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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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In the Matter of	)	
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Amendment of Section 90.20(e)(6) of the	)	RM-_____
Commission's Rules Regarding	)	
Stolen Vehicle Recovery Systems	)	

PETITION FOR RULEMAKING

LoJack Corporation ("LoJack"), by its attorneys and pursuant to Section 1.401 of the Commission's rules, hereby requests that the Commission amend 47 C.F.R. Section 90.20(e)(6) to permit transmissions from mobile units in a stolen vehicle recovery system with a duty cycle of 1800 milliseconds every 300 seconds, with a maximum of six messages in any 30 minute period.[1] This amendment will enable LoJack to introduce a mobile-to-base-station "uplink" technology that will improve stolen vehicle recovery time; increase stolen vehicle recovery rates; make more efficient use of radio spectrum; and reduce the potential for interference with television reception.

I. BACKGROUND AND SYSTEM DESCRIPTION

Section 90.20(e)(6) of the Commission's rules authorizes stolen vehicle recovery systems to operate on the frequency 173.075 MHz on a shared basis with federal government users. Transmissions are authorized solely for use in connection with recovering stolen vehicles; general-purpose vehicle tracking and monitoring operations are not permitted under this rule.

The LoJack Stolen Vehicle Recovery Network ("SVRN") operated by state and local police departments is the most extensive radio-based stolen vehicle recovery

[1] Simultaneously with this filing, LoJack is requesting a waiver that would enable it to operate with the new duty cycle in the interim, subject to the outcome of the rulemaking requested herein.

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network in the United States. Authorized on a regular basis by the FCC in 1989, the SVRN has been deployed in 17 states and the District of Colombia. LoJack transponder units ("LJUs") have been installed in approximately 1.25 million vehicles. To date, LoJack's system has assisted in the recovery of more than 30,000 LJU-equipped vehicles, with an estimated total value of $500,000,000. On many occasions when police recover an LJU -equipped vehicle, other stolen vehicles and parts are present and are also recovered. The technology has proven useful in solving other criminal activity and the police have achieved an arrest rate exceeding 20% of thefts. LoJack systems are also in place in eighteen foreign countries, including the United Kingdom, South Africa, Korea, China, Poland, Russia, Mexico, Argentina, and Colombia, to name a few.

A. Present System

Currently, LoJack's SVRN network operates as follows. Vehicles are fitted with an LJU, which is dormant until the vehicle owner reports it stolen. Once the vehicle owner submits a stolen vehicle report to the police, the police send a message to a central law enforcement computer. This computer, in turn, activates the "Sector Activation System," a network of radio base stations licensed to the police. Each station transmits a uniquely coded "activation" message that instructs the LJU to begin transmitting a brief "tracking" message. Activation messages are transmitted by each base station every 15 minutes for the first two hours, then once an hour thereafter until the vehicle is recovered or thirty days have passed, whichever is sooner.

The "tracking message" contains a unique reply code, which is received by tracking computers ("PTCs") installed in police cars. Police identify the vehicle make, model and registration from the reply code, and then track and recover the stolen vehicle. Once the police have recovered the vehicle, the base stations transmit a "deactivation" message, instructing the LJU to cease transmitting its tracking message and reset to its receive mode. The deactivation message is transmitted every 15 minutes for 24 hours.

B. Proposed System

Although LoJack's vehicle recovery rate has been impressive, success is determined by the lag time between the theft and the report to the police that the vehicle has been stolen. LoJack would like to improve the stolen vehicle system operation by incorporating an early warning feature to minimize that lag time so that it can better assist law enforcement in recovering stolen vehicles and promote efficient spectrum use.

As discussed in greater detail below, the early warning feature involves mobile-to-base station "uplink" transmissions. This technology was not available when LoJack's system first was introduced, and has been developed by LoJack as part of its ongoing efforts to expand and improve the recovery of stolen vehicles. The uplink signal would be used for two purposes.

First, in the event of a theft, uplink transmissions would be used to alert a control center, and then the vehicle owner, in order to effect a prompt police theft report, thereby improving the probability of a quick recovery. Second, uplink transmissions would be used to acknowledge base station activation and deactivation messages, thereby obviating the need for repetitive transmissions by high-powered base stations, reducing the actual transmitting time on channel by as much as a factor of 100:1. Uplink transmissions would be used in only these two, limited circumstances associated with vehicle theft and recovery activities. They would not be used for other purposes and, in particular, would not be used for general vehicle tracking and

monitoring operations.[2] Uplink transmissions are fully compatible with the existing SVRN.

Section 90.20(e)(6) of the Commission's rules already permits uplink transmissions within a stolen vehicle recovery network. The rule, however, limits such transmissions to a duty cycle of 200 milliseconds every ten seconds or, when a vehicle actively is being tracked, to 200 milliseconds every second. The uplink technology requires a duty cycle from LJUs of 1800 milliseconds every 300 seconds with a maximum of six messages in any 30 minute period. The uplink receivers will be located at the base station sites around the country.

