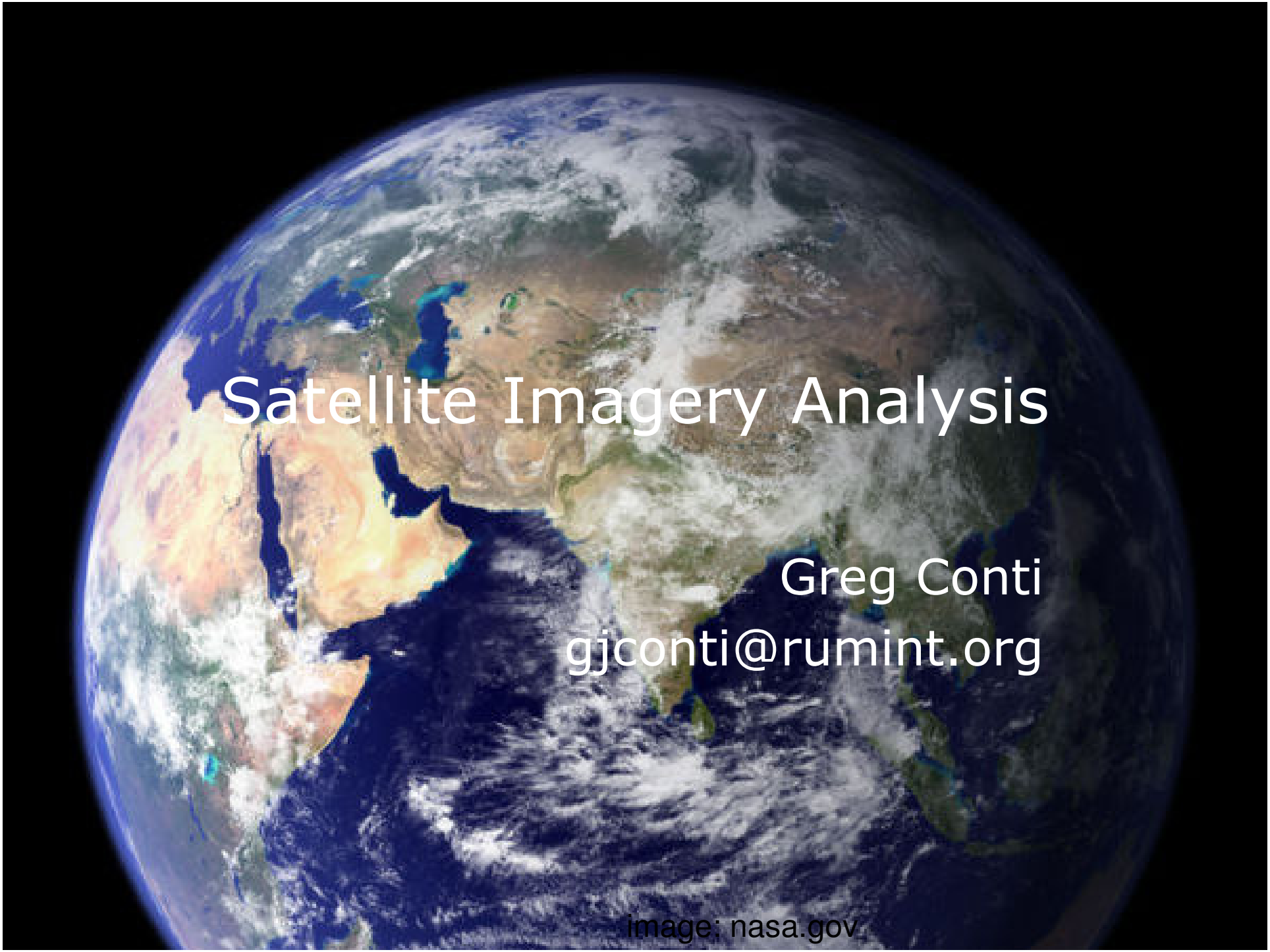
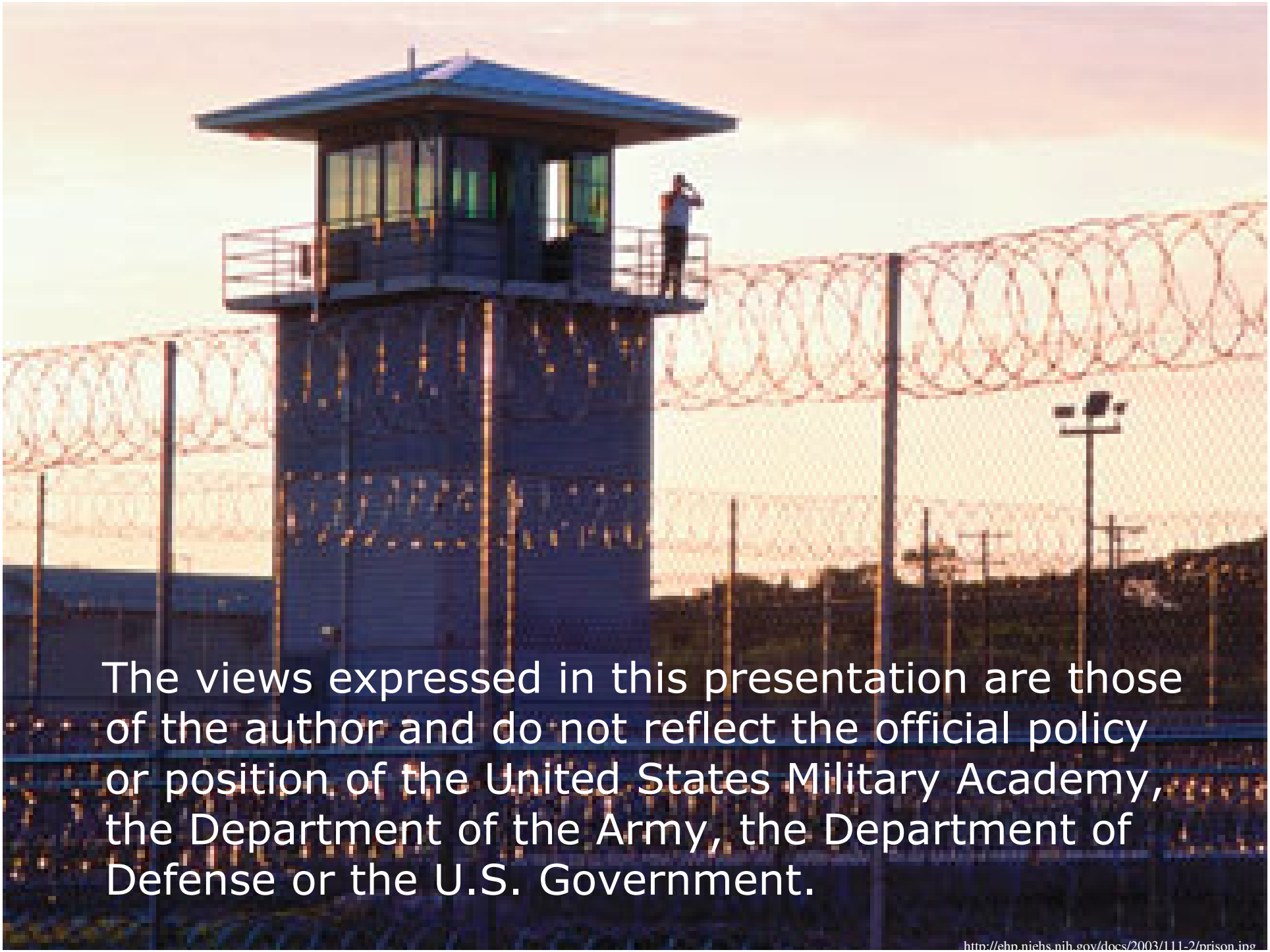


Satellite Imagery Analysis

Greg Conti
gjconti@rumint.org

image: nasa.gov


The views expressed in this presentation are those of the author and do not reflect the official policy or position of the United States Military Academy, the Department of the Army, the Department of Defense or the U.S. Government.
http://ehp.niehs.nih.gov/docs/2003/111-2/prison.jpg





http://googlesightseeing.com/2006/11/28/top-10-naked-people-on-google-earth/


S Las Vegas Blvd
NE
SW
http://maps.google.com/maps?um=1&tab=wl&hl=en&q=google%20street%20level%20view

