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Air Force Persistent Logistics

Sustaining Combat Power during 21st Century Competition and Conflict

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About the Forum

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Resilient and agile logistics…to ensure logistics sustainment while under persistent multi-domain attack.

U.S. National Defense Strategy, 2018

For the last three decades, adversaries watched the American way of war, learning how we operate and planning ways to counter our strengths. While supporting those three decades of operations, the Air Force basing and logistics enterprise became accustomed to operating in permissive and semi-permissive environments.[1] A learning, near-peer adversary will not offer this luxury in future conflicts. For this reason, the National Defense Strategy highlights "logistics under attack" as a key operational problem.[2] It recognizes the challenges a capable adversary will pose to our ability to sustain a fight by disrupting our transportation networks, attacking our information systems, and placing our installation power projection platforms under threat of physical attack.

Chief of Staff of the Air Force General CQ Brown's recently published "Accelerate Change or Lose" strategic approach eloquently expresses the need for urgent change. Given the understanding that "good enough today will fail tomorrow," the Air Force has a lucid vision and a clear mandate for action.[3] If logistics under attack is the key operational problem, then "persistent logistics," with the inherent ability to **posture, sense, and respond**, is the warfighting answer.

Posture, Sense, Respond

In any future conflict the NDS plans to address, logistics must support operational employment concepts and fuel the future fight regardless of the conditions on and off the battlefield. Multi-domain operations require persistent logistics to sustain and defend the force in contested environments from the tactical edge to the homeland and demand that logistics forces have the ability to "move to win." To this end, the A4, the air staff responsible for logistics, engineering, and force protection, collaborates closely with our joint and Air Force teammates, and our efforts remain tightly linked with evolving operational concepts, such as the joint warfighting concept, joint concept for contested logistics, and Agile Combat Employment (ACE), in order to survive and sustain combat power generation while under constant multi-domain attack through **posture, sense, and respond**. We view **posture, sense, and respond** as the logistics equivalent of "understand, decide and act" or, alternatively, John Boyd's observe-orient-decide-act "OODA" loop.[4] These three approaches allow the basing and logistics enterprise—functioning in concert with the operational kill chain—to create the desired effects across the competition continuum.

Posture for strategic inter-state competition. "**Posture**" is the element of persistent logistics with the most breadth, as it requires us to envision the future operating environment and set the conditions for success. It entails preparations for ACE in forward-based, highly contested areas; it entails new ways of training to produce Multi-Capable Airmen;[5] it begs for re-thinking pre-positioned equipment acquisitions and modernization, to include hardening and deception measures; and it extends to the rear echelon by protecting our depots, power projection platforms, and sometimes fragile supply chains from non-kinetic attacks. All of this requires reassessing force structure, force presentation, footprint, and international agreements.

Furthermore, it requires changing how the logistics, civil engineering, and force protection enterprise organizes, trains, and equips forces. Air Force doctrine calls for mission-ready forces prepared to operate in highly contested environments to be positioned with the right materiel at the right place and time to meet mission objectives.[6] We must right-size and posture pre-positioned equipment and commodities to meet operational objectives. We must also exercise regularly to allow Airmen

