High Speed Point-to-Point Market Analysis Quick Review

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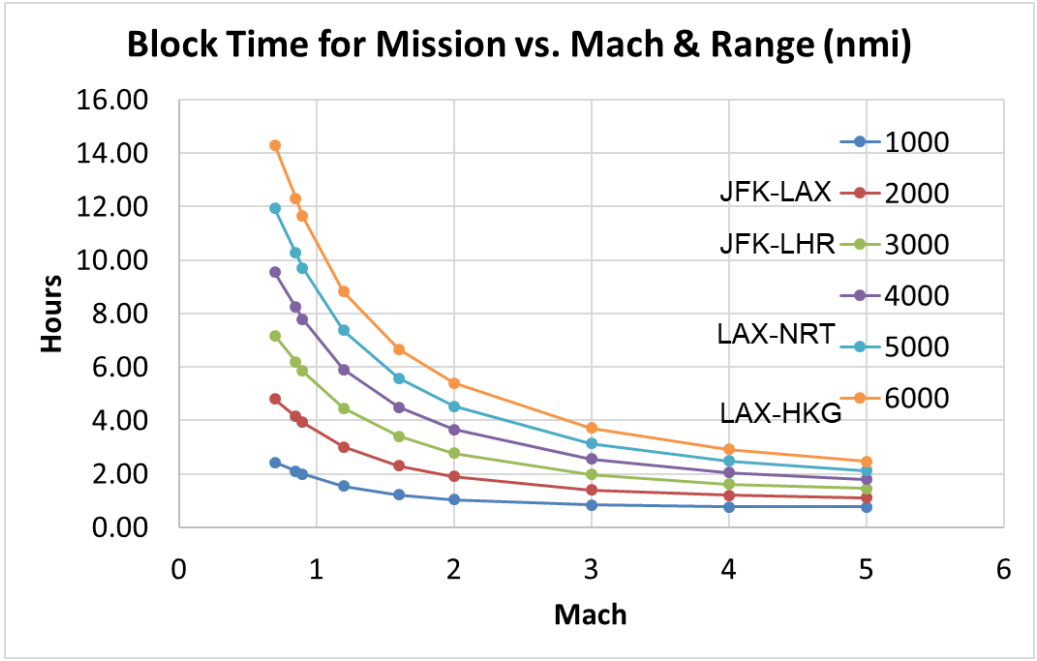
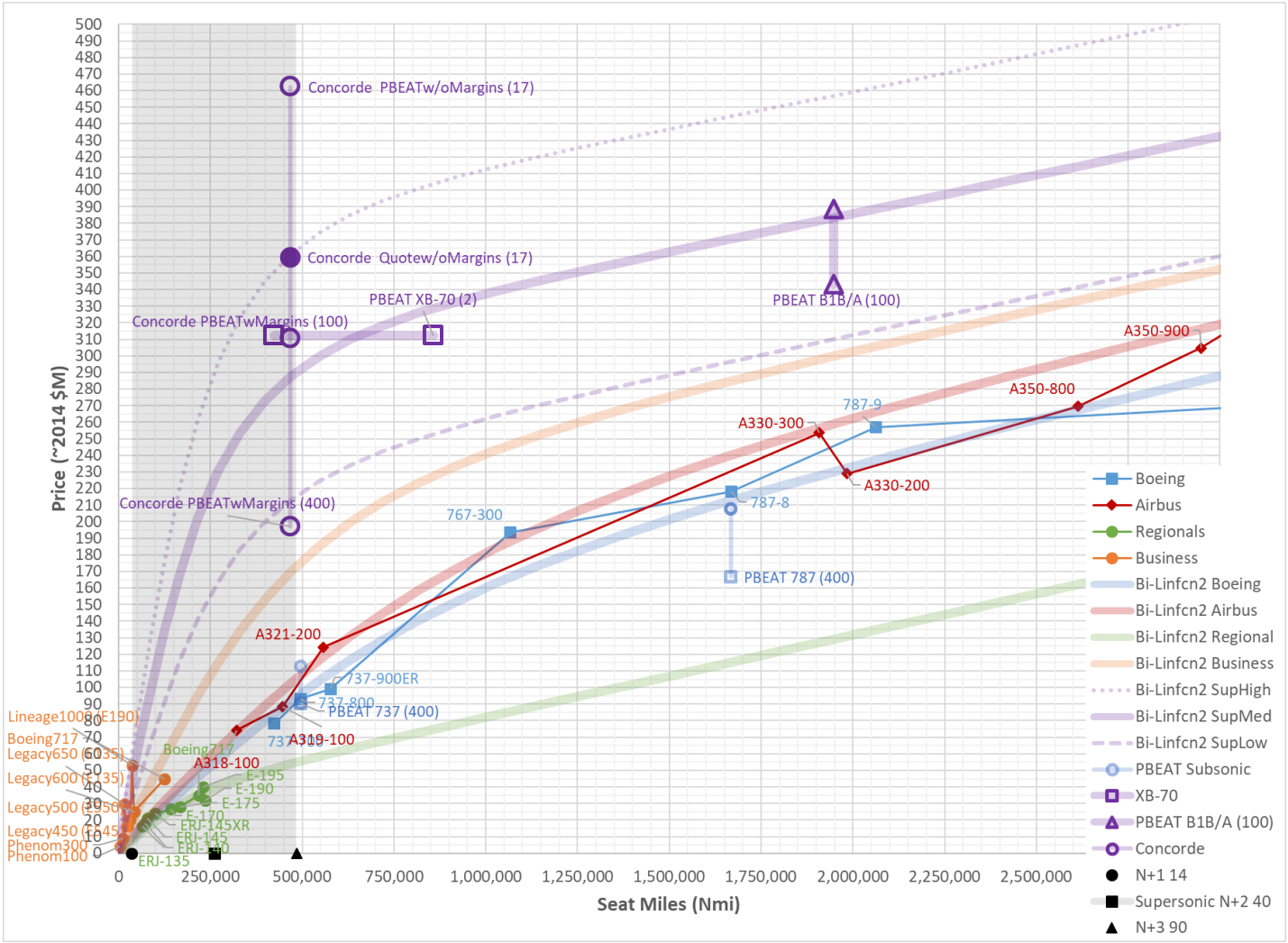
Recent NASA-Sponsored Market Studies at a glance

