

The Implications of Russia's New Weapon Systems

Description

FB says:

I would note that there is a lot of shock and anger in the US media...not only the aspect of 'Russian Aggression'...but also the idea that the Russians have made a major **technology leapfrog** over the US...

This is because for decades the US media and govt have loudly touted US and Western technology as far superior to that of the Soviet Union and Russia...

As with any propaganda theme of the West...this canard was eagerly accepted by all...the media...the public...the so-called 'experts' etc...

In a culture and at a historical time where 'technology' is fascinating to people...[despite the fact that they do not understand even the **basic** physical and technical side of it]... it is seen as a source of national power...

We have arrived at this point in time where it's all about the technology...and the corollary...

'...Our technology is the best in the world...especially our military technology...'

Of course...those who are technically literate and do in fact understand from a professional perspective the aerospace technology in particular...and will have likely been exposed to Russian and Soviet technical circles [such is the nature of science...it is and has always been an interactive, multinational field...]

...So for those people the Putin announcement of March 1, really does not come as a big surprise at all...many would who are familiar with the **vast scientific and technical potential** of this nation...are not shocked to see some very significant technical breakthroughs...

Still, speaking as one such individual, who has long taken the view that the Russians have the people and institutional tradition to pull off some amazing technological advances in aerospace, in particular...the magnitude of the leap described in the Putin address is still difficult to process...

If these technologies are as **mature** as Putin has implied...then this is **massive news** in the aerospace domain...

I will only highlight **one** of the new weapons systems here...the Kinzhal air-launched, hypersonic anti-ship missile...

What we know so far...it is an air-launched, maneuvering missile with an unprecedented range of 2,000 km [1,080 nautical miles]...and an unprecedented speed of Mach 10...[7,600 mph at sea level]...

If true...this is an astounding leap in cruise missile technology...ie if we consider here that 'cruise' means a **maneuverable** missile as opposed to one that flies on a simple ballistic trajectory like any piece of artillery...

Let us compare to what is out there now...the [Kh22 anti-ship missile](#) was put into service in 1962...56 years ago...

Like the Kinzhal it is air-launched...carried by the [Tupolev Tu22M supersonic long-range bomber](#)...

The missile weighs 5,800 kg and has a range of 600 km [324 nm]...with a maximum speed of M4.6 [3,500 mph]...

This was the original Soviet carrier-killer...there is nothing remotely similar in the West...the updated version that entered service in 2016... [the Kh32](#) boasts an increased range of 1,000 km [540 nm]...and a slight increase in speed to M5...

So clearly the groundwork for a 'super-sized' version of this kind of anti-ship missile has been in place for a long time...

Both the Kh models are powered by liquid fuel rocket engines and employ a flight trajectory where the missile first climbs to a high altitude...27 km [90,000 ft] for the KH22...and 40 km [130,000 ft] for the Kh32...

...then either dives at the target to achieve its maximum M4.6 speed [M5 for Kh32]...**maneuvering** all the way to the target to make it harder to knock out with air defenses...

...or, alternately, making a shallow dive at M3.5 and then approaches the target flying close to the water surface at a height of 500 ft...

Below is a picture of the KH22 carried by a Tu22M3



We see one Kh under the starboard wing and another in a conformal [ie half-buried] position under the fuselage...the port wing would carry a third Kh...

The below graphic shows the two flight profiles of the Kh...

And here we see a 'friendly' cockpit tour of the Tu22M by USN Admiral Charles R. Larson...Commander-in-Chief of the Pacific Fleet...during the Cold War...



So we see that the new Kinzhal missile claims **twice the range and twice the speed of the existing Kh32...**

We know nothing about the propulsion system of this missile nor its flight characteristics...ie how high does it go...and how does it make its final approach to the target...?

More on that in a bit...but first let's look at the overall picture...

The primary target for this missile would **not** be USN aircraft carriers but Aegis missile cruisers and destroyers carrying the SM3 ballistic missile defense interceptors [BMD]...as Andrei has pointed out...