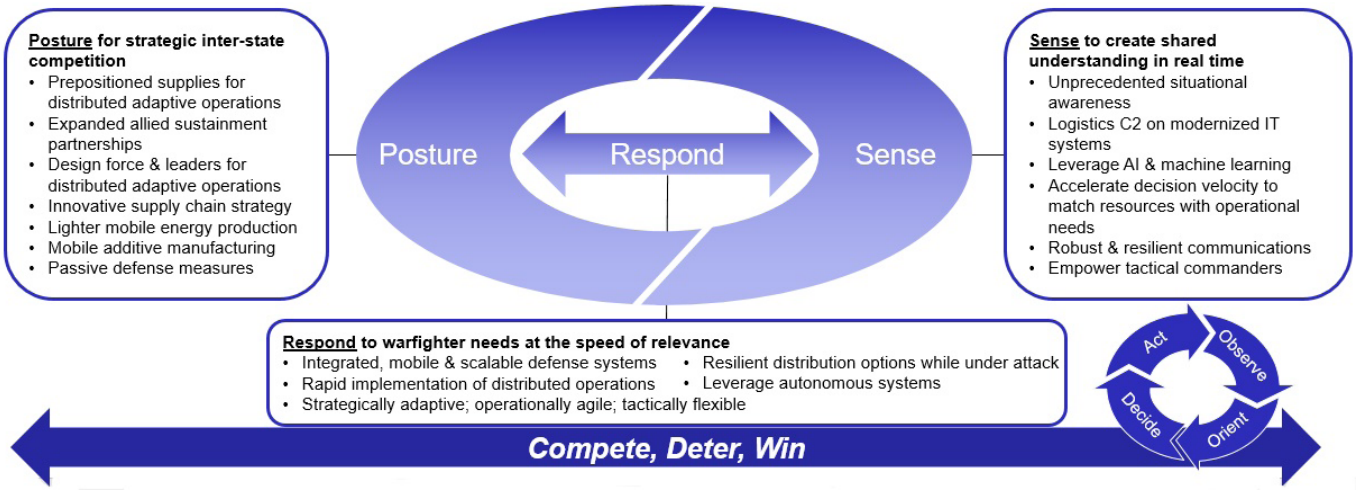


Figure 1: Persistent logistics strategic approach (posture, sense, and respond)

Source: U.S. Air Force

familiarity with those capabilities they will employ under fire. Innovations must focus on new ways to package, store, maintain, and transport materiel. A resilient sustainment network will underpin the global network of operating locations. Leveraging technologies such as additive manufacturing to reduce supply chain vulnerabilities and optimizing organic and contractor support capabilities will improve repair network capacity, supply chain velocity, and surge responsiveness. The supporting distribution network must enable the force to move and operate in contested environments and multiple domains. All of this must be postured before the call comes from our senior leaders and combatant commands.

Much of the work described above must be enabled with and through allies and partners. Allies are critical to improving access and setting theaters, and they may act as force multipliers for various capabilities. Where feasible, operating locations will have integrated base defense capable of protecting the force against kinetic and non-kinetic multi-domain threats. Updates to policy to facilitate access, basing, and overflight agreements; force posture; and combined exercises should be optimized to support future warfighting requirements.

Posture also involves how we present and generate forces, whether it's for an NDS fight or a threat that falls below the threshold of armed conflict, such as Humanitarian Assistance/Disaster Relief (HA/DR) or Dynamic Force Employment. For these scenarios, we must posture and train Airmen in ways that enable them to conduct operations that generate effects, counter multi-domain threats, and recover from damage across the full spectrum of military operations as part of a combined joint team. On the high end of that spectrum, agile operations will complicate the targeting problem for adversaries by unpredictably utilizing numerous, less-robust operating locations, which must

