From Kit to Culture: Lessons in Army Techcraft

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Center for Army Lessons Learned

The Center for Army Lessons Learned leads the Army Lessons Learned Program and delivers timely and relevant information to resolve gaps, enhance readiness, and inform modernization.

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Introduction

The Army must rapidly transform to ensure readiness to win future wars. To properly prepare the joint force to seamlessly integrate dynamic Army systems, resources, and warfighters to achieve overmatch on future battlefields, our Army's technological foundational concepts and infrastructure must also evolve at pace. The Army term "field-craft" describes the survival skills of a successful Soldier. However, the future environment demands a broadening of Army tactical and technical proficiencies to address the growing demand for technological competency. The term, "techcraft" encapsulates this broader concept within Army terminology, philosophy, and institutions to ensure comprehensive understanding as the Army transforms to fit the emerging battlefield.

History shows us that emerging technology will continue to change both the way we fight, and the baseline skills and knowledge required of Soldiers to be successful, adaptable warfighters. AFC defines techcraft as:

"The talents and culture associated with employing existing and emergent technology to gain tactical advantage or efficiency in military operations and tasks."

While previous techcraft articles gathered insight from direct leadership feedback, this deeper study used a more rigid framework to analyze units that have been successful in innovation and integration, to generate Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities, and Policy (DOTMLPF-P) recommendations for the Army.

This article is the culmination of Army Futures Command and The Center for Army Lessons Learned collaborative effort to collect Techcraft lessons and best practices concerning the underlying Soldier attributes, leader behaviors, and unit culture which contributes to successful integration of advanced military technologies in our Army today.

Assessment Methodology

The Techcraft collection was a mixed-methods informal evaluation, designed to define the unit culture, unit posture in change-readiness, and Soldier attributes which result in a unit's ability to rapidly adapt to changes in technology relevant to the battlefield. Based on the findings, the collection team made DOTMLPF-P recommendations to improve unit Techcraft culture. Army Research Institute (ARI) and Combat Capabilities Development Command (DEVCOM) subject matter experts (SMEs) assisted in revisions and adaptations of the evaluation framework, methodology, collection tools, and data analysis.

The assessment was informed by both quantitative and qualitative data. Quantitative data sets were collected from the Army Force Management System (FMSWeb), Army Training Network, observer Likert assessments, and participant surveys. Two surveys were distributed to the target demographics of leaders and Soldiers, following scheduled exercises. The survey questions focused on information such as feelings about technology, access to technology, resources, funding, and demographics.

Qualitative collections were sourced from on-site collector observations, interviews, and comment sections from surveys. All data was subject to quality assurance processing and rigorous de-identification. Qualitative indexes were compared to quantitative analytics when available, to determine the strength of each indicator[1].

Rigor and bias controls included interrater reliability with human subject matter experts, artificial intelligence, triangulation of data, and a comprehensive data trail. Considering the variables from the different units, exercise conditions, and the limits of assessing in-situ actions in a definitive way, prudence in attributing any observations will be placed in the appropriate environmental context.

The assessment was guided by the following open-ended questions:

- Problem 1: What knowledge, skills, and attributes are necessary for Soldiers and leaders to adopt, integrate, and employ emerging technologies in our formations?
- Problem 2: How can organizations prepare Soldiers and their units to be more capable to rapidly integrate new technologies into their operations?
- Problem 3: How are leaders identifying Soldiers with a high degree of techcraft?
- Problem 4: What factors are inhibiting the implementation of techcraft?

The collection team conducted on-site collection at the following Maneuver Battle Lab experiments on the following dates:

- Combat Net Radio, Soldier Touchpoint, 7-18 October 2024
- Small Tactical Universal Battery, Soldier Touchpoint, 12-22 November 2024
- Synthetic Training Environment, Live Training Simulation, 5-16 January 2025
- Army Expeditionary Warrior Experiment, 7-15 April 2025

Framework

To determine the "ideal" qualities of units and Soldiers which positively affect rapid integration and utilization of technology, the team used a mixed methods assessment to analyze results across three frameworks:

- Qualities of Unit Environments that Influence Techcraft. Six qualities were assessed regarding unit culture which influences a high degree of innovation and novel use of technology: Freedom, Leadership, Resources, Encouragement, Recognition, and Challenge.

[1] Indicators informed by validated measurement tools such as the standard National Science Board, Science & Engineering Indicators for innovation in industry, accessed on 1 April, 2024 at https://ncses.nsf.gov/pubs/nsb20241/knowledge-transfer-indicators-putting-information-to-use; Amabile, T. (1998) Model of Creativity and Innovation in Organizations. Organizational Behavior, Vol. 10, JAI Press, Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. Journal of Community Psychology, 28(3), 291–307; Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). "Adaptability in the Workplace: Development of a Taxonomy of Adaptive Performance. De Jong, J. P. J., & Den Hartog, D. N. (2010).

- Unit Dimensions of Readiness to Change. Measuring a unit's ability to introduce new military technologies with ease was graded against a traditional Community Readiness Scale[2] adapted with more specified language to target 'techcraft'. Observed organizations were rated on general unit knowledge of techcraft, awareness of the efforts to integrate technology, community climate regarding military technology, leadership action regarding military technology, and military technology transformation resources within the unit.

- Soldier Techcraft Attributes. Based on both industry and Army Research Institute[3] investigations into the characteristics optimal for high performance in techcraft, the collection team assessed the following attributes: curiosity, open-mindedness, problem-solving, collaboration, risk-tolerance, flexibility, technological proclivity, proficiency in basic soldier skills, physical fitness, leadership and management, communication, and any additional personally identified traits detailed by the Soldiers.

Assessment

Tools. Tools for collection included leader and Soldier surveys given to the exercise participants, semi-structured interviews of select unit representatives, and observer ratings against the three models mentioned above, (Further details in Appendix B, JLLIS folder 11792). Observers also rated perceived success in technology utilization, unit feelings about success, execution of standard Soldier skills, and unit cohesiveness. Quantitative Survey responses from the unit were rated on a 1 (low) to 5 (high) Likert scale by the participants. To quantify any qualitative written or spoken responses, a coding scheme was used to assign numerical values to the responses:

- Yes/No questions: 5 (Yes), 4 (Yes, but with some exception), 3 (Neutral or Unknown), 2 (No, but with some exceptions), 1 (No)
- Open-ended questions: 5 (Strongly agree), 4 (Somewhat agree), 3 (Neutral), 2 (Somewhat disagree), 1 (Strongly disagree)

Finally, observer ratings were recorded using behaviorally anchored rating scales aligned to a 5-point system for each evaluated criterion.

Population. The collection had a total of 122 individual participants in four different units (Appendix C, JLLIS folder 11792), all platoon level light formations. The Military Occupational Specialty (MOS) of participants was predominantly 11B Infantry (90.16%). Soldiers were mostly between the ages of 21 to 29, while leaders skewed predictably higher at a range of 24 to 35. The age distribution is found in Figure 1.

[2] Edwards, R. W., Jumper-Thurman, P., Plested, B. A., Oetting, E. R., & Swanson, L. (2000). Community readiness: Research to practice. Journal of Community Psychology, 28(3), 291–307.
[3] Pulakos, E. D., Arad, S., Donovan, M. A., & Plamondon, K. E. (2000). "Adaptability in the Workplace: Development of a Taxonomy of Adaptive Performance. De Jong, J. P. J., & Den Hartog, D. N. (2010). "Measuring Innovative Work Behavior." ARI Tech-fluency research (unreleased).

