

The Skunk Works®

*Bringing the
Future Forward*

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LM Senior Fellow - Skunk Works
December 17, 2014



Lockheed Martin Corporation

AERONAUTICS

Tactical fighters
Tactical and strategic airlift
Advanced Development



MISSION SYSTEMS & TRAINING

Radar and surveillance systems
Training and logistics solutions
Simulation technologies



SPACE SYSTEMS

Surveillance and navigation
Global communications
Human space flight
Strategic and defensive systems



INFORMATION SYSTEMS & GLOBAL SOLUTIONS

Civil
Defense
Security



MISSILES & FIRE CONTROL

Air and missile defense
Fire control and situational awareness
Nuclear systems and solutions



What We Do

- Prototyping and Winning New Programs and Special Mission Aircraft
- Leveraging Investments in Game Changing Technologies
- Improvements & Derivatives of Existing Products



Matters to National Security

Skunk Works Diversity

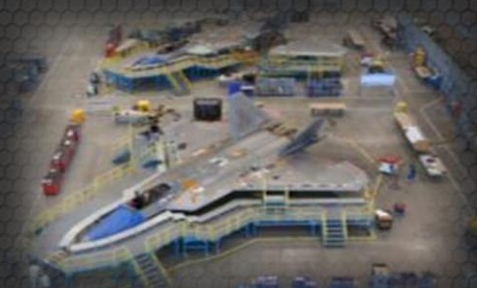
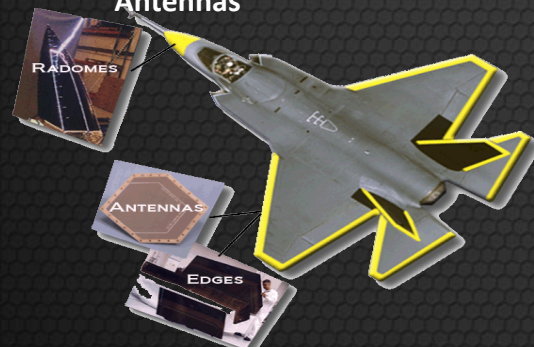


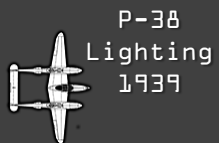
F-35 LO Edges & Antennas

F-22 Mods & Heavy Maintenance

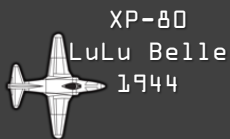
U-2 Sustainment

Classified Programs

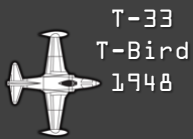




P-38
Lightning
1939



XP-80
LuLu Belle
1944



T-33
T-Bird
1948



RB-69
Neptune
1954



XC-130
Hercules
1954



F-104
Star Fighter
1954

1940



Creation
of ADP
Skunk Works

1950



F-94
Starfire
1949



X-7
King Fisher
1951

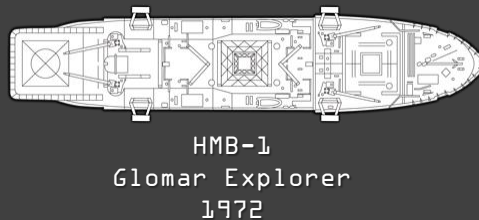
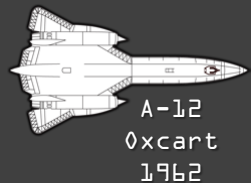
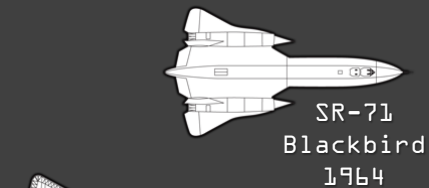


U-2A
Angel
1955



C-140
Jet Star
1957

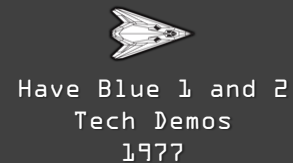
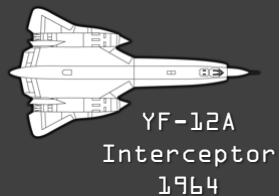
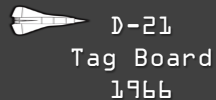
1960



