INCOSE Michigan Chapter

Monthly Newsletter

March 2026

In This Issue

President's Message

February was a great month! Karl Selewski and I really enjoyed manning the INCOSE Michigan booth at the Henry Ford Musem's Engineers Week kickoff. We passed out our elementary and high school scavenger hunts and chatted with college students from the University of Michigan Dearborn campus. We were set up next to the Gatorbots robotics team and saw the antics of both their mascot and their robot. I hope that the relationships we have established with the HFM staff will pay dividends in the future. They did make us aware of the opportunity to volunteer as judges for the *Invention Convention*; see below for details about this novel student competition.

On March 11, I will be reprising my talk "How to Avoid the Zombie Apocalypse in Systems Engineering" as the guest speaker for the INCOSE Washington Metro Area. Jonathan Weaver will be conducting a Systematic Innovation Toolkit workshop at our dinner meeting on March 24; I think any systems engineer will benefit from the techniques he will share.

We have taken control of the *The Dungeon Cocktail Experience* on March 14; it will have a systems engineering theme: *Scope Creep and Sorcery*! Details are below; we hope to see you there.

My family was steeped in the history of the Packard Motor Car Company, a brand that went out of business in the 1950s and whose abandoned plant became an enduring symbol of Detroit's urban blight. To us, though, Packards were Dad's classic cars and the gateway to adventure. The Packards International Midwest Region events filled my childhood and adolescence with excursions to interesting sites throughout the region and my parents' cottage industry (making replacement plastic trim parts for Packards) kept their early retirement interesting. I have added some upcoming events at the Packard Proving Grounds Historic Site; I hope you will consider joining us for an outing there.

Finally, we have opened registration for the April SysML 2.0 Bootcamp; INCOSE Michigan members had early access and registration is now open to all. It is certain to sell out, so please register promptly if you wish to attend.

Michael J. Vinarcik, ESEP-Acq, P.E, FESD

President

Michael Vinarcik (President) and Karl Selewski (President-Elect/Vice President)
at the 2026 Engineer's Week Kickoff Event at the Henry Ford Museum of American Innovation

Upcoming Events Calendar

Date	Event	Organization
March 11	How to Avoid the Zombie Apocalypse in Systems Engineering	INCOSE WMA Chapter
March 12	Pontiac Transportation Museum	SAE Detroit Section
March 14	The Dungeon Cocktail Experience	INCOSE Michigan Chapter
March 24	Systematic Innovation Toolkit	INCOSE Michigan Chapter
March 31	Invention Convention Judge Registration Closes	Henry Ford Museum
April 12	The Rise and Fall of the DeLorean Motor Company	Packard Proving Grounds
April 14-16	SysML v2 3-Day Bootcamp	INCOSE Michigan Chapter
April 17	Spring Symposium: AI in PM	PMI Great Lakes Chapter
April 25	Selfridge Military Air Museum Tour	ESD and SAE Detroit Section
June 13	Packards & Pours	Packard Proving Grounds

Upcoming Chapter Events

Sidequest Social: The Dungeon Cocktail Experience

Date: Saturday, March 14, 2026, 1:00 PM - 5:00 PM (including optional workshop)

Location: Epiphany Detroit, 10103 Kercheval Avenue, Detroit, 48214

Cost: Varies

You've been summoned.

INCOSE Michigan is organizing a group outing to The Dungeon Cocktail Experience (DCX) at Epiphany Detroit — a wildly fun, immersive night blending improv comedy, fantasy storytelling, live music, and three expertly crafted cocktails. No scripts, no repeats, no two nights the same.

We're calling it ***Scope Creep & Sorcery***, and it's unlike anything we've done before. Think systems engineering meets Dungeons & Dragons — part comedy show, part immersive theater, part fantasy-fueled party shaped by the audience. You don't need to know D&D or anything about fantasy to have a blast. Just show up ready to laugh, drink, and get swept into the adventure.

Optional Add-On: Inside the Dungeon: A DCX Character Workshop

Want to go deeper? Before the tavern doors open, a small group of guests are invited inside the dungeon for a 90-minute, cast-led experience that pulls you behind the scenes. You'll learn how they bring characters to life through guided improv, storytelling games, and insider techniques used in the show itself. The Saturday workshop begins at 1:00 PM and can be purchased as an add-on to your show ticket (it is not a standalone ticket).

After the show, we may head to dinner as a group — possibly at Bohemia at the Detroit Club. Details to follow based on interest.