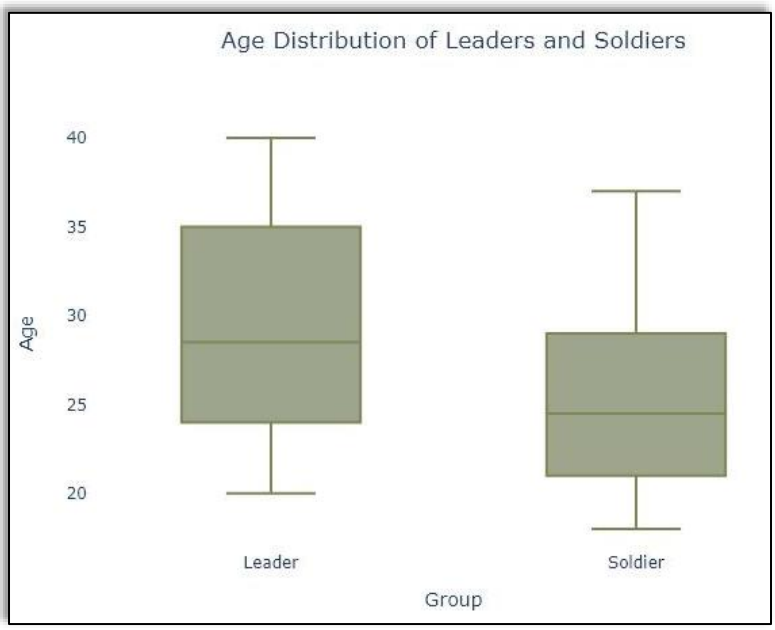

Figure 1. Age Distribution of Collection Participants, Courtesy Army Futures Command

Every unit observed had at least two leaders and one Soldier with combat experience. All units had at least one 'First Unit of Assignment' Soldier in their formation. Group one had a mission focus on Continuous Transformation, while groups two through four had standard Rifle Company missions: to close with the enemy by means of fire and maneuver to destroy or capture, or to repel his assault by fire, close combat, and counterattack.

Descriptive Scoring. A few composite scores were calculated to simplify descriptions of key unit qualities including: Technology Exposure, Resource Support, Risk Tolerance, and Cohesion (Appendix C, JLLIS Folder 11792).

Composite	Group 1	Group 2	Group 3	Group 4
Technology Exposure	High, 3.42	Med-High, 2.77	Med-Low, 2.66	Low, 2.62
Resource Support	High, 4.5	Med-Low, 1.93	Med-High, 2.6	Low, 1.8
Risk Tolerance	High, 3.77	Med-High, 2.57	Med-Low, 2.44	Low, 2.04
Cohesion	High, 4.1	Med-High, 3.9	Low, 2.1	Med-Low, 3.6

Figure 2. Composite Scores of Key Unit Qualities, Courtesy Army Futures Command

Observations

OBSERVATION: Cohesive teams are the foundation for successful introduction of new technologies.

DISCUSSION: Units with strong cohesion and proficiency in basic Soldier skills show a greater readiness to receive and engage with emerging technologies. Cohesive teams are more open to change, more enthusiastic about technology adoption, and display more consistent execution of standard Soldier tasks; an ideal and low risk environment to introduce advanced technology.

An analysis revealed near-identical strength between two key pairs: cohesion & positive feelings about technology, technology exposure & positive feelings about technology, (Figure 3). This indicates that both interpersonal trust and hands-on familiarity with systems drive enthusiasm, but in different ways. Where cohesion is linked to tactical effectiveness, exposure builds the confidence and interest necessary for technological innovation.

Variable Pair	Correlation
Cohesion & Tech Feelings	+0.95
Tech Exposure & Tech Feelings	+0.95
Cohesion & Soldier Task Success	+0.77
Tech Exposure & Cohesion	+0.80
Soldier Task Success & Tech Success	–0.58
Tech Exposure & Tech Success	+0.45

Figure 3. Performance, Cohesion, and Technology Exposure Correlations, Courtesy Army Futures Command

As expected, correlation values show a strong statistically significant relationship between Cohesion and Performance of Soldier Tasks. In units with high skill success, Soldiers are not overburdened by learning core skills and new technology at the same time, a major enabler of rapid transformation.

However, a slight negative correlation emerged between Technological Success & Task Success ($r = –0.58$), suggesting an unintended consequence: units that excel in technology integration may experience a slight drop in basic Soldier task proficiency, possibly due to time, training, or attention trade-offs.

"… some basic skills have clearly atrophied. Soldiers had trouble recalling and executing SMCT subject areas 4. Survive (Combat Techniques) and 6. Communicate." *-Observer Notation*

Leaders must be comfortable with small concessions to make large leaps in shaping the Future Force. The units evaluated in this assessment helped to outline 'models' of units and the actions leaders could take to reshape their formations in preparation for transformation efforts. See Appendix A for a sample tool "Commander's Guide to Unit Technological Readiness: Profiles and Recommendations."

RECOMMENDATIONS:

- Leaders should continue actions that build strength in basic Soldier skills and enhance unit cohesion; these aspects are the predicate foundation for success in technology fielding.
- Leaders should assess their unit and then appropriately pair teams with early technology exposure, hands-on training, and dedicated integration time. New technologies cannot compensate for gaps in tactical knowledge.
- Leaders could consider assessing their unit against the cohesion model in Appendix A. to help inform technology integration decisions.

OBSERVATION: Units where leaders set specific goals and resourced technology integration are more likely to develop Soldiers with strong techcraft attributes.

DISCUSSION: Intentional leadership direction consistently distinguishes high-performing units, particularly when leaders articulate clear objectives and dedicate time and resources toward achieving them.

A calculated correlation between unit environmental factors and the attributes of Soldiers, (Figure 4), revealed the two strongest predictors of robust Soldier-level techcraft attributes were leaders setting explicit goals for technology integration, and leaders resourcing those goals with familiarization time, training, and materiel. While p-values were above 0.05 due to consolidating into group counts, *r* values suggest meaningful relationships warranting further emphasis and exploration.

Even moderate indicators, such as leaders identifying as technology proficient, were less predictive than simply setting clear goals and backing them with support. This suggests that technical expertise is not a prerequisite for leaders to meaningfully drive transformation. Soldiers do not need leaders to be technology experts, they need committed leaders with vision, clarity, and follow-through.

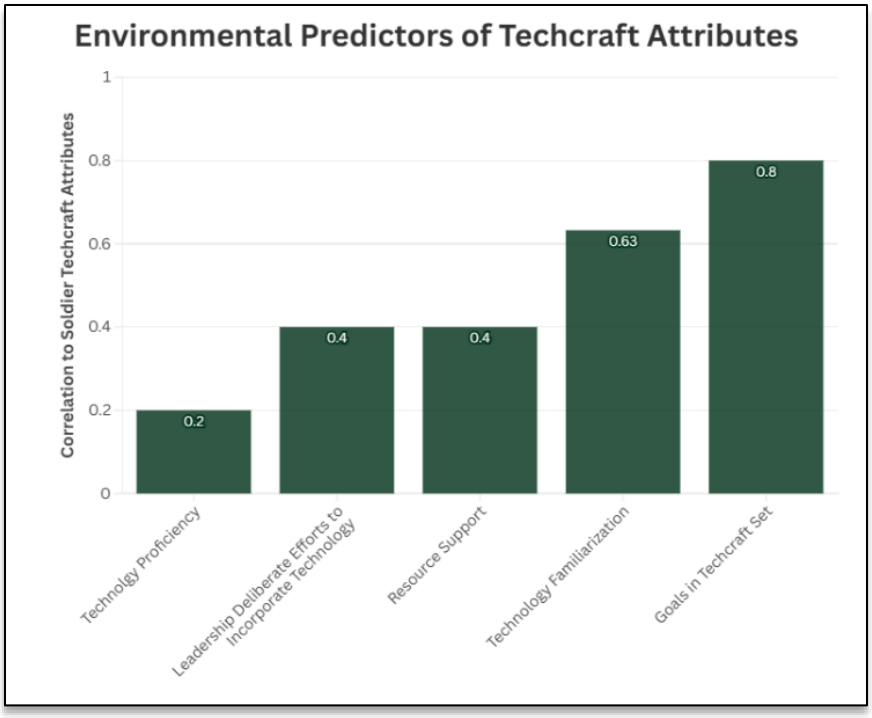

Figure 4. Correlation of Environmental Factors and Soldier Techcraft Attributes, Courtesy Army Futures Command

Notably, absolute difference calculations which show the distance between the average answers of leaders compared to the answers Soldiers gave to the same questions, revealed that Soldiers often perceived that techcraft goals existed even when leaders did not report setting any. This informal sense of purpose may help to some extent, but the strongest results occurred when goal setting was clearly communicated uniformly.