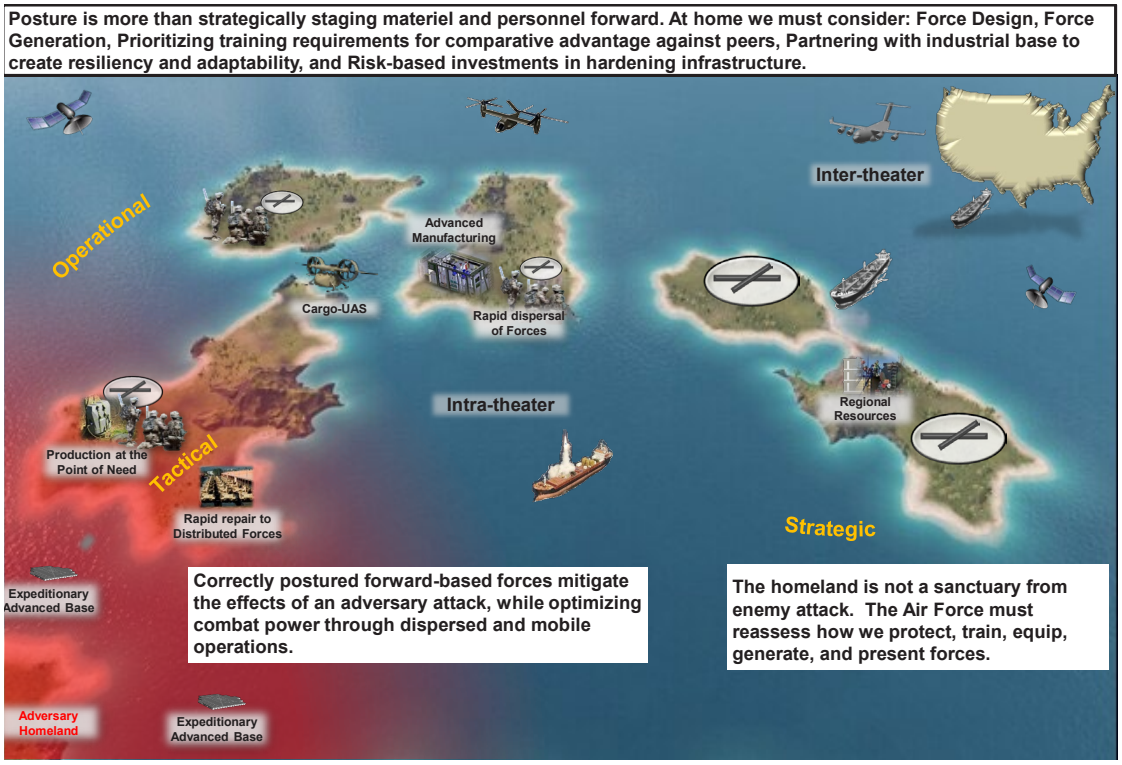


Figure 2: Persistent logistics: posture

Source: U.S. Air Force

Figure 3: Members of the Royal Australian Air Force, U.S. Air Force, and Japan Self-Defense Force participate in a simulated live-fire scenario

Source: U.S. Air Force

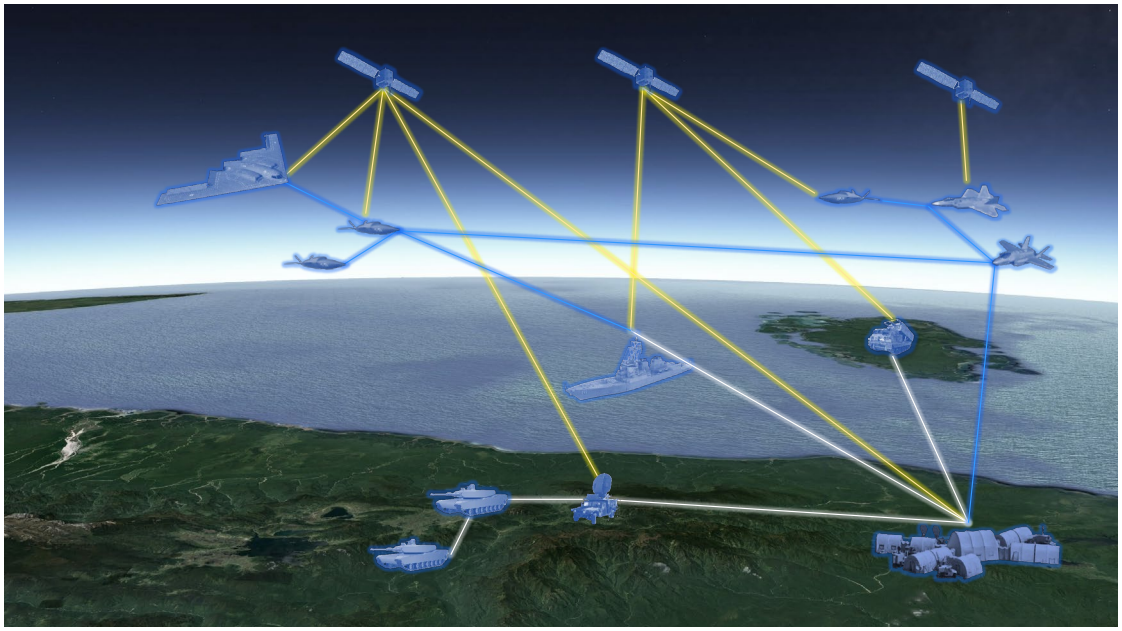
be prepared, to some degree, in advance. Agility also requires supply kits and airfield damage repair capabilities to be lighter. This same force posture and generation model framed for near-peer conflict could also be employed in HA/DR scenarios.

