Le projet Bloodhound SSC un défi pour ingénieurs !

« Chez nous, la théorie est d'emblée une hypothèse de travail : le savant antique contemple le monde, le savant arabe cherche la formule magique qui va lui permettre de conquérir des trésors, mais le savant occidental devient un ingénieur.

En Orient, on invente la poudre, et on en fait des feux d'artifice. En Occident, on en fait des canons. Il en va de même avec la boussole : on découvre l'Amérique. C'est l'Occident qui a su passer de la connaissance à la technique »

« De la cohésion à l'arrogance, les forces et faiblesses du monde de l'Ouest »
Régis Debray LE MONDE | 17 juillet 2014 Propos recueillis par Nicolas Truong

BLOODHOUND SSC

Saint Hubert
(limier)

Super Sonic Car

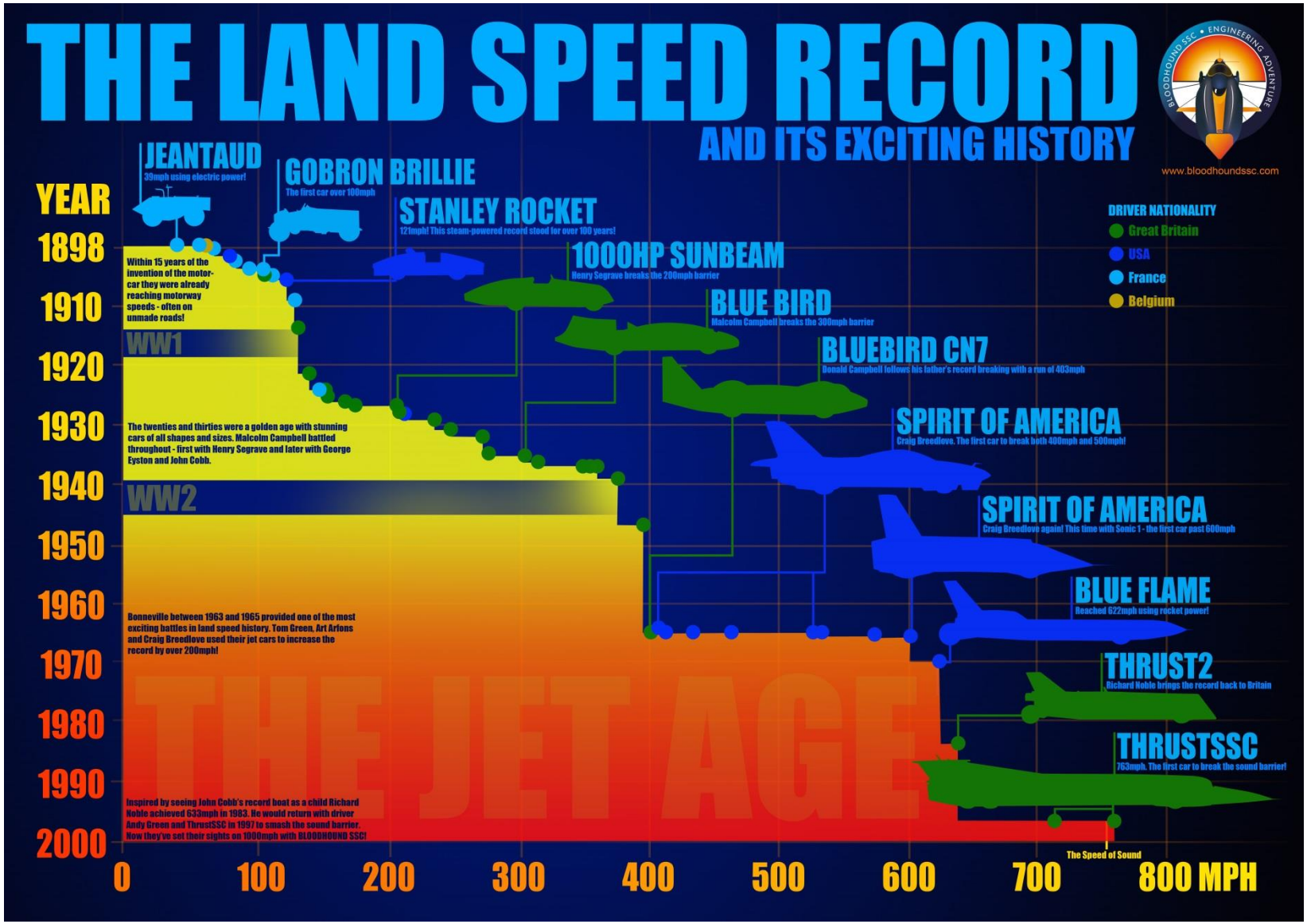
Présentation ☞

Budget 7,5 M€

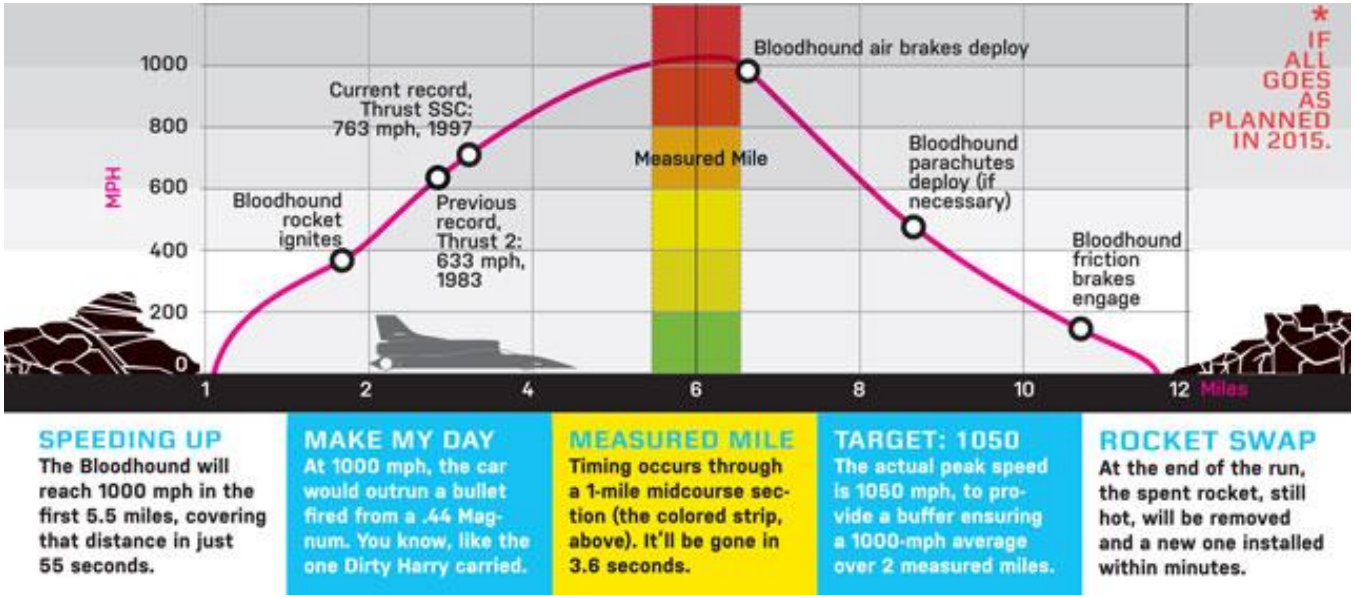
Bloodhound SSC est un véhicule terrestre conçu dans l'objectif de **battre en 2015 le record absolu de vitesse terrestre** détenu par un autre engin similaire, Thrust SSC, qui avait franchi le mur du son en 1997.

Vitesse visée : 1 000 mph,
soit plus de 1 600 km/h ou encore 447 mètres par seconde.

