

*Amou. Nepruu*

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100555/78

E/W -- SOVIETS FALL BEHIND U.S. IN BID TO HARNESS ATOMIC FUSION  
WASHINGTON, OCT. 10 (SPECIAL) -- THE FOLLOWING ARTICLE BY THOMAS  
O'TOOLE APPEARS IN TODAY'S WASHINGTON POST:

MOSCOW -- THE SOVIET UNION'S ATTEMPT TO HARNESS THE POWER OF THE  
HYDROGEN BOMB IS LAGGING, AFTER A QUICK START THAT GAVE IT WORLD  
LEADERSHIP FOR MOST OF THE LAST 10 YEARS.

THE SOVIETS ARE NO LONGER AHEAD IN THE RACE TO SEE WHICH COUNTRY  
FIRST WILL PRODUCE POWER FROM FUSION; THEY ARE NOW BEHIND THE UNITED  
STATES AND ALMOST CERTAINLY WILL STAY IN SECOND PLACE FOR AT LEAST  
THE NEXT 10 YEARS.

TOURING AMERICAN JOURNALISTS WHO VISITED THE KURCHATOV INSTITUTE  
ON THE WESTERN EDGE OF MOSCOW RECENTLY WERE TOLD THAT THE SOVIET  
PROGRAM TO TAME THE FURY OF FUSION IS ALMOST AT A STANDSTILL. THE  
SOVIET TOKOMAK MACHINE USED IN FUSION RESEARCH AT KURCHATOV HAS BEEN  
UNABLE TO REACH TEMPERATURES BEYOND 13 MILLION DEGREES, FAR LESS THAN  
THE 60 MILLION DEGREES REACHED LAST SUMMER AT THE TOKOMAK AT  
PRINCETON UNIVERSITY AND LIGHT YEARS DISTANT FROM THE 100 MILLION  
DEGREES SCIENTISTS SAY IS NECESSARY TO ACHIEVE FUSION.

A PROGRAM IS UNDER WAY TO DOUBLE THE TEMPERATURES ACHIEVED HERE  
TO 26 MILLION DEGREES, BUT THE T10 TOKOMAK WILL GET NO HOTTER THAN  
THAT AND WILL NOT GET THAT HOT BEFORE 1983. BY THAT TIME, A BIGGER  
TOKOMAK THAN THE ONE ALREADY IN PLACE WILL BE OPERATING AT PRINCETON  
AND MAY HAVE REACHED THE MAGIC MARK OF 100 MILLION DEGREES.  
SCIENTISTS SAY THAT TO ACHIEVE FUSION GAS OF A CERTAIN DENSITY MUST  
BE CONFINED AND HEATED TO 100 MILLION DEGREES FOR PULSES THAT LAST AT  
LEAST ONE SECOND.

"WE WILL NOT EXCEED THE PRINCETON TEMPERATURES, EVEN WITH OUR NEW  
MACHINE." BORIS KADOMTSEV, DIRECTOR OF THE PLASMA PHYSICS DIVISION  
OF THE KURCHATOV INSTITUTE, SAID. "WE EXPECT THE FIRST DEMONSTRATION  
OF FUSION POWER TO COME FROM PRINCETON.

TEMPERATURES OF AT LEAST 60 MILLION AND AS MUCH AS 80 MILLION  
DEGREES WERE REACHED REPEATEDLY AT PRINCETON LAST JULY. ONE WAY THE  
PRINCETON TOMAK ROUGHLY THE RUSSIAN WORD FOR "DOUGHNUT-SHAPED  
MACHINE." ACHIEVED ITS RECORD TEMPERATURE WAS TO SUPERHEAT THE  
DEUTERIUM GAS CONFINED BY HUGE MAGNETS WITH NEUTRAL SUBATOMIC  
PARTICLES STRIKING THE GAS AT FANTASTIC SPEEDS.

THE SOVIET TOKOMAK DOES NOT POSSESS THE NEUTRAL PARTICLE "GUNS"  
USED AT PRINCETON AND DEVELOPED AT THE OAK RIDGE NATIONAL LABORATORY  
IN TENNESSE. IN 1983, THE SOVIET PLAN TO HEAT DEUTERIUM GAS USING  
SHORT-WAVE RADIO BEAMS, AN ELEGANT METHOD THAT WILL HEAT THE GAS ITS  
ANTICIPATED 26 MILLION DEGREES BUT NO MORE.

THE SOVIETS ALSO HAVE LITTLE EXPERIENCE WITH THE SUPERCONDUCTING  
MAGNETS OF THE KIND USED ROUTINELY AT PRINCETON TO CONTAIN THE  
SUPERHEATED GAS "CALLED PLASMA) AND KEEP IT FROM TOUCHING THE WALLS  
OF THE TOKOMAK MACHINE. A SMALL MACHINE HERE AT THE KURCHATOV  
INSTITUTE HAS EXPERIMENTAL SUPERCONDUCTING MAGNETS BUT THEY ARE  
NOWHERE NEAR THE SIZE OF MAGNETS NEEDED TO CONTAIN FUSION  
TEMPERATURES.

