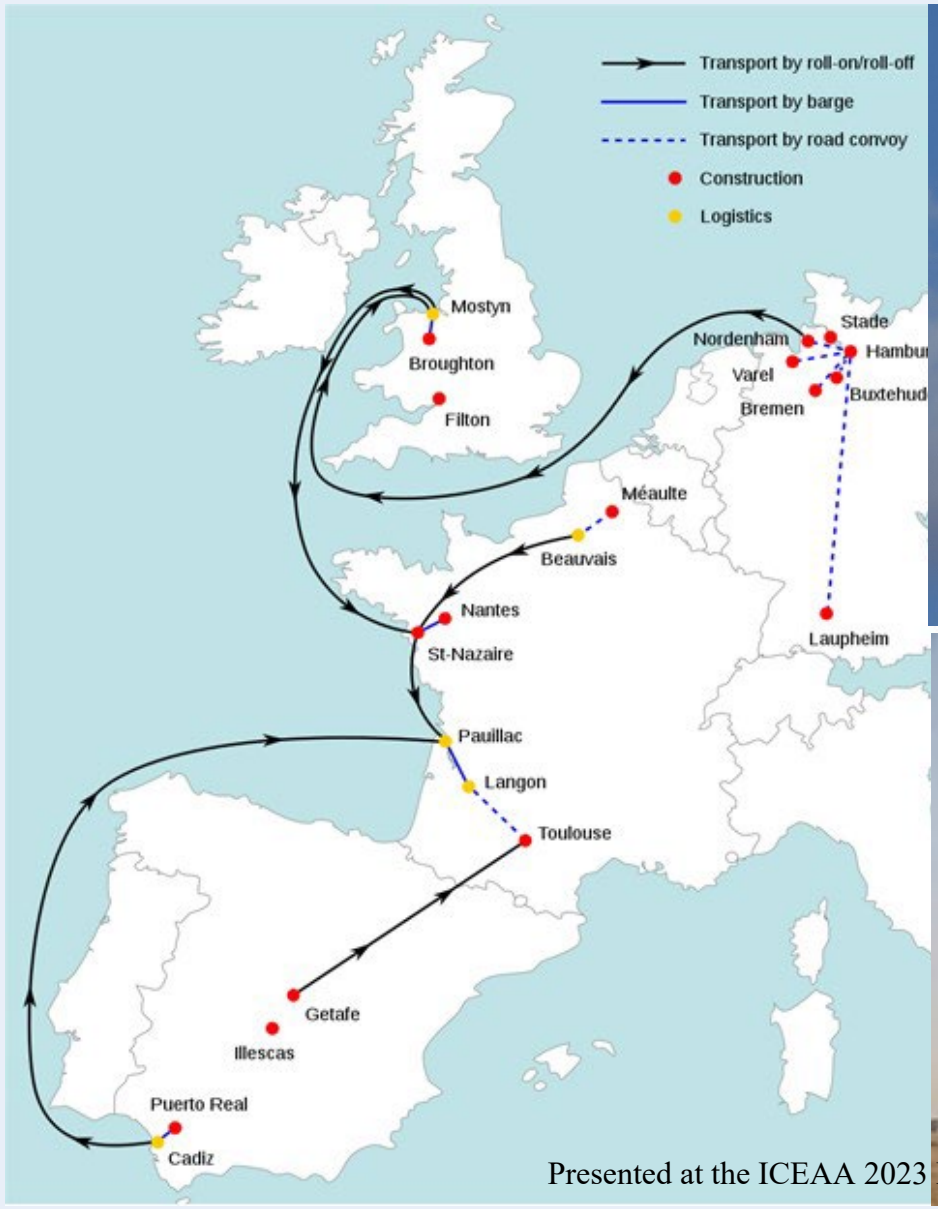
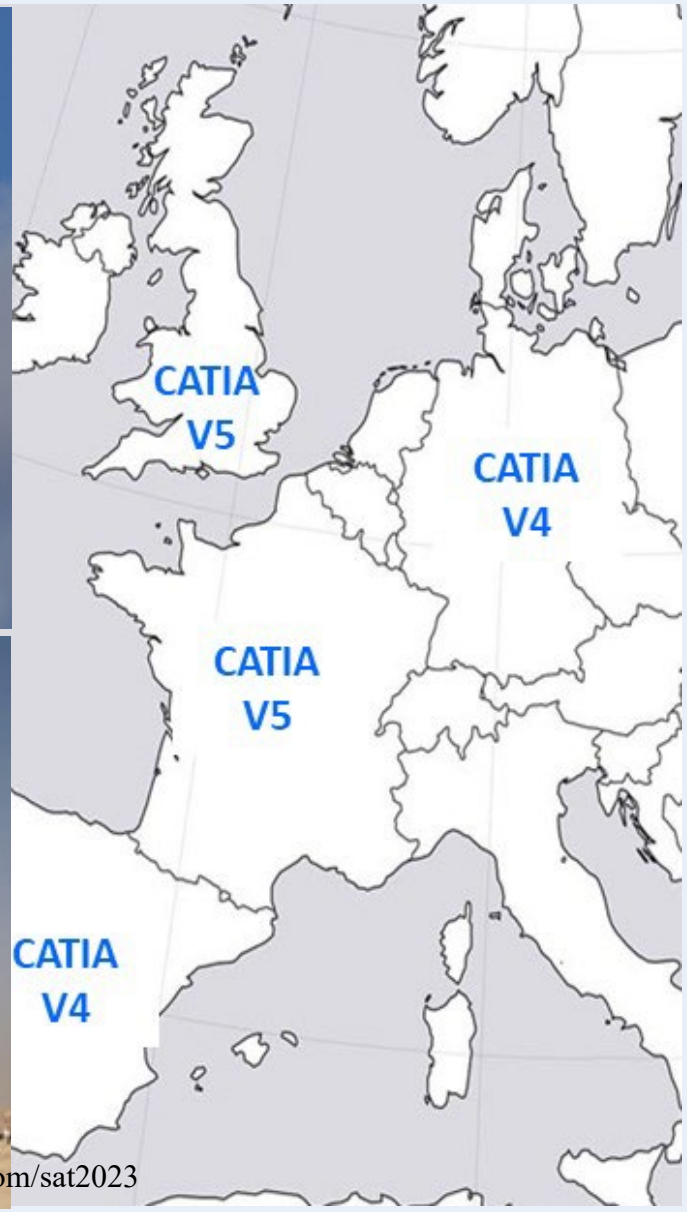
CSI EU (Cost Scene Investigation: European Union)

HYPERNOMICS
SEEKING HIGHER DIMENSIONS





OVERVIEW

- A380 production stopped short – Why?
  - Cost
  - Schedule
  - Demand
- DeLorean shut down after a few years – Why?
  - Cost
  - Schedule
  - Demand
  - Value
- How can firms prevent this from happening in the future?

How Do We Build A Project?

Buried inside this silly question there's an important idea – how do we end at the proper point?

Let's Consider Buildings

The pyramids align with the cardinal points with an accuracy of better than four minutes of arc, or one-fifteenth of one degree

Hypothesis: Starting with a proper base raises the chances of getting the top of the building close to its ultimate target

Not Everyone Gets It Right

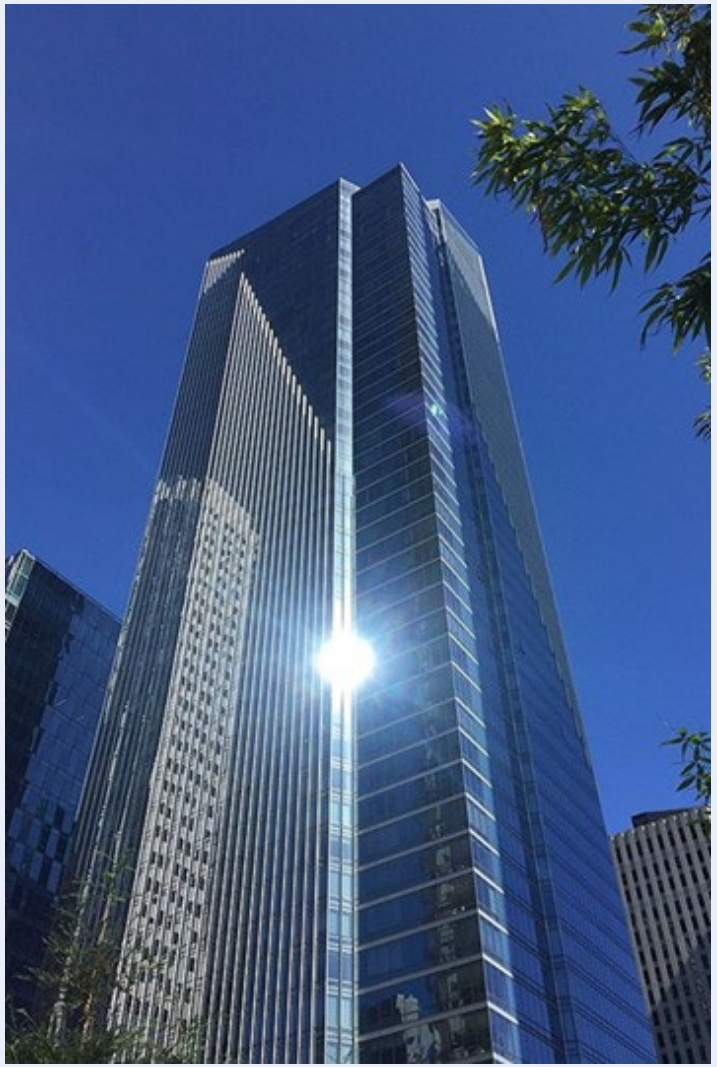
Without a solid base, things change

Pisa could have learned from Bologna

San Francisco ignored the Italian experience

Leaning Tower of Pisa, erected 1173-1372

Bologna's Two Towers, erected 1109-1119



Millennium Tower, San Francisco, 2005-2009

The Airbus A380

This is world's largest passenger aircraft, launched in 2000

Airbus targeted sales of 1250 units, but ended with only 251 sold, losing billions of €s

Were there some relevant experiences upon which the company could have drawn, but did not?

What Did The Airbus Head Know Pre-Launch?

We'll study what Airbus stated as viable goals vs. what they might have projected

What did the head of Airbus know compared to what he could have known?

