



**PRESENTATION BEFORE THE NTSB
INVESTIGATIVE HEARING
JAPAN AIRLINES, JA829J
BOEING 787 BATTERY FIRE**

**PANEL 2: 787 BATTERY DESIGN
& DEVELOPMENT**

APRIL 23, 2013



- Our History - Leading battery manufacturer since 1914
- Our Tradition – Based in Kyoto, Japan, with offices around the world.
- Our Commitment – Environmentally Sound, Highly Efficient, Fundamentally Safe Batteries
- Our Products and Industries – Batteries and power supply systems



GS Yuasa - Products



2

Automotive battery / Motorcycle battery



Automotive battery



Motorcycle battery

Lighting / UV system



Ceramic-metal-halide-lamp



DUV cleaner for FPD glass

Power supply system



DC power supply



AC uninterruptible power supply



Photovoltaic power conditioner

Lithium-ion battery



Lithium-ion battery for EV



Lithium-ion battery for HEV

Industrial battery



Stationary battery



Small valve regulated lead acid battery



Traction battery



Lithium-ion battery for satellite



Lithium-ion battery for industrial application

Lithium Battery Applications



3



Rail



Next to you

Battery for McLaren
GS Yuasa wins through battery power

Formula 1



Aircraft Battery

Boeing 787



Submarine & Rocket



International Space Station

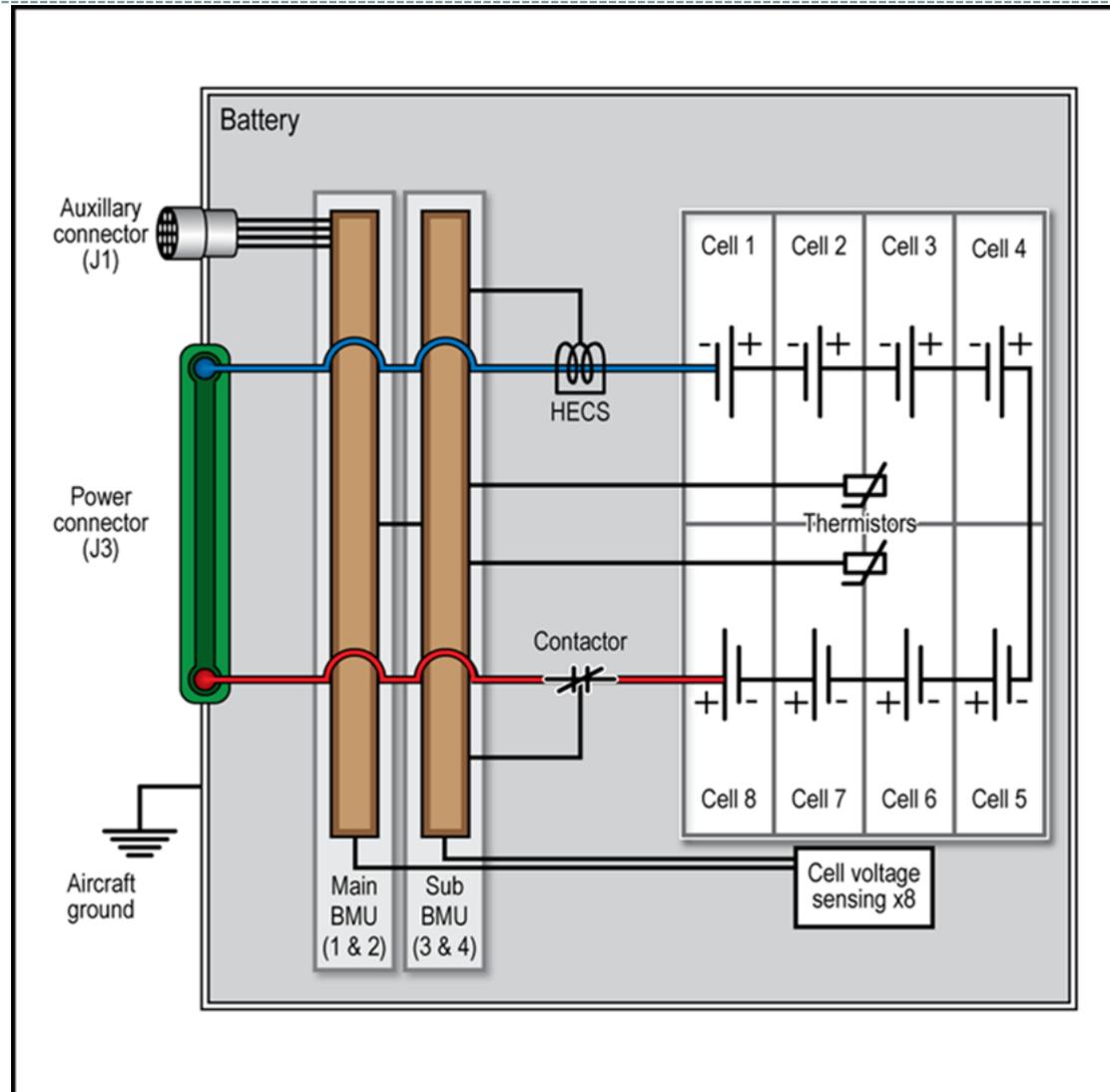
Courtesy of NASA

Battery Layout

8 cells in each battery

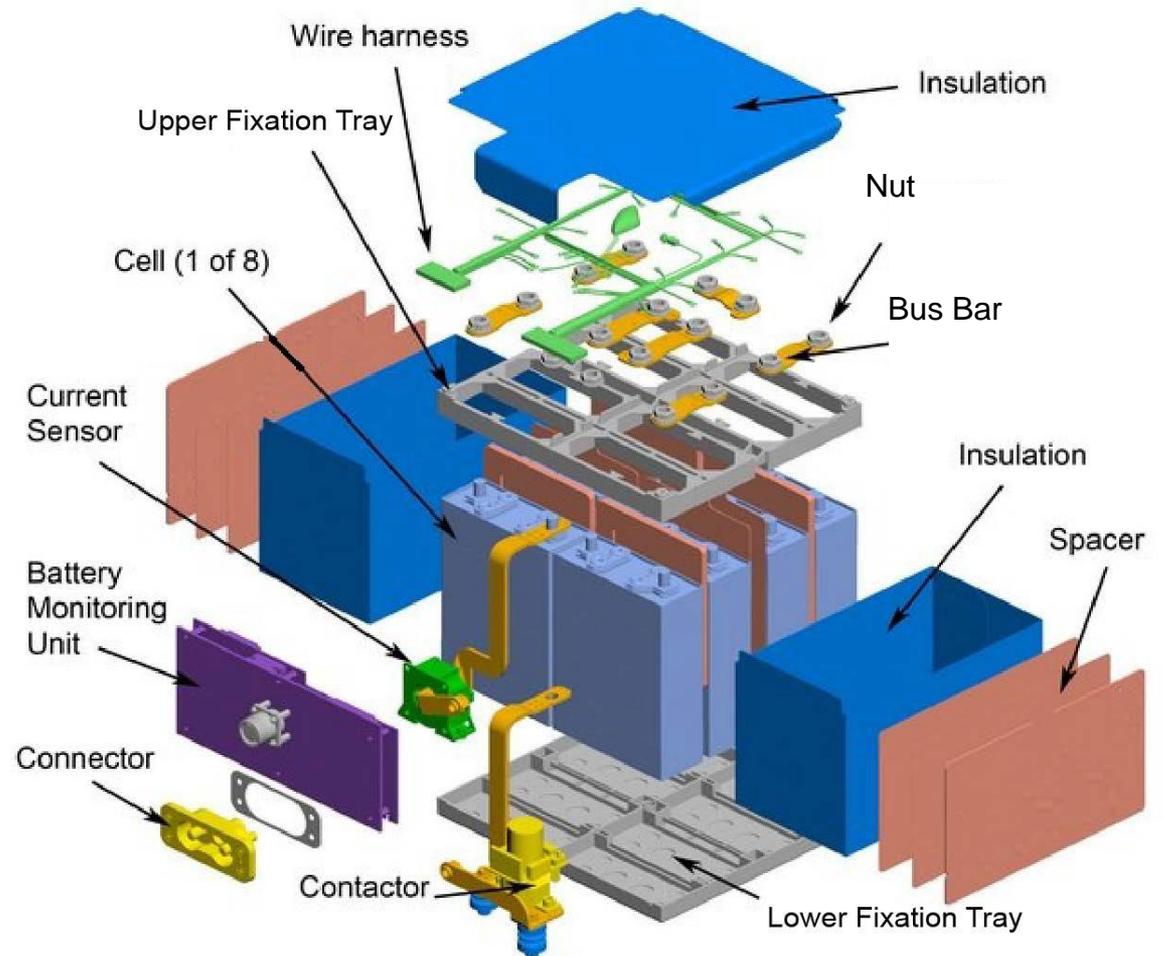
Positive terminal is connected to load and charger.

