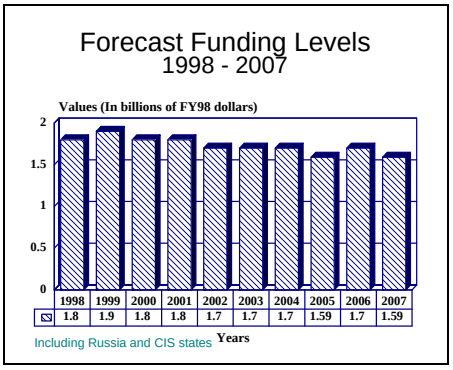
# Russia - ATC - Archived 7/99

## Outlook

- Five CIS nations adopt Lockheed-Martin ASOC as unified ATC system
- Russian proposal for new polar routes would force a speed-up of ATC upgrades within Russia
- Numerous Western contractors bidding for partial projects as well as becoming joint venture partners with Russian/CIS companies




## Orientation

Description. Russian air traffic control modernization program.

Sponsor. US: Federal Aviation Agency (FAA), Trade Development Agency (TDA), Russia Federation: Rosaeronavigatsiya, and others.

Contractors. Many varied joint ventures and consortia that are allied with Russian firms.

Licensee. While some equipment has almost undoubtedly been licensed for production in Russia there is currently no indications to the companies and/or products so licensed.

Status. Continuing development.

Total Produced. The program objective is to develop a modern unified air traffic control (ATC) network across the Commonwealth of Independent States (CIS), i.e., the former USSR.

Application. CIS airspace planning, operation and control.

Price Range. The scope of the program is so large that it prohibits any manner of equipment breakdown pricing.

## Technical Data

Characteristics. The characterization of the CIS air traffic control system differs significantly from that of Western Europe. The CIS represents a much larger geographic area of widely separated, diverse population centers spanning nine different time zones.

ATC activities in the 56-year-old Russian air traffic system differ greatly within this 8.65-million-square-mile area, of which 3.15 million square miles are over the Pacific and Arctic Oceans.

The airspace of Russia is divided into eight zones, and is regulated by 71 main regional ATC centers and 56 additional ATC centers with similar functions. Only two centers (Moscow and Rostov) are equipped with regional ATC automation systems. Eleven are equipped with aerodrome ATC automation systems and 18 with only secondary radars. Only 18 airports (out of 500) have technical equipment for flight maintenance. The equipment used by most of the airports is obsolete and must be replaced. The number of short-range and long-range navigation systems is very low.

In 1993 through 1994, the share of equipment operating beyond its lifetime grew from 30 to 45 percent, because of insufficient funding. Most of the current radio communications equipment was produced in the 1960s

and is obsolete. The same is true for surveillance and navigation equipment. Despite measures to prolong its operation, in 1996, Moscow's ATC Terkas system's lifetime expired.

Western Europe and the CIS are similar in that each must overcome national boundary, political and civilian versus military interest differences. The CIS situation is further complicated by the fact that newly formed CIS boundaries are still stabilizing, participants must overcome pent-up national feelings and learn to work together, and a single centralized authority must be identified.

# Variants/Upgrades

Rosaeronavigatsiya has five modern navigation complexes in operation, and the CIS air space is divided in eight sectors, or zones. The centers for each zone are the following cities: Moscow, St. Petersburg, Rostov, Samara, Ekaterinburg, Novosibirsk, Chintin and Khabarovsk. Each sector then in turn is divided to smaller sections. The largest significance of the sectors is believed to be with the Far Eastern zone (centers in Khabarovsk, Anadur, Magadan, Petroparsovsk-Kamchatskii, Ushno-Sakhalinsk and Vladivostok). This area will probably see the first upgrading measures before any others in this project, because of its importance to transcontinental traffic which can be used as a substantial revenue source. Furthermore, some areas in this zone are presently lacking coverage altogether, which makes them a top priority in the overall plan. In fact, some sources estimate that the income to be generated by this zone could be used to subsidizing even other zones.

# Program Review

Background. The end of the Cold War and eventual dissolution of the former USSR in 1991 caused member states to seek to increase their social, political and economic ties with the West. Russia was quick to realize that improved air travel was an important element in achieving this goal and in 1989 petitioned for membership in the International Federation of Air Traffic Control Associations (IFATCA). The far sighted objective was to obtain equipment that would be compatible with future Eurocontrol/Western European equipment and, at a higher level, with ICAO plans for a single, air traffic flow control management system for Eastern and Western Europe.

