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.

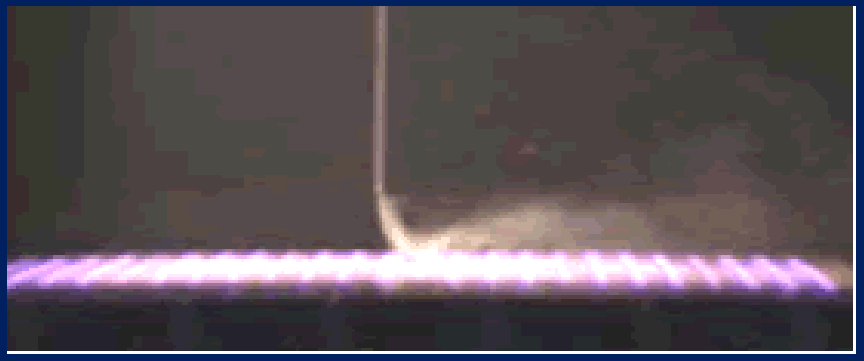
The 2004-06 USAF Weapons Project

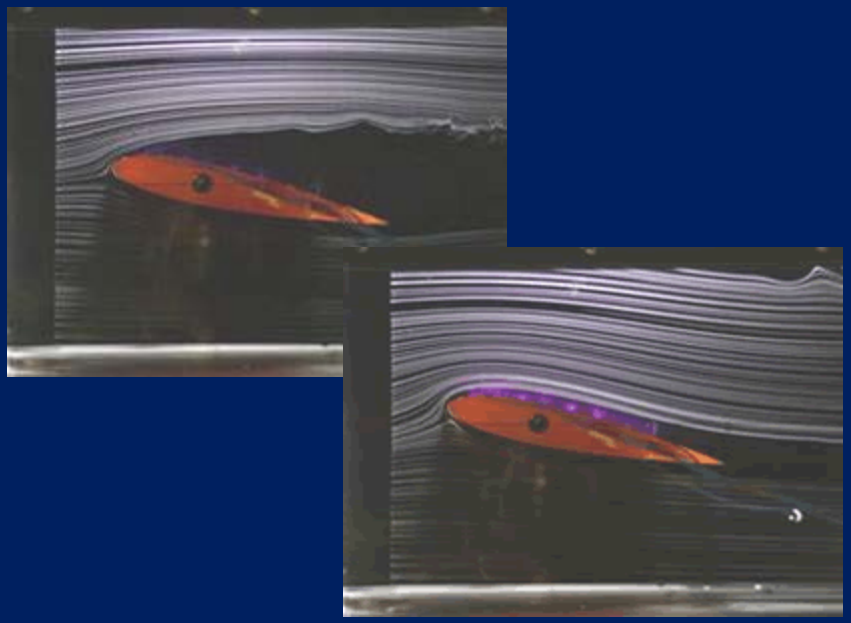
Global Hawk

Predator

- 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

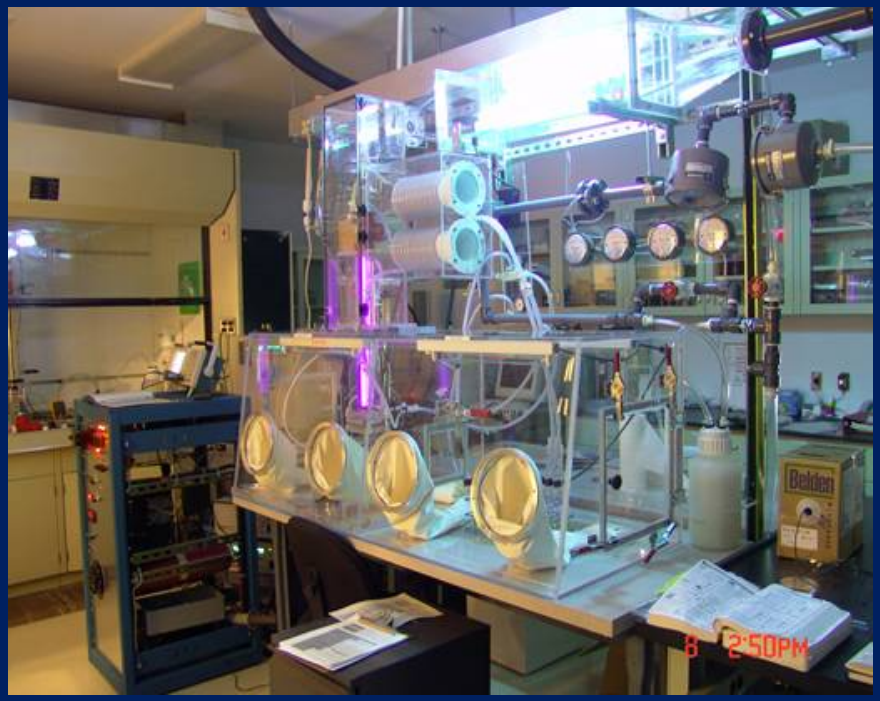
Plasma Technology Research





- 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.

agt atmospheric glow technologies

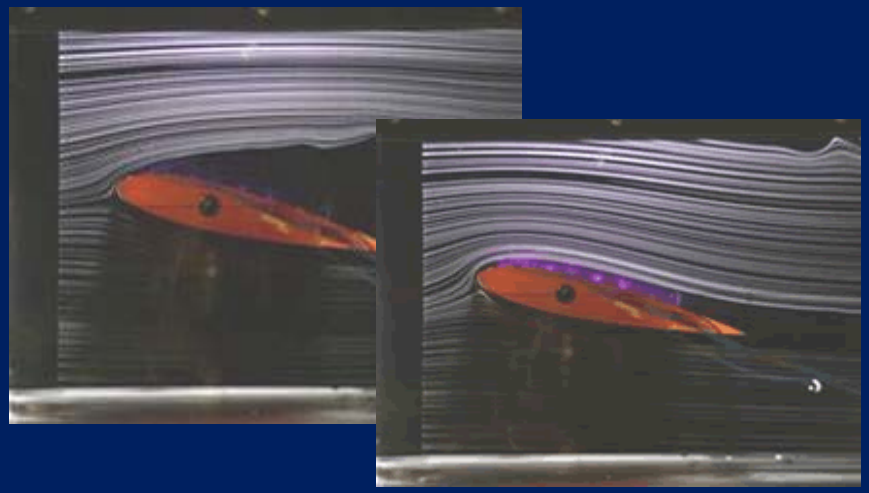


- Small company engaged in incentive research programs for various federal agencies bids on USAF Project Phase I and II
- Thirty full & part-time employees at peak operation. Not self-sustaining by profits; USAF R&D funding represented large percentage of income
- Lead Scientist Dan Sherman worked closely 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

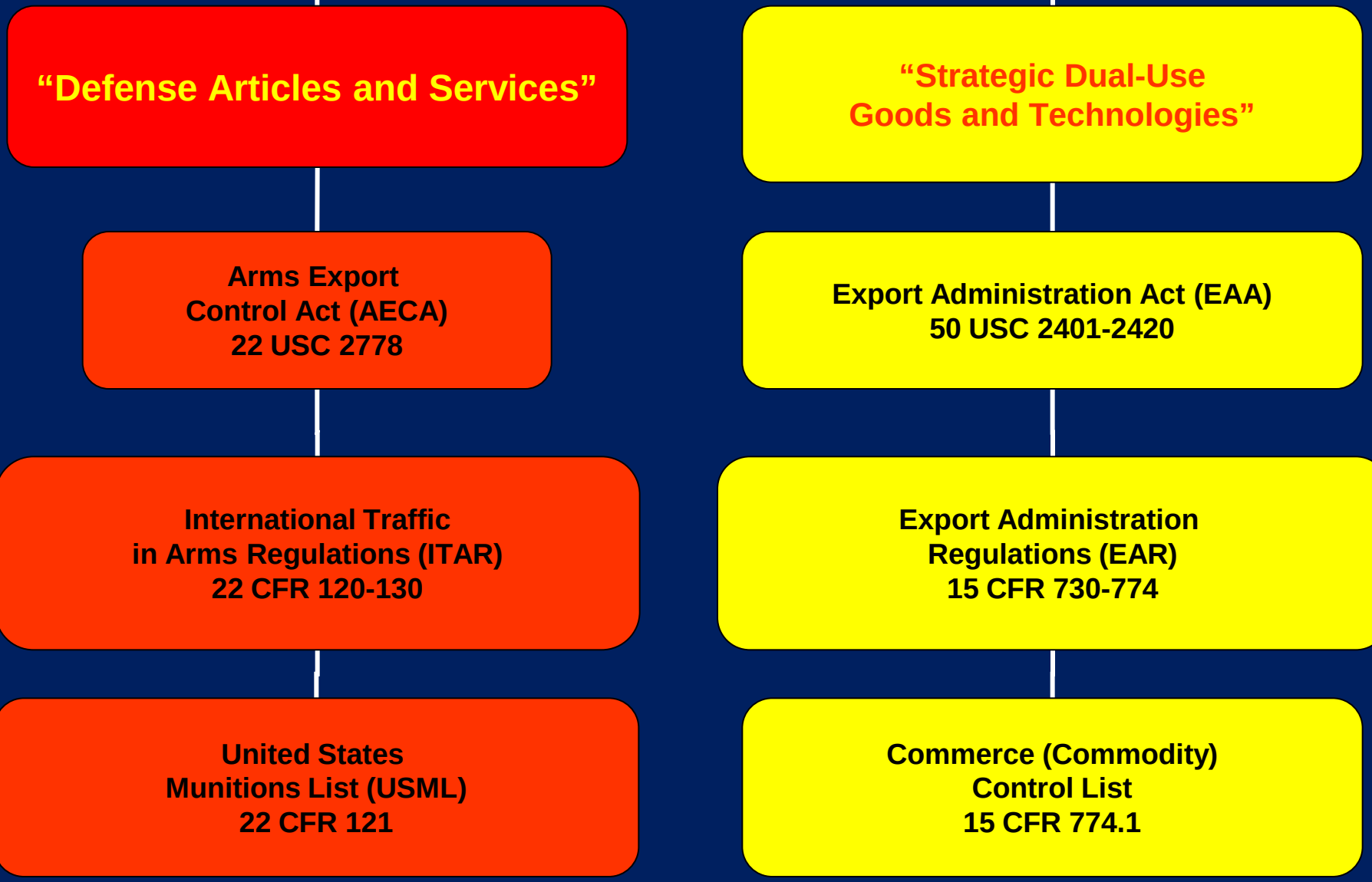
- **Expert in plasma physics (MIT / Cornell). Directed the UT Plasma Sciences Lab and invented a specialized plasma technology (“OAUGDP”). UT held patent on OAUGDP and licensed the commercial use & development to AGT.**
- **Twenty year history of visits to and partnerships with Chinese Universities (Tsinghua, 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



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.).

