IDC2

Execute Summary

- INCUBATOR
- SUPPORT
- SPECIALIZED FACILITY
- END-TO-END INVOLVEMENT
- RETOOLED FORMULATION

Overview

What is the IDC^2?

Why would I use this capability?

Join the focus
(Next Steps)

Customer and Testimonials

Meet our team

Overview

Who are we?
What is the IDC^2?

Who are we?

VISION

We are an incubator for concepts, technical maturation, missions, and structured ideation in a facilitated collaborative environment.

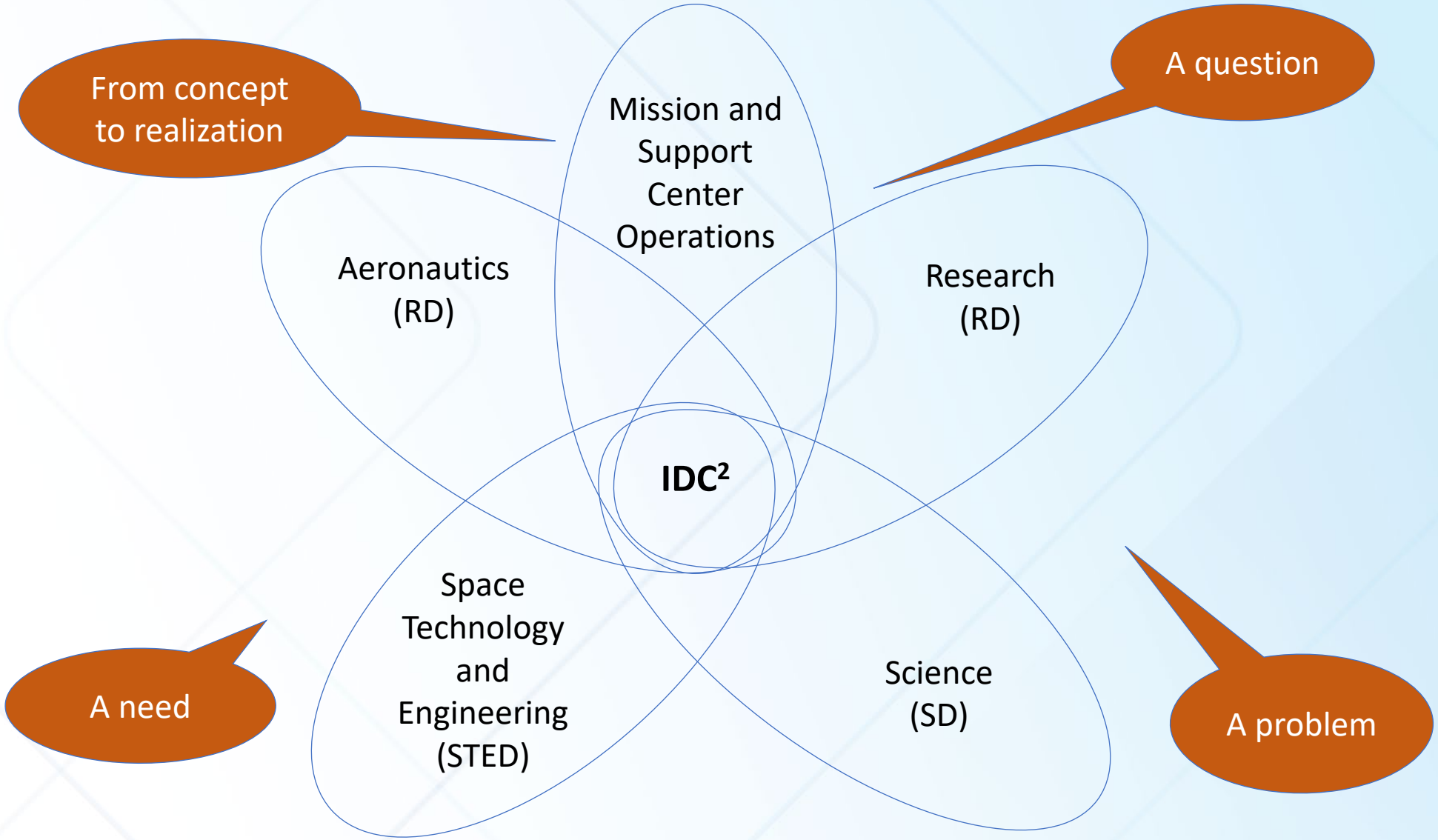
OBJECTIVE

To *facilitate rapid development* utilizing an *integrated approach with dedicated uninterrupted SME focus* using proven methodologies for a timelier and more effective outcome. Subject matter experts matrixed from across the Center participate to ensure a wide range of expertise is readily available to provide valuable input.