In Group 1, where technology experimentation was embedded in the unit's mission, Soldier and leader perceptions of goal setting were perfectly aligned; zero difference in quantified responses, (Figure 5).

	Group 1	Group 2	Group 3	Group 4
Absolute Difference Calculation of Leader (Q.18) Vs Soldier (Q.16) "Set goals in growing techcraft talent."	0	1.05	0.88	1.21

Figure 5. Leader and Soldier Perceptual Differences on Goals in Techcraft, Courtesy Army Futures Command

Conversely, leaders who fail to communicate goals, risk increased confusion and poor alignment if Soldier's self-defined goals deviate from theirs. Some responses indicated a conflation of task execution success with the performance of a technology to assist in the mission. Clear goals can help Soldiers build confidence in their abilities and equipment as separate and discrete objectives.

Participants reported that dedicated, hands-on training time was the most effective and preferred method for developing their own techcraft, (Figure 6). This further reinforces that leader driven prioritization, not ad-hoc exposure, is what builds confidence and capability.

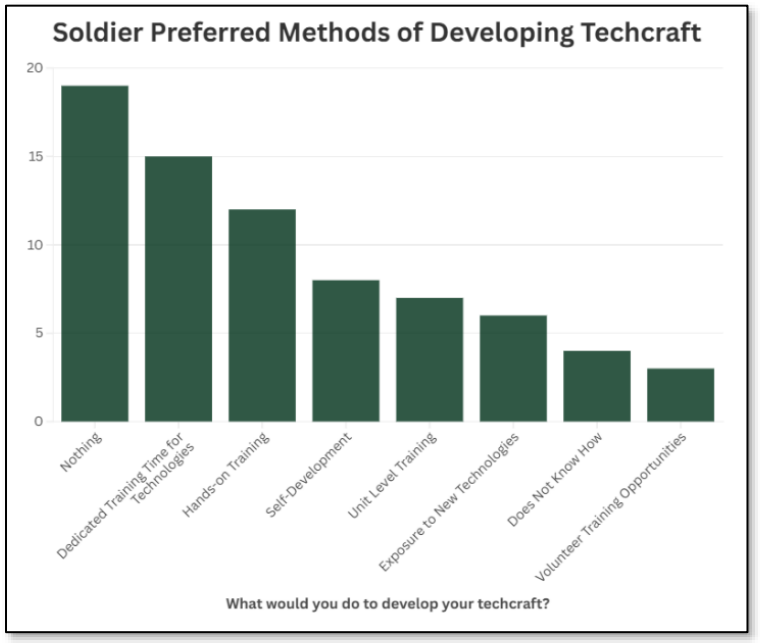

Figure 6. Soldier preferred methods for developing techcraft, Courtesy Army Futures Command

Also strongly endorsed however, was 'nothing'. Soldiers expect the Army to create the space and structure for them to grow their technology skills, further punctuating the importance of protected focused training time. Leaders must make every effort to provide this training.

"Leaders don't protect time to use tech, get expertise on it. They want to see it in action, but they don't allot the time to train and implement. We are often interrupted to fulfill some flash tasking." *-Leader, Group 2*

"Yes, my leader has set techcraft goals, we're working on Battle Drills often as a platoon to improve our skills in the field. Then, they give classes on different technologies for better understanding." *-Soldier, Group 2*

"Send guys out with a certain goal, but let them decide how they would do it. Instead of holding their hand saying, 'hey this is the route, this is how fast, and this is how long,' just give Soldiers a 'get to here, and do what needs to be done.' Then see how they move and integrate the technology in their own way, instead of trying to integrate it for them and make them work to someone else's plan. Our leadership is there for a reason, let them lead." *-Soldier, Group 1*

Training conditions within units are often developed informally, without official structure or resources. Soldiers 'found a way,' relying on peer knowledge, adjacent MOS experts, or leader encouragement to fill the gap. Where this informal innovative culture existed, progress was real, but uneven and unrecognized.

Soldiers uniformly endorsed value in hands-on learning opportunities, protected training time, and small-group experimentation led by peers or junior leaders; conditions Soldiers viewed as essential for gaining mastery in techcraft.

For example:
Group 2, a unit where informal experimentation was supported by cross-training and permissive leadership, reported willingness and flexibility to integrate technology.

"We borrow from [the Signal platoon] because they'll show us what we don't know."
-Soldier, Group 2

Group 1 was heavily exposed to new technologies but under highly restrictive constraints in official experiments. This controlled exposure limited opportunities for Soldiers to explore, adapt, and build higher confidences with the technologies through real-world application.

"Allow us to really test the technology, rather than giving us these planned out scenarios where we know where everyone and everything is in detail ahead of time."
-Soldier, Group 1

BARRIERS: Leaders expressed uncertainty about whether setting techcraft goals was within their scope and others deferred responsibility to higher echelons. In some circumstances, informal or passive support by leaders ("my Soldiers figure it out") appeared to replace intentional direction.

Question: Have you set organizational goals for growing techcraft talent within your organization?
"No, not sure how to approach this." *-Leader, Group 2*

"No, a decision for higher ups." *-Leader, Group 4*

There may be a concerning divorce between immediate readiness requirements and the larger Army goal of transformation, even though technology is used to enhance readiness. Leaders are likely not connecting technological solutions to their unit METL.
"We haven't set any goals in techcraft, our focus is tactical efficiency and lethality,"
-Leader, Group 4

This collectively suggests a critical blind spot: while Soldiers may take initiative, tech-fluency scales only when leaders shape intent, dedicate resources, and provide feedback loops for learning and adaptation. What leaders must never do: drop off a box of new equipment and expect integration to just happen.

Prioritizing training and goal setting signifies priorities and emphasis, yet leaders should also deliberately message the significance of new technologies as they are introduced.

"How you roll out a technology is just as much as what you roll out…" *-Observer Notation*

Platoon and Squad level leaders are at the decisive layer for driving techcraft. These leaders directly connect Soldiers' daily tasks to larger transformation goals. When leaders set clear, resourced objectives, unit climate and performance both benefit.

RECOMMENDATIONS:

- Enable units at the lowest level to schedule, resource, and protect dedicated hands-on training for building confidence in integrating military technologies.
- Teach and empower leaders, at the lowest level, to set and communicate goals in techcraft.
- Higher echelons prepare strategic communication plans within fielding orders to assist subordinate command messaging during initial phases of integrating new technologies.

OBSERVATION: Units with higher risk tolerance and greater access to resources consistently outperformed others in both transformation readiness and technology integration.

DISCUSSION: Transformation does not happen just because a unit has the new equipment. It happens when leaders are willing and able to use it, stress it, learn from it, and try again.

Risk-tolerant units score higher across every domain of change readiness, (Figure 7). Leaders and teams who take calculated risks are more prepared to adopt new technologies, tactics, and systems. There was a consistent directional alignment between risk tolerance and each dimension of readiness for change.

