Export Control Laws, Technical Data and Academic Research Projects

U.S. v. Dr. J Reece Roth, et. al.
Academic Research & Export Control

✓ Export controlled technical data: What does that mean & how does it apply to R&D projects at academic institutions?
✓ How did an University of Tennessee professor violate export control laws regarding R&D technical data?
✓ Keys to building an effective compliance program to prevent violations of export control laws so as to protect both the academic institution and the public interest.
The 2004-06 USAF Weapons Project

- In 2004, USAF was seeking to develop advanced technology for unmanned aerial vehicles (UAV) to maintain air dominance

- USAF funded a R&D project to develop smaller, stealthier, more cost effective UAVs (“drones”) with fewer moving parts

- Plasma physics to be applied to explore theoretical advantages in aeronautical engineering for the next generation UAVs
Plasma Technology Research

- Plasma applied to a surface can accelerate or slow a gas flow, such as air, affecting the aerodynamic properties of the surface.

- Plasma applied to an airfoil will also affect the “attachment” and “separation” of a fluid traveling over the airfoil.

- In theory, these phenomena can be manipulated to control a military drone traveling at subsonic speeds. Practical application of this theory is technically complex.
• Small company engaged in incentive research programs for various federal agencies bids on USAF Project Phase I and II

• Thirty full & part-time employees at peak operation. Not self-sustaining by profits; USAF R&D funding represented large percentage of income

• Lead Scientist Dan Sherman worked closely with Roth on USAF Project; warned Roth the Project was export controlled.

• Not a UT incubator company, but historically connected to UT; needed low cost UTPL GRAs to conduct research work.
J. Reece Roth

- Expert in plasma physics (MIT / Cornell). Directed the UT Plasma Sciences Lab and invented a specialized plasma technology (“OAUGDP”). UT held patent on OAUGDP and licensed the commercial use & development to AGT.

- Twenty year history of visits to and partnerships with Chinese Universities (Tsinghua, UESTC & Fudan).

- Honorary professorships at two major Chinese universities. Chinese Academy of Sciences published his books on plasma science.

- Wanted to market OAUGDP to PRC; didn’t consider PRC a real national security threats; viewed export control regulations as unnecessary restriction on exchange of academic ideas.
Technical Data Was The Key Focus

- USAF awarded a prime contract with AGT to develop plasma actuator technology for use as flight controls for military UAVs.

- AGT subcontracted with UT through Dr. Roth & UT Plasma Lab to help develop ITAR “technical data” for the USAF.

- The “technical data” at issue involved specific information derived from scientific tests on plasma actuators intended for military UAVs.
U.S. Export Controls

“Defense Articles and Services”
- Arms Export Control Act (AECA)
  22 USC 2778
- International Traffic in Arms Regulations (ITAR)
  22 CFR 120-130
- United States Munitions List (USML)
  22 CFR 121

“Strategic Dual-Use Goods and Technologies”
- Export Administration Act (EAA)
  50 USC 2401-2420
- Export Administration Regulations (EAR)
  15 CFR 730-774
- Commerce (Commodity) Control List
  15 CFR 774.1
ITAR Definitions: Export & Technical Data

- **EXPORT**: Sending or taking a defense article out of the United States in any manner ....
  or disclosing (including oral or visual disclosure) or transferring technical data to a foreign person...in the U.S. or abroad.

- **DEFENSE ARTICLE**: Any item or “directly related” technical data that is listed in the USML...“includes technical data recorded or stored in any physical form, models, mockups or other items that reveal technical data directly relating to items designated” in the USML.

- **DEFENSE SERVICE**: (1) The furnishing of assistance, including training, to foreign persons, whether in the United States or abroad in the design, development, engineering, manufacture, production, assembly, testing, repair, etc. of defense articles; and (2) the furnishing to foreign persons of any controlled technical data.