GOALS

1. Encourage research and technology, design, focused studies, and concurrent engineering uses
2. Encourage proposal development
3. Support professional development
4. Effectively utilize digital enhancement
5. Rapid prototype development

Scope of Operations



New and Improved

- Concurrent Design Centers depend on a specialized and unique set of tools for outstanding efficiency and productivity
- Evolving the study process to be consistent and repeatable, yet flexible enough to allow for changes.
- A consistent step-by-step process is essential to reach a conclusion and finish a design (including documentation of results) in an allotted amount of time.
- Define the interfaces between the different SME teams conducting distributed collaborative design sessions, similar to an interface agreement.

Reimbursable work
Continued support of Proposal development, Mission Architectures, and Design Studies.

- Center Capability no longer housed in the directorates
- Broadening the application of the IDC^2 studies
- Expanded use for Project lifecycle execution support, Risk mitigation, Integrated Tiger Teams, mishap reviews, Integrated business planning, Workforce Planning and review panels across all center Directorates

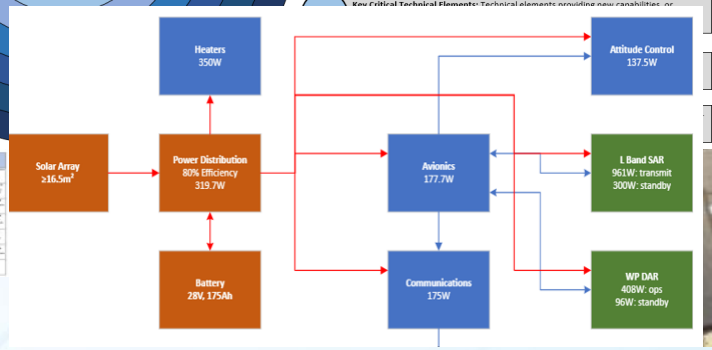
Overview

Why choose us?
Why would I use this capability?

From Ideation to Realization

From Ideation to Realization

Scale	Definition Advancement Degree of Difficulty (AD2)	Risk	Category	Success Chance
9	Requires new development outside of any existing experience base. No viable approaches exist that can be pursued with any degree of confidence. Basic research in key areas needed before feasibility approaches can be defined.	100%	Chaos	Almost Certain Failure (Very High Reward)
8	Requires new development where similarity to existing experience base can be defined only in the broadest sense. Multiple development routes must be pursued.	80%	Unknown Unknowns	High Likelihood of Failure (High Reward)
7	Requires new development, but similarity to existing experience base is sufficient to warrant comparison in only a subset of critical areas. Multiple development routes must be pursued.	70%	Unknown Unknowns	High Likelihood of Failure (High Reward)
6	Requires new development, but similarity to existing experience is sufficient to warrant comparison on only a subset of critical areas. Dual development approaches should be pursued in order to achieve a moderate degree of confidence for success. (Desired performance can be achieved in subsequent block upgrades with high confidence).	50%	Unknown Unknowns	High Likelihood of Failure (High Reward)
5	Requires new development, but similarity to existing experience is sufficient to warrant comparison in all critical areas. Dual development approaches should be pursued to provide a high degree of confidence for success.	40%	Known Unknowns	Probably Will Succeed
4	Requires new development, but similarity to existing experience is sufficient to warrant comparison across the board. A single development approach can be taken with a high degree of confidence for success.	30%	Well Understood	Almost Certain Success
3	Requires new development well within the experience base. A single development approach is adequate.	20%	Well Understood	Almost Certain Success
	Exists, but requires major modifications. A single			Almost



Why Use this Capability?

