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ABSTRACT

Technology has provided the public with the ability to steal the contents of multiple examinations in a short time period and at minimal cost. No examination is safe from compromise, and the only variable is the extent and sophistication used to bring about the compromise or theft. With the easy availability of micro-video equipment, audio recorders, and still cameras, the traditional methods are essentially archaic. Available technologies that are described are: (1) still cameras in small sizes; (2) audio recorders and transmitters; (3) video cameras, recorders, and transmitters; (4) electromagnetic spectrum interception; and (5) miscellaneous measures, such as the ultraviolet pen and pages. Electronic countermeasures are available, but the most economical and easy to implement countermeasures are through proctors and staff trained in effective observation skills and controlling the exposure of the examination. Computer testing, which had been regarded as a way to ensure examination security, is actually at least as vulnerable as paper and pencil testing. (SLD)

High-Tech Approaches to Breeching Examination Security

Espionage 101

March 25, 1997

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An Introduction To Espionage

When you took your first examination in grade school at least one student sitting in the classroom with you was trying to determine a means of cheating on that examination. It was and is, common practice for one student to ask a friend who has taken the exam earlier in the day, about the questions contained on the test or to look at the paper of the student at the next desk.

As time progressed and the necessity of passing examinations grew to include admittance into college, licensure in a chosen profession or occupation, or certification. In response to this increased challenge, the efforts to gain advance knowledge of the exam contents has advanced, respective to the gain of passing the exam.

As the stakes grew to passing examinations, so did the attempts to steal or compromise them. In keeping with the theory of supply and demand, organized efforts to steal exams surfaced, and provided for a black market source. It did not take long for unscrupulous individuals to realize that candidates would be more than willing to pay for advanced knowledge of the examination for which they were about to take.

The only question is:

> *How would, or does one obtain advanced knowledge of the exam questions without being discovered?*

This is a question which was easily answered by the natural developments of technology, coupled with the long standing techniques used in industrial espionage. Technology provided the general public with the ability to steal the contents of multiple examinations in an extremely short period of time and with minimal cost. Enabling the miscreant entrepreneur to supply their customers with the information instantly, with little to no chance of being caught.

The Threat

Examination materials are subject to loss at any given point. However, there are special issues when materials are exposed to unscrupulous candidates, or organized efforts to compromise examinations for financial gain. No examination is safe from compromise, the only variable is the extent and sophistication used to facilitate the compromise or theft.

Throughout the years, I have conducted numerous investigations into organized and unorganized theft of examination related materials. Some of the attempts to compromise examination materials and/or the examination process are as follows:

1. Organized efforts by individuals who obtain examination materials through a variety of means, and in turn provide such materials to candidates for a fee under

the auspices of examination preparation.

2. Candidates have sent other people to sit for the examination in their place.

3. Candidates have attempted to bribe the examination administration staff to either change their grade or provide them with some of the examination items in advance.

4. Candidates attempt and successfully remove an examination booklet and other materials from an administration.

5. Candidates have been caught with body worn tape recording devices and have attempted to record the contents of the examination.

6. Candidates have been caught attempting to photograph the pages of an examination.

The theft of examination materials by an individual from an administration site can be facilitated through a wide variety of efforts. With todays technology, sophisticated electronic devices have helped facilitate these efforts.

The theft of examination materials is no longer restricted to traditional methods such as taking a booklet, or copying down examination items. With the easy accessibility to micro-video equipment, audio recorders and still cameras, the traditional methods are essentially archaic. On a daily basis electronic devices are becoming smaller, more powerful and more accessible to the general public.

This technology which had been previously reserved for the international spy is now available for rent to anyone who wishes to do so. Additionally with the current lack of awareness it is highly unlikely that anyone using this technology would be discovered using them.

Current technology includes, but is not limited to:

1. Micro-Video cameras that are not much bigger than a quarter in size. Cameras which are quite commonly concealed within a neck tie, eye glass case, baseball cap, pager, euro pouch or just about anything!

2. A video transmitter that is smaller than the size of a pack of cigarettes and will easily transmit to a remote location up to 20 miles away.

3. A micro video recorder ½ the size of a pack of cigarettes and which can be easily concealed in a purse or on your person.

4. An Electromagnetic Spectrum Recorder, which is a device that will record whatever data is displayed on the screen of a computer, or the data as it is accessed from the hard drive of a computer. Again this device is smaller than a pack of cigarettes and is extremely effective.

5. Still cameras are concealed within a wrist watch, cigarette lighter, neck tie, etc.

Due to the nature of the espionage business, the full extent of this type of activity is unknown. However, last year there were in excess of 2,000 news stories involving failed attempts of industrial espionage, bugging and wiretaps, all of which were illegal.

