StarBooster™

U.S. Air Force Control of Space
NASA Alternate Access to *ISS*

Starcraft Boosters, Inc.

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StarBooster 30™

fully reusable space booster

StarBooster 30 **is the underpinning of several partially reusable launch configurations and the first operational unit of a series of similar but scaled-up reusable space boosters using safe hydrocarbon fuel.**

- **No flight crew (UAV)**
- **62.5 ft. body length**
- **6.7 ft. diameter**
- **Aluminum heat-sink airframe, no TPS (up to Mach 3.3, ~80,000 feet staging)**
- **Glideback subsonic return to base**
- **Runway landing @ less than 150 knots**
- **Fuselage cavity houses existing rocket engine *which is readily removable***
- **One *RD-120* rocket engine from P&W**
- **30% mass margins**

Size Comparison

USAF *F-15*

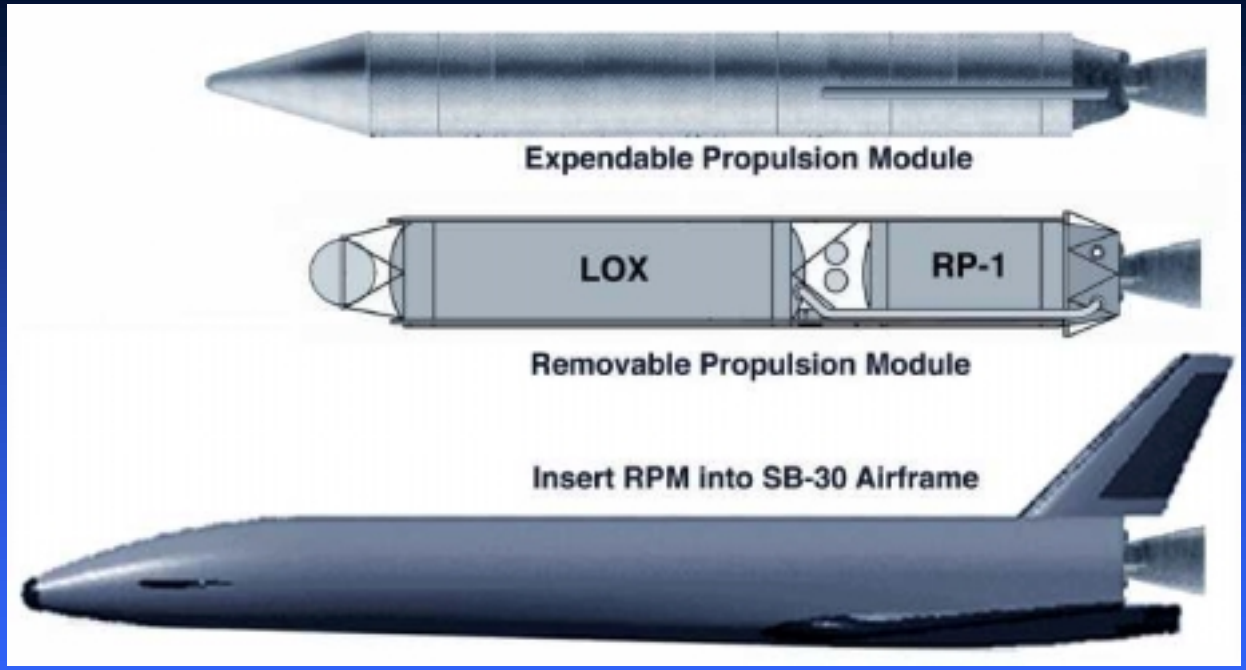
StarBooster 30

Profile

StarBooster 30

Plan View

The key to operability:
Reusable Propulsion Module™ (RPM)



- Mate with the ***StarBooster 30™*** airplane to recover **intact** the ***Removable Propulsion Module™ (RPM)*** for reuse and rapid refinement
- **Total dry mass = 27,590 lbm each, ~ 30% of *EELV* SRBs,**

