



Air Force Flight Test Center



War-Winning Capabilities ... On Time, On Cost

How Today's Complexity Drives Future Range Requirements



U.S. AIR FORCE

Brigadier General David J. Eichhorn
AFFTC Commander
30 Oct 2007

This Briefing is:
UNCLASSIFIED

Integrity - Service - Excellence



Future Range Requirements



- **Cost and complexity are increasing**
- **Funding is decreasing**
- **Range constraints are increasing**





Facing Changes



- B-52 with CALCM
- F-15 with LRSOW
- B-2 with SDBs
- Directed Energy
- Hypersonic





Trends



Gravity

GBU
CBU
WCMD
JDAM



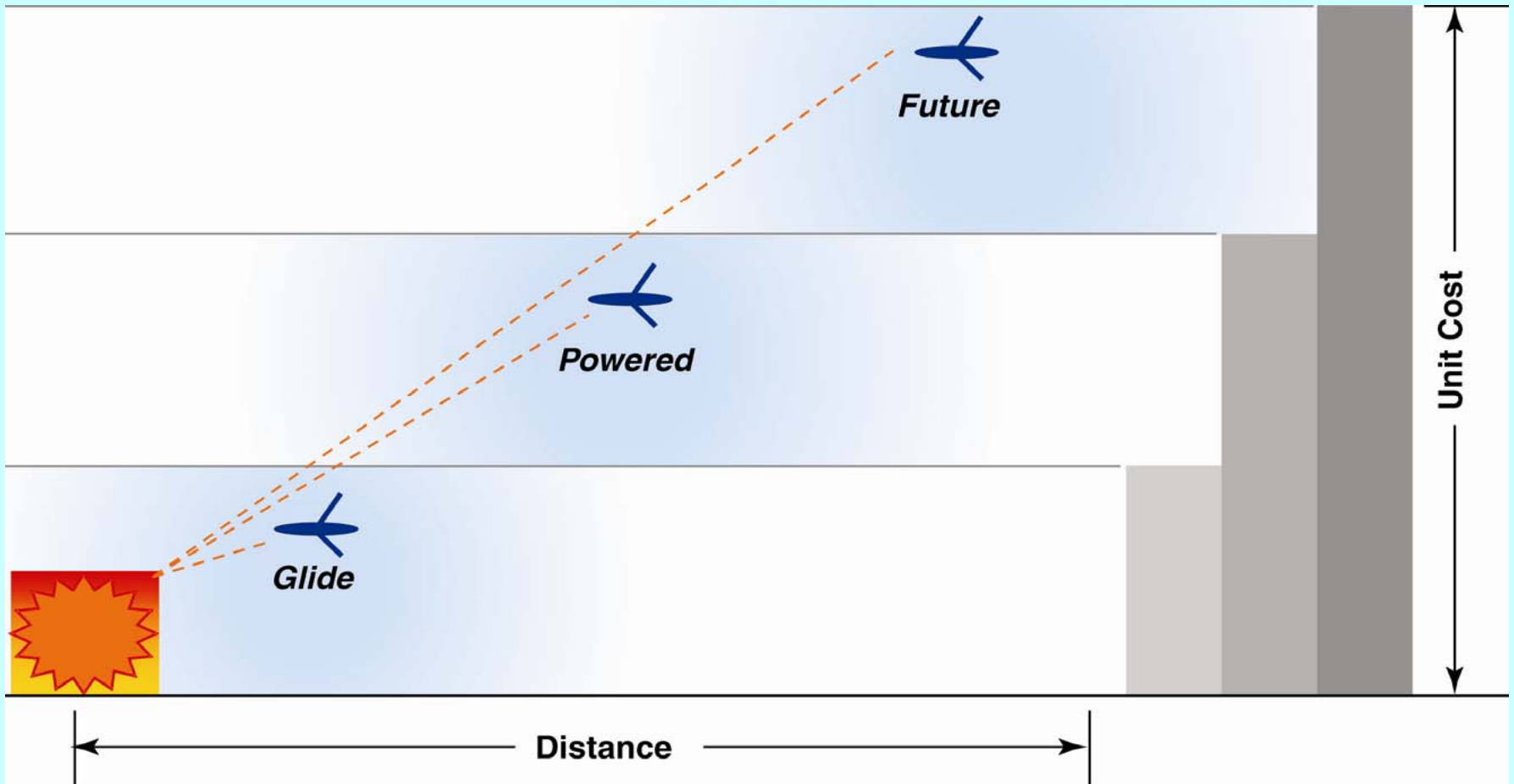
Glide

LONGSHOT
JSOW
SDB



Powered

TOMAHAWK
JASSM
JDRADM





Complexity of Weapons Tests