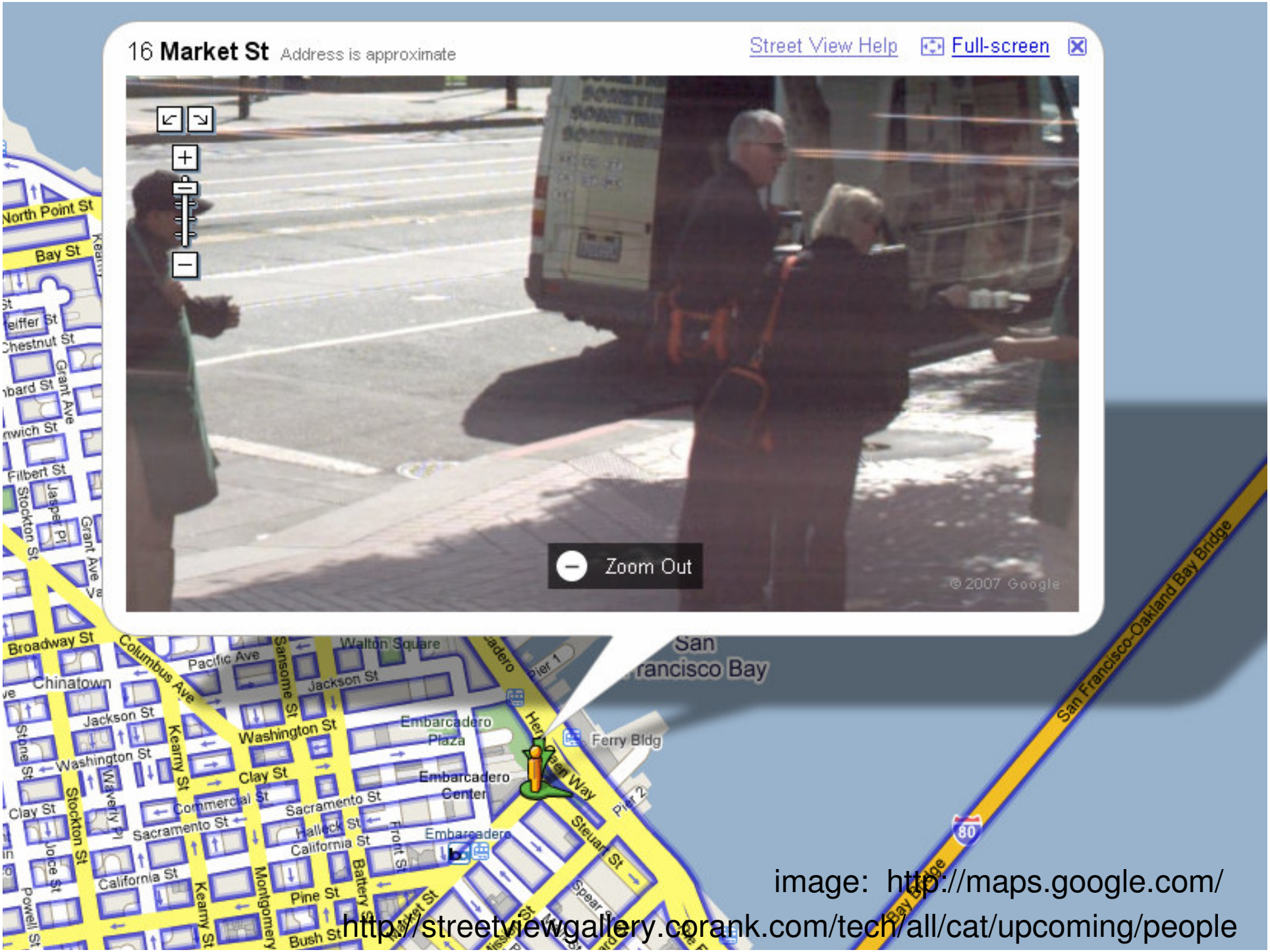
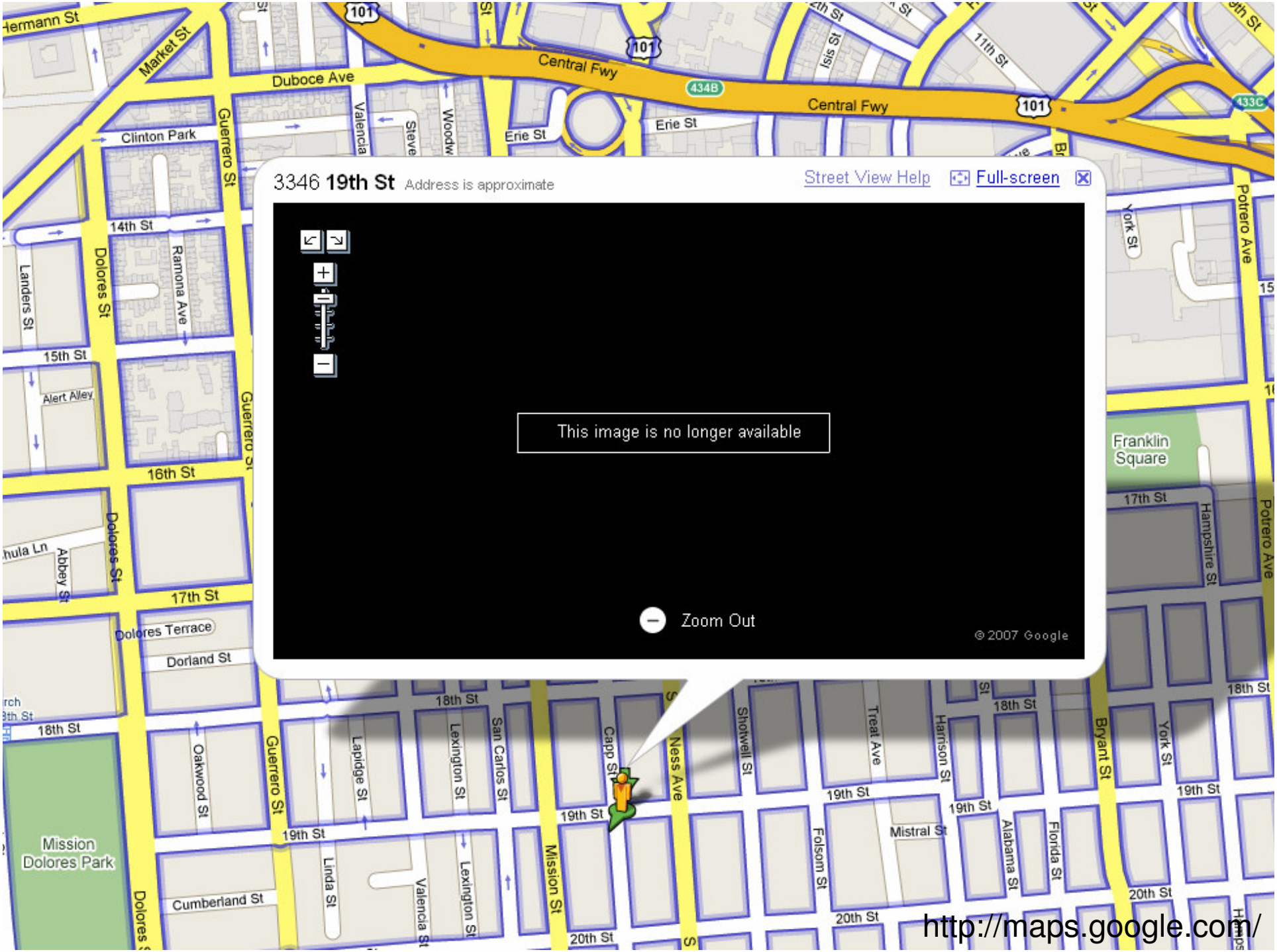


image: http://maps.google.com/
http://streetviewgallery.corank.com/tech/all/cat/upcoming/people


3346 19th St
Address is approximate
Street View Help
Full-screen
This image is no longer available
Zoom Out
© 2007 Google
Central Fwy
Duboce Ave
Market St
Guerrero St
Clinton Park
14th St
15th St
16th St
17th St
18th St
19th St
20th St
Dolores St
Ramona Ave
Landers St
Alert Alley
Abbey St
Dolores Terrace
Dorland St
Oakwood St
Lapidge St
Lexington St
San Carlos St
Linda St
Valencia St
Cumberland St
Mission Dolores Park
Capp St
Mission St
Ness Ave
Shotwell St
Treat Ave
Harrison St
Folsom St
Mistral St
Alabama St
Florida St
Bryant St
York St
Hampshire St
Potrero Ave
Franklin Square
Erie St
Isis St
11th St
Woodw
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Valencia
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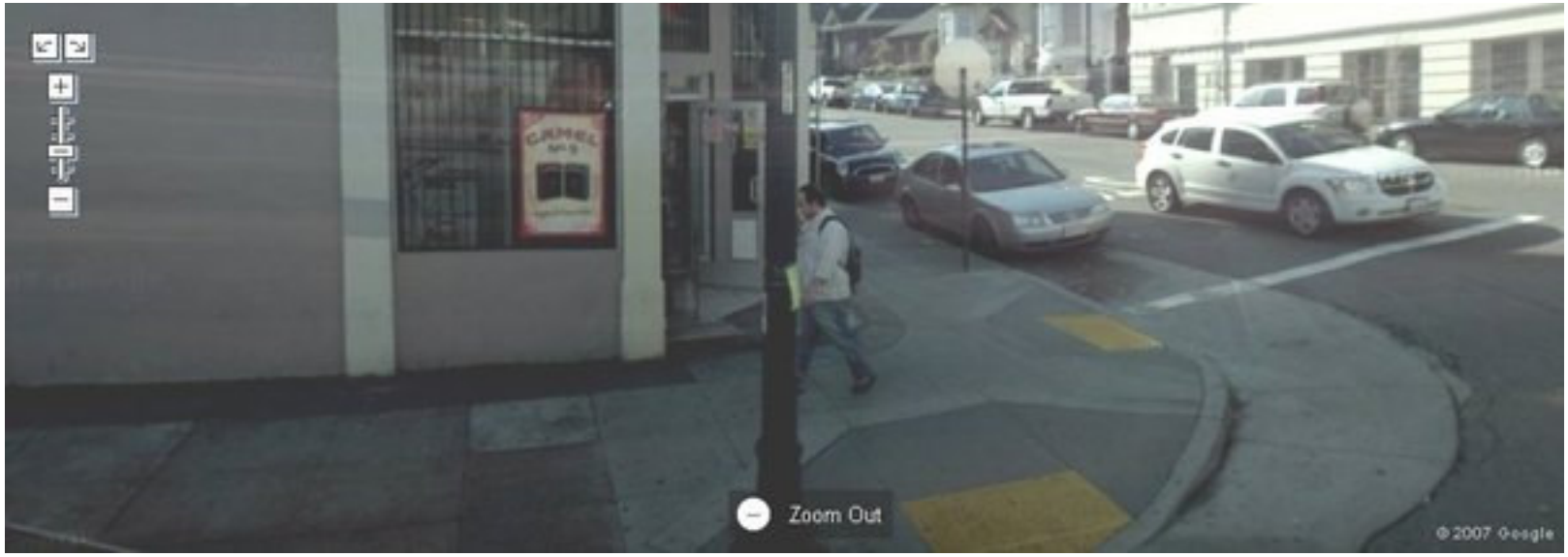
434B
433C
http://maps.google.com/

Be sure to photograph EFF attorneys



http://blog.wired.com/27bstroke6/2007/06/eff_privacy_adv.html

Checkbook Shutter Control

"I could certainly foresee circumstances in which we would not want imagery to be openly disseminated of a sensitive site of any type, whether it is here or overseas,"

- Robert Muttett, director National Geospatial-Intelligence Agency

"With the help of about $1 billion from Murrett's agency, the companies [DigitalGlobe GeoEye] plan to launch new satellites with higher resolutions later this year."

"While the public will begin to see crisper images online and elsewhere, government regulations will require the companies to degrade the quality of the imagery to a half-meter resolution."

http://www.komotv.com/news/tech/7404181.html

Imagery Analysis

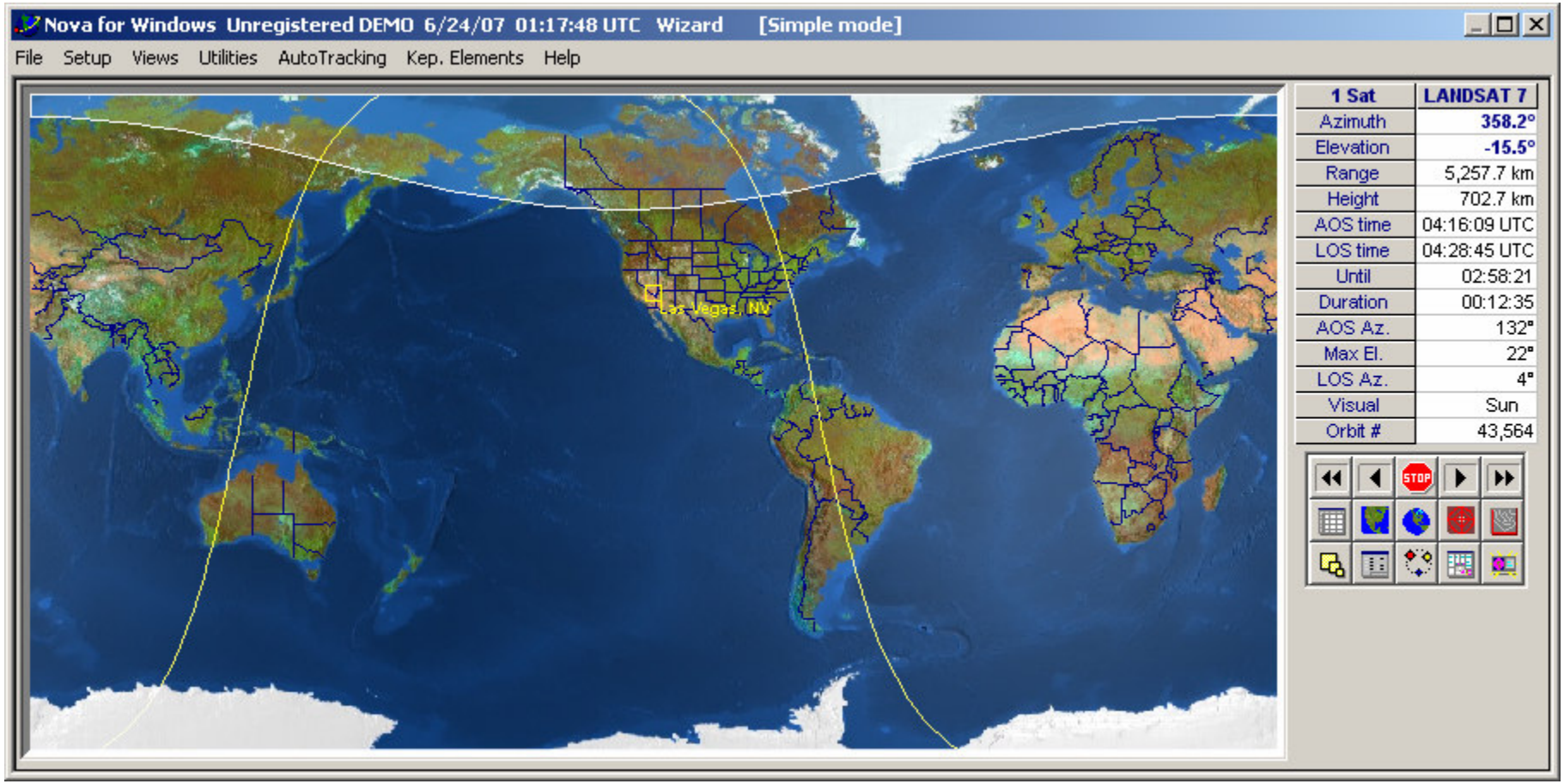
- Understand capabilities and limitations of sensors and platforms
- Image quality and realistic expectations
- Build smart books
- Combine multiple sources and times
- Seek out domain experts
  - Collaborative analysis
- Combine with other forms of information
- Reverse engineering a city
- Watching the watcher
- A look to the future

