletop Exercise June 21	LIVE	LIVE	LIVE	LIVE	LIVE	Modelling & Simulation Virtual Range May 21		LIVE	LIVE
MON 16 AUG	Arrival									
TUE 17 AUG	Emplacement, Startup									
WED 18 AUG	Familiarization Rides, Integration									
THU 19 AUG	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">↑</div> <div style="margin-right: 10px;">↓</div> </div>									
FRI 20 AUG										
SAT 21 AUG	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">↑</div> <div style="margin-right: 10px;">↓</div> </div>									
SUN 22 AUG										
MON 23 AUG	COP Development, Dark Target Identification, Support to Search and Rescue Preparation for VIP and Visitors Days									
TUE 24 AUG	<div style="display: flex; align-items: center; justify-content: center;"> <div style="margin-right: 10px;">↑</div> <div style="margin-right: 10px;">↓</div> </div>									
WED 25 AUG										
THU 26 AUG	IDG Debriefing, Lessons Identified									
FRI 28 AUG	Redeployment									



IRSA Cloud & Network

- Coresight - AI enabled analytics platform
- COMC2-GE overall UxV Mission Management
- Platform support (Insitu, Liquid Robotics, Aurora Flight Sciences)

Mission Centers

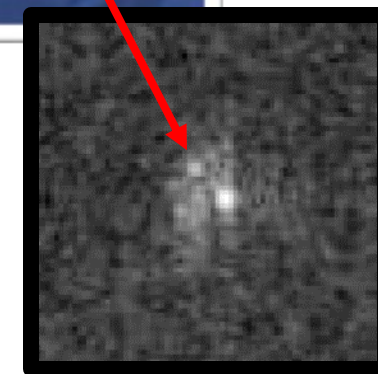
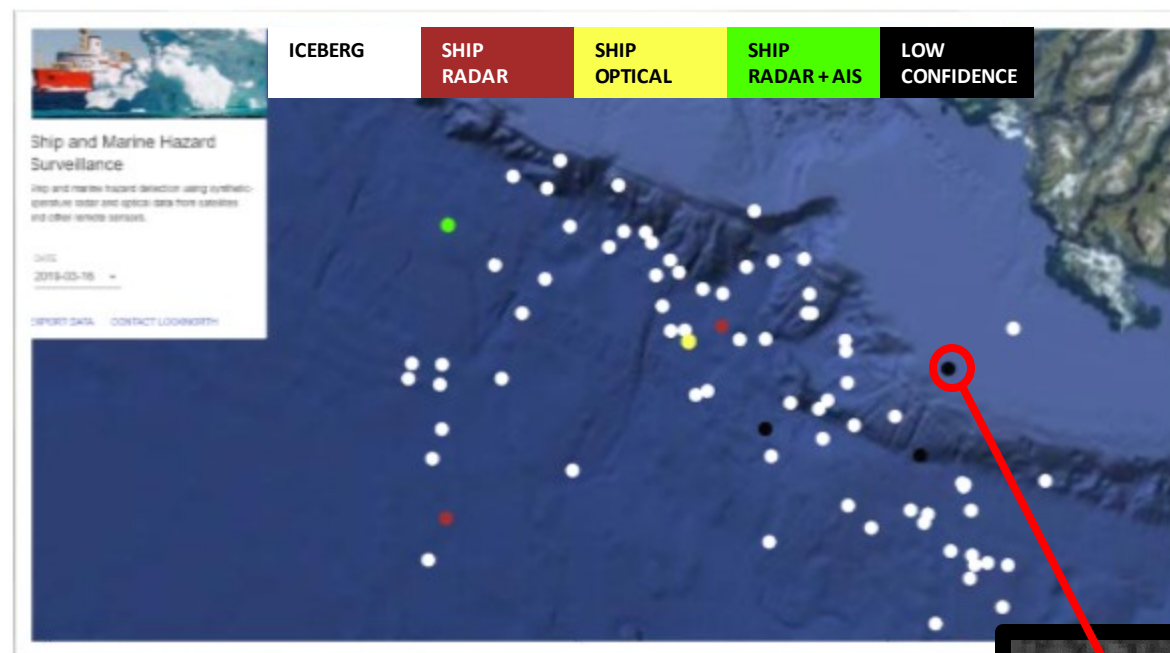
Analytics

IRSA Control Computers
Platform & Payload Control

IRSA Virtual Environment



- Modeling, Simulation, Analysis
 - Cost/performance
- Maritime surveillance
 - Satellite dark target detection
 - Tactical asset validation
 - Ship/iceberg discrimination
- Support Oil Spill detection/recovery
- Support to Search and Rescue
- Remote UAS Operations