Reciprocity ensures that the path loss of the signal between the base station and the vehicle are the same. The vehicle attenuates external noise and interference but the base station is in an optimal position to receive any noise and interference within the channel. To achieve link reciprocity between the high powered (300 watt) base stations and the low powered (2 watt) LJUs, the uplink uses a narrowband transmission with a 63-bit spacing code modulation. This approach results in greater receiver sensitivity and higher processing gain in the channel, and greatly improved reception. The power transmitted at the vehicle is approximately 100 times smaller than the base station power. The receiver at the base station must provide gain to compensate for this difference, plus immunity to the increased level of noise and interference.

The message length can be determined as follows: The transmissions use a reduced bit rate, two level FM modulation, with a bit rate of 17.92 ms/bit (3571.428 Hz clock divided by 64). The format is [short preamble][flag][frame][short preamble][flag]

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[2] The Commission has ruled that tracking of suspected stolen vehicles prior to the filing of the stolen vehicle report is not general purpose vehicle tracking or monitoring and, therefore, is permitted under Section 90.20(e)(6). *In the Matter of Amendment of Parts 2 and 90 of the Commission's Rules to Provide For Stolen Vehicle Recovery Systems*, Memorandum Opinion and Order, 6 FCC Rcd 622, ¶ 1, 10 (1991). Indeed, the Commission specifically stated that a SVRN network may incorporate the feature proposed by LoJack: *i.e.*, that a transmitting unit installed in a subscriber's vehicle automatically may begin signaling once a reasonable likelihood exists that a theft has occurred. Id. at ¶ 10.

which totals to 100 bits. 100 bits x 17.92 ms = 1792 ms. The request was rounded off to 1800 ms/300 seconds for simplicity.

II. A GRANT OF LOJACK'S PETITION WOULD SERVE THE PUBLIC INTEREST.

A. LoJack's Proposed Operations Would Enhance Stolen Vehicle Recovery Efforts.

LoJack's new uplink technology would be used for rapid theft detection and reporting. With LoJack's current system, recovery action cannot be taken until an owner is aware that the vehicle has been stolen and informs the police of that fact. Only then do the police send the required message to the SVRN central computer.

In the proposed system, vehicles would be fitted with an "Early Warning Detector," or "EWD." If at any time an EWD unit that has been enabled and armed detects external movement of the vehicle or determines that the vehicle has been started without using the key, (*i.e.*; "hot-wired"), it would send a brief alert signal to the LJU unit. The LJU unit then would transmit this alert to the nearest base station(s), which would receive, process, and forward the message (via the existing network) to a central, 24-hour-per-day control center operated by LoJack. Personnel working in the call center then would alert the owner that the vehicle has been stolen, making it possible for the owner immediately to notify the police of the theft.

Once the theft is reported to the police, the existing LoJack activation and tracking process can be initiated. By speeding up the theft detection and reporting process, the uplink technology would improve the chances for successful vehicle recovery and improve tracking efficiency. The more quickly the theft is detected and reported, the more defined the area in which the vehicle is likely to be located. When LoJack introduced this technology in South Africa, the vehicle recovery rate went up 10%, from 82% to 92%.

The EWD incorporates several limiting mechanisms to ensure that transmissions occur only when there is very good reason to believe that a theft has occurred. In this way, it is possible to reduce the incident of "false alarms" to a minimum.

B. LoJack's Proposed Operations Would Promote Efficient Spectrum Utilization.

LoJack's uplink technology also will be used for downlink message acknowledgement. Under the current system, all base stations in the vicinity of a stolen vehicle repeatedly transmit activate and, later, deactivate messages. Generally, transmissions are spread throughout a state in order to facilitate vehicle recovery. The current system architecture specifies the following transmission schedule:

- Activation messages are transmitted every 15 minutes for the first 24 hours and then every 60 minutes until the vehicle is recovered or until 30 days have passed. This equates to 792 messages per base station per stolen vehicle.
- Deactivation messages are transmitted every 15 minutes for 24 hours. This results in 96 messages per base station per stolen vehicle.

In total, each stolen vehicle thus can result in as many as 889 high-power downlink transmissions from each base station in the state.

With LoJack's proposed change, the LJU would transmit a brief message acknowledging the receipt of a message from the base station. Upon receiving an acknowledgement, each affected base station will cease transmitting any additional messages, thereby reducing dramatically the number of base station transmissions required for each theft/recovery activity. LoJack estimates that, in practice, the uplink capability would reduce the number of downlink transmissions from 889 *to as few as nine* (four activation messages spread over one hour, one track message, and four deactivation messages spread over one hour).

The dramatic decrease in the number of high-power downlink messages would result in substantially reduced channel occupancy, despite the existence of new low-power uplink transmissions. Based upon predicted theft rates, market penetration, and theft recovery times, LoJack estimates that the number of downlink transmissions per hour would fall from 7.24 in the present system to .34 under LoJack's proposal in the first year; from 8.73 to .41 in the second year; from 12.17 to .57 in the third year, and from 18.44 to .86 in the fourth year. Uplink transmissions would offset this only by a fraction (LoJack predicts .656 uplink transmissions per hour in the first year; .79 per hour in the second year; 1.1 per hour in the third year; and 1.67 per hour in the fourth year), thus resulting in substantially lower aggregate traffic. Importantly, the substantial reduction in transmissions from the higher-power base stations would reduce any interference potential of the LoJack system and enhance its spectrum efficiency.