StarHawk™ / *StarExpress*™ Missions

- **Space Control**
- **Alternative Access to *ISS***
- **Commercial Space Launch & CRAF “surge”**
- **Booster for Sounding Rockets & Scramjets**

Space Control via *StarHawk*™

- **Dual *StarBooster 30* glideback boosters**
- ***StarBooster 30 Expendable Propulsion Module (EPM)* as 2nd stage**
- **AFRL *Reusable Modular Stage (RMS)* as final stage with internal orbital payload; stage & payload return for data recovery, refurbishment & re-use**
- **Launch on-demand from ETR, WTR, Wallops or ?**
- **Launched to space where needed, when needed**
- **Arrives in 100 NM Due E. orbit with**
  - **Up to 4,480 lbm of useful payload (2030 kg)**
  - **Up to 3 days orbit loiter + maneuvering capability**
- **Global reach, no place is more than 45 minutes away**

StarHawk* with *EPM-3* & *RMS

StarHawk™ Booster Staging

StarExpress™ for *Alternate Access to Station* - Soon

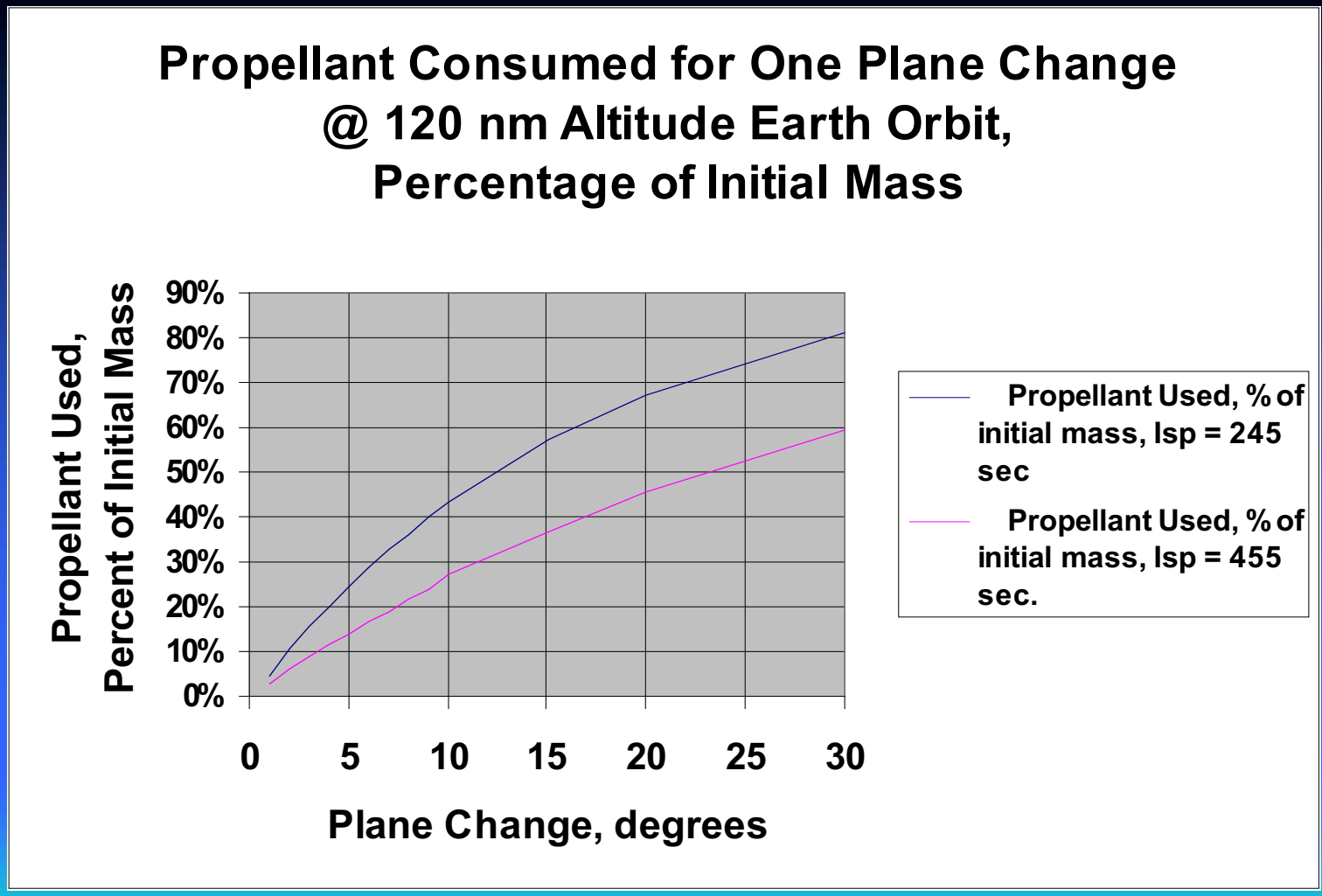
- **Three Stage Launch Vehicle ~ 2nd Stage is expended**
- **Two *StarBooster 30s* for boost phase ~ to near Mach 3, subsonic booster glideback to launch site**
- **Applies *EPM* as the expendable 2nd Stage - either *EPM-1* or *EPM 3* with two side-mount strap-on tanks; drawn from used *StarBooster 30 RPM* inventory**
- **Candidate 3rd stage/spacecraft is an expendable version of the AFRL *Reusable Modular Stage (EMS)***
- **Goal: Operational on both coasts late 2005 – by both NASA & USAF ~ potential commercial operations via CARF**