Keplerian Elements

- Epoch
- Orbital Inclination
- Right Ascension of Ascending Node
- Argument of Perigee
- Eccentricity
- Mean Motion
- Mean Anomaly
- Drag (optional)

http://www.amsat.org/amsat/keps/kepmodel.html

Example of Imagery Sat Keps



Space Craft Orbits

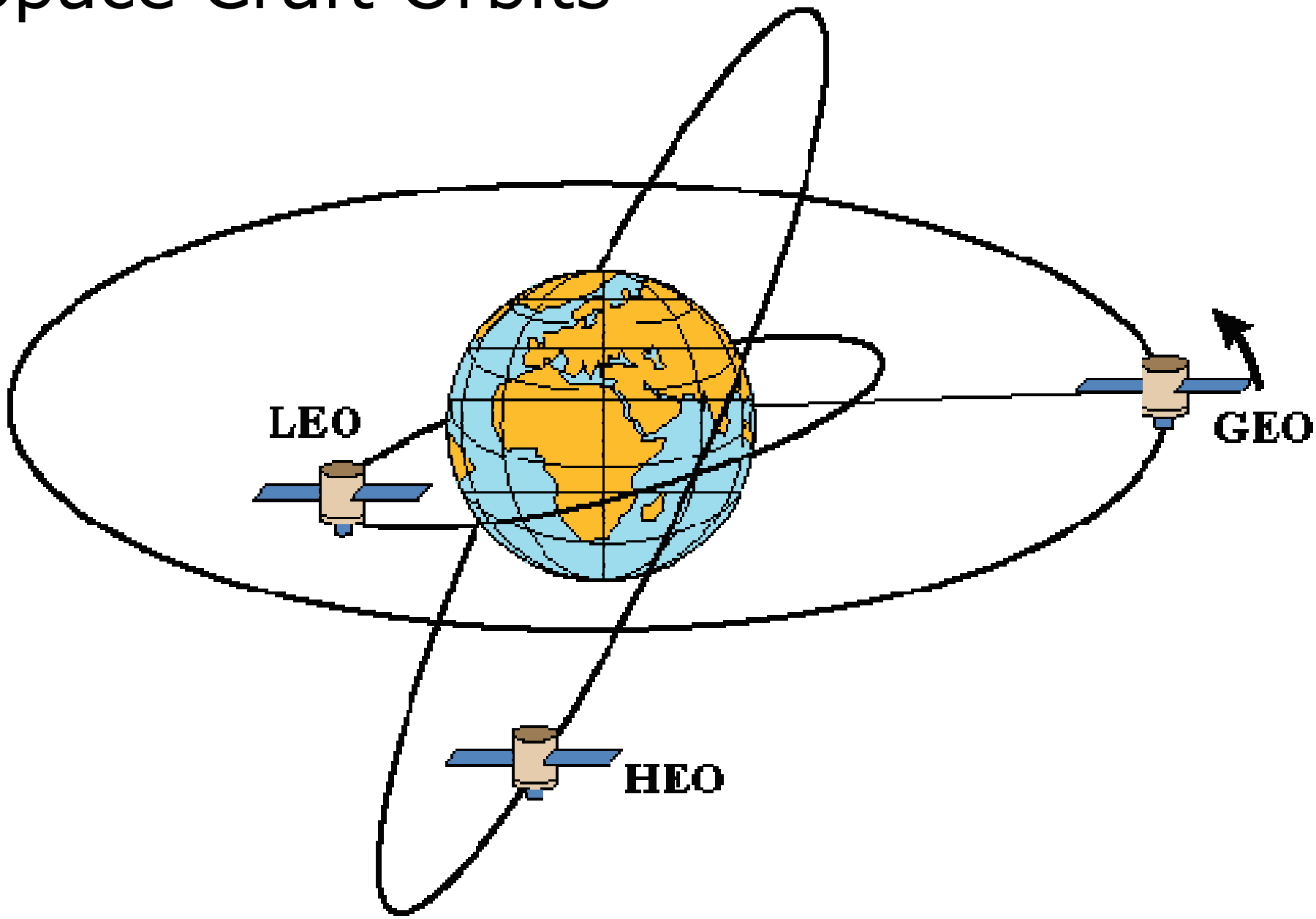
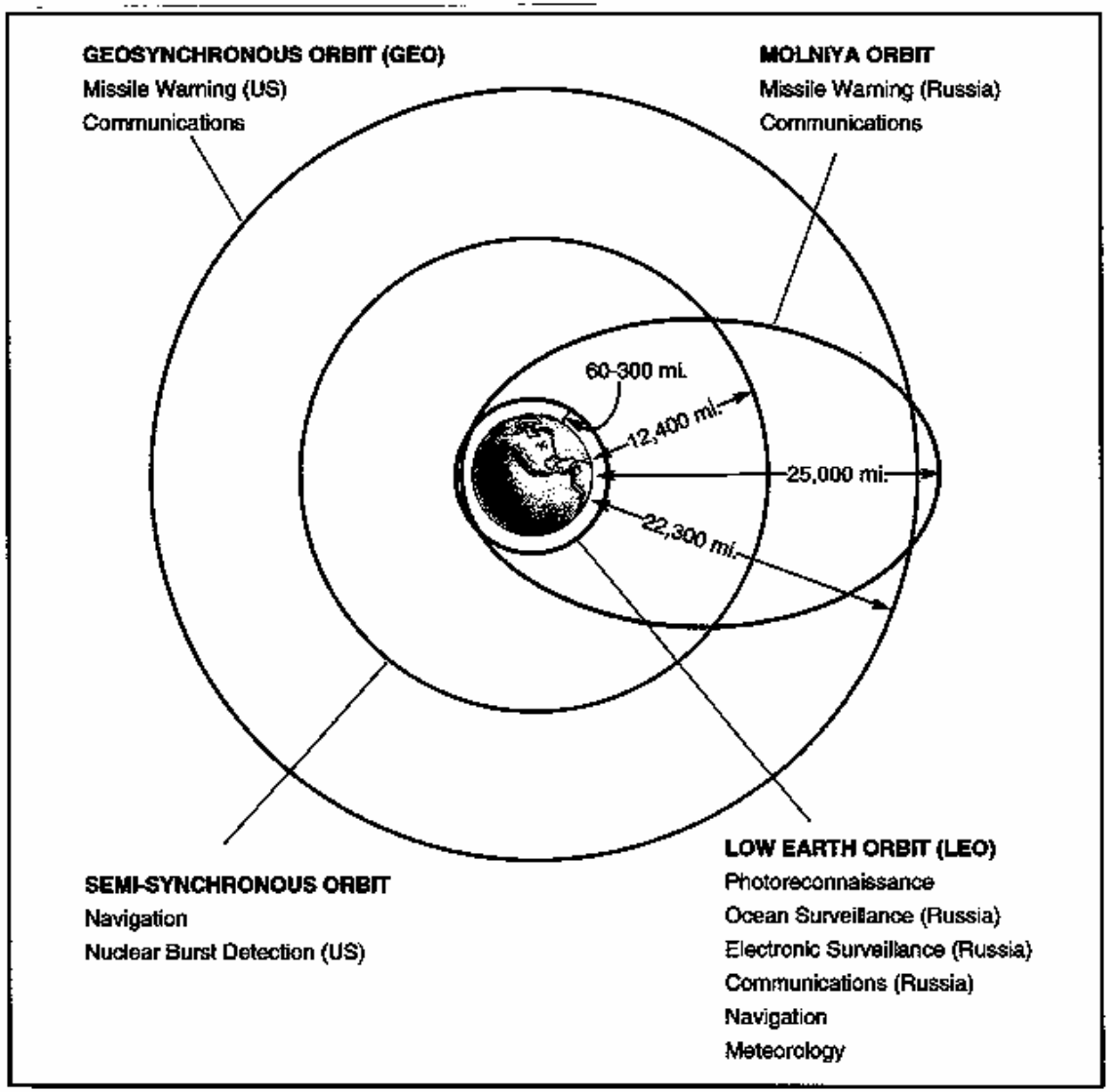