- Dedicated uninterrupted focus
  - Undistracted and undiluted
  - Full immersion in decision-making environment
- SME access
  - Standout subject-matter experts (technical and programmatic)
  - NASA LaRC experts matrixed from across the Center
  - Communication & collaboration on technical, programmatic, and organizational development.
- Facilities and Facilitation
  - Ideation
  - Optimized for pace and interactions during session
  - Technical Facilitation
- Efficient & Effective Methodologies
  - Clear, reliable, understood preparation and session methods for increased productivity and time savings
  - Concrete, relevant lessons learned from NASA LaRC prior concepts, proposals, and feedback.

Combine wording with slide 10

- Expert Facilitation and Coordination
  - Skilled guidance and moderation through each study and live session
- Practiced Formulation Skills
  - Identify alternative approaches to the problem
  - Experienced SMEs inspire innovative solutions
- Skillful Knowledge Management
  - Organized study content
  - Systematic leveraging of already vetted knowledge products
- Concepts
  - Expedited ideation and maturation
- Access to Subject Matter Experts across LaRC
  - Access to SMEs is free through FY23

IDC^2 Capabilities and Services

IDC^2 Services include:

- Technical Subject Matter Experts
- Coordination and planning assistance
- Facilitation/Moderation
- Tools and processes
  - Model Based Systems Engineering (MBSE)
  - Technology Readiness Assessment Insight Tool (TRAIT)
  - Cost/Schedule/Risk Assessment tools
  - Communication Tools
  - 3-D Printing Capability
  - Augmented Reality/Virtual Reality (AR/VR)
- Development and delivery of customer defined end products
- Large Meeting Room with Multimedia Center

What are the IDC^2 tools?

Concurrent Collaboration	Engineering	Study Management	Lab Management	Programmatic
Data Exchange Platforms	IDC^2 MBSE Template	Customer interface and data transfer tools	IT and Web Tools	Parametric and grassroots costing tools
In-lab audiovisual tools	Subsystem and discipline design tools	Support personnel assessment tools	Procedures	Scheduling tools
Remote presence tools	Parametric sizing and estimation tools	Shared use repositories	Administrative	Risk assessment tools
Kanban boards	Modeling and simulation tools (CAD)	Teams	Procurement	
Co-located teams	Engineering Databases		Financial support tools	
	Technology Readiness Assessment Insight Tool (TRAIT)			

IDC^2 Use Cases for Concept Elements

Technical

- Cost Estimates
- Design Sessions
- Design Studies
- Focus Studies
- Mission Architecture
- Proposal Development
- Target Studies
- Trade Studies
- Advanced concepts
- TRL/MRL Maturation
- Concept of Operations
- Technology Road mapping

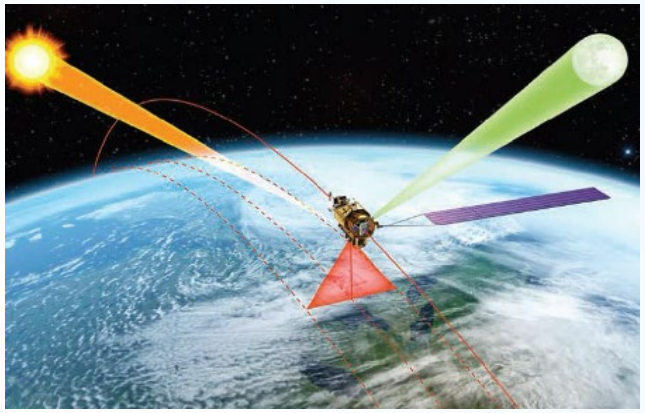
Programmatic

- Airborne Campaign Planning
- Brainstorming
- Budget Formulation
- Design Reviews
- Failure Investigations
- Risk Assessments
- Idea Sharing
- Lessons Learned
- Logistics Coordination
- Project Support
- PUD Integration
- Reimbursable Work
- Tiger teams

Organizational

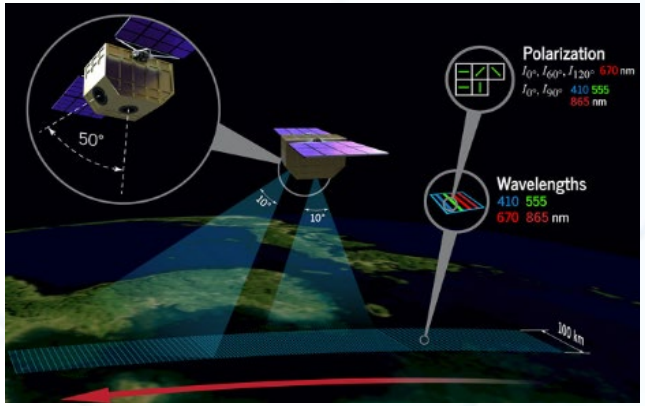
- Retreats
- Partnerships
- Roadmap Development
- Schedule Integration
- Strategic Planning
- Team building
- Tool Development
- Tours & Demos
- WBS Planning
- Workforce Planning