How to Register:

1. Purchase your tickets directly through Fever (select Saturday, March 14 at 3:30 PM): https://feverup.com/m/554276 (use discount code MICHAELV23531 to save $8)
2. E-mail michael.vinarcik@incose.net to let us know you're coming — we may be able to coordinate with Fever to seat our group together.
3. Please indicate in your e-mail if you're interested in:
    - The character workshop add-on (1:00 PM)
    - Joining us for dinner afterward

Seats are limited and this event sells out, so don't wait.

No rules. No prep. Just a legendary night out with your fellow engineers.

RSVP: Contact michael.vinarcik@incose.net if you plan to attend.

Introduction to Systematic Innovation: The Innovator's Mindset & Toolbox

Date: March 24, 2026, 6:00 PM - 8:00 PM (Dinner provided)

Location: The Engineering Society of Detroit, 20700 Civic Center Drive, Suite 450, Southfield, MI 48076

Innovation drives competitive advantage, yet most engineers receive little formal training in systematic innovation techniques. Join INCOSE Michigan in March 2026 for a hands-on workshop that bridges this gap.

About the Workshop

Dr. Jonathan Weaver, Professor of Mechanical Engineering at the University of Detroit Mercy, will guide participants through the Innovator's Toolbox—a structured approach organized into three areas: Strategy & Problem Definition, Ideation/Concept Generation, and Idea Management & Implementation. Participants will experience short, focused exercises demonstrating problem framing, structured ideation (including biomimicry), and disciplined selection methods.

Who Should Attend

Practicing engineers, product development leaders, systems engineers, project managers, and R&D professionals seeking repeatable methods to generate high-value concepts.

Engineering Expedition: The Rise and Fall of the DeLorean Motor Company

Date: Sunday, April 12, 2026
Time: 1:00 – 2:00 p.m.
Location: Packard Proving Grounds Historic Site, 49965 Van Dyke Avenue, Shelby Township MI 48317

Step onto the grounds of a National Register-listed, Albert Kahn–designed automotive proving facility and hear the dramatic story of John DeLorean's audacious attempt to build a revolutionary sports car company from scratch. From his meteoric rise at General Motors to the stainless-steel DMC-12 and the company's spectacular collapse, DeLorean's saga is a case study in entrepreneurial ambition, engineering risk, and systems-level decision-making gone wrong.

This talk is part of the Packard Proving Grounds' popular monthly Historical Speaker Series, which regularly draws 50+ attendees for topics at the intersection of automotive history, engineering, and Michigan heritage. Tickets are $5 for non-members, free for PPG members, and proceeds support ongoing restoration of the historic site.

Cost: $5

Register at https://packardprovinggrounds.org/event/historical-speaker-series-the-rise-and-fall-of-the-delorean-motor-company/

SysML v2 3-Day Intensive Bootcamp

Date: April 14-16, 2026, 8:00 AM - 5:00 PM

Location: Dassault Systèmes, 118 N. Main Street, Suite 200, Royal Oak, MI 48067

Hosted by: INCOSE Michigan Chapter & Dassault Systèmes

This in-person 3-Day Intensive SysML v2 course will teach you the three pillars of Model-Based Systems Engineering: Language, Tool, and Methodology. You'll learn the fundamentals of the new language through lectures, demonstrations, and hands-on activities using CATIA Magic 2026x.

Why Attend?

- End-to-end coverage: Language, Tool, Methodology
- All materials, licenses, and installation files provided
- Network with the CATIA Magic team and fellow modelers

Cost: $150 (30 seats will be available)

Register at https://lp.constantcontactpages.com/ev/reg/9w49fa5

Note: As our 2026 calendar of events solidifies, we look forward to bringing you additional SysML 2.0 content with other vendors/tools.

Sidequest Social: Packards & Pours

Date: Saturday, June 13, 2026
Time: 6:00 – 10:00 p.m.
Location: Packard Proving Grounds Historic Site, 49965 Van Dyke Avenue, Shelby Township MI 48317

Craft beer, wine, cocktails — and classic cars under the evening sky at one of Michigan's most atmospheric automotive heritage sites. Packards & Pours is the Packard Motor Car Foundation's signature summer fundraiser (formerly Packards & Pints), set among the original 1928 Tudor Revival buildings where Packard engineers once tested luxury automobiles on a 2.5-mile oval track.

Tour the historic Lodge, Repair Garage, and WWII Tank Test Center while enjoying drinks, food, and live music. All proceeds support the continued restoration of this 17-acre landmark. This is a relaxed, social evening — an ideal opportunity for chapter members and guests to mingle in a setting that practically defines Michigan automotive heritage.