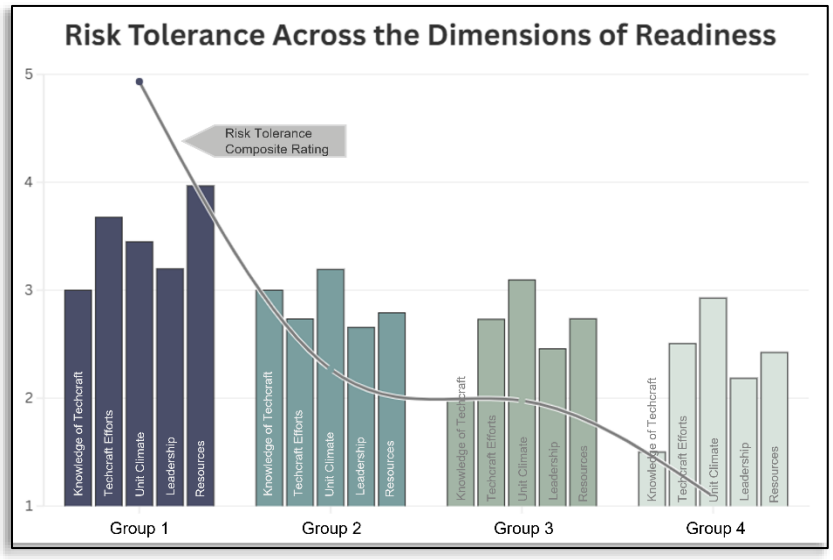

Figure 7. Risk-Tolerance Trends by Group, Courtesy Army Futures Command

Risk-tolerant units are not reckless, rather, their leaders encourage experimentation, tolerate short-term setbacks, and create conditions where Soldiers feel supported when trying something new. They understand that innovation requires iterative learning under realistic conditions. Preparing Soldiers for future conflict outweighs the risk of equipment loss in training.

A leader's feelings about risk are shaped by many factors. Leaders have the obligation to reflect on their tolerance levels, decide if those levels are appropriate, and set clear guidelines for their subordinate leaders on what risks they may accept when testing new technologies. Leaders who determine risk thresholds might be too high in live environments, should still ensure exposure to technology is part of deliberate training in some form. Simulators and Innovation Labs are quality alternatives: low cost, low risk. The typical 'crawl, walk, run' concept will find similar success with advanced technology integration as with any standard Soldier common task.

Another observed pattern in the data displayed a relationship between unit resource support and risk tolerance, suggesting that units with greater resources may adapt to a more risk tolerant culture. The risk tolerance and resource support scores are both calculated composites as seen in Figure 8. The pattern, while strong, merits additional research to determine levels of significance.

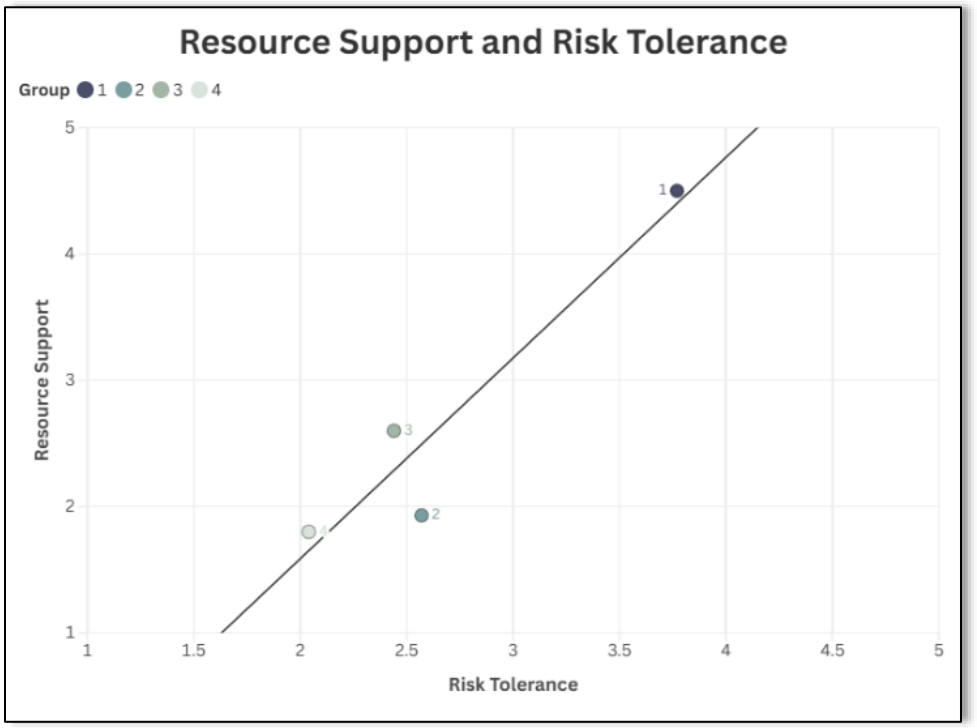

Figure 8. Risk-Tolerance and Resource Relationships, Courtesy Army Futures Command

Observations and data indicate a compelling trend: units with higher resource scores appeared to be more successful in integrating technology.

Among the factors analyzed, resource support emerged as the most consistent predictive factor of technology integration success. Group-level analysis shows a strong monotonic relationship between resource support and a unit's ability to adapt and perform when new technologies are introduced, (Figure 9). While a small sample limits statistical power, the consistency of the relationships suggests that resource access is a critical enabler of transformation

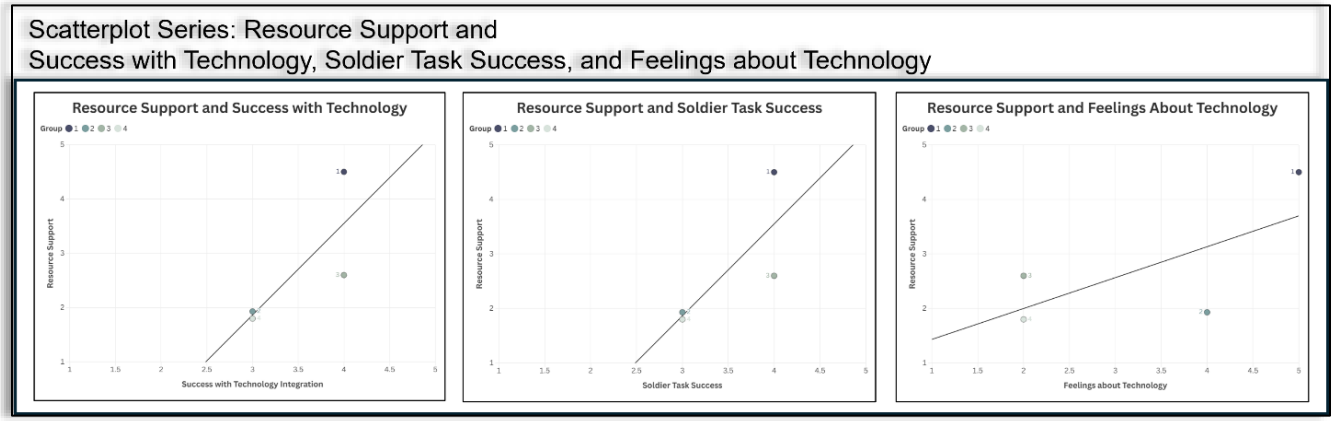

Figure 9. Resources Compared to Integration Success Observations, Courtesy Army Futures Command

These distinctions reinforce the idea that resource investment enables technological transformation. The Army must evaluate each step in logistical processes for gaps/weaknesses and address those head-on.

Furthermore, risk and resources are tightly linked. Leaders and Soldiers are unlikely to take risks with new equipment when they fear financial liability[4] or long delays in replacement. Leaders echoed these concerns, describing a culture of caution tied directly to logistics policy and cumbersome and punitive replacement processes.

