SHORAN-2

Manual

The SHORAN - short range navigation system. It features:
-Tracking an azimuth
-flying a circle
-tracking any point with the SHORAN range
-a landing mode, similar to ILS (not simulated)

The SHORAN is a high precision system, with more accuracy than a VOR. It sends 2 impulses at 100 RPM. One impulse will be send every 10° (so 36 impulses in total) and the other will be send every 10.29° (35 impulses in total). Only in the north, the two impulses meet at the same point. The on-board equipment will measure the difference in time of these two impulses and uses it to precisely calculate the azimuth.

The distance is calculated by a secondary surveillance radar. The SHORAN station sends a signal to the aircraft and the aircraft responds to the signal. The distance can then be calculated with the time difference between the signal and the response.

The range of the SHORAN system depends on the altitude of the aircraft:

Altitude, m	*1000*	*2000*	*3000*	*4000*	*5000*	*6000*	*7000*
Range, km	*112*	*160*	*195*	*225*	*252*	*276*	*300*

The maximum range is about 350km at an altitude of 10km.

There is also a dead-zone above the SHORAN where no signal can be received which radius equals approximately the altitude of the aircraft.

It must also be noted that the SHORAN stations indicate azimuth only in true north, not magnetic north! Therefore it is recommended to align the GDI (gyro direction indicator) with true north when it is planned to use SHORAN.

SHORAN stations where only installed in the former USSR and other eastern countries like the DDR. Today, most of them have been dismantled. A list of SHORAN stations is included in the doc folder. The lists was provided by Julik Tarkhanov.

This SHORAN simulation comes with two datasets by Andrey Pryadko (converted by Julik

Tarkhanov). One set contains the SHORAN stations from the time of the former USSR (late 1980s) and the other from the CIS (2002), where many stations are already dismantled. You can switch between the datasets in the options:

Power switch

The SHORAN system is pretty boring without power ;-)

Channel:

SHORAN uses channels to set the frequency. Old systems support only 40 channels, whereas never ones may support up to 176 channels.

The first switch is the so called 'Strobe' switch, which is used to set the first digit (0 – 40). The second switch is called 'Null' switch, it's used to set the second digit (0-9).

Modes

Use this switch to set your desired indications on the CFI (compound flying instrument) gauge

OFF CFI: *The needle is centered on the CFI. Don't use it or you'll think you're perfectly on course...*

AZIMUTH TO/FROM

This mode works like you're used to with VORs. The only difference is that the SHORAN system only uses true course, not magnetic course. Set your desired radial with this switch and the CFI will show your cross-track error:

ORBIT LEFT/RIGHT

If you like to fly in circles, use this mode. ORBIT LEFT means the SHORAN station is left of you. ORBIT right means the station is right of you. Here you set the desired radius of your circle:

The CFI will then show your cross-track error from the circle.

CALCULATOR

This mode allows you to track any position within the range of the SHORAN station. Take a look at the scheme below:

The red point is defined by the aspect angle and the distance from the SHORAN station. The point can be virtually anywhere within the SHORAN range. To track the point, you'll also need to

define an azimuth. It is called COURCE in the CALCULATOR mode. The CALCULATOR mode can be used to follow an airway, which does not cross the SHORAN, but lines nearby. The CFI displays the cross-track error as usual.

CFI

This multi-functional gauge can display SHORAN, VOR and ILS information.

When it indicates SHORAN information, each dot represents 1 KM cross-track error in any mode.

CFI Source

*This panel is located on the **NAV L** panel. It's used to set the source for the CFI.*

This table shows the indications of both CFIs in each setting:

	Left CFI	Right CFI
SHORAN	SHORAN	SHORAN
SHORAN SP-50	SHORAN	VOR1
1	VOR1	VOR1
BOTH	VOR1	VOR2
2	VOR2	VOR2

Back to the SHORAN panel:

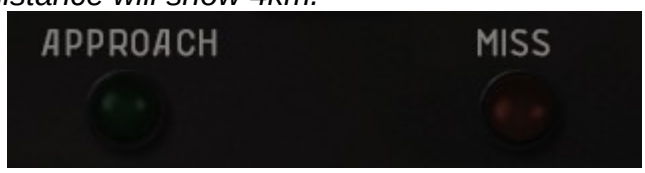
These lights lit up if you receive no azimuth (A) or no distance (D) signal.