Cost: $50

Register at https://packardprovinggrounds.org/event/packards-pours/

Partner Organization Events

Engineering Expeditions/Partner Event: SAE Detroit Section – Pontiac Transportation Museum Tour

Date: Thursday, March 12, 2026
Time: 5:30 – 8:00 p.m.
Location: Pontiac Transportation Museum, 250 W Pike St, Pontiac, MI 48341
Registration Deadline: March 9, 2026

Through our collaboration with SAE Detroit Section, INCOSE Michigan members are invited to participate in a guided tour of the Pontiac Transportation Museum. The museum showcases more than 70 cars, trucks, and specialty vehicles designed or manufactured in the metro Detroit area, complemented by interactive exhibits that celebrate the region’s rich automotive and industrial heritage.

Agenda:

- 5:30 – 6:00 p.m. Registration
- 6:00 – 8:00 p.m. Tour

Registration: INCOSE Michigan members may register at SAE member pricing by entering **"INCOSE"** as their SAE member ID during registration.

Note: Tour is limited to members and guests 10 years and older.

Register: https://www.sae-detroit.org/register/?id=492
Questions: Contact Cassandra Irick at cassandra.irick@sae-detroit.org or (248) 324-4445 ext

Outreach Operation:
Volunteer as a Judge at Invention Convention Michigan 2026

INCOSE Michigan members have a unique opportunity to engage directly with young inventors and spark their interest in engineering and systems thinking. Invention Convention Michigan (ICM), an affiliate of Invention Convention Worldwide and presented by Delta Dental of Michigan, is seeking volunteer judges for its 2026 State Finals competition on **Saturday, April 25** at the **Henry Ford Museum of American Innovation**.

Students in grades 3–12 from across Michigan will present inventions they've developed using a structured seven-step invention process — identifying problems, researching, ideating solutions, designing, prototyping, testing, and communicating results. As systems engineers, you'll recognize this as a natural application of SE thinking, and your feedback can make a real impact on how these students see engineering as a career path. Top-scoring students earn an invitation to compete at U.S. Nationals in June.

Why volunteer? This Outreach Operation directly supports our chapter's mission to promote systems engineering within academia and the community, and it's a meaningful way to invest roughly 6.5 hours in the future SE workforce.

Bonus: Your participation counts towards the Professional Development Units (PDUs) required for INCOSE ASEP/CSEP recertification.

Key Dates

- **Register by March 31** at mi.inventionconvention.org
- **Judge Training (mandatory, ~90 min):** Tuesday, April 7 at 6:00 PM *or* Thursday, April 9 at 12:00 PM
- **Virtual Video Scoring (~1 hour):** April 10–20
- **In-Person State Finals (~3.5 hours):** Saturday, April 25

Judges evaluate four components per project: logbook/journal, display board, prototype, and video presentation. No specific technical background is required — just a passion for innovation and mentoring young minds.

Register now or learn more at mi.inventionconvention.org | Questions? Email ICMI@thehenryford.org

Engineering Expeditions: SAE Detroit Section & ESD – Selfridge Military Air Museum Tour

Date: Friday, April 24, 2026
Time: 12:30 – 3:00 p.m.
Location: Selfridge Military Air Museum, 27333 C St, Harrison Township, MI 48045
Registration Deadline: April 16, 2026

Through our partnership with the SAE Detroit Section, INCOSE Michigan members are invited to join a guided tour of the Selfridge Military Air Museum, co-hosted with the Engineering Society of Detroit (ESD). The tour includes indoor exhibits, the new Aviation Education Center, and the outdoor Air Park featuring full-scale aircraft from the U.S. Air Force, Army, Navy, Marine Corps, and Coast Guard.

Selfridge is one of the nation's oldest continuously operating military airfields. For more than a century, it has played a central role in aviation innovation, illustrating the evolution of military, aerospace, and

systems engineering from World War I to today, from early propeller-driven aircraft to jet-powered, high-speed, and systems-integrated aviation.

Agenda:

- 12:30 – 1:00 p.m.: Registration
- 1:00 – 3:00 p.m.: Tour

⚠️ **MANDATORY BACKGROUND CHECK REQUIRED:**
The museum is located on an active military installation. All visitors must complete a background check at https://selfridgeairmuseum.org/base-access-pre-registration/ **no later than 7 days before the event** (30 days for foreign nationals).
Registration: INCOSE Michigan members may register at SAE member pricing by entering **"INCOSE"** as their SAE member ID during registration.