image: http://www2.uma.maine.edu/faculty/rsm/slides/chap11/f11-6.gif

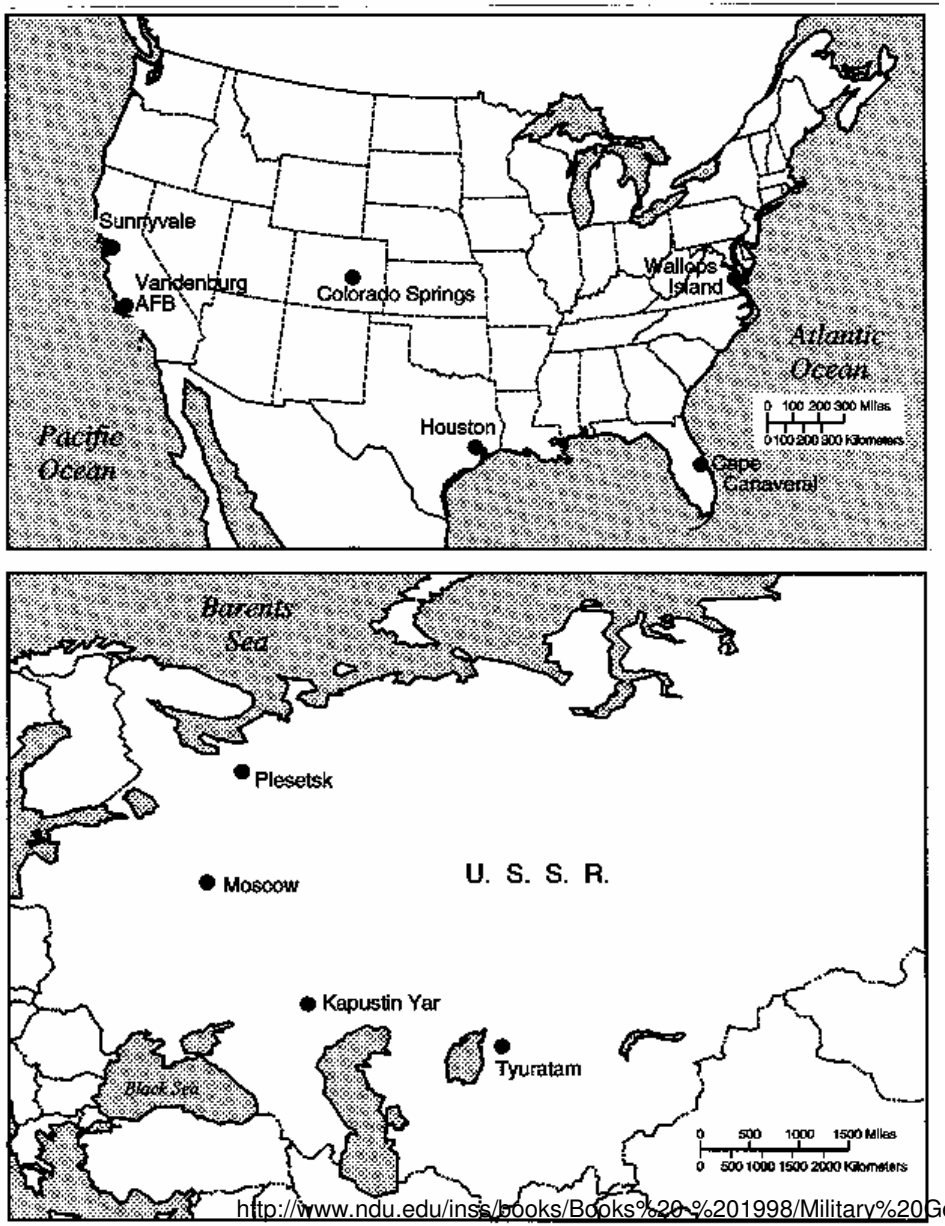
Typical Satellite Orbits



Adapted from "Satellites and Anti-Satellites" by Ashton B. Carter, *International Security*, Spring 1986.

http://www.ndu.edu/inss/books/Books%20-%201998/Military%20Geography%20March%2098/mgmap30.gif

U.S. and Soviet Space Launch Sites and Control Centers



http://www.ndu.edu/inss/books/Books%20-%201998/Military%20Geography%20March%2098/mgmap29.gif

UAVs

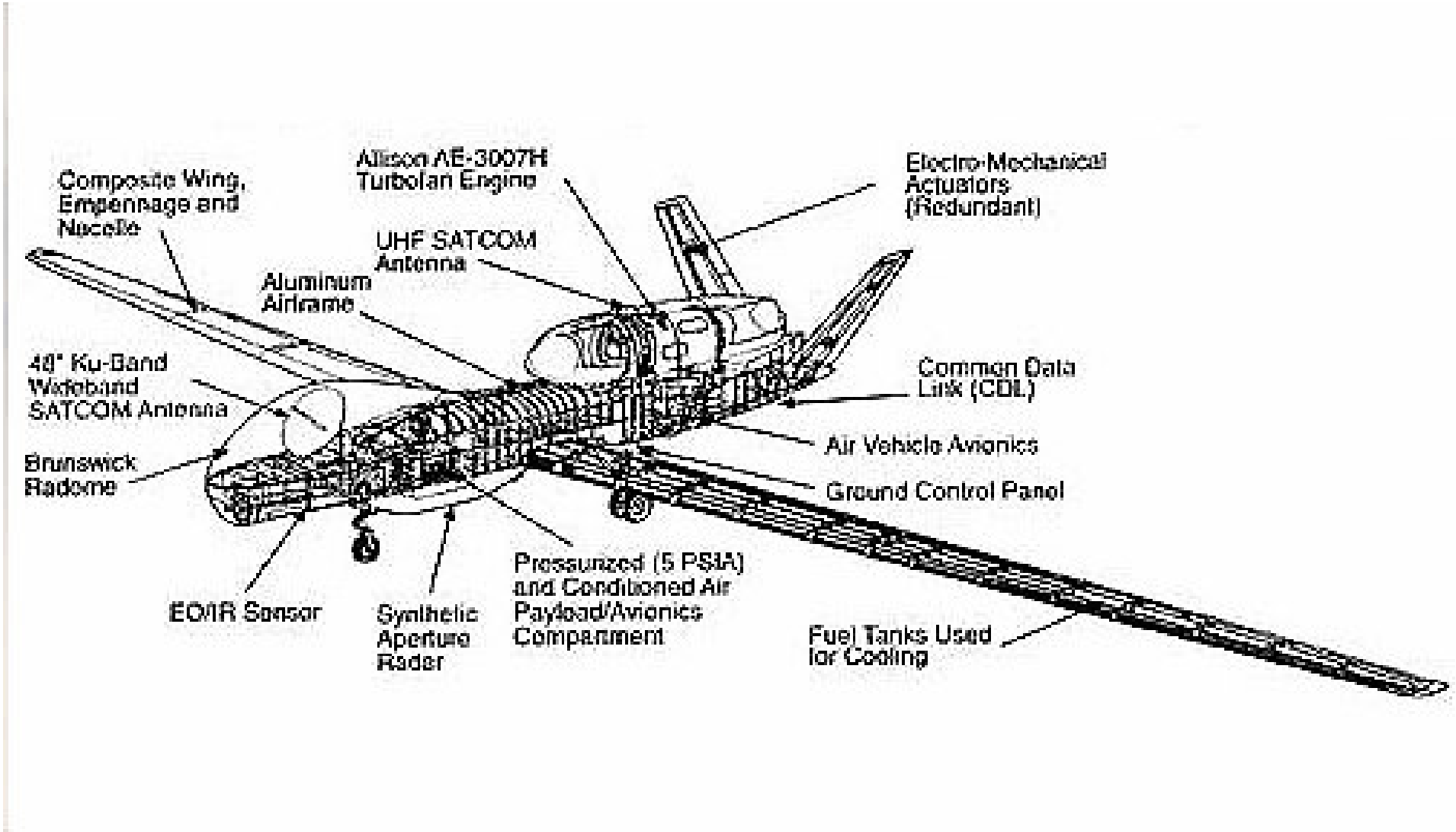
- RQ-1 Predator
- Predator B (jet powered)
- RQ-2 Pioneer
- RQ-4A Global Hawk
- BQM-147A Exdrone (Dragon Drone)
- see stats and images here...
  - https://wrc.navair-rdte.navy.mil/warfighter_enc/aircraft/UAVs/uavmain.htm

Other Platforms



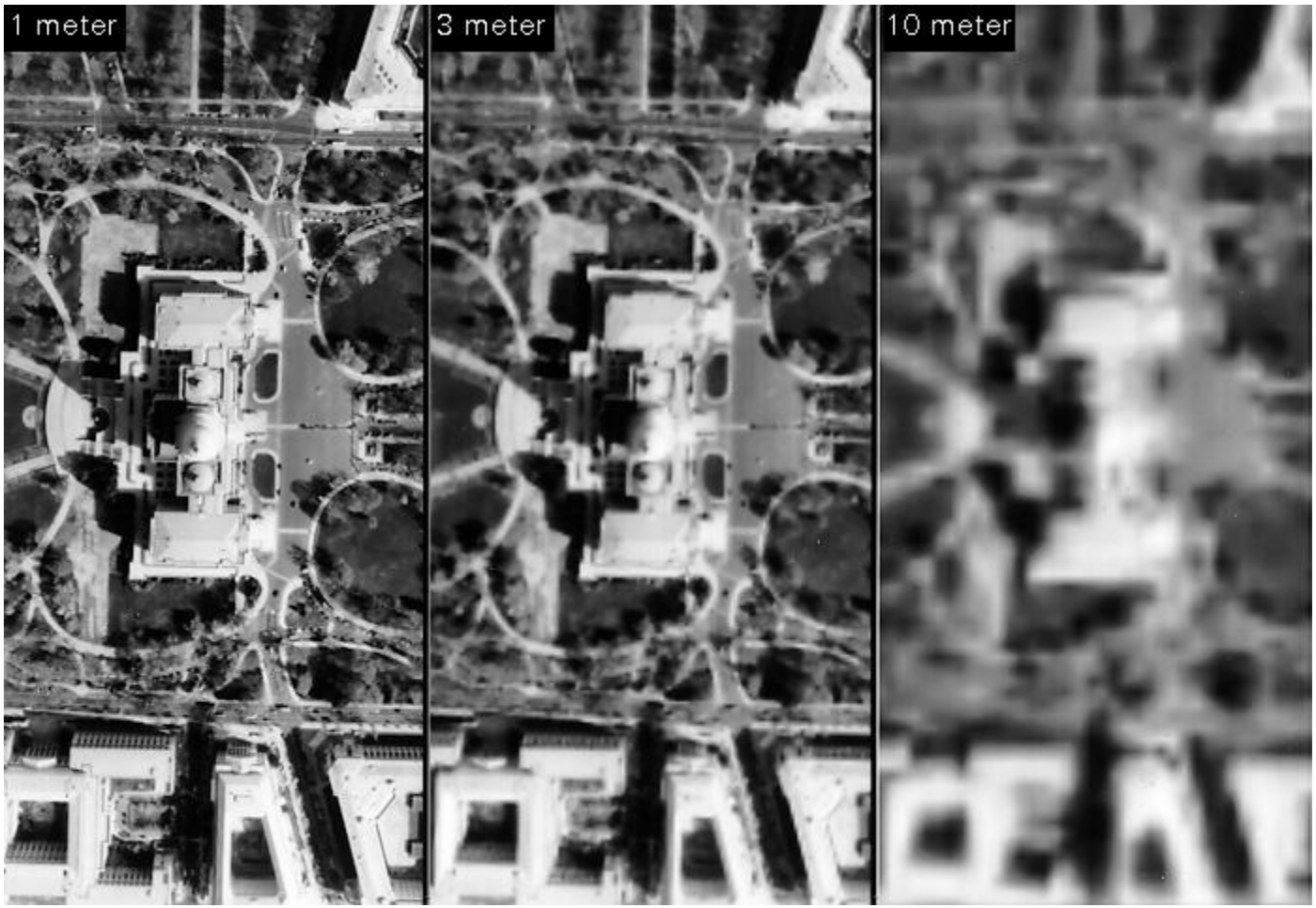
Global Hawk
Source: Teledyne Ryan Aeronautical Inc.