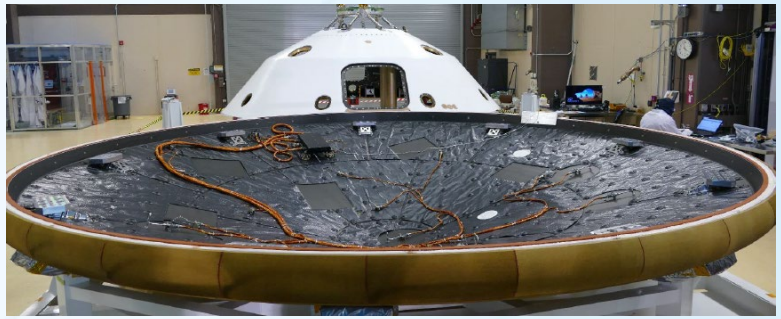
Concurrent Engineering helped to further design development here at LaRC



Space Missions
Flight Systems

Architectures
Instrumentation





Overview

Join the focus
Next Steps

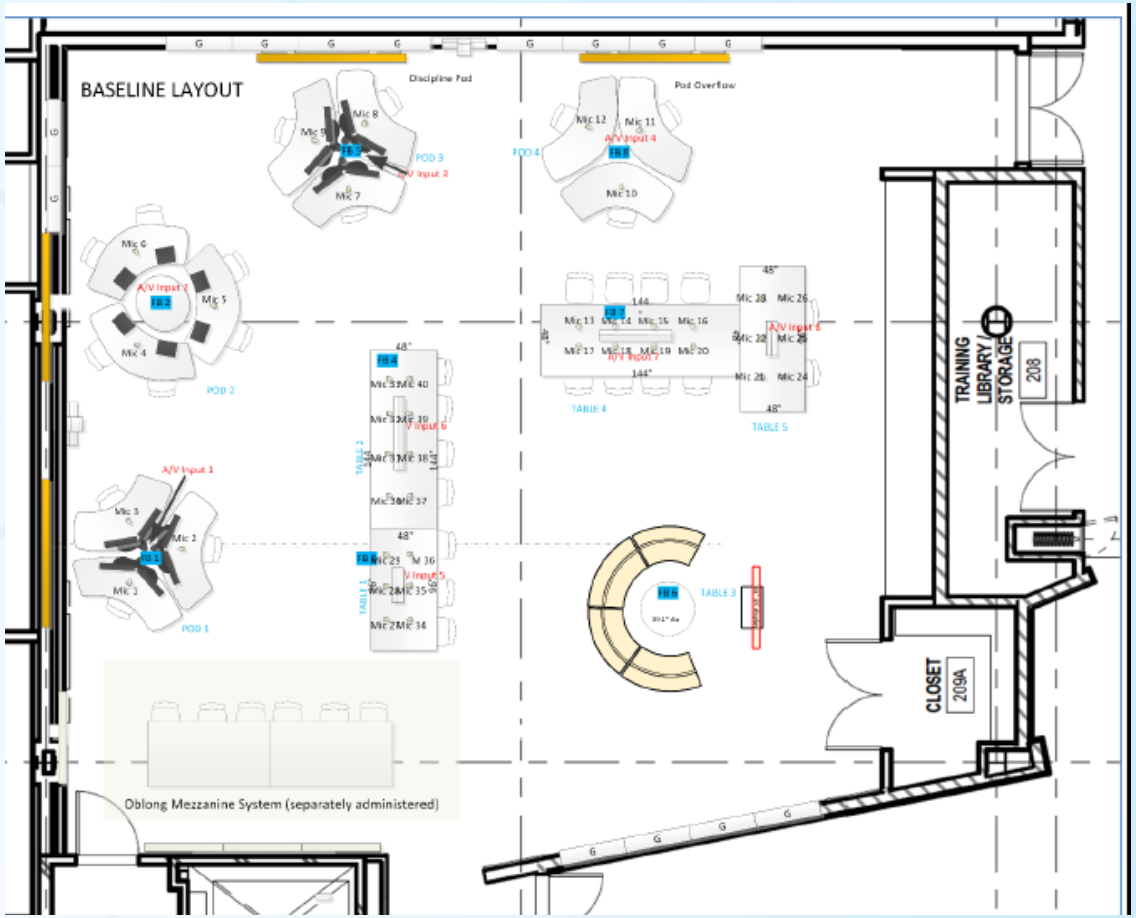
Where is it located?

