

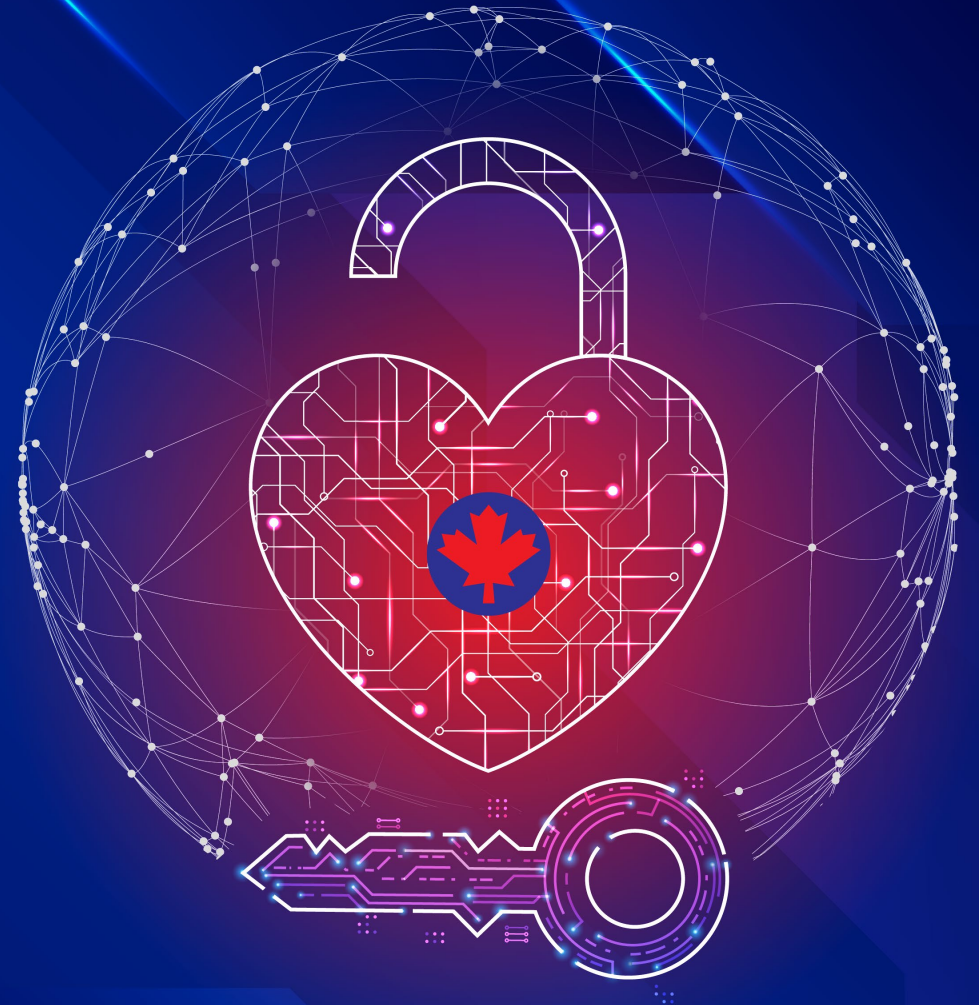


**2026 SES
Annual Conference**

Beyond Advisory Boards S- DACUM Approach: How Standards Professionals Can Transform Aviation, Aerospace, and Technical Education

**Dr Leila Halawi
Dr Mark Miller
Mrs. Sophia White**

Embry-Riddle Aeronautical University



Presenters



Dr. Leila Halawi, FRAeS ,
Associate Professor and Research Coordinator,
College of Aviation, WW Depts of Aeronautics
halawil@erau.edu



Dr. Mark Miller,
Associate Professor, MSA Program Coordinator,
College of Aviation, , WW Dept of Aeronautics
millmark@erau.edu



Mrs. Sophia White
Director of Instructional Design and Development,
College of Arts and Sciences
whites22@erau.edu



Campuses

Residential Campus

Daytona Beach, Florida



Prescott, Arizona



Worldwide (Online Campus)



- Over 100 campuses across the U.S., Europe, Asia, and South America with multiple modalities, including online, blended, and in person
- Three colleges: College of Aviation (COA), the College of Arts & Sciences (COAS), and the College of Business (COB).