BLOODHOUND SSC

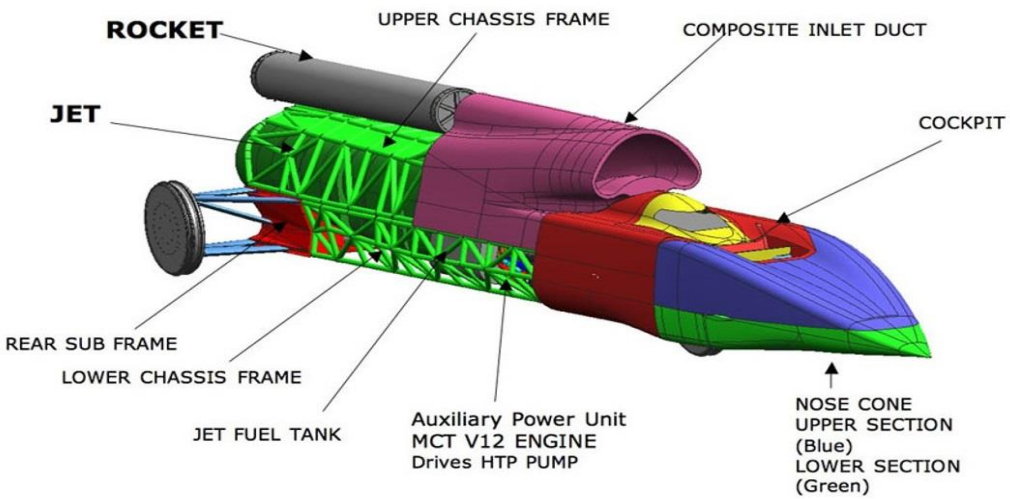


BLOODHOUND SSC Record



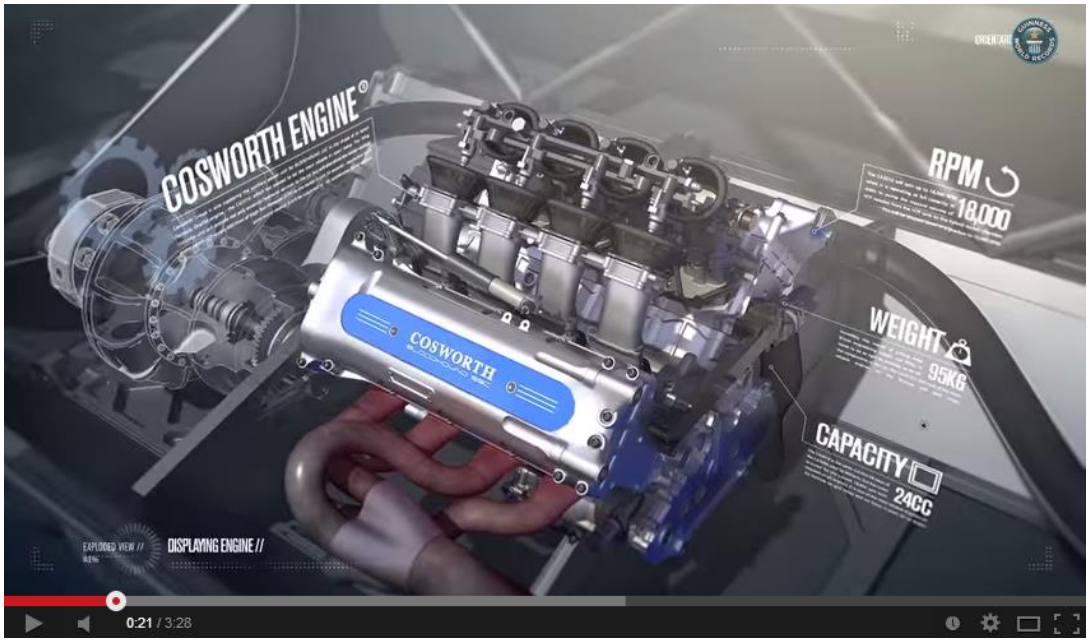
Pour homologuer le record de vitesse,
la FIA pose plusieurs conditions dont le chronométrage du temps pour parcourir un mile (ou un km) aller puis retour (le retour devant s'effectuer dans un laps de temps d'un heure).