22 C.F.R 120

Important Exceptions for Technical Data

- **EXCLUDED from the definition of "TECHNICAL DATA" are:**

1. GERNERAL PRINCPLES 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 CONSIDERD "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*

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?

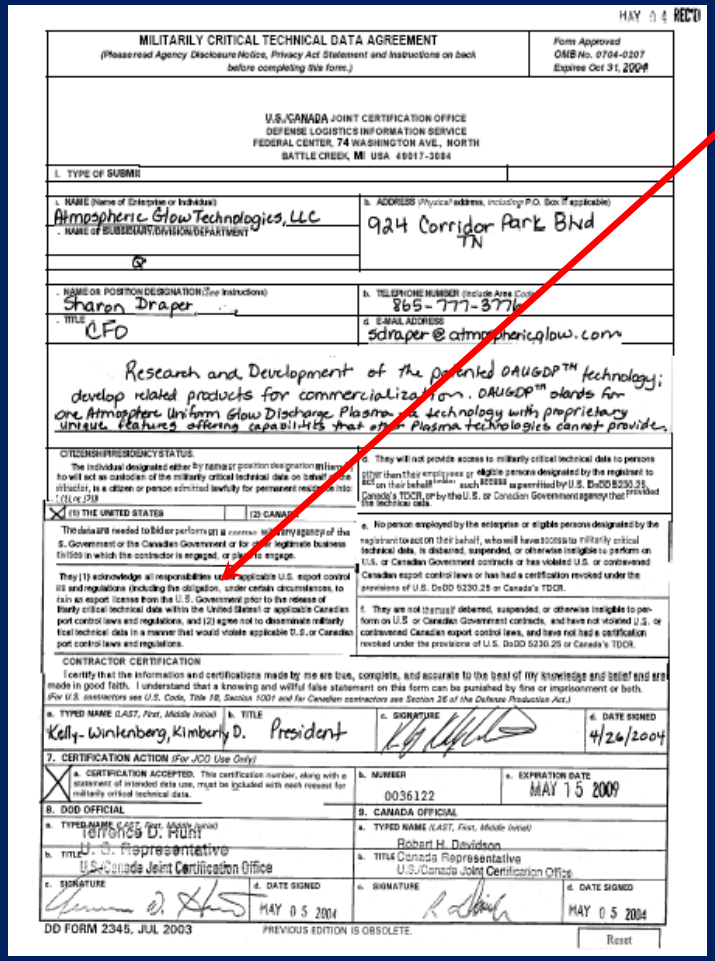
- AGT and Dr. Roth agreed to include a Chinese foreign national graduate student in the ITAR research project.

- 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?



MILITARILY CRITICAL TECHNICAL DATA AGREEMENT

(Please read Agency Disclosure Notice, Privacy Act Statement and Instructions on back before completing this form.)

Form Approved OMB No. 0704-0207 Expires Oct 31, 2004

MAY 0 4 RECD

U.S./CANADA JOINT CERTIFICATION OFFICE
DEFENSE LOGISTICS INFORMATION SERVICE
FEDERAL CENTER, 74 WASHINGTON AVE., NORTH
BATTLE CREEK, MI USA 49017-3084

1. TYPE OF SUBMIT

2. a. NAME (Name of Enterprise or Individual): Atmospheric Glow Technologies, LLC
b. NAME OF SUBSIDIARY/DIVISION/DEPARTMENT
&
b. ADDRESS (Physical address, including P.O. Box if applicable): 924 Corridor Park Blvd TN

3. a. NAME OR POSITION DESIGNATION (See Instructions): Sharon Draper
b. TELEPHONE NUMBER (Include Area Code): 865-777-3776
c. TITLE: CFO
d. E-MAIL ADDRESS: sdraper@atmosphericglow.com

4. Research and Development of the patented DAUGDP™ technology; develop related products for commercialization. DAUGDP™ stands for one Atmosphere Uniform Glow Discharge Plasma technology with proprietary unique features offering capabilities that other Plasma technologies cannot provide.

5. CITIZENSHIP/RESIDENCY STATUS
The individual designated either by name or position description in item 3 above to act as custodian of the militarily critical technical data on behalf of the enterprise, is a citizen or person admitted lawfully for permanent residence into: (X one box)
[X] (1) THE UNITED STATES [ ] (2) CANADA

6. The data are needed to bid or perform on a contract with the Department of Defense or other agency of the U.S. Government or the Canadian Government or for other legitimate business purposes in which the contractor is engaged, or plans to engage.

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

8. They will not provide access to militarily critical technical data to persons other than their employees or eligible persons designated by the registrant to act on their behalf unless such access is permitted by U.S. DoDD 5230.25, Canada's TDCR, or by the U.S. or Canadian Government agency that provided the technical data.

9. No person employed by the enterprise or eligible persons designated by the registrant to act on their behalf, who will have access to militarily critical technical data, is debarred, suspended, or otherwise ineligible to perform on U.S. or Canadian Government contracts or has violated U.S. or contravened Canadian export control laws or has had a certification revoked under the provisions of U.S. DoDD 5230.25 or Canada's TDCR.

10. They are not themself debarred, suspended, or otherwise ineligible to perform on U.S. or Canadian Government contracts, and have not violated U.S. or contravened Canadian export control laws, and have not had a certification revoked under the provisions of U.S. DoDD 5230.25 or Canada's TDCR.

CONTRACTOR CERTIFICATION
I certify that the information and certifications made by me are true, complete, and accurate to the best of my knowledge and belief and are made in good faith. I understand that a knowing and willful false statement on this form can be punished by fine or imprisonment or both. (For U.S. contractors see U.S. Code, Title 18, Section 1001 and for Canadian contractors see Section 26 of the Defense Production Act.)

a. TYPED NAME (LAST, First, Middle Initial)	b. TITLE	c. SIGNATURE	d. DATE SIGNED
Kelly-Winkenberg, Kimberly D.	President		4/26/2004

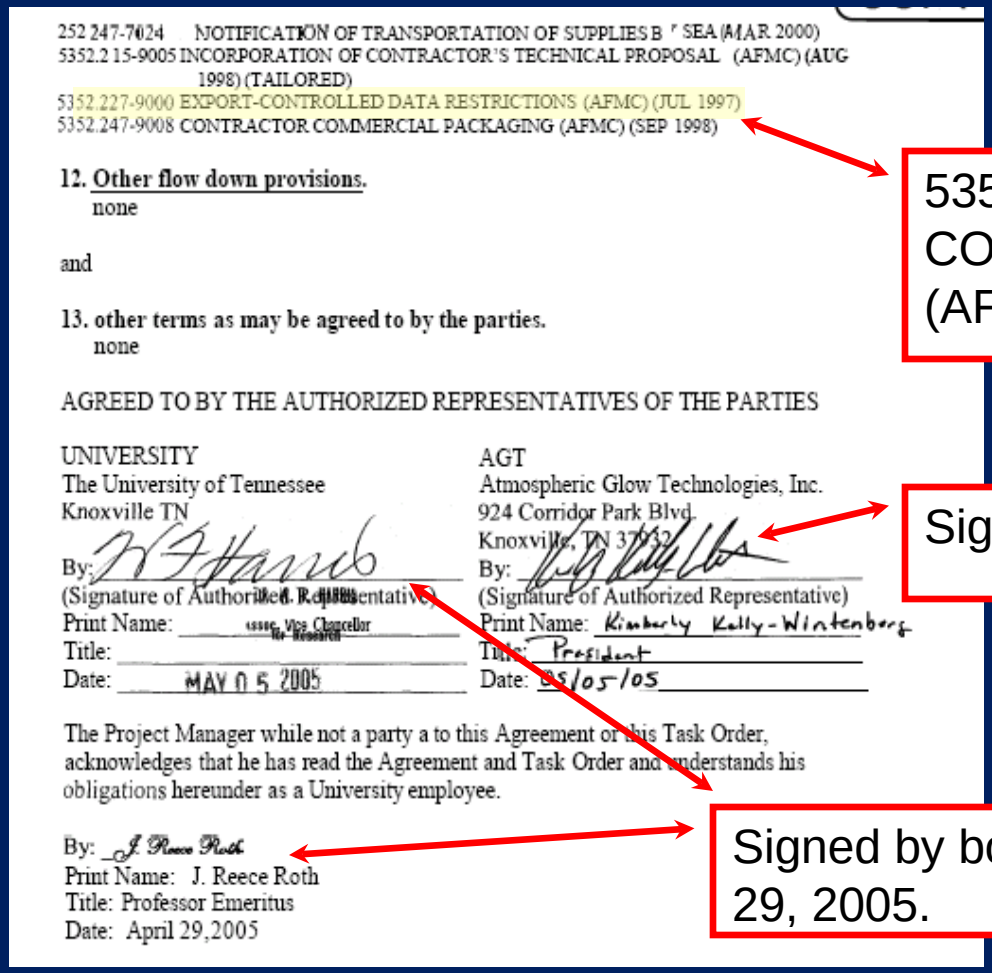
7. CERTIFICATION ACTION (For JCO Use Only)
[X] a. CERTIFICATION ACCEPTED. This certification number, along with a statement of intended data use, must be included with each request for militarily critical technical data.
b. NUMBER: 0036122
c. EXPIRATION DATE: MAY 15 2009