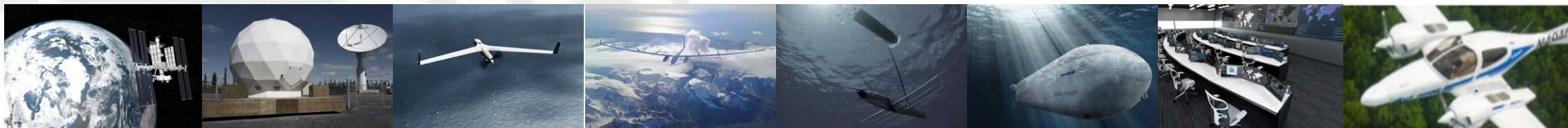
Data collection and movement

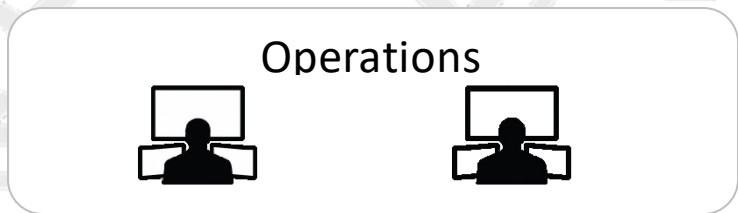
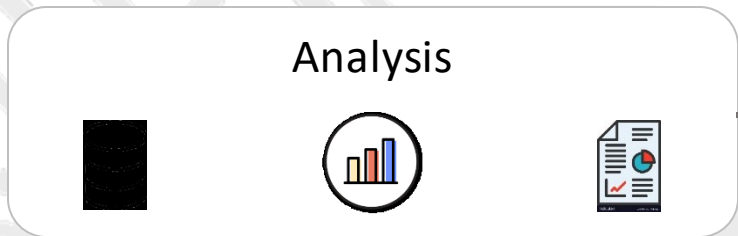
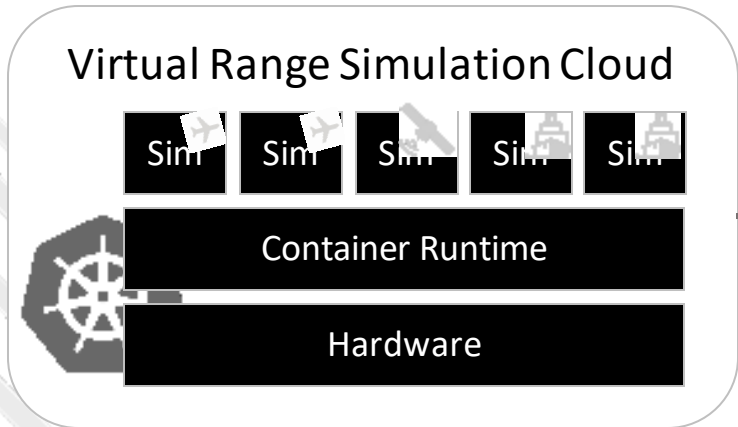
- ✓ Commercial Satellites (available now)
- ✓ Downlink Stations
- ✓ Sensors – EO/IR, Hyperspectral, RF (Commercial)
- ✓ Small UAS – Scan Eagle/Integrator
- ✓ MALE OPV - Centaur
- ✓ MALE UAS – Integrator ER
- ✓ Unmanned surface – Wave Glider
- ✓ Unmanned Under Surface - Echo Voyager
- ✓ Best available network technology
- ✓ COMC2-GE UxS control system
- ✓ Boeing Commercial Satellite Services - SATCOM
- ✓ Global logistics
- ✓ HALE to be developed (TRL 7)



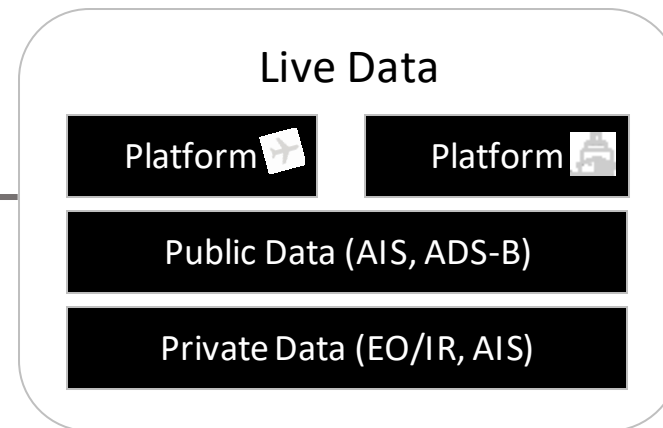
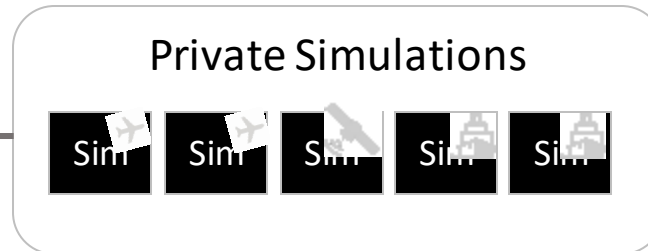
Data Fusion & Analysis