BLOODHOUND SSC Structure



TECHNICAL DATA

Length	13.47m
Height	3.57m
Mass	7786kg
Wheel Weight	90kg
Wheel Diameter	91cm
Wheel Speed	10,304rpm
Jet Engine Thrust	90kN
Rocket Thrust	122kN
Design Speed	1050mph
0-1000mph	55secs
Measured Mile	3.6secs



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BLOODHOUND SSC

WHAT FORCES AND STRESSES WILL THE CAR (AND ANDY) HAVE TO ENDURE?

www.bloodhoundssc.com

TEMPERATURE 150 °C

The combined heat of the desert sun, Cosworth engine, EJ200 Jet and rocket will make the interior extremely hot!

PARACHUTES 9 TONNES

As a backup to the airbrakes the chutes can be used to provide an extra 9 tonnes of drag. That's more than a double-decker bus!

G-FORCE +2 G to - 3 G

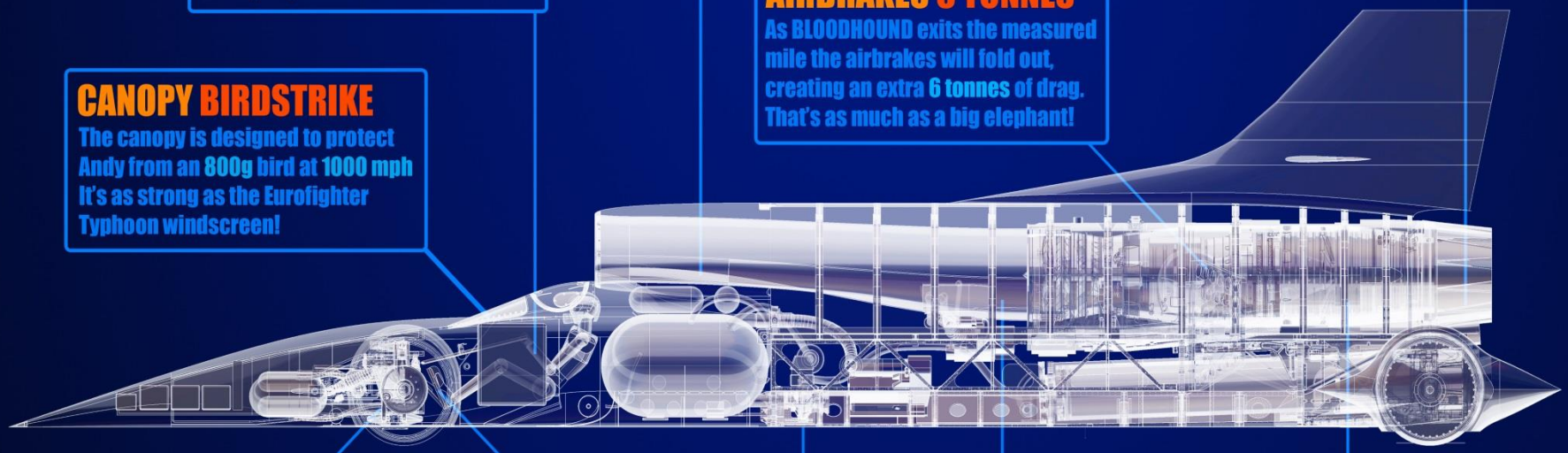
As driver Andy Green says, "Slowing at 66 mph per second is a crash in most people's books!"

AIRBRAKES 6 TONNES

As BLOODHOUND exits the measured mile the airbrakes will fold out, creating an extra 6 tonnes of drag. That's as much as a big elephant!

CANOPY BIRDSTRIKE

The canopy is designed to protect Andy from an 800g bird at 1000 mph It's as strong as the Eurofighter Typhoon windscreen!



SUSPENSION 30 TONNES

As the 7.5 tonne car hurtles across the pan the suspension will be subjected to huge loads - perhaps supporting the weight of a humpback whale!