Posturing includes active and passive defense measures (such as camouflage, concealment, deception and dispersal) at forward locations as well as in the continental United States. Traditional passive defense measures such as dispersal and hardening have an important role to play, but they can be applied in novel ways to complement emerging operational concepts such as ACE. We must harden key assets and infrastructure at main operating bases in a manner that prioritizes resilience and optimizes comparative advantage. This could include hardening against cyber threats and other non-traditional, non-kinetic threats. Additionally, we should consider emerging power generation technology such as lightweight solar alternatives, advanced battery systems, or micro-reactors to reduce the need to transport heavy generators or fuel. These passive measures will be complemented by active measures that will posture the Air Force to respond to an unpredictable, complex environment.

Sense to create and share real-time understanding. We define "**sense**" as fielding the correct mix of technology, leadership competencies, and knowledge management to overcome information overload and provide leaders with the relevant, timely information needed to build situational awareness through tactical, operational, and strategic echelons. It requires a highly connected network of sensors, systems, and organizations, to include allies and industry, utilizing robust, self-healing, multi-path "mesh" networks that support operations in degraded environments and protect against the loss of single nodes. Modernized information technology will employ artificial intelligence and machine learning (AI/ML) through cognitive analytics and visualization tools. This will support rapid decision-making, reducing the decision-to-implementation timeline while keeping the human "on the loop" (versus "in the loop"). Sensing enables the ability to share

Figure 4: Notional system of systems enabled by JADC2

Source: Mitchell Institute



decision-quality information and decision support capabilities with the Joint Logistics Enterprise, as well as select allies, partners, and commercial industry stakeholders. Notably, we do not seek to further centralize decisions and pull authorities to higher echelons through **sense**. Instead, we aim to empower commanders at the lowest levels to make better, faster decisions and simultaneously maintain an enterprise view in order to avoid sub-optimal choices and de-conflict competing priorities.

We will enhance the resiliency of networks and Airmen in the face of cyber and electronic threats. Advanced cryptography and blockchain-like technologies will protect information against cyber-intrusions. Cyber-native Airmen will use data analytics and information sciences to exploit advantages and mitigate risks. Investments in digital modernization will prioritize a Department of the Air Force "Internet of Things," with an open architecture, system-of-systems approach enabled by common standards for data, technology and applications integration. Big data holds great potential, but only if we can aggregate data in a standard format—collated and prioritized specifically to improve the quality and speed of decisions up and down the command hierarchy.

Sense must leverage all the technologies mentioned, but it will be enabled through changes in policies, processes, and culture. We have learned from similar technology journeys both within and external to the Air Force that material solutions alone will not guarantee mission success.[7] Investing in technology in a quest for maximum efficiency of status quo processes and legacy organizational structures leads to sub-optimal results. Hence, we will examine organizational design and policies with an eye to improve knowledge management and decision-making processes in ways that will ultimately enable operational agility for empowered commanders at the tactical edge of operations. At the major command level and below, processes for making and executing basing and logistics decisions should be evaluated to remove self-imposed constraints, empower leaders, and enable initiative. Leaders across the enterprise must work to change organizational

culture to value resiliency, responsiveness, and collaboration—built on a foundation of trust—to realize the potential increases in operational pace.

Respond to warfighter needs at the speed of relevance in an unpredictable environment. In the persistent logistics strategic approach, "**respond**" means creating a force that is tactically flexible, operationally agile, and strategically adaptive. This entails sustaining and defending smaller, lighter, dispersed, and more agile strike packages in a theater. It also involves overcoming bureaucracy at the strategic level to ensure the decision quality and speed enabled by **sense** can be acted upon in a high-end fight. An agile basing and logistics enterprise will create multiple operational dilemmas for adversaries through dispersal and deception, as well as through enabling joint information and electromagnetic spectrum operations.

To a large degree, **respond** relies heavily on **posture** and **sense**. The former can constrain response options, while the latter must provide actionable information to permit multiple response opportunities. **Respond** must happen in theater, and it must include the ability to rapidly flex forces and equipment to the point of need. This makes distribution systems, lift capabilities, and partnerships crucial to expand capacity, reduce footprint, and enhance resilience. Pre-conflict investments made during **posture**, specifically in force development and training, will pay dividends to overcome setbacks and develop operationally effective responses in contested and communications-degraded environments. Similarly, posturing measures to defend base clusters—including air base air defense; Counter small Unmanned Aerial Systems (C-sUAS) capability; defensive multi-domain command, control and communications; and enhanced security forces teams, combined with lighter, leaner repair capability—will be critical to deploying viable **respond** options in order to sustain combat power in the future operating environment.