"The Army needs to fix the culture of 'every expendable piece needs to be present so that slides are green and there are no shortages at any time.' That culture is what makes Leaders say 'don't take that thing out of the box,' we don't want to break or lose even the AA batteries or sacrificial lenses." *-Leader, Group 1*

"The monetary costs are of course a consideration. Everything broken is a [Financial Liability Investigation of Property Loss (FLIPL)] now… and Soldiers can't get new equipment until that FLIPL goes through... that can be over a six month process." *-Leader, Group 2*

"I've legit been told "we haven't opened these yet" so we won't use a new tech or device because it is intact and pristine condition… we definitely have both old and new kit in the arms room that have never been used." *-Soldier, Group 2*

"There is a lot of reticence in using kit; there is always hands across America if we lose anything in the field. My Squad Leader made me pay $100 for a lens I lost during training."
-Soldier, Group 3

Soldiers in units without a focus on transformation lack faith in the Army's ability to supply them with relevant tactical gear in a timely manner. Supply processes are opaque to the lowest leaders; Soldiers do not understand where logistical failures occur.

[4] DEVCOM Armaments Center observer noted reticence in equipment utilization during the fourth collection: *"A Soldier brought up the risks of financial/responsibility burdens. The staff assured him that it was okay to break things at the exercise because the vendors signed a hold harmless agreement. That relieved him."*

"Pretty difficult to get new equipment. They've been talking about getting new [night optical devices (NODS)] for like two years. Don't even know why. Even getting weapons parts is impossible, some of them have been broken for years. I think this is an Army level problem. Stuff is ordered and takes years." *-Soldier, Group 4*

This system unintentionally trains leaders and Soldiers to be risk-averse when it matters most. Risk-tolerant climates and strong resourcing aren't just complementary; they are mutually reinforcing factors for successful transformation.

The Army began to address this issue at an enterprise level by updating AR 735-5 Property Accountability Relief of Responsibility and Accountability, in March 2024, to allow room for more losses at the company level. Previously AR 735-5 only allowed Company Commanders to sign off on durable losses up to $500 per incident where no negligence or willful misconduct was suspected. The updated regulation allows Company Commanders to sign off on expendable, durable, or nonexpendable property losses up to $2,500.[5] It was expected that Commanders would be more willing to take risk with property due to this increase, but risk-aversion persists namely because the funds to replace those expended items are reported to 'not exist.'

"Leaders are 'dinged' by higher echelons for having property shortages within their formations -- even when the expendable property lost has no impact on the functionality of the equipment it was tied to." *-Leader, Group 1*

Even the most advanced technologies will go underutilized if units lack the logistical support (personnel, policy, and funds) to replace losses, and leaders lack the institutional backing to train with some risk. Without these conditions in place, units may reserve use until the stakes are highest, when the time for experimentation has passed.

RECOMMENDATIONS:

- Help leaders self-identify their levels of risk-aversion; support leaders in communicating their left/right limits or thresholds in risk to subordinates.
- Reinvest in supply expertise; incentivize 92Y Unit Supply Specialist Soldiers to reduce personnel gaps compounding existing logistical issues
- Re-evaluate supply and logistics policy and procedures to identify and eliminate elements which impede transformation at a meaningful speed. Strengthen supply processes so units are not 'punished,' formally or informally, for testing new systems.
- Leaders should empower subordinate leaders to take calculated risks during training by protecting them from excessive liability in the event of equipment damage. Teach leaders how to balance their resources throughout the year.
- Re-evaluate Financial Liability Investigation of Property Loss (FLIPL) and expendables thresholds and consider a designated category of "field loss acceptable" equipment to speed replacement and reduce fear of stress-testing equipment in field exercises.

[5] AR 735-5 (Property Accountability Relief of Responsibility and Accountability); Table 4-2.

- Increase battalion level, and higher, authority to sign off on equipment losses proportionally to the increases made at company level: a 500% increase at each tier.[6] Explore additional increases at company level and complimentary funding to support expected field losses of higher cost military technological devices.
- Reward leaders who create climates of innovation through flexibility, resourcing, and risk-tolerant decision-making.
- Offer and promote lower risk alternatives to full utilization of expensive technologies in a high-risk environment (i.e. simulators, innovation labs, test devices).

OBSERVATION: Soldiers consistently expressed interest in emerging technology and had similar preferred learning methods, regardless of mission, composition, or resource levels.

DISCUSSION: Soldiers almost uniformly (90%), expressed positive sentiment about the importance of technology integration, few neutral, and zero expressed negative sentiment. (Figure 10)

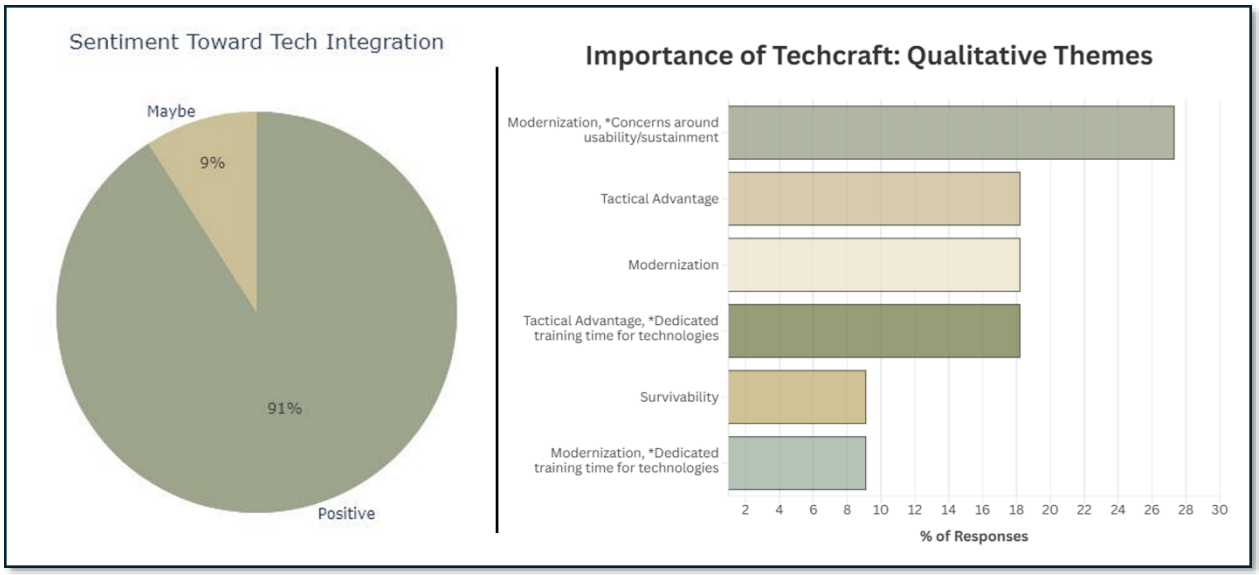

Figure 10. Importance of Technology Integration: Sentiment and Qualitative Themes, Courtesy Army Futures Command

Interview Question: Do you think opportunities for integrating emerging tech is important for your unit?

"Yes, because robots don't bleed." *-Leader, Group 1*

"100%; We can't fight tomorrow's fight with yesterday's equipment." *-Soldier, Group 2*

[6] The new AR 735-5 addressed thresholds at the Company Commander level (increased to $2,500) but did not change thresholds at higher echelons (i.e. BN remained at $5000). There are expendable pieces on new gear that are more expensive than $5,000, indicating regulatory lag behind the Army's transformation effort.

"Yes, its evolving, we gotta use the things that best help us. I would like more training if possible." *-Leader, Group 3*

"Yes, it's just the way I see the Army going with all the new tech; it is complicated. I look like a cyborg more like a Soldier. Too much may just not work. Some of our stuff is overcomplicated for our squad. Maybe it's better for a specialist." *-Leader, Group 4*

Additionally, their responses were framed around Army-aligned themes like modernization, tactical advantage, and survivability, yet many included caveats about the need for dedicated training time and resource support. This indicates a widespread understanding of the importance of technology, but Soldiers have not seen the support they deem necessary for techcraft to materialize.

Soldiers are not resisting technology, but they know success requires conditions the current system does not consistently provide. They are ready for it, but leaders must overcome the external barriers preventing those optimal conditions.