Potential ATC equipment suppliers recognized this interest and sought to provide assistance in ground floor planning and definition activities. Three competing teams, each seeking to ultimately capture a major segment of this large market, were formed; i.e., the Westinghouse-led GATSS consortium, a largely independent Thomson CSF effort, and the Buran consortium (See Design Features, above).

Since at least 1991, Russia has sought out partners to build a large amount of secondary ATC radars. The secondary radars in use at that time were over thirty years old and still using vacuum tubes. The Russian firm VNIIRA joined with Westinghouse and Siemens to research and manufacture new radars with the following capabilities:

- Feature two bands to allow for concurrent operation in the RBS and ATC modes.
- The two-band array should be built to support the specified parameters in either mode.
- The vertical aperture should measure at least 1.6 meters to secure the specified interference pattern in an effective coverage zone.
- The array should weigh no more than 500 kg.
- The array should be able to withstand wind gusts of 50 m/sec and ice build-up of 10 mm while continuing to rotate.
- High frequency channel components should ensure dynamic stability with the capacity to radically increase Mode-S output.
- The array should have a solid-state transmitter designed to sustain an output capacity of 2,200 W.
- The receiving units should feature three channels to maintain the monopulse coordinate-measuring mode.
- The signal decoding and processing should be built around highly integrated microprocessors.

The only secondary radar currently being ordered in Russia is the Krona system which is an updated version of the venerable Koren radar. Krona incorporates many of the features listed above, but the VNIIRA and Siemens are working on the List-W secondary radar which will be used to replace older systems first and eventually even the Krona radar.

GATSS Consortium. In the early 1990s, various study contracts were awarded to GATSS and Thomson CSF culminating in competing plans/proposals to develop the Russian ATC System. The product of the GATSS study was a recommendation for the implementation of a five step, 8000 project element development program requiring heavy up front funding support. The assimilation/resolution of these plans resulted in deadlock until the 1993 formulation of Raduga (See below).

The GATSS (Global Air Transportation Systems and Services) consortium proposed a system based mainly on a Global Satellite Navigation System (GNSS). The lack of basic electrical power and/or communication facilities in regions of Russia may create a predisposition for satellite-based communication solutions rather than developing a network of ground-based relay stations, etc. Russia does not have a huge radar infrastructure, and with introduction of GNSS there is a tremendous advantage to be gained. If the Russian government accepts this approach, it will avoid costly expansion of many ground-based navigation systems.

Despite the aspirations of GATSS and Thomson CSF, the limited hardware procurements awarded in this time period went to Buran. The consortium succeeded in receiving a series of contracts worth an estimated total of US$2.4 billion to build and install 41 radar systems through the year 2015. The radars are to be manufactured primarily in Russia. (Note: The estimated Alenia content of these contracts through 1993 is US$150 million).

A number of factors contributed to the deadlock situation, one of which was CIS member state lack of recognition of the need to work cooperatively. This was tentatively resolved in 1991 when CIS members signed a cooperation agreement, similar to that established in Western Europe, for joint regulation of the airspace over their countries. A catalyst for this agreement was the rapid growth of new Russian airlines after the USSR breakup. As of August 1992, 60 new airlines had been formed; thirty of which are internal carriers and 20 have registered with the ICAO and IATA.

ATC Requirements and Raduga. In further pursuit of the establishment of a unified air space, in March 1993 Russia indicated its desire to integrate its civilian and military ATC systems and sent a military delegation to the FAA to learn how to work with the US. A list of major needs was also developed by the GATSS Consortium in its initial modernization plan to modernize the ATC system for the entire CIS, about 60 to 70 percent of which can be applied to Russia. This plan included the following:

- 36 Air Traffic Control Centers
- 23 Tower Modernizations
- 66 Terminal Control Centers
- 246 Voice Switching Systems
- 176 Secondary Surveillance Radars
- 192 Microwave Landing Systems
- 156 Satellite Telecommunications Systems
- 479 Microwave Telecommunications Sites
- 407 VHF Radio Systems

