

CAIAC: Consortium for Accelerated Innovation and Insertion of Advanced Composites

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“KAYAK”



NIST AMTech Planning Grant

Advanced Manufacturing Technology (AMTech) Program will spur consortium-planned, industry-led R&D on long-term, pre-competitive industrial research needs.

The program aims to eliminate barriers to advanced manufacturing and to promote domestic development of an underpinning technology infrastructure

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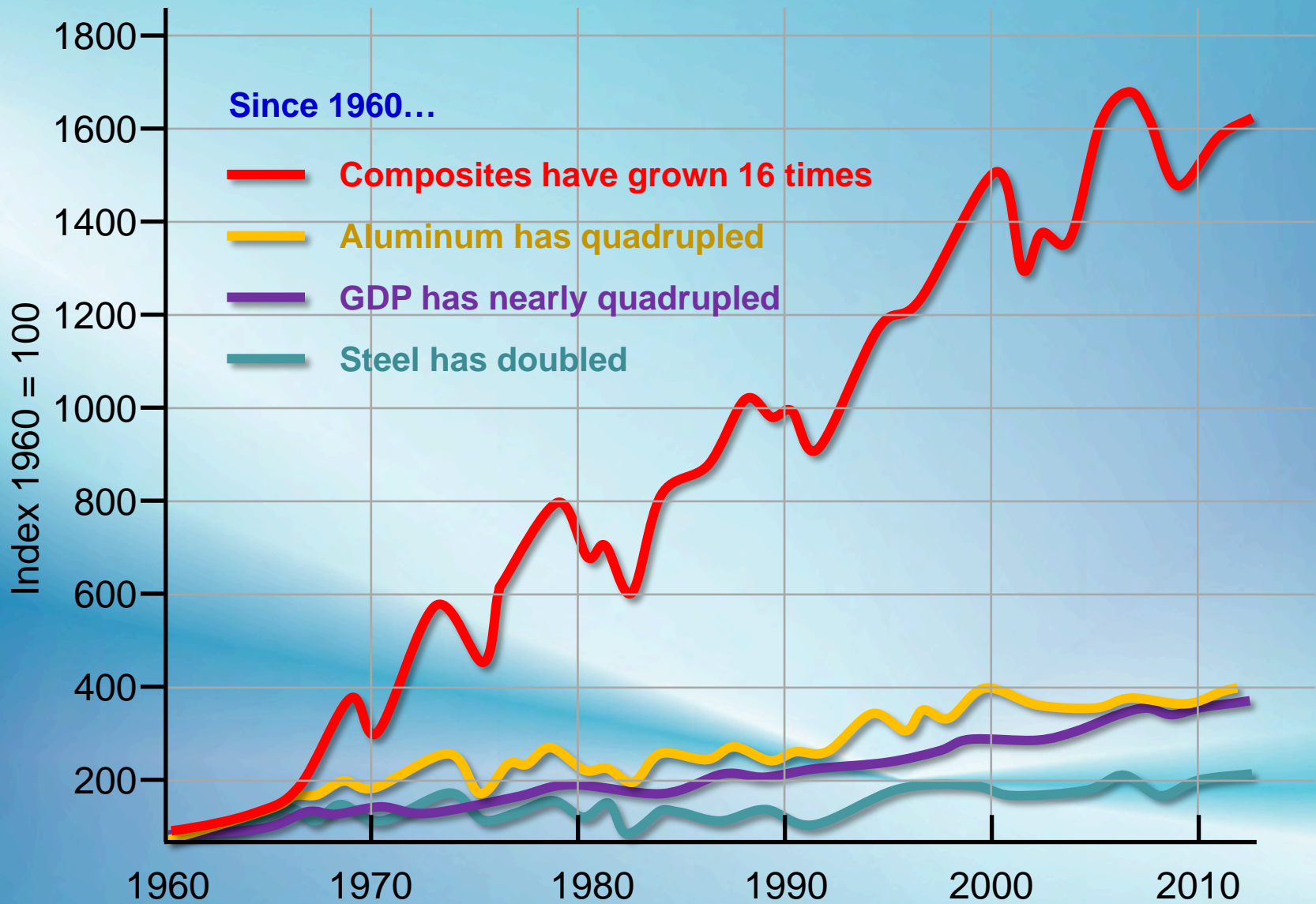
CAIAC Program Deliverables

Two Outcomes Are Required from Our Planning Grant Effort:

- A complete and ready to implement technology transfer **roadmap** that clearly shows each composite technology readiness for transfer to key industrial markets and government
- An identifiable **consortium** organization that is ready to implement the CAIAC mission

What Is “CAIAC”?

