Defining "Surety" Within the Interagency

by Punna Khanna Hayes

The fundamental differences between nuclear weapons, chemical agents, and biological select agents and toxins (BSAT) and the different ways in which interagency personnel interact with these materials necessitate different variations in protocols for their handling. These differences and handling protocols give rise to differing definitions of "surety," a concept the U.S. government uses to describe how personnel handle these sensitive items. The various surety programs found across the interagency are designed to ensure the safety, security, and reliability of U.S. nuclear, chemical, and biological weapons. The interagency—particularly the Department of Defense (DoD)—was initially convinced that "surety" should be defined the same way for every program. This article describes how that philosophy has changed and how various agencies now define surety differently and consequently operate differently. The DoD, Department of Energy (DOE), Department of Health and Human Services (HHS) and Department of Agriculture (USDA) maintain separate surety programs to regulate special nuclear material (SNM), chemical agents, and BSAT because each program is governed by multilateral and bilateral international treaties and federal law and regulated within specific agencies within the interagency. This article also highlights the common thread of "personnel reliability" these agencies share in their surety requirements.

Background

Throughout the history of the nuclear, chemical, and biological surety programs, various U.S. government agencies have debated and redefined what surety means. Surety did not exist as a concept until well after nuclear weapons were developed in 1945. Various U.S government agencies began formulating surety policy in the early 1960s, after a disturbed Air Force enlistee, receiving psychiatric therapy for deep depression, pointed a gun at a U.S. nuclear weapon located in Britain. Once the

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enlistee's psychiatric history was revealed, the U.S. imposed improved screening processes for those personnel in contact with nuclear weapons.[1] Ultimately, the U.S. government agencies would initiate various programs known as surety to maintain the security of U.S. nuclear weapons by protecting them from accidents, incidents, and unauthorized detonation. Such surety programs included an in-depth assessment (known as the personnel reliability program) to screen personnel before allowing them to work with nuclear weapons and codified the associated procedures in Service surety regulations. Surety programs for chemical and biological weapons were subsequently established.

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Over time, the interagency has adopted surety definitions that vary by material and mission. Today, personnel across the interagency—including the DoD, the DOE, HHS, and USDA—involved or otherwise affected by operations with nuclear weapons, chemical agents, and BSAT are subject to different surety standards with varying safety, security, inventory- accountability, and personnel-reliability procedures. Nuclear, chemical, and biological surety programs are defined in accordance with specific missions across the interagency (i.e., operational versus research, development, test, and evaluation [RDT&E]). Surety standards are designed to protect nuclear weapons from accidents, incidents, and unauthorized detonation, while those for chemical agents and BSAT protect these materials from theft, loss, diversion, release, or unauthorized access.

Per the DoD, surety programs consist of "policies, procedures, controls, and actions that encompass safety, security, and control measures, which ensure there will be no nuclear weapon accidents, incidents, unauthorized detonation, or degradation of weapon effectiveness."[2] Individually, the elements combine to provide surety. Agencies arrive at these varying definitions and programs based on vulnerability assessments that identify specific threats and risks to the materials and the facilities, and these are not the same.

Components of Surety

In order to understand why the nuclear, chemical, and biological surety programs differ across the interagency, one must understand how the separate elements of surety apply to SNM, chemical agents, and BSAT. Personnel conducting operations with these materials use specific procedures that may not directly transfer from one category of material to another.

Nuclear

The elements included for nuclear surety are safety, security, the personnel reliability program, nuclear weapons control, survivability, and the reliability of the nuclear weapons themselves. Interestingly, while the Air Force relies on the DoD definition of "nuclear surety," the Navy and Army have different definitions. For the Navy, surety is "ensur[ing] that nuclear weapon[s] and nuclear weapon systems are designed, maintained, transported, stored, and employed to maximize nuclear weapon and nuclear weapon systems safety, security, control, and reliability consistent with operational requirements. . . "[3] Conversely, the Army defines surety as "ensur[ing] the safety, security, reliability and survivability of Army operations in support of DoD's nuclear weapons program and at Army nuclear reactor facilities."[4] Within DoD, nuclear-weapon capable units of the Air Force and Navy must be operationally ready to implement an order to employ nuclear weapons, while the Army still has its own surety program. The difference in definitions reflects each service's role within the DoD nuclear enterprise by materiel and mission. The DOE,