Location

- The IDC^2 is located in B2102, Rm 209. It is located on the second floor of the Integrated Engineering Services Building (IESB).

Facility Technological Amenities

- Multiple workstations to support individual assessments.
- Two large screens in the front and two on the side of the room for projecting multiple displays.
- High quality audio and video conferencing for remote participants.



Technology upgrade is in the works for 2023!!!

How much will this cost me?

The IDC^2 is a Center capability offered to any program, project, or group within LaRC for free in FY23.

This includes Coordination, Facilitation, and SME support.

How do I Schedule an IDC^2 Session?

The type of project that you want to bring in influences how quickly you can use this capability

- When can I use it?
  - The IDC^2 is available beginning in January 2023.
- How long can I use it?
  - Depending on the type of session, the IDC^2 can be used anywhere from 3-5 days and across multiple sessions.
  - For an advanced concept session, a minimum **6-week** lead time is needed to adequately prepare for the session. This includes securing SMEs, pre-work, and preparations needed prior to the session.
- Who do I contact?
  - **Single Point of Entry** for new IDC^2 sessions:

    Lisa Rippy, IDC^2 Supervisor

    lisa.o.rippy@nasa.gov

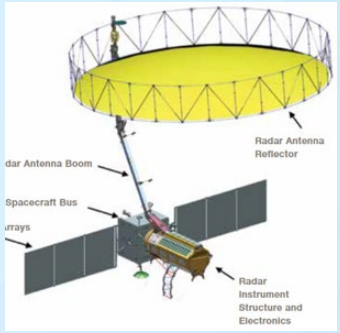
Overview

Customer and Testimonials

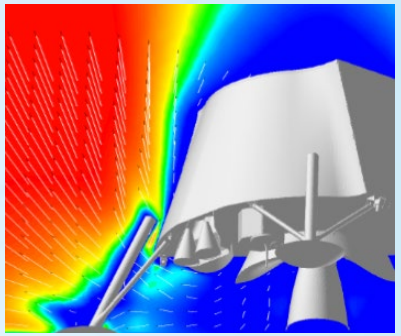
IDC² Sessions to Date

Sessions since late-Sept

Sessions since May 2022



1. **Lightweight Surface Manipulation System (LSMS)**
   - Cost, Schedule, and Risk Assessment following an AI&T discussion
   - TRAIT tool for technology maturation
2. **Surface Deformation and Change Study with focus on L1C Instrument Design**
   - Advanced concept instrument/mission design
3. **Lunar Lander Base Instrument (LLBI) on PLUMES**
   - Collaborative Sensor Team Meeting to better develop their concept of operations, science measurements, requirements, and preliminary schedule.
4. **Dust Ejecta Radar Technology (DERT) on PLUMES (Current session Dec 6-8)**
   - TRAIT tool for Concept Development and TRL maturation, requirements development, and preliminary schedule assessment.
5. **Summer Intern Tours and AR/VR demonstration**
6. **Systems Engineering Training with Tom Shull**



Customer Testimonials

What did previous sessions have to say about using the IDC^2 capability?

Nick Trombetta "We got more done in the two-day IDC^2 session than in the last two months.“

CLARREO –"3 months of effort done in 3 days.”