1. 2018 PAMO Supersonic Mach 1.8 (public report): Market & value-of-time studies complementing CST vehicle study of passenger class (PAX=18, 40, 60)
2. 2020 PAMO Hypersonic P2P study (unpublished): Market studies *premium seat traffic & city pair demand* leveraging PAMO-supersonics; 2013 gross 0th-order sizing.
    - Helped guide HTP studies to examine continuum, with Mach=2.0 lower bound for consistent grounding & applicability to both Hypersonic and Supersonic
3. 2021 HTP SAIC/Bryce (public report): Market studies & *stakeholder surveys of high-end users*, qualitative barriers examination.
4. 2021 HTP Deloitte/SpaceWorks (public report): Market studies & *vehicle concept tradespace; 1st-order MDO propulsion & airframe sizing & costs, ~quantitative look at barriers*
5. 2022 PAMO Supersonic Mach 1.6, 1.8, 2.0: Networking city-pairs & time savings

2020 PAMO Hypersonic P2P Speed vs. Range & Cost

- Diminishing time savings above Mach=2.0
- High cost sensitivity & uncertainties above Mach=1.0 (DDT&E and O&S cost)





HTP Sponsored Studies

Favorable High-Speed Market Characteristics

	SAIC (with Bryce Space & Technology)	Deloitte (with SpaceWorks & NIA)
Mach	3	2 to 4
Range	4500 nmi	4000 nmi to 4500 nmi
Number of routes	300	90 (1)
Aircraft Size (# PAX)	10 GA or 50 Commercial	20 to 50
Aircraft Cost	$200M - $300M	$131M - $228M (2)

SAIC Final Report: https://ntrs.nasa.gov/citations/20210015471
Deloitte Final Report: https://ntrs.nasa.gov/citations/20210014711

(1) Deloitte only considers over water routes
(2) Mach 3 at 4500 nmi

Summary Comments

- Weight & performance sensitivities indicate Mach~2 can support the largest commercial market of scheduled traffic; Mach~3 and 4+ could be viable in unscheduled bizjet market
- Passenger ticket price is high & sensitive due to high DDT&E and fuel-burn; vehicle size limits (due to airport integration) & limited premium traffic prohibit ability to defray with increased PAX count, results in reduced load factors
- Environmental (LTO & high altitude cruise emissions) are paramount concerns; dependence on SAFs could have net positive impact by bearing costs for fleet; barriers (emissions, noise, boom, NAS integ., etc.) should be CST/HTP synergies

- *Studies highlighted the need for objective market forecasting and cost/economics capabilities to help guide NASA technology investments*