Organization	DoD	DOE	Army	Air Force	Navy
Safety	X	X	X	X	X
Security	X	X	X	X	X
Personnel Reliability	X		X	X	X
Accountability	X	X		X	
Use Control	X	X		X	X
Survivability	X			X	
Weapon Reliability	X			X	X

Table 1: Comparison of Different Organizational Understandings of Nuclear Surety

however, defines nuclear surety as the "safety, security, and use control of nuclear explosives and nuclear weapons," but how those concepts are applied to procedures varies.[5] Use control refers to the "application of systems, devices, or procedures that allow timely authorized use of a nuclear explosive while precluding or delaying unauthorized nuclear explosive detonation." It is an integral part of how DOE maintains surety of nuclear weapons.[6] The DOE designs and develops nuclear weapons with specific controls to assure the weapon will reliably operate while preventing an unauthorized detonation. Different organizational understandings of nuclear surety are compared below. The table shows that each organization defines its surety based on its operational mission.

Chemical

Agencies also vary in their definitions of surety for chemical weapons and associated materials. The DoD defines chemical surety as security standards for safeguarding chemical agents. It follows that DoD security standards for safeguarding chemical agents consists of the "physical security, information security, and personnel reliability for Schedule 1 chemicals in the possession of the DoD. . .as defined by the Chemical Weapons Convention (CWC)."[7] Schedule 1 chemicals include blister, nerve, blood, and incapacitating agents, which were historically used in chemical weapons. However, there is further differentiation within the DoD definitions adopted as a result of different missions involving chemical agents. DoD chemical agent RDT&E units, for example, conduct research to develop countermeasures for protective purposes to support the warfighter against an enemy chemical agent attack, while DoD chemical demilitarization facilities destroy the chemical munitions left in the U.S. stockpile in accordance with the CWC. Within the DoD, the Army is the only Service conducting chemical agent RDT&E. U.S. research involving Schedule 1 chemicals, (e.g., sarin, VX, mustard, lewisite, ricin, and saxitoxin) complies with the CWC, which prohibits the stockpiling and use of these chemicals as weapons. The Army is the only Service currently storing obsolete chemical weapons in preparation for their destruction. It is also responsible for demilitarizing the remaining chemical agent munitions in the U.S. stockpile (in accordance with CWC requirements). In addition to RDT&E and demilitarization, the Army is also responsible for transportation and training missions with chemical agents. The

DoD chemical agent security program ensures that chemical agents are handled safely, are secure and accounted for, and that only certified, personnel reliability program personnel are working with chemical agents or chemical agent munitions left in the stockpile. The DoD chemical surety program is defined and regulated in accordance with its operational mission.

Biological

The DoD defines biological surety as security standards for safeguarding BSAT. This includes ensuring the "physical security and information security for BSAT in the possession of the DoD, and personnel reliability for Tier 1 BSAT as defined by part 73 of Title 42, Code of Federal Regulations (CFR), part 331 of Title 7, CFR, and part 121 of Title 9, CFR, collectively referred to. . .as the Select Agent Regulations."[8] HHS and the USDA administer the implementation of the Select Agent Regulations. The Centers for Disease Control and Prevention manages requirements in 42 CFR, part 73, on behalf of HHS. The Animal and Plant Health Inspection Service manages requirements in 7 CFR, part 331, and 9 CFR, part 121, on behalf of the USDA. DoD complies with the Biological Weapons Convention while conducting research with BSAT. DoD BSAT RDT&E units conduct research to develop countermeasures for "prophylactic, protective, or other peaceful purposes"[9] to defend the warfighter against enemy BSAT attacks. The DoD BSAT security program ensures that BSAT are handled safely, are secure and accounted for, and that only certified, personnel reliability program personnel are working with Tier 1 BSAT.

Concepts of Surety: Differences and Commonalities

Three surety elements – use control, survivability and weapon reliability – only apply to nuclear weapons, as the U.S. no longer has active chemical and biological weapons programs and, therefore, no need to maintain their reliability for use. Safety standards for SNM, chemical agents, and BSAT are not interchangeable for good reason. For example, a distinction such as biosafety level 1–4 (discussed on page 62), while entirely appropriate for dealing with BSAT would not apply to radiological isotopes. Additionally, nuclear surety requires that personnel use leaded shielding for protection from ionizing radiation, while personnel working with chemical agents require different measures to protect them from a splash or vapor hazard posed by chemical agents.