The A380 Empty Weight & Development Cost Targets

This was the A380 Manufacturing Empty Weight (MEW) and development cost target as they began the project

How Can We Estimate Final MEW from Initial MEW?

Here are 16 aircraft models with the starting and final MEW

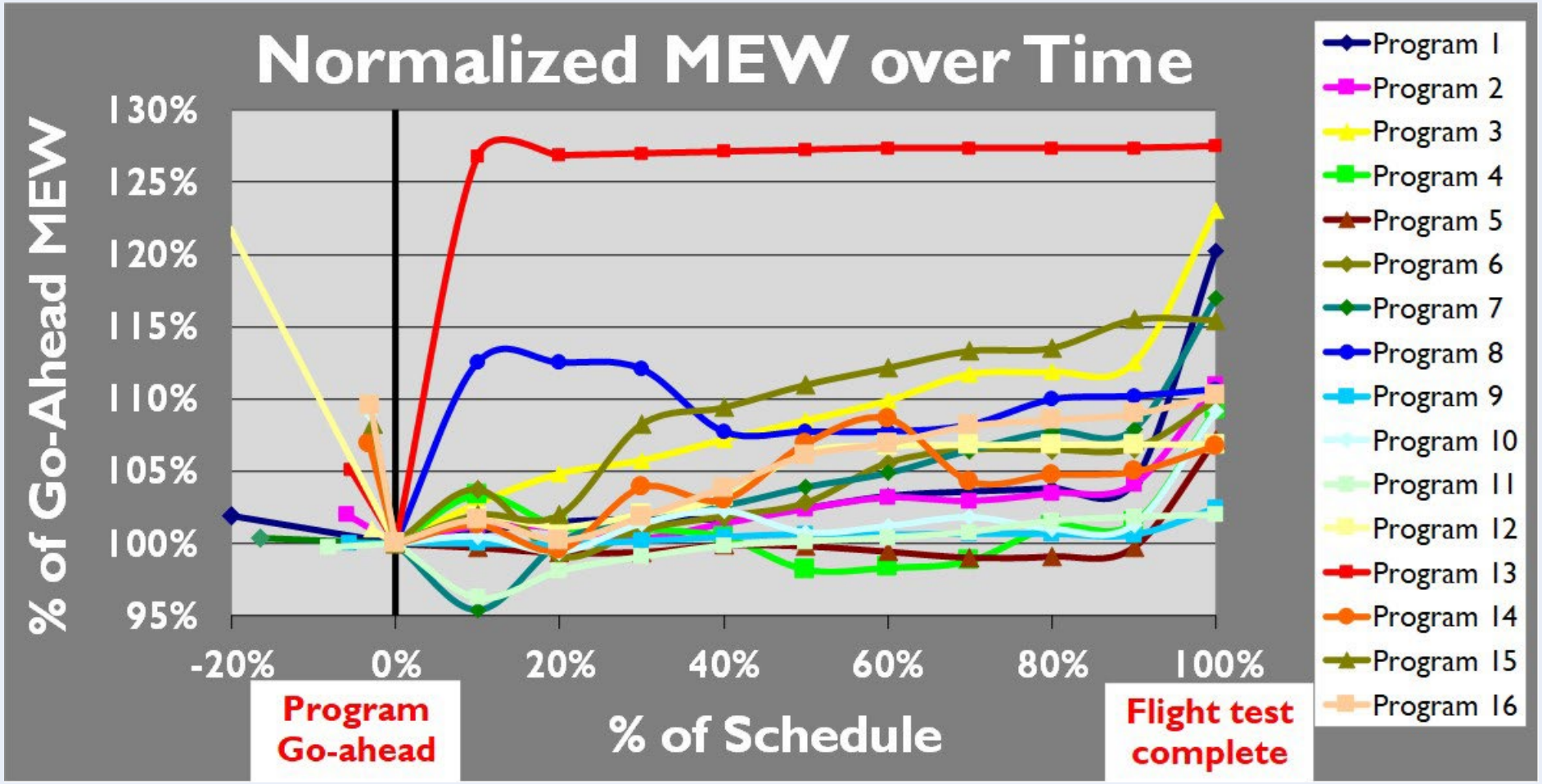
	Parametric MEW (lbs) - 0% of Schedule	Final MEW (lbs) - 100% of Schedule
Program 1	69,000	81,390
Program 2	54,733	61,842
Program 3	10,875	13,384
Program 4	10,524	11,500
Program 5	85,250	91,400
Program 6	54,000	59,338
Program 7	18,343	21,455
Program 8	118,350	130,971
Program 9	65,875	67,486
Program 10	313,500	342,158
Program 11	26,344	26,864
Program 12	38,783	41,437
Program 13	783	998
Program 14	23,200	24,765
Program 15	25,500	29,444
Program 16	24,600	27,123

We Can Track MEW Over Time

MEWs mostly fall from before program start dates, usually hitting a low at their go-ahead

Once started, all programs considered gained weight

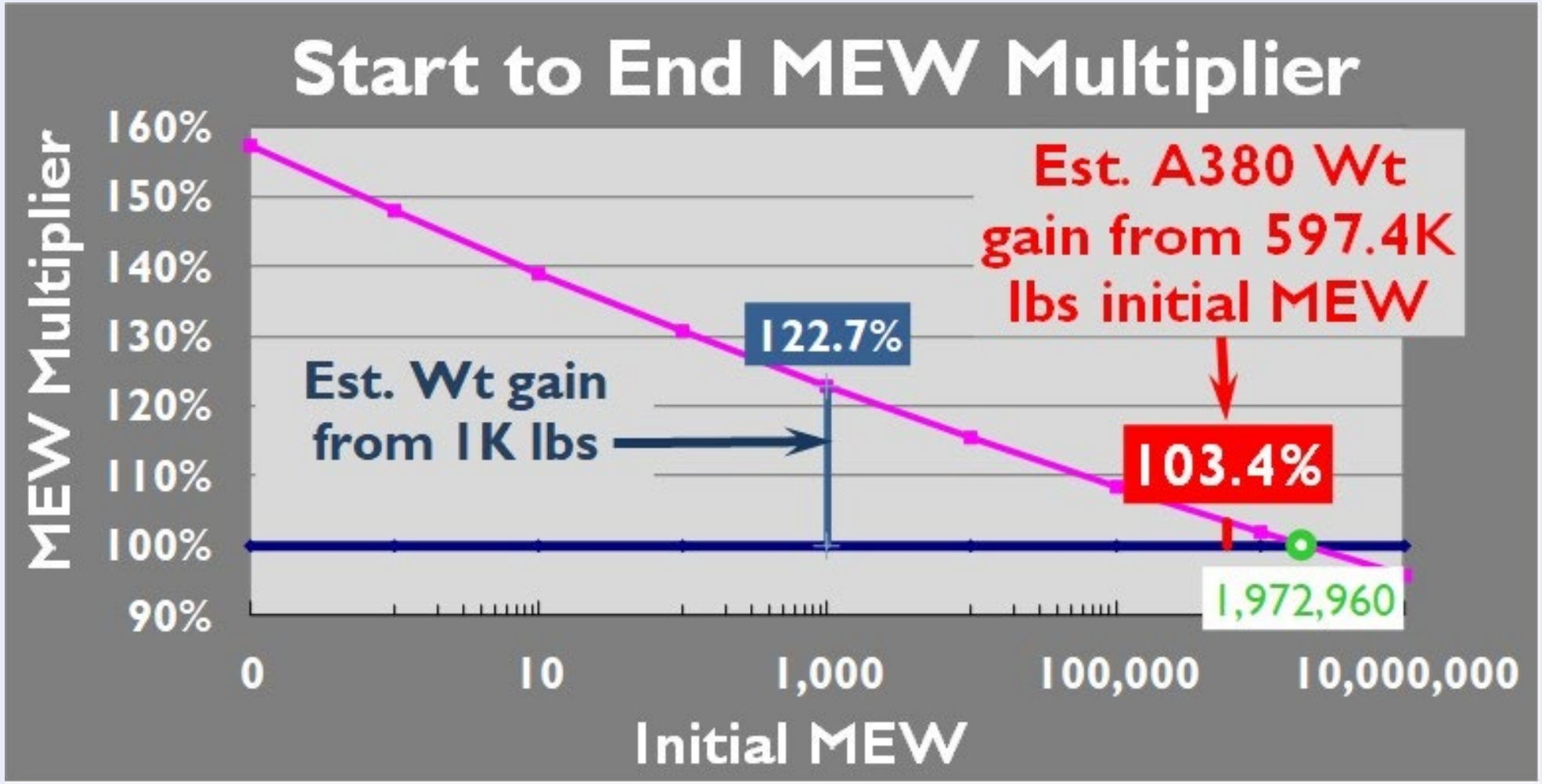
Is there a pattern?