1960

1970

1980

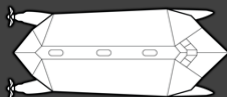




F-117
Night Hawk
1981



YF-22
Raptor
1990



Sea Shadow
1985



AGM-158
JASSM
1999

1980

1990

2000

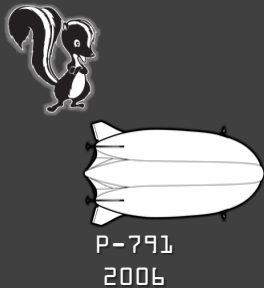


U-2/TR-1
Dragon Lady
1981



RQ-3A
DarkStar
Tier III
1996

✦
Desert Hawk
2001



2000



2010



Today



Science, Technology & Engineering

TRL 6/7
Flight Test



X-55 ACCA



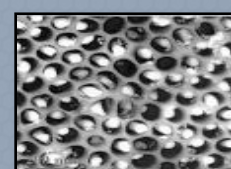
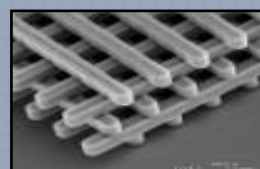
X-56A MAD MUTT



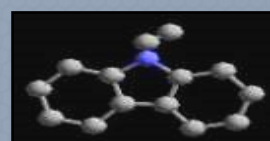
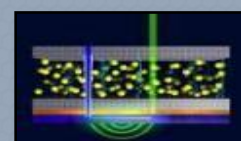
TRL 5
Relevant Env.



TRL 3/4
Components



TRL 0-2
Laboratory

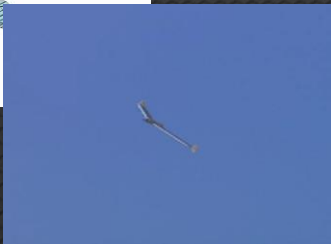
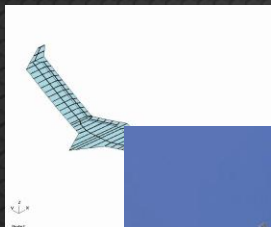


Balanced Investments in Game Changing Technologies

The Process of Moving the TRL Needle

Innovative Concepts

IRAD



System Validation

CRAD



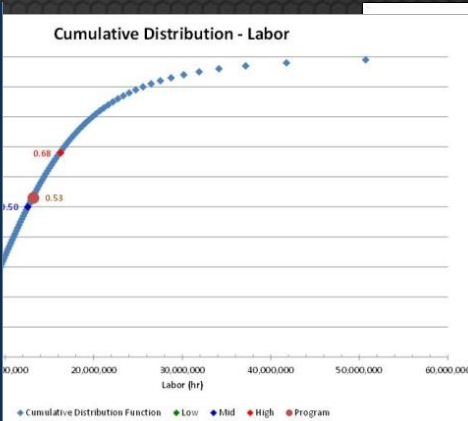
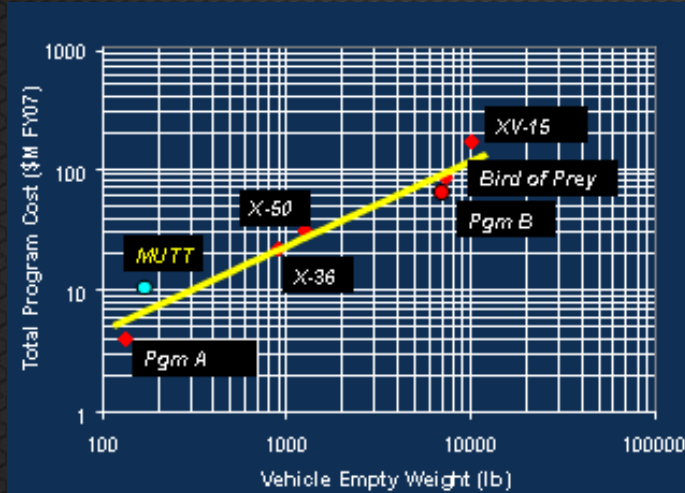
Product Integration

