Technology Alert List

From the U.S. Department of State
August 2002

This cable updates the Technology Alert List (TAL) which was transmitted in November 2000, with particular attention to certain revisions as a result of the September 11 terrorist attacks. The cable also provides additional guidance for its use in cases that may fall under the purview of INA section 212 (a)(3)(a), which renders inadmissible aliens who there is reason to believe are seeking to enter the U.S. to violate U.S. laws prohibiting the export of goods, technology or sensitive information from the U.S.

TAB A - CRITICAL FIELDS LIST

A. CONVENTIONAL MUNITIONS: Technologies associated with:

- Warheads and other large caliber projectiles
- Reactive armor and warhead defeat systems
- Fusing and arming systems.
- Electronic countermeasures and systems
- New or novel explosives and formulations
- Automated explosive detection methods and equipment

B. NUCLEAR TECHNOLOGY: Technologies associated with production and use of nuclear material for both peaceful and military applications. Included are technologies for:

- Enrichment of fissile material
- Reprocessing irradiated nuclear fuel to recover produced plutonium
- Production of heavy water for moderator material
- Plutonium and tritium handling

Also, certain associated technologies related to nuclear physics and/or nuclear engineering. Includes materials, equipment or technology associated with:

- Power reactors, breeder and production reactors
- Fissile or special nuclear materials
- Uranium enrichment, including gaseous diffusion, centrifuge, aerodynamic, chemical, Electromagnetic Isotopic Separation (EMIS), Laser Isotope Separation (LIS)
- Spent fuel reprocessing, plutonium, mixed oxide nuclear research
- Inertial Confinement Fusion (ICF)
- Magnetic confinement fusion
- Laser fusion, high power lasers, plasma,
- Nuclear fuel fabrication including Mixed Oxide (uranium-plutonium) fuels (MOX)
- Heavy water production
- Tritium production and use
- Hardening technology

C. ROCKET SYSTEMS (including ballistic missile systems, space launch vehicles and sounding rockets) and Unmanned Air Vehicles (UAV) (including cruise missiles, target drones, and reconnaissance drones): Technologies associated with rocket systems and UAV systems. The technology needed to develop a satellite launch vehicle is virtually identical to that needed to build a ballistic missile.

D. ROCKET SYSTEM AND UNMANNED AIR VEHICLE (UAV) SUBSYSTEMS: Propulsion technologies include solid rocket motor stages, and liquid propellant engines. Other critical subsystems include re-entry vehicles, guidance sets, thrust vector controls and warhead safing, arming and fusing. Many of these technologies are dual-use. Technologies include:

- Liquid and solid rocket propulsion systems
- Missile propulsion and systems integration
- Individual rocket stages or staging/separation mechanism
- Aerospace thermal (such as superalloys) and high-performance structures
- Propulsion systems test facilities

E. NAVIGATION, AVIONICS AND FLIGHT CONTROL USEABLE IN ROCKET SYSTEMS AND UNMANNED AIR VEHICLES (UAV): These capabilities directly determine the delivery accuracy and lethality of both unguided and guided weapons. The long- term costs to design, build and apply these technologies have been a limiting proliferation factor. Technologies include those associated with:

- Internal navigation systems
- Tracking and terminal homing devices
- Accelerometers and gyroscopes
- Rocket and UAV and flight control systems.
- Global Positioning System (GPS)

F. CHEMICAL, BIOTECHNOLOGY AND BIOMEDICAL ENGINEERING: The technology used to produce chemical and biological weapons is inherently dual-use. The same technologies that could be applied to develop and produce chemical and biological weapons are used widely by civilian research laboratories and industry; these technologies are relatively common in many countries. Advanced biotechnology has the potential to support biological weapons research. In the biological area, look for interest in technologies associated with:

- Aerobiology (study of microorganisms found in the air or in aerosol form)
- Biochemistry
- Pharmacology
- Immunology
- Virology
- Bacteriology
- Mycology
- Microbiology
- Growth and culturing of microorganisms
- Pathology (study of diseases)
- Toxicology
- Study of toxins
- Virulence factors
- Genetic engineering, recombinant DNA technology
- Identification of nucleic acid sequences associated with pathogenecity
- Freeze-drying (lyophilization)
- Fermentation technology
- Cross-filtration equipment
- High "DOP-rated filters" (e.g., HEPA filters, ULPA filters)
- Microencapsulation

- Aerosol sprayers and technology, aerosol and aerosolization technology
- Spray or drum drying technology
- Milling equipment or technology intended for the production of micron-sized particles
- Technology for eliminating electrostatic charges of small particles
- Flight training
- Crop-dusting, aerosol dissemination
- Unmanned aerial vehicle (UAV) technology
- Fuses, detonators, and other munitions technology
- Submunitions technology
- Computer modeling of dissemination or contagion
- Chemical absorption (nuclear-biological-chemical (NBC) protection)

In the chemical area, look for:

- Organo-phosphate chemistry
- Neurochemistry
- Chemical engineering
- Chemical separation technology
- Pesticide production technology
- Pharmaceutical production technology
- Chemical separation technology
- Toxicology
- Pharmacology
- Neurology
- Immunology
- Detection of toxic chemical aerosols
- Chemical absorption (Nuclear-Biological-Chemical (NBC) protection)
- Production of glass-lined steel reactors/vessels, pipes, flanges, and other equipment
- Aerosol sprayers and technology
- Flight training
- Crop-dusting, aerosol dissemination
- Unmanned Aerial Vehicle (UAV) technology
- Fuses, detonators, and other munitions technology
- Submunitions technology
- Computer modeling of dissemination