The growth of the spy industry within the United states has drastically increased over the past five years. This growth is clearly evidenced by increased growth of spy shops opening everywhere. There is not a major city in the U.S. which does not have a spy shop.

With the arrival of relatively inexpensive and easy to use micro miniature cameras, wire tapping devices, bugs and micro recorders came the open availability of these devices to the general public. In a mere 15 minutes a novice can be shown how to use and wear a concealed body video camera and use it for whatever purpose they see fit. With the availability of this high-tech low cost equipment, one can easily see how these devices could be used to target and get any information desired!

- An article in the Washington Post indicated that consumer surveillance or spy gear alone is now a $100 million dollar industry.

- The Associated Press reports that an official of "General Electric Company of Fairfield, Conn. has said that a rash of industrial spying cases, at it's primary plants cost them millions of dollars in recent years and was a factor in the layoff of thousands of employees."

- Newsweek - "Eighty per cent of the Fortune 1000 companies now maintain in house snoops, according to the Society of Competitive Intelligence Professional."

- Detroit Free Press - "Gerber Will end Tours of its Baby Food Plant Gerber Products Company, citing concerns about industrial espionage and public safety, announced that it will discontinue public tours of it's Freemont baby food plant after almost 80 years.

- Upjohn Company of Kalamazoo canceled its tours last year. Other companies have either cut back or eliminated tours, citing security and safety reasons.

- Time Magazine - "According to the F.B.I., several foreign governments are employing their spy networks to purloin business secrets and give them to private industry."

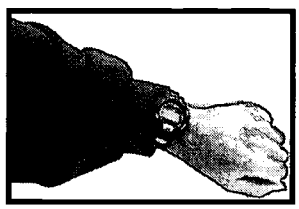
Maybe you have seen some of the covert surveillance devices contained within this presentation, then again maybe you haven't!!!

Available Technology

Still Cameras

Wrist Watch Camera

The wrist watch camera is the smallest still camera in the world. Developed in Germany, this ingenious digital watch conceals an actual working camera. Take photographs undetected! A developer kit which includes everything needed to develop your own negatives, is commonly included within the purchase price. The camera uses 7-exposure cartridges utilizing black and white 35mm film This fully functional watch features alarm, chronograph and a timer and sells for less than $300.00. Over 58,000 people in the United States have put this example of German high-technology to work for them, within the past two years.



Wrist Watch Camera

Cigarette Lighter Camera

This camera is the smallest camera in the world which uses a standard film, available in 12 or 24 exposures. This stylish camera is a fully functional cigarette lighter as well! This covert camera measures 4 3/8 x 1 1/16 x 3/4 and weighs 62 grams and sells for less than $400.00.

A still camera capable of photographing the contents of any document or examination can be easily concealed within almost any object imaginable.

Audio Recorders and Transmitters

Micro-Mini Recorder

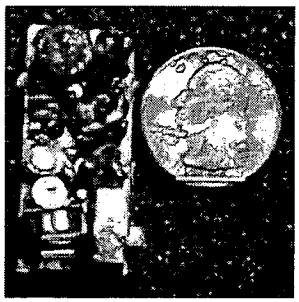
This is the worlds 2nd smallest high quality recorder. This recorder is small enough to be covered by a normal business card or fit inside a pack of cigarettes. This tiny little recorder has more features than most full size units. It features a built-in super sensitive microphone and a tiny tie clip microphone extension. The 2-speed operation allows a person to record for three hours. This little recorder is the hottest unit on the market, sales within the United States are reported at 4500 annually.

Pearlcorder L-400 Micro Mini Recorder

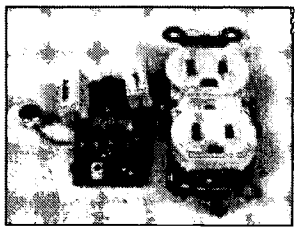
This is the worlds smallest high quality recorder. This unit offers an auto reverse mode, dual tape speeds for up to 3 hours of continuous recording, variable voice activation control, auto shut-off and a highly sensitive built-in microphone.

Transmitters

Audio transmitters have technologically advanced to the point where they are just larger than a dime and can literally be concealed anywhere. Below are just some of the examples of the covert audio transmitter devices that are available to the public.



Audio transmitter just larger than a quarter.

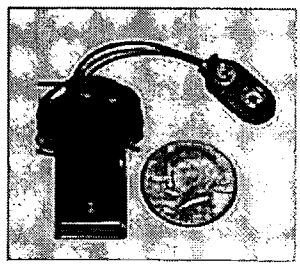


Microphone powered by and concealed within a wall plug

Microphone in the heel of a shoe

Transmitter concealed within a pen

Audio transmitter



Audio transmitter just larger than a dime.