This is the **real** concern for Russia...the US already has over [64 Arleigh-Burke class destroyers](#) in service plus [22 Ticonderoga class cruisers](#)...for a total of 86 large [Aegis-equipped](#) warships in service...

According to the US [Missile Defense Agency](#)...five of those cruisers and 28 destroyers are BMD capable...for a total of 33 ships as of 2017...the plan is to bring that number to over 70...

There is also the Aegis Ashore installation in Romania [operational] and Poland which will soon be operational...

Clearly that is a very large missile defense infrastructure that could pose an **existential threat** to Russia...

The other side of this equation is the US' longstanding drive for **nuclear first-strike capability** against Russia...

The scenario would unfold like this...the USN Ohio-class ballistic missile submarines would launch a surprise strike against Russian silo-based ICBMs...strategic bomber bases...and any Russian ballistic missile subs in port...with the [Trident 2 sub-launched ICBM](#)...

The retaliatory strike by Russia would be **neutralized** by the US missile defense...relying largely on the Aegis SM3 interceptor...which can be located on ships close to Russia's coast...[as well as the Aegis Ashore installations in Eastern Europe]...

This kind of first-strike has been openly discussed in US policy circles for more than a decade...

‘...According to our model, such a simplified surprise attack would have a good chance of destroying every Russian bomber base, submarine, and ICBM...’

[—Foreign Affairs, Volume 85, number 2...](#)

That from 2006...[and this from 2013...](#)

‘...On March 1, the Strategic Studies Quarterly, a journal published by the U.S. Air Force's Air University, published an article admitting what...the Russians, have long been warning against: that U.S. strategic policy under the Obama Administration is seeking to create the capability to launch a **first strike** against Russia and/or China, **without fear of nuclear retaliation**..’

Clearly Putin's announcement of these new weapons is to bring a **reality check** to such unhinged individuals...who may in fact represent the consensus in Washington to this day...

The threat as outlined in the above scenario is very real...the Trident 2 can cover 1,850 km [1,000 nm] in just 12.5 minutes...

That's with what is called a minimum energy trajectory or MET...which is the trajectory angle for maximum range for a given amount of rocket energy...

The US has been exploring depressed trajectory [DT] ICBM flights which would reduce the 1,850 km flight time to just **7.2 minutes**...

The Trident 2 ICBM has a much greater maximum range [up to 10,000 km] but the obvious advantage is to get as close as possible before launching...it is estimated that a US sub several hundred km offshore in international waters could hit the most inland Russian missile silos and bomber bases with a maximum range of about **3,000 km**...

A 3,000 km DT launch would have a [flight time of only 10 minutes](#)...

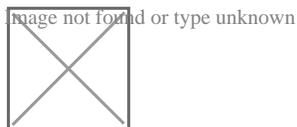
It is not clear whether the US has **achieved** the depressed trajectory capability, as this type of flight path results in increased heat loading [due to atmospheric friction]...and also reduced accuracy...due to unpredictable atmospheric effects like air density and winds aloft...

It is also unclear **just how well** the SM3 interceptor actually works...prominent critics like MIT's Prof. Ted Postol, a weapons expert and former science adviser to the pentagon...have pointed out that the SM3 flight test 'success' has been overstated and doubts that the system is actually capable of bringing down an enemy missile in an actual combat scenario...

We also note that out of the 33 Aegis BMD equipped warships...17 are in the Pacific Fleet [plus five more such Japanese navy ships...yet the US has not attempted to shoot down a North Korean missile...many of which have overflown Japan...

However...whatever the failings of the current system may or may not be...the rational assumption is that **sooner or later this capability will in fact be functional**...the same assumption can be made for the depressed trajectory launch of Trident 2 submarine ICBMs...

Here is how the Aegis SM3 is supposed to work...