8. DOD OFFICIAL	9. CANADA OFFICIAL
a. TYPED NAME (LAST, First, Middle Initial): Terrence D. Hunt	a. TYPED NAME (LAST, First, Middle Initial): Robert H. Davidson
b. TITLE: U.S. Representative, U.S./Canada Joint Certification Office	b. TITLE: Canada Representative, U.S./Canada Joint Certification Office
c. SIGNATURE	d. DATE SIGNED: MAY 05 2004
c. SIGNATURE	d. DATE SIGNED: MAY 05 2004

DD FORM 2345, JUL 2003 PREVIOUS EDITION IS OBSOLETE. Reset

….(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



252.247-7024 NOTIFICATION OF TRANSPORTATION OF SUPPLIES BY SEA (MAR 2000)
5352.215-9005 INCORPORATION OF CONTRACTOR'S TECHNICAL PROPOSAL (AFMC) (AUG 1998) (TAILORED)
5352.227-9000 EXPORT-CONTROLLED DATA RESTRICTIONS (AFMC) (JUL 1997)
5352.247-9008 CONTRACTOR COMMERCIAL PACKAGING (AFMC) (SEP 1998)

12. Other flow down provisions.
none

and

13. other terms as may be agreed to by the parties.
none

AGREED TO BY THE AUTHORIZED REPRESENTATIVES OF THE PARTIES

UNIVERSITY
The University of Tennessee
Knoxville TN

By: _____
(Signature of Authorized Representative)
Print Name: [illegible] Vice Chancellor for Research
Title: _____
Date: MAY 05 2005

AGT
Atmospheric Glow Technologies, Inc.
924 Corridor Park Blvd.
Knoxville, TN 37932

By: _____
(Signature of Authorized Representative)
Print Name: Kimberly Kelly-Wintenberg
Title: President
Date: 05/05/05

The Project Manager while not a party a to this Agreement or this Task Order, acknowledges that he has read the Agreement and Task Order and understands his obligations hereunder as a University employee.

By: J. Reece Roth
Print Name: J. Reece Roth
Title: Professor Emeritus
Date: April 29,2005

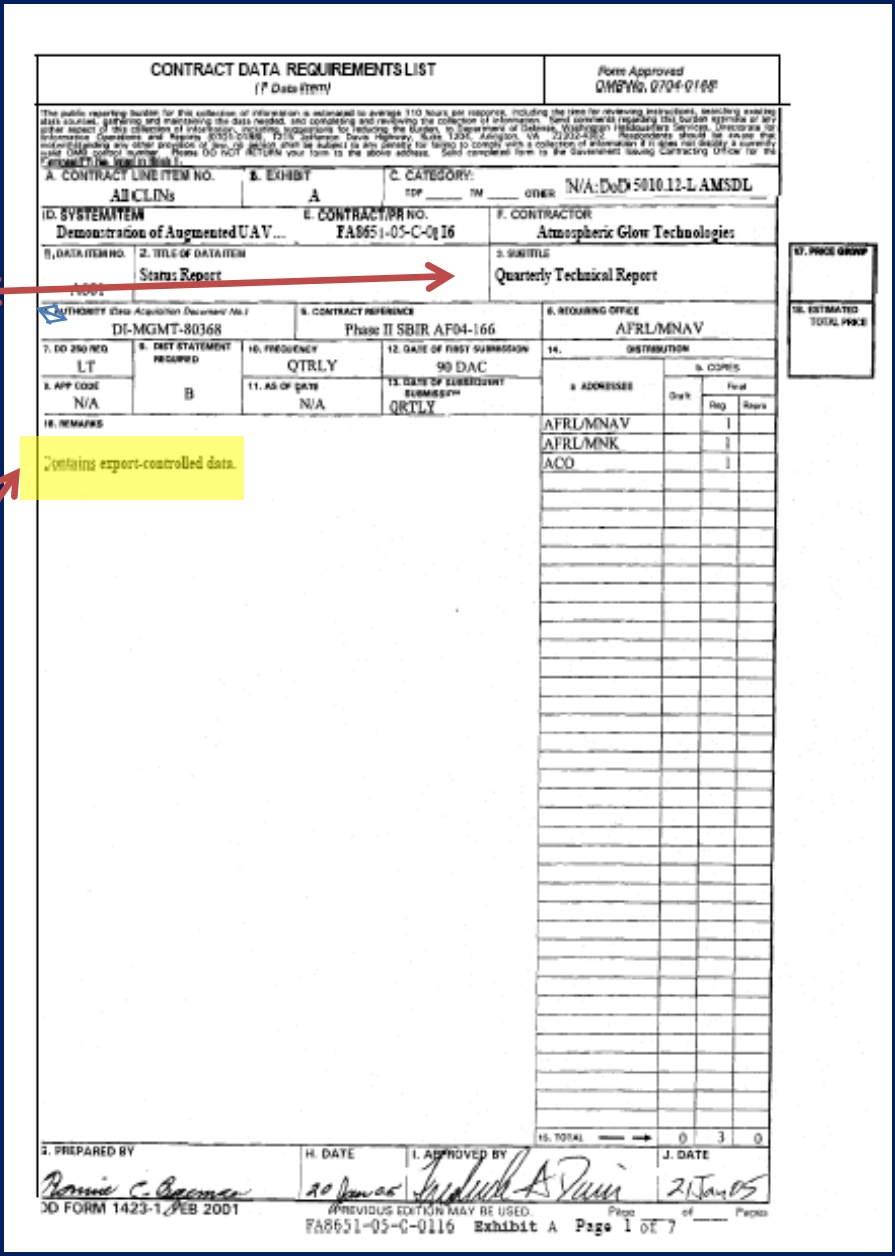
5352.227-9000 "EXPORT CONTROLLED DATA RESTRICTIONS" (AFMC)(JUL 1997)

Signed by AGT President on 05/05/2005

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

Quarterly Technical Report

Contains export controlled data



CONTRACT DATA REQUIREMENTS LIST
(1 Data Item)

Form Approved
OMB No. 0704-0188

A. CONTRACT LINE ITEM NO.: All CLINs
B. EXHIBIT: A
C. CATEGORY: TDP ____ TM ____ OTHER N/A: DoD 5010.12-L AMSDL
D. SYSTEM/ITEM: Demonstration of Augmented UAV...
E. CONTRACT/PR NO.: FA8651-05-C-0116
F. CONTRACTOR: Atmospheric Glow Technologies
1. DATA ITEM NO.: A001
2. TITLE OF DATA ITEM: Status Report
3. SUBTITLE: Quarterly Technical Report
17. PRICE GROUP
18. ESTIMATED TOTAL PRICE
4. AUTHORITY (Data Acquisition Document No.): DI-MGMT-80368
5. CONTRACT REFERENCE: Phase II SBIR AF04-166
6. REQUIRING OFFICE: AFRL/MNAV
7. DD 250 REQ: LT
8. DIST STATEMENT REQUIRED: B
9. APP CODE: N/A
10. FREQUENCY: QTRLY
11. AS OF DATE: N/A
12. DATE OF FIRST SUBMISSION: 90 DAC
13. DATE OF SUBSEQUENT SUBMISSION: QRTLY
14. DISTRIBUTION

a. ADDRESSEE	b. COPIES Draft	Final Reg	Final Repro
AFRL/MNAV		1	
AFRL/MNK		1	
ACO		1	
15. TOTAL	0	3	0

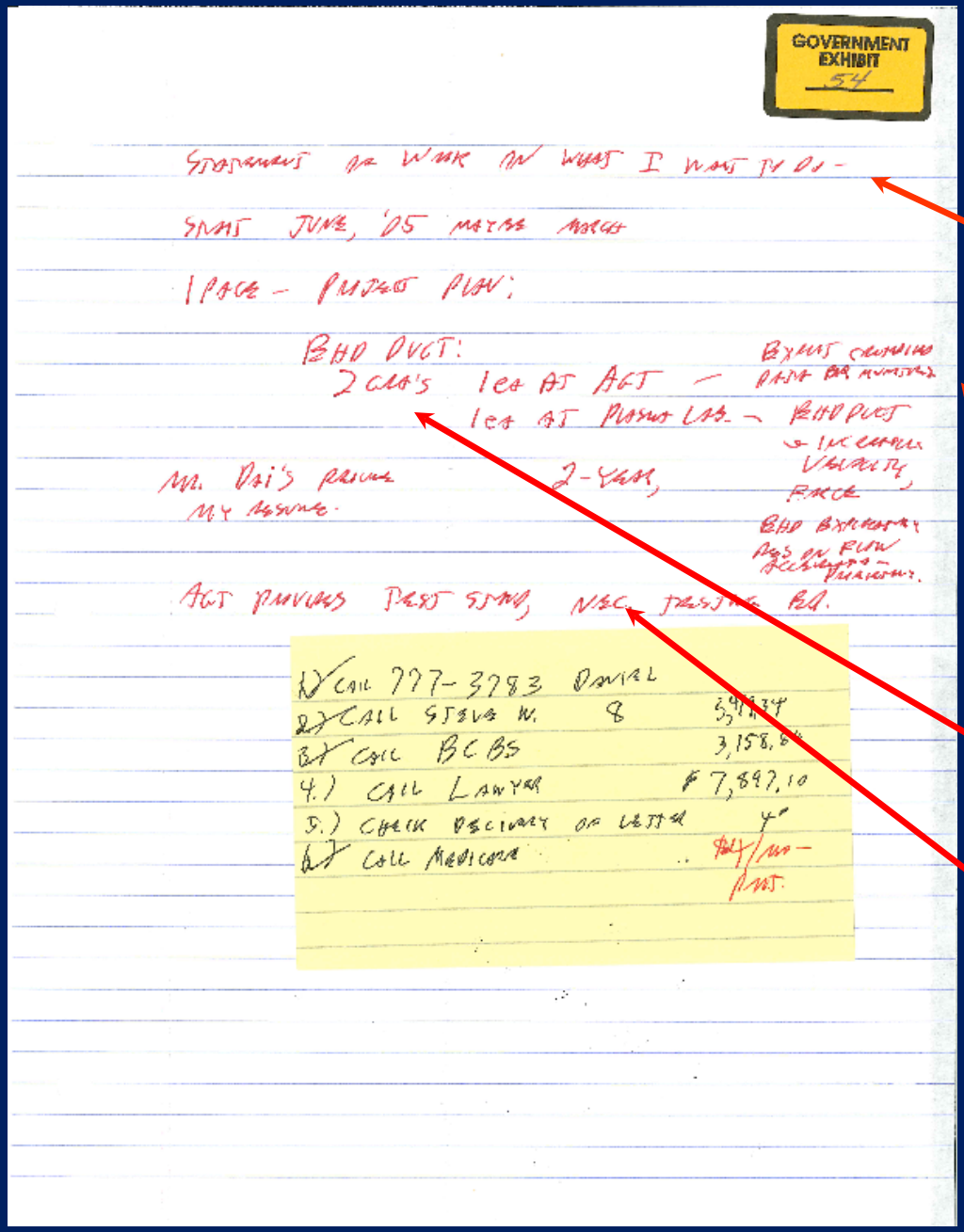
16. REMARKS: Contains export-controlled data.