https://wrc.navair-rdte.navy.mil/warfighter_enc/aircraft/UAVs/GHawk.htm

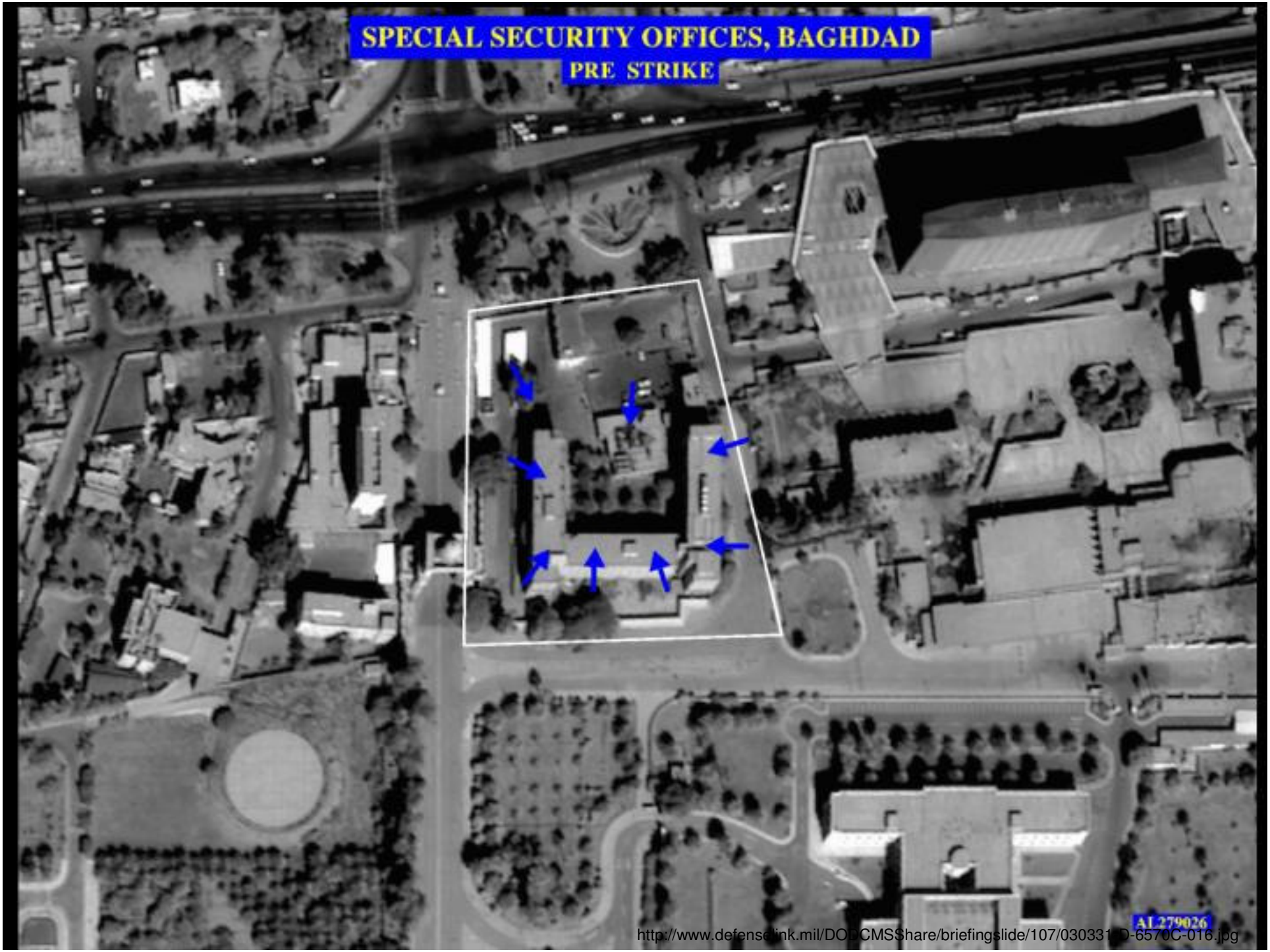


https://wrc.navair-rdte.navy.mil/warfighter_enc/aircraft/UAVs/GHawk.htm

Resolution



source: http://www.fas.org/irp/imint/resolve2.htm



http://www.defenselink.mil/DODCMSShare/briefingslide/107/030331-D-6570C-016.jpg


SPECIAL SECURITY OFFICES, BAGHDAD
POST STRIKE
KT142591
http://www.defenselink.mil/DODCMSShare/briefingslide/107/030331-D-6570C-016.jpg

Rotate Image to Vantage Point of Observer



Orient Yourself to the Location



Orient to North

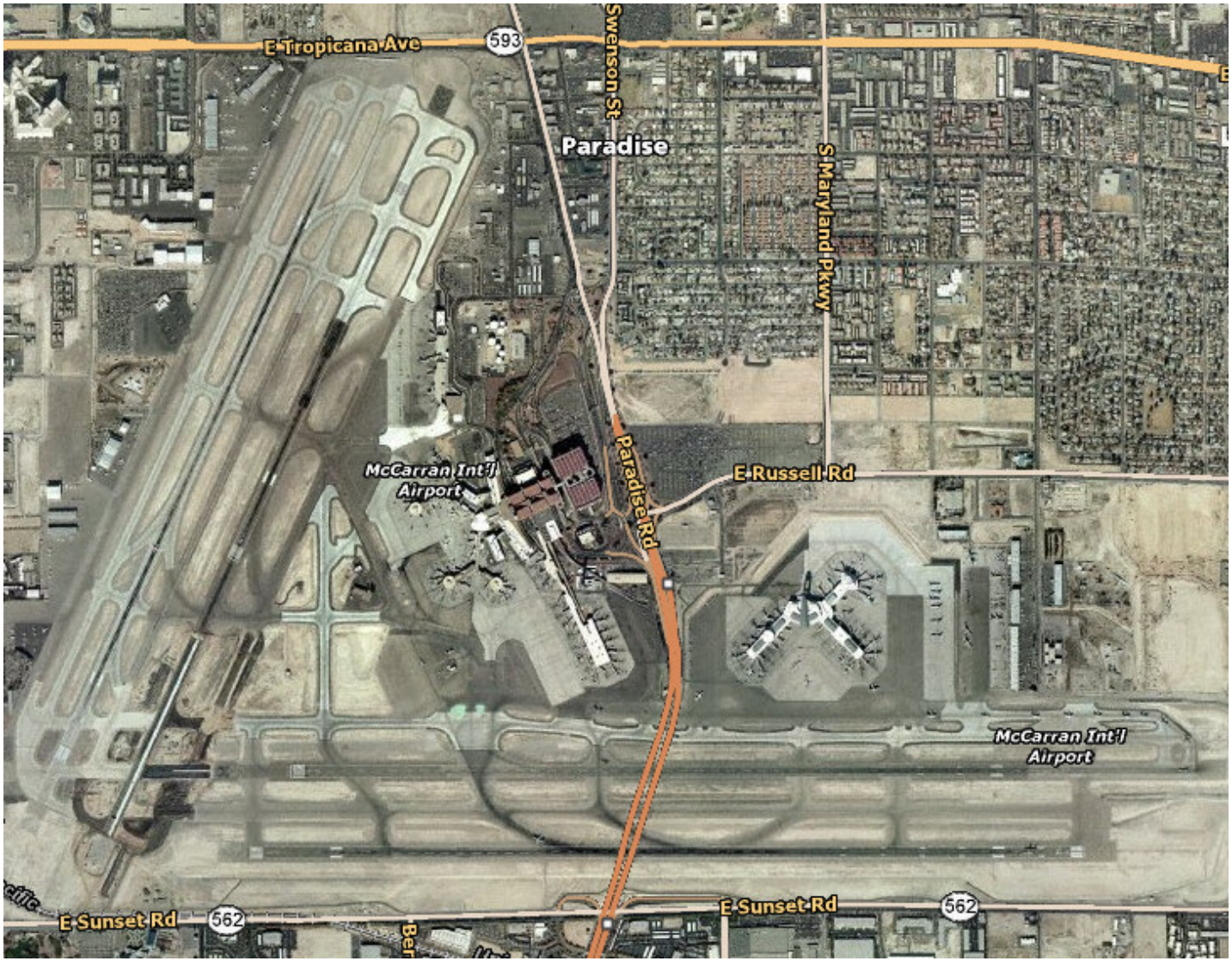


image: http://www.mapquest.com

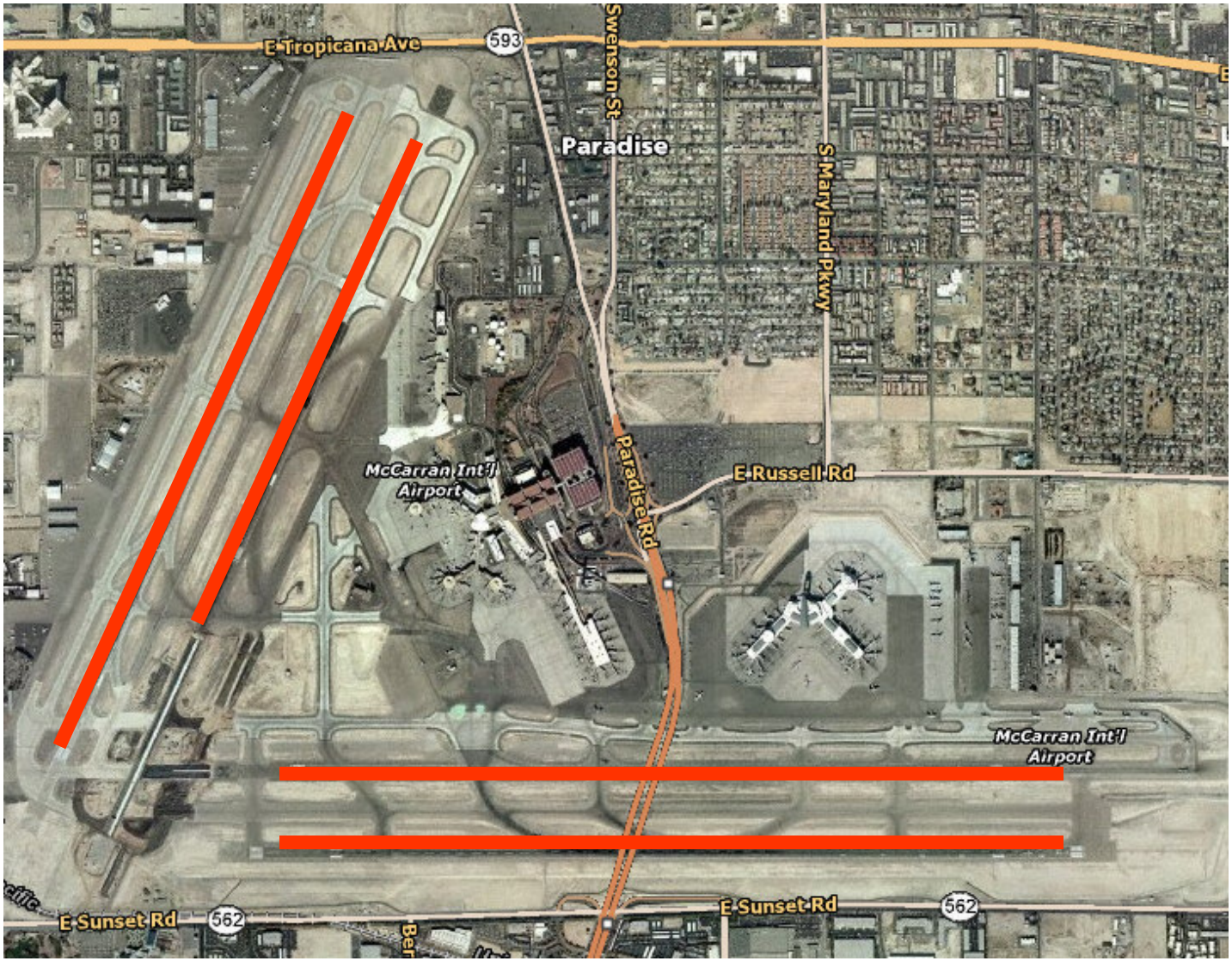
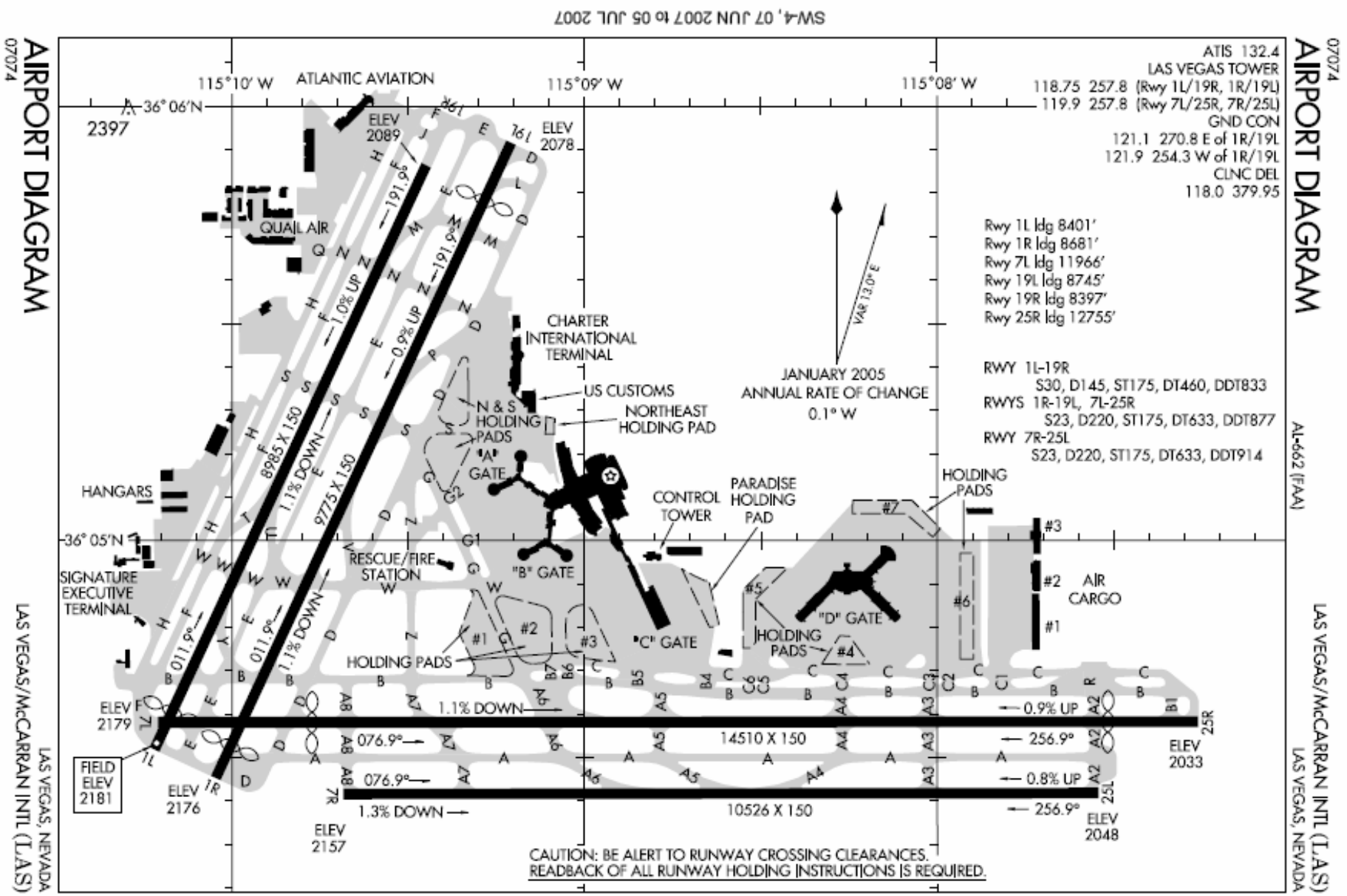