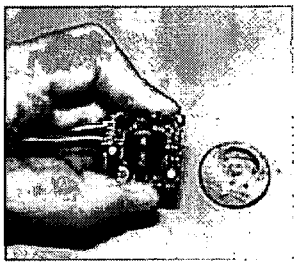
Video Cameras, Recorders and Transmitters

Covert Video Cameras

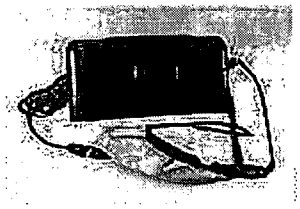
The development of micro electronics came the ability to produce a high resolution video camera which is not much larger that a quarter. As a result, this camera is easily concealed in a number of objects, all of which would not cause any suspicion. This pinhole board camera is the worlds finest and smallest and sells for about $150.00

These board cameras are commonly concealed within:

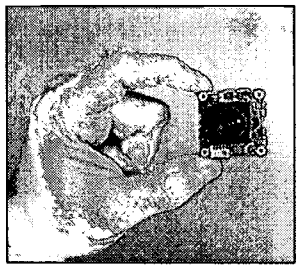
- Eyeglass case that easily fits in a pocket.
- Pager - standard belt, pocket or purse worn pager provides hands-free video.
- Hat Cam -standard baseball cap.
- Tie Cam - camera system concealed within a tie.
- Jacket Cam - a video camera which has been sewn into the fabric of a vest or jacket.



Color video camera



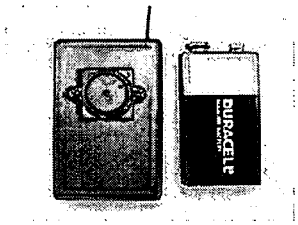
Video camera concealed within an eye glass case



Actual size of micro video camera

Pager video camera and transmitter

Video watch camera and transmitter

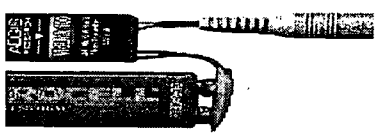


Micro video camera

Covert Wireless Video Link

This professional grade wireless video transmitter provides unparallel image quality, full color capability. It is the smallest crystal-controlled color/B&W video transmitter currently available and no special receiver is required; any cable-ready TV or VCR can receive it's signal and recorder at another location. The wireless Video Link is currently selling for $199.99.

There are a wide variety of covert video transmitters on the open market and that are capable of transmitting a clear signal up to 20 miles away.



Video signal transmitter

Electromagnetic Spectrum Interception

We all remember our mothers telling us not to sit so close to the TV! This was because of Electromagnetic radiation which was believed to be harmful. Throughout the years the government has regulated Televisions and have reduced the amount of electromagnetic radiation emitted from not only Televisions, but other electronic devices such as computers and computer monitors.

In 1985 a group of Swedish Engineers, led by William Van Eck, presented a paper called "Electromagnetic Radiation from video display units: An Eavesdropping Risk?" The paper described how one could easily and inexpensively convert a normal television set into a non-trespassing, passive device to intercept and reconstruct the information from any digital device, most notably computers.

An offshoot of the electromagnetic field is security. These same emissions carry with them the necessary information which, when decoded with the right, and relativity inexpensive equipment, can be used to recreate an exact replica of what is displayed on a monitor. Under the right circumstances, it is possible to do so over a distance of several hundred yards.

If you have the knowledge you can build a unit to intercept and decode the electromagnetic signals of another device such as a computer or monitor for $50.00 or $60.00. Models are also available commercially through local spy shops for about $150.00.

These devices are highly effective and created an unparalleled risk to any and all secure digital data. A risk which has been clearly exploited by unscrupulous individuals.

This is a threat that is real, present and could potentially compromise any information contained on a computer or viewed on a video screen.

Miscellaneous

Ultraviolet Pen

This felt-tipped pen provides the user with an inexpensive and convenient ultraviolet writing instrument. The pen is ideal for taking covert notes! The markings remain invisible until examined under an ultraviolet light source. Sales of this instrument in the United states exceed 19,000 per year and costs $9.00 each.

Pagers

In this day and time it would be unusual for someone not to have a pager clipped to their belt, pocket, book-bag or purse. It is believed that drug dealers were among the first to create coded messages to be used by their customers, that way if or when the dealer was arrested, the police would be unable to obtain any information from the dealers pager.

With the development of alpha numeric pagers the ability to send coded messages has

greatly increased.

Over the past two years numerous candidates at the test site have been found in possession of pagers which have contained the key to the examination for which they were sitting. The key was predominately represented in the below two forms, they being:

6. 1A 2C 3A 4D 5A 6A 7C 8B 9B 10D...etc

7. 11 23 31 44 51 61 73 82 92 104...etc

In the first example the coding is quite obvious, the number represents the position number and the letter represents the correct or desired response. In the second example, again the number represents the position number and the last digit represents the letter of the correct or desires response converted to it's corresponding letter, specifically 1=A, 2=B, 3=C & 4=D.