WHEELS 50,000 G

The solid, 95 kg aluminium wheels will spin at 10,200 rpm - 4x faster than those on a Formula One car!

FLOOR 'SANDBLASTED'

For 12 miles every run, desert dust will be thrown up at the car - sometimes at 1000 mph!
The floor is made of steel - other materials would be eaten away!

BODYWORK 12 T/m^2

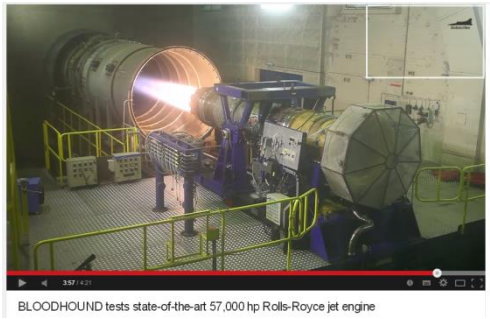
As the car accelerates the air will exert huge pressure on the structure.

THRUST 21 TONNES

At full power the jet will be providing 90 kN and the rocket 120 kN More than eight times the power of an entire Formula One grid!

BLOODHOUND SSC Développement

Comme pour tout système, pendant le développement du Bloodhound SSC les ingénieurs vont confronter trois points de vue :

Domaine du commanditaire	Domaine de la simulation	Domaine du laboratoire
		
Cahier des Charges Fonctionnel	**Modèle numérique**	**Système réel**

Domaine du commanditaire : CdCF

Le Cahier des Charges Fonctionnel définit les performances attendues par le commanditaire à l'origine de la conception du système.
Les ingénieurs ont pour mission d'élaborer la solution technico-économique qui répondra au mieux aux contraintes de ce cahier des charges.

THE BLOODHOUND PROJECT

VEHICLE PERFORMANCE

You are here: Project › Facts and Figures › Vehicle Technical Specification › Vehicle Performance

- Ten Astounding Facts about Bloodhound SSC
- Vehicle Technical Specification
  - Exterior Dimensions
  - Interior Dimensions
  - Geometric Datums
  - Package Capacities
  - Vehicle Operating Environment
  - Vehicle Mass Properties
  - Vehicle Centre Of Gravity
  - Vehicle Safety
  - Vehicle Performance
  - Auxiliary Power Unit and HTP Delivery System
  - Vehicle Stability Targets
  - Wheels

Bloodhound SSC Vehicle Technical Specification: configuration 11, June 2012

Acceleration / Velocity

Definition	Unit	Target	Status	Comment
Velocity av. of 2 runs in opposite direction over measured mile.	mph	>1000		To FIA regulations.
Acceleration distance	mile	<5.4		Total track distance 12 mile
Max Velocity (Vmax)	mph	1050		Or as appropriate to achieve the above average speed

- Vehicle Technical Specification
  - Exterior Dimensions
  - Interior Dimensions
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  - Vehicle Operating Environment
  - Vehicle Mass Properties
  - Vehicle Centre Of Gravity
  - Vehicle Safety
  - Vehicle Performance
  - Auxiliary Power Unit and HTP Delivery System
  - Vehicle Stability Targets
  - Wheels
  - Front and Rear Suspension
  - Control System Architecture
  - Propulsion - Jet
  - Propulsion - Rocket
- CAD Drawings

Wheels

Definition	Unit	Target	Status	Comment
Wheel Diameter	mm	900	915	
Wheel Width	mm	150	120	
Number of Keels		2	0	No Keels – V-shape
Keel Height	mm	15	0	No Keels – V-shape
Keel Width	mm	8	0	No Keels – V-shape
Wheel Weight	kg	<100	105	Base Design Aluminium Alloy.
Wheel Rotating Inertia	$kg.m^2$	<5	11.115	
Peak Wheel RPM at 1050 mph	rpm	10304	10304	
Specific surface loading (kg mass / mm wheel width)	kg/mm	<13	15.6	Based on 7500kg, 120 mm wide Contact area will be very small at high speed