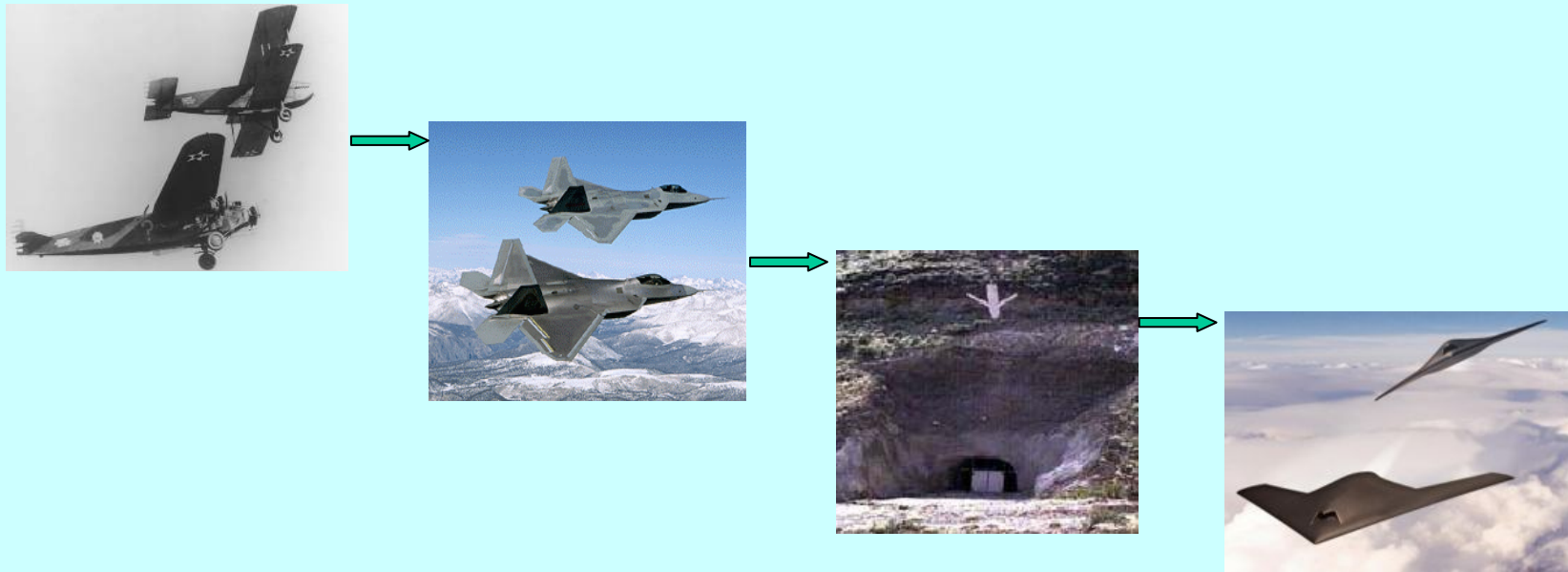




Test and Training Challenges



- Resource contention
- Aging fleet
- Mission priorities
- Complexity





Test Ranges Need

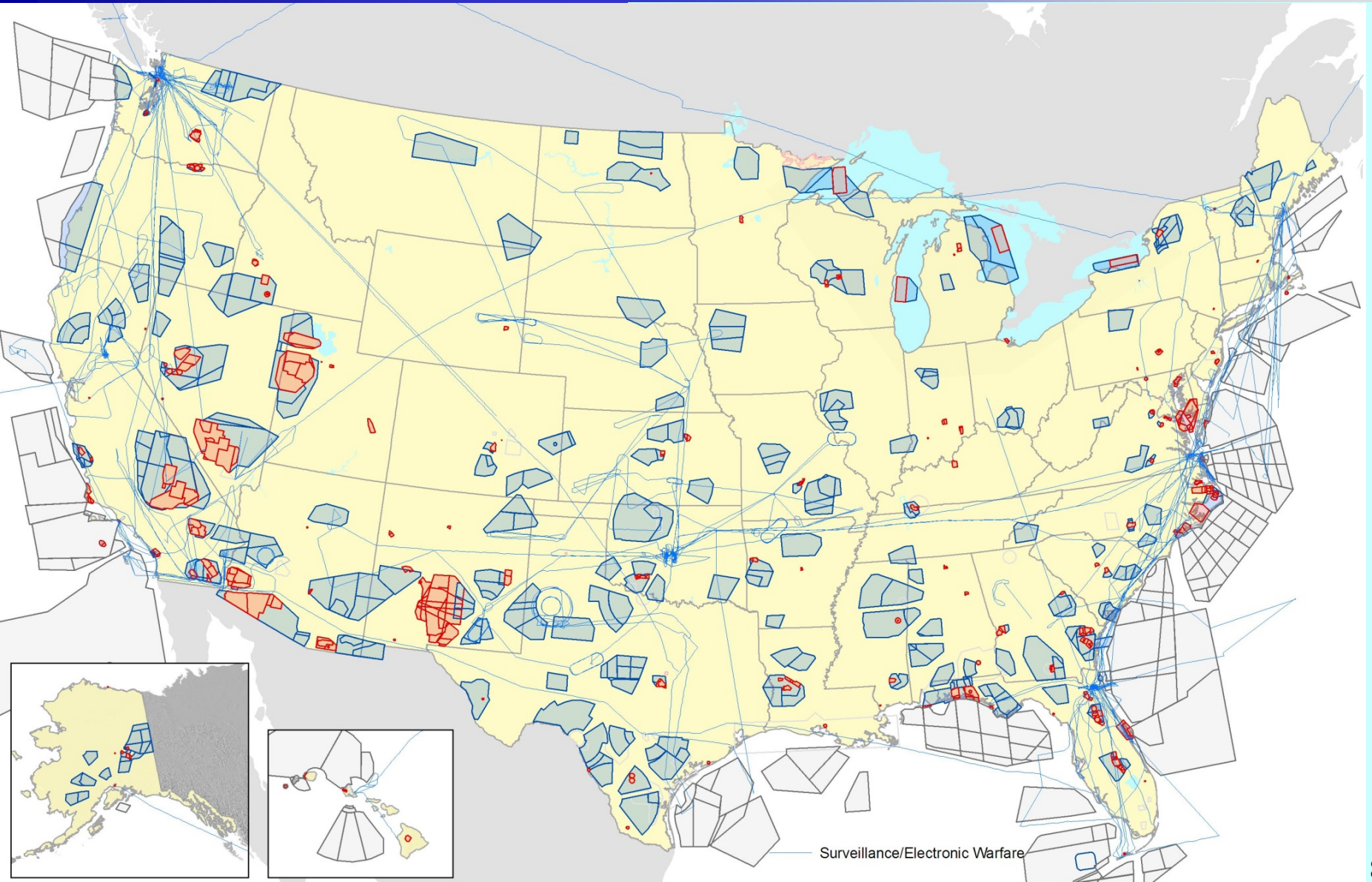


- **Airspace distance over land**
- **Restricted use for safety and security**
- **Network capabilities and bandwidth**
- **Infrastructure**