Barmac Taleghani "It was invaluable to have the SMEs in the same room, providing real-time information.“

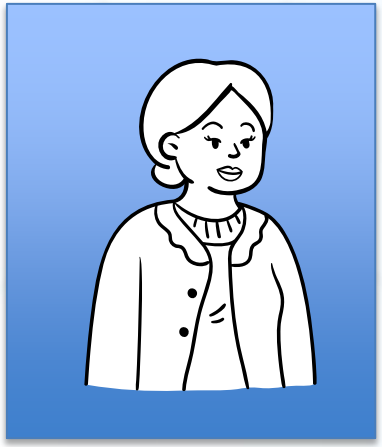
IDC^2 Sessions Planned for FY23

- IDC^2 Study Sessions in 2023
  - **Particle Impact Event (PIE) on PLUMES** (January)
    - Utilizing the GCD Technology Readiness Assessment Insight Tool (TRAIT)
  - **Conversion Aeronautics Systems (CASS)** (January)
    - Two-day workshop
  - **HiCAM** potential 3 sessions (January/February)
    - Utilizing the GCD Technology Readiness Assessment Insight Tool (TRAIT)
  - **High Spectral Resolution Lidar (HSRL) Tech Demo Concept**
    - Architecture design and costing session (February)
  - **PolCube** (late Feb/early March)
  - **Psionic** (outside funded) is planning 3 sessions beginning late May through December 2023. (Dependent on Phase 2 ACO award)

Overview

Meet our team

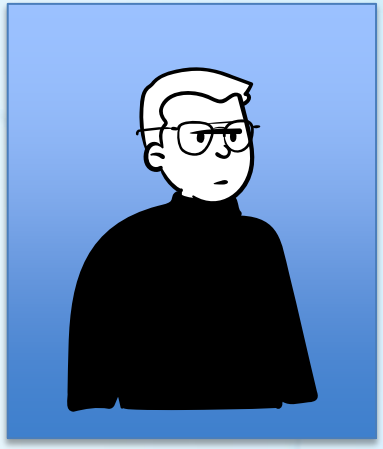
Who are the IDC^2 staff?



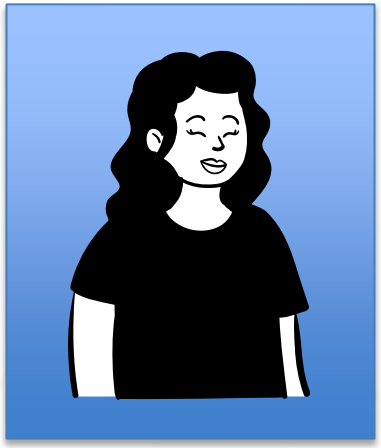
IDC^2 Coordinator: Anissa Proctor

IDC^2 Host Supervisor: Lisa Rippy

Single Point of Entry for new IDC^2 sessions:
Lisa Rippy, IDC^2 Supervisor
lisa.o.rippy@nasa.gov



IDC^2 Full Time Facilitator: Andrew Hunt



IDC^2 Working Group Lead: Suzy Maddock

IDC^2 Dedicated LSE: Kurt Woodham

IDC² Working Group Members

- As a Center Capability, the IDC² Governing Body was established consisting of the Mission Integration Forum (MIF) and the IDC² Working Group, a representation of various Directorates/Organizations at LaRC.
- The Governing Board was established to recommend an improved operating model to ensure the accountability and health of IDC² funding, processes, and products.

Working Group Member	Organization	Branch
Melissa Ashe	E3/PDO	Science Directorate
Lynn Bowman	E5	Space Technology & Exploration Directorate
Rania Ghatas	D318	Crew Systems and Aviation Operations
Suzy Maddock (Working Group Lead)	D208	Engineering Integration Branch
Samantha Magill	E1	Aeronautics Research and Mission Directorate
Jordan Klovstad	E402	Systems Analysis & Concepts Directorate
Samantha Infeld	D208	Engineering Integration Branch
Jim Price	LaRC-A	Project Support Office
Lisa Rippy	D208	Engineering Integration Branch

How do I get started?

Single Point of Entry for new IDC² sessions:

Lisa Rippy, IDC² Host Supervisor

lisa.o.rippy@nasa.gov

Schedule a Session
https://eds.larc.nasa.gov/

Backup

It’s not about the room, it's about the Process and the Facilitation.

How is the Current IDC^2 Used?

The IDC^2 facilitates purpose driven interaction as a Center capability, utilizing an integrated approach with dedicated uninterrupted focus and proven methodologies for rapid development. Subject matter experts matrixed from across the Center ensure a wide range of expertise is readily available to provide valuable input.