C. LoJack's Proposed Duty Cycle Will Not Result In Harmful Interference To Other Spectrum Users.

The implementation of the uplink and its proposed duty cycle will not result in harmful interference to other spectrum users. On the contrary, it will reduce even the remote possibility of harmful interference because the number of base-station transmissions needed for a typical stolen vehicle recovery sequence will be reduced greatly, as described above. Because the possibility of interference is largely determined by power and proximity, it is the 300 watt (ERP) base-station sites, and not the 2 watt (ERP) transponder unit, that are of interest. The LJU transponder units would transmit an uplink message only in the event that the vehicle was being stolen, activated, or deactivated, and then as has been previously shown, will cause the base-station to cease activation (or deactivation) commands.

D. LoJack's Proposed Operations Would Be Consistent With The Existing Rule In All Respects Other Than Duty Cycle.

LoJack has designed its uplink transmissions to use 2 watts of power output (below the existing limit of 2.5 watts), an F1D/F2D emission designator, and a bandwidth of 20 kHz (below the existing limit of 25 kHz). Thus, the only change to the current rule needed to accommodate LoJack's proposed operations is a modified duty cycle, permitting mobile transmissions of 1800 milliseconds per 300 seconds.

E. Commission Precedent Provides Support For LoJack's Proposal.

As part of its general effort to avoid unnecessarily burdensome regulations, the Commission has been moving away from imposing rigid technical restrictions. Instead, where technical considerations indicate that interference likely can be avoided, the Commission has begun to employ a more flexible approach under which licensees are required to avoid harmful interference but are left to determine the best means for achieving that end. Similar flexibility is warranted in this case.

For example, in September of this year the Commission eliminated the duty cycle rule for the 218-219 MHz service.[3] Licensees in this service must design and operate their systems to avoid causing television interference. Id. It is up to the licensees themselves, however, to determine whether to employ duty cycle limitations, geographic restrictions, or other solutions to meet this objective.

Several notable parallels exist between the 218-219 MHz decision and the request in this Petition. In both cases, the potential recipient of interference is television receivers; in both, there is no reason to expect that the proposed change in the duty cycle limit will result in harmful interference under realistic operating conditions; in both, mobile units operate in relatively well-defined geographic areas, under the control of a specific entity; and in both, the licensee has an obligation to cure any interference that may be caused.

LoJack seeks for the SVRN service substantially less flexibility than was granted to the 218-219 MHz service. LoJack is requesting that the Commission expand the permissible duty cycles, not that it eliminate the duty cycle limitation altogether. Moreover, SVRN mobile units operate at lower power levels (2.5 watts maximum) than do 218-219 MHz mobile units (4 watts maximum). Having eliminated the duty cycle for the 218-219 MHz service, the Commission should not hesitate to grant the more limited relief that LoJack is requesting in this Petition.

III. CONCLUSION

LoJack's proposed uplink transmissions are fully consistent with the purposes of Section 90.20(e)(6) as well as with all but one of its technical parameters. Their authorization will promote the Commission's more general goal of efficient spectrum utilization and will serve the pubic interest by enhancing the effectiveness of vehicle recovery systems and by preserving police resources. LoJack, therefore, respectfully requests that the Commission adopt the rule change proposed in this Petition for Rulemaking.

Respectfully submitted,

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December 20, 1999

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[3] *Amendment of Part 95 of the Commission's Rules To Provide Regulatory Flexibility in the 218-219 MHz Service*, Report and Order and Memorandum Opinion and Order, WT Docket No. 98-169, FCC 99-239, at ¶ 101 (rel. Sept. 10, 1999).

Appendix A

TEXT OF PROPOSED RULE CHANGE

Authority: §§ 4, 251-2, 303, 309, and 332, 48 Stat. 1066, 1082, as amended; 47 U.S.C. §§ 154, 251-2, 303, 309 and 332.

Title 47 of the Code of Federal Regulations, Section 90.20(e)(6), is amended as follows:

Section 90.20 Public Safety Pool.

(e) * * *

(1) * * *

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(6) The frequency 173.075 MHz is available for stolen vehicle recovery systems on a shared basis with the Federal Government. Stolen vehicle recovery systems are limited to recovering stolen vehicles and are not authorized for general-purpose vehicle tracking or monitoring. Mobile transmitters operating on this frequency are limited to 2.5 watts power output and base transmitters are limited to 300 watts ERP. F1D and F2D emissions may be used within a maximum authorized kHz bandwidth. Transmissions from mobiles shall be limited to <u>either</u> 200 milliseconds every 15 seconds <u>or 1800 milliseconds every 300 seconds</u>, except that when a vehicle is being tracked actively, the transmissions occur 200 milliseconds every second for 30 minutes and then revert to 200 milliseconds every 15 seconds.