StarExpress™ & *StarHawk*™ Performance

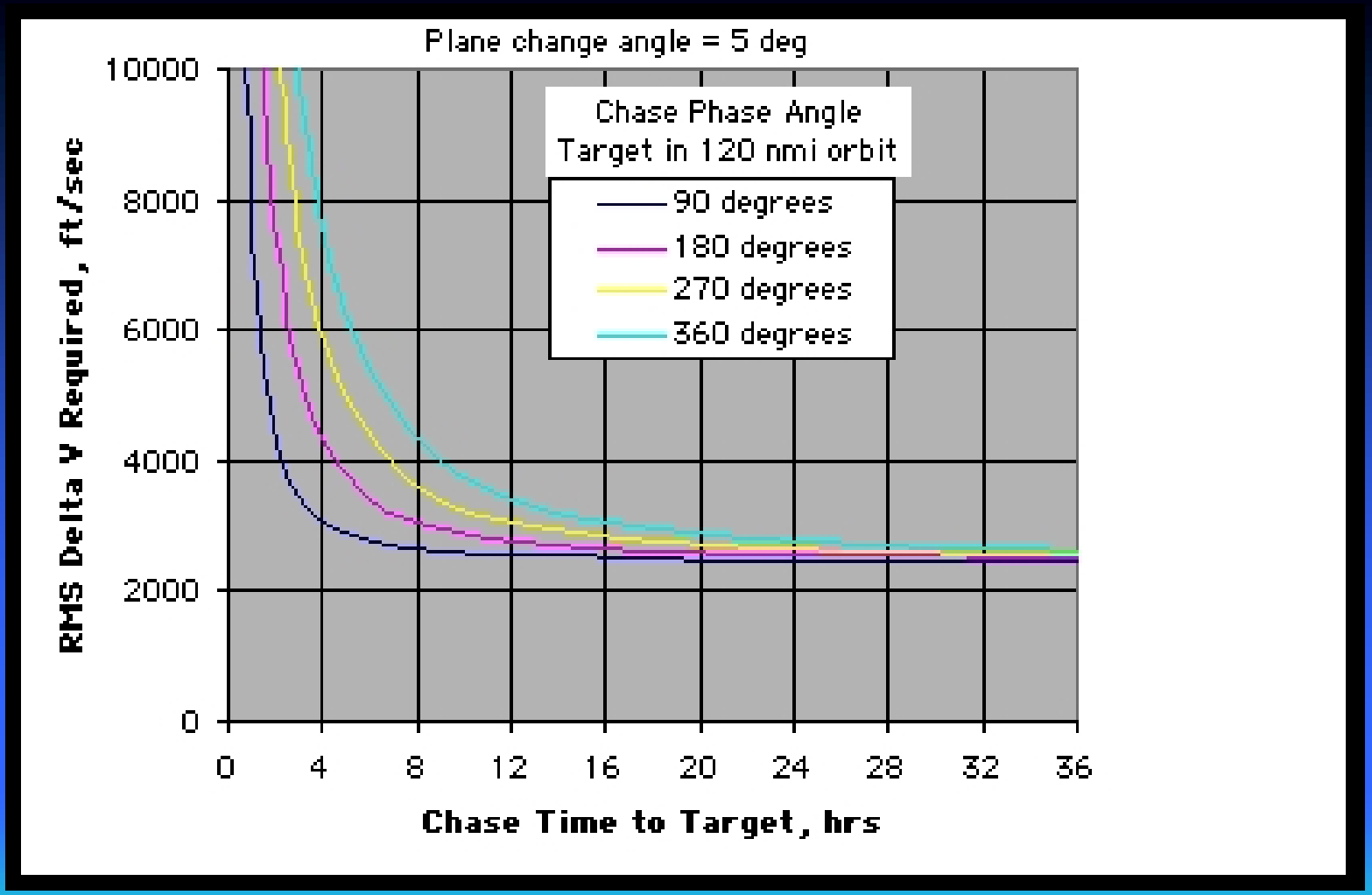
Payload to 185 km (100 nm) orbit, kilograms