Also in March 1993, Russia forged the formation of a new company, Raduga (Russian for Rainbow), to undertake the modernization of the Russian ATC system. The organization consists of various groups which had previously competed to win the production and/or R&D contract(s) to upgrade the Russian ATC system. These groups included:

- The Westinghouse-led Global Air Transportation Systems and Services (GATSS) consortium which includes AT&T, IBM, Hughes, C. Itoh of Japan and the Daimler-Benz division of Deutsche Aerospace.
- Thomson CSF of France, the leading supplier of ATC systems in Europe.
- The Italian Alenia/Russian Buran consortium. Buran, founded in 1990, is owned by two interests: the Soviet Institute of Scientific Research (51 percent) and Alenia (49 percent). The controlling Russian sector consists of the following partners from Russian government and industry:
- ROSAERONAVIGATSIYA, the former USSR State Research and Scientific Institute (Civil Aviation Ministry), is responsible for the development of a long-term strategic plan for implementing ground ATC and airborne systems as well as systems for navigation, landing and communications. The staff of 1200 experts located in Moscow coordinates the activity of the scientific and industrial organizations involved in these activities and also represents the CIS in the ICAO.
- GENERAL DIRECTION inherited from Rosaeronavigatsiya the role of buying authority (considered to be the counterpart to the US's FAA)
- AERONAVIGATSIYA, the State Research and Development Institute is responsible for ATC technical requirements and standards, and helps the Russian industry to fulfill its ATC modernization program. Aeronavigatsiya is working closely with the Russian Committee for Defense Industries on

the conversion from military to civilian ATC-related equipment production.

- ROTON, the Research and Production Association is an element of the former USSR Ministry of Radio Industry, Moscow. The organization has 24 plants, factories and research centers, and employs a work force of 25,000.
- VNIIRA, the All Union Scientific Research Institute of Radio Equipment. Also a member of the Ministry of Radio Industry, VNIIRA is the USSR leader in the design of automated terminal area ATC systems. VNIIRA is located in Leningrad and has a staff of 8,000.

The other partner in the consortium is ALENIA. Alenia is the parent company of a group which designs and manufactures aeronautics, space defense and commercial systems products. Alenia employs a staff of 30,000 at 42 plants and is part of the IRI-FINMECCANICA group listed on the Italian stock exchange. Alenia Commercial Systems has delivered ATC systems to 46 countries around the world.

Seeking to resolve the continuing deadlock which included significant competitive and financial issues, in late 1992 the CIS exerted pressure on the competitors to establish a cooperative global relationship. Talks were initiated and final resolution was reached on March 26, 1993, when the Russian trade minister signed a contract with the newly formed Raduga Company to develop the Russian ATC system.

The initial element of the contract is to provide a new control center for the overloaded and poorly/non-equipped 25 sector Moscow FIR. The plan in provisioning this center is that 50 percent of the manufacturing is to be performed within Russia with the remainder to be divided equally between the western countries. Western participation will be heaviest early in the program.

A team lead by Rockwell International, which includes Hughes Aircraft and the Russian State Research Institute of Aviation Systems (GosNIIAS), received a contract in late 1994 for the detailed planning of a satellite-based air traffic management system. The contract, issued under the DoD Cooperative Threat Reduction program, is a follow-up to a previous joint Rockwell/GosNIIAS study, which evaluated the feasibility of GPS and GLOSNASS satellites in an ATC role using the Russian far eastern route structure as a model. The intent of the program is to transfer Rockwell's GPS receiver, traffic alert/collision avoidance system, and ATM communication commercial products, as well as the Hughes TracView air traffic control station, to GosNIIAS for modification and application in the Russian ATC system.

In July 1997, Northrop-Grumman was awarded a US$15.7 million contract for the provision of a nationwide ATC system in Georgia. The loan was guaranteed by the Export-Import Bank and will be used to supply two mono-pulse secondary surveillance radars, microwave communications, generators, UPS systems, airspace management system, and logistics/ support training. The overall ATC system will also be produced in such a manner as to be easily expanded in the future.

In September 1997, Russia proposed more direct polar routes than the circuitous routes currently in use. These new routes could save as much as three hours of flying time. These routes would also aid Russia generating currency from overflight fees, but two potential problems threatens these new routes. The first is political- many of the proposed routes actually cuts through China. China still maintains a very sheltered, semi-xenophobic stance that will make an agreement a long time in coming. The other factor is that the Russian ATC system must continue to be modernized and upgraded in order to handle what will be extremely tight and narrow air corridors.