Note: Tour is limited to members and guests 10 years and older.

Register: https://www.sae-detroit.org/register/?id=491
Questions: Contact Cassandra Irick at cassandra.irick@sae-detroit.org or (248) 324-4445 ext. 6

PMI Great Lakes Chapter

2026 Spring Symposium: Implementing AI in a Project Management World

Date: Thursday, April 17, 2026, 7:00 AM - 5:00 PM

Location: Suburban Collection Showplace, 46100 Grand River Ave, Novi, MI 48374

Join PMI Great Lakes for their annual symposium featuring keynote speaker Princess Castleberry, CEO of Castleberry Global and author of *The Truth Is in the Trigger*™.

Opening Keynote: AI-Ready Leadership: Managing Projects in the World of Generative, Predictive, and Agentic AI. Learn how to integrate AI across the project lifecycle and evaluate AI readiness through data integrity, ethical governance, and human adaptability.

Closing Keynote: *The Truth Is in the Trigger*™: Leading Under Pressure in the Age of AI. Discover how behavioral pressure shapes decisions and collaboration during high-stakes project cycles in AI-driven environments.

What to Expect:

- Networking with fellow project management professionals
- Breakout sessions (details TBA)
- Interaction with sponsors

PDUs: 17.0 | **Cost:** Members $250 | Non-members $310

Register: https://pmiglc.org/calendar?eventId=44816

Note: Cancellations up to 5 days before the event subject to $8 processing fee; no refunds after the Friday before the Symposium.

Other INCOSE Chapter Events

INCOSE WMA Chapter:
How to Avoid the Zombie Apocalypse in Systems Engineering

Date: Wednesday, March 11, 2026, 6:30-8:00 PM

Format: Virtual (Zoom)

Topic: A 2017 video, *The Zombie Apocalypse in Systems Engineering*, explored the costs of bad modeling. The author will expand upon those concepts and discuss how digital engineering (DE) transformation efforts are at risk if organizations do not actively seek out and suppress zombies...those individuals and practices that shamble around in a semblance of life but actively harm their environment. Common types of DE Zombies will be classified and ways to mitigate or eliminate them will be shared...so organizations can avoid an apocalyptic collapse of their DE transformation.

Speaker Background: Michael J. Vinarcik, P.E., FESD is the INCOSE Michigan Chapter President

Register: **INCOSE WMA Chapter Meeting March 2026 (Wed., Mar 11, 6:30-8:00 p.m.)**

Other Events

ASM International Detroit Chapter:
Woodside Lecture: Iron: How One Element Built Our World

Save the Date: May 4, 2026

Historical Corner

This Month in SE History: Special Double Feature

Sixty Years Ago: Gemini 8 and the First Space Docking

On March 16, 1966, NASA astronauts Neil Armstrong and David Scott achieved the first docking of two spacecraft in orbit—a critical milestone on the path to the Moon. Within minutes, however, Gemini 8 became the first American mission to face a life-threatening in-flight emergency. The crew's response under extreme duress remains a defining case study in human-machine teaming and fault management.

Mission Objectives and the Docking Challenge

Gemini 8 was the sixth crewed mission of NASA's Gemini program, designed to bridge the gap between Mercury and Apollo. Its primary objective—rendezvous and docking with an unmanned Agena Target Vehicle—was essential for proving techniques required to reach the Moon. The Apollo lunar mission profile depended on the Lunar Module separating from the Command Module, landing on the Moon, then re-docking for the return to Earth.

At 10:00 AM EST, the Agena launched from Cape Canaveral on an Atlas rocket. One hundred and one minutes later, Gemini 8 followed on a Titan II at 11:41 AM EST. After a series of carefully calculated orbital maneuvers spanning nearly six hours, Armstrong guided the spacecraft to a successful docking at 5:14 PM EST—the first time two vehicles had ever joined in space.

In-Flight Emergency: Fault Detection Under Duress

Approximately 27 minutes after docking, the combined spacecraft began an unexpected roll. Armstrong and Scott initially suspected the Agena's attitude control system. Following standard procedures, they commanded the Agena to turn off its control system and used Gemini's Orbit Attitude and Maneuvering System (OAMS) to stabilize. The roll stopped—but then resumed.