Furthermore, surety inventory requirements vary as a function of material. Whereas SNM decays over time, BSAT can replicate, meaning that an ounce of SNM will not grow (and will probably decay), while an ounce of BSAT will likely grow. Meanwhile, chemical agents do not decay or replicate. Procedures for accounting for these materials must, therefore, vary accordingly. RDT&E chemical agents can be measured by volume (i.e., in milliliters) with graduated cylinders, beakers, pipettes, or other means. With diluted chemical agents, it is possible to calculate the actual concentration of the agent in the dilution to determine the exact amount of chemical agent in the dilution.

Surety Element #1: Safety Procedures

Personnel working with nuclear, chemical, and BSAT materials must use material-specific safety equipment, rely on specific engineering controls in order to conduct operations or research, and wear material-specific personal protective equipment.

Nuclear materials and radiation safety

Special nuclear materials, including plutonium and uranium, produce ionizing radiation and require particular handling considerations so that personnel may avoid

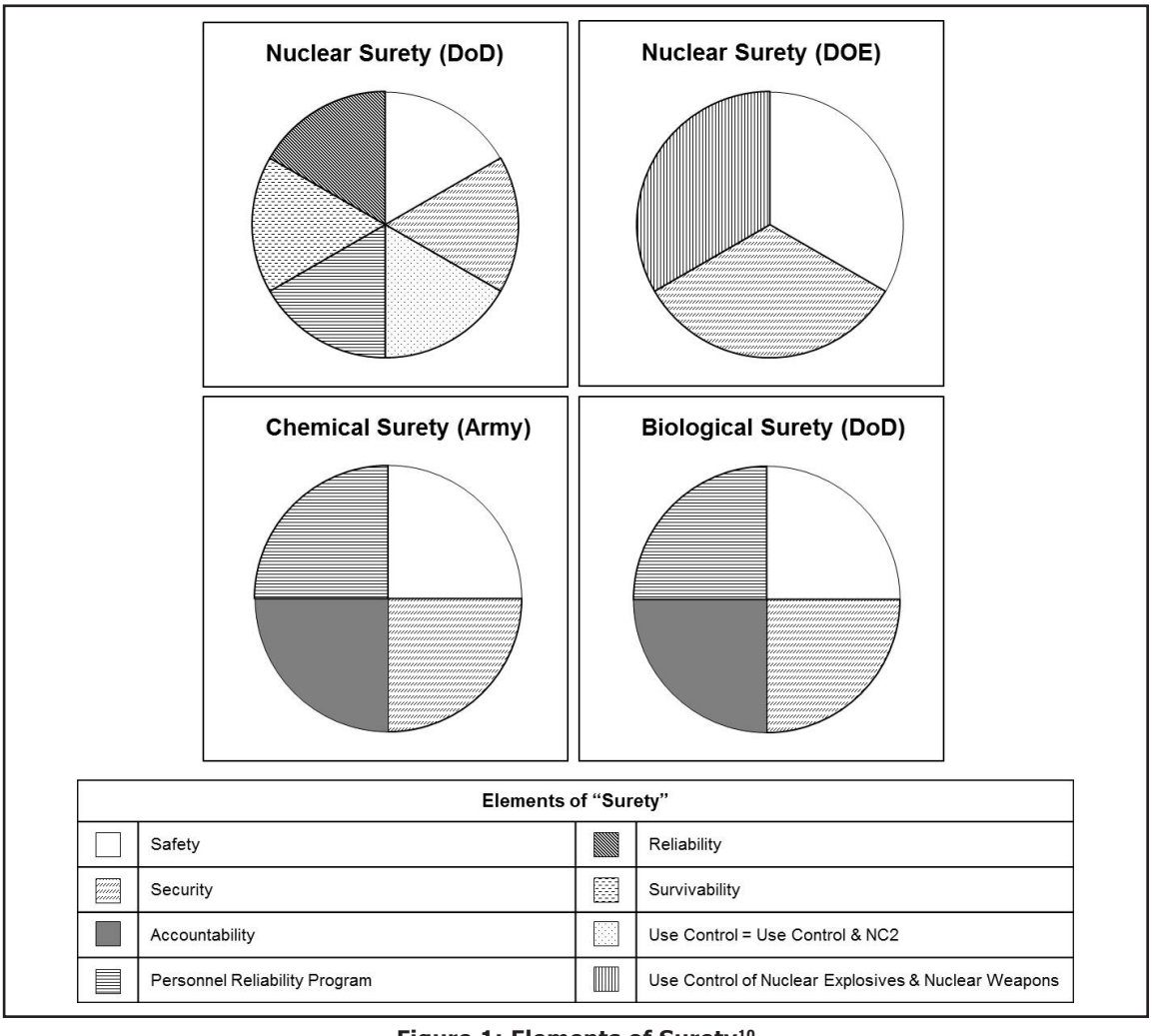

Figure 1: Elements of Surety[10]

skin burns and radiation sickness.[11] Workers use specially-designed, personal protective equipment, including "lab coats, latex gloves, lead aprons, shielding collars to protect the thyroid glands, and lead safety glasses."[12] Radioisotope fume hoods are designed and engineered to protect workers from exposure to radiation using special lead shielding. Collectively, these specific radiation safety measures are essential to protect workers from the effects of radiation exposure and its painful consequences.

Chemical agents and safety procedures

Chemical agents are synthesized materials, as opposed to naturally-occurring compounds. Chemical agents such as blister, nerve, blood, and incapacitating agents, can be particularly toxic and have been used as weapons on the battlefield. Those who handle them require protection from inhalation and physical contact with these agents. During demilitarization operations, for example, where chemical-filled munitions are being destroyed, personnel work under engineering controls such as "total containment" and "vapor containment" filters to prevent harmful chemical agents from being released into the environment. Engineering controls also prevent the potential ignition and explosion of chemical munitions. Additionally, personnel working with chemical agent munitions wear specialized personal protective equipment, divided into