BARRIERS: The failure of the train-the-trainer (T3) model was spontaneously mentioned in half of all interviews. Soldiers and leaders criticized the approach as ineffective and demotivating. Frequently, Soldiers sent to T3 or New Equipment Training (NET), lacked the expertise, credibility, or resources to effectively train others upon return.

"More technology comes out and there is a very hastily put together course with a train the trainer but the trainer may know the most basic stuff but not how to really apply the device." *-Leader, Group 2*

"The new tech takes months to get the knowledge/training. And then you need to get that Soldier back and have the time and access to kit to train the rest of us. I would say it's fair to estimate 2 months to get our 'train the trainer' then 6 months to train the unit. Not very efficient." *-Soldier, Group 4*

Soldier-load was another related barrier consistently raised by Soldiers and leaders. Many voiced apprehension that new technologies, no matter how promising, require offsetting tradeoffs in weight carried. This creates a dilemma: Soldiers are expected to innovate and adopt, but doing so adds literal burden to an already demanding load.

"They keep talking about making us lighter but they just keep bogging us down with kit. The mental effect after hearing I have to carry another thing is so taxing in itself." *-Soldier, Group 4*

"The weight we carry right now is unrealistic. We are going to have to make some hard choices about what we really take into combat. I may be able to tack on all this gear and do this ruck, but if I had to get down into the front leaning rest; all this tech would be submerged in the mud." *-Leader, Group 2*

"Sometimes we determine who does a thing based on their load; I really need to make sure we balance all the items we carry." *-Leader, Group 2*

If left unaddressed, Soldier-load could become a silent killer of innovation; not because Soldiers are not motivated, but because the Army failed to design integration with the user in mind. Soldiers are not resisting change, but they are asking for the support and conditions to succeed with it.

RECOMMENDATIONS:

- Address inadequacies or failures in the T3 model for emerging systems; fund research into the most effective training methodologies and identification of Soldiers to train in the T3 model.
- Identify T3 as a known risk in the next Transformation in Contact OPORD; Provide leaders guidance regarding optimal execution and the target audience of NET.
- Further incorporate embedded SMEs during training events for newly fielded equipment, particularly during early rollout phases. SMEs should be available during scheduled hands-on use, not just during initial briefings.
- Empower junior leaders to plan localized training cycles using these SMEs, shifting training from passive receipt to active mastery.
- Account for Soldier-load during fielding and training/experimentation cycles. Require each new system to identify what it replaces or offsets in a combat load.
- Continue persistent experimentation feedback loops with an emphasis on Soldier-load expectations and results.

OBSERVATION: Collaboration emerged as a decisive attribute for technological readiness.

DISCUSSION: Soldier collaboration was strongly linked to techcraft, amplifying confidence, shortening learning curves, and enabling shared experimentation across teams. Quantitative interpretations showed that collaboration is not a static personality trait, it grows in response to specific environmental conditions which leaders can shape.

DO THIS	**SEE THAT**
Increase Tech Familiarization for Soldiers	↑ Collaboration[7] & ↑ Tech Savviness
Leadership sets Techcraft Goals	↑ Flexibility, ↑ Curiosity
Raise baseline tech proficiency for Soldiers	↑ Tech Savvy & Risk Tolerance

Figure 11. Leader Actions and Soldier Attributes Comparison, Courtesy Army Futures Command

Across the Soldier dataset, a clear relationship emerged: higher levels of technical proficiency and system familiarization were strongly associated with higher ratings in collaborative behavior. (Figure 11). Soldiers familiar with technology share their knowledge and multiply the impact. Additional significant correlations are included in Appendix C Additional Data Sets, found in JLLIS Folder 11792

[7] Collaborator defined as a person who works together with others to achieve a mission or goal. Collaboration is statistically significant and explains 18% of the variance: (+0.43 coefficient, $R^2 = 0.178$; Pearson Correlation .422, *p*-value =.0001)

The most collaborative Soldiers were those who had hands-on technology experience and had leaders who actively pursued the use of technology to solve military problems. (Figure 12). This suggests that collaboration may act as both a catalyst and a conduit; helping Soldiers apply what they know, share what they have learned, and bridge expertise gaps within the team.

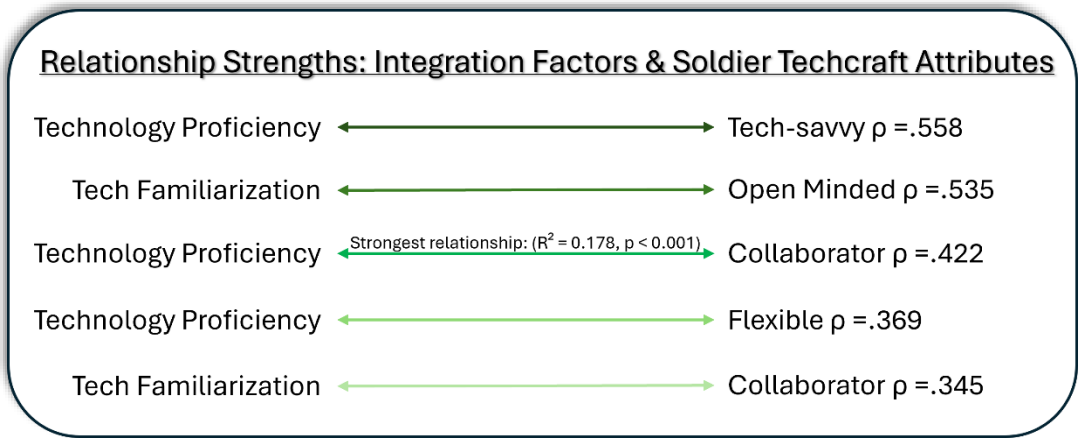

Figure 12. Integration Factors and Soldier (n=78) Techcraft Attributes, Courtesy Army Futures Command

Significant predictor relationships were observed between Soldier familiarity and multiple innovation-related attributes, further suggesting the importance of exposure to technologies to grow techcraft attributes.

Participants acknowledged positive feelings with regard to inclusion in persistent experimentation, and the opportunity to share their thoughts on emerging technology.

"A survey down to joe level is exceptional!" *-Soldier, Group 4*

In high-performing units, collaboration was not just an asset, it was a functional enabler of transformation.
"Our leaders that support our ideas or willing to take time to listen make us more willing to innovate." *-Soldier, Group 3*

BARRIERS: While Soldiers show strong potential for peer-based innovation, leaders are not consistently creating systems to support knowledge flow, which undermines long-term, scalable collaboration.

Collaborative potential may be stifled by a lack of leader-established pathways for knowledge sharing and low awareness / utilization of existing Army feedback channels. When leaders were asked if a formal or informal process existed for Soldiers to share lessons learned or ideas about emerging tech, average responses across all groups remained below 3 on a 5-point scale, indicating no consistent mechanism (or awareness of existing resources) for turning individual discovery into unit-wide learning or progressive change.[8]

[8] During semi-structured interviews, when both Soldiers and Leaders were asked about the Center for Army Lessons Learned (CALL) and the recently released 'Quick-Fire Portal', all reported they had never accessed these resources and only three reported they had heard of CALL.

"What are you doing in your unit to solicit solutions to challenging military technology problems from your Soldiers?"

"Nothing really, but I am interested in technology that solves problems. We could maybe do that during [After Action Reviews (AARs)]." *- Leader, Group 3*

This represents a missed opportunity: even in high-performing units, collaborative momentum can stall without systems that capture, share, and reinforce techcraft behaviors (i.e. awards, recognition).

The absence of these pathways is not just a missed opportunity, it is a barrier to transformation. Without channels to share what is working and what is not, Soldiers reinvent solutions in silos, and the cumulative benefit of testing new technologies in a realistic environment is lost.