“CAIAC” is currently a consortium concept for advanced composites being validated and planned that will result from a technology roadmap exercise to be presented to the National Institute of Standards and Technology



Sources:

1. U.S. Bureau of Economic Analysis (BEA), data retrieved online <http://www.bea.gov/>, September 8, 2012
2. "United States Steel Corporation Historical Segment Financial and Operational Data", June 30, 2012
3. Lucintel's report "Growth Opportunities in Global Composites Industry, 2012-2017", February 22, 2012

Future Requirements

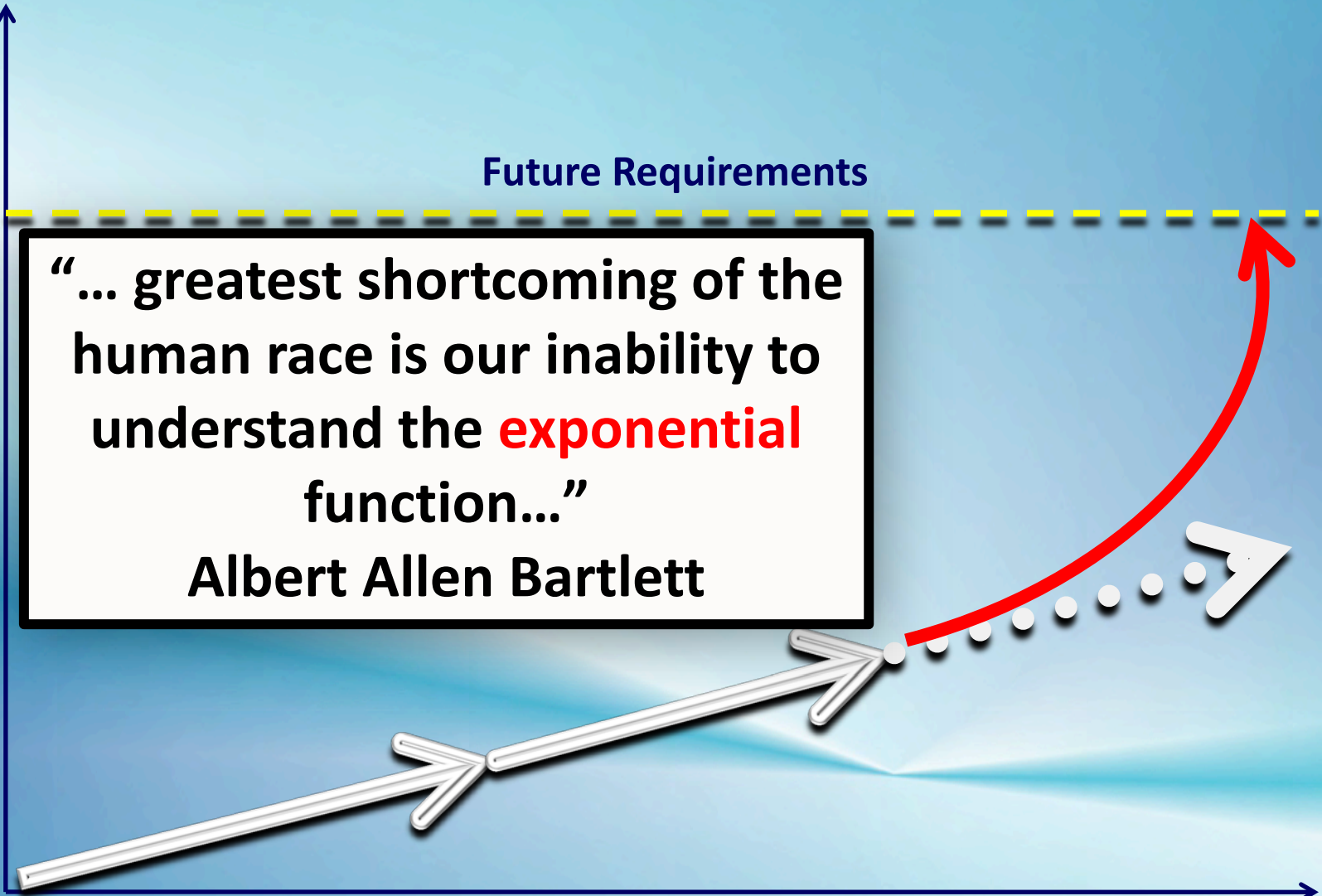
“... greatest shortcoming of the human race is our inability to understand the **exponential** function...”
Albert Allen Bartlett