image: http://www.mapquest.com



image: http://www.mapquest.com

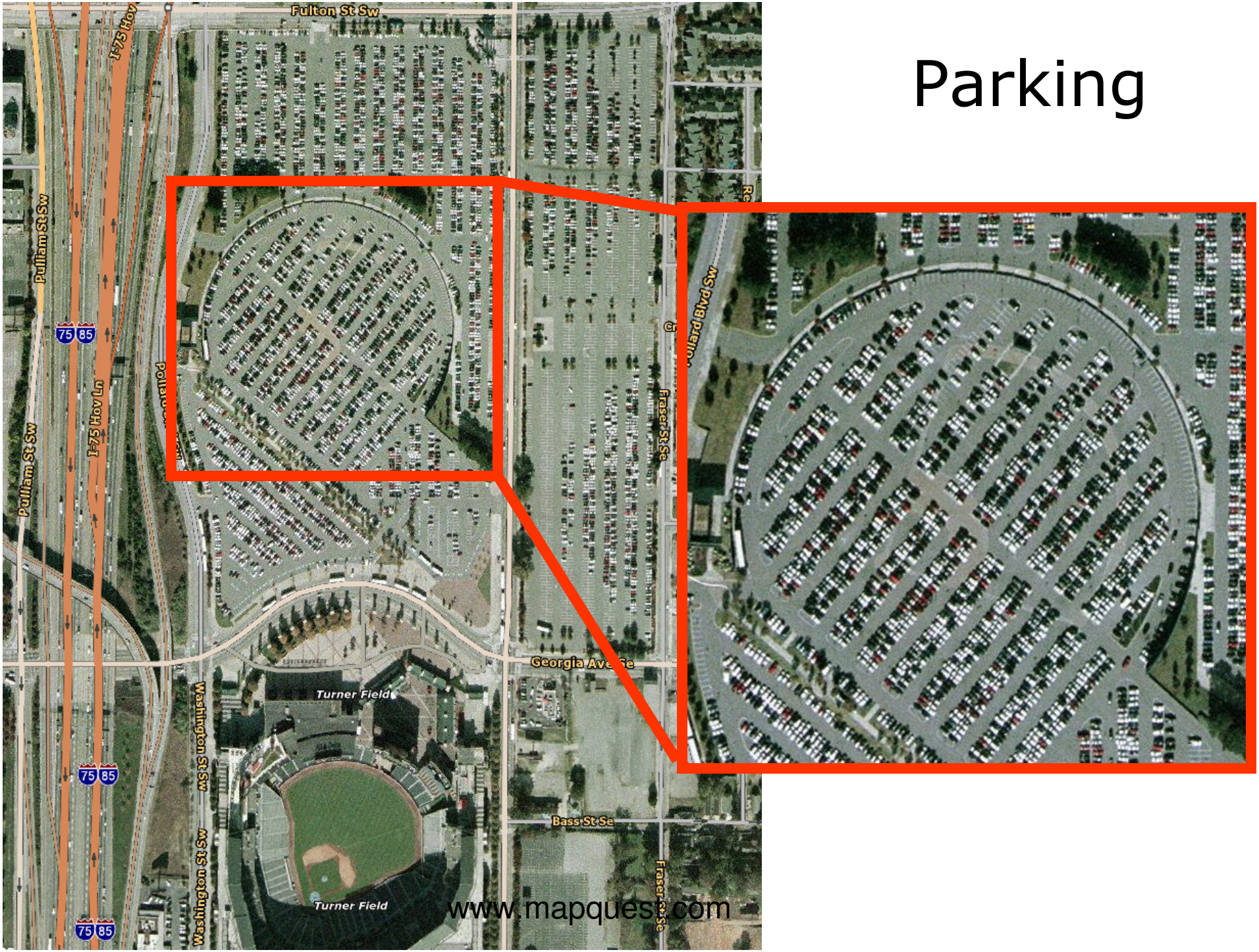


http://www.naco.faa.gov/index.asp?xml=naco/online/d_tpp

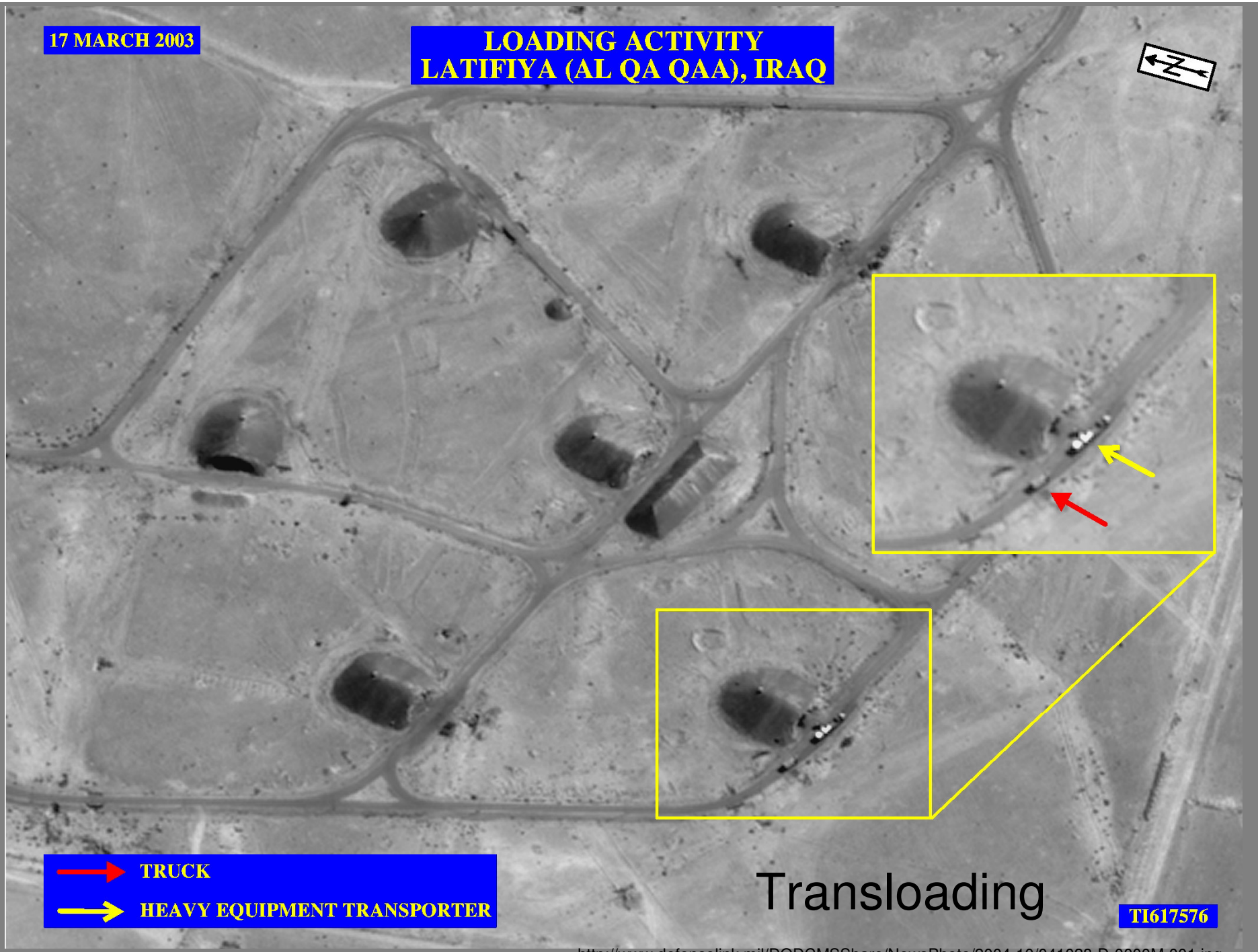


http://en.wikipedia.org/wiki/Runway

Parking



Fulton St Sw
I-75 Hov
Pulliam St Sw
75 85
I-75 Hov Ln
Pollard Blvd Sw
Fraser St Se
Georgia Ave Se
Turner Field
Washington St Sw
Bass St Se
Turner Field
www.mapquest.com