There Is A Correlation Between Starting & Final MEWs

Smaller aircraft have proportionally more weight gain

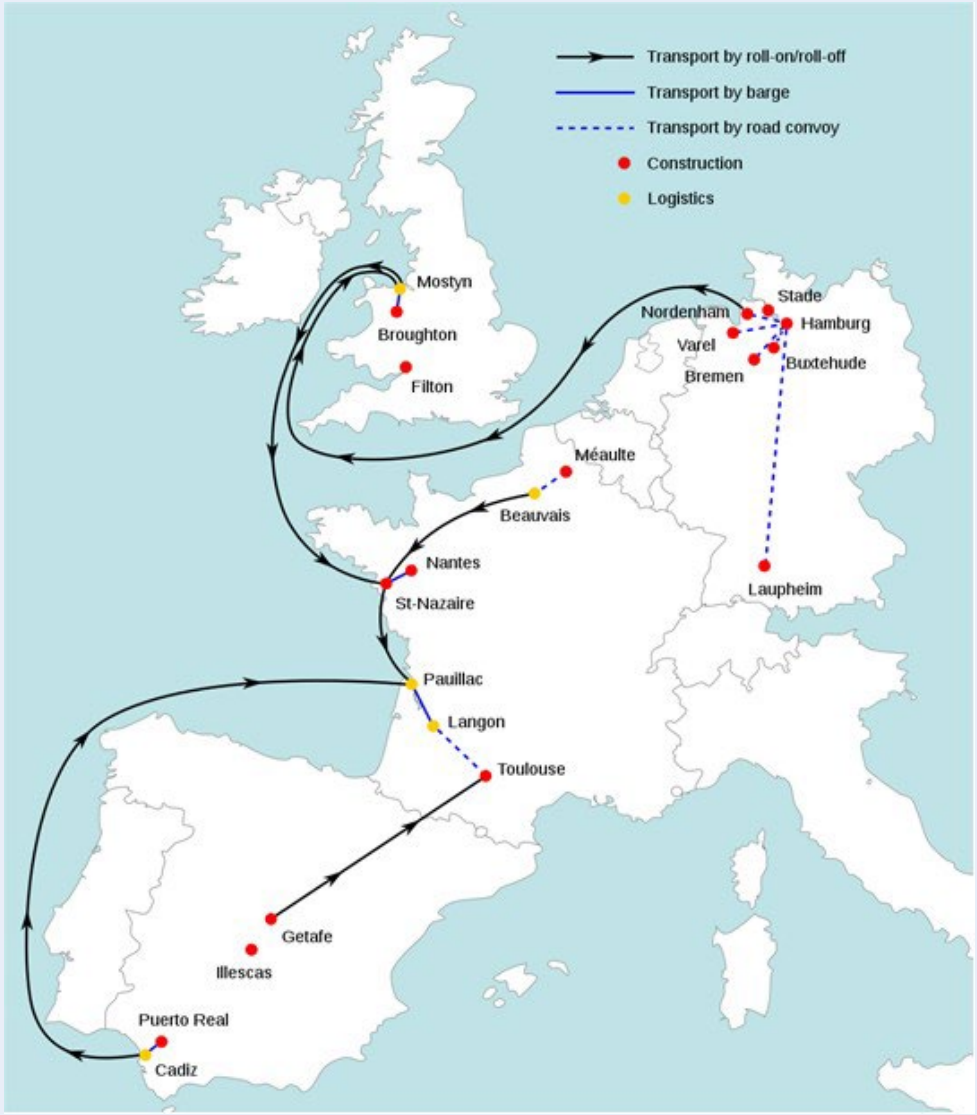
This equation forecasts a 3.4% increase in A380 MEW; its growth was instead 5.1%

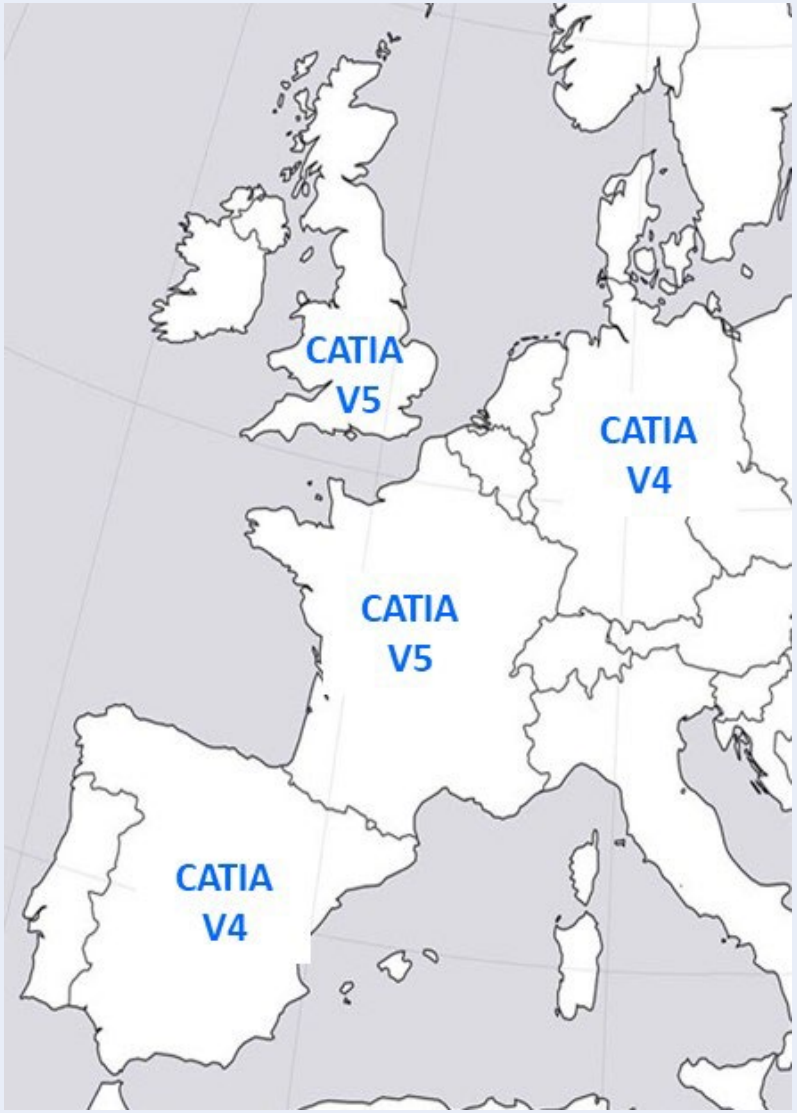


Added Contributors To Cost

Many large subassemblies had to travel

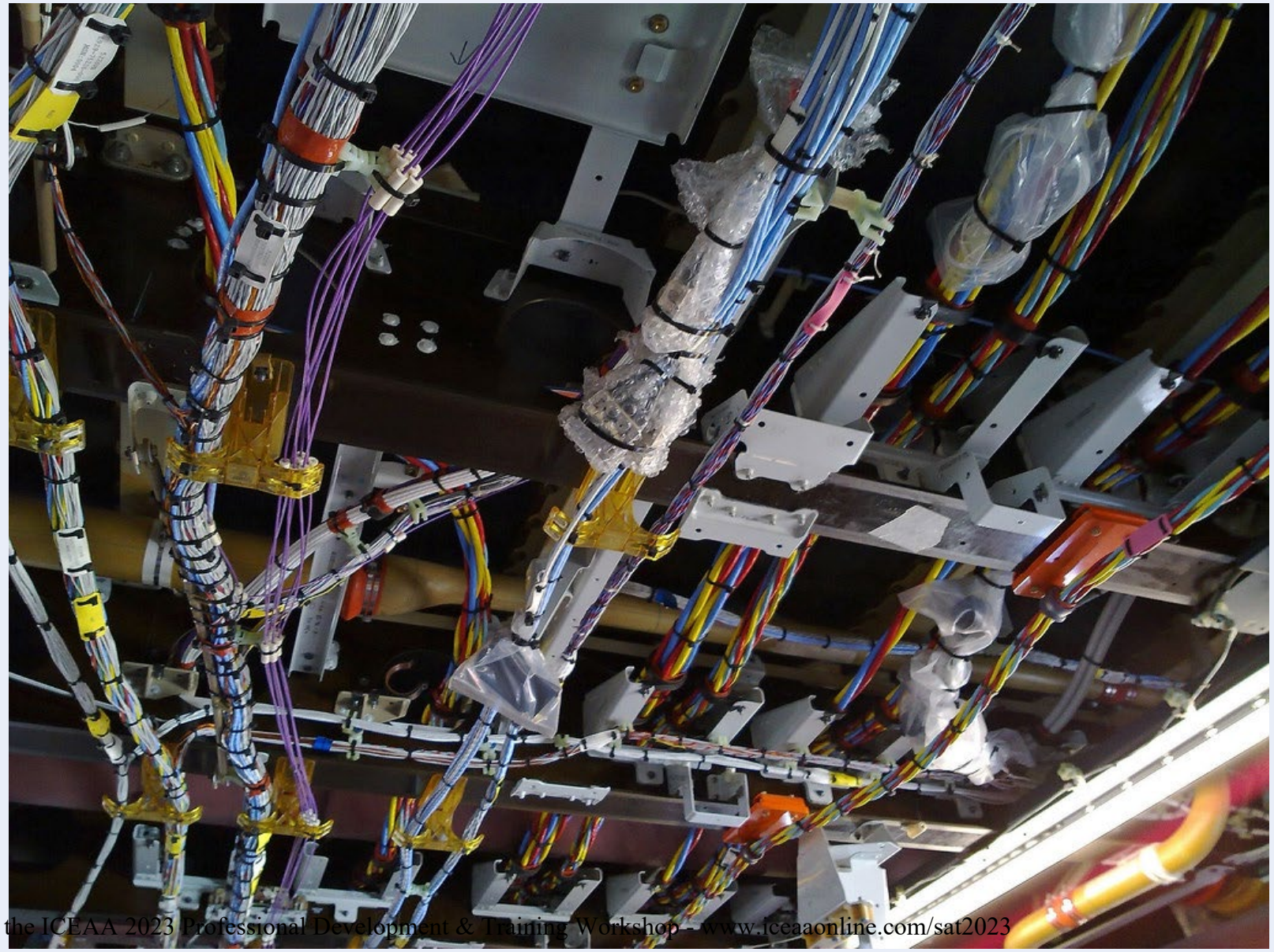
More significant were the incompatible software versions used