Also in September, the US government – as part of President Clinton's Partnership for Peace plan – pledged financial support for the acquisition of two Air Sovereignty Operations Centers (ASOC) for Bulgaria and Macedonia. While the ASOC can be used to control military as well as civilian traffic, the current decrepit condition of these countries' ATCs borders on unsafe, and must be updated as soon as possible. Three other ASOCs are also being delivered to Poland, Hungary, and the Czech Republic. All five centers, which are being produced by Lockheed-Martin, were due to come on-line by the end of 1998.

When the network is complete each ASOC will be able to communicate with its counterparts in another country. This will aid in greater regional awareness of air traffic, simplify the handover when an aircraft crosses borders, make upgrading relatively easy, and allow these countries to tie into the NATO ATC system if and when these countries join NATO.

Some decision-makers in Russia support the idea of using large ground-based communications lines and automation systems similar to IBM's Advanced Automation System (AAS). This is an extremely costly project, and Russia is unlikely to fund it. By the year 2000, AAS alone is expected to cost the US$10 billion in development, installation and maintenance – a figure thought to be near estimates for the entire Russian ATC modernization program.

This initial program is scheduled to be followed by a broader scale, 15-20 year, US$10-15 billion CIS ATC improvement program. It is clear that the Russian objective is to eventually manufacture as much equipment in the CIS as possible in order to stimulate growth of respective gross national products and to maintain an international balance of payments. Western nations are already forming long-term relationships with Russian companies well in advance of production activities in order to secure market share, requiring patience and determination to overcome the language, political, legal, and financial barriers that are present.

Speaking at a conference on the modernization of Russia's transport system in the summer of 1993, Viktor Galkin, deputy head of the Aeroanvatsia Institute, stated that although pressing to proceed with Russia's ATC modernization program, US$500 million in bridging aid (of the US$1.3 billion required to complete the initial Moscow modernization phase of the overall program) will be required.

The Russian ATC market represents a major long-term opportunity for those companies that have staying power and are willing to form, and provide early technical and financial support of, Russian partnerships. Reasons for forming these relationships as early as possible include the following:

1. Marketing Advantage - As a result of Russia's keen technical understanding, the CIS will not procure only readily available equipment but will play an active role in designing a cost-effective, high-performance, advanced state-of-the-art ATC system with long operational life and growth capabilities. Participation in requirements definition and equipment specification activities will provide important near-term competitive advantages.
2. In-Country Manufacture - In light of the stated CIS strategy of retaining as much manufacturing in-country during the later phases of the program as practical, contractual agreements formed early on as compensation for start-up financial support can be used to guarantee long-term manufacturing participation.
3. Russian Competition - Failure to form partnerships may eventually result in competition in global markets *from* Russian companies for advanced products developed during the ATC development program. The lower wages of Russian workers, which are forecast to remain in effect for an extended period, are particularly threatening in this regard.

# Funding

This is a former USSR/Commonwealth of Independent States sponsored program. Long-range financial details remain incomplete. It has been established, however, that major up-front gap bridging investments are being requested from foreign interests. In addition, western nation governments are providing limited assistance to participating companies during initial definition study/marketing proposal phases of the program. The following limited funding information has been documented.

| | | |
|---|---|---|
| Summer | 1991 | USSR earmarks US$2.4 billion for building and installing 41 radars at various Soviet airports through 2015. |
| March | 1993 | CIS awards 15-year, US$10 billion modernization program to Raduga; US$1.3 billion Phase I Moscow modernization allocated. US$500 million foreign participation solicited. |
| February | 1994 | US Trade and Development Agency awards US$400,000 to Westinghouse to support joint AUSRIRE radar evaluation study. |
| September | 1994 | US DoD awards US$4.7 million to Rockwell International to support joint GosNIIAS satellite navigation feasibility study. |
| September | 1997 | US government pledges financial support- amount unknown- for the acquisition of two Air Sovereignty Operations Centers (ASOC) for Bulgaria and Macedonia. |