Program



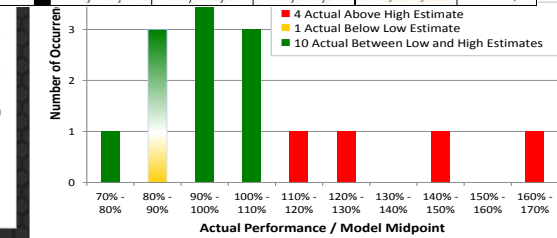
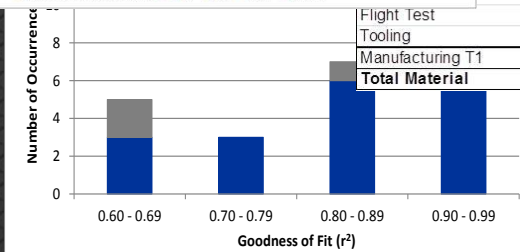
Each Step Increases the Accuracy of Future Cost Estimates

Predicting the cost and schedule of innovation



In-House Development and First Unit Manufacturing Labor					
	Low	Mid	High	Program	UM
on	3,637,000	3,972,000	3,997,000	3,637,000	hr
	275,000	1,077,000	1,227,000	945,000	hr
	330,000	440,000	660,000	440,000	hr
	400,000	500,000	2,000,000	2,000,000	hr
	535,000	1,873,000	2,123,000	1,573,000	hr
	175,000	292,000	510,000	425,000	hr
	23,000	200,000	141,000	25,000	hr
	1,922,000	2,401,000	2,665,000	1,922,000	hr
Mgmt.	612,000	959,000	1,537,000	858,000	hr
	524,000	736,000	1,026,000	1,026,000	hr
	121,000	170,000	237,000	237,000	hr
Mgmt.	75,000	109,000	160,000	103,000	hr
	8,629,000	12,556,000	16,283,000	13,191,000	hr