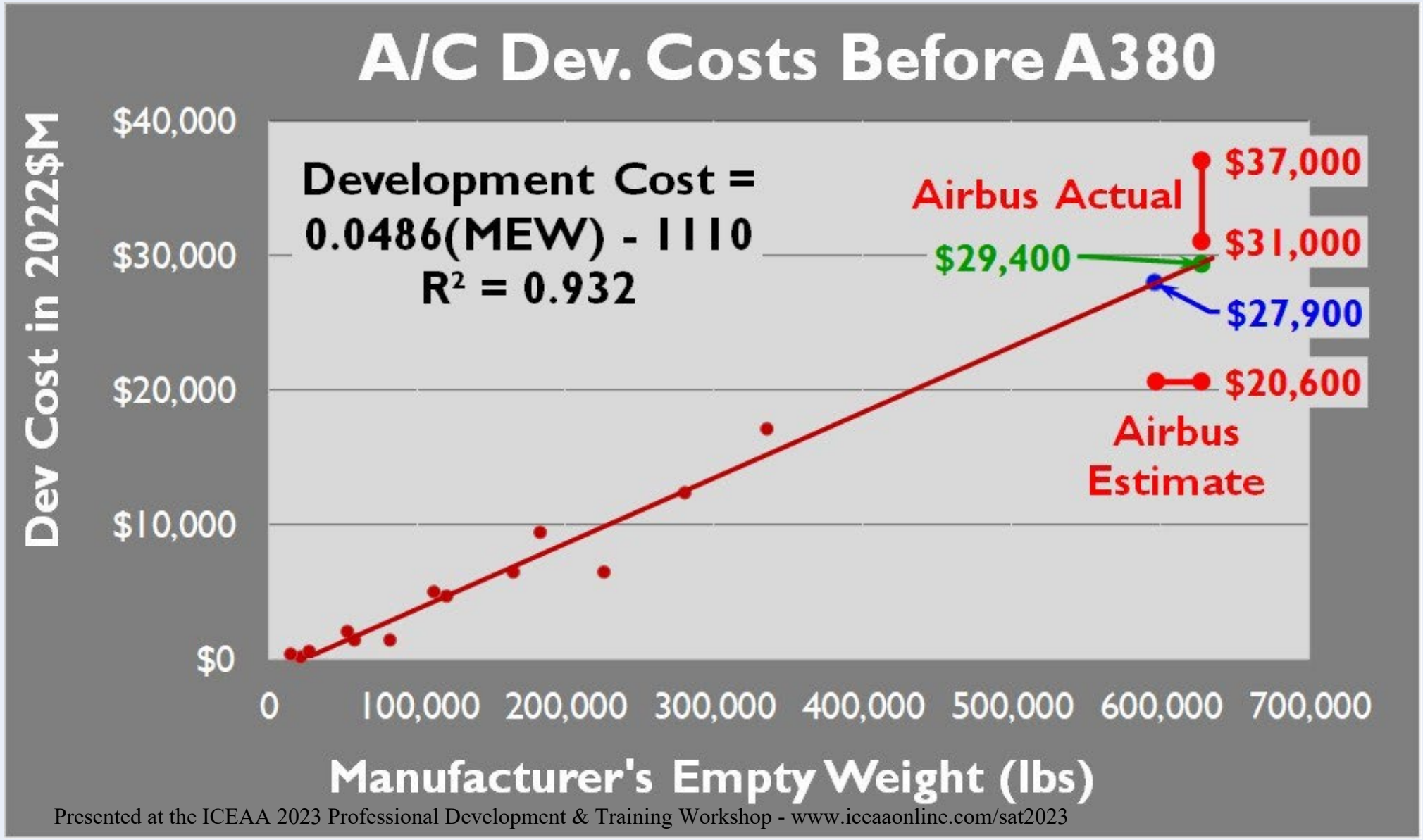
There Were Massive Electrical Issues

The incompatibility of software versions resulted in making many wire harnesses being made too short – this added almost 2 years of schedule, and $6.1B



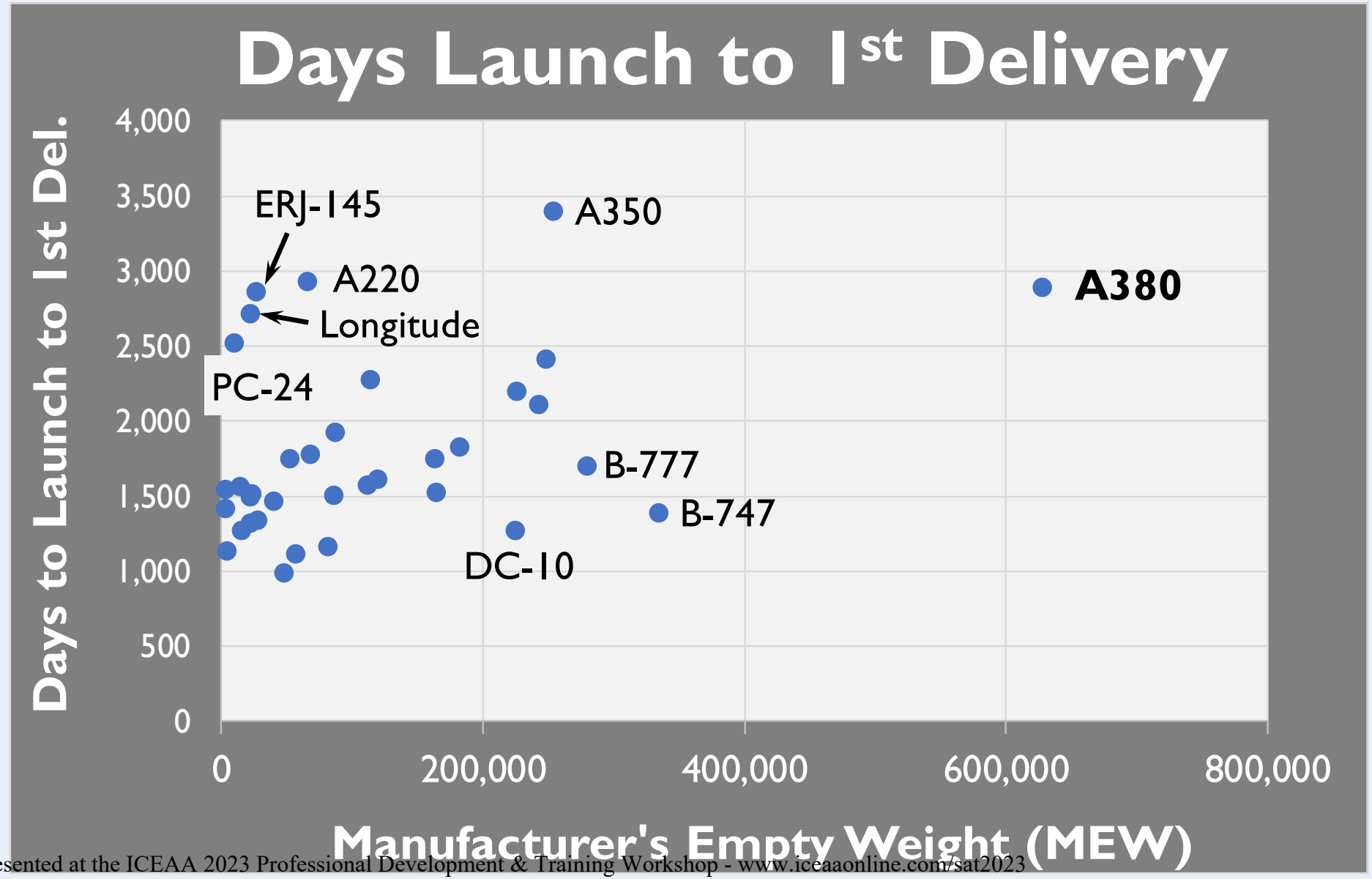
A Simple Estimator Would Have Reduced Error

Airbus missed their Development Cost estimate by about 9.6 Standard Deviations



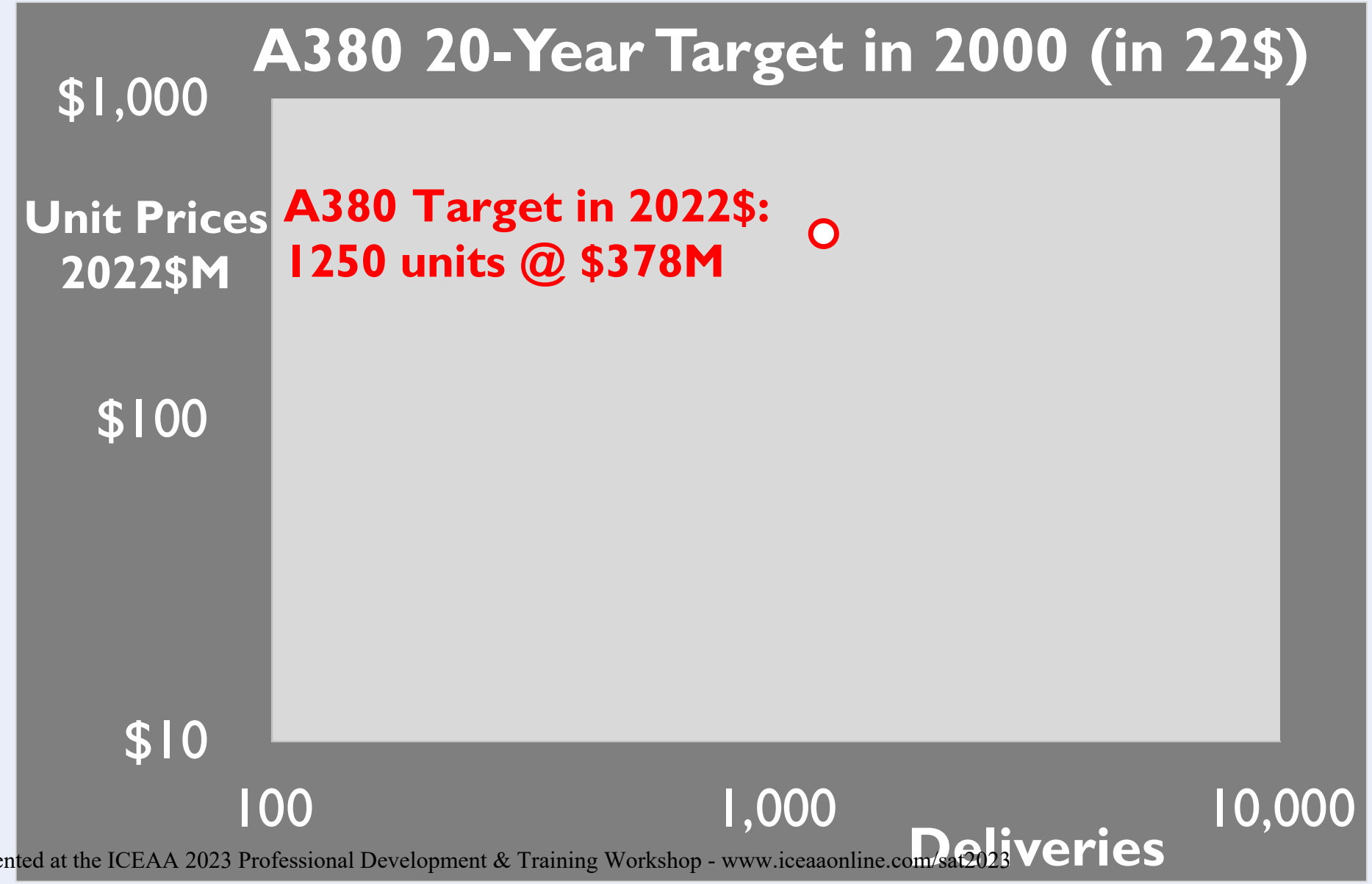
The Schedule Did Not Seem To Be A Prime Culprit