# Recent Contracts

| Contractor | Award ($ millions) | Date/Description |
|---|---|---|
| Raytheon | 2.5-3.0 (estimate) | Mid-1995 – Interim communications system for the Russian Far East, by Rosaeronavigatsiya. Other bidders included Rockwell and Hughes. Includes 11 ground satellite stations to cooperate with Horizon/Express and support ground-to-ground communications. |
| Varied | 280.0 | July 1997 – Pulkovo Air Transport will receive a loan from the European Bank of Reconstruction & Development as well as the Deutsche Bank. This loan will be used to improve the St. Petersburg, Russia airport. Funding is known to be earmarked for a new passenger terminal, new cargo handling facility, and unspecified upgrades to the airport as a whole. |
| Northrop-Grumman | 15.7 | July 1997 – An award presented by the country of Georgia for the provision of a nationwide ATC system. The system is to have two mono-pulse secondary surveillance radars, microwave communications, generators, UPS systems, airspace management system, and logistics/support training. |
| Lockheed-Martin | Unknown | August 1997 – Lockheed-Martin is to supply five Air Sovereignty Operations Centers (ASOC) for Bulgaria, Poland, Hungary, Macedonia and the Czech Republic. The first system will be operational by the end of 1997 with all remaining systems coming on line by the end of 1998. |

# Timetable

| Month | Year | Major Development |
|---|---|---|
| Early | 1980's | Main radar and processing system installed at the Moscow Flight Information Region (FIR) - Vnukovo Airport |
| Apr | 1989 | Soviet ATS applies for IFATCA membership |
| Jun | 1990 | Buran consortium forms |
| | 1991 | Westinghouse, Siemens and VNIIRA begin R&D on new secondary radar systems |
| | 1991 | USSR dissolved, CIS airspace agreement established |
| Mar | 1991 | Westinghouse-led GATSS consortium forms |
| Jun | 1991 | Thomson CSF Ku-band Astre radar installed at Moscow's Sheremetyevo airport to track movement of aircraft and vehicles on runways and taxiways, as a step toward Category 3 operation |
| Dec | 1991 | GATSS presents study results, five step modernization plan |
| Aug | 1992 | Russia evaluates GATSS and Thomson CSF ATC modernization proposals for intended end-of-the-year decision |
| Oct | 1992 | Northwest Airlines inaugurates US-Tokyo route across eastern Russian airspace |
| Nov | 1992 | GATSS, Thomson CSF and Buran initiate talks leading to formation of Raduga in response to CIS request for cooperative ATC development effort |
| Mar | 1993 | Raduga is chartered and wins contract for first phase (New Moscow Control Center) of 15-year ATC modernization program. Russia indicates desire to merge military and civilian ATC systems |
| Jul | 1993 | Russia announces request for US$500 million in bridging funding for first phase of ATC modernization program |

| Month | Year | Major Development |
|---|---|---|
| Feb | 1994 | US Trade and Development Agency underwrites Westinghouse in joint study with AUSRIRE to evaluate the feasibility of use of an accurate dual frequency monopulse secondary surveillance radar incorporating integrated hardware/ software for ATC application |
| Aug | 1994 | US and Russian officials announce progress in reducing government administrative snarls. Rosaeronavigatsiya, the Russian ATC and airspace organization, is recognized as the centralized federal agency for local ATC administration and collection of user fees |
| Apr | 1995 | ATC funds mandated to be used for "Federal program of modernization of the Unified ATC system in the Russian Federation for the period until 2005" by government resolution No. 368 |
| Jun | 1995 | Finland negotiates a new air agreement with Russia that provides for a shorter transpolar route to the East for all West European airlines starting in 1996 |
| Jul | 1995 | Russia's President Yeltsin signs a draft order to establish a public corporation for running both the military and civil ATC system. Final privatization order signed on August 2 |
| Aug | 1995 | Magadan's Automatic Dependent Surveillance (ADS) and control pilot data link, in addition to conventional voice communications, demonstrated by United Air Lines in Far Eastern zone. |
| May | 1996 | Russian government passes Resolution No 583 naming Russia's Federal Aviation Service as successor of all abolished and reorganized structures responsible for the unified ATC system |
| Sep | 1996 | ADS demonstration (Moscow) shows that ADS-broadcast messages can be integrated into existing air traffic management systems with secondary surveillance radar data |
| | 1997 | Russia proposes new, more direct polar routes that will require major upgrades within a short period if the proposal is accepted |
| | 1997-1998 | Five Air Sovereignty Operations Centers (ASOC) for Bulgaria, Poland, Hungary, Macedonia and the Czech Republic come on-line |

## Worldwide Distribution

The scope of this program is geographically restricted to the members of the former USSR's Commonwealth of Independent States. The long-range goal of the program, however, is to become a functional element of an integrated global ATC network. This is also evidenced by the fact that the project includes a number of non-Russian, western European contractors, who are transferring their technologies from other parts of the world to this region.