- **TECHNICAL DATA**: Information which is required for the design, development, production, manufacture, assembly, operation, repair, testing, maintenance, or modifications of defense articles (blueprints, etc.).
Important Exceptions for Technical Data

EXCLUDED from the definition of “TECHNICAL DATA” are:

1. GENERAL PRINCIPLES of science, mathematics or engineering taught in schools, colleges and universities, or

2. “PUBLIC DOMAIN” information 22 CFR Sec. 120.10

PUBLIC DOMAIN is defined as information:

1. PUBLISHED and is GENERALLY ACCESSIBLE in magazines, journals, books, patents, etc. or information released with approval for distribution by the appropriate US government authority, and

2. Information obtained through FUNDAMENTAL RESEARCH in science and engineering at accredited U.S. institutions of higher learning where the resulting information is ORDINARILY PUBLISHED and SHARED broadly in the scientific community

22 CFR Sec. 120.11
Important Exceptions to “Fundamental Research”

- **FUNDAMENTAL RESEARCH**
  - Defined to mean basic and applied research in science and engineering at accredited institutions of higher learning where the resulting information is ordinarily published and shared broadly in the scientific community.
  - Scientific research is **NOT CONSIDERED** “Fundamental Research” if:
    1. The academic institution or its researchers accept other restrictions on publication of scientific and technical information resulting from the project or activity, or
    2. The research is funded by the U.S. government and specific access and dissemination controls are applied to protect the dissemination of information resulting from the research.

22 CFR 120.11(a)(8)
Basic vs. Applied Research
Under DoD Regulations

“Basic Research”

- Budget Activity 1 Research
- “6.1 FUNDS RESEARCH”

Defined:

Basic Research is a systematic study directed toward greater knowledge or understanding of the fundamental aspects of phenomena and observable facts without specific applications towards processes or products in mind . . Farsighted, high-payoff research . . . “

“Applied Research”

- Budget Activity 2 Research
- “6.2 FUNDS RESEARCH”

Defined:

Applied Research is systematic study to understand the means to meet a recognized and specific national security requirement . It is the systematic application of knowledge to develop useful materials, devices, and systems or methods.

- SUBJECT TO EXPORT CONTROLS

UNCLASSIFIED
What was the “Technical Data” in the USAF Project with AGT & UT?

- *U.S. v. Roth, et.al.* involved USML technical data derived from scientific tests designed to develop plasma actuators as aeronautical controls of “aircraft, including...drones...specifically designed for military purposes.”

  22 C.F.R. 121.1, Category VIII(a) & (i)
What Were the Violations under the AECA?

> AGT and Dr. Roth agreed to include a Chinese foreign national graduate student in the ITAR research project.

> An initial attempt was made to “wall off” the Chinese graduate student from the export controlled research in an effort to evade export control restrictions. This “ITAR wall” was soon dropped to advance the project. University of Tennessee officials were not consulted on this plan.

> Dr. Roth willfully disclosed what he knew was export controlled USAF Technical Data to both a Chinese and Iranian graduate student (domestic or “deemed” export).

> Dr. Roth willfully took or sent what he knew was export controlled USAF Technical Data to China (foreign export).
Did Export Controls Apply to the USAF Prime Contract with AGT?

…. (1) acknowledge all responsibilities under applicable U.S. export control law and regulations (including the obligation, under certain circumstances, to obtain an export control license from the U.S. Government prior to the release of militarily critical technical data within the United States) . . . and (2) agree not to disseminate militarily critical data in a manner that would violate applicable U.S. or Canadian export control laws and regulations.
AGT - UT Subcontract Contained Export Controlled Data Restrictions

Signed by both UT Official and Dr. Roth on April 29, 2005.

Signed by AGT President on 05/05/2005

5352.227-9000 “EXPORT CONTROLLED DATA RESTRICTIONS” (AFMC)(JUL 1997)
Quarterly Technical Report

Contains export controlled data
Evidence of Dr. Roth’s Knowledge and Intent: “Willfulness”

Statement of Work on What I Want to Do

Export Controlled Data for Munitions

“BHD DUCT” = Plasma Actuators

AGT provides Test Stand, Misc. Testing Eq.

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“Virtually certain that AGT will get 1 of 2 SBIR contracts for subsonic actuator work – other will be Orbital Industries, Inc. – with Corke, et al – this is 6.2 money.”

“Conv. With Mj. Bill Hilbun 5/19/04”
“PHASE II” PLASMA ACTUATORS
Domestic Export of Technical Data

Weekly Progress Report
Property of AGT

Project Number: 354
Project Name: AFM-P2 Plasma Actuator Studies

Week 1
Date

1. List of Objectives for the week:
   1.1. Investigate new 2D top-electrode geometries and their effect on production.
   2. Results:
      2.1. Result #1: Saw-Tooth Top Electrode (AFM-61)

   It was originally thought that the sharp spikes would generate more active species than usual, but lots of
   active species were generated, which is outstanding. However, when operated with any top insulation,
   it turned out that the flat side generated more force than the flat side. Thus the flat side was
   insulated, and a thorough test run with the results shown above. Force efficiency was outstanding, but
   limited at relatively high applied voltage to be fully utilized.