levels A through D (with A requiring the most protection). In addition to personal protective equipment, personnel are subject to detailed workplace practices including changing of all personal clothing and wearing government-issued clothing, boots, and gloves. All personnel must also shower before leaving the facility for the day. DoD laboratory operations involving chemical agents rely on chemical fume hoods subject to federal and DoD standards to provide engineering controls and protect workers and the environment from exposure to chemical agents. Personnel are also issued protective masks, personal protective clothing, and butyl rubber gloves. Surgical gloves, worn two pairs at one time, may be used to provide more dexterity than butyl rubber gloves.

Nuclear, chemical, and biological surety programs all include security and accountability measures.

Biological agents and safety procedures

BSAT, including bacterial agents, viral agents, and biological toxins, can occur naturally and can cause illness through bacterial and viral infections in animals or humans. Personnel conducting operations with BSAT require specific equipment and personal protective equipment and different primary and secondary engineering controls. They must, for example, adhere strictly to laboratory techniques and practices using biological agent safety equipment and personal protective equipment. In addition, facility design and construction must meet standards for biological agent safety and containment; although, the latter depends on the particular risks associated with the type of BSAT being used. The interagency follows the HHS established four biosafety levels. Biosafety level 1 practices are the least stringent and consist of following standard microbiological practices. Biosafety level 2 practices are for biological agents that can cause human diseases. Biosafety level 3 practices are for biological agents (mostly BSAT) that can be aerosolized and cause serious or lethal infection. Biosafety level 4 is for the most dangerous biological agents (all of which are BSAT) that pose the highest risk for workers.[13] Usually, vaccines and treatments are not available for biosafety level 4 BSAT.

Surety Element #2: Site Security and Inventory Accountability

Nuclear, chemical, and biological surety programs all include security and accountability measures. The type of material being secured determines the implementation of security and accountability standards and procedures to protect the material from theft, unauthorized access, or use. Agencies also employ site-specific security measures in addition to design and engineering features, such as those DOE uses to protect and secure nuclear weapons.