Furthermore, Soldiers appreciate when their voice is heard and there is visible change based on their feedback. Leader communication breakdowns, however, hinder the mindset necessary for innovation.

"We have all sorts of kit that doesn't work. We have no one to tell that would result in change." *-Soldier, Group 4*

RECOMMENDATIONS:

- Institutionalize collaborative experimentation. Encourage peer-led technology experimentation events through awards and evaluations.
- Design integration scenarios that require cross-trained knowledge.
- Train junior leaders to identify and grow collaborative talent, not just individual talent with technology.
- Use collaboration as a measured outcome in techcraft assessments and AARs.
- Establish unit-level technology sharing mechanisms, such as a recurring "Technology AAR," shared learning logs, or after-action collaboration debriefs led by junior leaders
- Continue persistent experimentation which prioritizes iterative development based on direct Soldier feedback. Explore expanding Soldier / NCO participation in persistent experimentation events to maximize opportunities for exposure and buy-in on emerging technologies. At the lowest levels, increase inclusion / utilization of established collaborative resources such as: the content and support provided from the Center for Army Lesson Learned; Center of Excellence (CoE) Warfighter Forums; and the Innovation Forum.
- Encourage the use of Quickfire, Military Journals, and similar systems to ensure learning is captured and shared across the Army.
- Support modernization and AI integration for lessons learned repositories to enhance the ease of access to relevant knowledge for Soldiers in a technology infused environment. Simplify or summarize knowledge into digestible and actionable content relevant to the future force.
- Incorporate techcraft lessons into leader professional development, training meetings, or S-6 synchronization meetings to formally connect innovation to planning and sustainment, emphasize importance, and ensure the information is communicated to higher level leaders.

- Conduct further research on the continued impact and significance of collaboration in units which have enhanced direct training opportunities.

DOTMLPF-P Considerations

Doctrine:

- Reference the importance of techcraft in ADP 6-22 *(In Staffing)*.
- Develop a commander's handbook on how to assess unit readiness for technology integration (Sample in Appendix A).
- Army Blue Book mention of techcraft and the mutually supportive elements of technology integration. Reinforce building strength in basic Soldier skills and enhancing unit cohesion; these aspects are the predicate foundation for success in technology fielding.
- Explore Doctrinal opportunities to provide examples of messaging techcraft goals; (i.e. TC 6-22.6; page 2-2, "Support progress toward goals through focused communication.")

Organization:

- Add an Innovation Officer/NCO at Division and above levels with authority and resource support.
- Consider further research into:
    - Future Force expectations for 10/20/30 level maintenance in technologies
    - What echelons are most appropriate to make decisions which support techcraft: fielding plans, training, NET, resources required/allotment

Training:

- Explore improvements in the Train-the-Trainer (T3) model for advanced technology. Leverage existing models from ARI and expand research into ideal training modalities.
- Issue a 'best practices' guide with all fielding / NET training orders; embed SMEs during fielding and initial integration.
- Increase use of Innovation Labs[9] and simulators as low risk / low-cost options to technology infused training.
- Consider further research into building training paths for new technology (technology agnostic).

Materiel:

- During all Research & Development and fielding of new technologies, ensure new technology that a Soldier must carry either replaces something already carried or is of such value that the Soldier will want to carry it.
- Include additions into requirements documentation: embedded SMEs during training events for newly fielded equipment, particularly during early rollout phases. SMEs should be available during scheduled hands-on use, not just during NET.

[9] Eaglewerx, Fort Campbell; Applied Innovation Lab, Fort Bragg; Marne Innovation Center, Fort Stewart; Mountain Innovation Systems Integration Lab, Fort Drum; ARCENT Innovation and Manufacturing Center, Camp Arifjan; Mountain Innovation and Simulation Technology Lab, Fort Harrison; Tactical Operations Related to Cybersecurity Hub, Morgantown; Mobile Immediate Need Engineering Resource

- Strengthen Simulators / Innovation Lab projects by matching them to the Mission Essential Task List (METL) of units served.

Leadership & Education:

- Include 'risk tolerance' reflections in 360 Assessments – connect the concept to equipment decisions.
- Update professional military education to teach leaders how to shepherd innovation:
    - Formally connect innovation to planning and sustainment. Ensure ground level lessons learned connect to higher level leaders for positive action and follow-through signaling to the unit that techcraft is important. Incorporate techcraft lessons learned into Leader Professional Development, training meetings, or S-4, S-6 synchronization meetings.
    - Supply leaders with techniques to encourage Soldiers to look at how technology can be improved, processes improved. Establish unit-level technology sharing mechanisms, such as a recurring "Technology AAR"
- Use collaboration as a measured outcome in techcraft assessments and AARs. Emphasize collaboration as a force multiplier as early as initial military training.
- Further investigate Army policies, procedures, and cultures that impede leader commitment/capability to effectuate behaviors in line with FM 6-22 and ADP 6-22 models[10]

Personnel:

- Conduct further research into techcraft related Knowledge, Skills, and Attributes (KSAs).
- Reinvest in supply expertise. Incentivize 92Y Unit Supply Specialist Soldiers.
- Address increases in logistical demand for Transformation in Contact (TiC) units:
    - Consider providing a supply specialist or civilian employee as short-term individual augmentee to support TiC units.
- Explore adding a Technology Engineer position to select units
- Assign dedicated personnel duties to integrate the lessons learned program to the lowest levels.

Facilities:

- Installation Range Control, Army-wide, should make standardized adjustments to training areas to enable techcraft – consideration of frequency effects, airspace, and utilization of energized systems.
- Installations should enhance efforts to communicate existing techcraft support resources (i.e. innovation labs, simulators) to mid-level and below leaders. Maximize access and utilization of the systems for junior leaders and Soldiers ensuring:
    - The Ability to track utilization and research effects of Innovation Labs on Soldier techcraft. The findings indicate that utilization of these resources is more likely to occur if part of programmed training; Soldiers expect the Army to provide the time and space to train their techcraft.
    - Consider installation of new simulators for new systems, as fielded.

[10] Particularly highlighting the attributes from the LRM associated with Intellect: Mental Agility, Sound Judgment, Innovation, and Expertise. Reviewers from CAC emphasize that all stand out as attributes needed to enhance techcraft. Refer to page 4-5 of ADP 6-22 for a quick summary. Activities to receive feedback, study, and practice these attributes can be found in FM 6-22 starting on page 4-16.

- Consider construction of an AI and Autonomy Training and Research Center to increase understanding of emerging technologies in a military context.

- Explore opportunities for sharing ideas quickly on Soldier familiar platforms that can be secured; i.e. Discord Server.
- Evolve technical and mechanical facilities to accommodate repair and maintenance of new technologies; i.e. "Motor pool of the future".

Policy:

- Re-evaluate 'field loss acceptable' items; evaluate and reclassify select gear as Class V 'expendable,' retaining accountability when issued yet with the expectation that rugged use may result in damage or destruction of the item.
  - Consider in successive TiC OPORDs a list of items that should become 'field loss acceptable' items; direct commander to identify those items in their inventory and to incorporate them into training with offset risk conditions.
- Revise policy to increase the ease of industry and lower echelon collaboration; increase the ability for leaders to legally use, experiment, and test emerging technologies in field training.

CONCLUSION

Technology presence does not equal technology readiness. Soldiers may see equipment, but they do not automatically 'see' preparation for future conflict unless it is made deliberate and personal. Therefore, immediate leader involvement is critical. Modernization succeeds not by issuing new equipment alone, but by cultivating future-focused leadership, Soldier ownership, and visible pathways for techcraft innovation at every echelon.

The techcraft collection makes one thing unequivocally clear: the mere presence of modern technology does not ensure readiness for the future fight. While advanced systems are fielded with increasing frequency, true transformation depends on the conditions leaders create; conditions that enable Soldiers to access technology, trust it, train with it, and integrate to effect.