G. PREPARED BY: Bonnie C. Carman
H. DATE: 20 Jan 05
I. APPROVED BY: Frederick A. Davis
J. DATE: 21 Jan 05

DD FORM 1423-1, FEB 2001 PREVIOUS EDITION MAY BE USED. Page ____ of ____ Pages

FA8651-05-C-0116 Exhibit A Page 1 of 7

Evidence of Dr. Roth's Knowledge and Intent: "Willfulness"



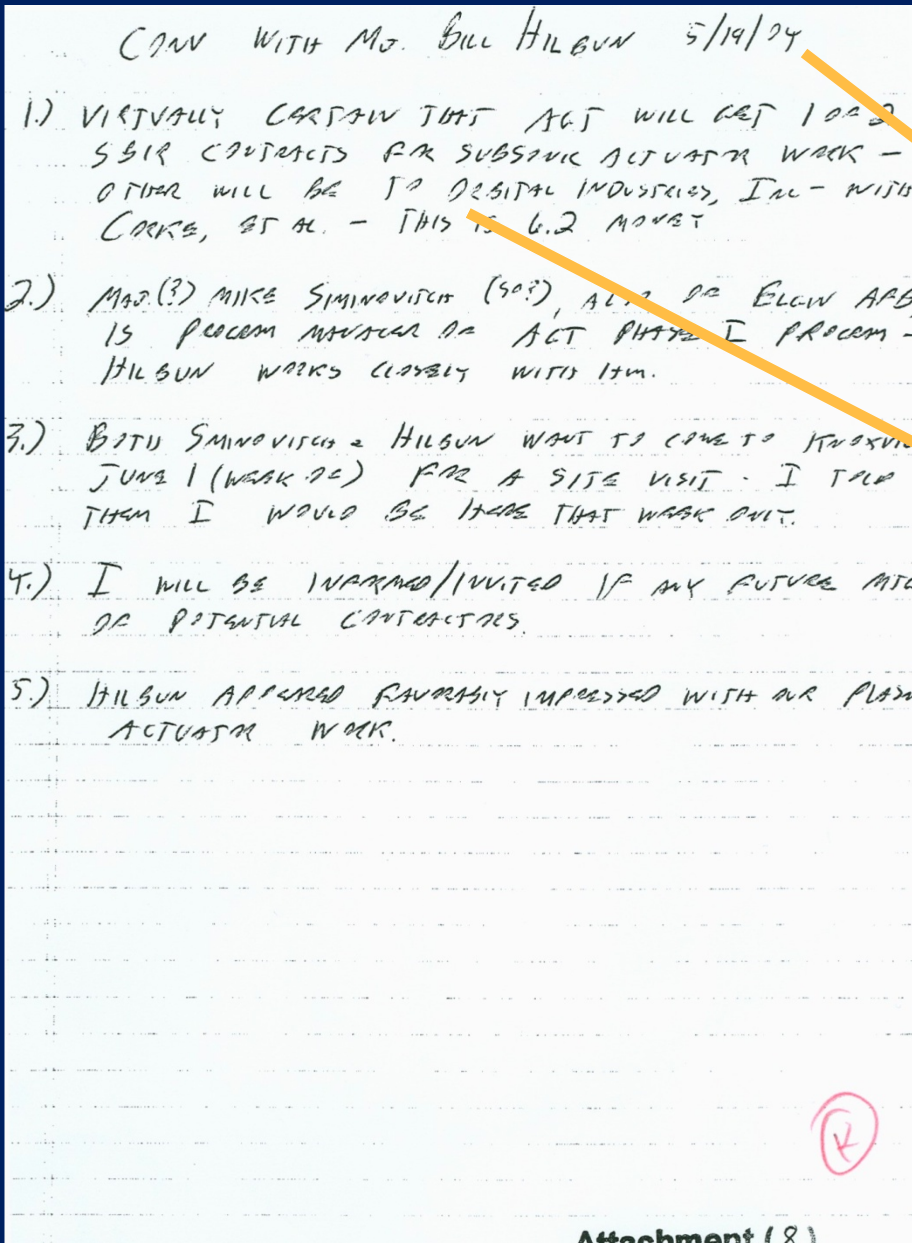
Statement of Work on What I Want to Do

Export Controlled Data for Munitions

"BHD DUCT" = Plasma Actuators

AGT provides Test Stand, Misc. Testing Eq.

Willfulness Evidence



CONV WITH MJ. BILL HILBUN 5/19/04

1.) VIRTUALLY CERTAIN THAT AGT WILL GET 1 OF 2 SBIR CONTRACTS FOR SUBSONIC ACTUATOR WORK – OTHER WILL BE TO ORBITAL INDUSTRIES, INC – WITH CORKE, ET AL. – THIS IS 6.2 MONEY

2.) MAJ. (?) MIKE SIMINOVITCH (SP?), ALSO OF EGLIN AFB IS PROGRAM MANAGER OF AGT PHASE I PROGRAM – HILBUN WORKS CLOSELY WITH HIM.

3.) BOTH SIMINOVITCH & HILBUN WANT TO COME TO KNOXVILLE JUNE 1 (WEEK OF) FOR A SITE VISIT. I TOLD THEM I WOULD BE HERE THAT WEEK ONLY.

4.) I WILL BE INFORMED/INVITED IF ANY FUTURE MTG OF POTENTIAL CONTRACTORS.

5.) HILBUN APPEARED FAVORABLY IMPRESSED WITH OUR PLASMA ACTUATOR WORK.

Attachment (8)

"Conv. With Mj. Bill Hilbun 5/19/04"

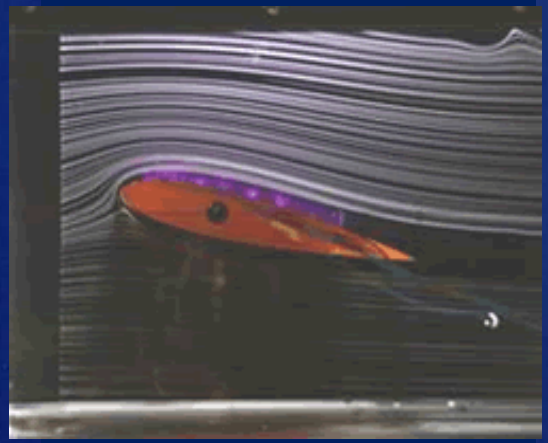
"Virtually certain that AGT will get 1 of 2 SBIR contracts for subsonic actuator work – other will be Orbital Industries, Inc. – with Corke, et al – **this is 6.2 money.**"