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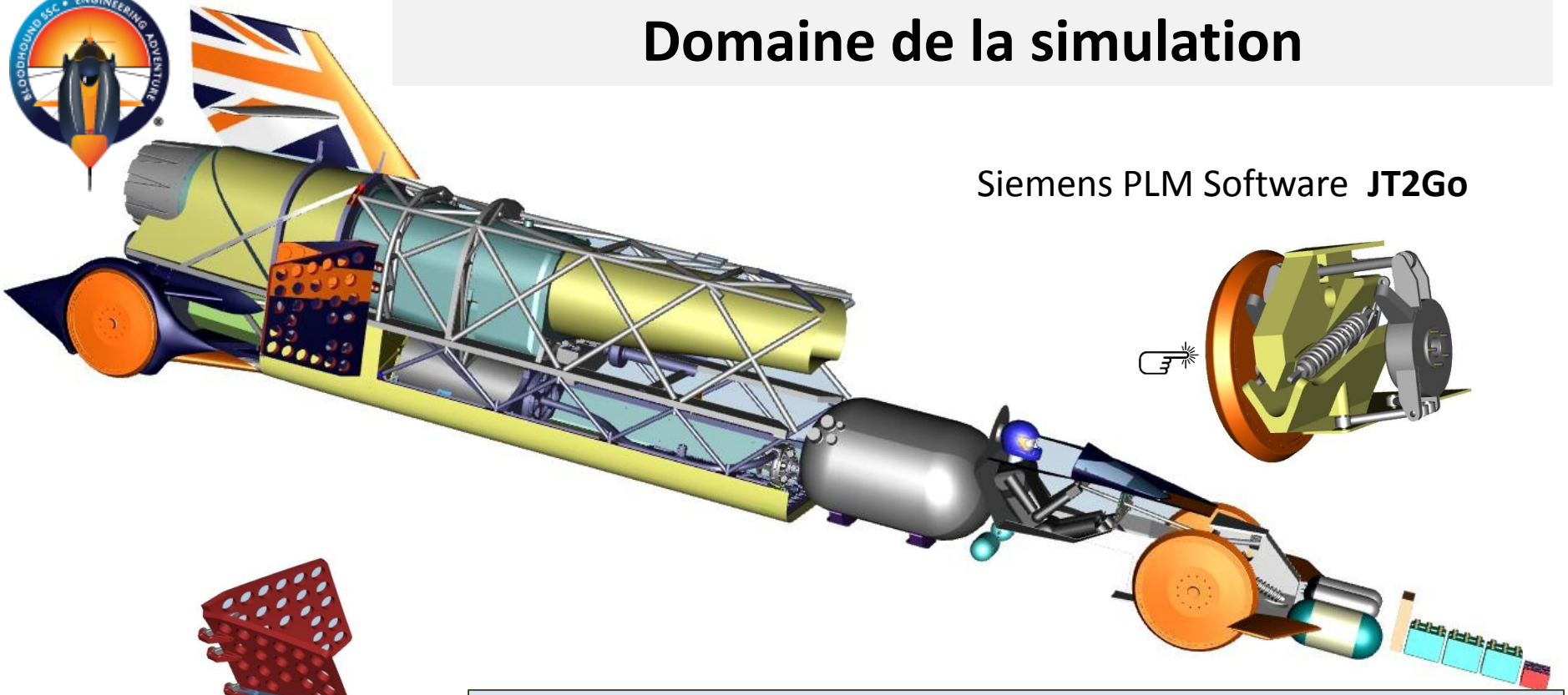
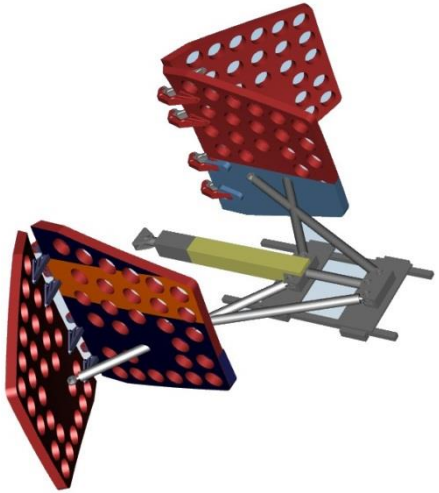
Domaine de la simulation

Siemens PLM Software **JT2Go**





Modèle numérique

Dans la phase de conception du système, les ingénieurs s ’appuient sur des modèles le plus souvent numériques.