Equipment Availability

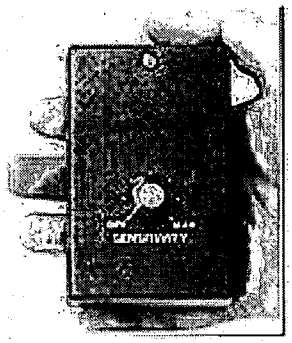
All of the equipment which I have referenced within this document is readily available to anyone, without question from your local spy shop, the Internet or by mail order catalogs, such as Time magazine, Electronics Now, Popular Electronics and a host of other main stream magazines and publications.

Countermeasures

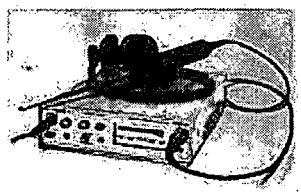
General

There are generally two categories of countermeasures available, they are electronic countermeasures and observation countermeasures. Proctors and staff trained in effective observation skills and controlling the exposure are the most economical and easiest to implement.

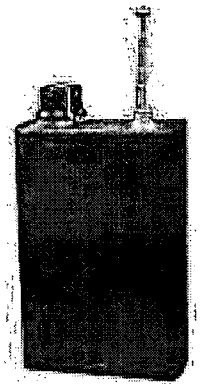
The second being the use of electronic countermeasures which includes the use of a spectrum analyzer, which will pinpoint the source of any audio or video transmission or recorders present within a targeted area. Other electronic countermeasures include, nullifiers or noise generators which scramble the signal of a device either transmitting or recording. The down side of electronic countermeasures is the cost of the equipment and the level of expertise required to ensure the proper operation of the equipment.



Hand held recorder detector



Spectrum analyzer



Hand held transmitter detector

Metal Detectors

The Super Scanner

Hand held metal detectors have become the most popular weapons detector in the world! These detectors are also extremely useful for detecting body worn covert surveillance devices, such as video cameras & transmitters, tape recorders etc. These hand held detectors commonly sell for $180.00 and are an effective countermeasure.

Transmission and Recorder Nullifiers

A transmission and recorder nullifier is a device which produces and emits a nullifying "noise" which will block the transmission of another device which is, or may be transmitting information from a targeted area. There are a wide variety of effective devices readily available from the local spy shop, on the Internet and through the mail.

Observation Techniques

The following are clear indications that your examination has been compromised and are warning signs that espionage has possibly occurred or is occurring at the site.

- Look for candidates who finish their examination in an unreasonably short period time.
- Candidates who are completing their answer sheet without opening the booklet, or seldom turning a page.
- A Candidate making multiple trips to the restroom.
- A candidate appears to be more attentive to what the administration staff are doing, rather that taking his examination.

- A candidate appears to be unreasonably nervous.
- Watch for candidates who hold their examination booklet upright, apposed to leaving it on the table like every one else.
- Candidates who are continuously passing their wrist over the pages of the examination booklet, while having the face of their watch pointing downward towards the booklet. This is an example of a person who may be using a watch camera.
- Watch out for the candidate who stands over their examination booklet. If a candidate has not completed their examination and needs to leave their seat to use the restroom or get a drink of water, a Proctor should close the Candidate's examination booklet prior to the Candidate being permitted to stand up.
- Note any electrical interference during the announcement of candidate instructions, if a public address system is used. A variety of less sophisticated video and audio transmission devices will commonly cause problems with the use of this equipment.
- Pagers and cellular telephones should not be permitted within the examination room. Candidates should be instructed to leave such devices at home, the office or in their car, or placed on the proctors table and returned only as the candidate completes his examination and leaves the room. Turning off the device is not sufficient!

Conclusion

The technology of cheating on examinations is not limited to talking to someone who sat for the same examination earlier, or looking at another candidates answer sheet as it was when you were in grade school. Today high-tech approaches of industrial espionage represent low-cost, low-risk means of stealing examination materials. Accordingly, high-tech approaches to detecting security breeches are now a necessary element of the testing business.

We have long looked to computer-based testing as a means of ensuring examination security. However, recent news articles concerning breeches of computer-based examination item banks and the availability of inexpensive spectrum interception equipment capable of reading and storing the image on a computer screen, makes this medium of testing at least as vulnerable as paper and pencil testing.

Significant sums of money are invested in the development of examinations, particularly those used to support high-stakes decisions such as college admissions, licensure and certification. The high level of these costs makes the possibility of examination espionage a real threat to the viability of such programs. These risks, combined with the financial motivation of cram-schools that guarantee that their students will pass, make it clear that counter-measures be considered.

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