“PHASE II” PLASMA ACTUATORS

AFM-10

AFM-15

AFM-21



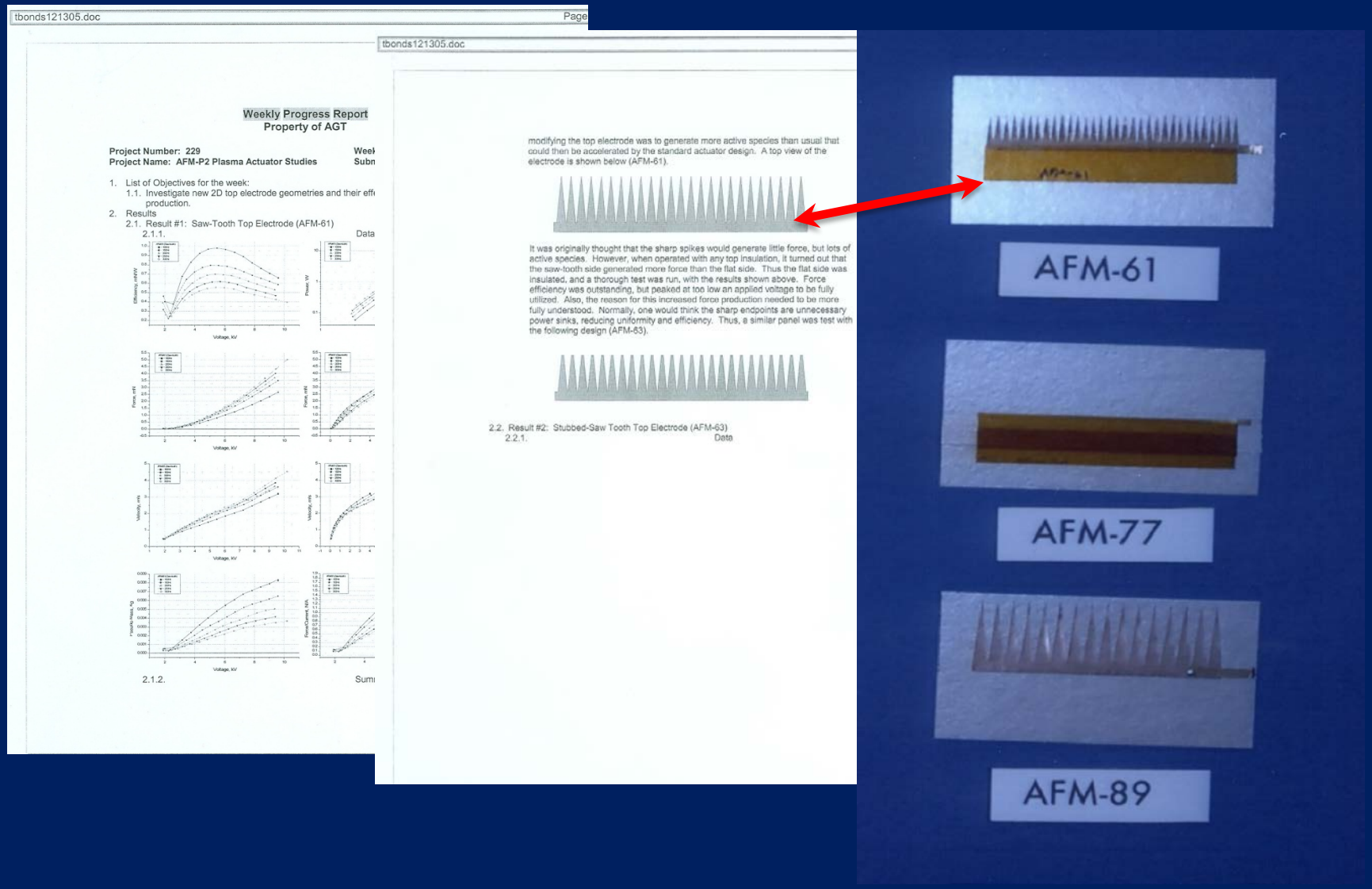
AFM-61

AFM-77

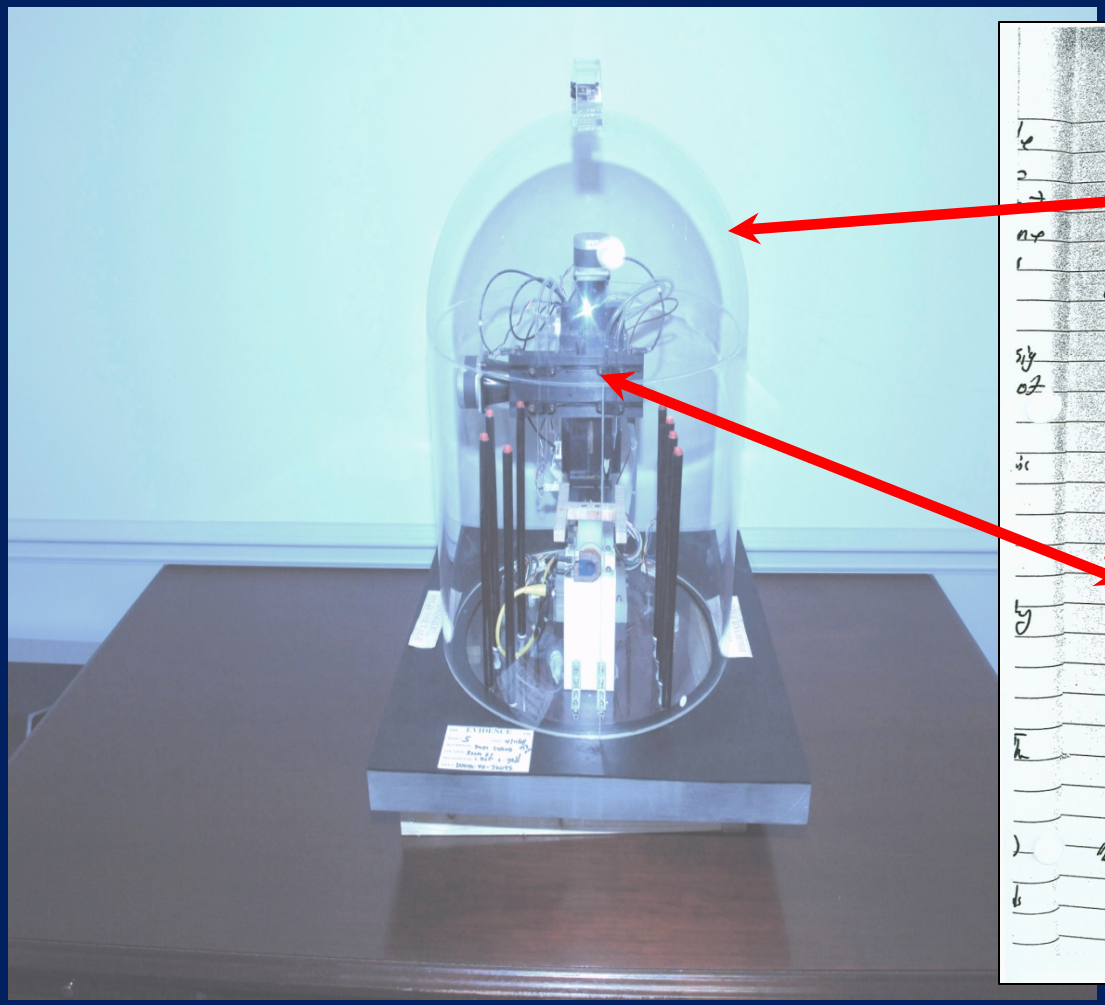
AFM-89

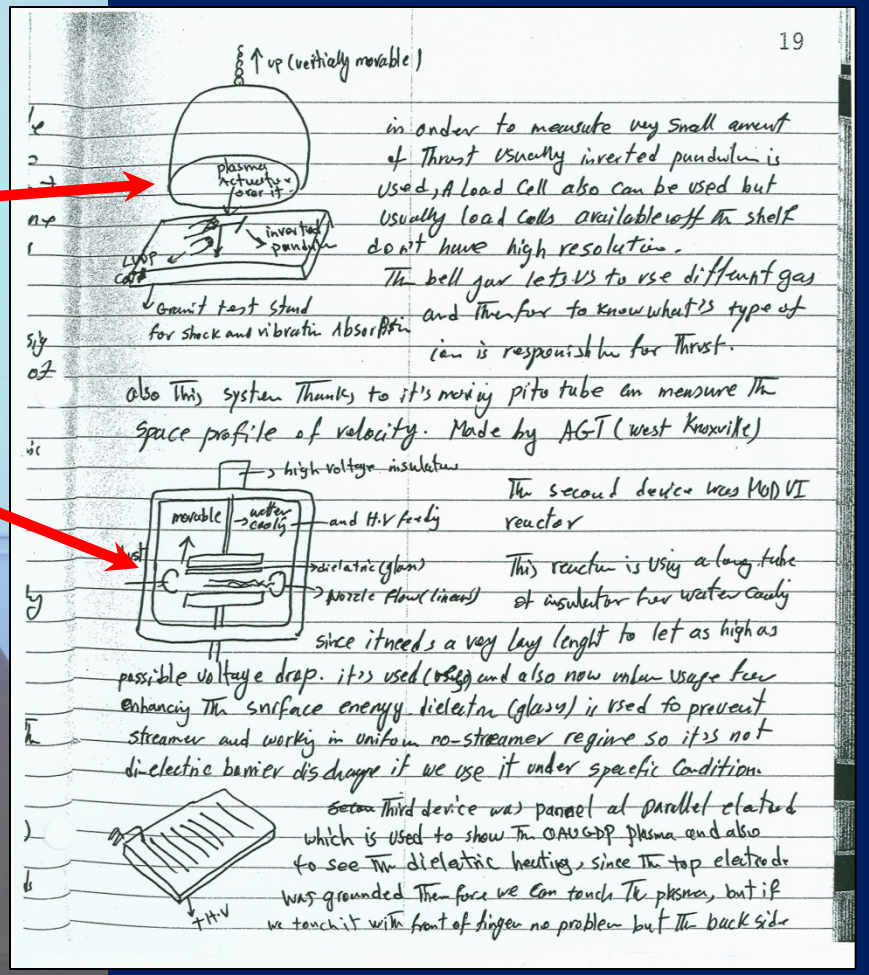

GOVERNMENT
EXHIBIT
35

Domestic Export of Technical Data



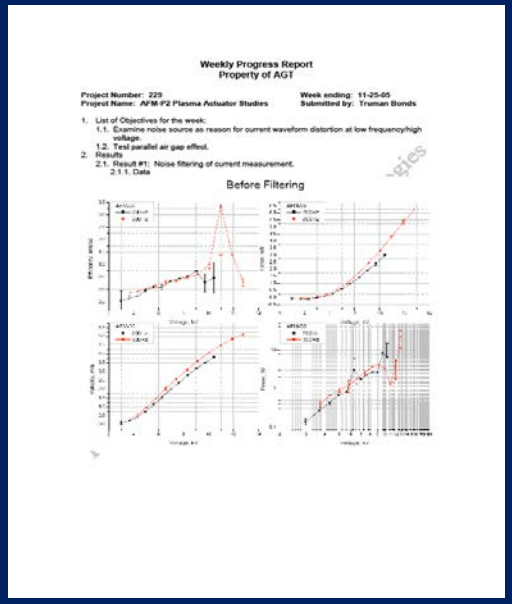
The “Force Stand” - a Defense Article used to provide Defense Services to foreign GRA