Agenda

01

Problem

02

The Bridge

03

S-DACUM Deep Dive

04

Ethics and Competency

05

Your Action



Purpose: Bridging the Academia-Industry Skills Gap

The Problem and Motivation

The Gap: There is often a discrepancy between higher education outcomes and the immediate technical requirements of the workforce, leading to redundant and costly employer-provided training.

Our Goal: To reduce this gap and enhance graduate readiness for the workforce.



Our Grant: Integrating Standards Into Aviation/Aerospace and Engineering Curriculum

- **Objective:** To investigate how academic institutions can effectively integrate professional standards into their curricula.
- **Funding:** This work is made possible through a National Institute of Standards (NIST) grant, emphasizing its national relevance and commitment to standards.



Grant Objectives

1. Create two customizable modules on engineering and aviation standards into higher education curricula to enhance learning outcomes.
2. Evaluate student outcomes with input from university boards and subject matter experts across campuses.
3. Develop a model curriculum for wider use in colleges to integrate standards and support certifications



From the Gap to the Standard

S-DACUM and the Future of Aerospace Workforce Readiness

The Advisory Board Problem · The Safety Risk · Ethics as a Technical Requirement · S-DACUM in Practice

PART 1
The Problem

PART 2
The Bridge

PART 3
S-DACUM Deep Dive

PART 4
Ethics and Competency

PART 5
Your Action

TRUSTED BY:

Boeing · General Electric · Lockheed Martin · General Motors · Korean Air · Motorola · UPS · Disney · American Electric Power

Norton, 1997



2026 SES Annual Conference

Advisory Boards: The Illusion of Alignment

Industry Feedback Received: *"We need more soft skills." "Students should be better prepared." "More hands-on."*

VAGUE

No Specificity

Advisory feedback rarely maps to a specific FAA regulation, AS9100 clause, or measurable task. It is opinion, not specification.

LAGGED

Structural Delay

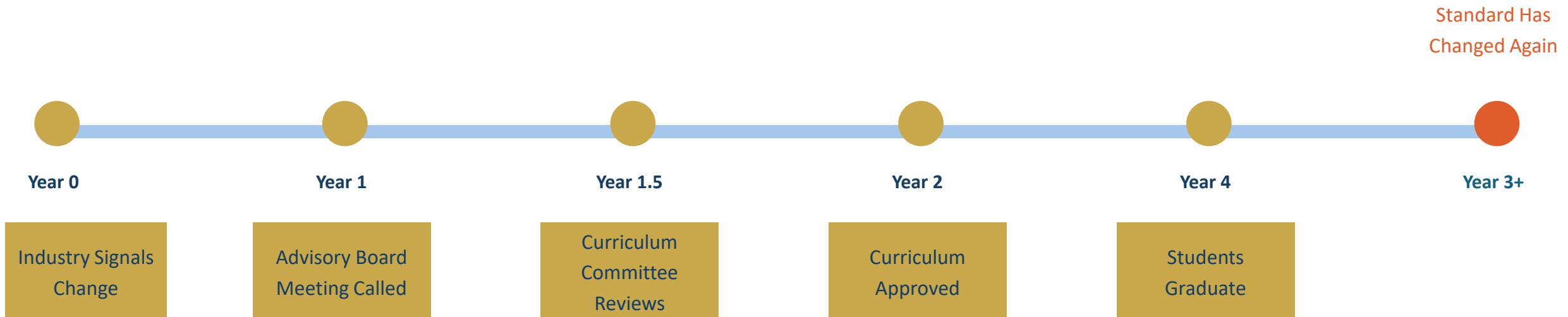
Curriculum revision cycles take 12 to 24 months. By then, the regulation or technology has already moved. The classroom is always behind.

RISKY

Aviation Consequence

In commercial aviation and aerospace, 'close enough' is not an acceptable standard. It is a safety hazard and a liability.

By the Time We Update, The Standard Has Moved



The Regulatory Reality: FAA and EASA revisions, new Part 147 requirements, and AS9100 Rev D updates do not wait for curriculum committees. The pace of standards is the industry's pace. Our education systems must match it.