THE FIRST USE OF LARGE SUPERCONDUCTING MAGNETS WILL BE IN THE  
NEWER T10M DEVICE THAT WILL START UP IN 1983 AT THE KURCHATOV  
INSTITUTE, WHICH IS NAMED FOR ONE OF THE FATHERS OF THE SOVIET ATOMIC  
BOMB, ICOR KURCHATOV. (PTO)

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E/W -- (1) -- SOVIETS FALL BEHIND U.S. IN BID TO HARNESS ATOMIC FUSION

THE UNITED STATES HAS NOT ALWAYS HELD SUCH A COMMANDING LEAD IN THE RACE TO EXTRACT ELECTRICITY FROM THE HEAT OF A CONTROLLED THERMONUCLEAR EXPLOSION. IT WAS THE SOVIETS WHO CONCEIVED OF THE DOUGHNUT SHAPE FOR A MACHINE TO CONFINE THE ENORMOUS HEATS PRODUCED WHEN HYDROGEN ATOMS FUSE, AND PRINCETON'S TOKOMOK WAS DERIVED FROM THIS IDEA.

MONEY IS ONE REASON, THE UNITED STATES MANAGED TO PASS THE SOVIETS IN FUSION. THE U.S PROGRAM HAS BEEN ENLARGED OVER THE LAST FIVE YEARS, WHILE THE SOVIET PROGRAM HAS APPEARED TO SHRINK. WESTERN OBSERVERS THINK THE KREMLIN MONEY MANAGERS DRAINED CASH FROM THE SOVIET FUSION EFFORT TO SUPPORT OTHER ENERGY RESEARCH THAT PROMISES A QUICKER PAYOFF. FUSION EXPERTS PREDICT COMMERCIAL FUSION POWER NO SOONER THAN THE SECOND DECADE OF THE 21ST CENTURY.

KADOMTSEV MADE IT CLEAR IN HIS TALK TO AMERICAN JOURNALISTS THAT THE SOVIET FUSION PROGRAM IS SHIFTING AWAY FROM THE PURE FUSION ELECTRICITY APPROACH TO WHAT HE CALLED A "HYBRID" PLAN TO USE FUSION NEUTRON ENERGY TO BOMBARD BLANKETS OF URANIUM OR PLUTONIUM WRAPPED AROUND A FUSION DEVICE.

THE ENORMOUS NUMBER OF NEUTRONS RELEASED IN A FUSION REACTION WOULD OVERWHELM THE URANIUM AND PLUTONIUM BLANKETS IN SUCH A WAY THAT THE BLANKETS WOULD BREED MORE PLUTONIUM, AS MUCH AS 10 TIMES AS MUCH PLUTONIUM AS WAS USED IN THE ORIGINAL BLANKETS. THE PLUTONIUM COULD THEN BE USED IN NUCLEAR POWER PLANTS TO MAKE ELECTRICITY.

THIS IS THE SAME CONCEPT THAT IS BEHIND THE FAST BREEDER REACTOR EXCEPT THAT IT IS 10 TIMES AS EFFICIENT. THE BEST A BREEDER CAN HOPE TO GET IS TWICE AS MUCH PLUTONIUM FROM THE FUEL IT BURNS IN ROUGHLY A 10-YEAR PERIOD.

BUT EVEN HERE, THE SOVIET PROGRAM IS NOT FIRM. ORIGINALLY, THE SOVIETS TALKED OF BUILDING THEIR OWN HYBRID MACHINE (KNOWN ON PAPER AS THE T20) BUT NOW THEY SPEAK OF RAISING THE BILLIONS OF DOLLARS IT WILL TAKE TO BUILD THE FIRST HYBRID FROM AN INTERNATIONAL PARTNERSHIP THAT INCLUDES THE UNITED STATES, JAPAN, AND MOST OF THE NATIONS OF WESTERN EUROPE.

"WE WOULD LIKE TO CONSTRUCT SUCH A MACHINE RIGHT HERE AT KURCHATOV WHERE ALL THE COUNTRIES WOULD BRING THEIR OWN BLANKETS TO PRODUCE PLUTONIUM," KADOMTSEV SAID. "WE THINK THAT IF THE INTERNATIONAL COMMUNITY GETS BEHIND SUCH A CONCEPT WE CAN BE PRODUCING PLUTONIUM AS MUCH AS SEVEN YEARS BEFORE THE FIRST COMMERCIAL FUSION ELECTRIC PLANT IS BUILT." EH