This shows that the SM3 is designed to intercept a ballistic missile two distinct phases of flight...the **ascent** portion of the target flight...starting right after rocket burnout and as the target is ascending in space on its ballistic trajectory...

And secondly...the **descent** portion of the flight...where the target missile has passed its midpoint apogee and is descending toward the target...

Now here is the important part that somehow got lost in the original post...

We see here that intercepting the target ballistic missile in the **ascent** phase requires the placement of the Aegis SM3 interceptors close to where the target missile is launched...

In the case of Russia...that would mean getting those Aegis ships near to Russia's coast or the Aegis Ashore installations in Eastern Europe...

If the **intent** was to intercept those target missiles on the **descent** part of the flight...the Aegis ships would be placed near the US...and Aegis Ashore would be placed right in the US...not Eastern Europe...

So by understanding how **midcourse** missile defense works we see also the intent of those ballistic missile interceptors...**they are aimed squarely at Russia...**

The other part that got lost in my original post was my introductory remarks about the [Iskander ground-launched missile...](#) which is suggested by Andrei as the possible building block for the Kinzhal...

To briefly recap about what is known about the Iskander...it weighs 3,800 kg...two tons less than the Kh22 and has about the same range...500 km...

This range limitation as noted already is likely artificial in order to meet the Intermediate Nuclear Forces Treaty [INF] which limits intermediate range missiles to 500 km maximum range...

Which means adding a longer fuel section...it is a solid-fuel rocket so can be modular...can increase the range...

The missile carries a warhead of up to 800 kg...so it is definitely able to sink a large warship with a direct hit...the Kh22 used a 1,000 kg warhead...which is said to have made a quite massive hole...

‘...Soviet Tests showed that a Kh-22MA equipped with 1,000 kg (2,205 lb) RDX warhead and with an approach speed of 800 m/s (Mach 2.4), used against an aircraft carrier, will make a 22 m² (240 sq ft) hole, and the warhead's cumulative jet will burn through internal ship compartments up to a depth of 12 m...’

That's with an approach speed of just M2.4...with a higher approach speed the kinetic energy itself would be greater...kinetic energy increases by the square of speed...so just doubling impact speed to ~M5 would quadruple the kinetic energy...**M10 would mean 16 times the kinetic energy on impact...** [in comparison to the Kh22 impacting at M2.4...

Although it should be noted here that the likely impact speed would certainly be less than M10...perhaps half that I would estimate...due to drag in the thick air down low...we see the same with the Kh22...[the M5 is a top speed...not impact speed...which is not actually given]...

In any case...it means a smaller warhead than that used on the Kh22 would actually be

adequate...freeing up more fuel payload...

As I noted already...the Iskander is fully maneuverable throughout its flight...using both gas dynamic [ie thrust vector by means of paddles in the exhaust gas stream]...and aerodynamic control...ie by means of control surfaces like movable fins...

Also as noted the MiG31 is the ideal platform for this missile...the Tu22 is bigger and can carry three Kh22/32...which is 18 tons...but it does not have the speed or altitude capability of the MiG31...