“Close Enough” is an Aerospace Safety Hazard

Boeing 737 MAX

MCAS System Failures — 2018 and 2019

When the gap between engineering standards and operational training is not closed with precision, the consequences are catastrophic. 346 lives were lost in part because crew training did not fully reflect the certified system behavior. A curriculum gap became a safety breach.

Challenger Disaster

STS-51L — January 1986

Known risk data on O-ring performance in cold temperatures was not translated into a hard stop standard. Engineers knew. The standard was not enforced in decision-making. When compliance becomes optional, failure becomes inevitable

PART 1 STANDARDS AND ETHICS: THE FOUNDATION

In high-stakes aerospace and engineering, ethics is a core technical requirement — not a 'soft skill"
Ethics is the standard - **Every accreditation body already requires it. S-DACUM embeds it in every task**

How Each Standard Embeds Ethics

ABET

Informed judgments in design; impact analysis

AABI

Crew Resource Management; duty to speak up

RAeS

Public interest paramount; whistleblowing

SACS

Institutional integrity; honest assessment

Unified Ethical Themes

Safety First

Ethical duty to prioritize human life over project deadlines or costs

Anonymous Reporting

The professional responsibility to report safety violations

Sustainability

An emerging ethical requirement to consider environmental impact

Conflict of Interest

Ensuring technical judgments are not biased by personal or financial gain



From Advisory to Architected: Introducing S-DACUM

THE OLD WAY

- Advisory boards meet 1x per year
- Vague feedback, no standard anchors
- Curriculum lag of 2 to 4 years
- Graduate arrives behind the standard