With the situation deteriorating and limited ground communication available over that portion of the orbit, Armstrong made the decision to undock from the Agena and isolate the problem. This proved the fault was in Gemini itself: a short circuit had caused OAMS Thruster #8 to fire continuously. Free of the Agena's mass, Gemini 8 began spinning even faster—approaching or possibly exceeding one revolution per second, a rate that could cause the crew to lose consciousness within seconds.

Armstrong's response demonstrated exceptional fault isolation reasoning. He deactivated the OAMS entirely and engaged the separate Reentry Control System (RCS) to regain attitude control. This decision—which, under pre-established mission rules, committed the crew to an immediate abort—was precisely correct. Within 30 seconds, the spacecraft was stabilized.

Systems Engineering Principles Demonstrated

- **Redundancy and Independence:** Gemini's architecture included separate control systems for orbital maneuvering (OAMS) and reentry (RCS). This functional redundancy—with independent propellant supplies and electronics—provided the crew with an alternative when the primary system failed. Modern spacecraft continue to employ similar separation of safety-critical functions.
- **Fault Isolation Through Systematic Elimination:** Armstrong and Scott methodically isolated the fault by eliminating potential causes: first the Agena, then the combined vehicle dynamics, and finally individual Gemini systems. This approach—hypothesis, test, eliminate—remains fundamental to anomaly resolution.
- **Human-Machine Teaming:** The crew's ability to recognize that automated systems were providing incorrect inputs, override them, and apply manual control was decisive. The fact that Armstrong and Scott resolved the emergency largely autonomously—with minimal ground support due to limited tracking station coverage—further underscores the value of human judgment in ambiguous, time-critical situations. This lesson remains actively debated in the context of autonomous systems today.
- **Mission Rules and Abort Criteria:** Pre-mission planning had established clear rules: if the RCS was activated for any reason other than reentry, the mission must abort. This unambiguous criterion removed decision paralysis and enabled immediate action. Well-defined abort criteria remain a cornerstone of mission planning.
- **Post-Incident Design Improvement:** The Gemini 8 anomaly drove concrete design changes: NASA improved thruster isolation capabilities and revised fault detection procedures. These improvements were incorporated into subsequent Gemini missions and informed the development of more sophisticated caution and warning systems for Apollo. The systematic feedback loop from operational anomaly to design improvement is a fundamental SE practice that strengthens successor systems.

Legacy and Continuing Relevance

Gemini 8 validated docking—the technique that would enable Apollo 11 just forty months later. Neil Armstrong's performance during the emergency contributed to his selection as commander of the first lunar landing mission. David Scott went on to command Apollo 15 and became the seventh person to walk on the Moon.

Sixty years later, Gemini 8 remains required study for systems engineers. Its lessons on redundancy architecture, fault isolation, and the irreplaceable role of trained operators resonate in domains from aviation to autonomous vehicles. When systems fail in unexpected ways, the principles Armstrong and Scott applied in those critical seconds continue to guide our response.

References

- NASA Gemini VIII Mission: nasa.gov/history/gemini-viii
- Smithsonian Air & Space – Spinning Out of Control: airandspace.si.edu
- NASA History – On the Shoulders of Titans: history.nasa.gov/SP-4203

This article was drafted with assistance from Claude.ai by Anthropic.

Twenty Years Ago: Mars Reconnaissance Orbiter Arrival

On March 10, 2006, NASA's Mars Reconnaissance Orbiter (MRO) fired its main engines for 27 minutes, slowing the spacecraft enough for Mars' gravity to capture it into orbit. Twenty years later, MRO has returned more scientific data than all other interplanetary missions combined and remains a cornerstone of NASA's Mars exploration architecture—a testament to robust systems engineering and design for longevity.

Mission Architecture and Design Philosophy

MRO was designed from the outset to be the most capable Mars orbiter ever built. Lockheed Martin Space Systems constructed the spacecraft under management by NASA's Jet Propulsion Laboratory, with a clear systems engineering mandate: maximize science data return while providing critical infrastructure support for current and future Mars missions. This dual-use architecture—science platform and telecommunications relay—has defined the mission's extraordinary value.

The spacecraft carries six science instruments provided by five organizations, including the High Resolution Imaging Science Experiment (HiRISE)—the largest telescope ever carried on a deep space mission. HiRISE can resolve surface features smaller than one meter across from orbit, enabling detailed study of surface processes and identification of safe landing sites for future missions.