Domestic or “Deemed” Export

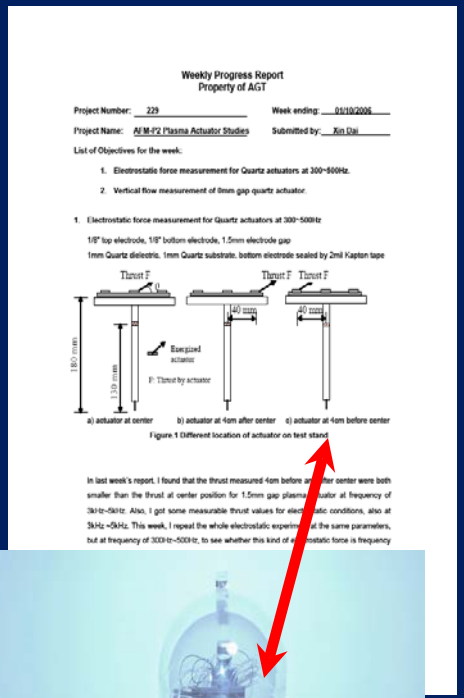
“Transferring Technical Data” to PRC National by Weekly Reports


Weekly Progress Report
Property of AGT

Project Number: 229
Project Name: AFM-P2 Plasma Actuator Studies
Week ending: 11-25-05
Submitted by: Truman Bonds

1. List of Objectives for the week:
   1.1. Examine noise source as reason for current waveform distortion at low frequency/high voltage.
   1.2. Test parallel air gap effect.
2. Results
   2.1. Result #1: Noise filtering of current measurement.
      2.1.1. Data

Before Filtering


Weekly Progress Report
Property of AGT

Project Number: 229
Project Name: AFM-P2 Plasma Actuator Studies
Week ending: 01/10/2006
Submitted by: Xin Dai

List of Objectives for the week.

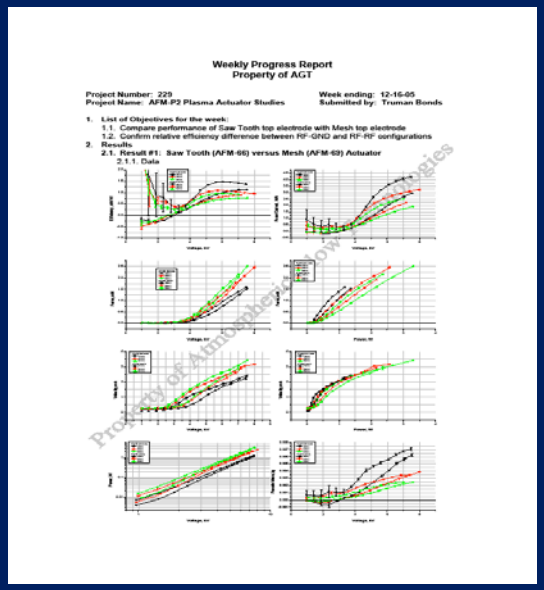
1. Electrostatic force measurement for Quartz actuators at 300~500Hz.
2. Vertical flow measurement of 0mm gap quartz actuator.

1. Electrostatic force measurement for Quartz actuators at 300~500Hz

1/8" top electrode, 1/8" bottom electrode, 1.5mm electrode gap
1mm Quartz dielectric, 1mm Quartz substrate, bottom electrode sealed by 2mil Kapton tape

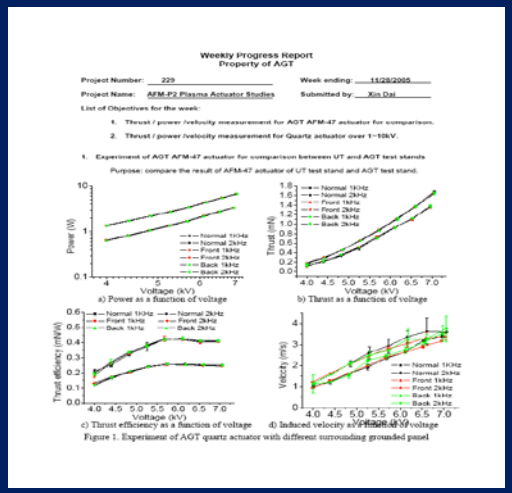
Thrust F
40 mm
180 mm
130 mm
Energized actuator
F: Thrust by actuator
a) actuator at center
b) actuator at 4cm after center
c) actuator at 4cm before center
Figure 1 Different location of actuator on test stand

In last week's report, I found that the thrust measured 4cm before and after center were both smaller than the thrust at center position for 1.5mm gap plasma actuator at frequency of 3kHz~5kHz. Also, I got some measurable thrust values for electrostatic conditions, also at 3kHz ~5kHz. This week, I repeat the whole electrostatic experiment at the same parameters, but at frequency of 300Hz~500Hz, to see whether this kind of electrostatic force is frequency


Weekly Progress Report
Property of AGT

Project Number: 229
Project Name: AFM-P2 Plasma Actuator Studies
Week ending: 12-16-05
Submitted by: Truman Bonds

1. List of Objectives for the week:
   1.1. Compare performance of Saw Tooth top electrode with Mesh top electrode
   1.2. Confirm relative effiuency difference between RF-GND and RF-RF configurations
2. Results
   2.1. Result #1: Saw Tooth (AFM-66) versus Mesh (AFM-69) Actuator
      2.1.1. Data


Weekly Progress Report
Property of AGT

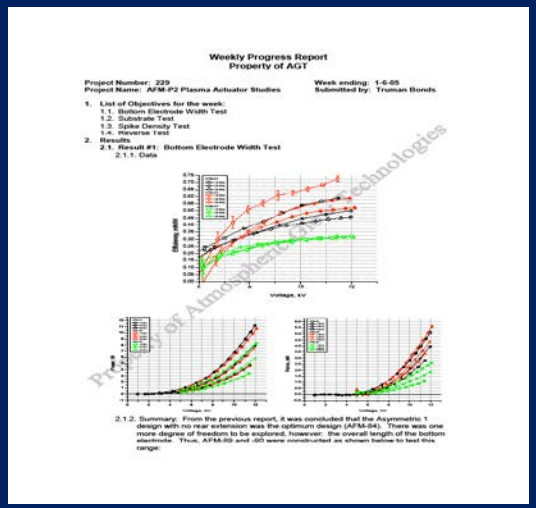
Project Number: 229
Project Name: AFM-P2 Plasma Actuator Studies
Week ending: 11/28/2005
Submitted by: Xin Dai

List of Objectives for the week:

1. Thrust / power /velocity measurement for AGT AFM-47 actuator for comparison.
2. Thrust / power /velocity measurement for Quartz actuator over 1~10kV.

1. Experiment of AGT AFM-47 actuator for comparison between UT and AGT test stands
   Purpose: compare the result of AFM-47 actuator of UT test stand and AGT test stand.

Power (W)
Voltage (kV)
a) Power as a function of voltage
Thrust (mN)
Voltage (kV)
b) Thrust as a function of voltage
Thrust efficiency (mN/W)
Voltage (kV)
c) Thrust efficiency as a function of voltage
Velocity (m/s)
Voltage (kV)
d) Induced velocity as a function of voltage
Normal 1KHz
Normal 2KHz
Front 1kHz
Front 2kHz
Back 1kHz
Back 2kHz
Figure 1. Experiment of AGT quartz actuator with different surrounding grounded panel


Weekly Progress Report
Property of AGT

Project Number: 229
Project Name: AFM-P2 Plasma Actuator Studies
Week ending: 1-6-05
Submitted by: Truman Bonds

1. List of Objectives for the week:
   1.1. Bottom Electrode Width Test
   1.2. Substrate Test
   1.3. Spike Density Test
   1.4. Reverse Test
2. Results
   2.1. Result #1: Bottom Electrode Width Test
      2.1.1. Data

Efficiency mN/W
Voltage, kV
Thrust, mN

2.1.2. Summary: From the previous report, it was concluded that the Asymmetric 1 design with no rear extension was the optimum design (AFM-84). There was one more degree of freedom to be explored, however: the overall length of the bottom electrode. Thus, AFM-89 and -90 were constructed as shown below to test this range:

May 2006 - UT Learns of Violation:

DO NOT EXPORT!

- 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

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

From: Witherspoon, Mary Robin
Sent: Thursday, May 11, 2006 5:08 PM
To: 'jrr@utk.edu'
Cc: Cox, Evelyn C; Harris, William F; Collier, Billie J; Woody, Alice M; tompkins@tennessee.edu
Subject: Export Control clause in the Atmospheric Glow prime contract

GOVERNMENT EXHIBIT

Dr. Roth,

I have reviewed the Air Force's prime contract with Atmospheric Glow. The prime contract contains the Export Control restriction (AFMC 5352.227-9000 EXPORT-CONTROLLED DATA RESTRICTIONS) on foreign nationals that I spoke to you about on the phone. I contacted the State Department yesterday (without naming names) and talked to them about the technology involved and asked if foreign students would be allowed to work on such a project. I did mention Iran and China. The person I talked to confirmed that Iran and China are denied countries for export control purposes. The AFMC clause cannot be negotiated out of this contract. What this means is that only American students can work on the project, and have access to the equipment involved in the research, unless we could obtain a license from the State Dept. I will caution that a license can take six months to a year to process, which would side line your research for that period of time. I also do not think that State will grant a license in our case.

In my conversation with the folks at Atmospheric Glow, I discussed the foreign national restriction and the problem with foreign national access to the equipment. I understand that you will meet with them in the morning. I hope an agreement can be made at that time beneficial to us all. I will be out of town on Friday, but feel free to leave me a message or e-mail and I will pick that up on Monday.