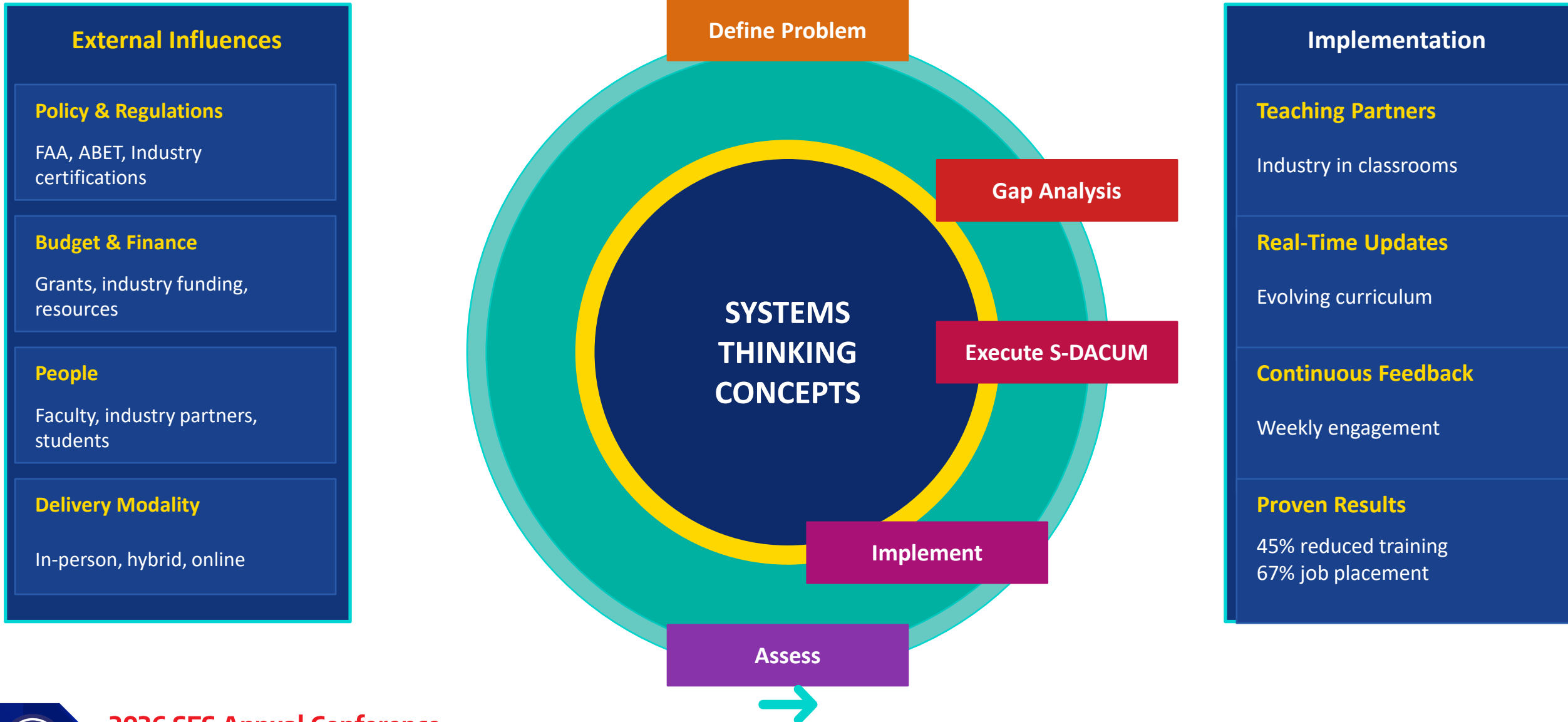
S-DACUM

THE S-DACUM WAY

- Expert workers define tasks in real time
- Every task anchored to a standard or regulation
- Rapid revision: one module, not a full degree
- Graduate certified to current standard

Traditional advisory boards are too slow for the pace of modern aerospace. We need a systematic, standards-driven bridge.

S-DACUM: A Systems Thinking Approach



Developing A Curriculum: A Proven Industry Method

"DACUM is a brainstorming, yet structured technique for job skill identification and comparison. It consists of a panel of 5 to 9 expert workers, a competent and trained DACUM facilitator, and a recorder. Panel experts create and verify professional job skills and proficiencies that employees should possess depending on job skill category."

FOUNDATIONAL ASSUMPTIONS

- Expert workers are the best source for task analysis — not professors, not textbooks, not consultants
- Any occupation can be described in terms of Duties, Tasks, and Knowledge, Skills, and Traits
- Industry-based, low cost, and produces a tangible finished product using Subject Matter Experts

2026 SES Annual Conference

APPLICATIONS ACROSS SECTORS

Curriculum

Development, Review, Needs Assessments, Competency Testing, Articulation

Human Resources

Job Descriptions, Performance Evaluations, Certification, Licensing, Promotions

Strategy

TQM, SOPs, Career Counseling, Organizational Development, Decision Making



PART 3 / THE DACUM STRUCTURE: Job → Duty → Task → Step

ENABLERS (essential items — not duties or tasks): General Knowledge and Skills · Tools, Equipment, Supplies · Worker Behaviors

JOB

The Whole Occupation

The entire occupational role being analyzed.

Example:
Aviation Maintenance
Technician

DUTY

Cluster of Related Tasks

6 to 12 duties per job. General areas of ongoing competence or significant responsibility.

Example:
Maintain powerplant systems

Verb + Object + Qualifier

TASK

Specific Unit of Work

6 to 20 per duty. Observable, measurable, 2+ steps, definite start and end.

Example:
Inspect engine oil system for leaks

75 to 150 per job

STEP

Specific Activity

Always 2 or more per task. Sequential activities required to perform a task completely.

Example:
Remove panel; check oil lines

Always 2+ per task

Every Statement = Verb + Object + Qualifier

VERB

Precisely describes the worker's action.

"The worker must be able to..."

e.g., select, prepare, inspect, certify,
document

OBJECT

What is acted upon by the worker.

e.g., equipment, documentation, systems,
components

QUALIFIER

Modifies and clarifies the statement.

In S-DACUM: cites the governing standard.
e.g., per AMM 12-10-00 and AS9100 Rev D

DUTY CRITERIA

- Describes large areas of work in performance terms
- Serves as title for a cluster of 6 to 20 related tasks
- One verb, one object, and usually a qualifier
- Stands alone — meaningful without reference to other duties
- Avoids references to behaviors, tools, or knowledge

TASK CRITERIA

- Concisely describes a task in performance terms
- Single action verb and a clear object
- Meaningful by itself — independent of duty
- Can be observed, measured, and assessed
- Avoids references to knowledge, behaviors, or tools



The "S" Is the Game-Changer

Traditional DACUM

- Asks: What do workers do?
- Maps tasks and duties
- Produces a competency profile
- Updated when convenient



STANDARDS-LED

*Not just DACUM.
Not just job analysis*

S-DACUM

- Asks: What standard governs this task?
- Anchors every task to FAA, ISO, AS9100
- Standard IS the curriculum foundation
- Updated when the standard changes

We do not just ask workers what they do. We anchor every task to the regulatory and quality standards of the industry.