http://www.defenselink.mil/DODCMSShare/NewsPhoto/2004-10/041028-D-0000M-001.jpg

Aircraft Identification



Cessna Citation II



Gulfstream IV



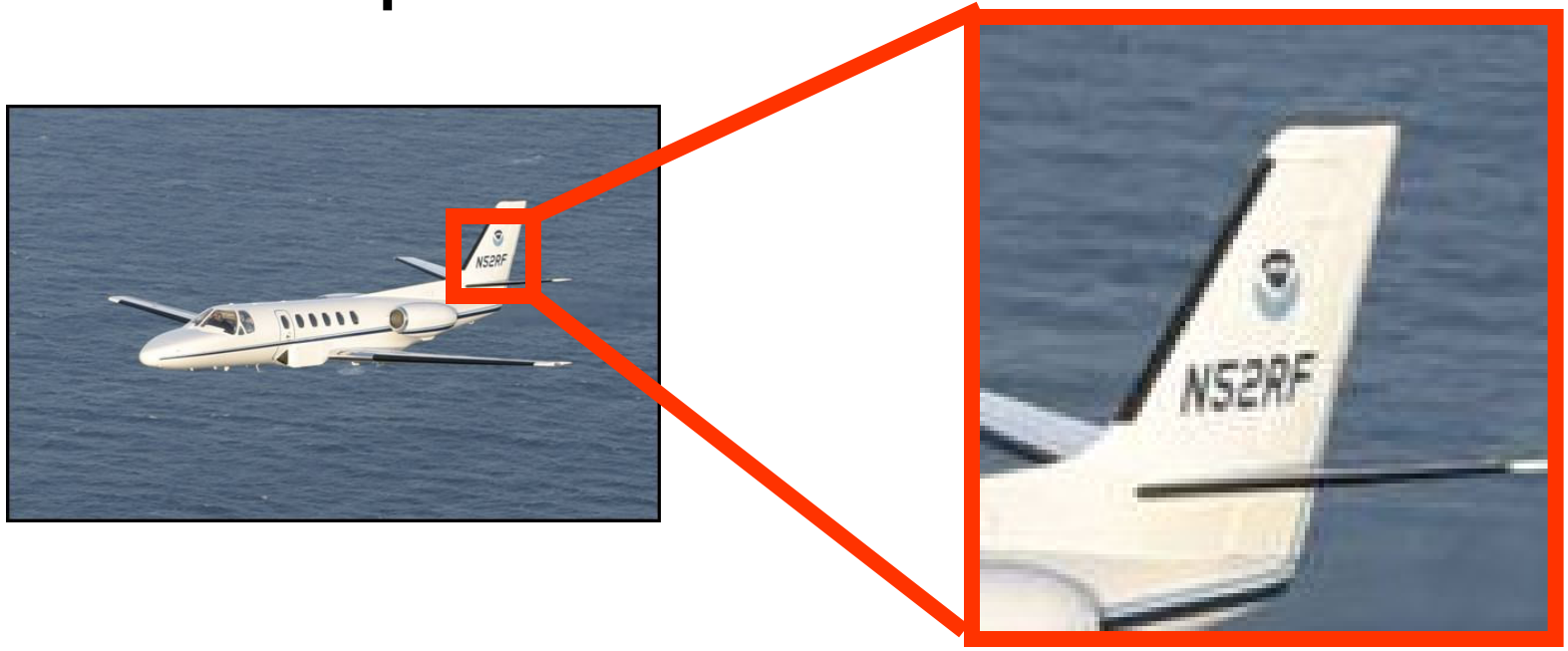
Lockheed WP-3D Orion



Lake Seawolf (LA-27)

http://www.aoc.noaa.gov/

Unique Aircraft Identification



UNITED STATES DEPARTMENT OF COMMERCE

NOAA AIRCRAFT OPERATIONS CENTER
7917 HANGAR LOOP DR HANGAR 5
MACDILL AFB, FLORIDA 33621-5401

Serial Number		550-0021
Type Registration		Government
Manufacturer Name		CESSNA
Certificate Issue Date		01/26/1988
Model	550	
Status	Valid	
Type Engine		Turbo-Jet
MFR Year		1978

N-number inquiries: http://registry.faa.gov/aircraftinquiry/NNum_inquiry.asp

Kazan Helicopter Plant



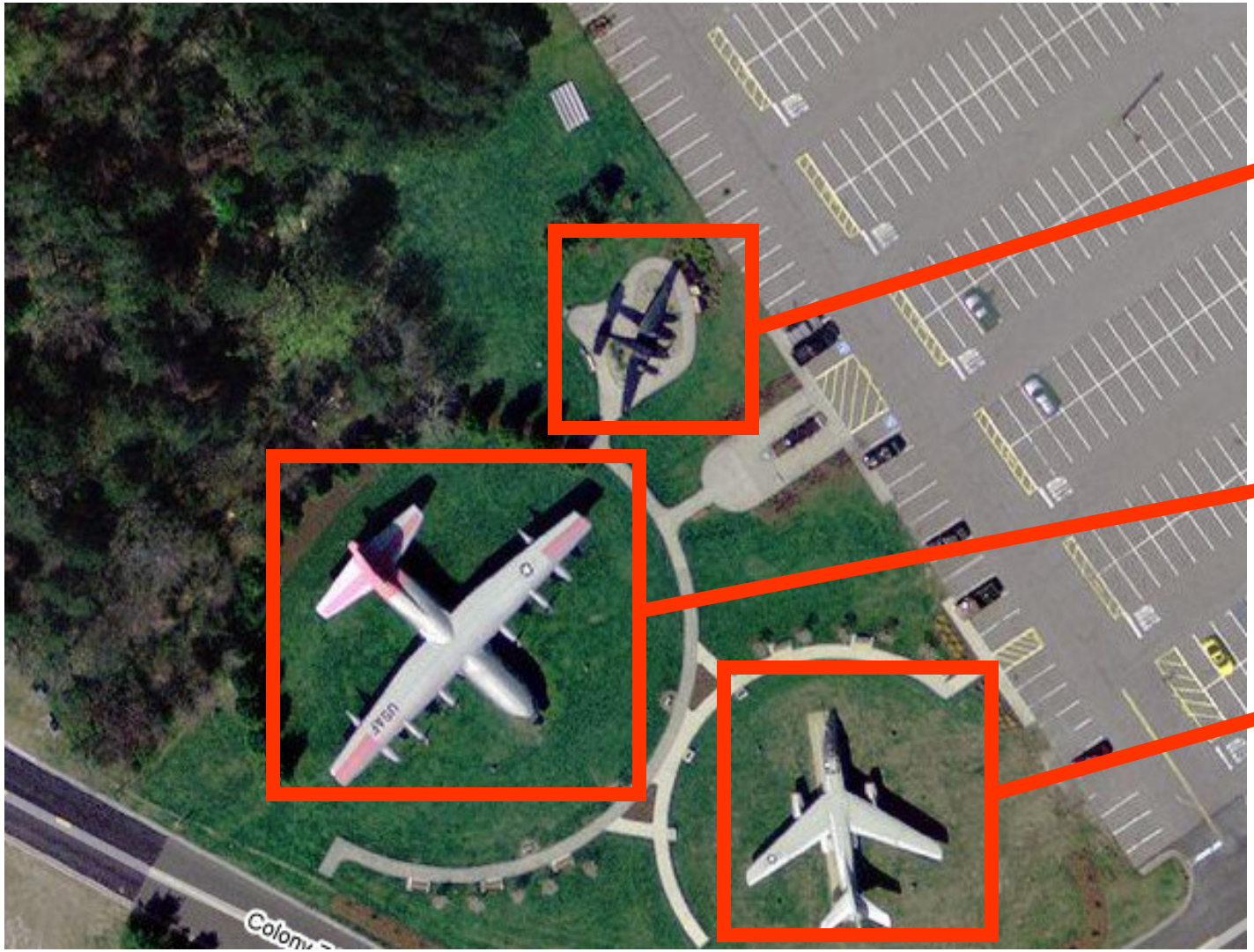
http://www.kazanhelicopters.com/index.php?id=4

MiG-35 at Aero India Airshow



http://www.defensenews.com/aero/video.php?id=29

Museums

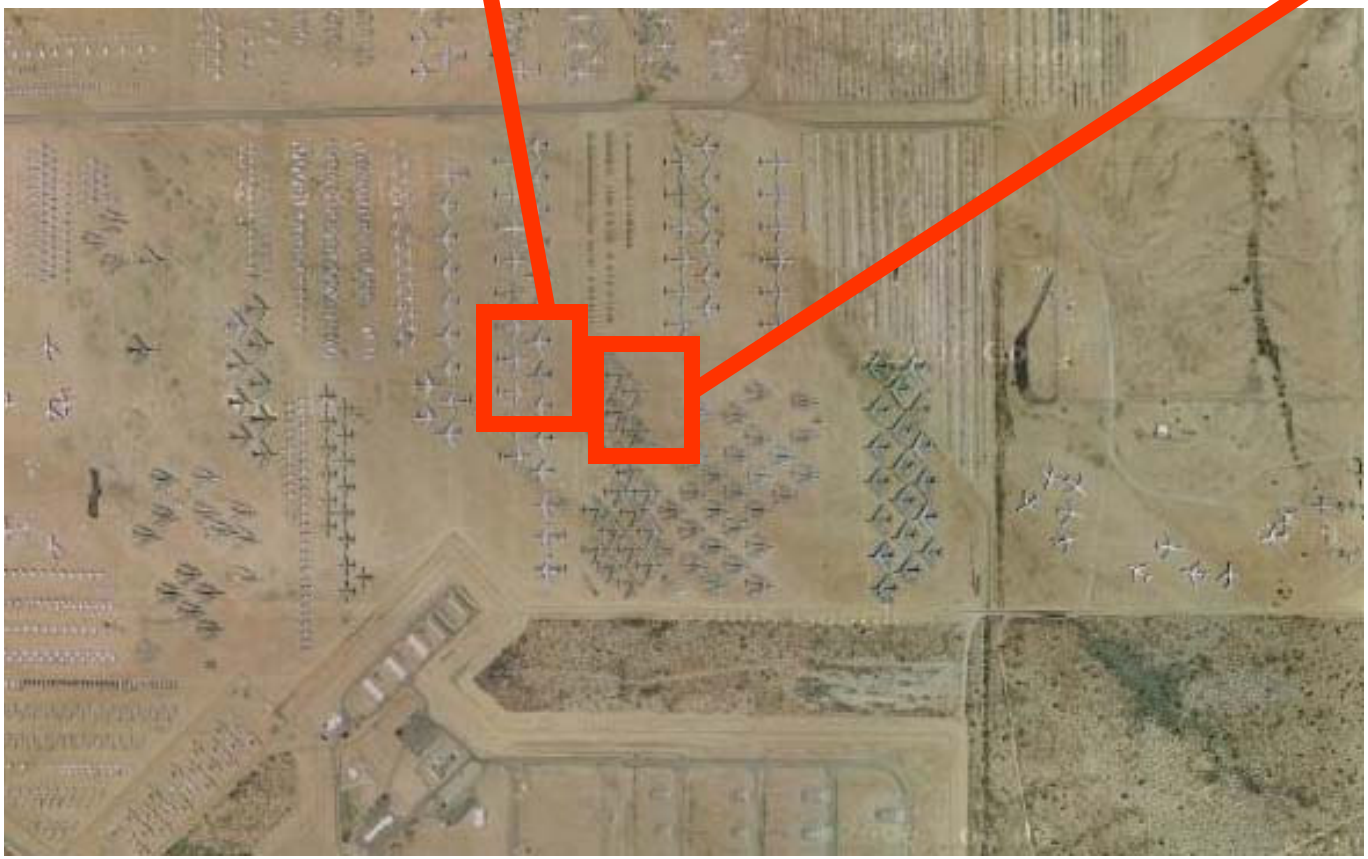


maps.google.com

Graveyards...