Airbus finished their A380 in fewer days than their A350, which is less than half its size



The Airbus Sales Target

Airbus set this sales target for themselves in 2000



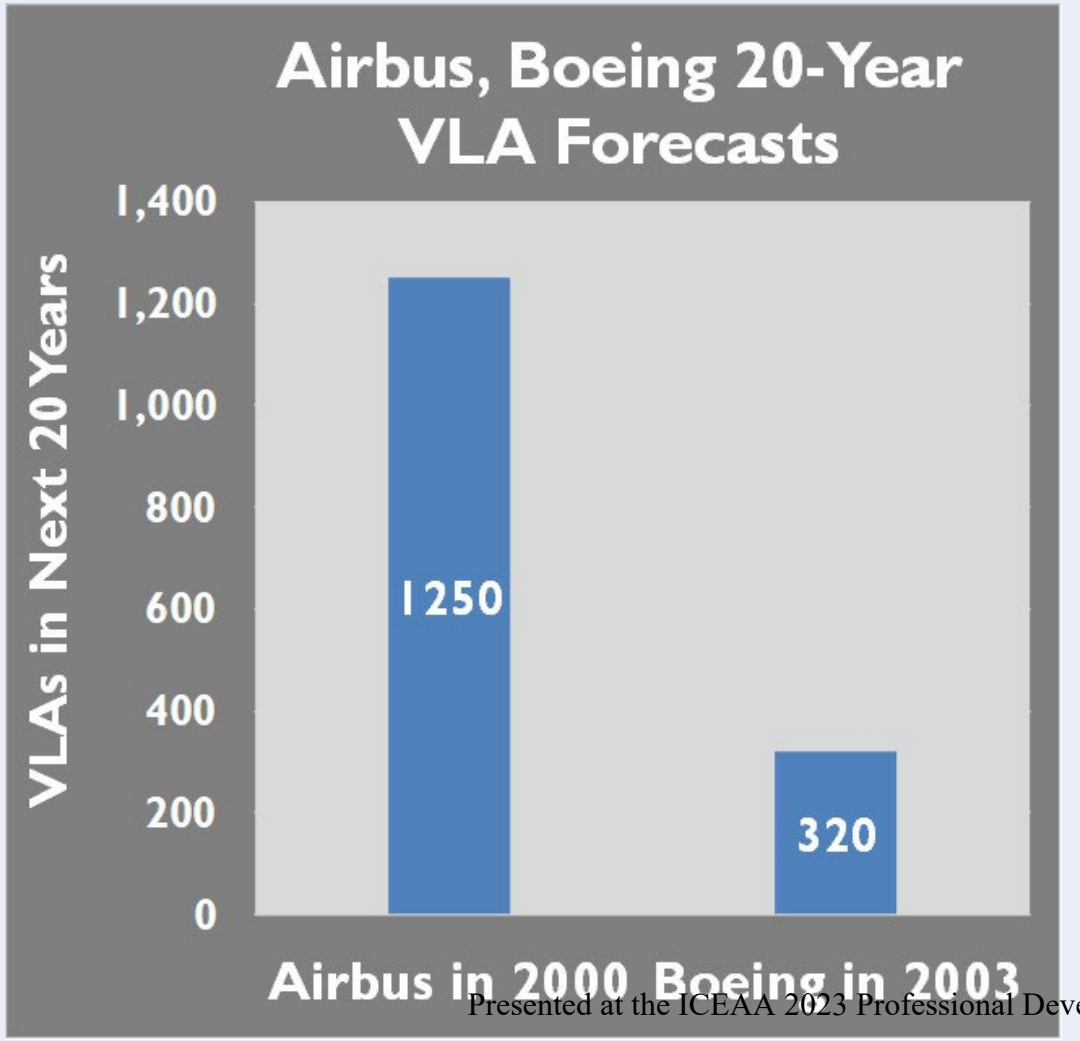
Airliner Posted Prices Exceed Their Discounted Prices

Most airliners come with discounts, especially for large orders

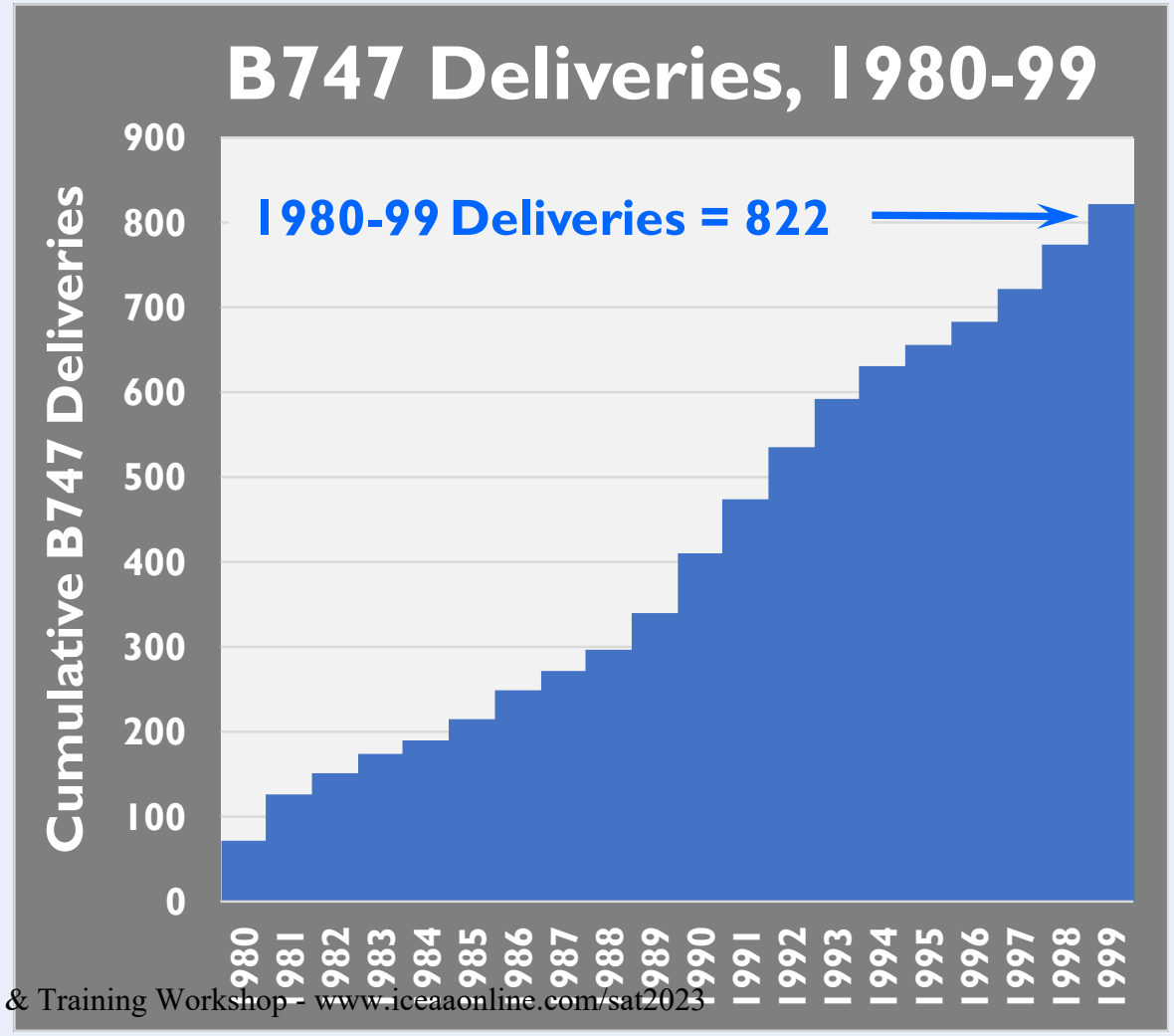
Aircraft	List ($m)	Dis-count	Mkt ($m)	Year
A380	432.6	45%	236.5	2016
Boeing 747-8	351.4	59%	145.0	2013
B777-300ER	339.6	54%	154.8	2016
A350-900	308.1	51%	150.0	2016
B787-9	264.6	46%	142.8	2016
B787-8	224.6	48%	117.1	2016
A330-300	256.4	57%	109.5	2016
A330-200	231.5	63%	86.6	2016
A321	114.9	54%	52.5	2016
A320neo	107.3	55%	48.5	2016
B737-900ER	101.9	53%	48.1	2016
B737-800	96.0	52%	46.5	2016
A320	98.0	55%	44.4	2016
A319	89.6	58%	37.3	2016
B737-700	80.6	56%	35.3	2016

Forecasts and History For Very Large Aircraft (VLA)