Nuclear weapons and SNM

For nuclear weapons and SNM, security is one of the highest priorities across the interagency. Installation commanders and national laboratory directors regularly conduct vulnerability assessments to determine the precise risks to the installations and laboratories and then apply a combination of physical security measures, access controls, and information security measures. According to DoD policy, "protection for all nuclear weapon systems will incorporate policies, procedures, and equipment in a layered approach of physical security, information assurance, personnel actions, procedures, and nuclear weapon design features as determined through a risk analysis."[14] Therefore, security measures are site-specific and tailored to protect nuclear weapons and SNM. Security plans and procedures for nuclear weapons and SNM ensure that only technically proficient and qualified personnel are present

during operations. Personnel are subject to access controls (authorization), and site control measures include keys and locks, identification badges, and biometric devices. Additionally, two certified, personnel reliability program workers must be present at all times while performing operations with nuclear weapons and SNM. There are secure sites where SNM is stored to prevent unauthorized access, generally in a vault, and protected using a defense-in-depth strategy (to deter, detect, deny, delay, and defend the site). The U.S. Nuclear Regulatory Commission, which licenses all agencies using SNM, mandates physical SNM "inventory accountability" in accordance with 10 CFR 74 at least every six months. Inventory accountability for SNM includes verifying that the Nuclear Regulatory Commission-issued SNM is properly accounted for by the site.

Chemical Agents

Chemical agent security and accountability falls under DoD surety programs. DoD chemical agent facility directors and contractor laboratories that work with DoD chemical agents are required to develop reliable security systems and processes that facilitate DoD's ability to "detect, assess, deter, communicate, delay, and respond to unauthorized attempts to access chemical agents."[15] Facility directors and contractor laboratories must also conduct vulnerability assessments to determine risks at each facility. Their security program recommendations can include the implementation of measures such as intrusion detection systems, key and lock control, access controls, and inventory accountability. Whereas chemical munitions are stored in underground bunkers, RDT&E quantities of chemical agents are generally stored in a restricted laboratory or in a locked fume hood. Access controls for and peer oversight of chemical munitions or RDT&E chemical agents vary based on use. Whereas chemical munition operations require the presence of two, certified, personnel reliability program personnel, for example, operations in RDT&E laboratories do not. Likewise, inventory accountability varies for chemical munitions and RDT&E chemical agents as a function of meeting international treaty obligations. While chemical munitions are inventoried by counting the number of munitions, RDT&E chemical agents are inventoried by an accounting of quantity of agent in the container. Similarly, reporting procedures vary as well. The status of chemical munitions is reported annually to the Organization for the Prohibition of Chemical Weapons in compliance with the CWC, while the quantity of RDT&E chemical agent at each laboratory is reported semiannually through the DoD Accountability Manager for Schedule 1 chemicals to DoD.[16]

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BSAT

BSAT facilities and laboratories using Tier 1 BSAT must be registered and certified in accordance with the federal HHS and USDA Select Agent Regulations. BSAT security and accountability are governed both by federal law and DoD regulations. BSAT facility commanders and laboratory directors conduct vulnerability assessments to determine the specific risks to the facilities and laboratories and implement physical security measures, access controls, and information security measures. "The security plan will address the controls used to secure the BSAT from misuse, theft, and unauthorized removal from the BSAT registered space."[17] While only authorized individuals can access Tier 1 BSAT, two, certified, personnel reliability program workers do not have to be present during operations with Tier 1 BSAT (unlike nuclear weapons or SNM). For inventory accountability

purposes, BSAT is usually stored in vials, unless it is being used in an experiment. BSAT can be maintained in refrigerators and freezers for long-term storage. In accordance with the federal Select Agent Regulations, laboratories working with BSAT must maintain a current and accurate inventory of all BSAT in long-term storage at all times.

All programs require continuing evaluation of reliability that consists of personnel security investigation periodic reinvestigations; medical evaluations, as necessary; and random drug testing.

Surety Element #3: Personnel Reliability Program

Personnel reliability is another security feature aimed specifically at personnel working with SNM, chemical agents, and BSAT. Generally, the requirements for all three programs ensure that personnel are mentally and emotionally stable, physically capable, trustworthy, and have the technical qualifications to the work with the materials. The requirements that govern the personnel reliability program are similar in that all three programs require a personnel records review, a personnel security investigation, a medical records review, and drug testing. All programs require continuing evaluation of reliability that consists of personnel security investigation periodic reinvestigations; medical evaluations, as necessary; and random drug testing.