- ✓ Advanced Machine learning Algorithms
- ✓ Commercial Satellite Remote sensing Data (more satellites will come)
- ✓ UAS Sensor Data
- ✓ AIS data
- ✓ Expert System DAA (Detect and avoid)
- ✓ Data Fusion and Analysis Capability
 - Situational awareness





Boeing LabNet



Enabling Experimentation through Unified System Analysis

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DRAFT
Under development

IRSA

Integrated Remote Sensing in the Arctic

Concept of Operations CONOPS

The document that describes IRSA operations in the Arctic.

Title	IRSA - CONOPS	0000000	01-10-2019	Version	0.3
Author	IDG	0000000	05-08-2019	Status	Draft
Created	0000000	0000000	IRSA Development Group	Page	1 of 25

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IRSA

Integrated Remote Sensing in the Arctic

Use Case Broadband Communication

The document that describes how IRSA can provide Broadband Communication in the Arctic.

Title	IRSA - Search & Rescue Use Case	0000000	21-10-2019	Version	0.3
Author	IDG	0000000	06-03-2019	Status	Final good
Created	0000000	0000000	IRSA Development Group	Page	1 of 8

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DRAFT
UNDER DEVELOPMENT

IRSA

Integrated Remote Sensing in the Arctic

Use Case All Domain Situational Awareness

The document that describes how IRSA can contribute to All Domain Situational Awareness in the Arctic.

Title	IRSA - ADISA in the Arctic	0000000	21-10-2019	Version	0.2
Author	IDG	0000000	14-10-2019	Status	Final good
Created	0000000	0000000	IRSA Development Group	Page	1 of 18