C-141





B-52

Antennas



Yagi





Cell Towers



Microwave



Parabolic Reflector / Satellite Dish

See notes section for image citations

Example: Bridging

Bridging



Trestle Bridge



Arch Bridge



Bridge Under Construction



Draw Bridge

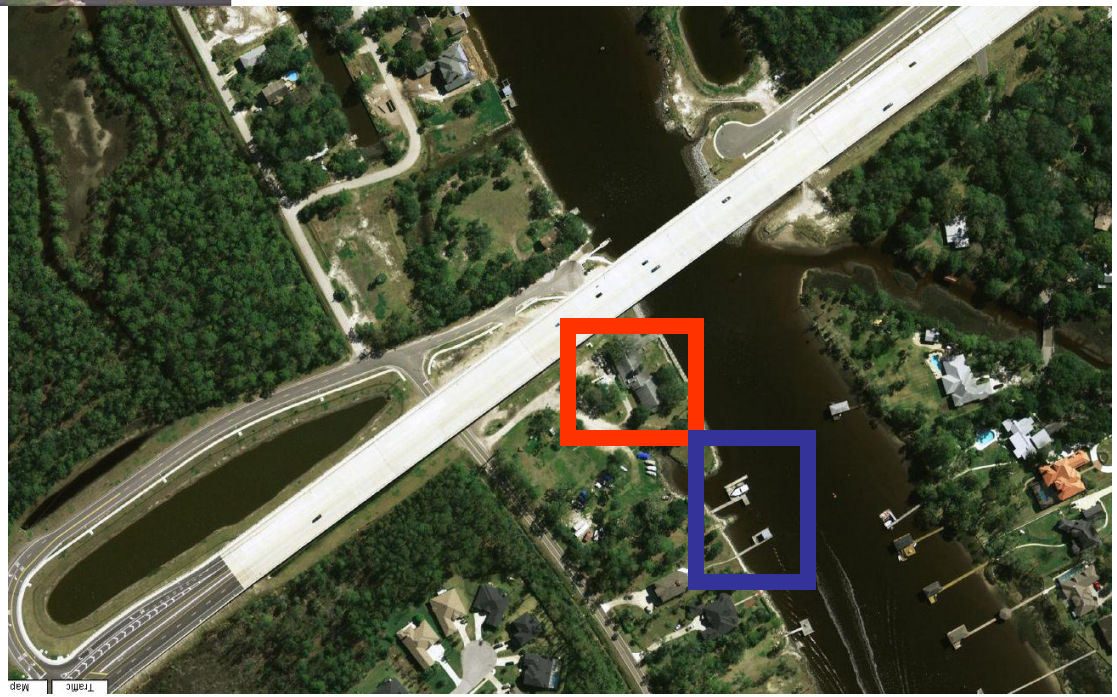
http://en.wikipedia.org/wiki/Bridg



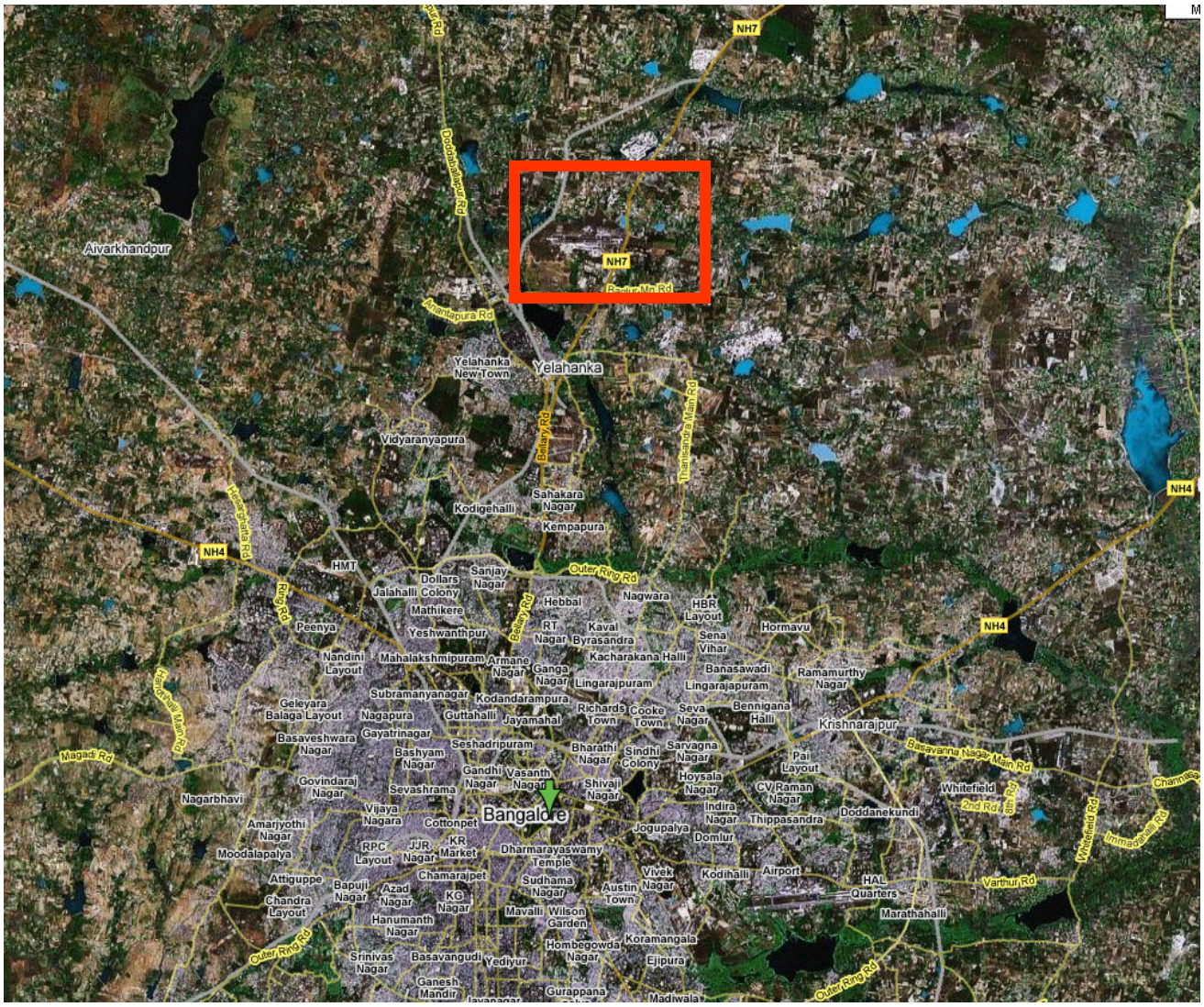



Traffic
Map




Traffic
Map

Bangalore, India



http://maps.google.com/

Yelahanka Air Force Base



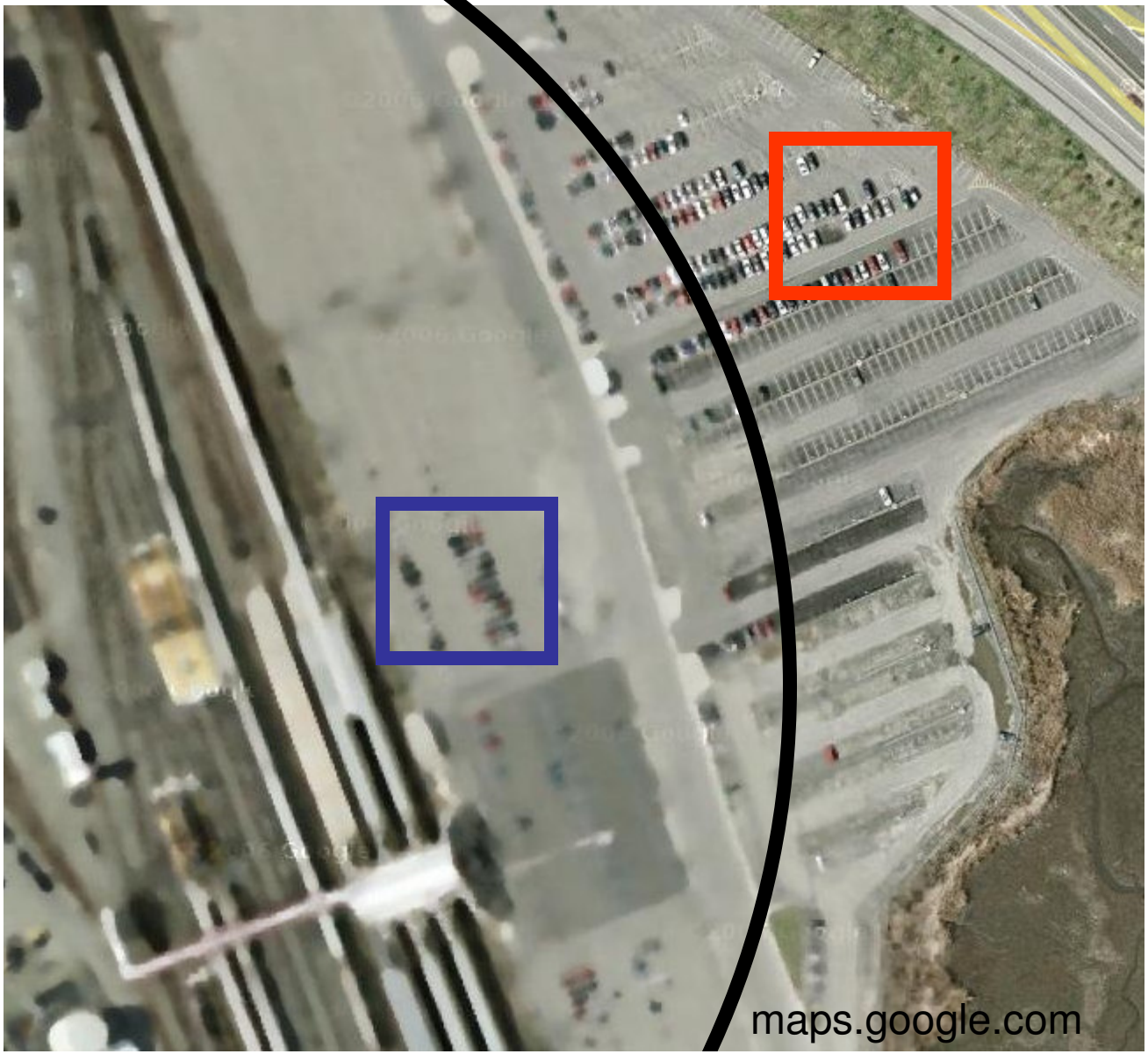
http://maps.google.com/

Anonymization



Image from Jacobs Ladder by Carolco Pictures

Selective Obscuration








Conclusions
http://rapidfire.sci.gsfc.nasa.gov/gallery/2005292-1019/Wilma.A2005292.1640.250m.jpg