- **IDC^2** ***is an incubator*** *for concurrent engineering and collaborative research where all researchers, scientists, engineers, and technicians can develop technical skills, defend and deliberate on analysis-driven trades, and advance interpersonal skills of effective listening and communicating.*
- Examples:
  - Proposal Development for solicitations – Earth Venture (EV) Instrument, EV Continuity, Instrument Incubator Program (IIP)
  - CLARREO – **Quote: "3 months of effort done in 3 days**
  - SAGE III Contamination Measurement Package (CMP) for ISS
  - CERTAIN Range Requirements Development (Targeted study)
  - Gateway Standing Review Board (SRB) - Orientation and planning meeting (Kevin Rivers) (In person session)
  - Aerosol and Cloud, Convection and Precipitation (ACCP) Directed Observables (DO) 8G-1 Spacecraft Design – 2-part study: #1 In-person & #2 Virtual

Questions for the IDC^2

- Why would I use your capability versus my own existing capability?
  - Skilled SME's with a variety of experience and background who can provide unique, objective viewpoints to the sessions.
    - Leverage the Facilitator who can recognize and pull in the appropriate SME's into the session's conversations based upon skillsets as needed.
- What is the IDC2?
  - is an incubator for concept, technical maturation, mission, and structured ideation in a facilitated collaborative environment.
  - Value proposition: Facilitation – objective viewpoint
  - Venue to pull in skill sets and talents within NASA/Langley
- What is different from the EDS, what makes the IDC^2 "new and improved"?
  - Human-centered design
- Who is the staff, who do I go to find out... to request...
- How much does the capability cost
- When can I use it / when is it available? How long is it available?
- What are the use cases for this capability?
  - Example 1
- What have recent customers had to say about the capability?
  - How beneficial was using the IDC^2 for them? Would they use it again, why or not?

IDC² Governing Board

IDC² Governing Board comprised of two bodies:

- **Mission Integration Forum (MIF)** members would be the decision-making body – members include PUDS's and CRUD's
- **IDC² working group** members would manage the **IDC²** and take decisional items to MIF for approval – members include **IDC²** facilitator(s), PDO, PSO, PUD's/ CRUD's representatives
    - The **EDS** originated in D208. Over the last 15 years, experienced facilitators and SMEs have originated in D208. The first chair was chosen from D208, but will rotate through the group every two years.
    - Vice chair shadows the chair and can serve if chair not available but also becomes next chair after 2 years

Governance Board Goals

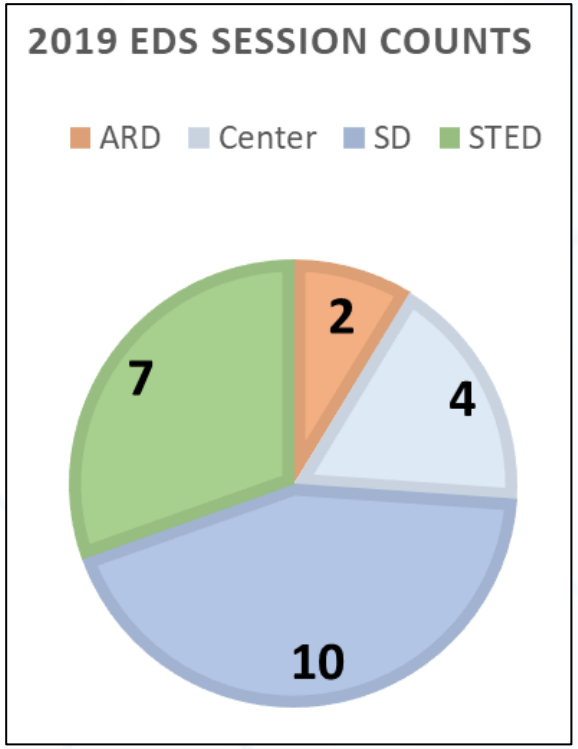
- Communicate the IDC² capabilities and flexible processes.
- Accommodate customer needs with flexible and tailorable IDC² collaborative processes.
- Provide cooperative capabilities for the virtual/remote participants
- Gain a new user community both internally among the Aeronautics, Space Technology Exploration, and Science Directorates within NASA LaRC and with external partners.