	RMS	*RMS*	*EMS*	Mission
Inclination	*EPM-1*	*EPM-3*	*EPM-3*	
98.7	556	1410	2110	Sun-sync VAFB
90	615	1494	2192	Polar VAFB
51.6	674	1602	2262	*ISS* Service 460 km orbit
37.9	987	2030	2716	Due East from Wallops Island
28.5 GTO	1034 none	2086 none	2786 689	Due East – from either CCAFS or Wallops Island

Space Maneuvers are Energy Intensive



Phasing Maneuvers Take Time



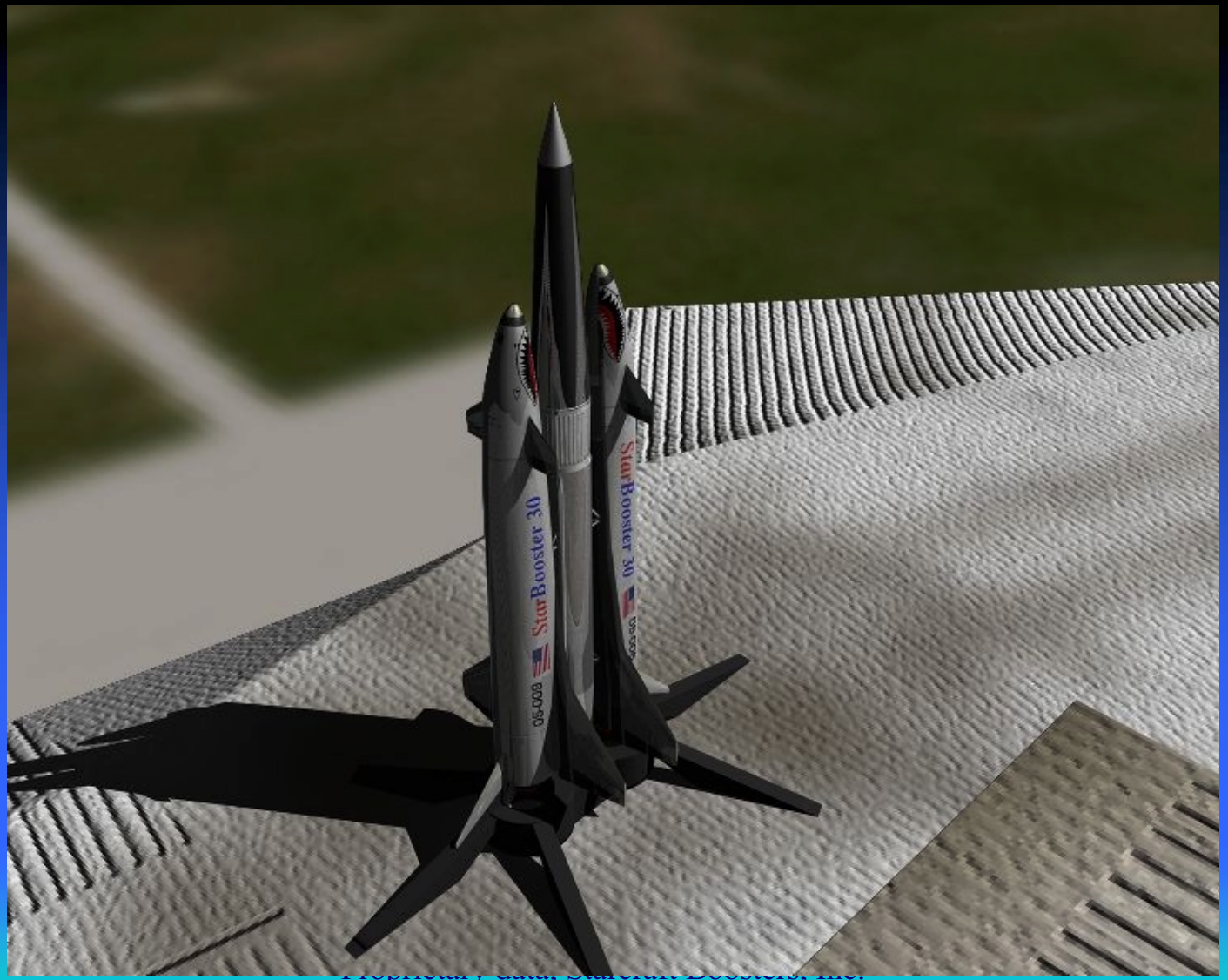
Space Control Operations

- **Not that different from fighter tactics**
  - **See him before he sees you**
  - **Close quickly**
  - **Take appropriate action**
- **Should we base our assets in space (*X-37* approach) or on alert at two + ground bases?**
- **Orbital mechanics dictates ground basing - many targets may be inaccessible in time using space basing due to excessive space maneuvers required for plane change & phasing**
- **For *StarHawk*:**
  - **Multiple ground bases**
  - **Launch in-plane to the orbit of the target**
  - **Launch to just below his altitude**
  - **Close on target**
- **What payload is required? a ton or so is probably enough**