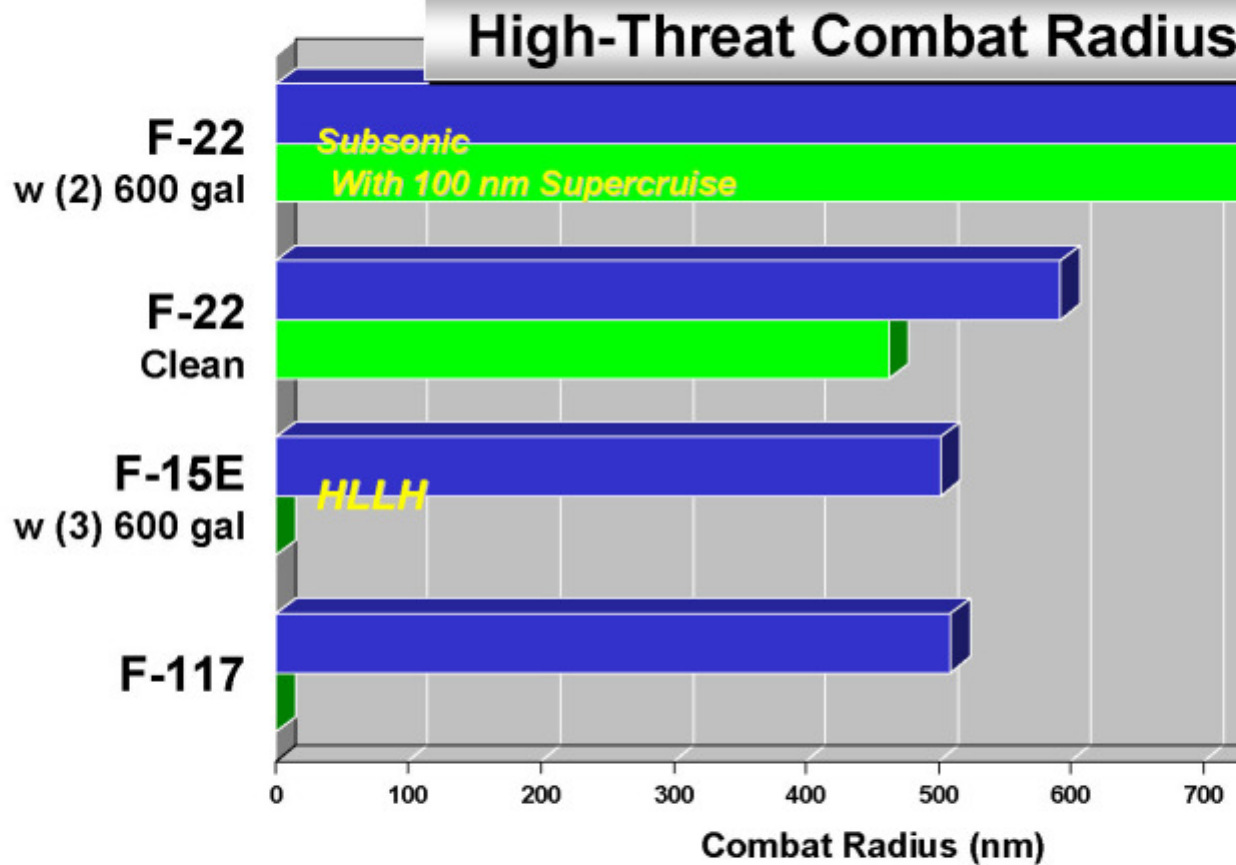
Also important is that the MiG31 is designed to cruise at M2.4...it is the only aircraft in existence...since demise of the Concorde to cruise supersonically at high Mach number...neither the Tu22 nor the bigger Tu160 heavy bomber is designed for sustained supersonic...only dashes...

This is true of all combat aircraft...

For instance the F22 is designed for only a 100 nm sprint in its supercruise at M1.8...



Combat Radius Comparison



*Refs: F-22 Supercruise = -6% Routing Factor
Config: (4) AIM + (2) 1K JDAM*

F-22 Subsonic = -6% Routing Factor

F-117 = (2) 2K LGBs – 6% Routing Factor

*F-15E = TAC Ranger; -1 Manual
Config: (4) AIM + (2) 2K LGB*

Tank



LOCKHEED MARTIN PROPRIETARY INFORMATION

Lockheed Martin Aeronautics Company

So the bottom line as far as the Kinzhal is concerned is that this is probably the most likely of the weapons mentioned by Putin that is closest to actual use...all the pieces are definitely there...the Iskander technology is well proven and has seen combat...2008 Georgia war...

The MiG31 has been a uniquely powerful aircraft for three decades now and is a perfect match for this type of missile...

As for the other weapons...certainly the nuclear powered cruise missile is intriguing...but we will leave that for another day...lots to unpack there...