Negative terminal is connected to the ground of aircraft.



Source: NTSB Interim Report March 7, 2013

787 Battery Components

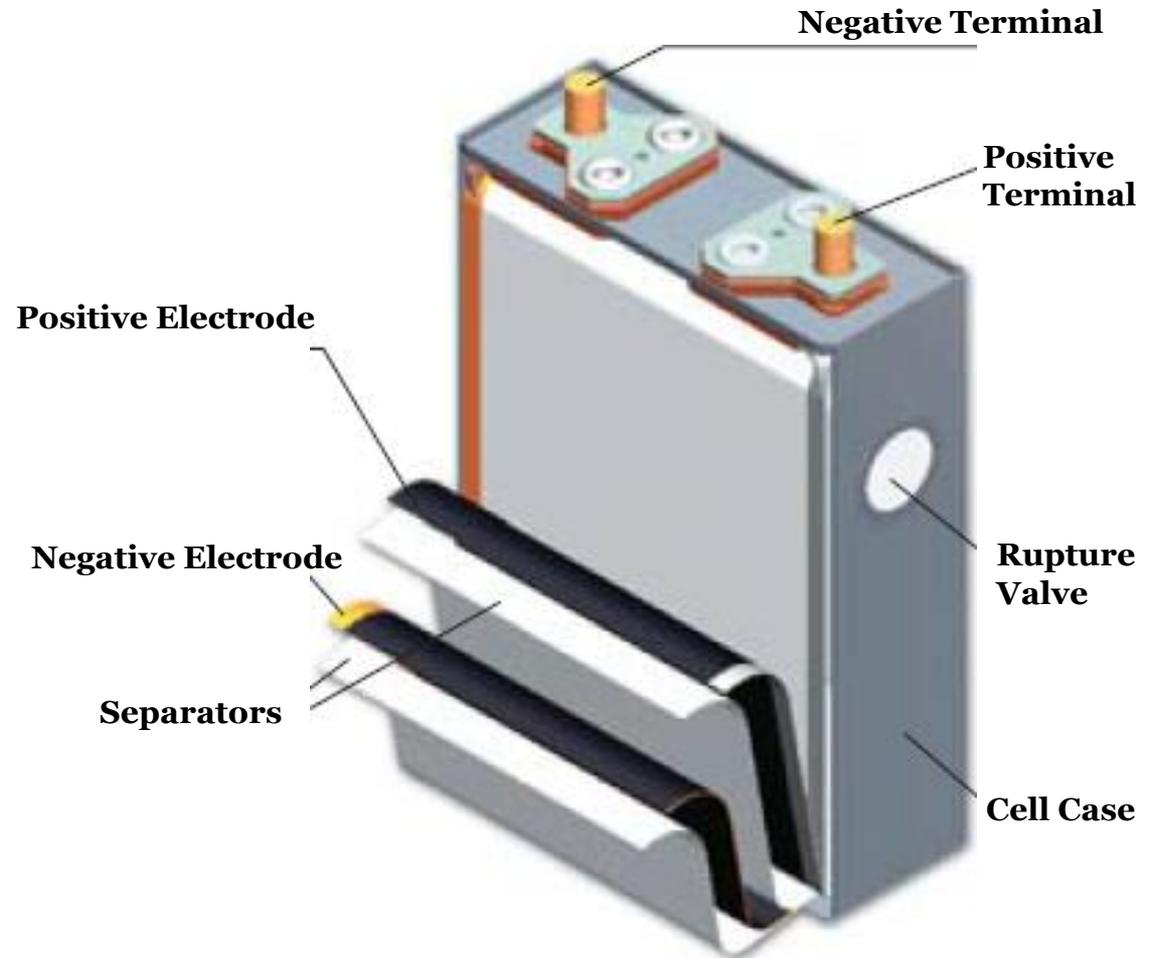


Inside the Cell

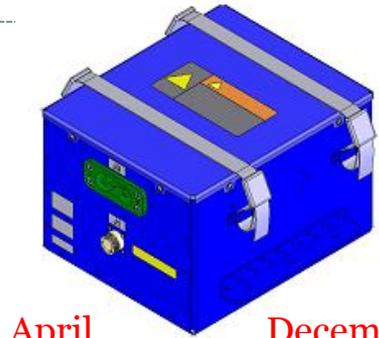
Positive electrode is made from aluminum coated with lithium cobalt oxide based material.