G. REMOTE SENSING, IMAGING AND RECONNAISSANCE: Satellite and aircraft remote sensing technologies are inherently dual-use; increasingly sophisticated technologies can be used for civilian imagery projects or for military and intelligence reconnaissance activities. Drones and remotely piloted vehicles also augment satellite capabilities. Key-word associated technologies are:

- Remote sensing satellites
- High resolution multi-spectral, electro-optical and radar data/imagery
- Imagery instruments, cameras, optics, and synthetic aperture radar systems
- Ground receiving stations and data/image processing systems
- Photogrammetry
- Imagery data and information products
- Piloted aircraft

- Unmanned Air Vehicles (UAV)
- Remotely-piloted vehicles; and drones

H. ADVANCED COMPUTER/MICROELECTRONIC TECHNOLOGY: Advanced computers and software play a useful (but not necessarily critical) role in the development and deployment of missiles and missile systems, and in the development and production of nuclear weapons. Advanced computer capabilities are also used in over-the-horizon targeting, airborne early warning targeting, Electronic Countermeasures (ECM) processors. These technologies are associated with:

- Supercomputing, hybrid computing
- Speech processing/recognition systems
- Neural networks
- Data fusion
- Quantum wells, resonant tunneling
- Superconductivity
- Advance optoelectronics
- Acoustic wave devices,
- Superconducting electron devices
- Flash discharge type x-ray systems
- Frequency synthesizers
- Microcomputer compensated crystal oscillators

I. MATERIALS TECHNOLOGY: The metallic, ceramic and composite materials are primarily related to structural functions in aircraft, spacecraft, missiles, undersea vehicles, and propulsion devices. Polymers provide seals and sealants for containment of identified fluids and lubricants for various vehicles and devices. High density graphite is used in missile nosetips, jet vanes and nozzle throats. Selected specialty materials (i.e., stealth and the performance of these materials) provide critical capabilities that exploit electromagnetic absorption, magnetic, or superconductivity characteristics. These technologies are associated with:

- Advanced metals and alloys
- Non-composite ceramic materials
- Ceramic, cermet, organic and carbon materials
- Polymeric materials
- Synthetics fluids
- Hot isostatic
- Densifications
- Intermetallic
- Organometals
- Liquid and solid lubricant
- Magnetic metals and superconductive conductors

J. INFORMATION SECURITY: Technologies associated with cryptography and cryptographic systems to ensure secrecy for communications, video, data and related software.

K. LASER AND DIRECTED ENERGY SYSTEMS TECHNOLOGY: Lasers have critical military applications, including incorporation in guided ordinance such as laser guided bombs and ranging devices. Directed energy technologies are used to generate electromagnetic radiation or particle beams and to project that energy on a specific target. Kinetic energy technologies are those used to impart a

high velocity to a mass and direct it to a target. Directed energy and kinetic energy technologies have potential utility in countering missiles and other applications. Look for technologies associated with:

- Atomic Vapor Laser Isotope Separation (AVLIS)
- Molecular Laser Isotope Separation (MLIS)
- High Energy Lasers (HEL) (i.e., laser welders)
- Low Energy Lasers (LEL)
- Semiconductor lasers
- Free electron lasers
- Directed Energy (DE) systems
- Kinetic Energy (KE) systems
- Particle beam, beam rider, electromagnetic guns, Optoelectronics/electro-oPtics (Europe)
- Optical tracking (i.e., target designators)
- High energy density
- High-speed pulse generation, pulsed power
- Hypersonic and/or hypervelocity
- Magnetohydrodynamics

L. SENSORS AND SENSOR TECHNOLOGY: Sensors provide real-time information and data, and could provide a significant military advantage in a conflict. Marine acoustics is critical in anti-submarine warfare; gravity meters are essential for missile launch calibration. Look for technologies associated with:

- Marine acoustics
- Optical sensors
- Night vision devices, image intensification devices
- Gravity meters
- High speed photographic equipment
- Magnetometers

M. MARINE TECHNOLOGY: Marine technologies are often associated with submarines and other deep submersible vessels; propulsion systems designed for undersea use and navigation and quieting systems are associated with reducing detectability and enhancing operations survivability. Look for technologies connected with:

- Submarines and submersibles
- Undersea robots
- Marine propulsion systems
- Signature recognition
- Acoustic and non-acoustic detection
- Acoustic, wake, radar and magnetic signature reduction
- Magnetohydrodynamics
- Stirling engines and other air independent propulsion systems

N. ROBOTICS: Technologies associated with:

- Artificial intelligence
- Automation
- Computer-controlled machine tools
- Pattern recognition technologies.

O. URBAN PLANNING: Expertise in construction or design of systems or technologies necessary to sustain modern urban societies. (PLEASE NOTE: Urban Planning may not fall under the purview of INA section 212 (a)(3)(a), U.S. technology transfer laws, or any other U.S. law or regulation. However, Urban Planning is a special interest item and posts are requested to refer such visa application requests to CA/VO/L/C for further review.) Look for technologies/skills associated with:

- Architecture
- Civil engineering
- Community development
- Environmental planning
- Geography
- Housing
- Landscape architecture
- Land use and comprehensive planning
- Urban design