2026 SES Annual Conference



Turning Analysis into Curriculum. Standards into Learning.

01

Real-Time Competency Mapping

FROM: *What should students know?*

TO: *What must the technician do on the hangar floor?*

Behaviors, not theories. Every objective is observable, measurable, and tied to a verified task performed by current practitioners.

02

Standards as the Foundation

FROM: *The textbook says...*

TO: *AS9100, FAA Part 147, ISO 9001 says...*

The regulatory requirement is the design document. Standards are not references — they are the curriculum blueprint. The standard IS the authority.

03

The Rapid Feedback Loop

FROM: *Rebuild the whole degree program.*

TO: *Update that one module. Done*

Each task maps to a specific standard. When the standard changes, only that module updates. Programs become as agile as the organizations they serve

Example: Aviation Maintenance Technician — Powerplant Systems

GROUND RULES: Rank stays at the door · Everyone participates equally · No references · One person speaks at a time · Hitchhike on ideas · Observers cannot participate · Enjoy the process!

DACUM PROCEDURAL STEPS (Norton, 1997)	
1	Complete Orientation Brief performer on process, ground rules and expected outputs
2	Review the Job/Occupation Brainstorm initial overview and develop organizational chart
3	Identify Duties General area of responsibility – target 6 to 12 per job
4	Identify tasks per duty Brainstorm all tasks for each duty – target 6 to 20 per duty
5	Develop enablers and future trends General knowledge, tools, worker behaviors, and emerging needs
6	Review, refine, and sequence Finalize all statements and confirm logical task sequence

S-DACUM Output Example
DUTY: Maintain powerplant oil systems
TASK: Inspect oil system for leaks and contamination Standard: 14 CFR 43.13 AMM 12-10-00
TASK: Service engine oil system to specified quantity Standard” AS9100 rev D 8.5.1 AMM 12-11-00
TASK: Document oil system maintenance actions Standard: 14 CFR 43.9 AS9100 7.5 <i>Ethics flag: Honest recordkeeping – due to accuracy</i>
TASK: Report oil system anomalies beyond task scope Standard: 14 CFR 43.12 FAA Order 8300.10 <i>Ethics flag: Whistleblowing – duty to escalate safety concerns</i>



PART 4 / Ethics Embedded in Every Task

Ethics is woven into every governing standard — S-DACUM makes it visible and assessable

How Each Standard Embed Ethics

ABET

- Informed judgements in design; impact analysis – ethical obligation in every engineering decision

AABI

- Crew Resource Management; duty to speak up – ethical obligation regardless of rank

RAeS

- Public interest is paramount; anonymous reporting – professional duty above organizational loyalty

SACS

- Institutional integrity; honest assessment – transparency and accuracy as baseline ethics

Unified Ethical Themes In S-DACUM

Safety First

- Ethical duty to prioritize human life over deadlines – embedded in all safety-critical task statements

Anonymous Reporting Systems.

- Professional responsibility to report safety violations – explicit ethics flag in anomaly reporting

Sustainability

- Emerging ethical requirement for environmental impact – entering regulatory frameworks via EASA and ISO 14001

Conflict of Interest

- Technical judgements must not be biased by personal or financial gain – embedded in certification and sign-off tasks



A Grade of "C" Doesn't Fly.

Mastery of the standard is the only metric. Not a letter grade. Not a rubric score. Demonstrated competency against a living, regulated standard.

Traditional Education Model

- Pass with 70% — 30% may not meet standard
- Demonstrate understanding of concepts
- Measured against peer performance
- Graduate and learn the gaps on the job

S-DACUM Competency Model

- Demonstrate mastery — no partial credit
- Perform the task to documented specification
- Measured against the regulatory benchmark
- Graduate certified to the current standard

Architect. Translator. Validator.