Negative electrode is made from copper coated with carbon based material.

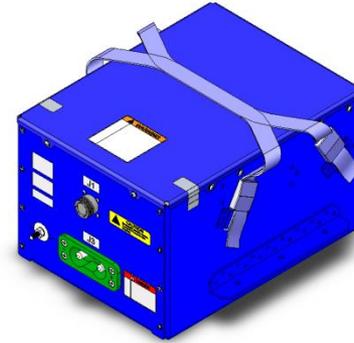
Positive and negative electrodes are electrically insulated by separators.



Battery Development Timeline



Battery 1
Original Spec



Battery 3
+ Improved active material
+ Sealing
+ BMU w/ latch function

April
Development
start

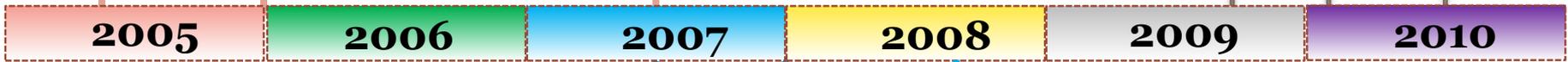
December
CDR

June
Qual test
completion

October
Development
start

January
CDR

June
Qual test
completion



Securaplane
Incident

June
Development
start

December
CDR

October
Qual test
completion

APSIF
Incident

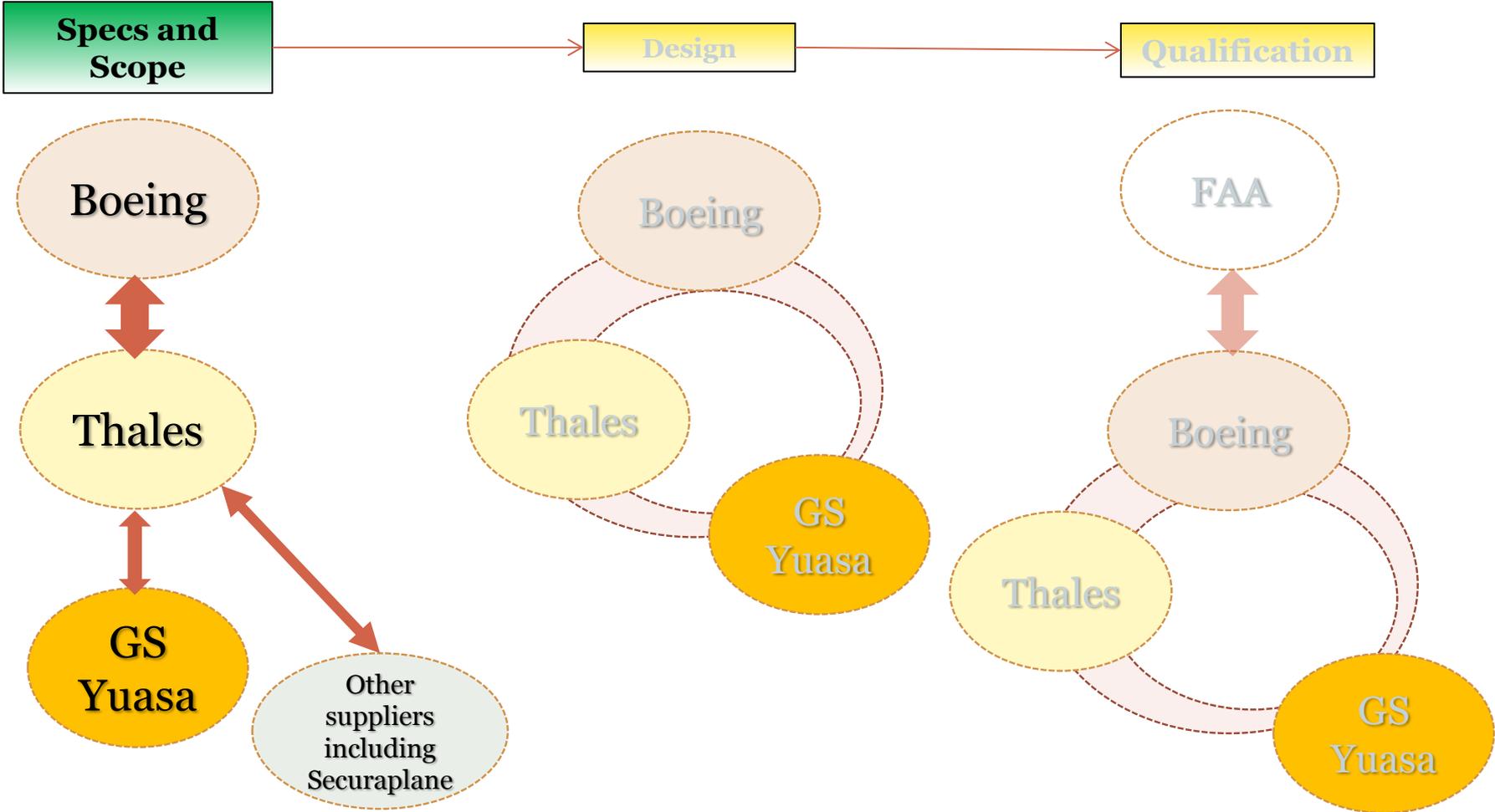


**Battery 2 + Internal
contactor + sub BMU**

Process & Roles: Specs & Scope



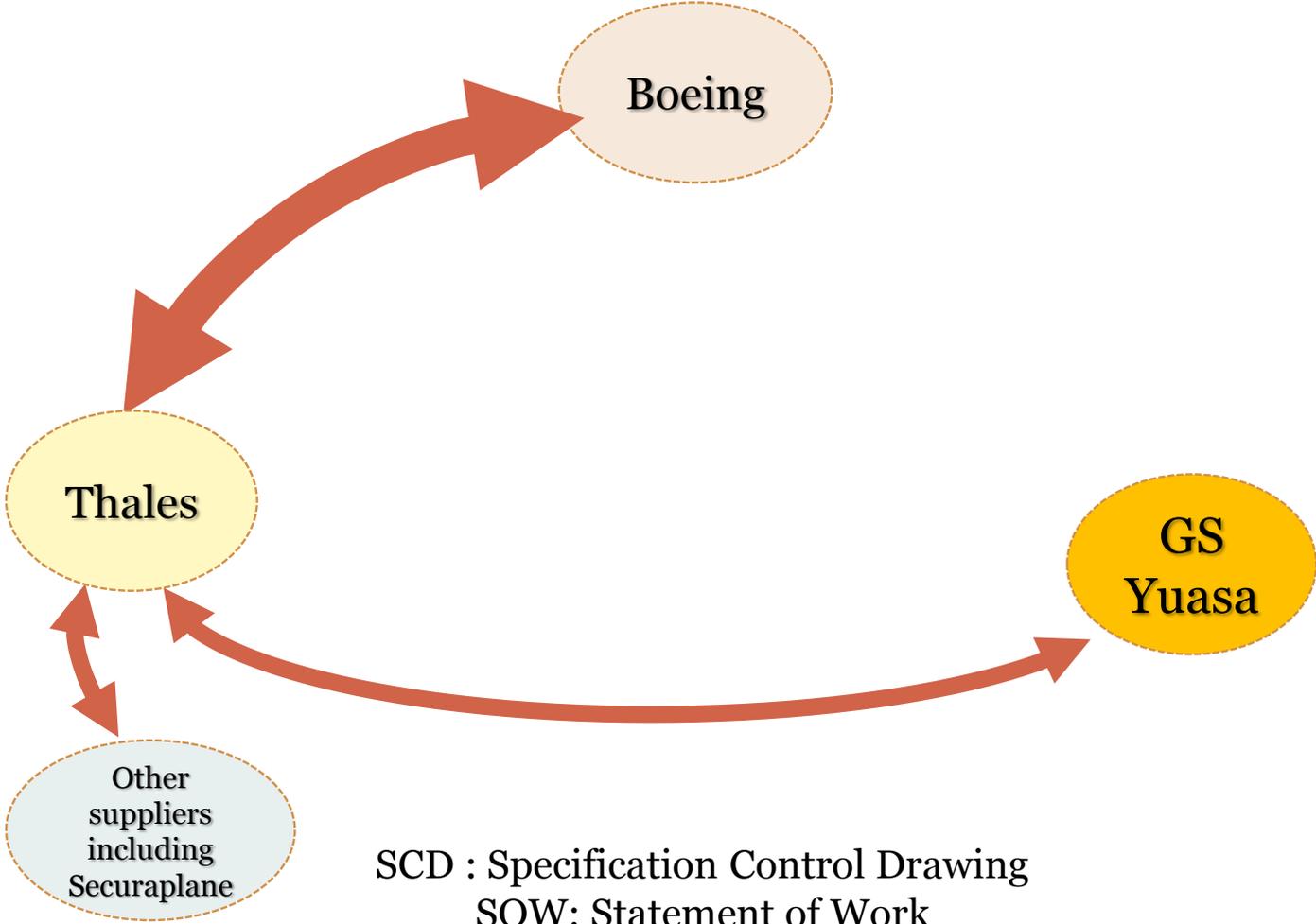
8



Collaboration: Specs & Scope