Across the hundreds of data points assessed, the most effective environments had tactically proficient, cohesive teams with leaders that set clear goals, tolerated calculated risk, resourced their intent, and empowered their Soldiers to experiment in these climates. Soldiers reported higher confidence, adaptability, and willingness to integrate technology into real-world tasks, traits that were reinforced, not assumed.

Conversely, units with modern inventories but absent leadership focus, disrupted training timelines, or repeated logistical failures routinely underperformed. The result is a pattern: technological success follows leadership behavior, not material presence alone.

If the Army is to succeed in large scale operations, it must go beyond issuing modern technologies. It must issue intent. It must build resourced, risk-tolerant, leader-driven cultures where Soldiers are not just allowed to innovate, they are expected to. Transformation is not something we equip, it is something we lead.

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Appendices:

Appendix A. Commander's Tool to Determine Unit Technological Readiness
Appendix B. Measurement Tools, found in JLLIS Folder 11792
Appendix C. Additional Data Sets, found in JLLIS Folder 11792

Note: The Joint Lessons Learned Information System (JLLIS) is only available to authorized users. In order to access this site, you must establish a JLLIS account at https://www.jllis.mil.

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Appendix A. Techcraft Collection: Commander's Tool to Determine Unit Technological Readiness

Purpose. This guide is intended as a rough guide to assist Command Teams in assessing organizations within their command and determining their readiness to receive new technologies. This guide was based on three key dimensions derived from observation, surveys, and outcome analysis, calculated by group and normalized from multiple quantitative survey items during the techcraft collection:

1. Cohesion derived from observer ratings of team dynamics including communication, trust, shared objectives, support, and morale.

2. Soldier Task Success taken from Observer-rated "Success at Soldier Tasks;" and interpreted as a measure of baseline Soldier proficiency.

3. Technology Exposure which is a score reflecting the frequency of interaction with new technologies, access to resources, and opportunities to innovate.

Each of the eight possible combinations of go/no go values across the three dimensions was assigned: a nickname (e.g., Model Unit, Overextended Innovators); profile summary; targeted sustainment recommendations; improvements; risk in integration of new technology; and observable indicators to help Commanders identify their own unit type.

The most successful introduction of new technologies is predicated by a cohesive unit, fully versed on existing Soldier skills and kit, and open to the possibilities of a tech-integrated battlefield. Cohesion was weighted more than the other two variables based on the findings of the techcraft collection. Therefore, units assessed as struggling with Cohesion will rate as moderate or high risk for introduction of emerging tech.

If leaders determine weakness in any area, for any climate/environmental reason (i.e. REAARM Cycle, change of command, summer PCS season, leader risk aversion, resource constraints, etc.), they should consider adjusting the introduction of new technologies and/or experimental field exercises until they can build the conditions primed for best outcomes.

Furthermore, to help commanders assess their unit's readiness to adopt and integrate new technologies a sample set of survey questions has been provided. These questions are designed to be added to a DEOCS (Defense Organizational Climate Survey) as a custom module to provide insight into the unit's current state across three dimensions used in this guide: Cohesion, Soldier Task Proficiency, and Technology Exposure.

Commander's Guide to Unit Tech Readiness: Profiles and Recommendations					
Model Name	Profile (Cohesion / Skill / Exposure)	Sustainment Focus	Improvement / Change Focus	Tech Introduction Risk Level	Commander Identification Guide
Model Unit	(Cohesion / Skill / Exposure) High / High / High	Enablement of Soldier-led innovation; cross-unit mentorship	Expand tech-testing roles and opportunities for hands-on; document best practices for Army-wide scaling	Low	Soldiers are confident, teams are trusted, gear is used as intended or creatively adapted. NCOs are leading innovation without prompting. Leaders are empowered to fail; experiment through left/right guidance and resource support through higher HQs.
Steady but Underutilized	(Cohesion / Skill / Exposure) High / High / Low	Strong peer training and trust networks	Increase resource access, exposure opportunities and tech confidence through training exercises	Low	Soldiers demonstrate mastery of core tasks and teamwork, but avoid or resist unfamiliar equipment or systems, often due to lack exposure opportunities and/or Leader risk-aversion. There is discipline but minimal experimentation.
Skilled but Fragmented	(Cohesion / Skill / Exposure) Low / High / Low	Individual technical competency	Team-building, shared objectives, and leader engagement; explore opportunities for familiarization	High	Soldiers show talent and task execution but default to working alone. High performance is unevenly distributed, unrecognized, and tech use is driven by individual personality/proclivity versus leader direction.
Overextended Innovators	(Cohesion / Skill / Exposure) Low / High / High	Field-level experimentation capacity	Build cohesive frameworks to sustain innovation and reduce burnout; protect training and personal time; reward team accomplishments	Moderate	Soldiers are confident with equipment but frustrated with leadership inconsistency or unclear direction. Unit lacks shared rhythm or purpose. (Unit may be at a cycle of high turnover or experiencing a recent change of command).
Emerging Force	(Cohesion / Skill / Exposure) High / Low / Low	Trust, effort, and motivation	Focused Soldier skill development with low-risk tech exposure (i.e. simulation)	Moderate	Unit is enthusiastic and willing but slow at integrating new systems. Unit is often 'tasked' to execute last minute missions extraneous to core mission. Common to hear "we want to do more" but technical errors are frequent or basic.
Potential Hotspot	(Cohesion / Skill / Exposure) High / Low / High	High buy-in and tech access	Targeted foundational training to avoid tech outpacing Soldier ability	Moderate	Soldiers express positive attitudes about innovation and have tools available but fumble basic task execution even while supplied with advanced tech. Results may vary wildly between teams or shifts.
Isolated Achievers	(Cohesion / Skill / Exposure) Low / Low / High	Independent success with hardware	Command team development and collaborative problem-solving training; high reps/sets in basic skills to build teams	High	Soldiers may use gear well in bursts or during evaluations but underperform as a team. Miscommunication is common; Soldiers lack clarity on unit objectives. Innovation is siloed or led by one overburdened high performer.
At-Risk Environment	(Cohesion / Skill / Exposure) Low / Low / Low	N/A	Reset training fundamentals, leader development, low-risk cohesion drills, be careful when introducing technologies	High	Frustration and confusion are common. Tasks are incomplete, tech is ignored or misused, risk aversion is high, and morale is low. Leadership often reactive and crisis-driven.

Custom DEOCS Survey Questions for Techcraft

All responses use standard DEOCS 5-point Likert scales:
- Agreement scale: Strongly Disagree (1) to Strongly Agree (5)
- Frequency scale: Never (1) to Always (5)

COHESION

1. Members of my unit freely share ideas about how to use or improve the technologies we're issued. (Agreement)
2. When new technology is introduced, our team works together to figure out how to apply it effectively in our mission. (Frequency)

SOLDIER TASK PROFICIENCY

3. My unit maintains strong performance in fundamental Soldier tasks even during periods of technolgical experimentation or modernization. (Agreement)
4. Leaders in my unit ensure that technology complements—not replaces—our tactical training. (Agreement)

TECHNOLOGY EXPOSURE

5. I regularly get hands-on opportunities to explore and train with new or emerging military technologies. (Frequency)
6. When technology is introduced, I know what it's for, how it connects to our mission, and how to give feedback on it. (Agreement)

Scoring: To determine which unit technology readiness model your formation most closely reflects:
1. Score each response from 1–5.
2. Average each dimension: Q1 + Q2 = Cohesion; Q3 + Q4 = Soldier Task Proficiency; Q5 + Q6 = Technology Exposure
3. Use the average scores to match your unit to the corresponding profile in the Commander's Guide to Unit Technological Readiness:

Additional Ideas for Use:
- Compare pre/post TiC, technology fielding, or experimentation participation
- Share trends with subordinates for targeted leader development
- Incorporate techcraft feedback into quarterly training assessments or command climate briefings