Ranges Today





Range Constraints Today





Other Constraints on Today's Testing



Environmental



Commercial
Airspace

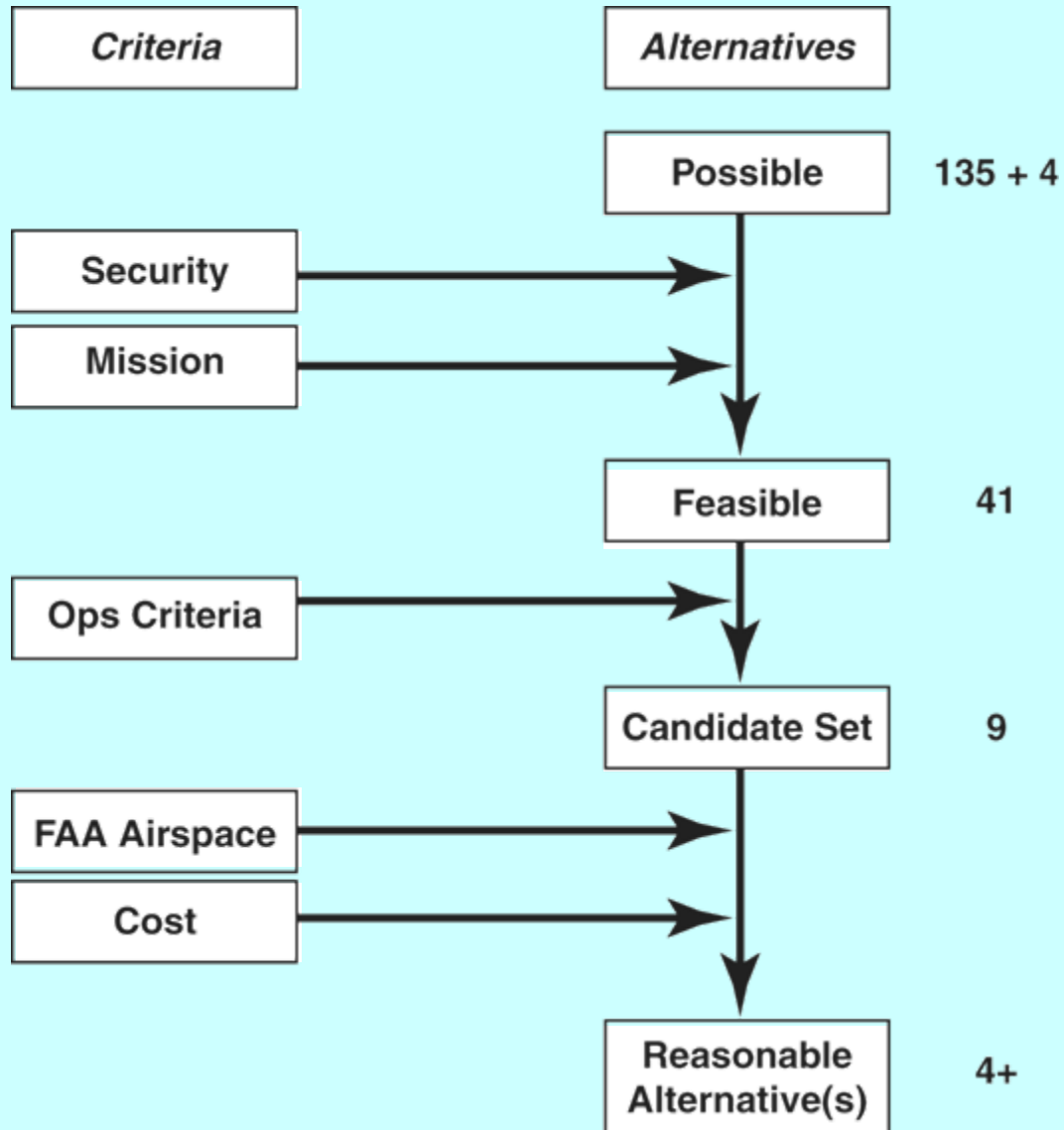


Population
Encroachment



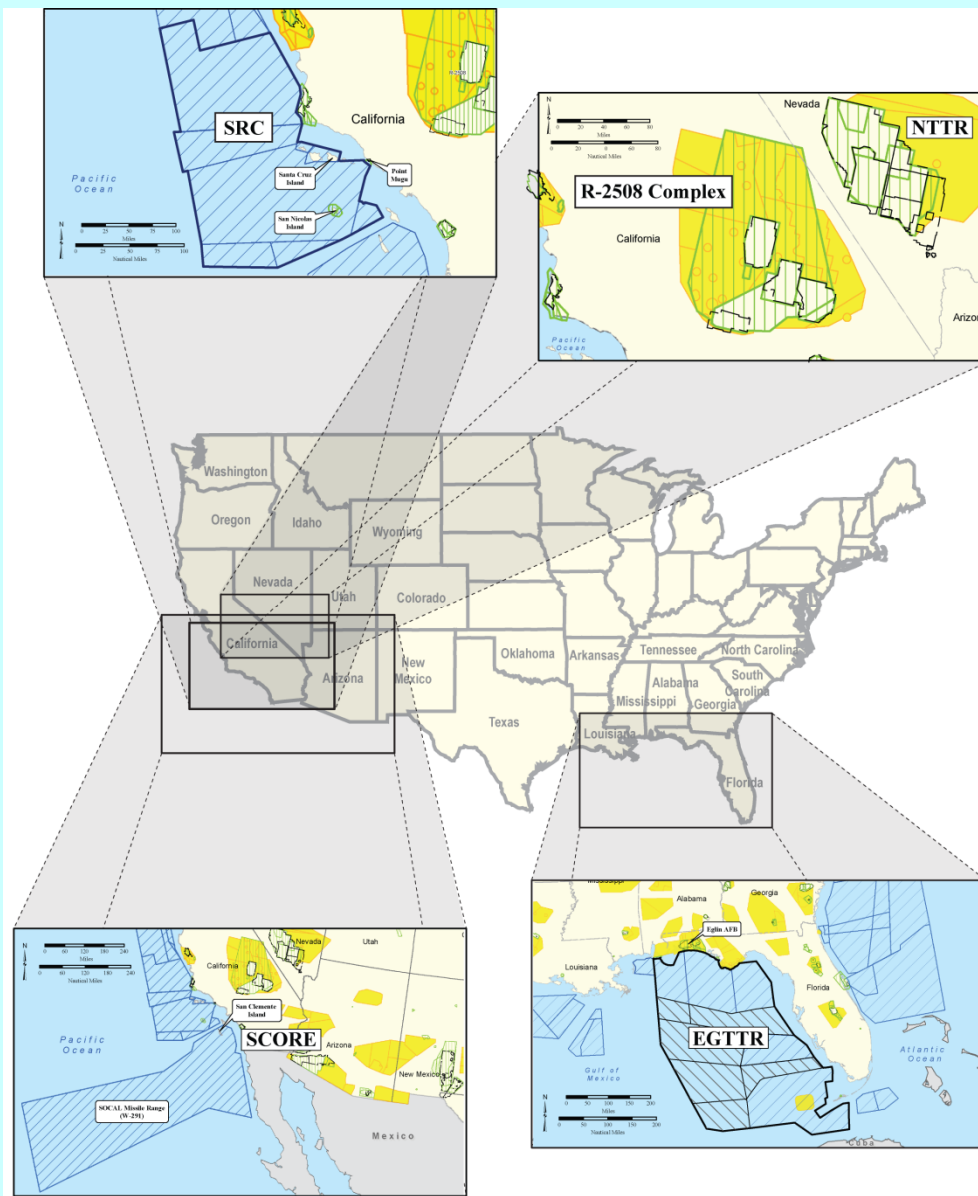


Finding Ranges for Testing

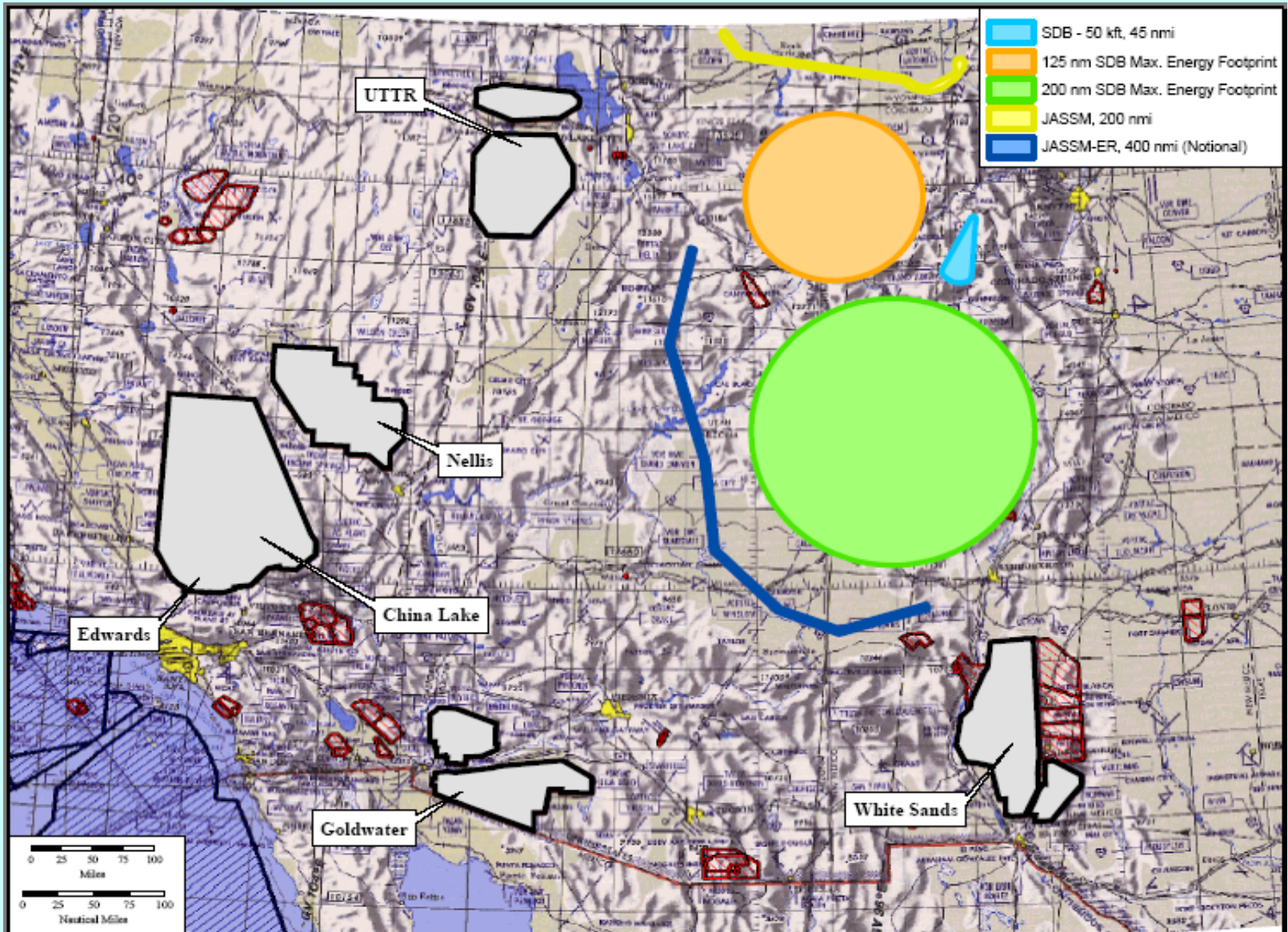




Finding Ranges for Testing



Considerations





Current Hypersonic Projects



- **Test Planning underway**
 - **X-37B Orbital Test Vehicle**
 - Land at VAFB, EAFB Backup - 2008
 - **X-51A Scramjet Demo Vehicle (Mach 5)**
 - B-52 Launch, Pt Mugu, ocean impact - 2009
 - **FALCON Blackswift Study (Mach 6)**
 - Horizontal takeoff and landing – 2011
 - **Future Responsive Access to Space Technologies (FAST) - 2012**





Range Safety



- **Public safety responsibility rests with the Range Commander**
- **Safety guidelines set by Range Commander**
- **Requires vehicle situation awareness from two independent sources during total trajectory**
- **Flight termination system must be independent of aircraft systems**
- **Required for all non-piloted UAVs**



Range



- **Where to fly driven by vehicle type**
 - **Reentry vehicle landing established by manned Space Shuttle**
 - **Air-Launched vehicle – can be launched required distance from landing site**
 - **Non-recoverable – can be launch over ocean**
 - **Suffers lost ability to inspect or reflly**
 - **Programs are now defining need to recover**
 - **Horizontal or vertical takeoff and landing is the challenge**
 - **Vehicle must fit the takeoff and landing sites available AND with acceptable corridors**
 - **Data Acquisition sites must be located to support all potential trajectories to support data collection and continuous situation awareness for Range safety**



EA Process



- **Requires vehicle characteristics and trajectories, including envelope expansion**
- **First product is the Quantitative Risk Assessment to determine range safety acceptability**
- **Other analysis required for:**
 - **Sonic booms, commercial air traffic, impact to ground test sites, etc**
- **EA can cost \$500k and take 2 years**
- **Test Range pre-defining and conducting initial EAs for assumed configurations can reduce time and cost to specific projects**