   2.2. Result #2: Slanted Saw-Tooth Top Electrode (AFM-62)

   Cuts

   2.3. Result #3: Slanted Saw-Tooth Top Electrode (AFM-63)
The “Force Stand” - a Defense Article used to provide Defense Services to foreign GRA
Domestic or “Deemed” Export

“Transferring Technical Data” to PRC National by Weekly Reports
Once aware of possible AECA violations, UT Export Control Officer informs Dr. Roth it is clear the USAF Research Project is export controlled.

UT officials direct Dr. Roth **NOT** to further disclose export controlled technical data to foreign national graduate students.

UT administrators direct Dr. Roth **NOT** to take USAF Phase II information and technical data to the PRC.

DO NOT EXPORT!

From: Witherspoon, Mary Robin
Sent: Thursday, May 11, 2006 5:00PM
To: jrr@utk.edu

DO NOT EXPORT!

The prime contract contains the Export Control restrictions (AFMC 5352.227.9000 EXPORT CONTROLLED DATA RESTRICTIONS) on foreign nationals that I spoke to you...

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The Risk of Foreign Export: Roth’s May 2006 PRC Lecture Tour

- Official Schedule for Roth’s lecture series at PRC Universities during May 2006

“Lecture 3: Subsonic Plasma Aerodynamics for Flight Control of Aircraft.”
Roth’s Tsinghua Univ. Lecture: Risk of Export of Technical Data?

• An undated e-mail from Roth to “Professor Guan” from Tsinghua University, regarding his upcoming May 2006 trip to the PRC:

“Topics on which I can speak that relate to our recent research on the applications of the OAUGDP are the following: . . . 2.) Subsonic Plasma Aerodynamics for Flight Controls of Aircraft which contains some of our recent results on optimizing plasma actuators.”
Foreign Export of Technical Data

Subject: RE: Review of AIAA Draft and other urgent matters
From: Xin Dai xdai@utk.edu
Date: Sat., 20 May 2006, 11:11:19 – 0400
To: sdzhang@fudan.edu.cn

Dr. Roth,

In the attachment is the Reno 2007 paper (Text only). It's around 17 pages. I can not reduce it to 8 pages anyway. I apologize for the delay. In my next e-mail the full pdf file, in case you have fast internet service in China. It's about 5.8Mb. Sirous is out of town this week. He will be back today. We will work together to finish part for Schlieren Optical Experiments Results. As for the multiple actuator experiments, I did some experiment, but the relative error is too large. You know, AGT took the test stand away. I have to do the experiment manually. It takes longer time. After I re-check the data, I will add all the figures.

laptop (unless a setting needs to be changed) or at the Chinese end of the Internet. I am currently using the Internet address of Prof. Shanduan Zhang, sdzhang@fudan.edu.cn.

Time is running out on the draft for the AIAA meeting, which I have not received. Please send its electronic file to me immediately at Prof. Zhang's address above. He will get it to me, and I will attempt to get it back to you in time to make the May 22 deadline. I

• Xin Dai tells Dr. Roth: “You know, AGT took the Test Stand away.”
• Roth directs Xin Dai to e-mail the 2007 AIAA draft paper to Dr. Zhang’s e-mail at Fudan University in China
• Dr. Zhang (in the PRC) acknowledges receipt of 2007 AIAA paper
Dr. Roth exports USAF Phase II Technical Data to Fudan University

- AIAA Paper draft contained data and diagrams directly from USAF Phase II Weekly Reports #31 and #32.

- Concept diagrams of Force Stand and technical data.

- Contained technical data on the configuration and sensitivity of Force Stand.
What Made This a Crime under the AECA?

1. Dr. Roth exported, attempted to export, or caused to be exported to a foreign national…..or from the United States of America to a foreign country…

2. A defense article or defense service, or technical data directly relating to such an item, that is listed on the United States Munitions List…

3. Without having first obtained a validated license or written approval from the State Department; and

4. Acted knowingly and willfully.     [Jury Instructions]
What is “Knowingly and Willfully”?  

• “The Government must prove beyond a reasonable doubt that the Defendant voluntarily and intentionally violated a known legal duty. In other words, the Defendant must have acted voluntarily and intentionally and with the specific intent to do something he know was unlawful, that is to say, with the intent to either disobey or disregard the law.”