System's Benefits

Generation I

Generation II

Generation III



Grand Technical Challenges

CAIAC Starter Set Based on Polling Key Leaders:

- Scalable and reproducible out-of-autoclave processes and affordable tooling
- Structural health monitoring of life cycle performance
- Inclusion of nanomaterials for improved performance
- Quick and reliable joining and repairs
- Standardized composite design and testing for faster and more affordable certifications
- Recycling and reuse of composites

The potential business benefits of next generation advanced composites are compelling; however, no single company has the financial resources or the technical depth to make it a reality any time soon.

It takes a community...

Vision

- CAIAC will create a domestic, innovative manufacturing ecosystem to accelerate innovation and industry adoption of advanced composite products
- CAIAC is committed to significantly shortening composite development cycles and providing “right-the-first-time material yields”
- CAIAC will enable rapid technology transfer resulting from both advanced technologies coupled with an improved understanding of business environments

Mission

- Accelerate innovation and assist rapid insertion of advanced composites
- Develop broad-based applications for advanced composites
- Encourage “invent here, build here” in the United States to improve U.S. competitiveness and sell advanced composite products globally

How CAIAC Differs

- **Technology maturation** - concurrent maturation of TRL, MRL, business cases and an ecosystem to accelerate innovation and insertion as well as to ensure that the new technology is "invent here, build here in the US"
- **Full value chain engagement** - involving small- and medium-sized enterprises that support OEMs in a wide range of sectors
- **Innovative technology** – a fully integrated experimental and computational approach to dramatically reducing the "time to full readiness" of, e.g., novel nanomaterials, out-of-autoclave processes, rapid certification and recycling of composites

Product “Tech Transfer” Successfully Occurs Only When Technology and Business Factors Are Ready

Some readiness level metrics are well known – others are not but needed:

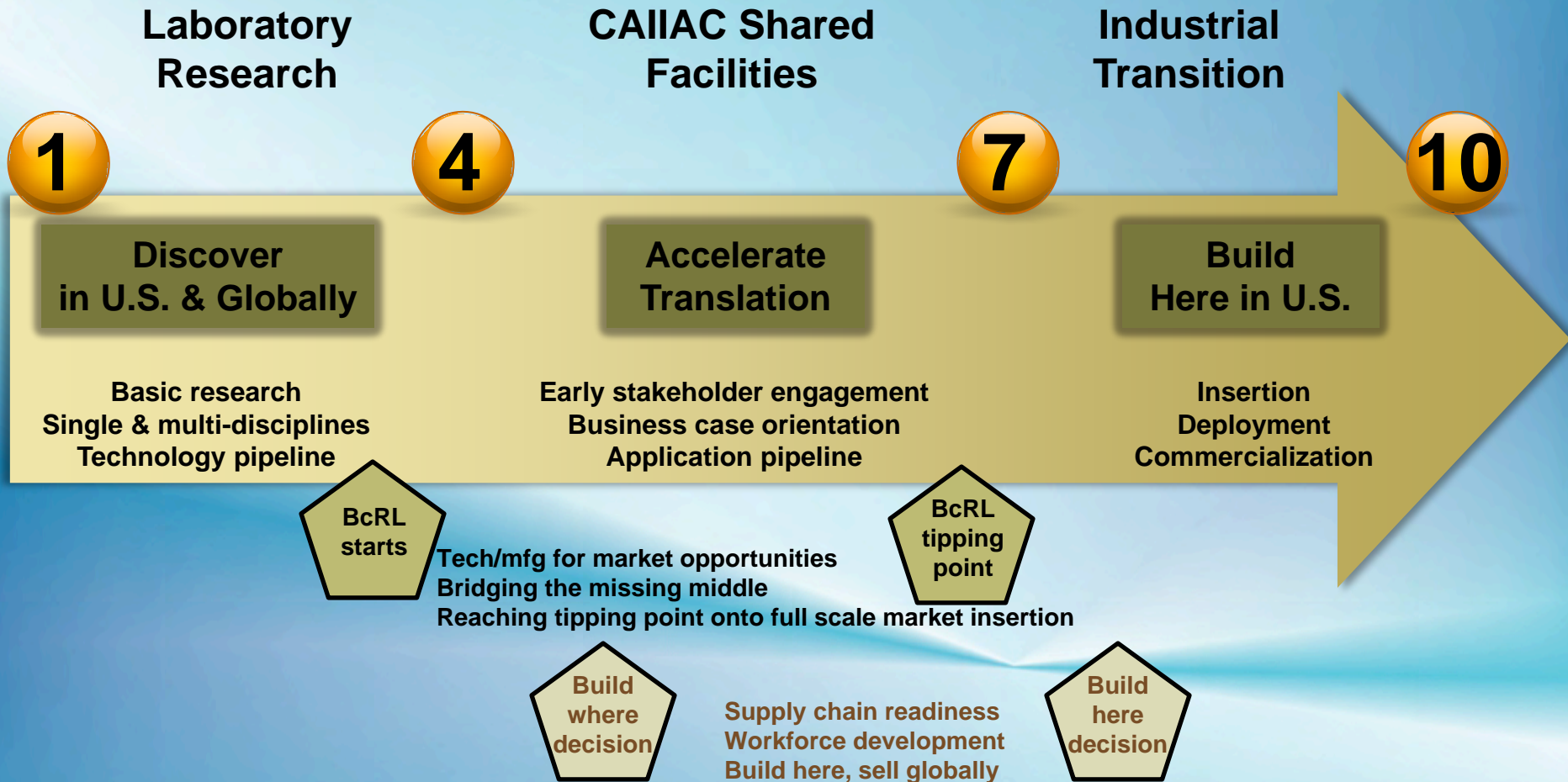
- **TRL** from NASA and **MRL** from the DoD
 - Extensive use in aerospace - less in commercial activities
- Business cycle may not be in step with technology
 - Expected funding is slow to come or never does
 - Technology projects die In “The Missing Middle”
 - Markets are slow to develop
- Metric needed for Business Case (**BcRL**) and Regional Manufacturing Infrastructure Readiness, or Eco-system Readiness (**EcRL**)

xRL Is a Top Tier Metric that Defines Technology Transition Readiness to Industry

xRL consists of four distinct readiness level metrics to support CAIAC mission:

- **TRL:** used by public-private sector technologists to communicate readiness level for technology use
- **MRL:** used primarily by defense community to assess readiness risk of the industrial base
- **BcRL:** used by Georgia Tech to engage industry and government customers to assess market opportunities, impact and risks of technology/manufacturing maturation and product development
- **EcRL:** used by Georgia Tech and regional manufacturing clusters to identify “build here” capabilities for job and business creation and retention