EAFB Hypersonic Test Corridors

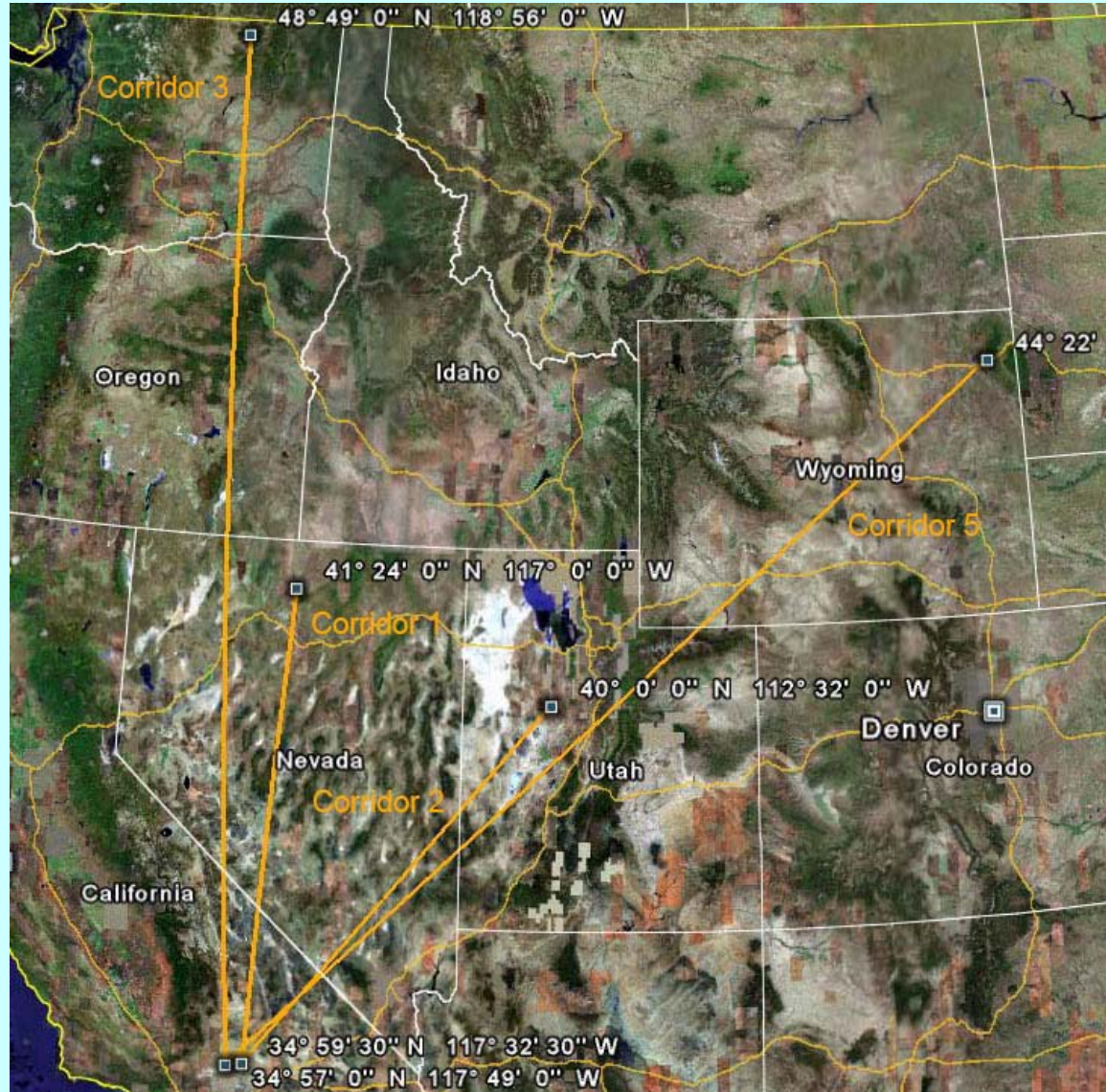


- Mach 8 Air-Launched Research Vehicles
 - 400 nm Risk Assessment Completed
 - 825 nm Risk Assessment in work