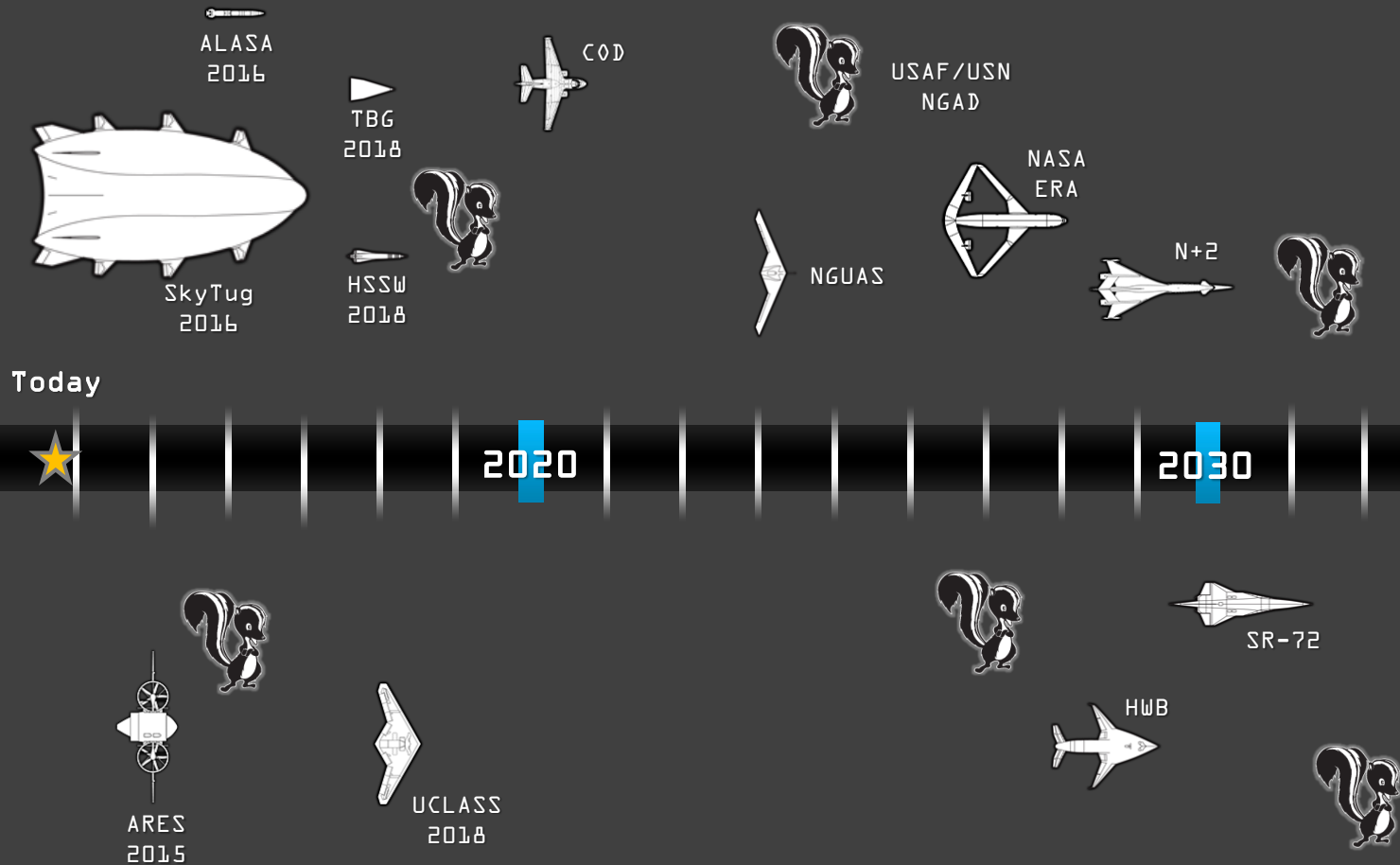
Development and First Unit Manufacturing Material Cost (Escalated)					
	Low	Mid	High	Program	UM-Base
on	18,830,000	67,591,000	242,615,000	47,491,000	2014\$
	1,942,000	6,800,000	7,708,000	6,800,000	2014\$
	2,432,000	3,761,000	5,817,000	3,818,000	2014\$
	11,623,000	18,860,000	30,601,000	20,255,000	2014\$
	18,320,000	28,050,000	42,948,000	35,717,000	2014\$
	53,147,000	125,062,000	329,689,000	114,081,000	2014\$



1.2	System Engineering	0	0	0	2014\$	0.426	
1.3	Program Management	0	0	0	2014\$	0.426	
1.4	System Test and Evaluation	0	0	0	2014\$	0.426	
1.5	Training	0	0	0	2014\$	0.426	
1.6	Data	0	0	0	2014\$	0.426	
1.7	Peculiar Support Equipment	26,125,000	40,000,000	61,245,000	40,000,000	2014\$	0.426
1.8	Common Support Equipment	0	0	0	0	2014\$	0.426
1.9	Operational/Site Activation	0	0	0	0	2014\$	0.426
1.10	Industrial Facilities	52,249,000	80,000,000	122,490,000	80,000,000	2014\$	0.426
1.11	Initial Spares and Repair Parts	0	0	0	0	2014\$	0.426
	Total Supplier Development	1,188,673,000	1,820,000,000	2,786,640,000	1,820,000,000	2014\$	

Minimum $r^2 = 0.64$ Median $r^2 = 0.89$
Maximum $r^2 = 0.99$

“All models are wrong, but some are useful” (George Box)



Parting Words

- Keep gathering data
- Keep looking at the data in new ways
- Keep asking the hard questions
- And keep making useful models!

Thank You!