Robin

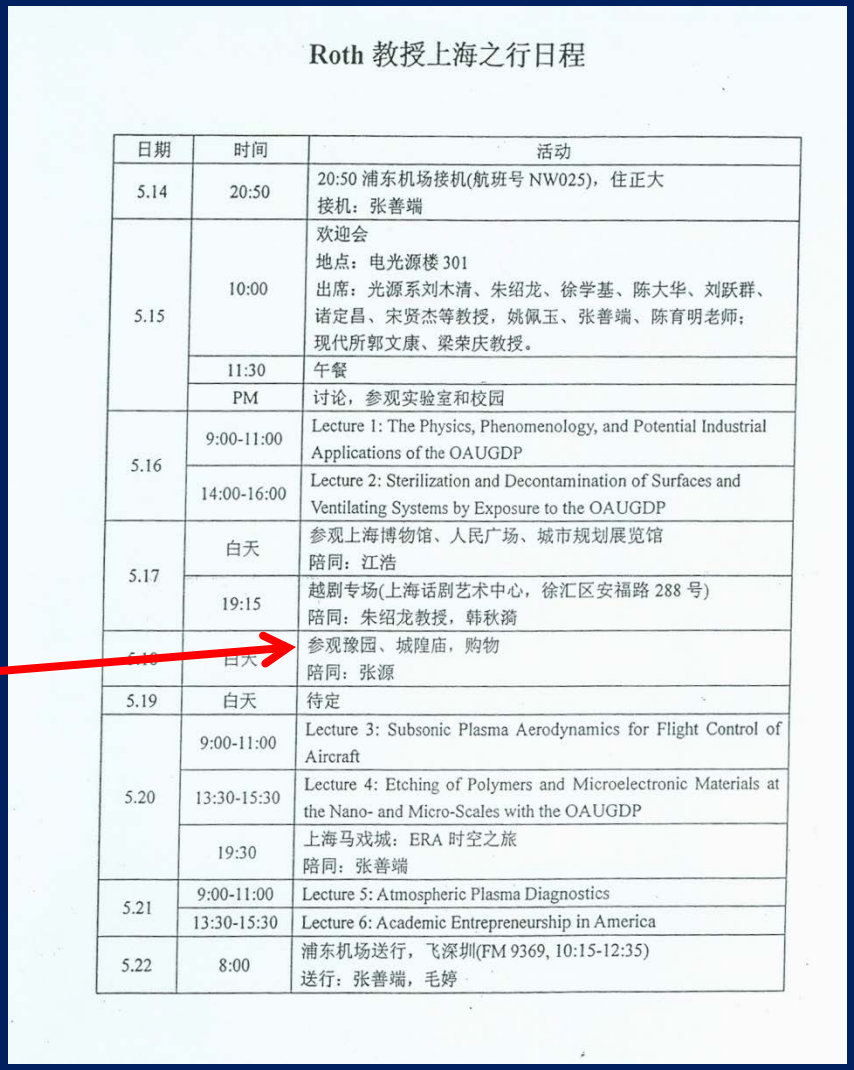
Robin Witherspoon
Coordinator, Export Control
University of Tennessee
Office of Research
1534 White Avenue
Knoxville, TN 37996-1529
Phone: 865.974.0232
Fax: 865.974.2805
http://exportcontrol.utk.edu

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

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."



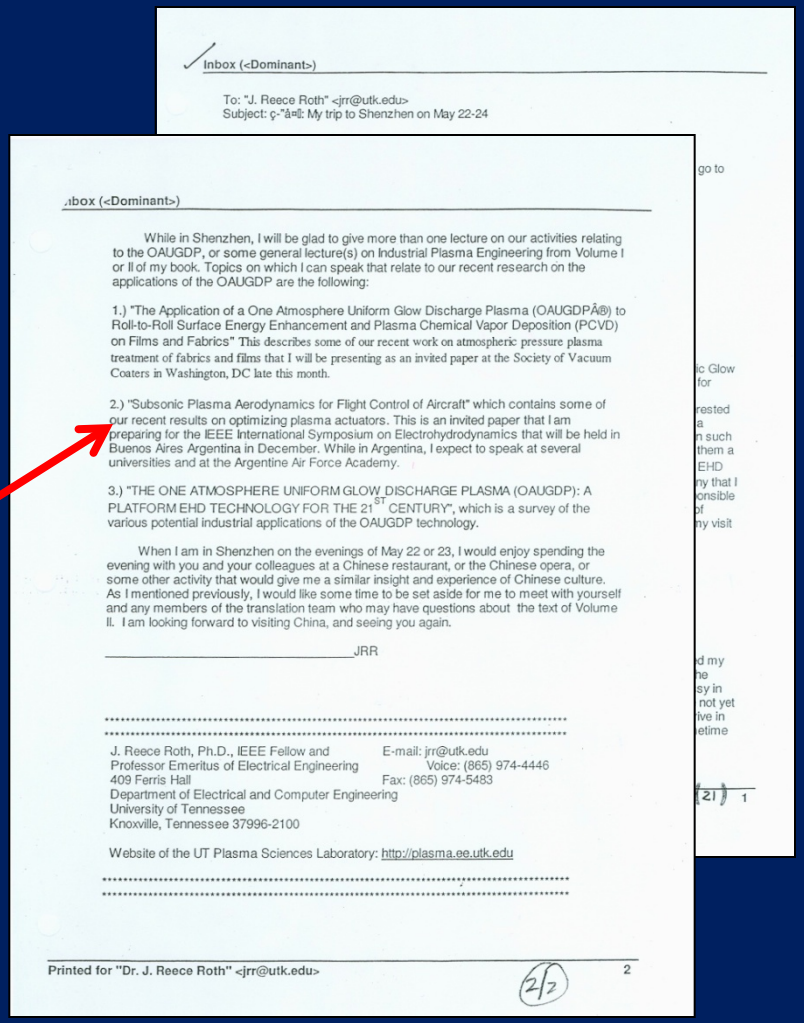
Roth 教授上海之行日程

日期	时间	活动
5.14	20:50	20:50 浦东机场接机(航班号 NW025)，住正大 接机：张善端
5.15	10:00	欢迎会 地点：电光源楼 301 出席：光源系刘木清、朱绍龙、徐学基、陈大华、刘跃群、诸定昌、宋贤杰等教授，姚佩玉、张善端、陈育明老师；现代所郭文康、梁荣庆教授。
	11:30	午餐
	PM	讨论，参观实验室和校园
5.16	9:00-11:00	Lecture 1: The Physics, Phenomenology, and Potential Industrial Applications of the OAUGDP
	14:00-16:00	Lecture 2: Sterilization and Decontamination of Surfaces and Ventilating Systems by Exposure to the OAUGDP
5.17	白天	参观上海博物馆、人民广场、城市规划展览馆 陪同：江浩
	19:15	越剧专场(上海话剧艺术中心，徐汇区安福路 288 号) 陪同：朱绍龙教授，韩秋漪
[illegible]	白天	参观豫园、城隍庙，购物 陪同：张源
5.19	白天	待定
5.20	9:00-11:00	Lecture 3: Subsonic Plasma Aerodynamics for Flight Control of Aircraft
	13:30-15:30	Lecture 4: Etching of Polymers and Microelectronic Materials at the Nano- and Micro-Scales with the OAUGDP
	19:30	上海马戏城：ERA 时空之旅 陪同：张善端
5.21	9:00-11:00	Lecture 5: Atmospheric Plasma Diagnostics
	13:30-15:30	Lecture 6: Academic Entrepreneurship in America
5.22	8:00	浦东机场送行，飞深圳(FM 9369, 10:15-12:35) 送行：张善端，毛婷

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."



Inbox (<Dominant>)

To: "J. Reece Roth" <jrr@utk.edu>
Subject: ç-"â¤: My trip to Shenzhen on May 22-24

Inbox (<Dominant>)

While in Shenzhen, I will be glad to give more than one lecture on our activities relating to the OAUGDP, or some general lecture(s) on Industrial Plasma Engineering from Volume I or II of my book. Topics on which I can speak that relate to our recent research on the applications of the OAUGDP are the following:

1.) "The Application of a One Atmosphere Uniform Glow Discharge Plasma (OAUGDPÂ®) to Roll-to-Roll Surface Energy Enhancement and Plasma Chemical Vapor Deposition (PCVD) on Films and Fabrics" This describes some of our recent work on atmospheric pressure plasma treatment of fabrics and films that I will be presenting as an invited paper at the Society of Vacuum Coaters in Washington, DC late this month.

2.) "Subsonic Plasma Aerodynamics for Flight Control of Aircraft" which contains some of our recent results on optimizing plasma actuators. This is an invited paper that I am preparing for the IEEE International Symposium on Electrohydrodynamics that will be held in Buenos Aires Argentina in December. While in Argentina, I expect to speak at several universities and at the Argentine Air Force Academy.

3.) "THE ONE ATMOSPHERE UNIFORM GLOW DISCHARGE PLASMA (OAUGDP): A PLATFORM EHD TECHNOLOGY FOR THE 21ST CENTURY", which is a survey of the various potential industrial applications of the OAUGDP technology.

When I am in Shenzhen on the evenings of May 22 or 23, I would enjoy spending the evening with you and your colleagues at a Chinese restaurant, or the Chinese opera, or some other activity that would give me a similar insight and experience of Chinese culture. As I mentioned previously, I would like some time to be set aside for me to meet with yourself and any members of the translation team who may have questions about the text of Volume II. I am looking forward to visiting China, and seeing you again.