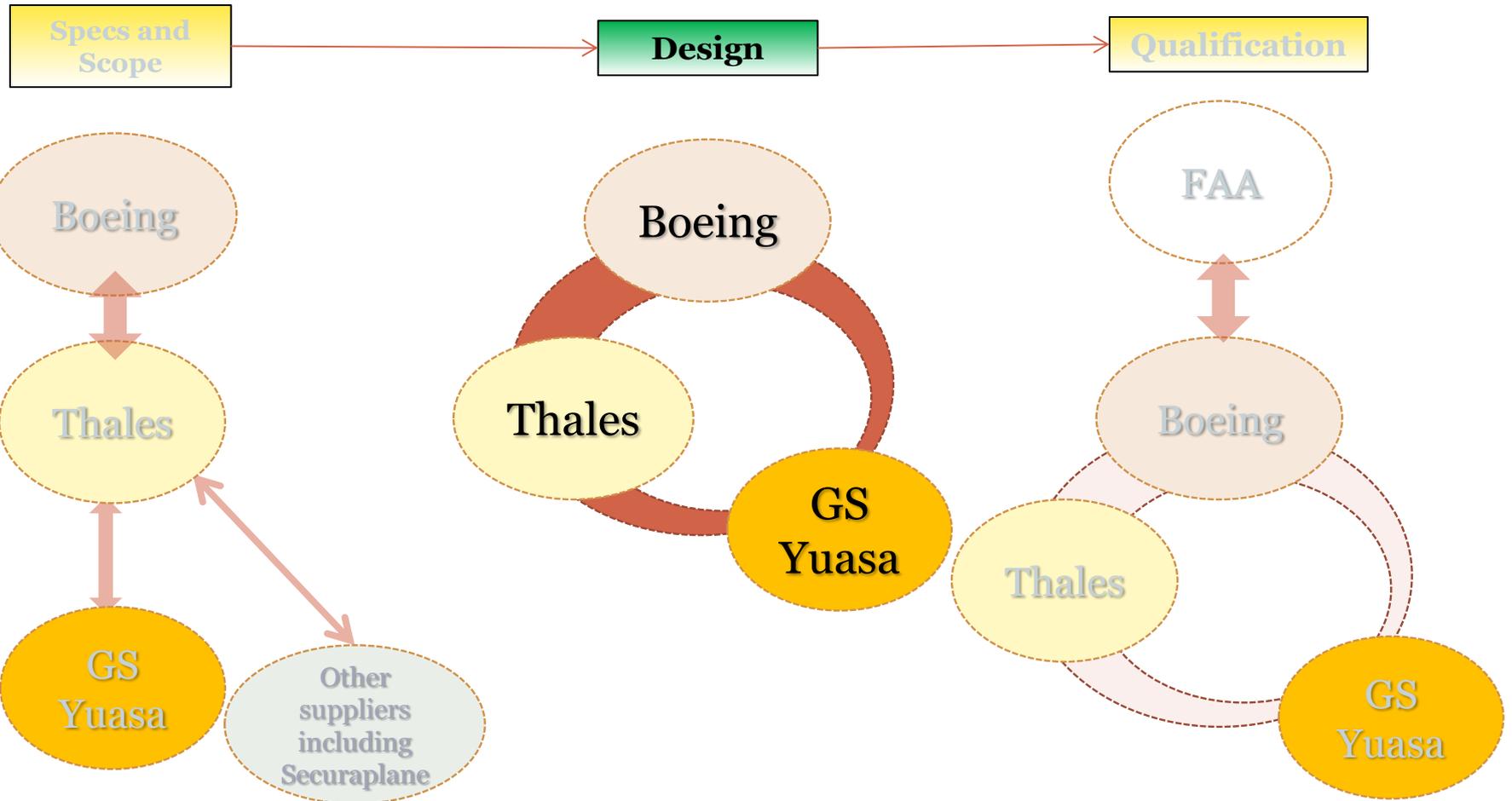


9

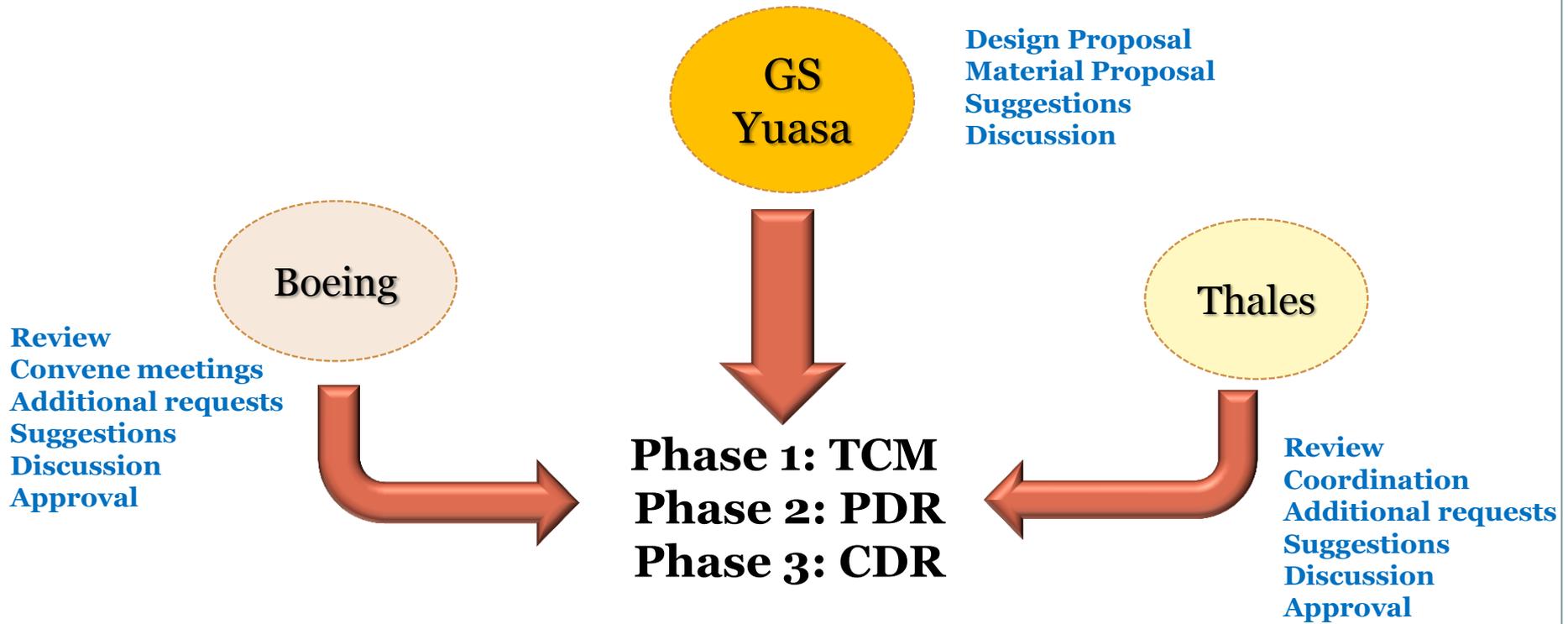


SCD : Specification Control Drawing
SOW: Statement of Work

Process & Roles: Design



Collaboration: Design



Iterative Design Process

Collaboration: Design

12