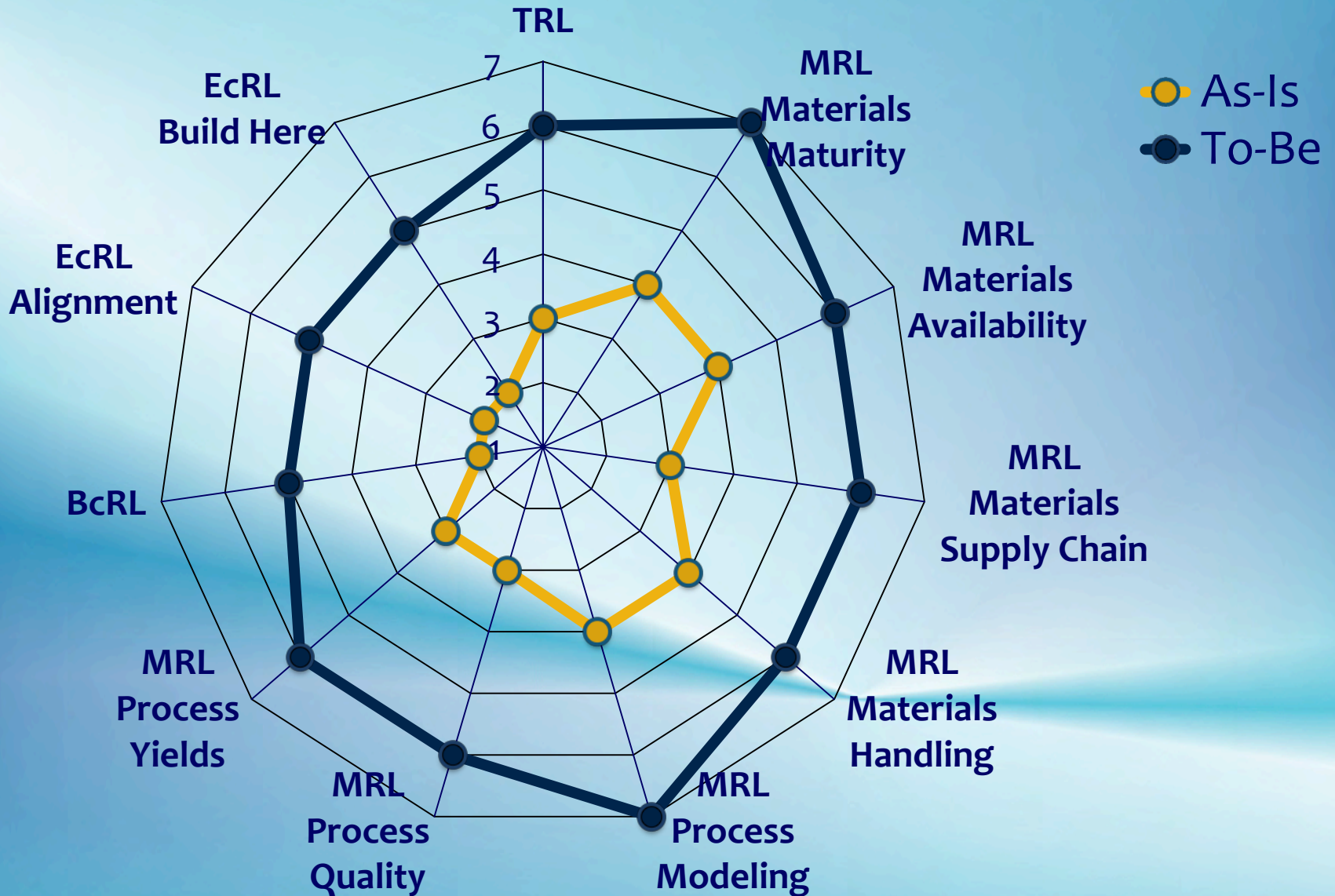
CAIAC Technology Maturation Approach



Business Case Readiness Level

Phase	BcRL	Readiness Level Definitions
Phase 3: Reaching the “Tipping Point” and on to Full Scale Market Insertion	9	Full Rate Production into National Markets – Future Product Improvements Planned
	8	Full Rate Production into Local Market – Confirmation of Financial Metrics Estimate
	7	Product Insertion into one Target Market – Positive Market Focus Group Response
Phase 2: Bridging the “Missing Middle”	6	Market Ready Research Prototype Vetted to Outside Entity and Key Customers
	5	Financial Issues Defined – ROI Required, Margin, Funding Source (Internal, External, or Both)
	4	Research Concept /Target Markets Presented to Industrial Partners – Fit to Strategic Plan Goals
Phase 1: Technology/ Manufacturing for Market Readiness	3	Research Concept Vetted to Outside Entity (ADTC, Incubator Board, etc.) for Review
	2	University Team Review and Validation of Potential Research Concept Market Insertion
	1	Research Concept Proven in Laboratory – PI Defines Usage of Potential Market Value

xRL Readiness Maturity with Time



CAIAC Membership Activities

1. Identified Key Potential Partners in the Composites Industry – Many are Here Today
2. Established Database of Potential Partners
 1. Highlights Composite Expertise
 2. Identifies Market Segment Represented
 3. Covers Technologists to Business Specialists
3. Contact via F2F, Phone, Text and/or E-mail
4. Gratis Membership During Planning Grant Duration

Takeaway messages

- Linear, material substitution approach will not work
- Accelerate material development by integrating physical and computational experimentations
- Simultaneous maturation of technology, manufacturing and business cases is key
- Develop a shared facility for companies of all sizes to co-invest in new technologies on a pre-competitive basis