  Jury Instructions, U.S. v. Roth
Evidence of Dr. Roth’s Willfulness

- He knew from at least 2004 that the USAF Project was a “6.2 Funded” R&D weapons project subject to export controlled restrictions.
- He knew from 2005 that a Chinese and Iranian GRA were working on the USAF Project that involved “export control data for munitions.”
- In May 2006 he transported USAF Project “technical data” to China (despite UT warnings).
- He never informed the USAF and UT that foreign nationals were working on the USAF Project or that he was taking USAF Project information to China (knowing of AGT concern).
The Indictment: Export Control Violations

**Domestic Exports to a Chinese and Iranian Foreign National**
- Inclusion of a Chinese foreign national in the USAF export controlled R&D project resulting in repeated exports of Technical Data [Counts 3-10]
- Export of “Force Stand” Defense Services. [Counts 14-15]
- Providing a document containing ITAR Technical Data to an Iranian foreign national [Count 17]

**Foreign Exports to China during a May 2006 Lecture**
- Transportation of three documents containing ITAR Technical Data [Counts 11, 12 & 13]
- Causing wire transmission of a document containing ITAR Technical Data [Count 14]
What were the Consequences?

Dr. J. Reece Roth
- Convicted on 17 counts of conspiracy and violating the AECA
- Sentenced to 4 years imprisonment

Atmospheric Glow Technologies (AGT)
- Pled guilty to 10 counts of AECA violations and cooperated in investigation
- Dan Sherman pled guilty to conspiracy to violate AECA with Dr. Roth and testified
U.S. v. Roth: Lessons Learned

- Technical Data **by itself** is covered by the Export Control laws:

  “Federal regulations extend export controls to all stages of defense projects that are covered by the AECA, not just the final stages when military devices are directly involved. …[R]esearch requires multiple stages before a project reaches completion, and export controls [apply] to all those phases.”
“We hold that [AECA] does not require a defendant to know that the items being exported are on the Munitions List, it only requires knowledge that the underlying action is unlawful.”

U.S. v. Roth (6th Cir. 2011)
Research Institutions: What level of risk as to export violations?

Export Controls

DoD directly or indirectly funded a high percentage of university-based engineering and science research in 2008 including:

• 76% of electrical engineering,
• 72% of mechanical engineering,
• 15% each aeronautical and astronomical engineering,
• 24% of astronautical engineering,
• 47% of metallurgy and materials,
• 41% of computer sciences,
• 36% percent of oceanography,
• 15% each chemistry and mathematics.

Source 2008 DOD Official S&T Website
Foreign Students & Export Control

✓ 690,923 Foreign Students enrolled 2009-10.
✓ Chinese students represent the largest source of all foreign students at 18.5%.
✓ 52% of all Chinese students in U.S. academic institutions are graduate students.
✓ Chinese students have increased by 30% from 2009; some Doctoral-level institutions saw an 130% increase in undergraduates.

Why is this Important?

Senior Colonel
Yinghong Li
People’s Liberation Army
Air Force

Air Force Engineering University, Xian, PRC

Experimental Investigation on Plasma Aerodynamic Actuator's Emission Spectrum Characteristics

Yun WU¹ and Yinghong LI²
Engineering College, Air Force Engineering University, Xi’an, China, 710038

Yikang PU³
Department of Engineering Physics, Tsinghua University, Beijing, China, 100084

Gang ZHAO⁴ and Bangqin CHENG⁵
Engineering College, Air Force Engineering University, Xi’an, China, 710038

and

Zhigang GUO⁶
Department of Engineering Physics, Tsinghua University, Beijing, China, 100084

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Keys to an Effective Compliance Program

1. Know Your Funding Source Restrictions
2. R&D Contract Review and Oversight
3. Monitor Research Assignments and Equipment
4. Attention to Risks of Foreign Travel
5. Meaningful and Effective Export Control Program and Office
6. Emphasize Training and Education
7. Policy & Practice of Timely Self-Reporting Violations and taking Corrective Actions
Future Cutting Edge DARPA R&D Projects that might need Advanced Research Collaboration

Plasma Weapon and Landspeeder UAV
Advanced Research is Essential to National Security
Academic & Government Alliance: Upholding the Public’s Trust by Safeguarding National Security

Will Mackie
Assistant U.S. Attorney
Eastern District of Tennessee
will.mackie@usdoj.gov
865-545-4167
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