Aerobraking: Trading Time for Mass

MRO's initial Mars capture placed it in a highly elliptical 35-hour orbit. Reaching the planned 2-hour science orbit through propulsion alone would have required carrying far more fuel—mass that could instead be allocated to scientific instruments and telecommunications hardware. The solution was aerobraking: using controlled passes through Mars' upper atmosphere to gradually reduce orbital energy through atmospheric drag.

Over five months and 445 orbits, MRO dipped into the Martian atmosphere, each pass lowering its apoapsis by small increments. This process required precise navigation, real-time atmospheric density monitoring, and continuous adjustment of periapsis altitude to maintain safe drag levels. The aerobraking campaign demonstrated mature operational techniques first proven on Mars Global Surveyor and Mars Odyssey, while pushing to more aggressive parameters enabled by improved atmospheric modeling.

Telecommunications Relay: The Interplanetary Internet

MRO's 3-meter high-gain antenna and powerful transmitter enable data rates up to 6 megabits per second to Earth—roughly ten times faster than previous Mars orbiters. This capability has allowed the spacecraft to return over 450 terabits of data, more than all other interplanetary missions combined.

Equally important is MRO's role as a telecommunications relay for surface missions. The orbiter has served as the primary data link for the Phoenix lander, Curiosity rover, InSight lander, and Perseverance rover. This relay architecture—where surface assets transmit to an orbiter that then forwards data to Earth—dramatically increases the data return possible from landed missions while reducing their power and antenna requirements.

MRO has also provided critical support during entry, descent, and landing (EDL) events. Its cameras have captured dramatic images of spacecraft under parachute, and its relay capability has returned real-time telemetry during the most critical mission phases. This infrastructure support function was designed into the mission from the beginning—a systems engineering decision that has paid dividends across the Mars program.

Design for Longevity: Twenty Years and Counting

MRO's primary science phase was originally planned for two years. That it continues operating productively after twenty years reflects deliberate design choices and careful operational management. The spacecraft's solar arrays still generate approximately 2,000 watts of power. Its reaction wheels, used for precision pointing, have been managed through operational workarounds after experiencing friction increases. Backup systems and operational flexibility built into the original design have enabled the team to maintain full mission capability.

The mission has weathered challenges including safe-mode events, computer resets, and a four-month shutdown in 2009 to investigate anomalies. In each case, the flight team's deep understanding of spacecraft systems—combined with robust fault protection designed into the vehicle—enabled recovery and continued operations.

SE Lessons for Practitioners

- **Multi-Use Architecture:** MRO demonstrates the value of designing systems to serve multiple roles. The telecommunications relay capability added modest cost during development but has multiplied the mission's value to the broader Mars program.
- **Trading Development Complexity for Operational Flexibility:** Aerobraking required sophisticated navigation and atmospheric modeling but enabled a smaller launch vehicle and more capable payload. This trade—accepting operational complexity to improve system capability—is a recurring theme in planetary mission design.
- **Heritage Reuse and Incremental Improvement:** MRO's aerobraking campaign built directly on techniques proven by Mars Global Surveyor and Mars Odyssey, pushing to more aggressive parameters enabled by lessons from those earlier missions. This deliberate reuse and incremental refinement of proven operational techniques across a program of missions is a hallmark of effective systems engineering—reducing risk while advancing capability.
- **Margins and Redundancy for Extended Operations:** MRO's continued operation well beyond its design life validates the approach of building in performance margins and redundant systems. Components that seemed over-designed for a two-year mission have proven essential for twenty years of service.
- **Infrastructure Investment:** The decision to include relay capability—serving missions that didn't yet exist when MRO was designed—illustrates how infrastructure investments enable future capabilities. Systems engineers should consider not just immediate requirements but the broader ecosystem their systems will support.

Twenty years after arrival, MRO continues its dual mission of scientific discovery and programmatic support. Its cameras have revealed a Mars far more dynamic and diverse than previously understood. Its relay has enabled surface missions to return unprecedented data. And its longevity demonstrates

what careful systems engineering can achieve—a spacecraft that continues delivering value decades after its designers moved on to other projects.

References

- NASA Mars Reconnaissance Orbiter: mars.nasa.gov/mro
- JPL – Ten Years of Discovery: jpl.nasa.gov/news/ten-years-of-discovery
- HiRISE Camera: uahirise.org
- MRO Aerobraking: mars.nasa.gov/mro/mission/timeline/mtaerobraking

This article was drafted with assistance from Claude.ai by Anthropic.

INCOSE Michigan Chapter

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Portions of this newsletter were researched and drafted with assistance from Claude.ai (Anthropic, 2026).