You are not here to check a box. You hold the Tacit Knowledge — the compliance details that no textbook writer 1,000 miles away could ever capture. That knowledge belongs in the curriculum. S-DACUM is the mechanism for getting it there.



THE ARCHITECT

Decides which standards map to which outcomes. Asks: which specific standard governs this task? Without your precision, the curriculum is built on opinion, not specification.



THE TRANSLATOR

Converts the high-level language of SAE specs and FAA regulations into measurable learning objectives faculty can build around. Only you can do this



THE VALIDATOR

Ensures every objective meets the same precision as an airworthiness release. You are the regulatory sign-off on the curriculum design.

ASCI 693: STANDARDS INTEGRATION RESULTS

ASCI 693: Aviation and Aerospace Research Topics

Standards Integration Pilot | NIST Grant Initiative

COURSE OVERVIEW

Duration:	9-Week Graduate Course
Standards Integrated:	AS 9100D and ISO 31000
Focus Modules:	Modules 1 and 2 of 9
Research Type:	Qualitative and Quantitative
Grant Source:	NIST Funded Initiative
Platform:	Canvas with Yellowdig Integration

STUDENT ACTIVITY

- Students selected from 4 qualitative research scenarios.
- Each scenario required application of either AS 9100D or ISO 31000 to a real aviation or aerospace problem.
- Standards were introduced as living tools, not just reference documents.
- Students connected standards to Safety Management System (SMS) frameworks already in practice.
- Group project scenarios reinforced cross-disciplinary application.

STUDENT FEEDBACK: STRENGTHS

What students said was working well

Practical Application

"AS9100 and ISO 31000 made the course feel more practical because they turn qualitative findings into structured, usable improvements."

Clear Outcomes

"This module was informative and clearly communicated outcomes and expectations."

Balanced and Engaging Content

"The content is perfect, very balanced and engaging. Engaging in a way that is better than small micro-learn activities."

Real-World Relevance

"Gaining a better perspective of the usefulness of ISO 31000 and AS9100D and how they apply to the traditional Safety Management System."

Forward-Looking Mindset

"Moving forward, I will use these standards to keep my research grounded in real aviation quality and risk management instead of just descriptive themes."



*Key themes from ASCI 693 student feedback | Modules 1 & 2 | AS9100
and ISO 31000*



The Work Begins This Month.

WEEK 1

Identify One Program

Map one program's learning outcomes against applicable FAA, AS9100, or Part 147 standards. Document every gap you find. That list is the evidence base

WEEK 2

Find the Performers

Identify 5 to 8 current expert practitioners people who performed the work within the last 12 months. Not former. Current

WEEKS 3-4

Pilot the Workshop

Two days. Map tasks. Anchor each to its standard. Add ethics flags. Build the competency profile. Bring your standards community.

JOIN THE S-DACUM STANDARDS COLLABORATIVE — Choose Your Role:



PILOT PARTNER

Co-facilitate one S-DACUM workshop in the next 60 days.



STANDARDS REVIEWER

Serve as the regulatory anchor for one curriculum review cycle.



NETWORK CONNECTOR

Introduce one current practitioner whose tacit knowledge belongs in a classroom.



The future of Aerospace depends on a workforce that speaks the language of standards.

*We must stop treating industry as a guest in the classroom
and start treating them as the
lead designer*

THE CHALLENGE: Identify one program this month. Pilot one S-DACUM workshop. Build a pipeline that is built to spec — not built to opinion.

The standard is not the ceiling. It is the floor. | S-DACUM Standards Collaborative



NIST Acknowledgement

- Our work was conducted under a curricular development grant awarded by the National Institute of Standards and Technology in 2023, under the sponsorship of the U.S. Department of Commerce. The authors wish to thank the U.S. Department of Commerce and the National Institute of Standards and Technology for their sponsorship of this work under award **70NANB23H240**.
- The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Institute of Standards and Technology or the U.S. Department of Commerce.

Questions



Q.Q.O.Q.C.C.P.
Comment? Où?
Qui?
Quand? Pourquoi?
Combien? Pourquoi?

Connect With Us



Dr. Leila Halawi

halawil@erau.edu



Dr. Mark Miller

millmark@erau.edu



Mrs. Sophia White

whites22@erau.edu