Figure 5: Airmen practice airfield damage repair

Source: U.S. Air Force

Respond also must happen in the homeland to protect and optimize the enterprise processes that fuel the fight forward. It can involve AI/ML to know when supplies are required by the warfighter, turning a "pull" system based on requisitions to a "push" system based on predicted need. This would deny adversaries the advantage gained from potential temporary disruptions to our sustainment system. We must couple this transition to a "push" system with agile distribution systems and new lift capabilities that leverage autonomy. We must also develop concepts for partnering with allies to make use of a broad set of airfield options, and when not available, runway-independent operations. This will maximize many more dispersed locations which can be sustained for hours and days (rather than weeks or months) on short notice to support high-intensity operations. Such concepts would take advantage of windows of opportunity inside the threat ring, placing the enemy on the horns of multiple dilemmas.[8]

However, no matter how well we employ ACE concepts, our power projection platforms will sustain damage, and we must develop

Figure 6: Innovative repair materials developed to use locally available material

Source: U.S. Air Force

capabilities to enable short-duration, high-intensity operations in the aftermath of kinetic attacks on our installations and forward operating locations—as envisioned in the NDS. We have continued to modernize our airfield and infrastructure repair capabilities over the years; however, technology and employment concepts were focused on operations at main operating bases, rather than at dispersed austere locations. Hence, equipment sets and supporting repair materials are large, heavy, and manpower intensive. Future repair capabilities must be easily transportable, use available materials to reduce the burden on the supply chain, and minimize both the number and reliance on specialized Airmen to employ.

Finally, strategic interstate competition occurs at all times in multiple domains. As such, the logistics enterprise must be ready to respond to threats below the threshold of armed conflict as well. This will require coordinated efforts with other federal agencies, allies and partners, and industry to secure sensitive data, plans, and critical infrastructure; improve resiliency and flexibility within the Defense Industrial Base; and enable increased capacity for dynamic force employment.

Closing Capability Gaps & Operationalizing Persistent Logistics

In order to win, we should operate at a faster tempo or rhythm than our adversaries.
John R. Boyd, Col (ret.), USAF

Adaptability, agility, and resilience are key attributes that will dominate the 21st century security environment. Persistent logistics—**posture, sense, and respond**—provides our strategic approach to delivering those attributes for the Air Force, and it solves the key operational problem of conducting logistics under attack in an era of great power competition. **Posturing** for strategic inter-state competition, **sensing** at the speed of relevance, and **responding** to warfighter needs in an unpredictable environment addresses the "operational end" of our business. We've analyzed the root causes of our challenges and have begun to action multiple lines of effort toward overcoming those challenges through a fully integrated and synchronized plan within the Air Force.

However, meeting the challenges of great power competition requires partnerships beyond just the Department of the Air Force,

Department of Defense, and other federal agencies. Perspectives from academia, think tanks, and the broader Defense Industrial Base add valuable diversity of thought and potential innovative solutions we must consider how to remain relevant in a rapidly evolving security, technology, and resource environment. Our ongoing relationships with federally funded research and development centers (RAND, MIT-Lincoln Labs, and MITRE, for example) have continued to further our body of knowledge in breakthrough warfighting capabilities. Additionally, as multiple studies have shown, the bulk of research and development now occurs outside the Department of Defense as compared to the previous century. Advancements in computing, autonomy, artificial intelligence, energy storage and transport, and resilient materials—just to name a few—have largely been pioneered within the commercial sector, particularly when it comes to practical application of technology. We have embarked on several initiatives to build connective pathways between the Air Force and industry—most notably with organizations like AFWERX with AFVentures to expand the technology base and Prime to expand transition pathways between innovation and implementation. Finally, relationships with vibrant think tanks like the Mitchell Institute bring all of these elements together to explore the "art of the possible," built on the foundation of historical lessons learned.