JRR

J. Reece Roth, Ph.D., IEEE Fellow and
Professor Emeritus of Electrical Engineering
409 Ferris Hall
Department of Electrical and Computer Engineering
University of Tennessee
Knoxville, Tennessee 37996-2100
E-mail: jrr@utk.edu
Voice: (865) 974-4446
Fax: (865) 974-5483

Website of the UT Plasma Sciences Laboratory: http://plasma.ee.utk.edu

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

GOVERNMENT EXHIBIT 41

Message0001	
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

Message Body

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 is the full pfd 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 Experimental 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 settng 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
>atempt 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.

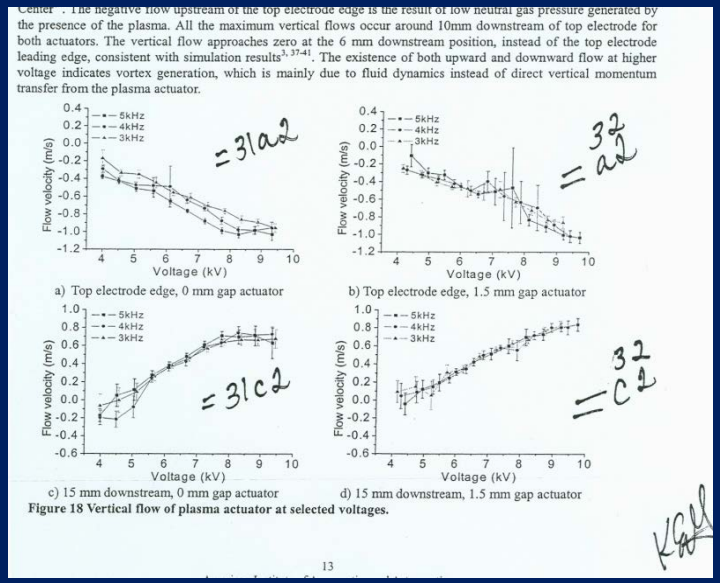
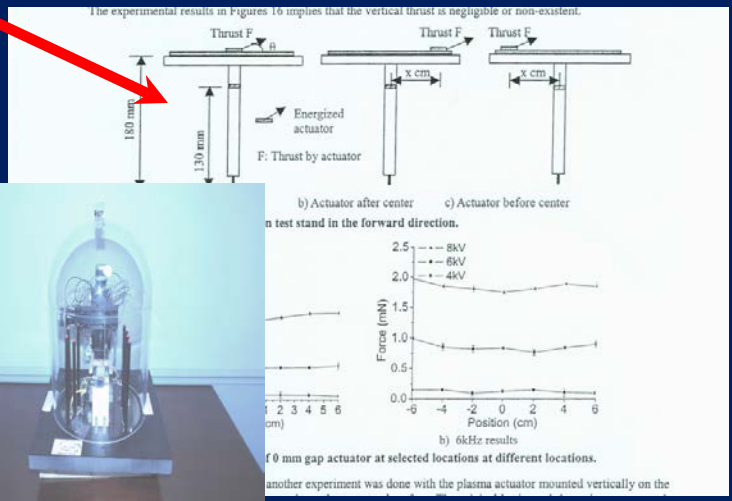


Figure 18 Vertical flow of plasma actuator at selected voltages.



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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 our

- 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."

U.S. v. Roth
General Knowledge of Export Control Laws

- "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.

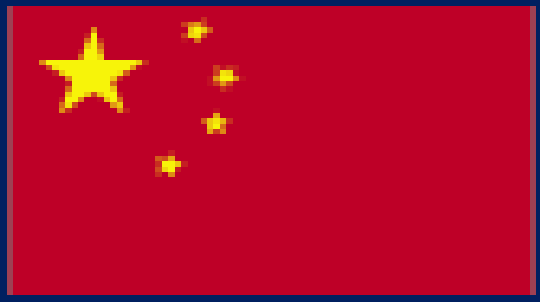
Source: Chronicle of Higher Education (citing 2010 Open Doors Annual Report, Inst. of International Education)

Why is this Important?

Senior Colonel

Yinghong Li

People's Liberation Army Air Force



Air Force Engineering University, Xian, PRC

46th AIAA Aerospace Sciences Meeting and Exhibit
7 - 10 January 2008, Reno, Nevada

AIAA 2008-1105

Experimental Investigation on Plasma Aerodynamic Actuator's Emission Spectrum Characteristics

Yun WU[1] and Yinghong LI[2]
Engineering College, Air Force Engineering University, Xi'an, China, 710038

Yikang PU[3]
Department of Engineering Physics, Tsinghua University, Beijing, China,100084

Gang ZHAO[4] and Bangqin CHENG[5]
Engineering College, Air Force Engineering University, Xi'an, China, 710038

and

Zhigang GUO[6]
Department of Engineering Physics, Tsinghua University, Beijing, China,100084

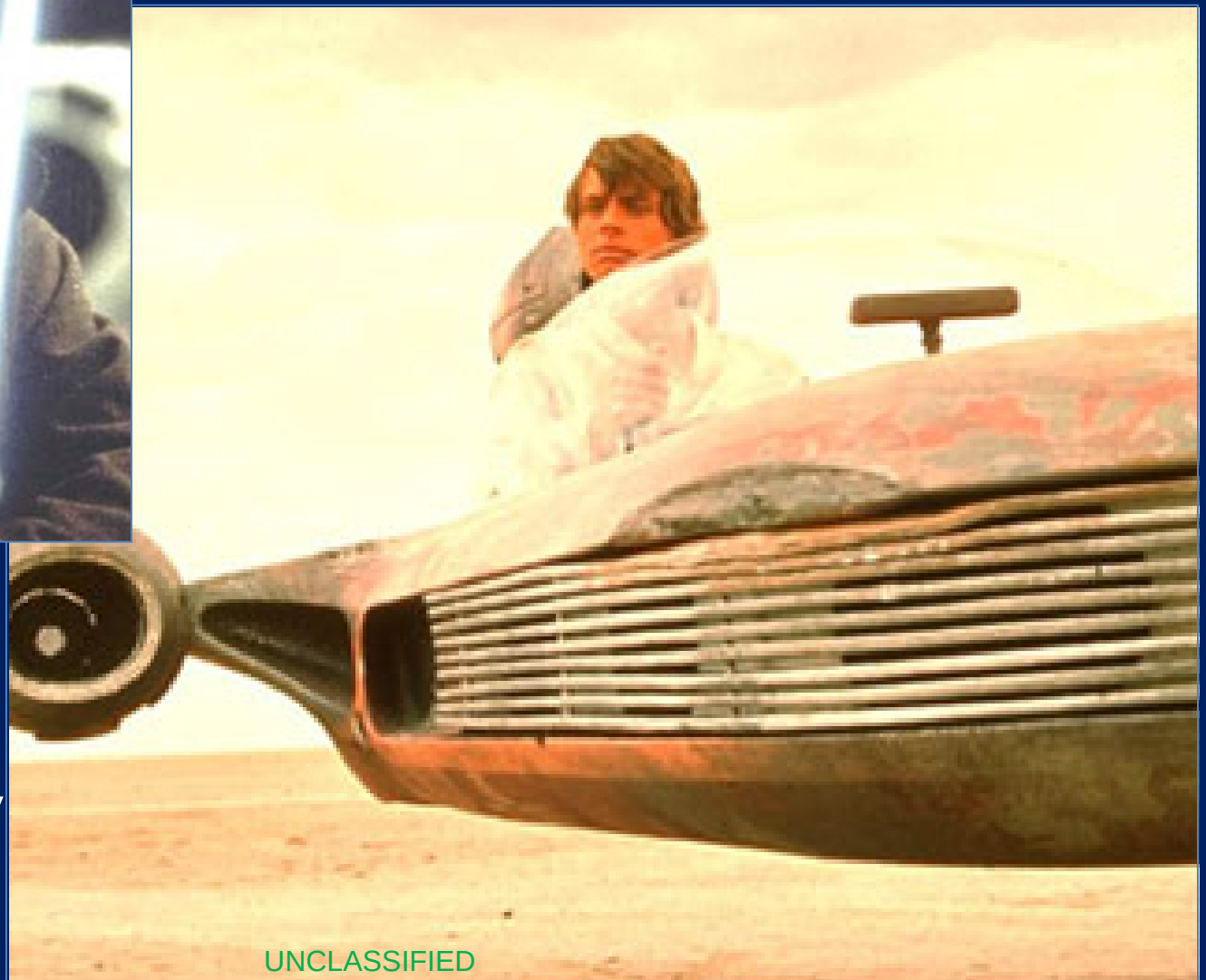
Keys to an Effective Compliance Program

Export Controls

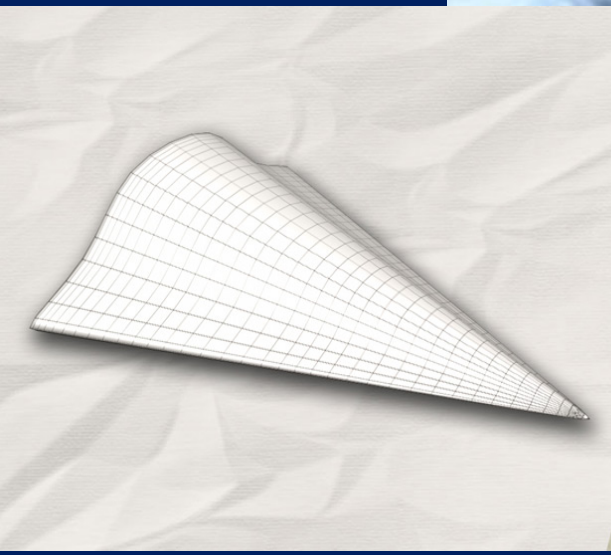
1. Know Your Funding Source Restrictions
2. R&D Contract Review and Oversight
3. Monitor Research Assignments and Equipment
4. Attention to Risks of Foreign Travel
5. Meaningful and Effective Export Control Program and Office
6. Emphasize Training and Education
7. Policy & Practice of Timely Self-Reporting 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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