How the personnel security investigation requirement is applied varies, however. For example, within DoD, personnel working with nuclear weapons must be eligible for a top-secret clearance, whereas personnel working with SNM must be eligible for a secret clearance. For work with chemical agents, personnel need only be eligible for a secret security clearance. Finally, all personnel working with BSAT must pass the federal Select Agent Regulations screening process, while personnel working with Tier 1 BSAT (that have a documented risk of "causing a high consequence event") must also be eligible for a secret clearance.

DOE has a personnel reliability program designed specifically for the national laboratories, which primarily employ contractors. Human Reliability Program for personnel working at the national laboratories is designed in accordance with 10 CFR 712.10. Although the Human Reliability Program is not exactly the same as the personnel reliability program, the intent of both programs is the same.

Surety Element #4: Nuclear Weapons Control, Survivability, and Reliability

Key components of surety for nuclear weapons are use control, survivability, and reliability. The U.S. ensures "positive measures will be taken to maintain control of all U.S. nuclear weapons during the entirety of their life cycle. Use control, which includes NC2 [nuclear command and control], is a feature that engineers can integrate into U.S. nuclear weapons. It may either be integrated into the warhead or weapon system, and may also be complemented by system operation."[18]

"Survivability" is essential to U.S. second-strike capability. Nuclear weapons are engineered to survive and operate **after** a nuclear attack. Special design features, including permissive action links, are incorporated into U.S. nuclear weapons in order to ensure they are operational when authorized to be.

DOE's Stockpile Stewardship and Management Program ensures and maintains the operational reliability of U.S. nuclear weapons in the stockpile. Nuclear weapons use control, survivability, and reliability are all elements to ensure U.S. nuclear weapons will work when

needed. However, as important as these surety concepts are to nuclear weapons, they simply do not apply to chemical munitions left in the U.S. stockpile, chemical agents, or BSAT.

The U.S. nuclear weapons surety program is in place to ensure that nuclear weapons, as national strategic assets, are strictly controlled and reliable if required for use. The chemical surety program has standards that have changed over the years, producing a focus ranging from offensive chemical weapons capability to the current chemical munitions demilitarization effort and the RDT&E chemical agent programs. Meanwhile, the biological surety program is being disestablished in favor of the federal Select Agent Regulations and DoD policy. As a result of the 2015 interagency review on biological surety, the Secretary of the Army was designated the Executive Agent for DoD-wide BSAT activities. The Secretary of the Army further designated the Army Surgeon General as Responsible Official for this mission. The Surgeon General now has oversight for all DoD laboratories working with BSAT. The change in oversight in no way relaxes the laws and policies that all the Services are required to follow.

Conclusion

The absence of offensive chemical and biological weapons capabilities might indicate that there is no need for chemical or biological surety programs or may support the idea that a single, cross-substance, integrated, nuclear surety program should include all types of dangerous materials. Disestablishing the chemical and biological surety programs because of an absence of offensive capabilities or merging them with the existing nuclear surety program, however, does not consider the requirements imposed by the materials. Nuclear surety assures that nuclear weapons, as national security assets, will operate when needed, while the RDT&E chemical and biological surety programs focus on protecting the warfighter from enemy attacks using chemical agents or BSAT. Thus, the non-complementarity of surety requirements across the DoD, let alone the interagency, renders their administrative merger into one program a virtual impossibility.

Of course, some might argue that the deadly nature of nuclear, chemical, and BSAT materials logically leads to a single surety program. However, this argument misses the point. The whole notion of surety does not hinge on an offensive or defensive capability; it hinges on the nature of the material itself. When looking at surety from this point of view, having one surety program and regulation would mean that the materials are similar in nature. This logic would also lead to the conclusion that the regulations can be effectively merged, thus creating a means for common oversight, cutting costs, and actually increasing the success of surety efforts across the interagency. However, this argument neglects the very real differences in the materials and the hazards they represent.

Given current technological development of small modular nuclear reactors, the use of nanotechnology in chemistry, and the merging of biology and engineering to create artificial biological systems, the interagency will continue the debate and adapt the surety programs in the future. Whatever the outcome, one thing is reliably certain: Those who aim to merge surety into one administrative program across the interagency will find that future advances will only complicate their task. Given the current intractability of that task, the strong likelihood exists that surety programs, distinguished as they currently are, will be with the interagency for the foreseeable future. ***IAJ***

The views expressed in this article are those of the authors and are not an official policy or position of the National Defense University, the Department of Defense or the U.S. government.

NOTES

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