TECHNICAL: GENERA L AVIATIO N

Gulfstream/Sukhoi SSBJ 'challenges' identified

BY GRAHAM WARWICK

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ulfstream Aerospace and
Sukhoi have agreed a twin-
engined configuration for their
planned supersonic business jet
(SSBJ). A model of the twin-
engined SSBJ will be displayed
in the Soviet pavilion at the
Paris air show in June.
When Gulfstream and Sukhoi
announced their teaming ar-
rangement in September 1989,
they planned a first flight of a
prototype three-engined SSBJ as
early as 1993. Now they believe
a twin-engined aircraft could fly
early next century, provided
certain technical challenges are
overcome.

"The issue is technical readi-
ness," says Gulfstream senior
vice-president engineering and
technology Charles Coppi, add-
ing: "We could put an SSBJ into
the air today and it would be
just a little bit better than Con-
corde." By waiting until aerody-

namic, propulsion and materials
technology has advanced suffi-
ciently, the team believes it can
meet the demanding specifica-
tion which has emerged from
Gulfstream's market studies.
The SSBJ is envisaged as an
$40 million-50 million, eight- to
18-passenger aircraft with Mach
2 cruise speed, 7,400km
(4,000nm) range and 6,500ft
(2,000m) take-off distance at a
45,400kg gross weight. These
requirements cannot be met
using existing technology,
Gulfstream admits. "An SSBJ
based on today's technology ap-
pears to be too big and too
costly to be commercially via-
ble," it says.
A three-engined aircraft
weighing over 68,000kg was
Sukhoi's first solution, designed
using Concorde-level technol-
ogy, says Coppi. (Sukhoi is
responsible for configuration
definition and Gulfstream for
design requirements under the

MSE Limited edition tempts pilots upmarket

Mooney introduces exclusive MSE Mooney Aircraft has intro-

duced a limited-edition
MSE light aircraft aimed at en-
couraging more owner/pilots to
move up to high-performance
singles. At $144,900, the IFR-
equippe d MSE Limited is
claimed by Mooney to undercut
its main rivals.
The 149kW (200hp) aircraft
has the 73kg increase in useful
load, to 533kg, introduced on
all MSEs built since April, says
Mooney. The dual-control MSE
Limited comes equipped with a

Bendix/King 1FR avionics suite,
including DME.
Mooney, which recently ter-
minated its partnership with
Aerospatiale subsidiary Socata
on the TBM700 turboprop sin-
gle, currently produces the
168kt-cruise (310km/h) MSE,
220kt-cruise turbocharged TLS
and IFR-equipped ATS ad-
vanced trainer.
It has also proposed the aero-
batic Mooney EFS for the US
Air Force's Enhanced Flight
Screening trainer programme, n

Potential Gulfstream/Sukhoi
twin configuration

terms of their agreement.)
The latest Soviet twin-en-
gined design weighs in at
48,000kg and, by the year 2000,
take-off weight will be down to
around 44,000kg. To reach that
goal, the SSBJ team hopes to
capitalise on technical and po-
litical advances necessary if a
next-generation supersonic air-
liner is to fly early next century.
Where Boeing has forecast
lift:drag ratios of about 8.8 for
its High Speed Civil Transport
(HSCT), Gulfstream/Sukhoi
studies suggest the smaller SSBJ
will achieve only around 7.3
because of its much lower fuse-
lage finesse (length:diameter)
ratio. With a 1% reduction in
supersonic drag yielding a 2%
lower take-off weight,
Gulfstream is pinning its hopes
on NASA work on supersonic
laminar flow as a means of
reducing cruise drag.
Improved engine technology
is anothe r key area, says
Gulfstream. Each 1% reduction
in specific fuel consumption
will yield a 2% lower take-off
weight. Airport noise is a criti-
cal issue as the SSBJ must be
able to use secondary and re-
liever airports close to cities.
Variable-cycle engines are pres-
ently too large and complex and
current ejector-mixer nozzles
cannot reduce jet noise suffi-
ciently. Both approaches add
weight and require further de-
velopment, Gulfstream says.
The need for new lightweight
materials, in engines, airframe
and even furnishings, is even
more critical in the SSBJ than in
the muc h larger HSCT.

Gulfstream/Sukhoi studies sug-
gest every kilogramme saved
results in a 6kg reduction in
take-off weight.
Safety considerations include
crew visibility. A traditional
windshield entails a significant
penalty in supersonic-cruise
drag, says Gulfstream. The US/
Soviet team has rejected a
sharply raked windshield and
Concorde-type hinged nose —
the former because of internal
reflections, the latter because of
weight — and is pursuing both
synthetic vision, combining
television and infra-red sensors,
and an indirect optical viewing
(periscope) system.
Another safety concern is
protecting digital avionics from
high-intensity electromagnetic
fields, such as those around
high-power radio transmitters.
Traditional metal shielding
places an unacceptable weight
burde n on the SSBJ, says
Gulfstream. Fibre-optics meet
the requirement but need fur-
ther development. Present con-
nector technology prevents the
design of an avionics architec-
ture with line-replaceable units
for ease of maintenance.
The team's major concern is
reducing sonic boom; the SSBJ
must be able operate supersoni-
cally over land otherwise the
market for such an aircraft is
unlikel y to exist, says
Gulfstream. Here, the team
hopes to benefit from the multi-
national HSCT effort to define
an acceptable sonic-boom signa-
ture and to have restrictions on
civilian overland supersonic
flight removed. •

FLIGHT INTERNATIONAL 15 - 21 May, 1991 17