Les outils numériques permettent d’évaluer les performances du système afin de quantifier les écarts au cahier des charges pour progresser dans la conception, ou les écarts au système réel pour affiner le modèle.

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Domaine du laboratoire

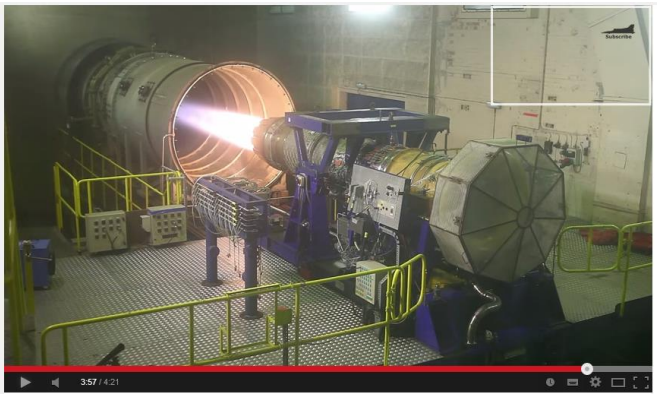
Système réel

Le système réel (ou une partie du système) est expérimenté par les ingénieurs au laboratoire. Ses performances sont mesurées à l'aide d'une instrumentation adaptée afin de quantifier les écarts au cahier des charges ou au modèle.
L'objectif de ces essais est de valider le cahier des charges fonctionnel ou de renseigner et affiner le modèle de simulation dans la phase de conception.

Essai de la fusée
Technologie hybride
Poussée moyenne 111 000 N
Poussée max 122 000 N

Essai des Roues
900 mm
10429 tr/mn
50 000 G

Essai du réacteur EJ200
(prototype Eurofighter)
Poussée max 90 000 N



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Composite Design Engineer

Steve Laughton
Design Engineer

Max Malpass
Engineer

Huw Jones
Engineer

Tony Dineen
EJ200 Engine Manager

John Macleod
Run Controller

Chris Dee
Assembly & Build Lead

Viv Cowley
Assembly and Build

Dave Tuffs
Assembly and build

Mark Owen
Assembly and build

Lee Giles
Assembly and build

Chris Fairhead
Delivery Director

Mark Chapman
Chief Engineer

Ron Ayers
Chief of Aerodynamics

Martyn Davidson
Operations Director

Conor La Grue
Engineering Lead - Commercial, and Product Sponsorship Lead

Brian Coombs
Engineering Lead - Mechanical Design

Mark Elvin
Senior Design Engineer

Joe Holdsworth
System Engineer

Jenna Gaff
Design Engineer

Kelly Moran
Design Engineer

Matt Dyke
Stress Engineer

Jon Hunt
Design Engineer

Matt Pegler
Engineer

Gary May
Design Engineer

Phil Seward
Design Engineer

George Morris
Design Engineer

Jeff Woolmer
Design Engineer

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Head of IT; Mission Control Centre - Project Manager

Chris Hannon
Design Engineer

Major Oli Morgan

WO2 (AQMS) Lee Smith

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Cpl Stuart Richardson

LCpl Kayleigh Williams

LCpl Siobhan Spiers

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Mark Owen
Assembly and build

Lee Giles
Assembly and build

Blackie
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Mark Robinson
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Kim Watts
Sponsor Liaison

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CFD Engineer

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Rocket engine consultant

Andrew Sims
Dstl liaison (technical) rocket consultant

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http://www.bloodhoundssc.com/