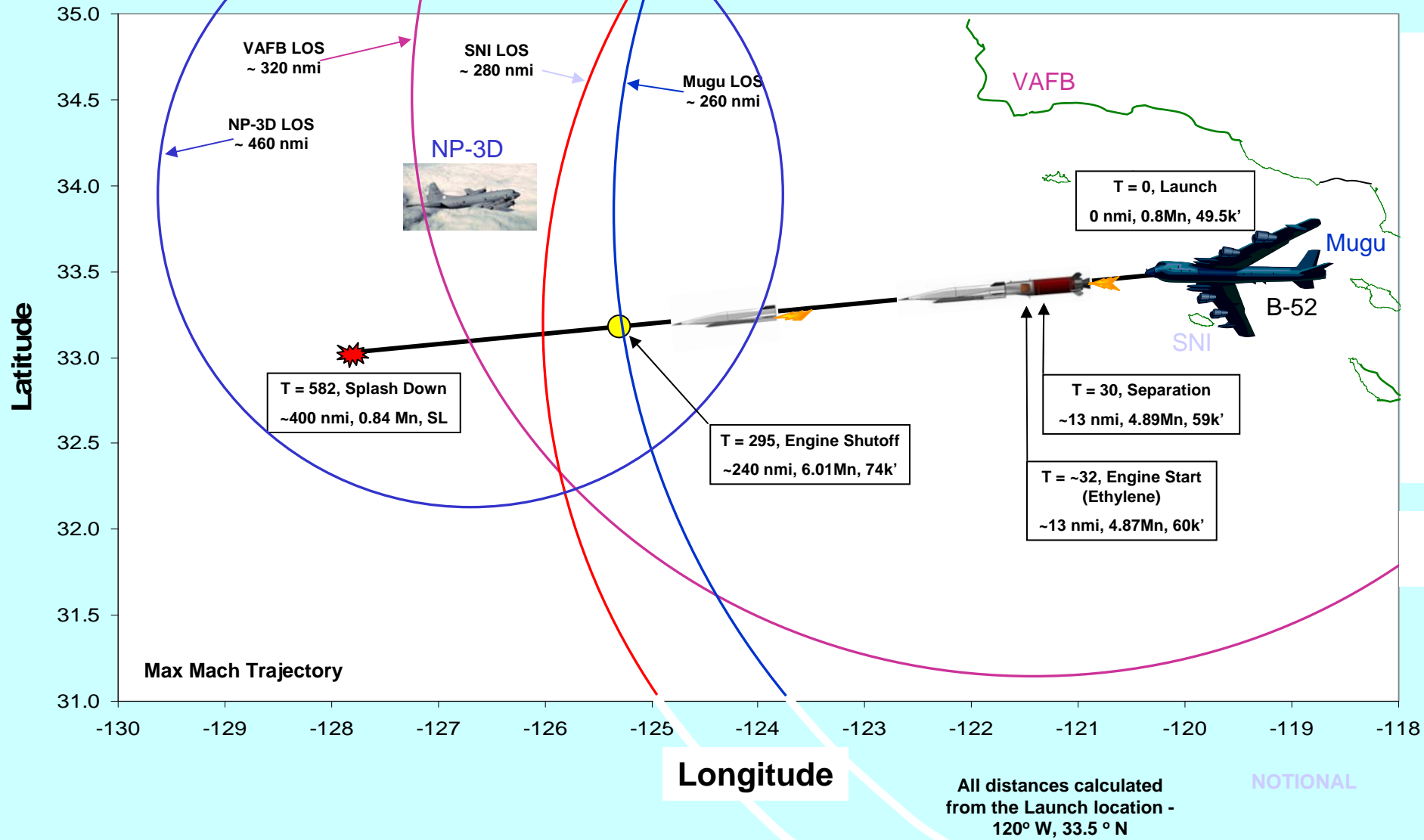


EAFB Hypersonic Test Corridors





X-51 Mission – Pt Mugu





Future Range Needs



<i>Test Components</i>	<i>Operational</i>	<i>End-to-End</i>	<i>Range Support</i>	<i>Connectivity</i>
<i>Ideal</i>	Test and Training	Airspace and ground exclusive test use	Support all tests all the time	End to End all parameters
<i>Reality</i>	Test or Training	Limited restricted use airspace and range	Priorities and support	Priorities and pick parameters and throughput



Examples of Ongoing and Future Coordination



- **Meeting expanded airspace test requirements**
 - Work with civil aviation
 - Narrow test schedule requirements
- **Improve confidence in tests**
 - Proven Flight Termination System
 - Test components to improve trust in combined system
 - Identify locations with reduced potential for impacts
- **Reduce competition for Range time**
 - Coordinate training and test scheduling
- **Improve testing**
 - Improve test methodology and tools

What next?



- **Develop flexible mobile test infrastructure for deployment to different test locations**
- **Test at varied locations**
 - **Some currently used**
 - **Some joint agency**
 - **Some historically not used for tests**
- **Government, industry, and the public must work together to meet test requirements**



Complexity Drives Future Ranges



- **Complexity will only increase**
- **One-stop shopping for all tests is unrealistic**
- **Weapons systems costs will drive test and training**
- **Safety will continue to be number one requirement**
- **Testing and training ranges face multiple complex constraints**
- **Future Range requirements will be met by coordination and flexibility**