Airbus and Boeing had dramatically different forecasts in the early 2000s

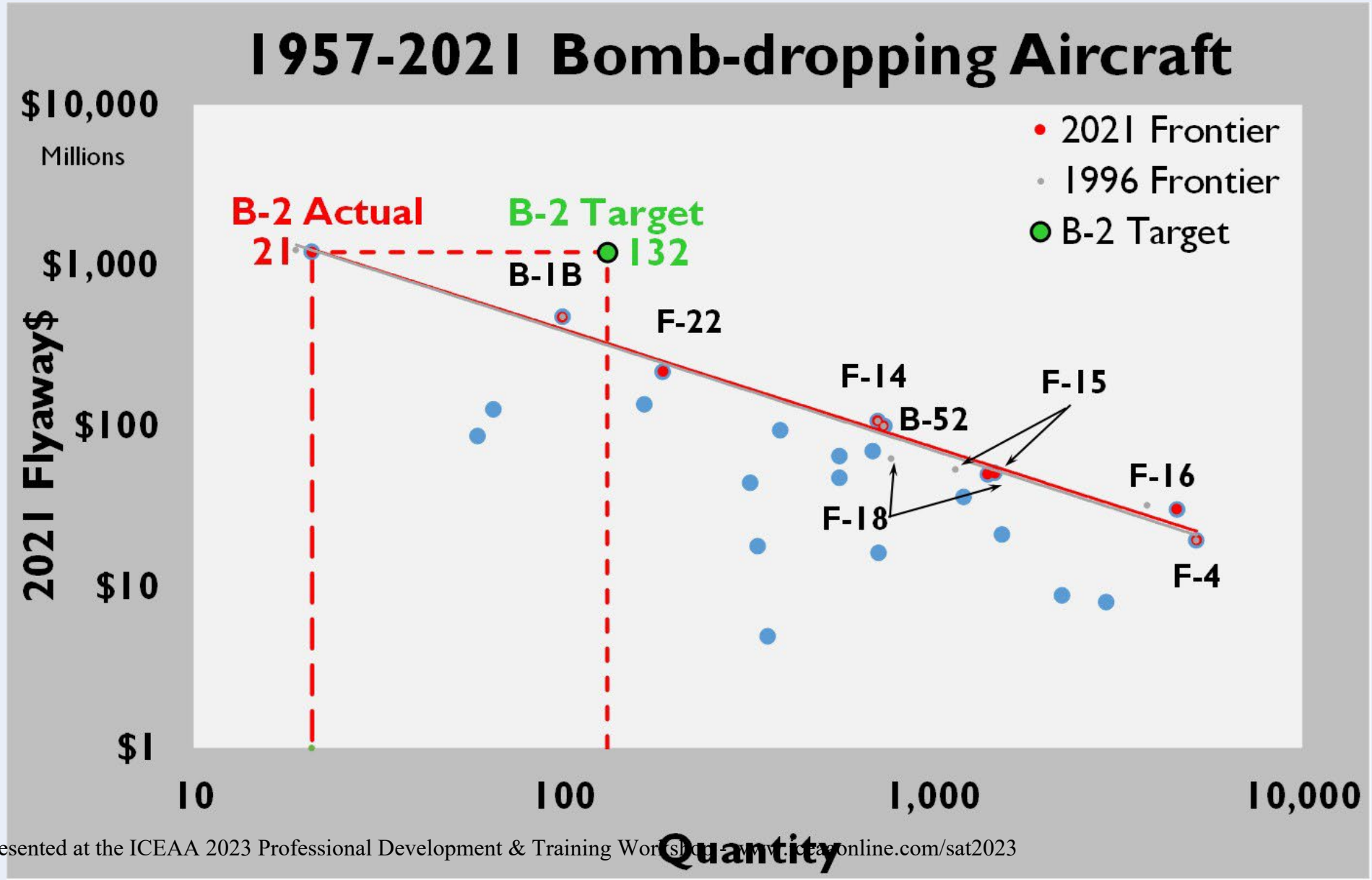


Boeing delivered 822 B-747s throughout the 1980s and 1990s

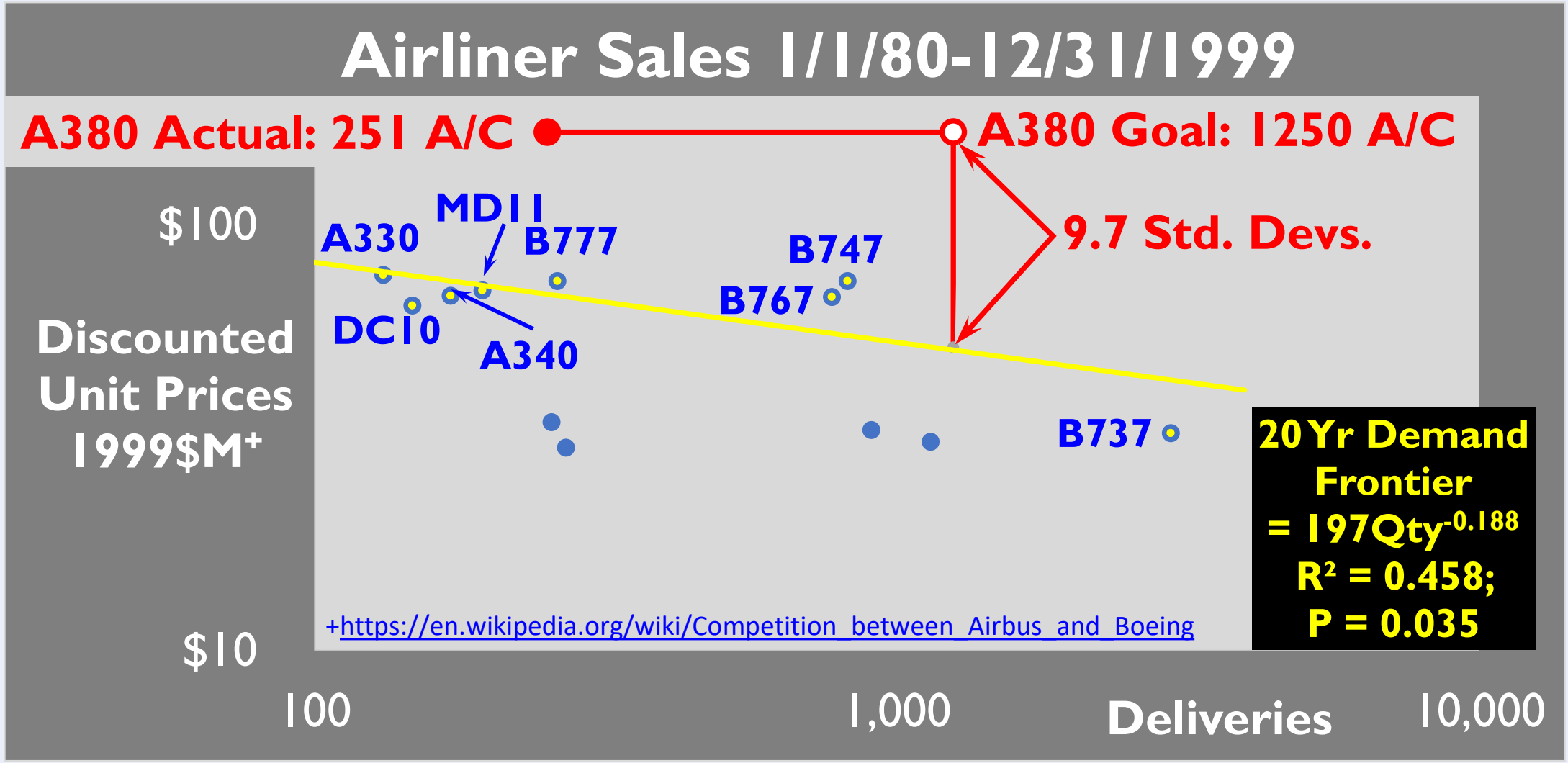


The USAF Didn't Consider the B-1B While Buying B-2s

It is difficult to buy vastly more units of a product whose price exceeds that of the next most expensive product



Airbus Missed Their Target By Nearly 10 Std. Deviations



All the data needed to figure out the Demand Frontier existed prior to A380 launch

Decades Before, Europe Had Another Similar Situation

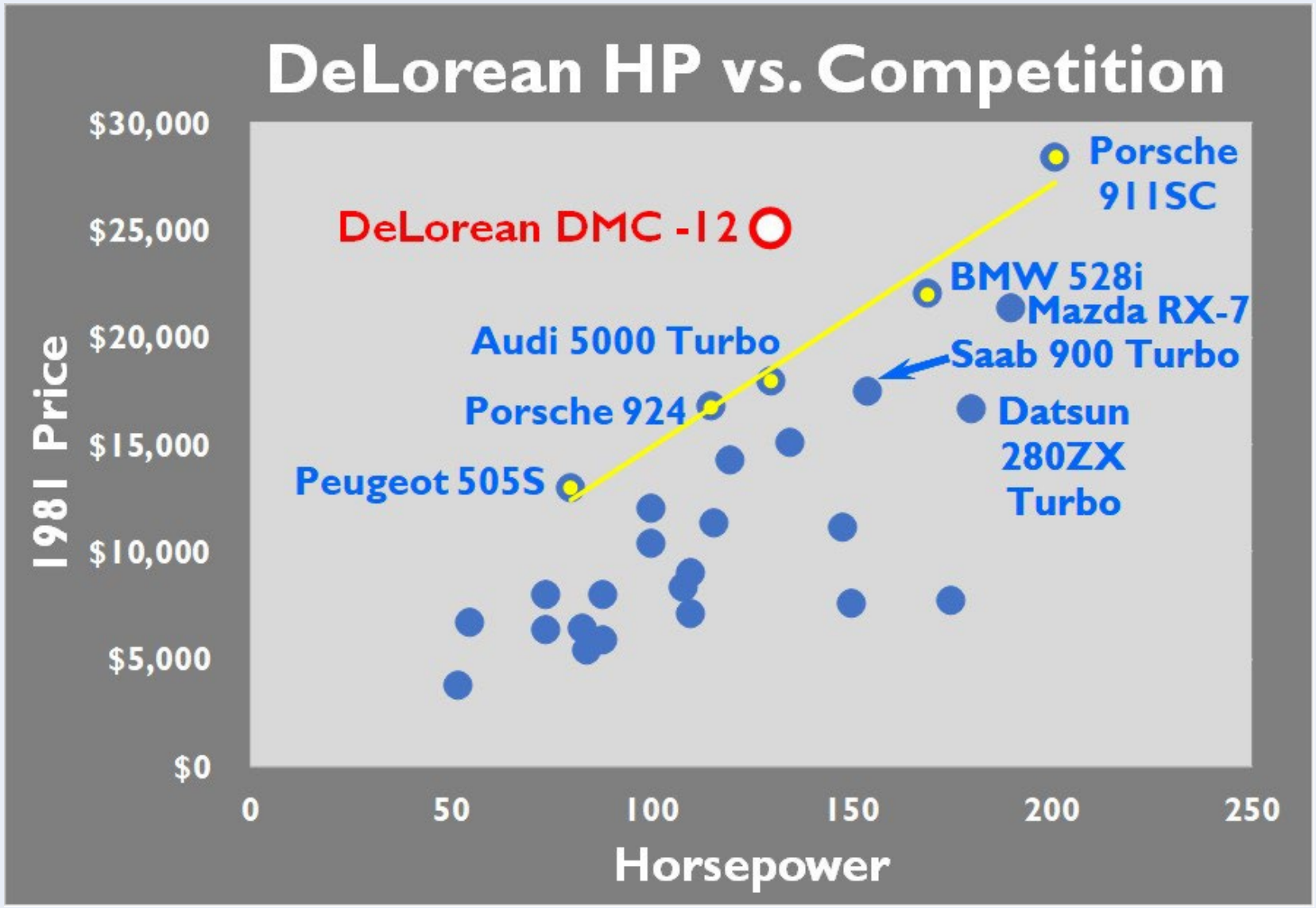
The DeLorean DMC-12

What Was DeLorean Selling?