Quick Response, Rapid Turnaround are Keys to Success

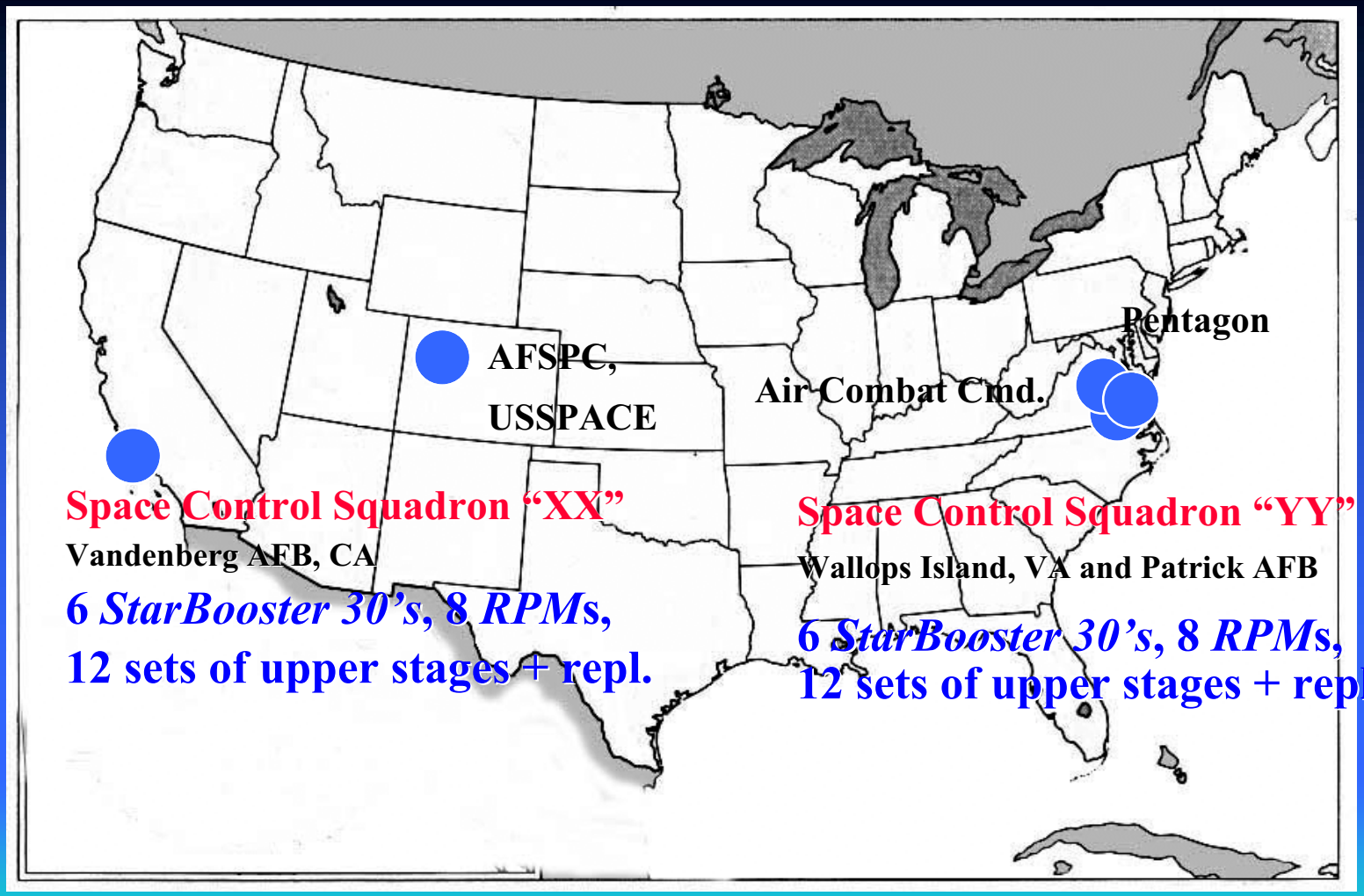
- **Preliminary analysis indicates it is feasible to launch from alert status in hours, provided payloads are treated as ordnance**
- **Based on demonstrated ICBM & space launch history**
- **Turn-around for re-flight planned for less than two days.**
- **Detailed timeline by former USAF Maintenance Officer with ICBM and space launch operational experience**
- **To be validated early by *StarBooster 3* demonstrator**

StarHawk™ on Launch Pad



Space Control Wing

63.4 to 110 deg orbits



38-55 deg. orbits

Implementation Phase Will Attain

- **Early space control capabilities for USAF**
  - **Rapid response from alert status**
  - **Turn-around in less than one day**
  - **Surge capability**
  - **Responsive capabilities on-call: due East, *ISS*, polar, sun-synchronous, GTO**
- **Alternate access to *ISS* for NASA**
  - **Soon, with modest budgets and low risks**
  - **In parallel with advanced technology experimentation**
- **Prospective commercial use, providing "surge" via CARF**
- **Operational ease & rapid response on both coasts**
- **Placing the United States on the correct path to attain:**

Improved Reliability through Reuse

StarBooster 30™

A Unifying Project for Access to Space

Re-use + Rigor = Reliability