Interoperability with allies and trusted partners should also be designed to better enable "move to win" operations. ACE is one way of conceptualizing "move to win" operations—a basic understanding of ACE leads to the conclusion that the effectiveness of ACE operations is significantly enhanced as operating location options increase. Operating from a larger number of less predictable locations complicates adversary targeting and increases the effort required by adversaries to reduce USAF combat power generation.[9] The most efficient way to increase operating location options is to partner with allied nations. Air Force basing and logistics enterprise leaders must deliberately increase and enhance engagement with allies and partners while remaining aligned with national policy and combatant commander intent. Rather than thinking in terms of historical precedent, we must think creatively about improved interoperability to turn aircraft, share information, pool munitions, defend against all domain attacks, and collaborate to transport supplies or personnel. The integration of data and resources could enable significant progress in addressing bottlenecks driven by geography, supply, or transportation.

The aspirational capabilities outlined in our discussion of Persistent Logistics provide multiple opportunities for a "whole of United States" approach to solutions. Within **posture**, we outlined the need to explore innovative energy technologies to lessen our fuel burden, as well as resilient hardening materials to strengthen passive defense measures. Additionally, we recognize the necessity to modernize our pre-positioned equipment to increase agility and interoperability with service and allied partners. To increase our ability to **sense**, we continue to collaborate with industry leaders in data integration and have begun piloting AI/ML applications to quicken our pace to "observe and orient," as well as increase our predictive capabilities in the area of aircraft maintenance and re-supply. Architecting and fielding a "DAF Internet of Things" to couple with the Air Battle Management System's "Military Internet of Things" is a critical foundational capability if we are to realize a truly interconnected, self-healing, meshed sense capability for

all echelons of command and across the sustainment federation. Together, our ability to **posture** and **sense** will permit viable **respond** options both forward and in-garrison, but only if we continue to remain organizationally relevant and explore ways to optimally balance effectiveness and efficiency.

While the challenges are significant, there is reason to be optimistic. The United States Air Force is a service founded on military challenges posed by disruptive technology. The roots of the adaptable and empowered culture required now already exist in today's Air Force.

Today and over the next 20 years, the increasing speed of economic, political, and security changes means the superior military force will often be the more adaptable, more resilient force. The air and space forces better able to rapidly adapt to unexpected challenges in the operating environment or unpredictable enemy actions will have a significant advantage. By accelerating transformation towards persistent logistics, the Air Force will be positioned to employ and sustain new and evolved capabilities to outpace, outmaneuver, out-think, and outcompete adversaries as part of a joint or combined warfighting force.

Endnotes

1 A permissive environment can be defined as an "operational environment in which host nation military and law enforcement agencies have control, as well as the intent and capability to assist operations that a unit intends to conduct," from the *DoD Dictionary of Military and Associated Terms* (June 2020). In future high-end wars, peer or near-peer adversaries have the ability to contest the U.S. ability to defend, sustain, and deploy forces in multiple domains. We cannot assume the global common air or sea lanes would retain the attributes of permissive environments.

2 Office of the Secretary of Defense (OSD), *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge* (Washington, DC: DOD, 2018), 7.

3 Charles Q. Brown, *Accelerate Change or Lose* (Washington, DC: United States Air Force, 2020), 2, 4.

4 Christian Brose, T*he Kill Chain: Defending America in the Future of High-Tech Warfare* (New York: Hachette Book Group, 2020), 233.

5 Multi-Capable Airmen (MCA) consist of specific subsets of selected enlisted career fields (Air Force Specialty Codes [AFSC]) who will be trained/certified to perform specific tasks outside of their core AFSC in order to enable Agile Combat Employment. MCA execution is in development.

6 Air Force Doctrine Volume 1, Basic Doctrine Annex 4-0 "Combat Support."

7 Eliyahu M. Goldratt and Jeff Cox, *The Goal*, 30th Anniversary Ed. (Great Barrington, MA: North River Press Publishing Corp, 2014), 9.

8 Department of the Air Force, *Air Force Future Operating Concept*, 2015, 19.

9 Miranda Priebe et al., *Distributed Operations in a Contested Environment: Implications for USAF Force Presentation* (Santa Monica, CA: RAND Corporation, 2017), viii.

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