Range and azimuth direct-reading instrument

This gauge indicates your azimuth and distance to the SHORAN.

The outer scale (diamond needle) shows the azimuth from 0-360 degrees. The inner scale shows the azimuth precisely in 0.1 steps. Don't forget that the azimuth indications refer to true north, not magnetic north!

The window in the middle of the gauge shows the distance to the SHORAN station. The distance depends very much on the altitude of the aircraft. If you're exactly over the SHORAN, but at an altitude of 4km, the distance will show 4km.



*When the **APPROACH** lamp lits up, it means that you'll reach the SHORAN station within the next two minutes. **MISS** only lits if your azimuth is within 1.1° to your set azimuth and the distance is less than 1.1km to the set orbit distance.*

*As your altitude also counts into the indicated distance, the **MISS** lamp will never lit up when your altitude is higher than 1.1km. Therefore the ORBIT value should be set at least to you altitude.*

Navigation

*The **range and azimuth direct-reading instrument** is a high precision instrument and can be used to find your way to the SHORAN station.*

*Simply change your heading to the azimuth indicated on the **range and azimuth direct-***

reading instrument. *You'll then probably see the small needle still moving. If it moves to the left, turn to the left. If it moves right, move right, too. When it stops moving, you'll by flying exactly to the SHORAN!*

The azimuth mode allows a VOR like operation of the SHORAN system. Simply set the mode to ***AZIMUTH TO*** *or* ***FROM*** *and track the radial with the CFI gauge. It is also recommended to always set the ORBIT value, because only then the overflying light will go on.*

If your route doesn't uses SHORAN station, but you want to use them for precise navigation, then use the ***CALCULATOR*** *mode. I recommend this tool to calculate the navigation data:*

http://www.avsim.su/f/fs2004-utiliti-45/rsbn-kalkulyator-versiya-1-3-10010.html

(You can set it to English in the options)

Also if you're flying in the ***CALCULATOR*** *mode, set up* ***AZIMUTH*** *and* ***ORBIT*** *for the lamps.*

Datasets

Thanks to Andrey Pryadko for providing the SHORAN databases and thanks to Julik Tarkhanov for converting the databases. You can learn more about Julik's project here:

http://github.com/julik/rsbn

Adding own SHORAN stations

The datasets can easily be opened with a text editor. You'll find these lines:

40|SURGUT|AM|117.95|61.3500|73.4167|61.0

40*: The channel of the SHORAN station*

SURGUT*: The name of the SHORAN station*

AM*: The identifier. It usually consisted of the first and the last letter of the airfield callsign*

117.95*: Each channel actually corresponds to a frequency. Refer to this table:*

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	116.00	**11**	116.50	**21**	117.00	**31**	117.50
2	116.05	**12**	116.55	**22**	117.05	**32**	117.55
3	116.10	**13**	116.60	**23**	117.10	**33**	117.60
4	116.15	**14**	116.65	**24**	117.15	**34**	117.65
5	116.20	**15**	116.70	**25**	117.20	**35**	117.70
6	116.25	**16**	116.75	**26**	117.25	**36**	117.75
7	116.30	**17**	116.80	**27**	117.30	**37**	117.80
8	116.35	**18**	116.85	**28**	117.35	**38**	117.85
9	116.40	**19**	116.90	**29**	117.40	**39**	117.90
10	116.45	**20**	116.95	**30**	117.45	**40**	117.95

61.3500*: Latitude (use - for south)*

73.4167*: Longitude (use - for west)*

61.0*: Elevation in meters (used for improve range calculations)*

If you follow this file format, you can easily add your own SHORAN stations.