## Forecast Rationale

It is difficult to predict the current ATC situation within Russia and the CIS states. While it is known that the overall ATC network is in a decrepit state, due to extreme age and technological inferiority, Russia and the CIS are putting forth a tremendous effort to correct these deficiencies.

While many areas of Russia/CIS continue to have no radar coverage whatsoever, the modernization program has focused- and rightly so- on the major airports and air corridors. In the last few years major airports have received radar and electronics upgrades based on microprocessor technology. Secondary radars, glide slope systems, improved VASI systems, and other equipment are being purchased at a fairly substantial rate. As an example of the resources needed, Russia has over 300 secondary radars of which only 22 meet ICAO standards.

One of the newest ATC systems to be procured is the Air Sovereignty Operations Centers (ASOC) for the CIS nations of Bulgaria, Poland, Hungary, Macedonia and the Czech Republic. These systems will allow an integrated ATC environment to exist between these countries thereby aiding in air traffic movement monitoring, allow smoother handover when an aircraft

flies into a new control zone, etc. It also provides a commonality base with which to allow upgrades and add-ons to be easily integrated into the ASOC system.

The biggest problem currently facing procurement of these systems continues to be funding. The ASOC system was purchased after negotiations with several banks and the partial funding of two systems from the US government. Russia/CIS nations are attempting a variety of means in order to receive loans, technology, etc. Many joint ventures have been formed with Western companies in order to research and produce ATC related equipment. Russia has guaranteed several loans by putting up its yearly overflight fees (in excess of US$400 million) as both collateral and loan repayment.

The above situation indicates that at least in the near term, other sources of funding will be needed. A combination of alternatives includes government guarantees, direct government payments, loans form export credit agencies, commercial banks, and private investors that would be used to pay for ATC modernization.

Another possible solution to the funding crunch would be to allow airport authorities to be created as joint-stock companies. This would allow state-owned airports to gradually become more independent with local and regional authorities having more of a say in overall operations. In 1997, one of the first airports to be taken over by a commercial enterprise, the St. Petersburg airport, received a US$280 million loan for the primary use of a new terminal and cargo handling facility but also the upgrade of some of the ATC systems.

In the ten-year forecast funding will stay at a relatively stable level as in previous years. Russia and the CIS appear content to modernize at a steady pace starting with the most important airports and air corridors and then branching out to secondary and tertiary sites. This strategy appears to have aided them as many banks and countries, seeing a long-term commitment coming about with a relatively solid financial basis, have agreed to major loans in recent years.

Many international corporations are starting to become more involved with the Russian ATC effort. Despite the possibility of long-term production rewards, potential individual/networked suppliers do not have the resources and/or perhaps the confidence in the final outcome to fully fund these systems. Those companies who have doggedly stood by the Russian ATC modernization program since 1991 will most likely receive a handsome reward on their investment as the years progress.

The members of the CIS and Russia have made an irrevocable commitment to transform into a market economy. One of the key factors in this economy is that improved air travel is a necessity as both a major source of hard currency revenue as well as a critical factor in connecting the vast areas of the former USSR. The development of a unified, state-of-the-art ATC system within Russia/CIS will probably be promoted on a priority basis to achieve this objective.

It is estimated that the ATC program will not be finished prior to 2010+ with a current total cost of approximately US$23 billion.

# Ten-Year Outlook

**ESTIMATED CALENDAR YEAR FUNDING ($ in millions)**

| | | | High Confidence Level | | | | Good Confidence Level | | | Speculative | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Designation | Application | Thru 97 | 98 | 99 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | Total 98-07 |
| RUSSIA-ATC | AIR TRAFFIC CONTROL (VARIOUS) | 5.45 | 1.80 | 1.90 | 1.80 | 1.80 | 1.70 | 1.70 | 1.70 | 1.59 | 1.70 | 1.59 | 17.28 |