DeLorean bet that the DMC-12's style would draw buyers

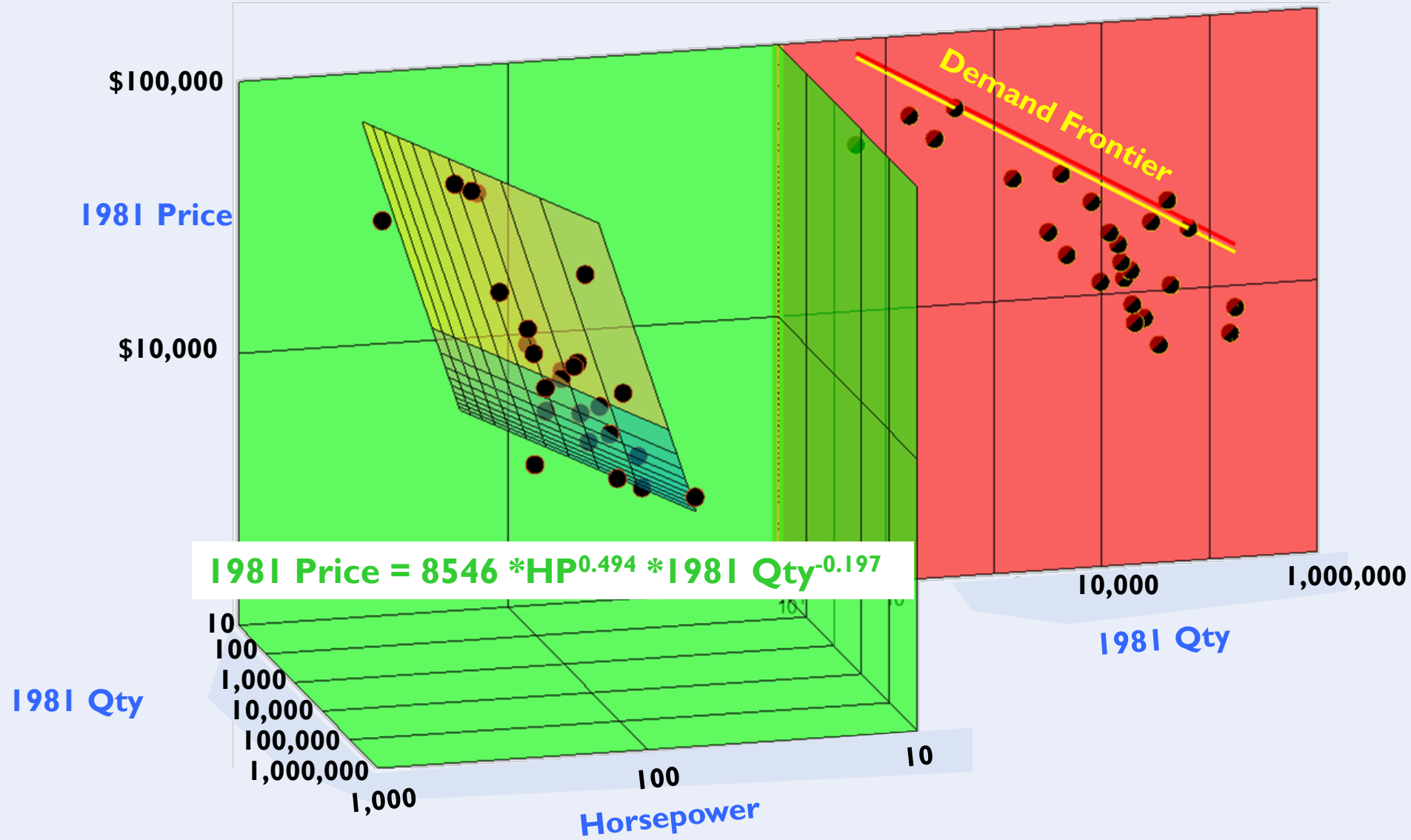
Style In Important, But The DMC-12 Was Underpowered