LaRC Needs to Stay Relevant

Langley Top Line Strategy	Technology is moving rapidly, and the IDC² meets the demand by
Prioritize our customer and stakeholder relationships *to* identify their decision drivers and challenges.	• **IDC² strengthens customer and stakeholder relationships** by enabling collaborative communications **to listen and respond to their real-time needs in an integrated manner**
Connect our capabilities with partners *to* innovate and develop solutions.	• **IDC² connects our hybrid cross-functional teams with collaborative tools, capabilities, and facilitated processes** to develop enhanced solutions **faster**
Drive agility and action *to* accelerate results and communicate impact.	• **IDC² enables dedicated uninterrupted focus with professional facilitators for rapid results**
Invest in our workforce and workplace *to* deliver today's commitments and create tomorrow's opportunities.	• **IDC²** leverages **professionally trained staff in unique processes** to allow for **workforce professional development** opportunities for future leaders

2019 IDC^2 Uses

In 2019, IDC^2 supported *23* various study types across multiple PUD's & Center



2019 IDC2 Uses		
PUD	Name	Study Type
ARD	CERTAIN Live Virtual-Constructive (LVC) UAS Testing Requirements	Targeted Study
ARD	East Coast Emerging Aviation Consortium	Targeted Study
Center	Congresswoman Luria Visit	Other / PAO
Center	Highly Organized Multi-agent Enclosure (HOME) IRAD	Project Support
Center	OSACB Strategic Technology Partnerships	Targeted Study
Center	Structures Materials Lab Preliminary Engineering Report (PER)	Targeted Study
SD	HQ Small Sat Program visitors and discussion	Other / PAO
SD	Earth Science Dedicated Observables	Project Formulation
SD	SmallSat demo project formulation (ATHENA)	Project Formulation
SD	Monitoring the Evolving State of Clouds and Aerosol Layers (MESCAL) milestone review (pending)	Project Support
SD	Saturn Probe **(Includes external Partner Hampton University)**	Proposal
SD	DEMETER Instrument Incubator Program	Proposal
SD	Earth Venture Continuity (EV-C) Proposal system design	Proposal
SD	Small Next-gen. Atmospheric Probe (SNAP) –Titan Saturn (pending) **(Includes external Partner Hampton University)**	Proposal
SD	Bonded Stores process	Targeted Study
SD	EV-C Red Team Review	Targeted Study
STED	On-orbit Servicing, Assembly, and Manufacturing (OSAM) Lunar Mission Brainstorming	Project Formulation
STED	OSAM RAMSES/XST Architecture Definition	Project Formulation
STED	Nuclear Thermal Propulsion Flight Demo. formulation for GCT (pending)	Project Formulation
STED	Human Lander System Lunar Ascent Element	Project Support
STED	Human Lander System Integration Systems Task definition	Project Support
STED	Human Lander System DAC2 out brief	Project Support
STED	Lunar Surface Manipulation System (LSMS) ROM (letter proposal)	Proposal

Projected IDC^2 Future Use

- With marketing **IDC^2** capabilities and flexible processes, the user community is expected to increase

	Actuals	Projected Use		
Customer	**2019**	**2022**	**2023**	**2024**
ARD	2	2	6	8
Center	4	2	4	5
SD	10	5	8	9
STED	7	3	6	7
NESC	0	0	2	3
HQ / External Partners	0	0	4	6
Total	**23**	**12**	**30**	**38**
NOTES	Prior to COVID	Maintain current users, Clio/ATMOS, Transformation, EVI-6, NIAC's, Tipping Points/ACOs; Expand marketing	EVC-2, EVS-4, New Frontiers; Expand to ASAB, ARD Centers, ATOL, UAM Flyers, CERTAIN range	EV-7; Expand to HQ & External partners

Coordinator Role & Responsibilities

- Coordinate and Schedule Dates for Session
  - Schedule, Invite, Attend all Planning meetings and Live Sessions/Virtual Sessions
  - Coordinates all technology in the IDC^2 during sessions
  - Notate questions/concerns and meeting deliverables

Facilitator Role & Responsibilities

- Guiding the room focus on the identified needs goals & objectives
  - This helps the team by providing focused moderation to ensure all objectives are satisfied

- Brainstorming, requirements development, concept development