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IRSA

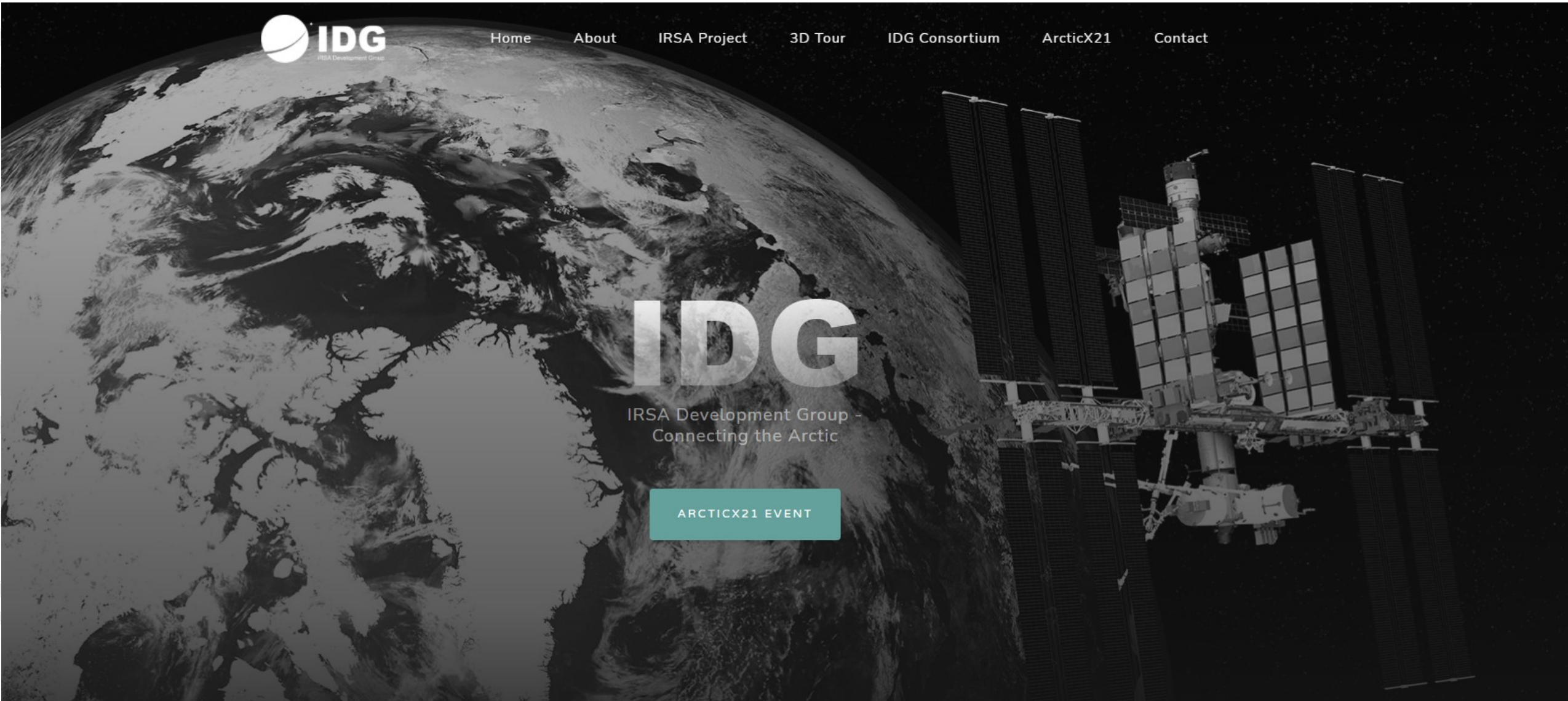
Integrated Remote Sensing in the Arctic

Use Case Search and Rescue

The document that describes how IRSA can provide support to Search and Rescue operations in the Arctic.

Title	IRSA - Search & Rescue Use Case	0000000	21-10-2019	Version	0.3
Author	IDG	0000000	06-03-2019	Status	Final good
Created	0000000	0000000	IRSA Development Group	Page	1 of 20

During Arctic X we will be developing a Mission Center SOP for IDG Operations



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IDG

IRSA Development Group -
Connecting the Arctic

ARCTICX21 EVENT

Back-ups

ARCTIC  **2021**

IDG Company Core Competencies

Boeing	C-Core	Andoya Space	MDSI	Insitu	Aurora Flight Sciences	Maritime Undersea / Liquid Robotics
In-Direct Offset Contributor	Satellite remote sensing analytics with specialization in SAR satellites, machine learning, operational implementation	First class instrumented large test range for weapon systems, UAV's or other systems testing requiring an established danger zone	Overall ArcticX planning coordinator	27 years of experience in the design, development, production and operation of high-performance, cost-effective and runway-independent unmanned aircraft systems for land and ship-based applications; more than 3500 aircraft manufactured to-date	30 years developing advanced aircraft w/ autonomous systems & integrated sensors	Mobile Marine Monitoring
Commercial Space Communications	Modeling-simulation, analysis of concept of operation performance; cost optimization with multiple satellite missions and airborne; seagoing platforms	Supports advanced and flexible test environments	Operational execution for ArcticX	Software development for UAS command and control, media management, and processing, exploitation and dissemination of ISR data	Autonomous, Long Endurance Aircraft	Real-Time sensors
Global C2Systems	Web based analytics/dissemination platform for informed decision making.	Operating small UAV's in different scenarios.	CONOPs, use cases, and SOP's for IRSA	Payload and sensor development for multi-INT missions, including the integration of third-party payloads.	Close-in, non-kinetic Counter-UAS capability	Seabed to Space Communications
	Satellite ground segment infrastructure for tasking/reception of remote sensing data. Satellite calibration transponder development	Host of ArcticX supporting a multiple advanced systems and C2 high requirements	IRSA mission network architecture and Asset integration	UAS supplier for more than 28 international customers including 1/3 of NATO	Orion Medium Altitude, Heavy Lift, Long Endurance (5 days) aircraft	Long Endurance ISR
	24/7 operations for applications such as maritime surveillance, flooding, oil spill monitoring	Establishing an environment for launching small satellites	Solid Air force and Joint operational background	Provider of 10,000 flight hours per month of ISR services at more than 45 global sites.	Odysseus Ultra Long (months) solar powered stratospheric aircraft	
	Defence R&D for emerging satellite mission requirements, radar performance modeling, TCPED optimization, prototype development	Very experienced organization for sounding rockets	Extensive military and political network in the Kingdom of Denmark	UAS training and education; more than 9500 students trained to-date.		

Template for Experiments

Reason for the Experiment?

Scenarios

How results are fed into the Development of IRSA