The DeLorean DMC-12 did not match the horsepower of its competitors

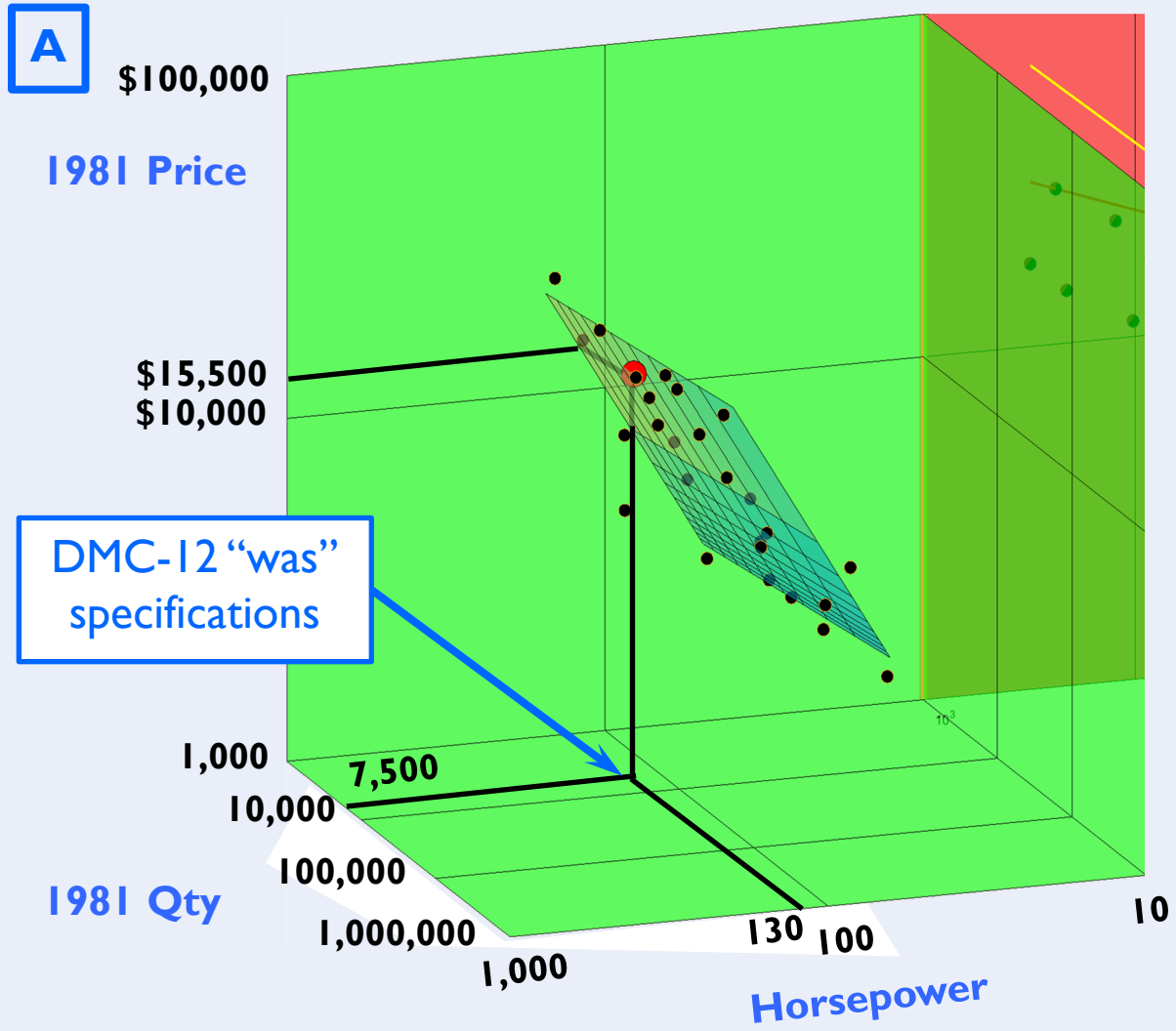


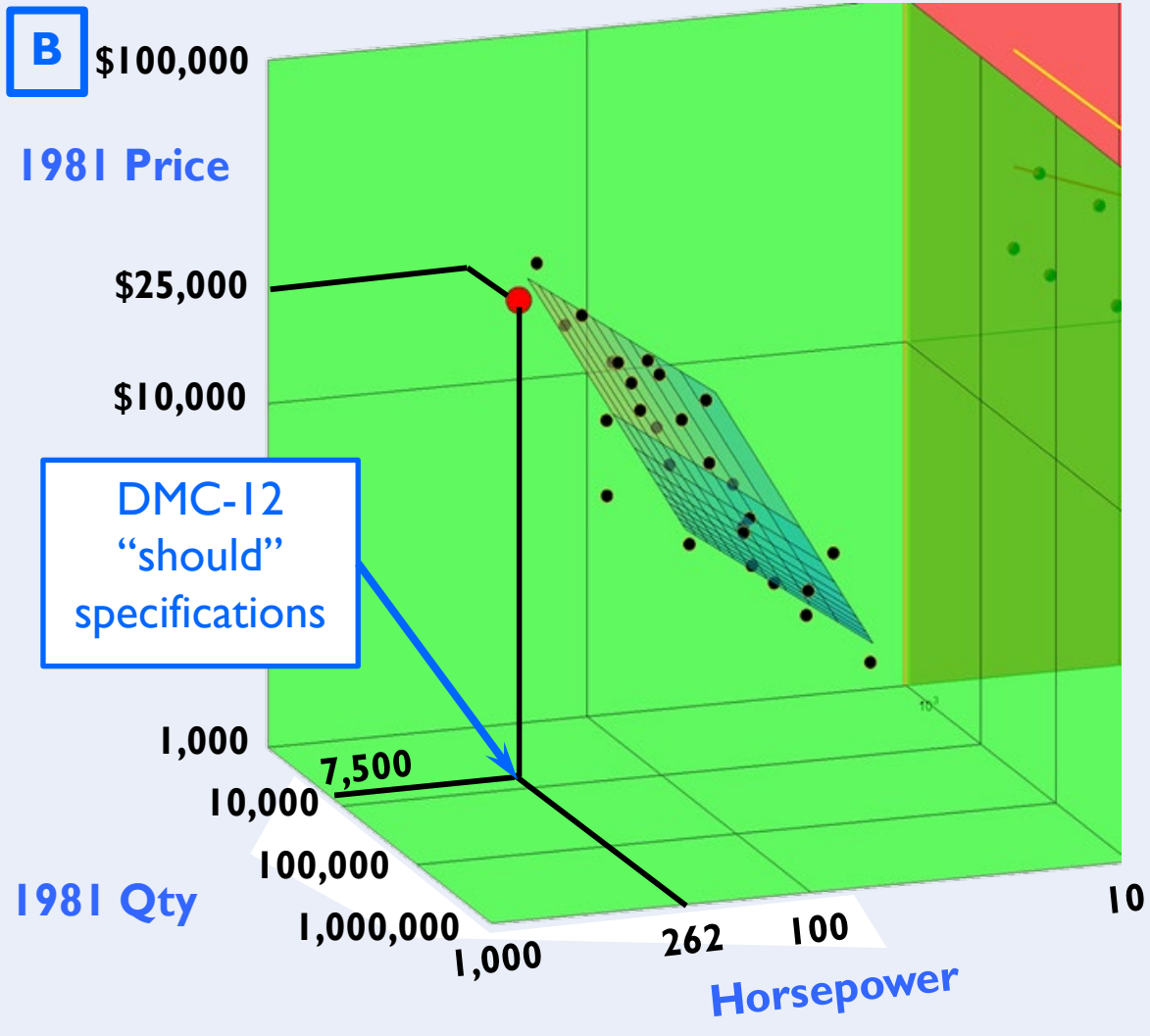
The 1981 Car Market Formed A 4D System

Value goes up with Horsepower, and down with added Quantities



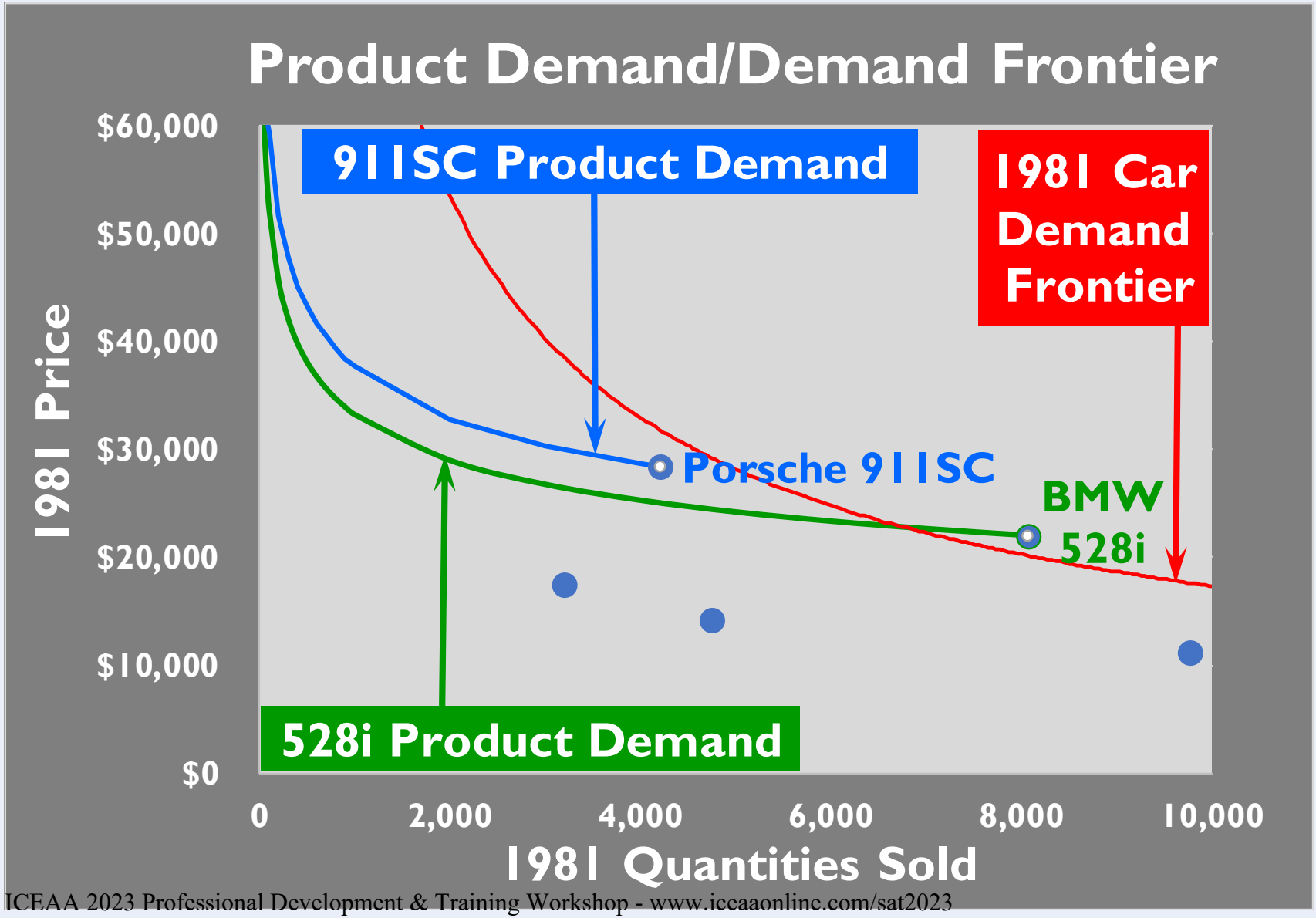
DMC-12 Needed Twice Its Horsepower For Its Price





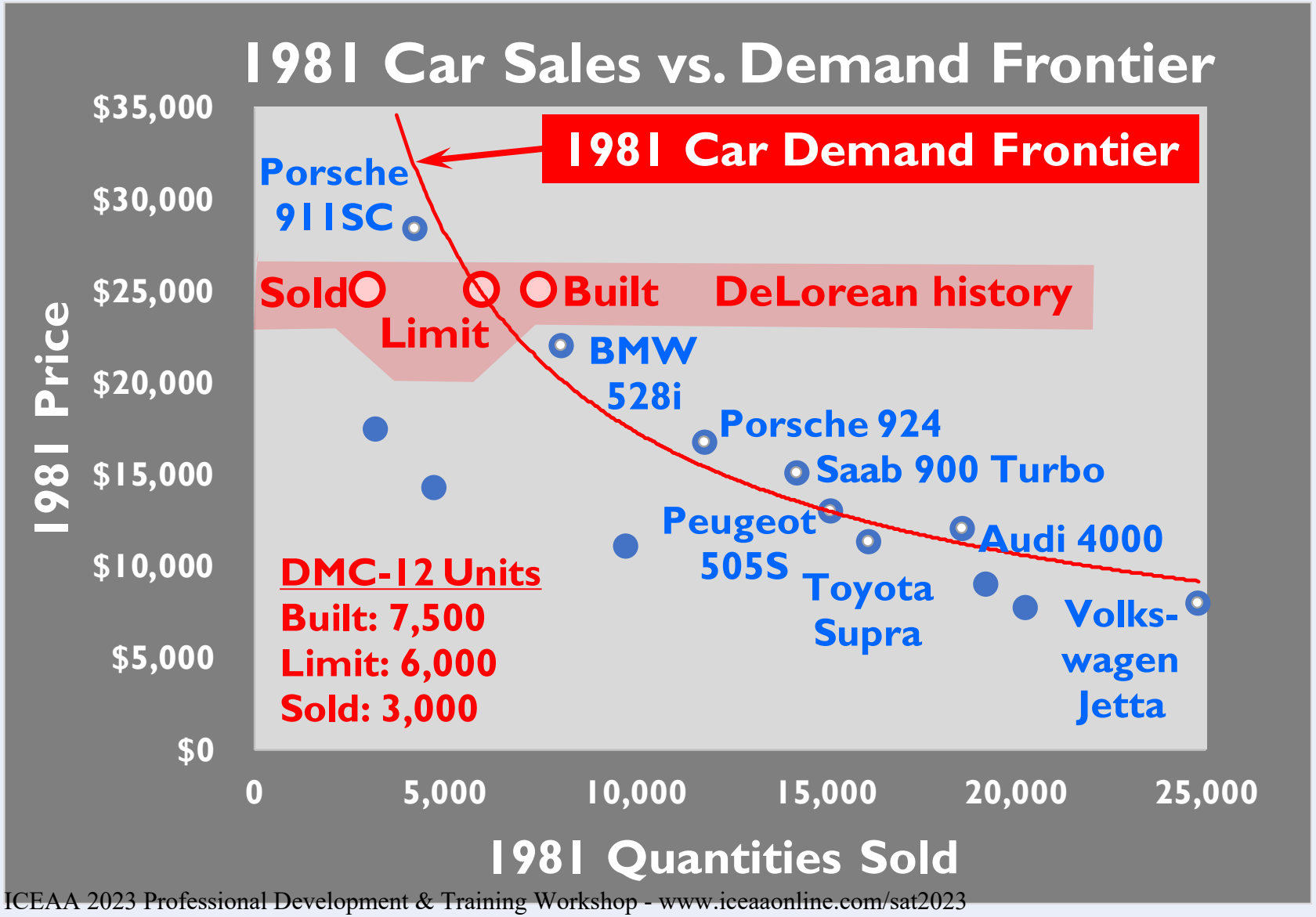
Product Demand Curves May Intersect Demand Frontiers

Producers need to account for Product Demand Curves, as well as Demand Frontiers



DMC-12 Missed Cost, Schedule, Value, & Demand Targets

DeLorean missed all available targets



Summary

- A380 production stopped short but never should have started
  - There never was a large market
  - Costs were out of control
  - Demand analysis would have confirmed a smaller market
- DeLorean shut down after a few years for a myriad of reasons
  - Costs too high
  - Value too low
  - Demand analysis not performed, DeLorean attempted and failed to exceed Demand Frontier
- These broader analyses need to be done for all programs